/// FZ0418310-E00MUM

ICF Trainset (Train 18) - Brake System
Maintenance / Use manual

Maintenance/Use manual

ECO/ECO: **.DC**
Compiled: **.**
Checked: **.**
Approved: .

Date: 09/09/2022 - Revision: A00
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WC-F-ENG-017A

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	09/09/2022	First release	.DC	.	.	.
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/// 1. SAFETY INSTRUCTIONS

1.1 PREFACE

The rules are integrating parts of this maintenance manual and are intended to provide the basic knowledge needed by staff involved in maintenance operations to avoid injuries, damage and environmental pollution.

The safety rules are subject to improvement by the operator or by the authority in charge of using and maintaining the vehicle. In particular, the factors that are not known at the release date (for example, real operating conditions, tools available, skills of personnel, etc.) must be considered before the operations are carried out.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, and however the notion of sound judgment applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

The device only be used, serviced and repaired by appropriately trained personnel. Otherwise, any warranty with respect to the terms of delivery will be forfeited.

This manual must be easily accessible to all involved personnel for immediate consultation. Personnel must be informed of the content of this manual before undertaking any actions.

It is compulsory that staff is aware of the legal conditions that relate to health and safety at work and accident prevention. Personnel must have the basic knowledge necessary in the operations' domain (mechanics, pneumatic system, transport, etc.).

Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.

The safety requirement comes in addition to safety rules on the site of intervention.

In addition to this manual, you must observe and apply the binding general statutory and other regulations on accident prevention and environmental protection.

Also, respective product manuals to be referred for conditions and usage specific to the product.

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1.2 SYMBOLS

Within this document, the risks are identified using specific warning notes as below symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

Note: A note indicates important information in the text!

1.3 PRELIMINARY OPERATION

The vehicle must be stopped and secured with the appropriate means to prevent it from moving on its own.

WARNING: some operations on the braking system can make it completely ineffective and make the vehicle free to move.

Generic risk

Indicate clearly the obvious warning signs that a maintenance action is in progress (for example, warning on the driver desk offices or the display panels) to prevent abnormal interference by other parties.

Before carrying out any actions, make sure that they do not present any risks for anyone else working on any other part of the vehicle.

In general, cleanliness must be guaranteed to avoid contamination by dust, dirt or other external agents.

Pressurised vessel

Before any intervention on the pneumatic parts, make sure that pressure devices are vented to atmosphere. During elements removal, pay attention to any potential residual pressure.

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Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipe works when the device is removed.

Before any intervention, make sure that the power is cut off.

1.4 PRECAUTIONS

The device must be used as specified in the designated system. Any other use is not allowed.

Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.

The device must be maintained when and as prescribed by Faiveley Transport. In case of doubt, stop the maintenance and consult the manufacturer for clarification.

For maintenance activities Faiveley Transport recommends using only original parts supplied by Faiveley Transport. This to be understood for all components and for those containing rubbers and degradable materials. Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.

Authorised personnel must carry out installation and maintenance.

For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.

Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

1.5 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

For operations on the roof, personnel must be secured with adequate means to prevent falling (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

For operations under the vehicle, personnel must wear protective helmet.

Generic risk

Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles. WARNING! The safety warning label could be missing.

While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapours and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

Flammable materials

When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

While cleaning or drying parts, do not use high-pressure air jets.

While cleaning filters or cooler fins, use adequate air aspirator.

Hot surface

Prior to undertaking any actions on parts that may be hot (disks, pads, coolers, etc.) make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

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While testing the components, never exceed the maximum operating pressure limits.

Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.6 FUNCTIONAL SAFETY

Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

Make sure that the air used to supply the system externally (e.g. through the Air Service Point Group) is dry and free from dirt and debris. The air supply quality MUST be class 5-3-4 according to NF F11100; otherwise the devices will be damaged.

After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

It is good practice not to exchange all the brake pads on the vehicle at the same time, as this may cause a quite reduced braking effectiveness. It must however be taken into due account that the pad exchange causes a temporary reduction of the braking performance.

1.7 ENVIRONMENTAL SAFETY

During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion. All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.8 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENTS

Use of product: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

Degraded conditions: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

Operating life: the system is designed for a life of 30 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring to zero the pressure and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

Maintenance: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

Replacement of parts: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

Modifications and repairs: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

Risks from pressure blow-off: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended. Caution! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

Residual risks: the following risks have not been considered during the design; therefore it is the responsibility of the user to take them into due account.

External fire: risks from external fire have not been considered.

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External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taking into account.

Misuse: no foreseeable misuse abuse has been identified and therefore has not been considered.

1.9 STORAGE CONDITIONS

All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust and temperature shocks.

Ambient temperature and relative humidity must be within the values prescribed inside the system maintenance manual. If no system maintenance manual is provided, the ambient temperature must be within 0°C and +25°C and the relative humidity must be within 10% and 65%.

Take care that the packaging is protected from rodents.

If out of their original packaging, equipment must be protected against bad weather (rain, snow, excessive humidity) and by light (UV).

Parts must be picked off the shelf in order of time of manufacture.

For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.

Rubber parts should be protected from direct sunlight or intense artificial light having a high ultra-violet content.

Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.

Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that can generate ozone, such as mercury lamps or high-voltage electrical equipment, giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.

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All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.

All the protective plugs must be removed only at the time of installation.

Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.

Blowholes of equipment must be turned downward, respect the position according to the sticker “up/down”.

During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap

1.10 SPECIFIC CONDITIONS

Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:

- pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
- prior to the installation of a pneumatic or electro-pneumatic component on the vehicle:
- if the date of manufacture or last overhaul dates back more than:

  6 months: safety valves;

  18 months: brake manipulator, distributor, emergency valves, magnet valves for brake control, safety valve and other functional valves;

  36 months: all other equipment

  - the equipment must undergo a functional test according to the applicable procedure. If the functional test fails, the product must be overhauled and then a functional test must be performed before installing it on the system.

  - if the component has not been used for more than the overhaul/replacement periodicity, it must be overhauled and then tested with the applicable functional test before the installation on the system or replaced with a new one if overhaul is not foreseen for the component.

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In the case of bogie brake equipment mounted on inoperative vehicle, perform every 3 months release brake of parking brake. Then carry out at least 10 brake / release actions of service brake in order to move the mechanical parts, visually check that brake pads are in contact with the disc during phases of braking. At the end of the checking, apply the parking brake.

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/// 2. GENERAL MAINTENANCE RULES

2.1 FOREWARD

These norms have the purpose of providing to the maintenance staff the main notions on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. Faiveley Transport cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

2.2 SCHEDULE

In the maintenance plan two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected.

This is since some parts degrade over time and not over travelled distance.

2.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

2.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

While cleaning filters or cooler fins, use adequate vacuum cleaner.

While cleaning or drying parts, do not use high-pressure air jets and/or water jets.

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2.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating.
- Damages to cables and connectors.
- Seizure of mechanical parts due to corrosion or lack of lubrication.
- Level of liquids (lubricant, coolant, etc.).
- Need to drain water/oil separators.

These operations must be carried out in optimum light conditions.

2.6 REMOVAL OF COMPONENTS FROM PANELS AND TRAIN

Operations must be carried out according to the specific instructions. In general, take care to the following points:

- before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

2.7 RE-INSTALLATION OF COMPONENTS ONTO PANELS AND TRAIN

Operations must be carried out according to the specific instructions. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- In case of mounting on pneumatic panel, replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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2.8 FUNCTIONAL CHECK / SYSTEM CALIBRATION

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Depending on the type of component that is replaced, a common functional check can be sufficient or more complex operations may be required: calibrations of other equipment, drainage, topping up, etc. The procedure to be carried out is prescribed in the product-relevant maintenance documentation.

2.9 REPLACEMENT OF FLEXIBLE HOSES

While installing a new flexible hose, the operator must avoid it is unduly torque, bent or pinched. Prior to installing it, it must be internally cleaned by using an air jet. If present, seals must be replaced. After installation, a leak test must be carried out.

2.10 COMPONENT OVERHAUL

Operations must be carried out according to the specific instructions. For the moment this activity is not foreseen by the car builder and the valves must returned to ***Faiveley Transport*** for overhauling.

2.11 RESERVOIRS

Unless otherwise prescribed, reservoirs and pressurised vessels are subject to periodic inspections and tests, in accordance with the applicable norms. It is the responsibility of the User, or the Authority in charge, to plan and carry out said inspections and tests, according to the applicable norms.

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2.12 TIGHTENING TORQUES

Unless otherwise specified, bolts, screws and nuts must be tightened according to the values given in the following tables.

"TIGHTENING TORQUES FOR HEX-SOCKET CAP BOLTS"

Thread	Nominal tightening torques for steel screws and bolts in Nm	
	Stainless	Zinc coated
	Bolt strength class	
	A2-70	8,8
	Nut strength class	
	R 50	R 80
M6×1	8	8,5
M8×1,25	19	20
M10×1,5	35	39
M12×1,75	64	66,8

"TIGHTENING TORQUES FOR COUNTERSUNK SCREWS"

Thread	Nominal tightening torques for steel screws and bolts in Nm	
	Stainless	Zinc coated
	Bolt strength class	
	A2-70	8,8
	Nut strength class	
	R 50	R 80
M6×1	9,5	10
M8×1,25	23	24
M10×1,5	46	47
M12×1,75	78	80

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"TIGHTENING TORQUES FOR HEXAGON HEAD BOLTS"

Thread	Head gauge (wrench Size) mm	Nominal tightening torques for steel screws and bolts in Nm					
		Stainless as per UNI 7323/8			Zinc coated		
		Bolt strength class					
		A2-50	A2-70	A2-80	5,8	8,8	10,9
		Nut strength class					
		R 50	R80		R50		R 80
M2	4				0,32	0,3	0,62
M2,3	4,5				0,51	0,5	1
M2,5	5				0,72	0,86	1,45
M3	5,5				1,12	1,35	2,25
M3,5	6				1,7	2	3,48
M4	7				2,5	3	4,2
M5	8-9				3,2	5,8	8,2
M6	10	4,9	7,4	11	4,4	7,4	11
M8	13	15	25	34	15	24	32
M10	17	32	51	73	31	49	70
M12	19	54	86	123	52	83	118
M14	22	90	147	206	87	142	196
M16	19	57	91	127	55	88	123
M16	24	-	221	304	-	211	294
M18	27	-	324	451	-	304	431
M20	30	-	451	628	-	431	598
M22	32	-	598	843	-	569	804
M24	36	-	755	1060	-	726	1020

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“TIGHTENING TORQUES FOR BOLTS USED WITH HELI-COIL INSERTS”

Thread	Tightening torques for 8-8 quality degree (Nm)
M4×0,7	2,5
M5×0,8	5,0
M6×1,0	8,6
M8×1,25	21,0
M10×15	42,0
M12×1,75	76,0
M14×2,0	121,0
M16×2,0	189,0
M18×2,5	261,0
M20×2,5	370,0
M22×2,5	510,0
M24×3,0	635,0
M27×3,0	945,0
M30×3,5	1280,0
M33×3,5	1740,0
M36×4,0	2230,0

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/// 3. GENERAL DESCRIPTION

ACRONYMS

AASU	Auxiliary Air Supply Unit
ACU	Auxiliary Compressor Unit
ADV	Auto Drain Valve
AGTU	Air Generation and Treatment Unit
AI	Analog Input
AO	Analog Output
AR	Auxiliary Reservoir
ASSY	Assembly
ATO	Automatic Train Operation
ATP	Automatic Train Protection
BCE	Brake Control Electronics
BOG ISO	Bogie Isolation EP Valve
BP	Brake Pipe
BSP	British Standard Pipe
CLP	Closed Line Parallel
DC	Direct Current
DCRV	Duty Cycle Regulating Valve
DE	Driver End
DI	Digital Input
DO	Digital Output
DTC	Driving Trailer Car
DBV	Driver's Brake Valve
EMU	Electric Multiple Unit
EP	Electro Pneumatic
EVAA	Automatic Coupling Magnet Valve
EVF	Elettro Valvola Fernatura (brake electro valve)
EVPB	Parking Brake apply Magnet Valve
EVIM	Brake Valve Isolating Magnet Valve
EVSF	Elettro Valvola SFernatura (release electro valve)
EVSB	Elettro Valvola Sblocco (unlock electro valve)
EVSOCC	Elettro Valvola Soccorso (safety electro valve)
GW	Graham White
HT	High Tone
ICF	Integral Coach Factor
LT	Low Tone
MP	Main Pipe
MR	Main Reservoir
MVB	Multi Vehicle Bus
MC	Motor Car
NC	Normally Closed
NDE	Non-Driving End
NDTC	Non Driving Trailer Car
PCF	Brake Cylinder Pressure Switch
PS	Suspension Pressure switch
PBPS	Parking Brake Pressure Switch
PWM	Pulse Width Modulation
RIPF	Brake Panel Main Air Supply Isolation Cut out cock

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RIBK	Brake Isolation Cut out cock
RIC	Brake Cylinder Cut out cock
RIS	Suspension Cut out cock
RIPB	Parking Brake Cut out cock
SS	Speed Sensor
TBA	To Be Allocated
TBD	To Be Defined
TC	Trailer Car
TCF	Brake Cylinder Pressure Transducer
TCMS	Train Control and Management System
TPL	Load Pressure Transducer
TPIL	Control Pressure transducer
Vdc	DC Voltage
VPR	Variable Pressure Regulator
WSP	Wheel Slide Protection
WSP BV	Anti-slide Magnet Valve - Brake Valve portion for Application
WSP EV	Anti-slide Magnet Valve - Exhaust Valve for Release

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3.1 INTRODUCTION

Wabtec Corporation has offered Brake System to Trainset (TRAIN 18) EMU built by ICF.
This document describes the document references and maintenance plan to be followed for the service of the Brake system supplied to Trainset EMU.

3.2 SYSTEM DETAILS

The train configuration for the TRAIN 18 EMU formation consist of two basic units ‘end basic unit’ and ‘middle basic unit’. Basic units comprising of DTC (Driving Trailer Car), MC (Motor Car) and TC (Trailer Car). The Configuration of the Trainset is DTC+8MCs+6TCs+DTC - 16 Car Formation.

Brake system overview as follows:

- The Bogie control logic (Independent control for each bogie).
- Brake function is managed by EP Brake unit (Brake panel) controlled by Brake Control Electronics (BCE).
- Each cars are fitted with Brake Control Unit (BCU) (installed inside vehicle cubicle).
- Brake unit assembly is mounted in the underframe of the car body.
- Wheel slide protection is managed by Dump valves controlled by WSP Electronics.
- Bogie is equipped with Wheel mounted disc brakes.
- WMD's are fitted at all wheel stations, in which parking brake actuators (P) are fitted 50%, 1 no. in each axle.
- Air Supply is managed by AGTU & ACU controlled by TCMS.
- ACU is used for Pantograph application.
- All motor car axles are driven and capable of producing Electro-dynamic brake effort.
- TC car is same as DTC car but without the cab equipment and Air Supply Unit.
- The Driver's cab has a Driver's Brake Valve (DBV) for applying and releasing backup brakes in-addition to a Power-Brake manipulator.
- Brake system can manage braking for Train operating at speed of 160 kmph.

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Features / Characteristics	Parameters
Lifetime	35 years
Number of days in Service	355 days
Average daily time of service operation	12 hours
Average commercial speed	120 kmph
Annual average mileage	500,000 km
Maximum operational speed	160 kmph
Maximum gradient	4%
Medium voltage supply	400V AC
Low voltage supply	110V DC
Network interface	RS485

3.3 TECHNICAL INFORMATION

System Technical Description document *"FZ0418310-E00TDE"* to be referred for the following details.

1) Train composition and features
2) Brake performance requirements
3) Brake architecture
4) Brake controls - functions and command

AGTU Technical Description document *"FZ0053718-100-E00TDE"* to be referred for the following details.

1) Characteristics of AGTU
2) AGTU - functions and command

Pneumatic schemes documents mentioned below to be referred for the Brake system.

1) *"FZ0418310-A00" Describes about the Train Set formation*
2) *"FZ0418310-A01" Shows the Pneumatic scheme of DTC car*
3) "FZ0418310-A02*"* Shows the Pneumatic scheme of MC car
4) "FZ0418310-A03*"* Shows the Pneumatic scheme of TC car
5) "FZ0418310-A04*"* Shows the Pneumatic scheme of NDTC car

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Bill of Materials document *"FZ0418310-E01BOM"* of Middle Basic Unit and "FZ0418310-E00BOM" of End Basic unit to be referred for the components used in the proposed Brake System.

Maintenance / Use manual of the components used in the Brake System to be referred for the following information of the product.

1) Precautions specific to product
2) Details of equipment
3) Maintenance prescriptions
4) Removal procedure
5) Installation procedure
6) Spare parts and consumables
7) Special tools
8) Disposal

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Product / Components use and first level maintenance details to be referred in document reference mentioned in the below table.

Ref.	Description	Code	Document ref
01.01	Duplex pressure gauge Ø80 scale 0÷12 bar [MR-BP]	FT0053800-100	FT0024834-100-E00MUM_C00
01.02	Pressure gauge Ø80 scale 0÷10 bar	FT0024835-100	FT0024834-100-E00MUM_C00
01.03	Duplex pressure gauge Ø80 scale 0÷12 bar [AR-BC]	FT0053800-101	FT0024834-100-E00MUM_C00
01.04	Pneumatic horn - LT	714 0011 00	714001000-E00MUM_A00
01.05	Pneumatic horn - HT	714 0010 00	714001000-E00MUM_A00
01.06	Hose assy 3/8" [length 3000 mm]	708 0144 00	FT0052371-000-E00MUM_B00
01.07	Hose assy 3/8" [length 1600 mm]	708 0096 00	FT0052371-000-E00MUM_B00
01.08	Hose assy 3/8" [length 2000 MM]	708 0099 00	FT0052371-000-E00MUM_B00
01.16	Guard emergency brake valve	FT0051058-A00	FT0051058-A00-E00MUM_A00
01.18	Driver's brake valve (backup brake)	FT0053712-100	FT0050803-100-E00MUM_B00
01.26	Horn control & backup brake module	FT0053354-100	FT0053354-100-E00MUM_A00
02.01	1-1/4” Cut off angle cock with vent - (MP)	607 0016 00	607001600-E00MUM_A00
02.03	1-1/4" Hose for dead movement (MP)	608 0010 00	FT0052371-000-E00MUM_B00
02.04	1-1/4” hose connection (MP)	608 0014 00	FT0052371-000-E00MUM_B00
02.07	Dummy coupling type "F" with chain	708 0108 00	Not Applicable
02.11	1-1/4” cut off angle cock with vent - (BP)	607 0015 00	607001500-E00MUM_A00
02.13	1-1/4" hose for dead movement (BP)	608 0011 00	FT0052371-000-E00MUM_B00
02.14	1-1/4” hose connection (BP)	608 0013 00	FT0052371-000-E00MUM_B00
02.15	Isolating cock 1" [W/O vent]	023 0170 00	FT0051880-100-E00MUM_B01
02.16	Isolating cock 1" [W/O vent]	023 0170 00	FT0051880-100-E00MUM_B01
03.01	Pressure transducer type F 4÷20 mA 0÷10 bar (with female connector)	2/520070	2_520076-E00MUM_A00
04.01	BCE with WSP	FT0027800-014	UM-457900_A05
04.02	BCE with WSP	FT0027800-018	UM-457900_A05
04.21	Brake module - DTC	FT0053702-100	FT0053702-100-E00MUM_A00
04.22	Brake module - MC, MC2, MC3	FT0053702-101	FT0053702-100-E00MUM_A00
04.23	Brake module - TC	FT0053702-102	FT0053702-100-E00MUM_A00
05.01	Air suspension frame assy - DE	FT0053353-100	FT0053353-100-E00MUM_A00
05.07	Air suspension frame assy - NDE	FT0053353-101	FT0053353-101-E00MUM_A00

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Ref.	Description	Code	Document ref
05.04	Levelling valve	038 0010 00	038001500-E00MUM_A00
05.16	Installation lever assy with ball and socket	FT0053176-101	Not Applicable
07.02	Phonic wheel	FT0053767-000	-
07.03	S-VEL Speed sensors (Current Output - Double Channel) with Shims	FT0053861-K00	FT0024981-101-E00MUM
07.11	Dump valve type DV12 dc (with bracket)	FT0051572-106	FT0126060-100-E00MUM
08.01	Auxiliary compressor frame assy	FT0053703-100	FT0053703-100-E00MUM_A00
08.16	3/8" isolating cock with drain	FT0053740-100	FT0051880-100-E00MUM_C00
13.01	Air generation and treatment unit	FT0053718-100	FT0053718-100-E00_A00
13.16	Main pipe reservoir 200 litres	FT0053704-100	FT0051876-000-E00MUM_A00
13.21	Automatic drain valve	010 0012 00	UM-010001200_0
13.23	3/4" isolating cock & micro switch	FT0050822-100	FT0050822-102-E00MUM_B00
13.29	1/2" drain cock - CLP	FT0051880-100	FT0051880-100-E00MUM_C00
13.30	Magnet valve with pipe bracket	013 0031 00	013003100-E00MUM_B01
13.195	Test point	FT0027358-000	Not Applicable
13.196	Pressure transducer - 4-20mA 0-16 bar (including female connector)	2/520076	2_520076-E00MUM_A00
14.06	Wheel mounted disc ø750	29003-IR	MM1-29003-01-EN-00
14.04	Set of brake pads	43152C0A64	Not Applicable
14.07	Brake caliper service brake (with C3 actuators)	FT0120441-101	VH/16/091
14.08	Brake caliper service + parking brake (with C3 actuators with parking brake and anti-compound)	FT0120441-100	VH/16/091
14.14	Hose assy - service brake	FT0053735-000	FT0052371-000-E00MUM_B00
14.15	Hose assy - parking brake	FT0053734-000	FT0052371-000-E00MUM_B00
03.04	Pressure switch (low threshold 4/ high threshold 4.5bar)	FT0054544-102	FT0020043-117-E00MUM_C00
13.35	Pressure switch (low threshold 7.5/ high threshold 10bar)	FT0054544-101	FT0020043-117-E00MUM_C00
13.36	Pressure switch (low threshold 6.5/ high threshold 7.0bar)	FT0054544-103	FT0020043-117-E00MUM_C00
20.01	Isolation cock 1/4"	2/515252	FT0051880-100-E00MUM_C00

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/// 4. MAINTENANCE PLAN

Maintenance schedule proposed here is based upon the best knowledge so far acquired. It must be updated / changed properly, should this necessity become evident from the service exploitation, especially where safety is concerned.

This section contains the indications of the recommended timing to carry out the maintenance task. The tasks described hereafter have been studied for the typical mission profile here shown and the peculiar environment of ICF Trainset (Train 18) project.

Annual Mileage	500,000 km
Operating service hours	12 hours
Compressors duty cycle	-

IMPORTANT!

The timing indicated both in terms of mileage and in terms of calendar time. The one occurring first must be observed. Every task includes the tasks occurring at higher frequency.

The proposed maintenance schedule takes into account regular service conditions. More severe operational and environmental circumstances may require more frequent tasks.

A tolerance of +10% is admitted, if evidence from field proves this is sustainable with no adverse effects on safety and/or reliability

No special cleaning operations have been considered, however, depending on the installation on the vehicle, it could be necessary to remove regularly the possible deposits of dirt and debris that may affect the equipment's functionality.

Make sure that the air used to supply the system externally is dry and free from dirt and debris. The air supply quality MUST be class **5-3-4** according to **ISO 8573-1**, otherwise the devices will be damaged.

After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality

For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

Generic risk

CAUTION!

Overhaul or replacement periodicity must include both the years of functioning and the years of storage on-the-shelf or mounting on inoperative vehicles.

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
01.01	I	Duplex pressure gauge Ø80 scale 0÷12 bar [MR-BP]	FT0053800-100	Replacement			P			R			
01.02	I	Pressure gauge Ø80 scale 0÷10 bar	FT0024835-100	Replacement			P			R			
01.03	I	Duplex pressure gauge Ø80 scale 0÷12 bar [AR-BC]	FT0053800-101	Replacement			P			R			
01.04	I	Pneumatic horn - LT	714 0011 00	Replacement									
01.05	I	Pneumatic horn - HT	714 0010 00	Replacement									
01.06	I	Hose assy 3/8" [length 3000 mm]	708 0144 00	Replacement		V				R			
01.07	I	Hose assy 3/8" [length 1600 mm]	708 0096 00	Replacement		V				R			
01.08	I	Hose assy 3/8" [length 2000 mm]	708 0099 00	Replacement		V				R			
01.16	I	Guard emergency brake valve	FT0051058-A00	Repair			P			O			
01.18	I	Driver's brake valve (backup brake)	FT0053712-100	Replacement						O			
01.26	I	Horn control & backup brake module	FT0053354-100										
01.03	II	Magnet valve assy (3/2, NC)	018 1050 00	Repair			P			O			
01.04	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
01.08	II	Check valve 3/4"	FT0051874-100	Repair						O			
01.19	II	Filter	FT0051672-100	Replacement	P		P						
01.20	II	Reservoir 2 litres	FT0053729-000	Replacement		P						O	
01.21	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
01.22	II	P1K relay valve	781 121 03 08	Repair						O			
01.23	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
01.24	II	Brake valve isolator	FT0053756-100	Repair						O			
01.25	II	Pressure regulator 5.0 bar set	AB746-W15	Repair			P			O			
02.01	I	1-1/4" cut off angle cock with vent - (MP)	607 0016 00	Replacement			P						
02.03	I	1-1/4" hose for dead movement (MP)	608 0010 00	Replacement		V							
02.04	I	1-1/4" hose connection (MP)	608 0014 00	Replacement		V				R			

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
02.07	I	Dummy coupling type "F" with chain	708 0108 00	Replacement									
02.11	I	1-1/4" cut off angle cock with vent - (BP)	607 0015 00	Replacement			P						
02.13	I	1-1/4" hose for dead movement (BP)	608 0011 00	Repair		V				R			
02.14	I	1-1/4" hose connection (BP)	608 0013 00	Repair		V				R			
02.15	I	Isolating cock 1" [W/O vent]	023 0170 00	Replacement			P						
02.16	I	Isolating cock 1" [W/O vent]	023 0170 00	Replacement			P						
03.01	I	Pressure transducer type F 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.01	I	BCE1 with WSP1	FT0027800-014	Repair									
04.02	I	BCE2 with WSP2	FT0027800-018	Repair									
04.21	I	Brake module - DTC	FT0053702-100										
03.02	II	Test point	FT0027358-000	Replacement									
04.07	II	Filter	FT0044798-100	Replacement	P		P						
04.48	II	Check valve 3/4"	FT0051874-100	Repair						O			
04.08	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
04.33	II	Check valve 1/2"	FT0051875-100	Repair						O			
04.35	II	Variable pressure regulator (setting TBD)	FT0053765-102	Repair			P			O			
04.40	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.42	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
05.02	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
04.31	II	Test point	FT0027358-000	Replacement									
04.34	II	EP valve (application) EVF	2/518056	Replacement			P			R			
04.36	II	EP valve (release) EVSF	2/515811	Replacement			P			R			
04.37	II	Magnet valve Type 3/2 - VE3 (emergency) EVSOCC	781 120 07 08	Replacement			P			R			

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
04.47	II	EP valve (EVSB)	2/515814	Replacement			P			R			
04.38	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.12	II	Test point	FT0027358-000	Replacement									
04.15	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P						
04.16	II	Drain cock 1/2"	FT0051880-100	Replacement									
04.24	II	Test point	FT0027358-000	Replacement									
04.30	II	Test point	FT0027358-000	Replacement									
04.32	II	N-JMR distributor (set 4.5 bar)	728 835 16 48	Replacement			P			O			
04.39	II	Averaging relay valve	AB 587-T6	Repair						O			
04.41	II	Two control port relay valve (P2K)	784 053 01 08	Repair			P			O			
04.51	II	Pressure regulator	FT0051995-101	Repair			P			O			
05.03	II	Test point	FT0027358-000	Replacement									
05.08	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P					O	
05.09	II	Charging check valve 7,8 bar set	AB746-W20/BFX	Replacement			P			R			
05.12	II	Drain cock 1/2"	FT0051880-100	Replacement									
05.14	II	Flanged load simulation test point (T-test point)	FT0013186-000	Replacement									
06.01	II	Pressure regulator [6.5 bar]	FT0051995-105	Repair			P			O			
06.02	II	Test point	FT0027358-000	Replacement									
06.04	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
06.05	II	Pressure switch (PBPS) 5.2/6.0 bar	FT0051877-203	Replacement			P			R			
06.06	II	Bistable magnet valve 110 Vdc	013 0065 00	Repair						O			
07.09	II	Pressure switch assy (PCF)	FT0051877-200	Replacement			P			R			
04.22	I	Brake module - MC, MC2, MC3	FT0053702-101										
04.07	II	Filter	FT0044798-100	Replacement	P		P						
04.48	II	Check valve 3/4"	FT0051874-100	Repair						O			
04.08	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
04.33	II	Check valve 1/2"	FT0051875-100	Repair						O			

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
04.35	II	Variable pressure regulator (setting TBD)	FT0053765-103	Repair			P			O			
04.40	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.42	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
05.02	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
04.31	II	Test point	FT0027358-000	Replacement									
04.34	II	EP valve (application) EVF	2/518056	Replacement			P			R			
04.36	II	EP valve (release) EVSF	2/515811	Replacement			P			R			
04.37	II	EP valve (emergency) EVSOCC - Type VE3	781 120 07 08	Replacement			P			R			
04.47	II	EP valve (EVSB)	2/515814	Replacement			P			R			
04.38	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.12	II	Test point	FT0027358-000	Replacement									
04.15	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P						
04.16	II	Drain cock 1/2"	FT0051880-100	Replacement									
04.24	II	Test point	FT0027358-000	Replacement									
04.30	II	Test point	FT0027358-000	Replacement									
04.32	II	N-JMR distributor (setting 4.5 bar)	728 835 16 48	Replacement			P			O			
04.39	II	Averaging relay valve	AB 587-T6	Repair						O			
04.41	II	Two control port relay valve (P2K)	784 053 01 08	Repair			P			O			
04.51	II	Pressure regulator	FT0051995-105	Repair			P			O			
05.03	II	Test point	FT0027358-000	Replacement									
05.08	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P					O	
05.09	II	Charging check valve 7,8 bar set	AB746-W20/BFX	Replacement			P			R			
05.12	II	Drain cock 1/2"	FT0051880-100	Replacement									
05.14	II	Flanged load simulation test point (T-test point)	FT0013186-000	Replacement									
06.01	II	Pressure regulator [6.5 bar]	FT0051995-105	Repair			P			O			

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
06.02	II	Test point	FT0027358-000	Replacement									
06.04	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
06.05	II	Pressure switch (PBPS) 5.2/6.0 bar	FT0051877-203	Replacement			P			R			
06.06	II	Latched solenoid valve	013 0065 00	Repair						O			
07.09	II	Pressure switch assy (PCF)	FT0051877-200	Replacement			P			R			
04.23	I	Brake module - TC	FT0053702-102										
04.07	II	Filter	FT0044798-100	Replacement	P		P						
04.48	II	Check valve 3/4"	FT0051874-100	Repair						O			
04.08	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
04.33	II	Check valve 1/2"	FT0051875-100	Repair						O			
04.35	II	Variable pressure regulator (setting TBD)	FT0053765-104	Repair			P			O			
04.40	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.42	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
05.02	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
04.31	II	Test point	FT0027358-000	Replacement									
04.34	II	EP valve (application) EVF	2/518056	Replacement			P			R			
04.36	II	EP valve (release) EVSF	2/515811	Replacement			P			R			
04.37	II	EP valve (emergency) EVSOCC	781 120 07 08	Replacement			P			R			
04.47	II	EP valve (EVSB)	2/515814	Replacement			P			R			
04.38	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.12	II	Test point	FT0027358-000	Replacement									
04.15	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P						
04.16	II	Drain cock 1/2"	FT0051880-100	Replacement									
04.24	II	Test point	FT0027358-000	Replacement									
04.30	II	Test point	FT0027358-000	Replacement									
04.32	II	N-JMR distributor (set 4.5 bar)	728 835 16 48	Replacement			P			O			
04.39	II	Averaging relay valve	AB 587-T6	Repair						O			

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
04.41	II	Two control port relay valve (P2K)	784 053 01 08	Repair			P			O			
04.51	II	Pressure regulator	FT0051995-105	Repair			P			O			
05.03	II	Test point	FT0027358-000	Replacement									
05.08	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P					O	
05.09	II	Charging check valve 7,8 bar set	AB746-W20/BFX	Replacement			P			R			
05.12	II	Drain cock 1/2"	FT0051880-100	Replacement									
05.14	II	Flanged load simulation test point (T-test point)	FT0013186-000	Replacement									
06.01	II	Pressure regulator [6.5 bar]	FT0051995-105	Repair			P			O			
06.02	II	Test point	FT0027358-000	Replacement									
06.04	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
06.05	II	Pressure switch (PBPS) 5.2/6.0 bar	FT0051877-203	Replacement			P			R			
06.06	II	Latched solenoid valve	013 0065 00	Repair						O			
07.09	II	Pressure switch assy (PCF)	FT0051877-200	Replacement			P			R			
04.25	I	Brake module - NDTC	FT0053702-103										
04.07	II	Filter	FT0044798-100	Replacement	P		P						
04.48	II	Check valve 3/4"	FT0051874-101	Repair						O			
04.08	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
04.33	II	Check valve 1/2"	FT0051875-100	Repair						O			
04.35	II	Variable pressure regulator (setting TBD)	FT0053765-105	Repair			P			O			
04.40	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.42	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
05.02	II	Isolating cock 3/4" vented	FT0050522-102	Repair			P			O			
04.31	II	Test point	FT0027358-000	Replacement									
04.34	II	EP valve (application) EVF	2/518056	Replacement			P			R			
04.36	II	EP valve (release) EVSF	2/515811	Replacement			P			R			
04.37	II	EP valve (emergency) EVSOCC	781 120 07 08	Replacement			P			R			

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
04.47	II	EP valve (EVSB)	2/515814	Replacement			P			R			
04.38	II	Pressure transducer 4÷20 mA 0÷10 bar (with female connector)	2/520070	Replacement									
04.12	II	Test point	FT0027358-000	Replacement									
04.15	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P						
04.16	II	Drain cock 1/2"	FT0051880-100	Replacement									
04.24	II	Test point	FT0027358-000	Replacement									
04.30	II	Test point	FT0027358-000	Replacement									
04.32	II	N-JMR distributor (set 4.5 bar)	TBD	Replacement			P			O			
04.39	II	Averaging relay valve	AB 587-T6	Repair						O			
04.41	II	Two control port relay valve (P2K)	784 053 01 08	Repair			P			O			
04.51	II	Pressure regulator	FT0051995-105	Repair			P			O			
05.03	II	Test point	FT0027358-000	Replacement									
05.08	II	ST. Steel reservoir 70L	FT0051876-000	Replacement			P					O	
05.09	II	Charging check valve 7,8 bar set	AB746-W20/BFX	Replacement			P			R			
05.12	II	Drain cock 1/2"	FT0051880-100	Replacement									
05.14	II	Flanged load simulation test point (T-test point)	FT0013186-000	Replacement									
06.01	II	Pressure regulator [6.5 bar]	FT0051995-105	Repair			P			O			
06.02	II	Test point	FT0027358-000	Replacement									
06.04	II	Cut-out cock with drain and micro	FT0050523-100	Replacement			P			O			
06.05	II	Pressure switch (PBPS) 5.2/6.0 bar	FT0051877-203	Replacement			P			R			
06.06	II	Latched solenoid valve	013 0065 00	Repair						O			
07.09	II	Pressure switch assy (PCF)	FT0051877-200	Replacement			P			R			
05.01	I	Air suspension frame assy - DE	FT0053353-100										
05.05	II	Duplex check valve	FT0054993-100	Repair						O			
05.06	II	1/2" isolating cock with drain & micro switch	FT0050822-102	Repair			P			O			
05.13	II	Test point 1/4" BSP	FT0027358-000	Replacement									

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
05.18	II	Surge reservoir 50 litres	FT0053771-000	Replacement			P					O	
05.19	II	Drain valve	702 0160 00	Replacement			P			R			
04.45	II	1/2" isolating cock with drain & micro switch	FT0050822-102	Repair			P			O			
07.10	II	Dump valve type DV 12 PT (with support)	FT0105131-100	Replacement						R			
05.07	I	Air suspension frame assy - NDE	FT0053353-101										
05.05	II	Duplex check valve	FT0054993-100	Repair						O			
05.06	II	1/2" isolating cock with drain & micro switch	FT0050822-103	Repair			P			O			
05.13	II	Test point 1/4" BSP	FT0027358-000	Replacement									
05.18	II	Surge reservoir 50 litres	FT0053771-000	Replacement			P					O	
05.19	II	Drain valve	702 0160 00	Replacement			P			R			
04.45	II	1/2" isolating cock with drain & micro switch	FT0050822-103	Repair			P			O			
07.10	II	Dump valve type DV 12 PT (with support)	FT0105131-100	Replacement						R			
05.04	I	Levelling valve	038 0010 00	Repair			P			O			
05.16	I	Installation lever assy with ball and socket	FT0053176-101	Replacement									
07.02	I	Phonic wheel	FT0053767-000	Replacement									
07.03	I	S-VEL speed sensors (current output - double channel) with Shims	FT0053861-K00	Replacement									
07.11	I	Dump valve type DV 12 PT (with support)	FT0051572-106	Replacement						R			
08.01	I	Auxiliary compressor frame assy	FT0053703-100										
08.02	II	ACU manifold assembly	FT0053737-100										
08.03	II	Check valve 1/2"	-	Repair						O			
08.04	II	Safety valve set AT 8.5 bar	024 0030 00	Replacement			P		R				
08.05	II	Air filter	-	Replacement	P								

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
08.06	II	Test point	FT0027358-000	Replacement									
08.07	II	Pressure switch 5.3 bar to 7.5 bar	FT0053738-000	Replacement			P			R			
08.09	II	Reservoir 25L	FT0053705-000	Replacement			P					O	
08.10	II	Screwed vented plug	016 8120 00	None									
08.11	II	Auxiliary compressor buran 0	FT0026423-102	Repair		P	P			O			
08.12	II	Vibration damper	FT0039890-000	Replacement						R			
08.13	II	Hose	FT0052371-000	Replacement			V			R			
08.14	II	3/8" isolating cock with drain	FT0053740-000	Replacement			P			O			
08.15	II	Seal (for 1/2" BSP thread)	0018-16S	None									
08.16	I	3/8" isolating cock with drain	FT0053740-100	Replacement			P			O			
13.01	I	Air generation and treatment unit	FT0053718-100				P						
13.11	II	Motor compressor buran 10 6P	FT0044547-100	Repair			P			O			
13.12	II	Air dryer (GW model 975)	FT0053022-100	Repair	P		P		O				
13.13	II	Final filter	FT0051762-100	Repair			P		O				
13.14	II	Safety valve 11.0 bar set	FT0052383-100	Replacement			P			R			
13.15	II	Minimum pressure valve	2/517329	Replacement						R			
13.18	II	Air intake filter	1/320658	Replacement	P		P						
13.20	II	Hose	FT0052297-000	Replacement			V			R			
13.24	II	Water seperator	FT0053017-100	Repair			P		O				
13.25	II	Drain valve for water seperator	FT0025443-102	Replacement						R			
13.26	II	Test point	FT0027358-000	Replacement									
13.16	II	Main pipe reservoir 200 litres	FT0053704-100	None			P						
13.21	II	Automatic drain valve	010 0012 00	Repair					O				
13.23	II	3/4" isolating cock & micro switch	FT0050822-100	Repair			P			O			
13.29	II	1/2" drain cock - CLP	FT0051880-100	Replacement									
13.30	II	Magnet valve with pipe bracket	013 0031 00	Repair						O			
13.31	II	Electric box assembly - hour counter	FT0055157-100										
13.195	I	Test point	FT0027358-000	Replacement									
13.196	I	Pressure transducer - 4-20mA 0-16 bar	2/520076	Replacement									

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Ref.	BOM Level.	Description	Code	Corrective Maintenance	Interval in years								
					0.17	0.5	1	2	4	6	8	12	16
14.06	I	Wheel mounted disc Ø750	29003-IR	Replacement	P		P						
14.04	I	Set of brake pads	43152C0A64	Replacement									
14.07	I	Brake caliper service brake (with C3 actuators)	FT0120441-101	Replacement	P		P			R			
14.08	I	Brake caliper service + parking brake (with C3 actuators with parking brake and antl-compound)	FT0120441-100	Replacement	P		P			R			
14.14	I	Hose assy - service brake	FT0053735-000	Replacement		V				R			
14.15	I	Hose assy - parking brake	FT0053734-000	Replacement		V				R			
20.01	I	Isolation cock 1/4"	2/515252	Replacement			P						
03.04	I	Pressure switch (low threshold 4/ high threshold 4.5bar)	FT0054544-102	Replacement			P			R			
13.35	I	Pressure switch (low threshold 7.5/ high threshold 10bar)	FT0054544-101	Replacement			P			R			
13.36	I	Pressure switch (low threshold 6.5/ high threshold 7.0bar)	FT0054544-103	Replacement			P			R			

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Abbreviations:

V: Visual inspection
P: Preventive maintenance
O: Overhaul
R: Replace

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Rev : A01
Date : 03.11.2022

Vande Bharat - Brake System - User Manuals

Sl No	Scheme Ref.	User Manual reference	Type	Description	Part Number
1	01.01	FT0024834-100-E00MUM_D00	MUM	DUPLEX PRESSURE GAUGE Ø80 SCALE 0÷12 bar [MR-E	FT0053800-100
2	01.02	FT0024834-100-E00MUM_D00	MUM	PRESSURE GAUGE Ø80 SCALE 0÷10 bar	FT0024835-100
3	01.03	FT0024834-100-E00MUM_D00	MUM	DUPLEX PRESSURE GAUGE Ø80 SCALE 0÷12 bar [AR-B	FT0053800-101
4	01.04	714001000-E00MUM_A00	MUM	PNEUMATIC HORN - LT	714 0011 00
5	01.05	714001000-E00MUM_A00	MUM	PNEUMATIC HORN - HT	714 0010 00
6	01.06	FT0052371-000-E00MUM_C00	MUM	HOSE ASSY 3/8" [LENGTH 3000 MM]	708 0144 00
7	01.07	FT0052371-000-E00MUM_C00	MUM	HOSE ASSY 3/8" [LENGTH 1600 MM]	708 0096 00
8	01.08	FT0052371-000-E00MUM_C00	MUM	HOSE ASSY 3/8" [LENGTH 2000 MM]	708 0099 00
9	02.03	FT0052371-000-E00MUM_C00	MUM	1-1/4" HOSE FOR DEAD MOVEMENT (MP)	608 0010 00
10	02.04	FT0052371-000-E00MUM_C00	MUM	1-1/4" HOSE CONNECTION (MP)	608 0014 00
11	02.13	FT0052371-000-E00MUM_C00	MUM	1-1/4" HOSE FOR DEAD MOVEMENT (BP)	608 0011 00
12	02.14	FT0052371-000-E00MUM_C00	MUM	1-1/4" HOSE CONNECTION (BP)	608 0013 00
13	14.14	FT0052371-000-E00MUM_C00	MUM	HOSE ASSY - SERVICE BRAKE	FT0053735-000
14	14.15	FT0052371-000-E00MUM_C00	MUM	HOSE ASSY - PARKING BRAKE	FT0053734-000
15	01.16	FT0051058-A00-E00MUM_A00	MUM	GUARD EMERGENCY BRAKE VALVE	FT0051058-A00
16	01.18	FT0050803-100-E00MUM_C00	MUM	DRIVER'S BRAKE VALVE (BACKUP BRAKE)	FT0053712-100
17	01.26	FT0053354-100-E00MUM_A00	MUM	HORN CONTROL & BACKUP BRAKE MODULE	FT0053354-100
18	02.01	607001500-E00MUM_A00	MUM	1-1/4" CUT OFF ANGLE COCK WITH VENT - (MP)	607 0016 00
19	02.11	607001500-E00MUM_A00	MUM	1-1/4" CUT OFF ANGLE COCK WITH VENT - (BP)	607 0015 00
20	02.15 02.16	FT0051880-100-E00MUM_D00	MUM	ISOLATING COCK 1" [W/O VENT]	023 0170 00
21	08.16	FT0051880-100-E00MUM_D00	MUM	3/8" ISOLATING COCK WITH DRAIN	FT0053740-100
22	08.14	FT0051880-100-E00MUM_D00	MUM	3/8" ISOLATING COCK WITH DRAIN	FT0053740-000
23	20.01	FT0051880-100-E00MUM_D00	MUM	ISOLATION COCK 1/4"	2/515252
24	13.29	FT0051880-100-E00MUM_D00	MUM	1/2" DRAIN COCK - CLP	FT0051880-100
25	04.21	FT0053702-100-E00MUM_A00	MUM	BRAKE MODULE - DTC	FT0053702-100
26	04.22	FT0053702-100-E00MUM_A00	MUM	BRAKE MODULE - MC, MC2, MC3	FT0053702-101
27	04.23	FT0053702-100-E00MUM_A00	MUM	BRAKE MODULE - TC	FT0053702-102
28	04.25	FT0053702-100-E00MUM_A00	MUM	BRAKE MODULE - NDTC	FT0053702-103
29	05.01	FT0053353-100-E00MUM_A00	MUM	AIR SUSPENSION FRAME ASSY - DE	FT0053353-100
30	05.07	FT0053353-100-E00MUM_A00	MUM	AIR SUSPENSION FRAME ASSY - NDE	FT0053353-101
31	05.04	038001500-E00MUM_B00	MUM	LEVELLING VALVE	038 0010 00
32	08.01	FT0053703-100-E00MUM_A00	MUM	AUXILIARY COMPRESSOR FRAME ASSY	FT0053703-100
33	01.20	FT0051876-000-E00MUM_B00	MUM	RESERVOIR 2 LITERS	FT0053729-000
34	08.09	FT0051876-000-E00MUM_B00	MUM	RESERVOIR 25L	FT0053705-000
35	05.18	FT0051876-000-E00MUM_B00	MUM	SURGE RESERVOIR 50 LITERS	FT0053771-000
36	13.16	FT0051876-000-E00MUM_B00	MUM	MAIN PIPE RESERVOIR 200 LITERS	FT0053704-100
37	03.04	FT0020043-117-E00MUM_D00	MUM	PRESSURE SWITCH (Low Threshold 4/ High Threshold	FT0054544-102
38	13.35	FT0020043-117-E00MUM_D00	MUM	PRESSURE SWITCH (Low Threshold 7.5/ High Threshol	FT0054544-101
39	13.36	FT0020043-117-E00MUM_D00	MUM	PRESSURE SWITCH (Low Threshold 6.5/ High Threshol	FT0054544-103
40	08.07	FT0020043-117-E00MUM_D00	MUM	PRESSURE SWITCH 5.3 bar to 7.5 bar	FT0053738-100

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Vande Bharat - Brake System - User Manuals					
Sl No	***Scheme Ref.***	***User Manual reference***	***Type***	***Description***	***Part Number***
41	04.01	UM-457900_A05	MUM	BCE with WSP	FT0027800-014
42	04.02	UM-457900_A05	MUM	BCE with WSP	FT0027800-018
43	07.02	1-449195-E00MUM_A00	MUM	PHONIC WHEEL	FT0053767-000
44	07.03	FT0024981-101-E00MUM_A00	MUM	S-VEL SPEED SENSORS (Current Output - Double Chann	FT0053861-K00
45	07.11	FT0126060-100-E00MUM_A00	MUM	DUMP VALVE TYPE DV12 DC (WITH BRACKET)	FT0051572-106
46	13.21	UM-010001200_0	MUM	AUTOMATIC DRAIN VALVE	010 0012 00
47	14.06	MM1-29003-01-EN-00	MUM	WHEEL MOUNTED DISC Ø750	29003-IR
48	14.07	VH/16/091	MUM	BRAKE CALIPER SERVICE BRAKE (WITH C3 ACTUATORS	FT0120441-101
49	14.08	VH/16/091	MUM	BRAKE CALIPER SERVICE + PARKING BRAKE (WITH C3 A	FT0120441-100
50	13.01	FT0053718-100-E00MUM_A00	MUM	AIR GENERATION AND TREATMENT UNIT	FT0053718-100
51	13.23	FT0050822-102-E00MUM_C00	MUM	3/4" ISOLATING COCK & MICRO SWITCH	FT0050822-100
52	13.30	013003100-E00MUM_B01	MUM	MAGNET VALVE WITH PIPE BRACKET	013 0031 00
53	13.196	2_520076-E00MUM_A00	MUM	PRESSURE TRANSDUCER - 4-20mA 0-16 BAR(INCLUDIN	2/520076
54	03.01	2_520076-E00MUM_A00	MUM	PRESSURE TRANSDUCER TYPE F 4÷20 mA 0÷10 bar (WI	2/520070

01.01_01.02_01.03 Duplex pressure gauge

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/// FT0024834-100-E00MUM

DUPLEX PRESSURE GAUGE
FT0024834-100
FT0054503-100
FT0053800-101
FT0053800-100
PRESSURE GAUGE
FT0024835-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0024834-100-E00MUM.docx	D00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	11/05/2016	NEW RELEASE	.	SRC	.MK	. VK
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
C00	12/10/2021	New P/N added: FT0054503-100, FT0054503-100	DRC 1922	VP	.KMS	.BSH
D00	01/11/2022	Document updated with new template and added new P/Ns: FT0053800-101, FT0053800-100 and FT0024835-100	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Duplex Pressure Gauge is an instrument used to measure the pressure in a pneumatic circuit.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

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- Prior to accessing the electric parts, make sure the power is duly switched off.
- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.
- For operations under the vehicle, personnel must wear protective helmet.
- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.
- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.
- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.
- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).
- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.
- While testing the components, never exceed the maximum operating pressure limits.
- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.
- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

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1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.
- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.
- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.
- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.
- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and

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dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

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Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +47°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;

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- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +47°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to + 47°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from +3°C to 25°C during 3 months maximum and also, in summer from +25°C to +47°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Duplex Pressure Gauge must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Duplex Pressure Gauge and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Duplex Pressure Gauge for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
AR	Auxiliary Reservoir
BC	Brake Cylinder
DC	Direct Current
LED	Light Emitting Diode
OD	Outer Diameter
P/N	Part number
QTY	Quantity
V	Voltage

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Duplex Pressure Gauge is an instrument used to measure the pressure in a pneumatic circuit.

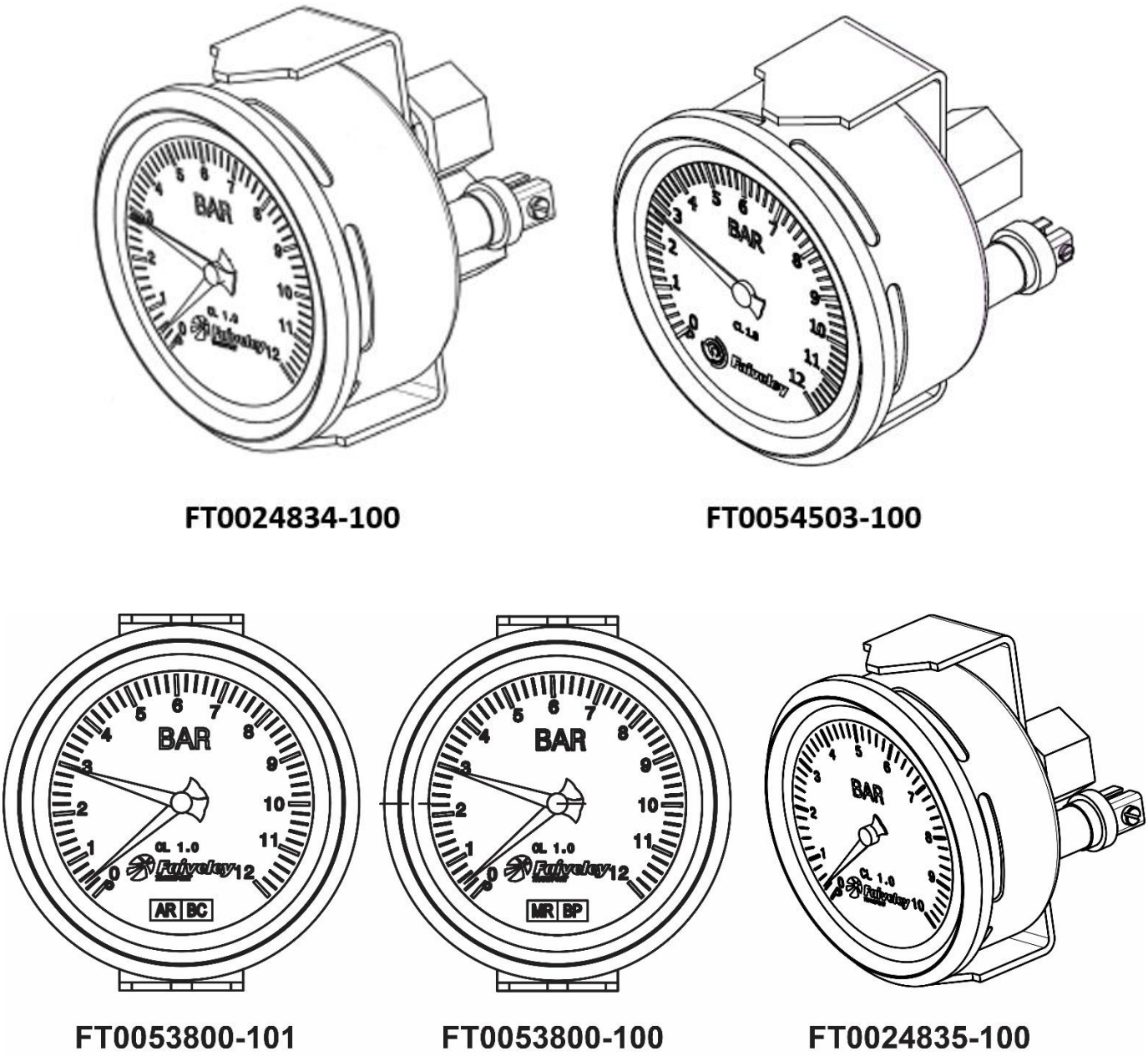

Figure 1a - Duplex Pressure Gauge, Isometric view

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Figure 1b - CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	FT0024834-100	FT0054503-100	FT0053800-101	FT0053800-100	FT0024835-100
Max operating pressure	10 bar	10 bar	10 bar	10 bar	10 bar
Working pressure range	0-12 bar	0-12 bar	0-12 bar	0-12 bar	0-10bar
Number of pointers	2	1	2	2	1
Port connections	M16x1.5x10 OD pipe	M16x1.5x10 OD pipe	M16x1.5x10 OD pipe	M16x1.5x10 OD pipe	M16x1.5x10 OD pipe
Range	0-12 bar	0-12 bar	0-12 bar	0-12 bar	0-10bar
Direct illumination	with 110 V DC LED	LED-LAMP WHITE, TYPE BA9s 60-150V AC/DC	with 110 V DC LED	with 110 V DC LED	with 110 V DC LED
Diameter	80mm	80mm	80mm	80mm	80mm

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/// 3. OPERATIONS

Refer to Figure 2

The Duplex Pressure Gauge is used to monitor and indicate the air pressure of AR and BC.

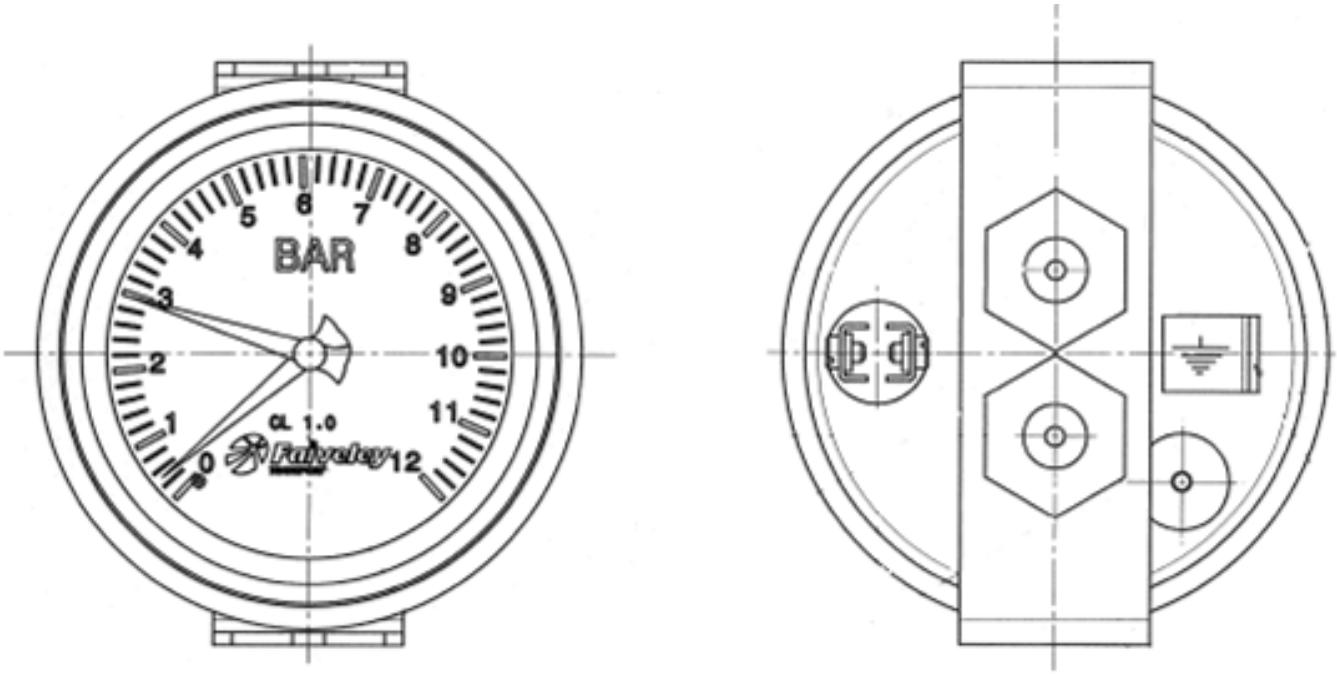

Figure 2 - Duplex Pressure Gauge, Normal Condition

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

No tools are required.

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME.	APPLICATION
Loctite 242 or 243	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be maintained regularly as required by the Operator's rules; the mission profile and the environmental conditions. Typical functional test periodicity: 1 year. (refer section 5.2.1).

2. Second Level Maintenance: replacement as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be replaced regularly as required by the Operator's rules; the mission profile and the environmental conditions.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

Refer to Figure 3

The correct calibration can be verified with a test bench, as shown below. Indicative schematics of the test bench:

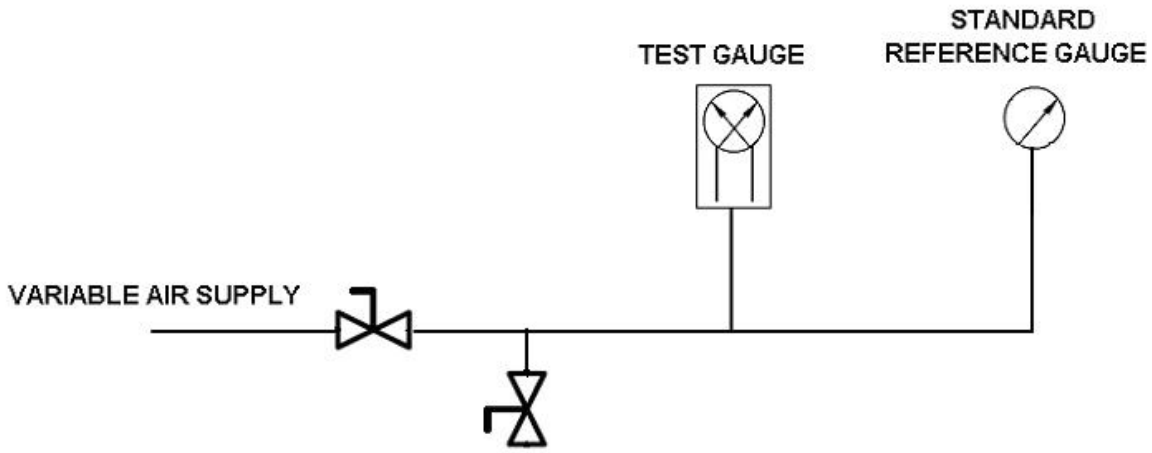

Figure 3 - Duplex Pressure Gauge, Indicative Schematics of the test bench

NOTE: The precision of the reference device must be at least four times better than the precision of the device under test. The pneumatic ports must be at the same height.

Perform a series of measures for several points distributed evenly over the range of the gauge (from zero to full-scale included) and record the results. The maximum error must be within the acceptability criteria shown in the table below (values in bar).

Numeration field	Precision class				
	0.25	0.6	1	1.6	2.5
	Absolute acceptable uncertainty limit				
0 - 6	± 0.015	± 0.036	± 0.06	± 0.096	± 0.15
0 - 10	± 0.025	± 0.06	± 0.1	± 0.16	± 0.25
0 - 16	± 0.04	± 0.1	± 0.16	± 0.26	± 0.4

In case the pressure gauge is not calibrated, it must be sent to the manufacturer WABTEC for inspection and control.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch of power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 4

1. Unscrew the nuts (5) and disconnect the pneumatic connections.
2. Disconnect the electrical wires from the socket (4) of pressure gauge (1).
3. Disconnect the hose fittings (5) and remove the U-clamp (2).
4. Then finally remove the pressure gauge (1) from the front side of panel.

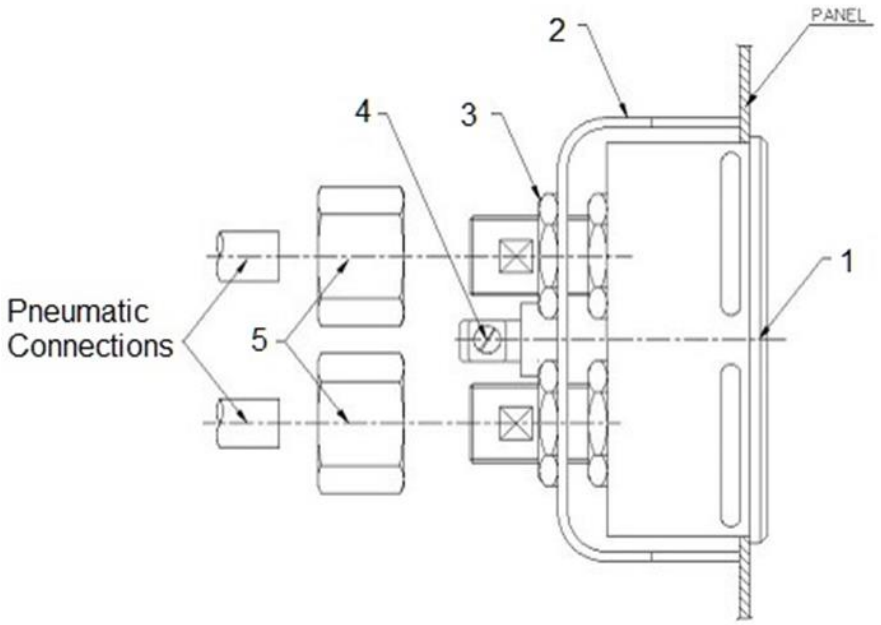

Figure 4 - Duplex Pressure Gauge, Removal/Installation

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 4

1. Apply Loctite 242/243 on the threads of the two lock nuts (3).
2. Take care to orient the gauge in correct position on the panel and secure it using U-clamp (2) and the two lock nuts (3).
3. Connect the hose fittings (5).
4. Connect the electrical connection to the socket (4).
5. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6. Spare Part List

- Routine Maintenance - Spare parts not required.
- Installation - Spare parts not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the laws in force in the Country where the component is used.

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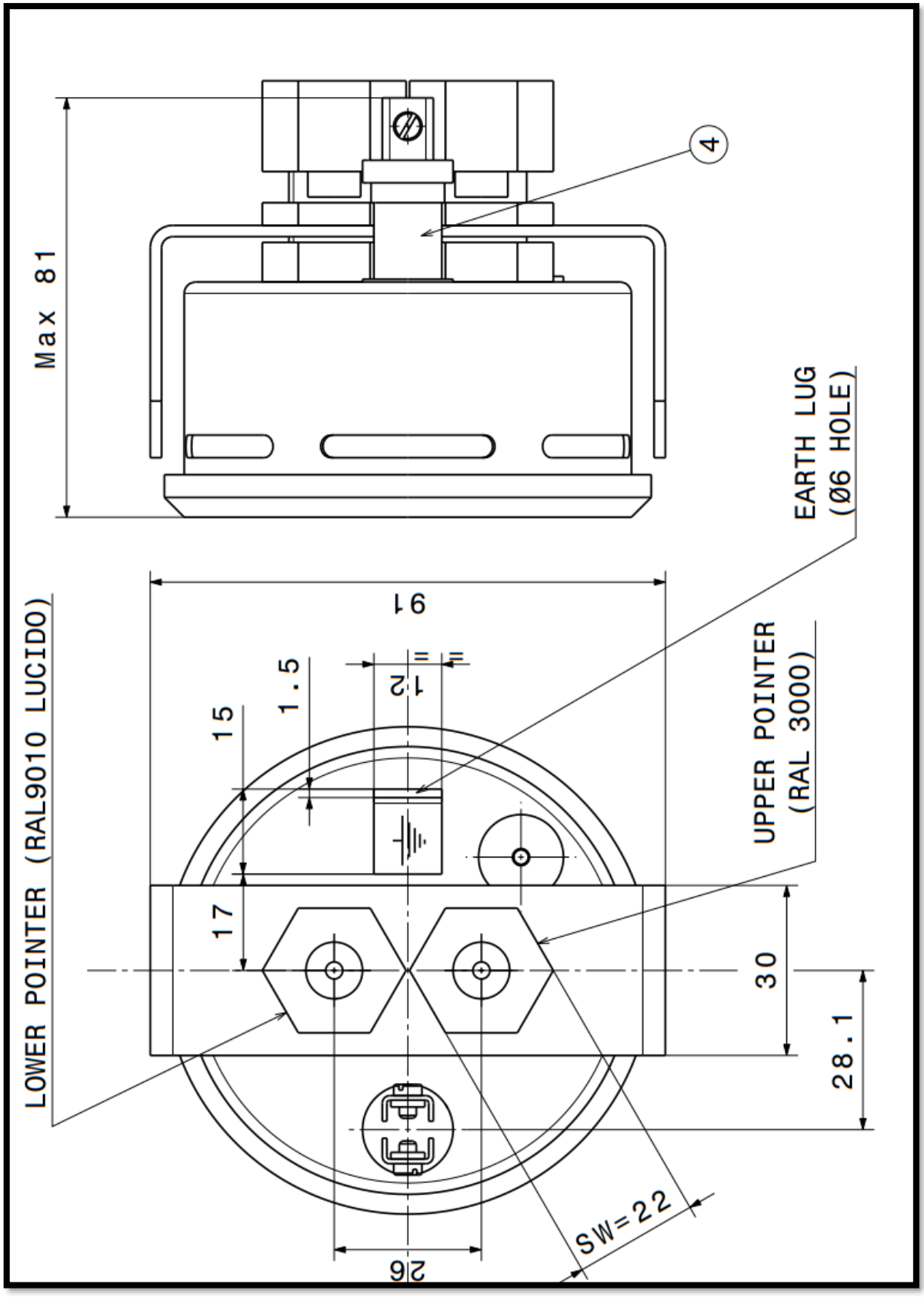
/// 8. OUTLINE DRAWING

Duplex Pressure Gauge - FT0024834-100



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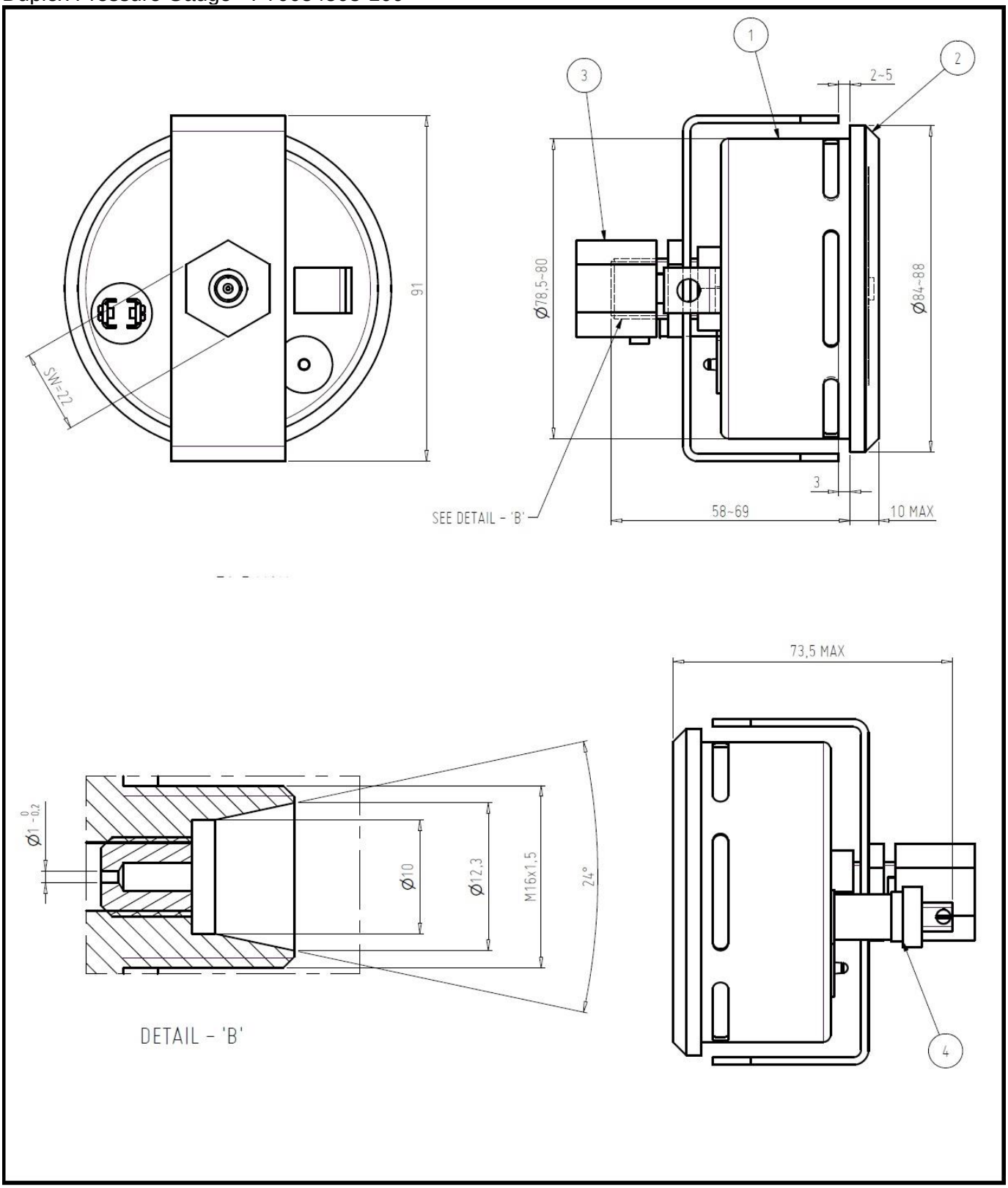
Duplex Pressure Gauge - FT0054503-100



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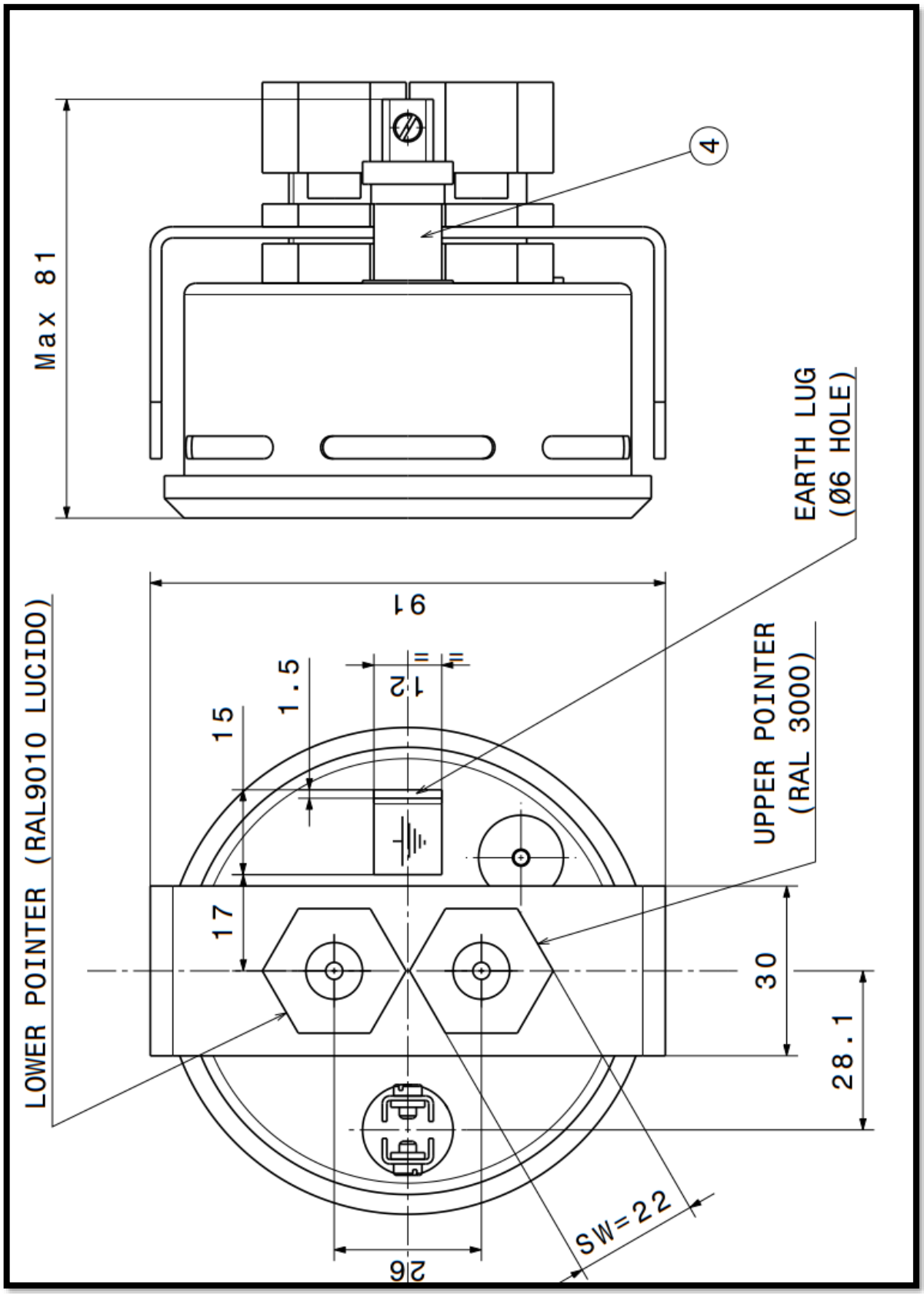

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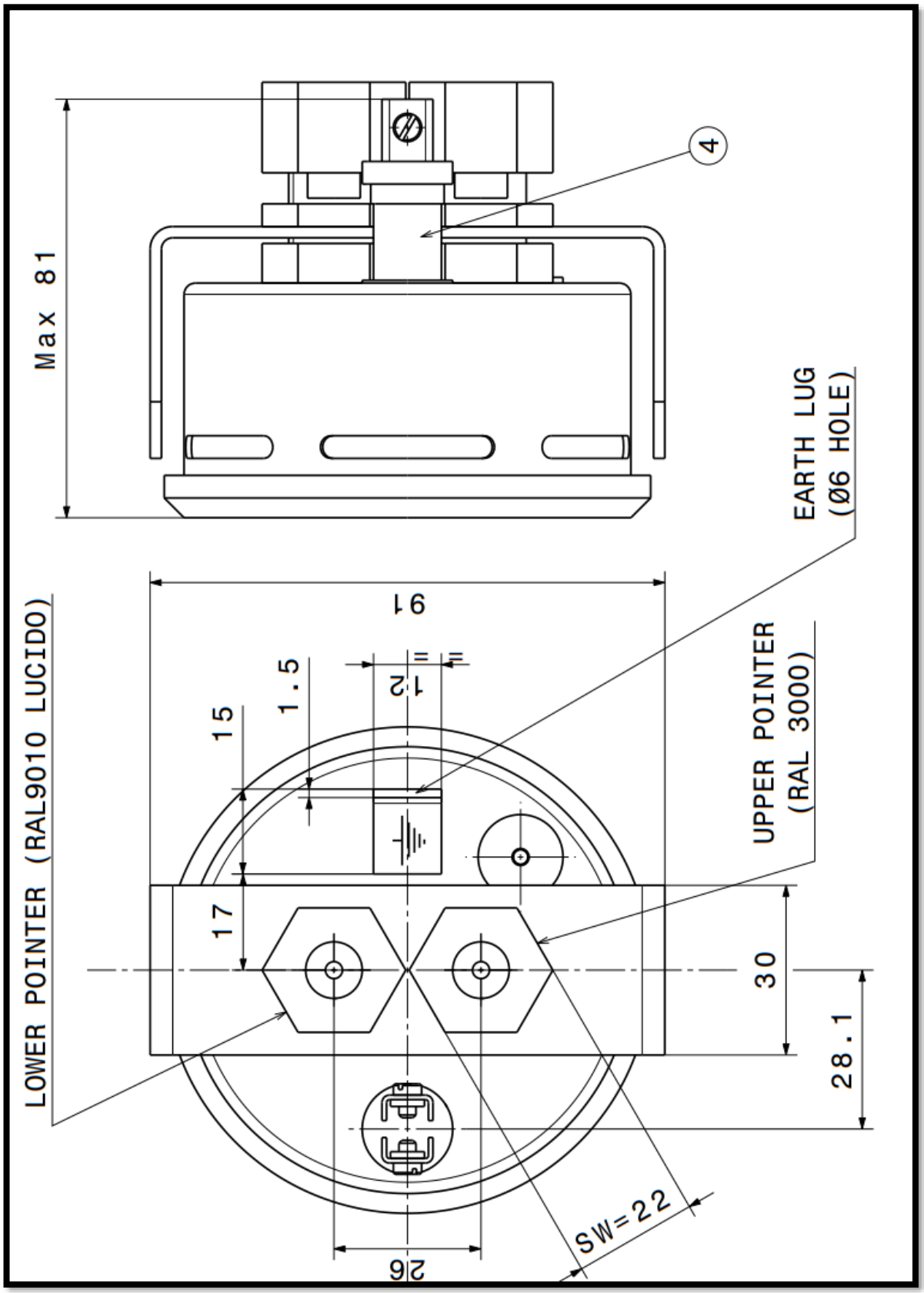

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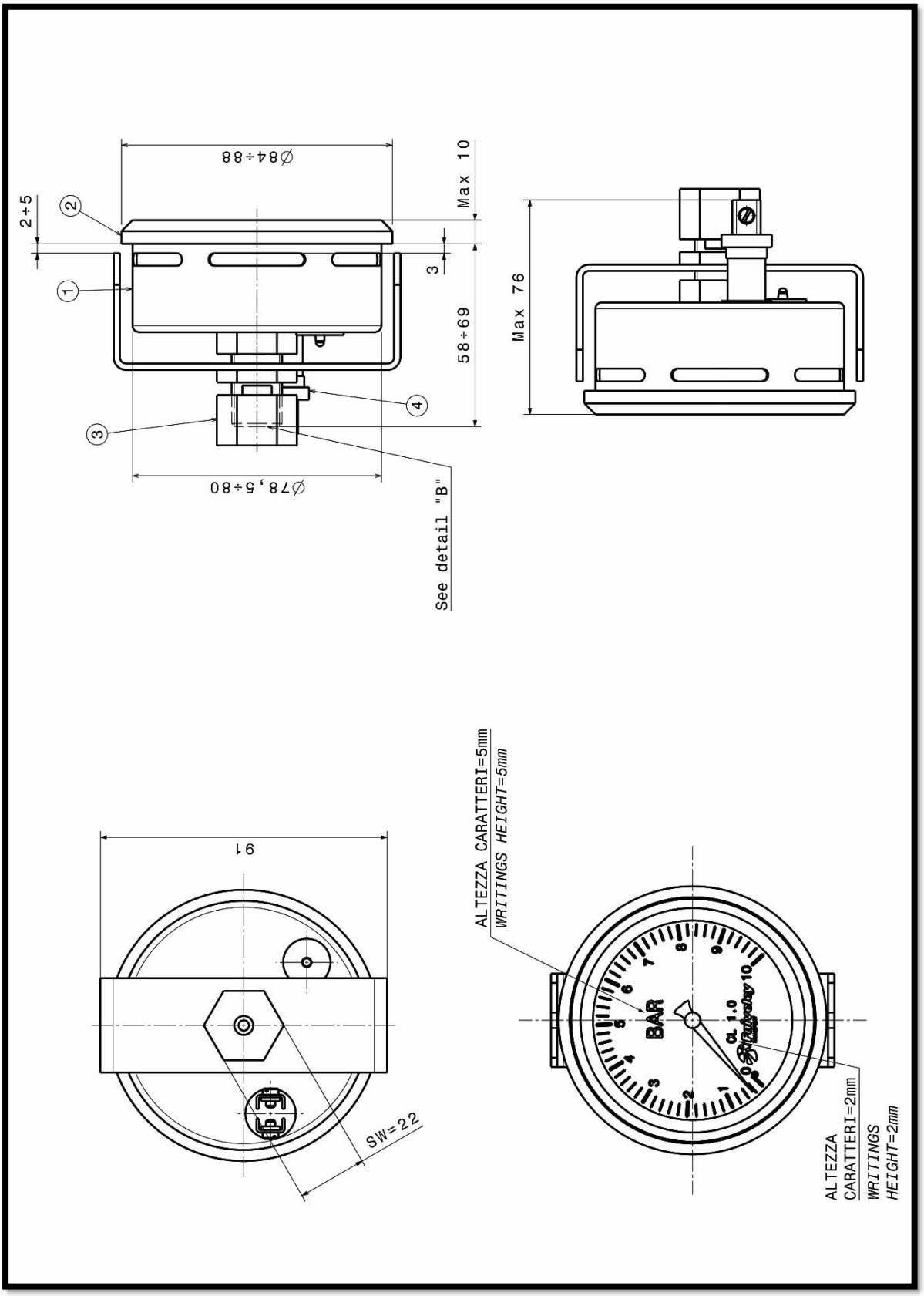

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01.04_01.05_Pneumatic horn - HT & LT

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PNEUMATIC HORN - HT
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PNEUMATIC HORN - LT
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Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
714001000-E00MUM.docx	A00	RELEASE

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Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

An air horn is a pneumatic device designed to create an high tone or low tone of sound for signaling purposes.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +47°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +47°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to + 47°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from +3°C to 25°C during 3 months maximum and also, in summer from +25°C to +47°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Pneumatic horn must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Pneumatic horn and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Pneumatic horn for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
P/N	Part number
QTY	Quantity
HT	High Tone
LT	Low Tone
BSP	British Standard Pipe

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

An air horn is a pneumatic device designed to create an high tone or low tone of sound for signaling purposes. It usually consists of a source which produces compressed air, which passes into a horn through a reed or diaphragm.

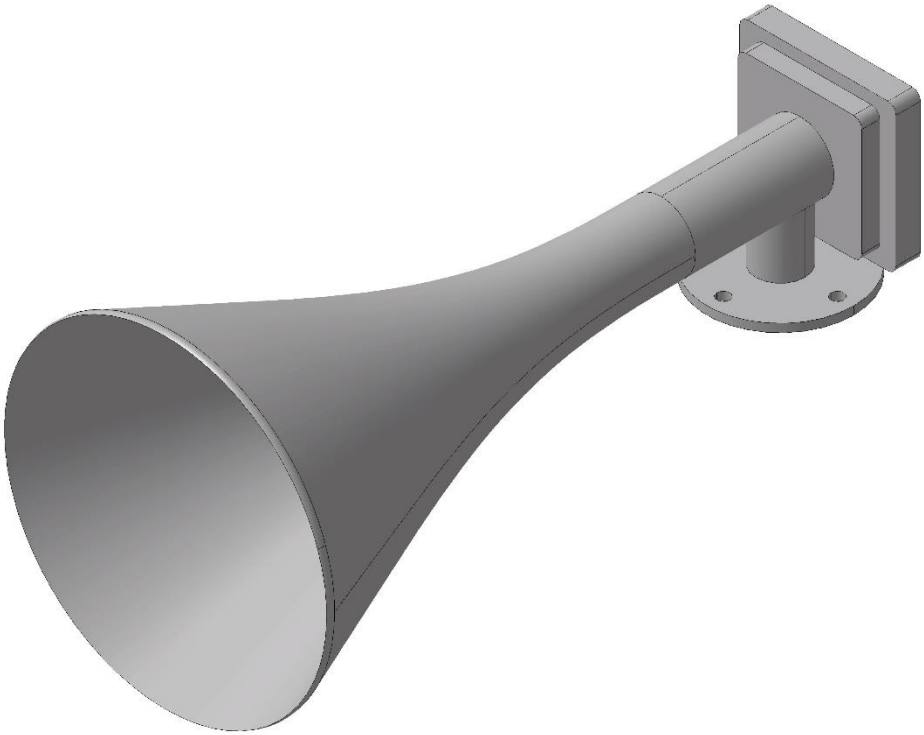

Figure 1: Pneumatic Horn, Isometric View

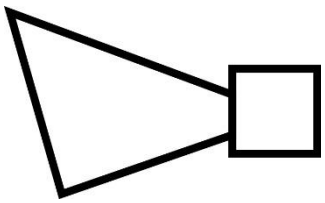

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	714001000 714001100
Operating pressure:	5 – 10 bar
Auidability range	1100 yards
Weight	3.0 kgs Approx
Frequency	-
Loudness	-

/// 3. OPERATIONS

The horn is composed by a flanged body in which the air enters from port (1) and after a canalization exits from (2). The sound is created through the internal canalization.

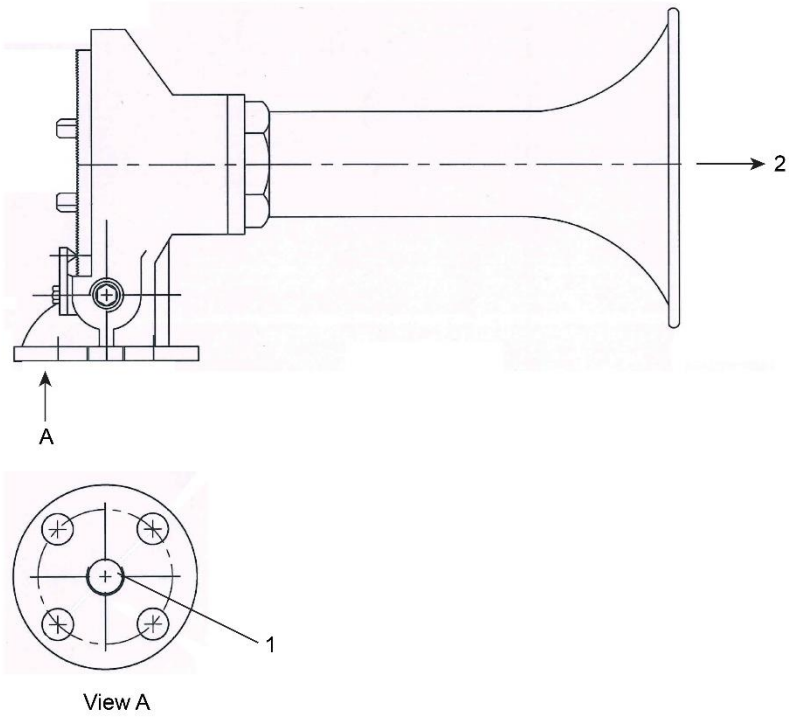

Figure 3: Pneumatic Horn, Operation

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
24 mm spanner/socket wrench	Tighten/loosen the fastners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242 or 243	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): not required.

2. Second Level Maintenance: Replacement as scheduled in the system maintenance plan. If no system maintenance plan is provided; the device must be replaced regularly as required by the Operator's rules; the mission profile and the environmental conditions (KIT is not part of WABTEC scope of supply).

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

Not applicable.

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5.3 REMOVAL PROCEDURE OF EQUIPMENT

CAUTION! Pressurised system! Discharge the pressure before removal.

Important! Take care to prevent ingress of dirt or debris in the system.

Important! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

Attention! Do not perform a functional test in confined space or protect suitably the ears from loud sound.

The horn should be mounted so far as is practicable, from impact and subsequent blockage by airborne objects, such as debris, dust, snow, hail and birds. Also when positioning the horn, the effect of any protection devise or panel on the projected sound level should be taken into account.

Refer to Figure 4

1. Remove the inlet pipe connections from horn (1).
2. Unscrew and remove four M16 fastners set (2) using 24mm spanner and remove the horn (1) from the system.

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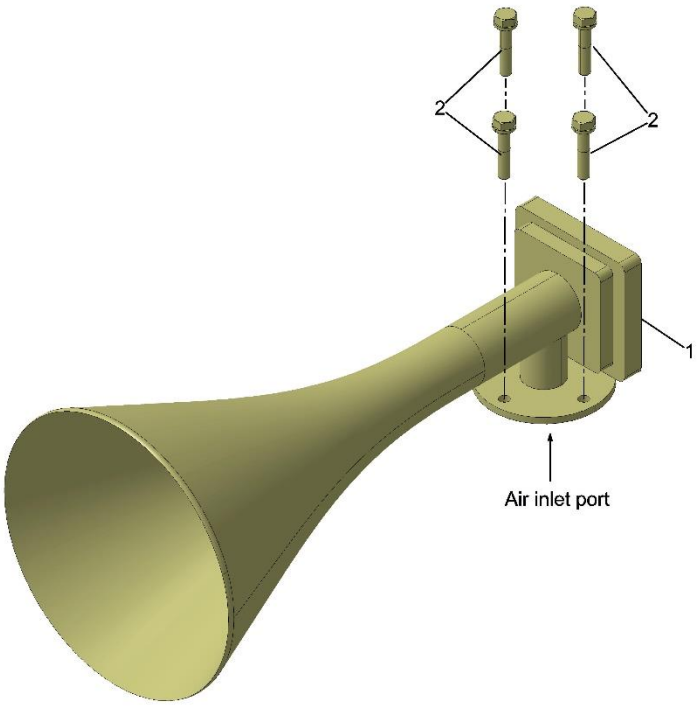

Figure 4: Pneumatic Horn, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PNEUMATIC HORN - HT	714001000	1
1	PNEUMATIC HORN - LT	714001100	1
2	MOUNTING FASTNERS SET M16	-	4

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 4

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Install the horn (1) with interface and secure it with suitable four M16 fastners set (2) using 24 mm spanner.
5. Torque tighten four M16 fastners set (2) to 206 Nm.
6. Connect the pneumatic fittings. Fittings shall be locked using the driving torque indicated by the fitting manufacturer.
7. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance - Not WABTEC scope of supply.
- Installation: Spare parts not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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/// FT0052371-000-E00MUM

FLEXIBLE HOSE 1/4 " - FT0052371-000
FLEXIBLE HOSE 1/8 " - FT0054752-000
FLEXIBLE HOSE 3/4 " FT0053958-000, FT0105239-004, FT0054504-000, -001, -102, FT0054761-000, FT0052297-000
FLEXIBLE HOSE 1-1/4 "- 608001300, 608001400, 608001100, 608001000
HOSE ASSY 3/8 - 708009600, 708009900, 708014400
HOSE - FT0053734-000, FT0053735-000

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0052371-000-E00MUM.docx	C00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1661	VP	JP	.AE
B00	05/11/2022	NEW P/N ADDED: FT0105239-004, FT0054752-000, FT0054504-001, FT0054761-000, FT0054504-002, FT0054504-000 SECTION 2 AND SECTION 5 UPDATED	DRC 1922	VS	.JP	.AE
C00	07/02/2023	Document updated with new template and added new P/Ns: FT0053734-000, FT0053735-000, FT0052297-000, 608001300, 608001400, 608001100, 608001000, 708009600, 708009900, 708014400	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The hoses are used to connect two pneumatic connections in a flexible way.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

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- Prior to accessing the electric parts, make sure the power is duly switched off.
- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.
- For operations under the vehicle, personnel must wear protective helmet.
- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.
- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.
- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.
- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).
- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.
- While testing the components, never exceed the maximum operating pressure limits.
- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

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- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to + 50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Flexible Hose must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Flexible Hose and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Flexible Hose for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
BSPP	British Standard Parallel Pipe
BSP	British Standard Pipe
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity
RP	Internal Parallel Thread

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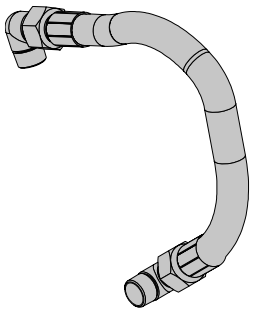
/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The hoses are used to connect two pneumatic connections in a flexible way.

FT0052371-000



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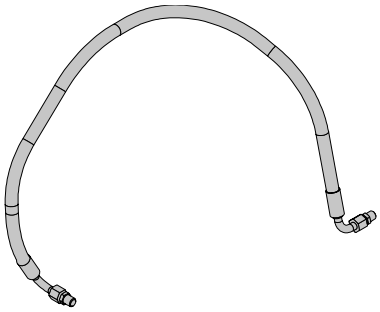

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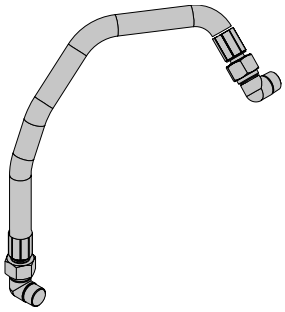

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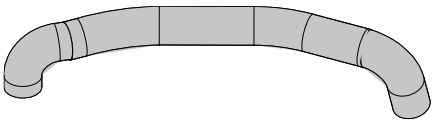

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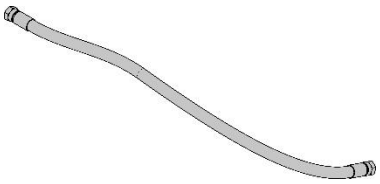

FT0052297-000

Figure 1: Flexible Hose, Isometric View (Sheet 1 of Sheet 2)

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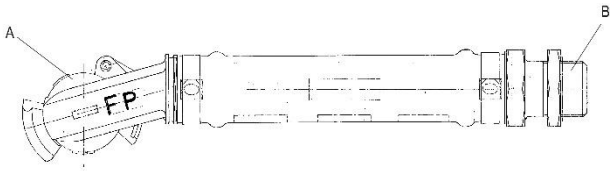
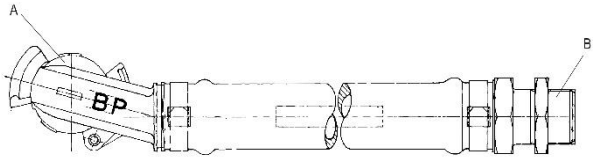
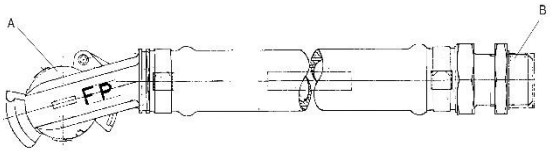


608001000

608001100



608001300



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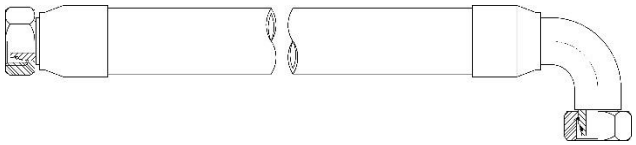

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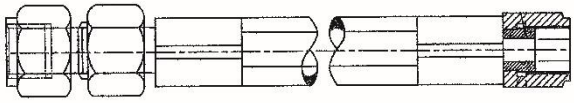
FT0053735-000



708009600
708009900
708014400

Figure 1: Flexible Hose (Sheet 2 of Sheet 2)

NOTE: Drawing for information only. Connection types, length, diameter, may vary, depending on the code.

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

TYPE	PART NO	MIN BEND RADIUS	LENGTH	MAX. WORKING PRESSURE	END CONNECTION	
					A	B
Type 1	FT0052371-000	45 mm	650 mm	175 bar	1/4 “ BSPP	
	FT0053958-000	120 mm	840 mm	150 bar	3/4 “ BSPP	
	FT0105239-004	-	650 mm	-	3/4 “ BSPP	
	FT0054752-000	75 mm	800 mm	150 bar	1/8 “ BSPP	
	FT0054504-001	120 mm	630 mm	150 bar	3/4 “ BSPP	
	FT0054761-000	100 mm	660 mm	150 bar	3/4 “ BSPP	
	FT0054504-002	120 mm	530 mm	150 bar	3/4 “ BSPP	
	FT0054504-000	120 mm	575 mm	150 bar	3/4 “ BSPP	
	FT0052297-000	120 mm	1137 mm	150 bar	3/4 “ BSPP	
	FT0053734-000	60 mm	660 mm	11 bar	3/8” BSPP	
	FT0053735-000	110 mm	640 mm	11 bar	3/4” BSPP	
	708009600	127 mm	1600 mm	10 bar	3/8 “ BSP	
	708009900	127 mm	2000 mm	10 bar	3/8 “ BSP	
	708014400	127 mm	3000 mm	10 bar	3/8 “ BSP	
Type 2	608001300	-	585 mm	-	*	1-1/4” RP
	608001400	-	560 mm	-	*	1-1/4” RP
	608001100	-	790 mm	-	*	1-1/4” RP
	608001000	-	790 mm	-	*	1-1/4” RP

* Coupling

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/// 3. OPERATIONS

The flexible hose consists of a rubber pipe with two connections at its ends. Connection types, length, diameter, may vary, depending on the part number.
Refer to the drawing for further details.

/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
Spanner	Tighten/loosen the pipe fittings
Torque wrench	Torque tighten the pipe fittings

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 577	Sealant for pipe fitting

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Visual inspection as scheduled in the **system maintenance plan.** If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions.
   Typical visual inspection periodicity: 6 months. Refer 5.2.1

2. Second Level Maintenance: Replacement as scheduled in the **system maintenance plan.** If no system maintenance plan is provided; the device must be replaced regularly as required by the Operator's rules; the mission profile and the environmental conditions.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 VISUAL INSPECTION

Caution! Pressurised system! In case of removal, discharge the pressure first.

Important! When fitting the hose DO NOT twist or bend it and make sure it is free from mechanical stresses

Caution! Take care to prevent ingress of dirt or debris in the system.

1. Remove all traces of dirt and deposit.
2. Inspect accurately the hose in order to check there are no signs of damage or wear like cracks, fretting, etc.
3. With pressurised system, check for leakages.
4. If necessary, discharge the system and replace the device (Refer section 5.3 and 5.4).
5. Check the device's production date; if an interval greater than the replacement period prescribed at as per section 5.1 has passed, discharge the system and replace the device (Refer Section 5.3 and 5.4).

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5.3 REMOVAL PROCEDURE OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal.

Important! When fitting the new hose DO NOT twist or bend it and make sure it is free from mechanical stresses.

Caution! Take care to prevent ingress of dirt or debris in the system.

5.3.1 REMOVAL OF TYPE 1 HOSES

Refer to Figure 3

1. Remove the Hose (1) from system disconnecting the pipe fittings (2) using an appropriate spanner.

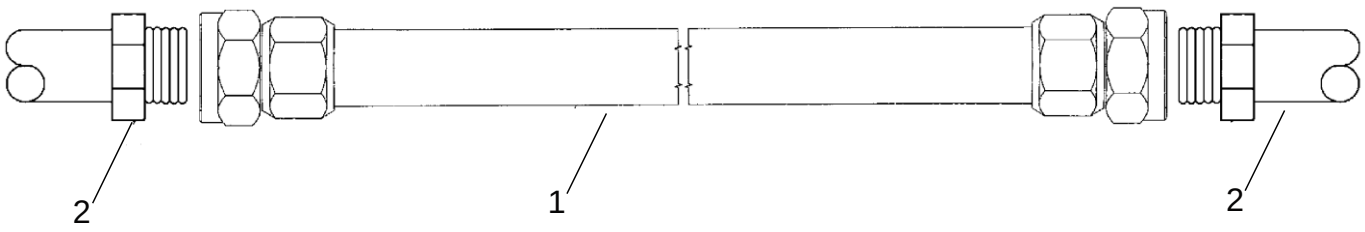

Figure 3: Removal / Installation flexible hose with pipe fittings

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5.3.2 REMOVAL OF TYPE 2 HOSES

Refer to Figure 4

1. Before disconnection of hose couplings, the cut off angle cocks should first be closed to vent the trapped air from the coupled hose assemblies. Manually rotate the palm ends at slow rate and disconnect the Joints.
2. Unscrew the lock nut (1) using appropriate spanner and then hose assembly from the end nipples (2).
3. Retract gasket (3) by using a blunt tool.

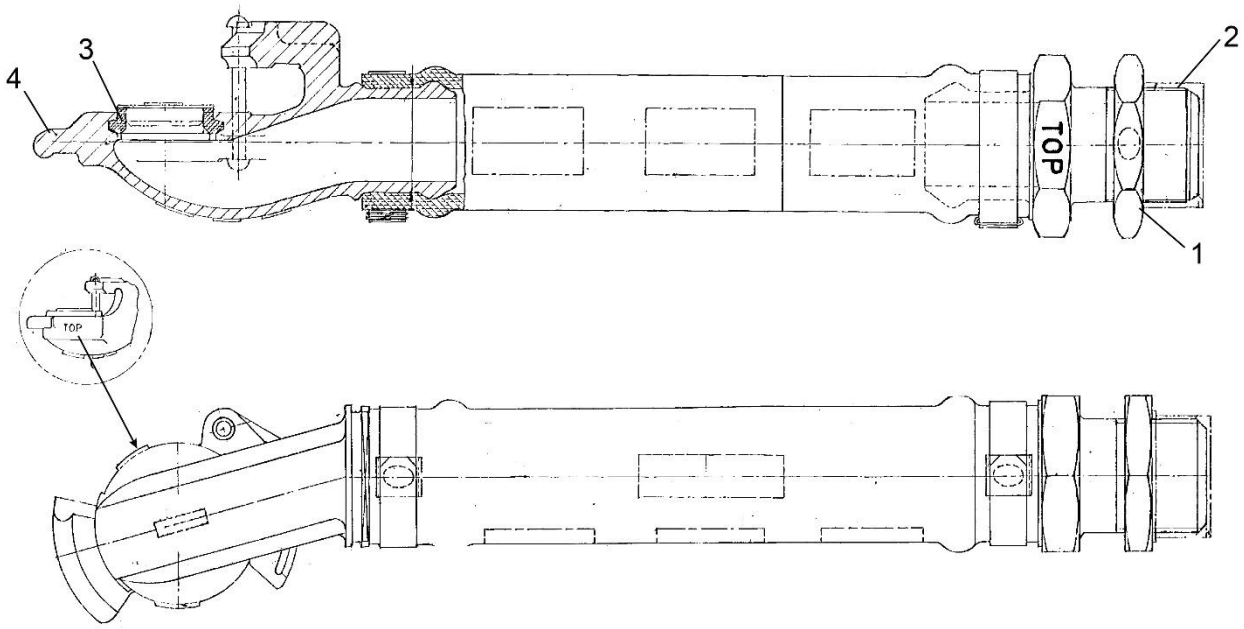

Figure 4: Removal / Installation flexible hose coupling

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

5.4.1 INSTALLATION OF TYPE 1 HOSES

Refer to Figure 3

1. Before assembly of pipe fittings (2) perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP or BSP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 577 on the pipe fittings (2).
5. Install the Hose (1) to the system by connecting the pipe fittings (2) using an appropriate spanner. Pipe fittings (2) shall be locked using the driving torque indicated by the fitting manufacturer.
6. Pressurise the system and check for leakages.

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5.4.2 INSTALLATION OF TYPE 2 HOSES

Refer to Figure 4

NOTE: Before assembly, hose assemblies should be examined for a correct orientation of the coupling head with the nipple. The face of the coupling head should be at a perpendicular plane to the inscription “TOP” on the nipple. Even if this is ensured, care must be taken to keep the inscription to ‘TOP” at the correct top most point while installing in the pipes.

If the Coupling is not oriented correctly as described above, premature failure of hoses may occur due to a twisted alignment of hose assemblies which under pressure surges during brake application & releases may stretch the fabric inside the hose leading to rupture ultimately.

1. Before assembly of lock nut (1) perform cleaning of piping on the vehicle.
2. Locate the gasket (3) into the coupling head (4) using blunt tools.
3. Secure the hose assembly and lock nut (1) to the end nipple (2).
4. Pressurise the system and check for leakages.

/// 6. Spare Part List

- Routine Maintenance - Not required.
- Installation: Not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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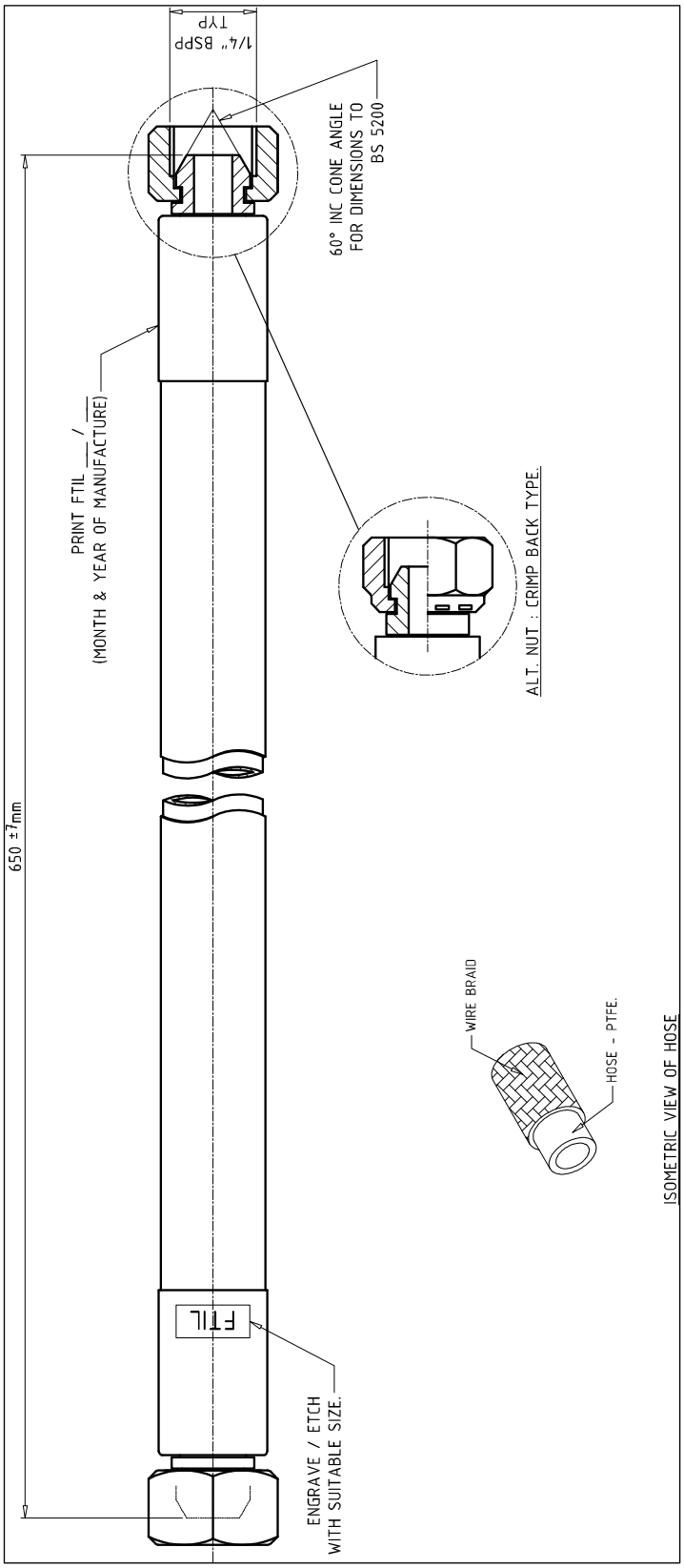
/// 8. OUTLINE DRAWING

Flexible Hose - FT0052371-000



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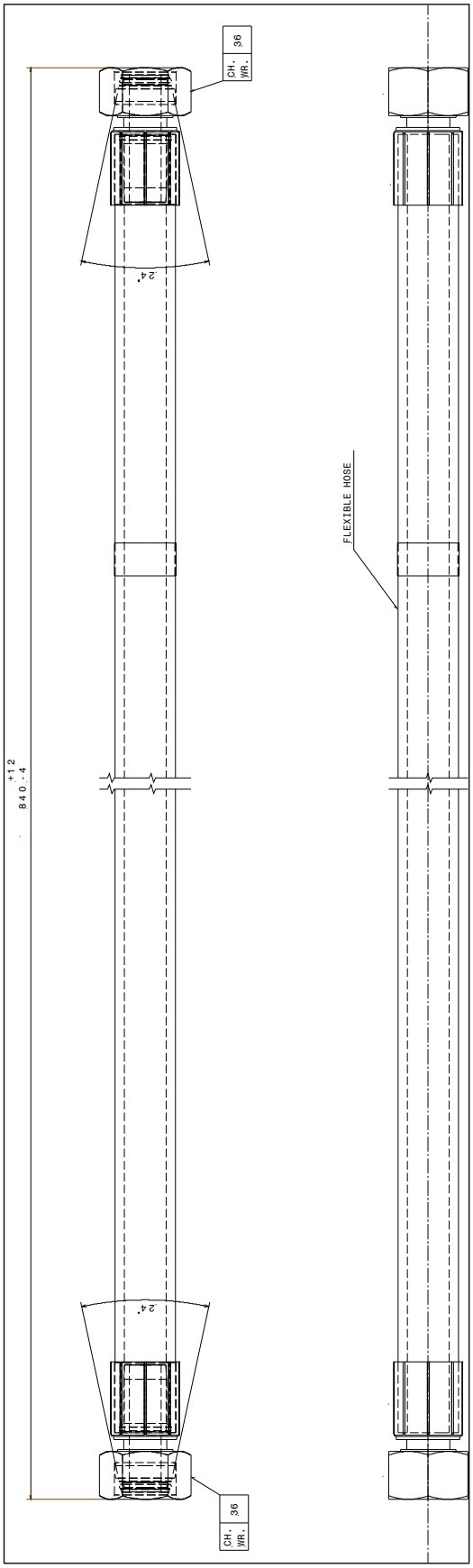
Flexible Hose - FT0053958-000



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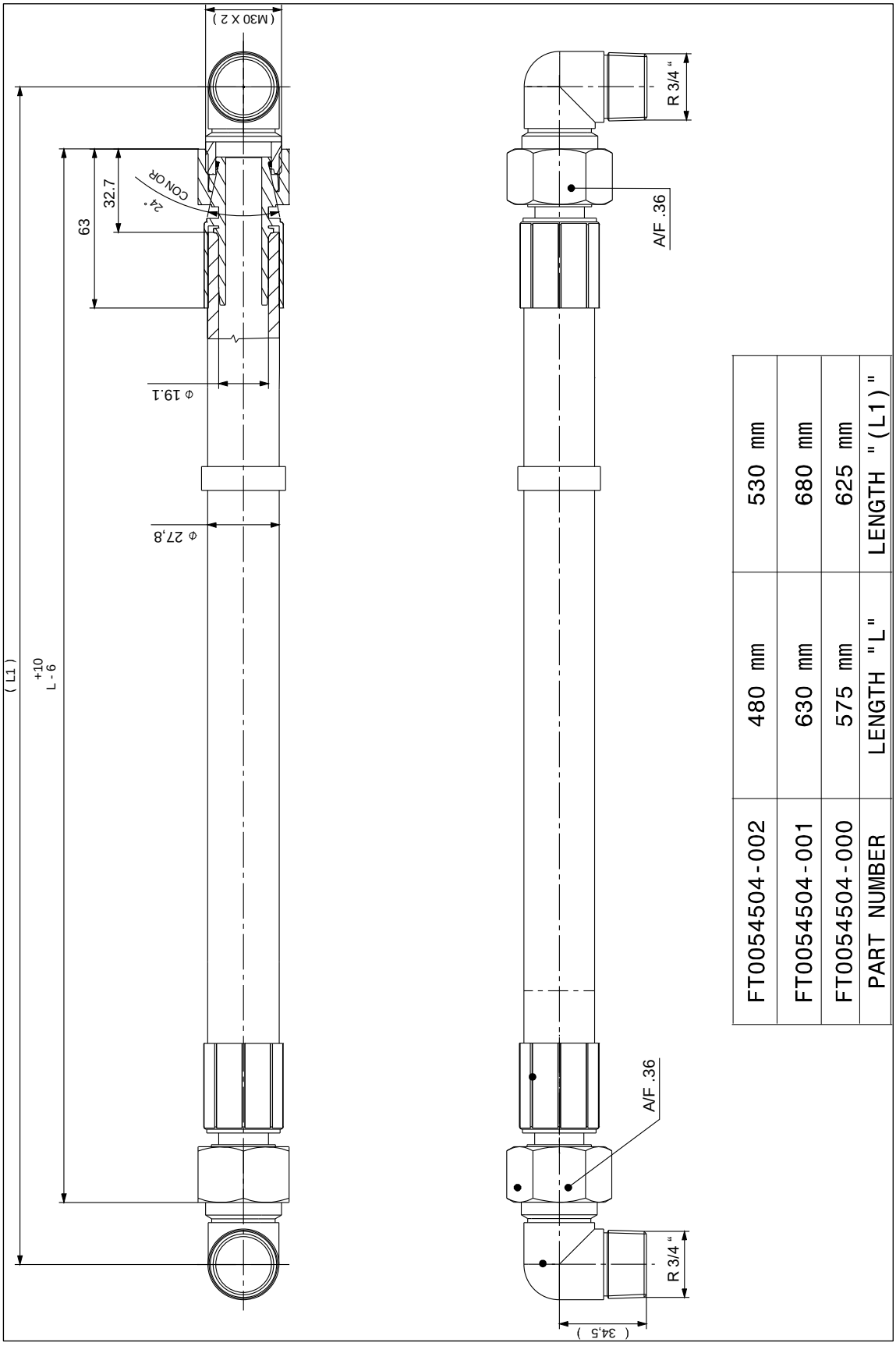

PART NUMBER	LENGTH "L"	LENGTH "(L1)"
FT0054504-002	480 mm	530 mm
FT0054504-001	630 mm	680 mm
FT0054504-000	575 mm	625 mm

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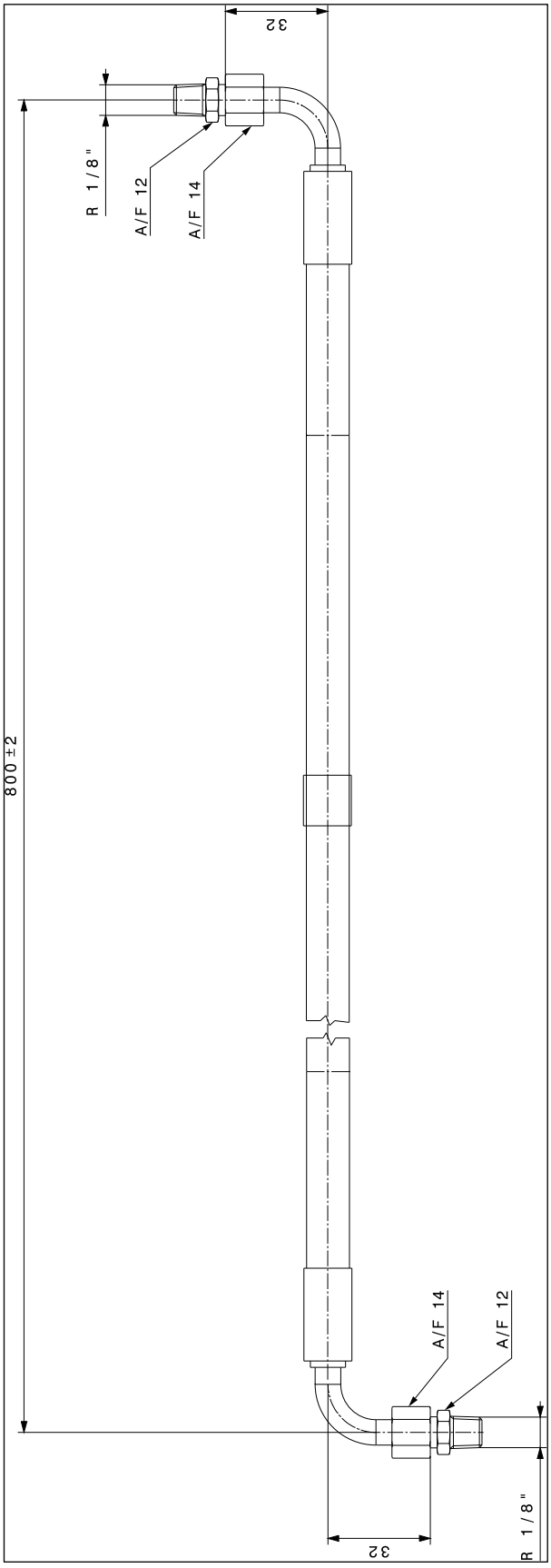
Flexible Hose - FT0054752-000



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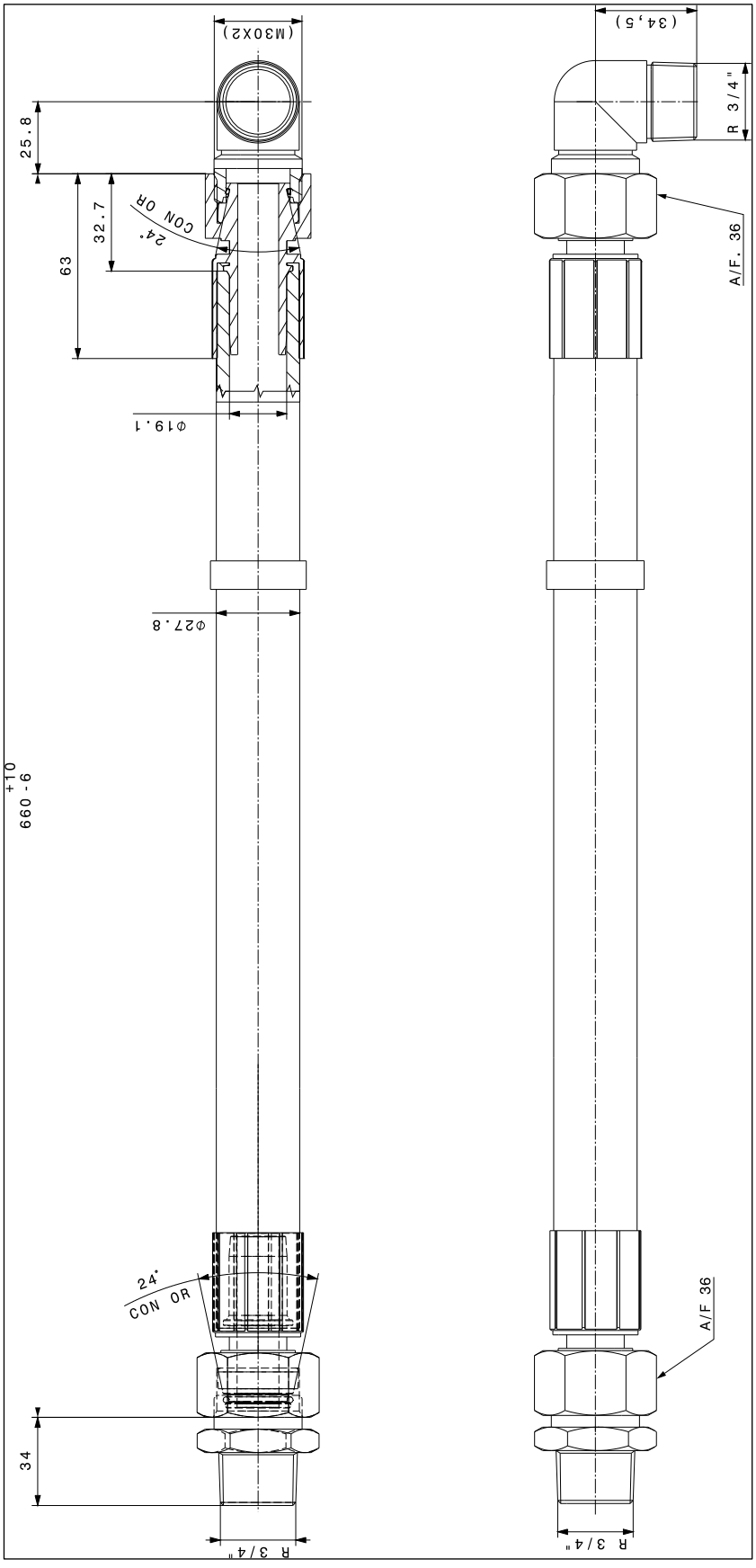
Flexible Hose - FT0054761-000



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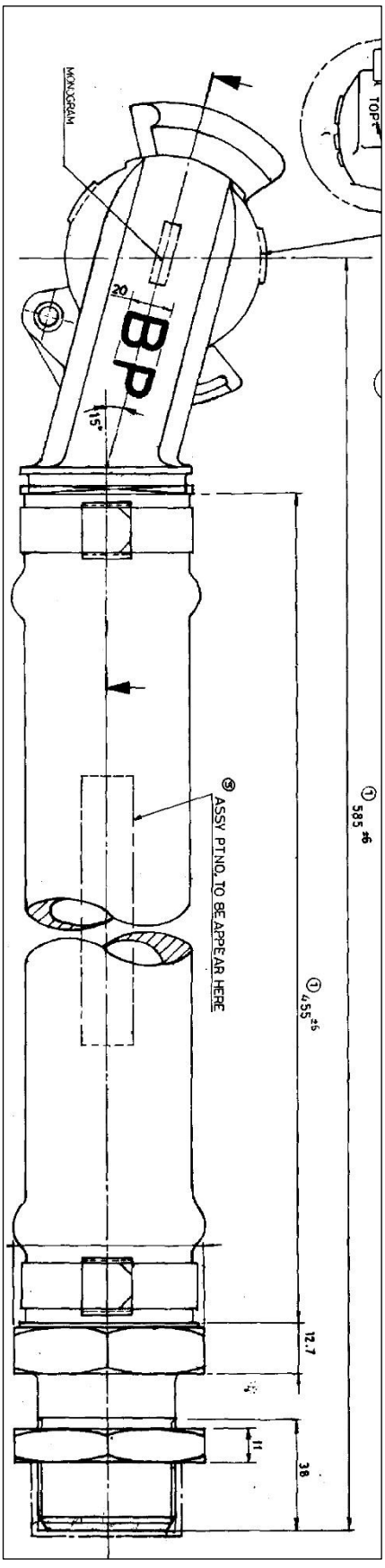
1-1/4" Hose Connection (BP) – 608001300



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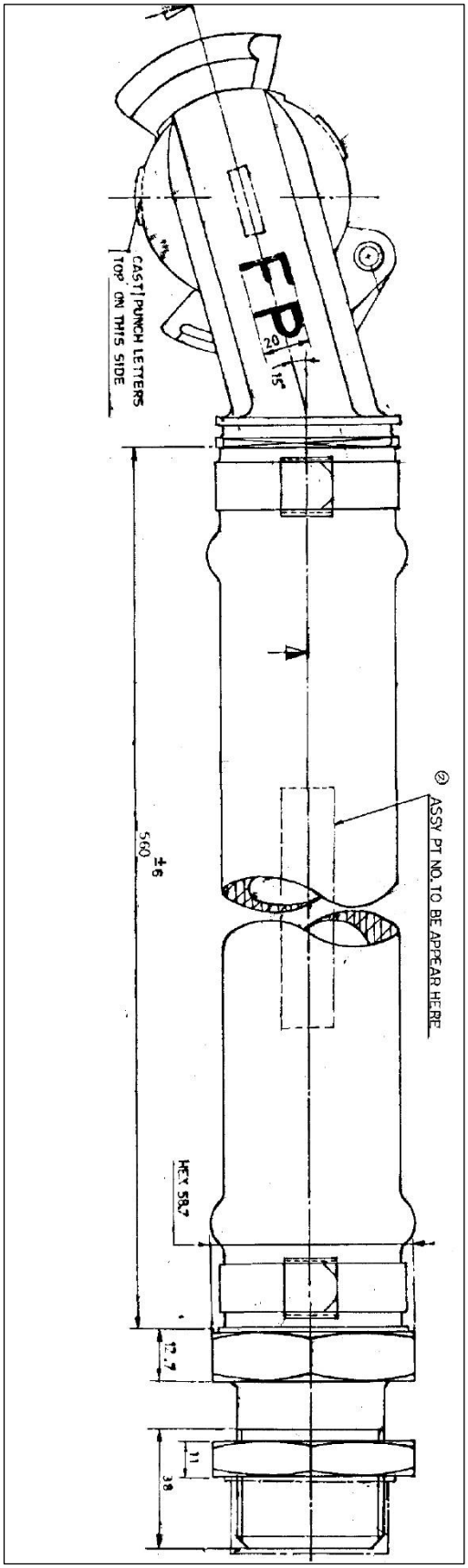
1-1/4" Hose Connection (MP) – 608001400



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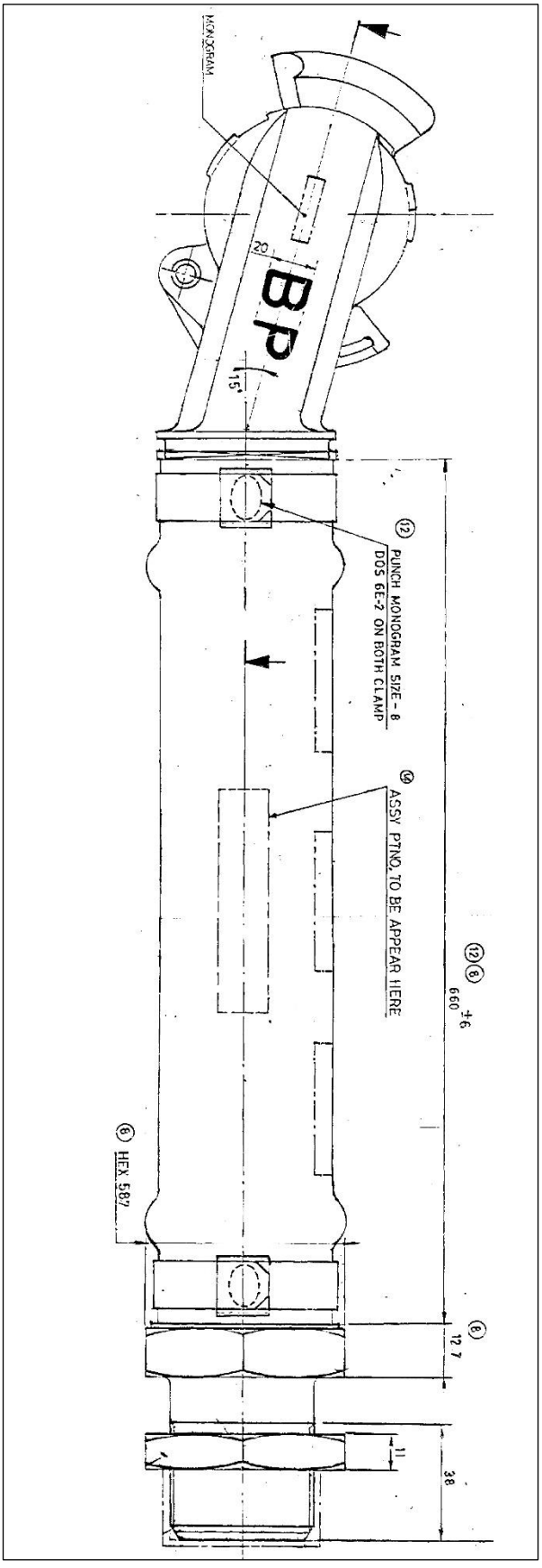
1-1/4" Hose for Dead Movement (BP) – 608001100



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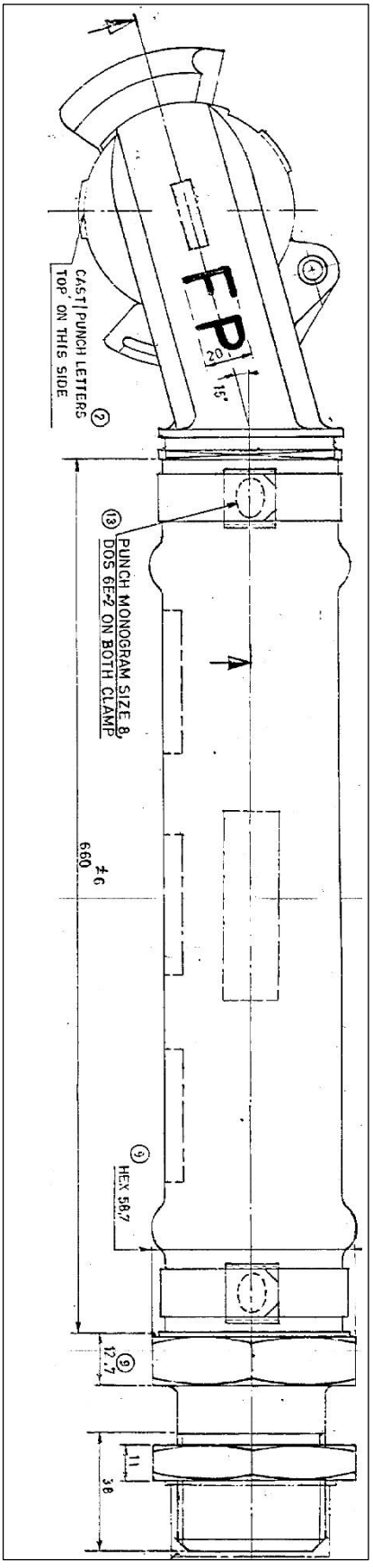
1-1/4" Hose for Dead Movement (MP) – 608001000



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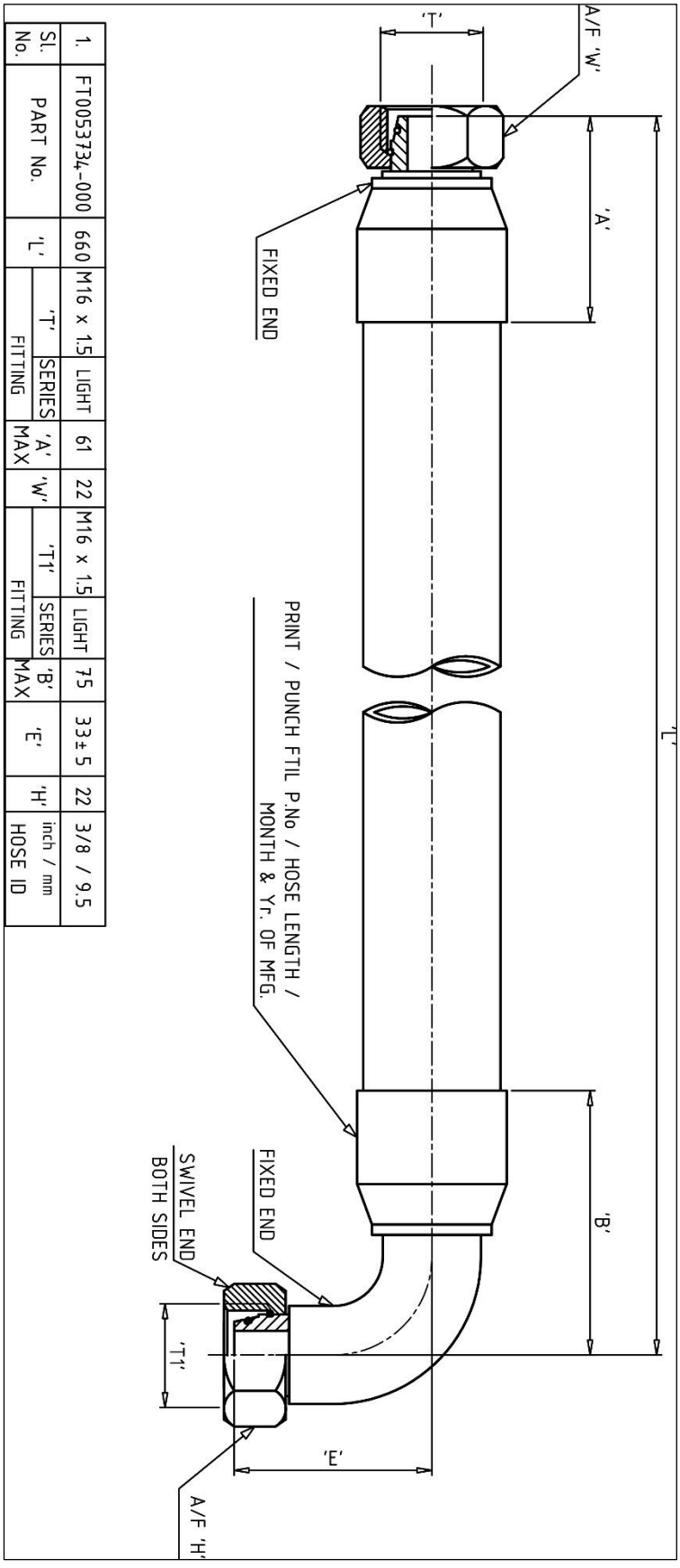
Hose Assembly – Parking Brake - FT0053734-000



Sl. No.	PART No.	'L'	FITTING 'T'	FITTING SERIES	'A' MAX	'W'	FITTING 'T1'	FITTING SERIES	'B' MAX	'E'	'H'	HOSE ID inch / mm
1.	FT0053734-000	660	M16 x 1.5	LIGHT	61	22	M16 x 1.5	LIGHT	75	33± 5	22	3/8 / 9.5

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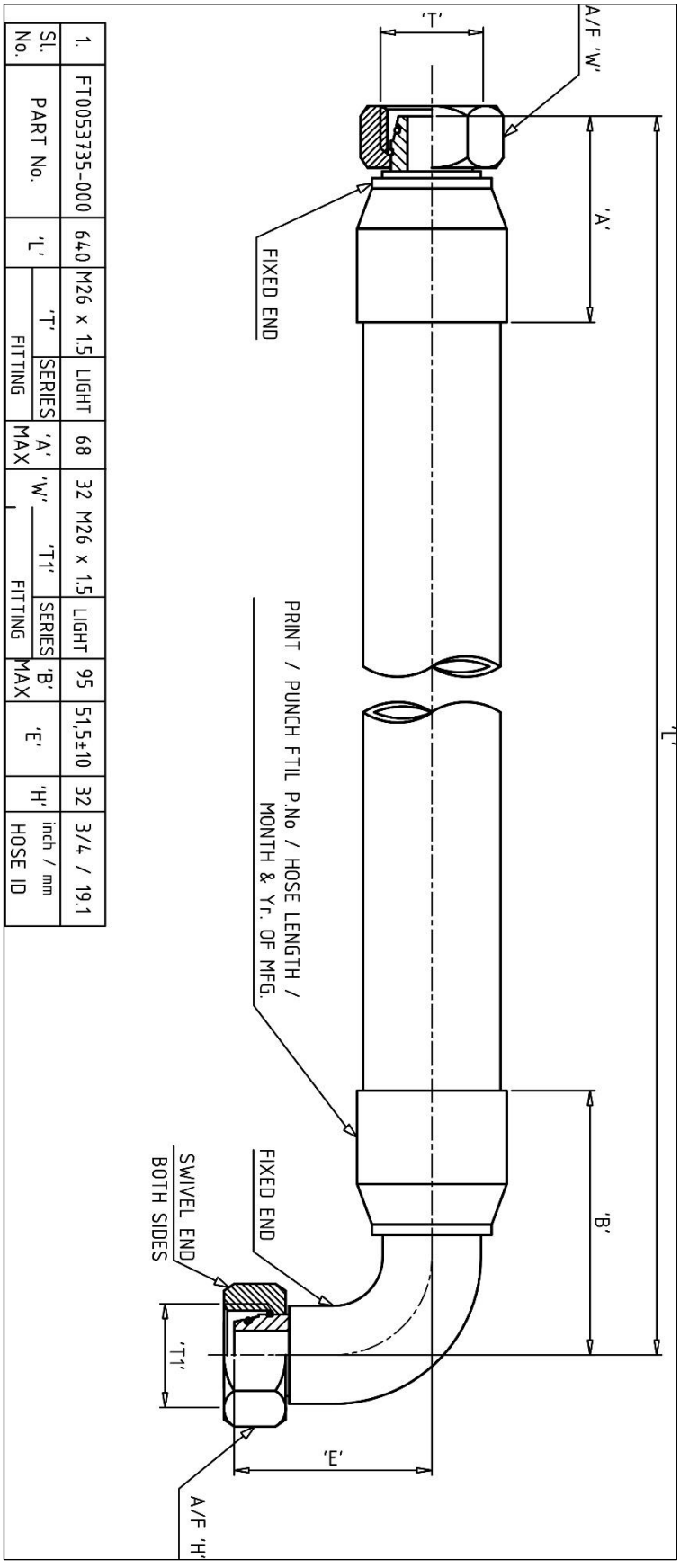
Hose Assembly – Service Brake - FT0053735-000



Sl. No.	PART No.	'L'	FITTING 'T'	FITTING SERIES	'A' MAX	FITTING 'W'	FITTING 'T1'	FITTING SERIES	'B' MAX	'E'	'H'	HOSE ID inch / mm
1.	FT0053735-000	640	M26 x 1.5	LIGHT	68	32	M26 x 1.5	LIGHT	95	51,5±10	32	3/4 / 19.1

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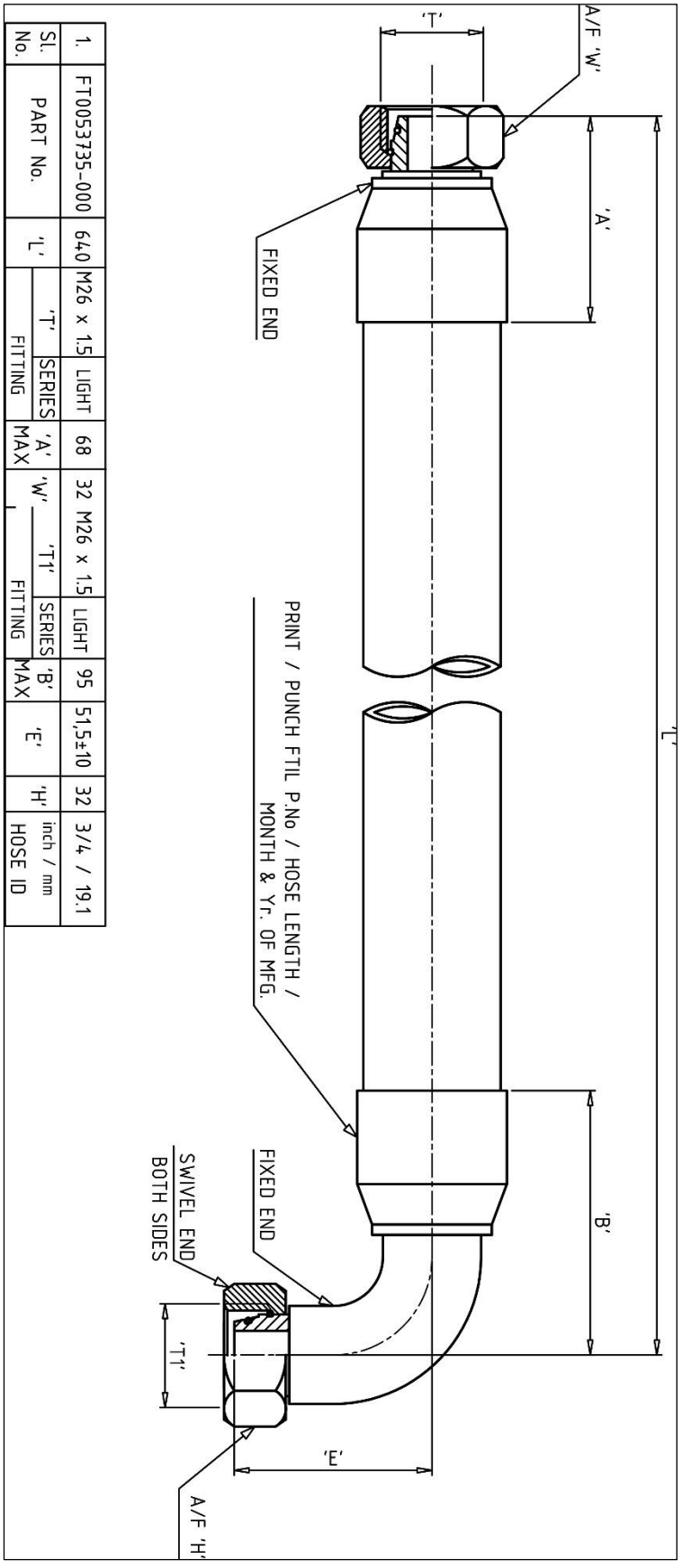
Flexible Hose R3/4“–FT0052297-000



Sl. No.	PART No.	'L'	FITTING 'T'	FITTING SERIES	FITTING 'A' MAX	FITTING 'W'	FITTING 'T1'	FITTING SERIES	'B' MAX	'E'	'H'	HOSE ID inch / mm
1.	FT0053735-000	640	M26 x 1.5	LIGHT	68	32	M26 x 1.5	LIGHT	95	51,5±10	32	3/4 / 19.1

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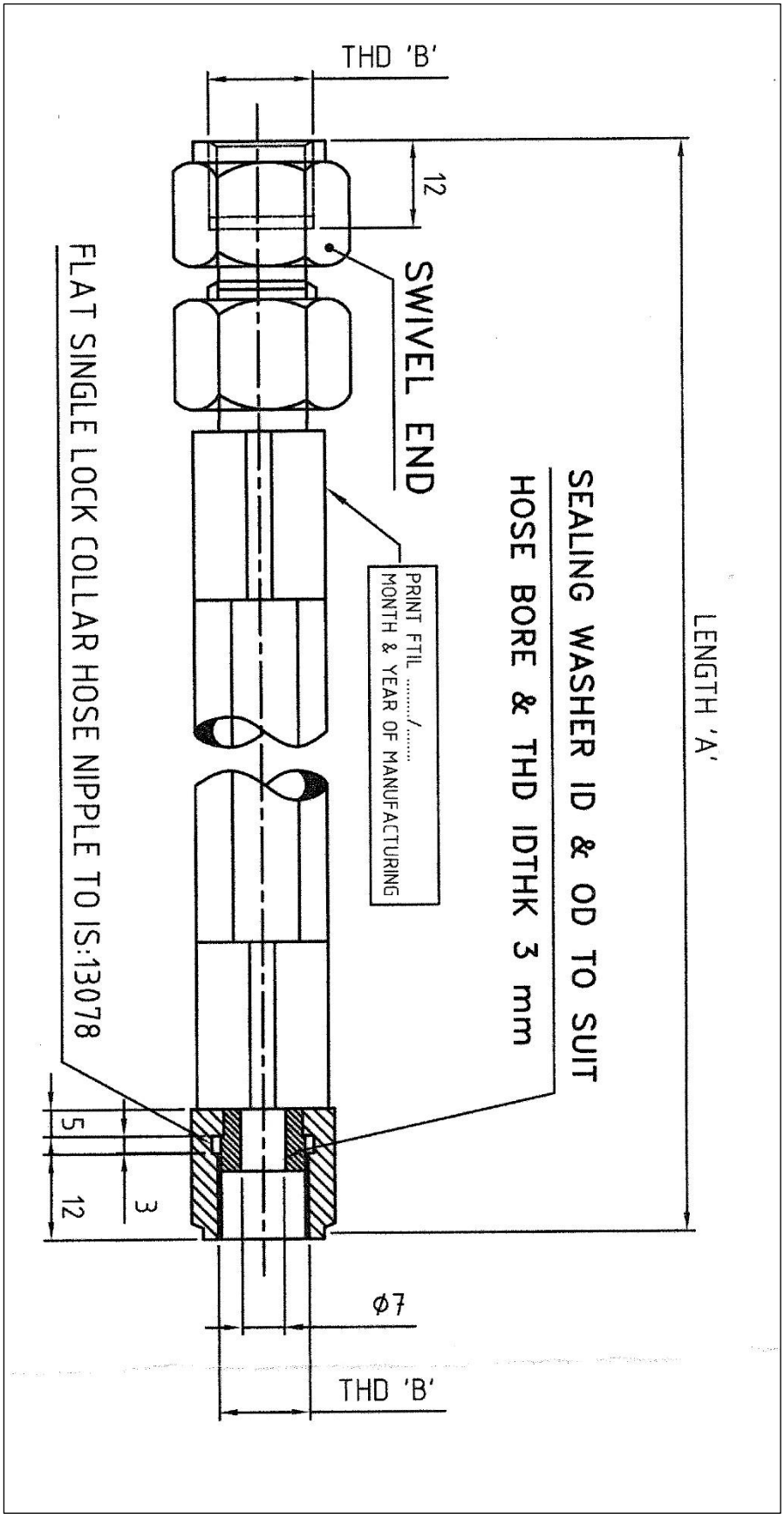
Hose Assembly 3/8" L= 1600 mm - 708009600
Hose Assembly 3/8" L= 2000 mm - 708009900
Hose Assembly 3/8" L= 3000 mm – 708014400



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01.16_Guard emergency brake valve

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/// FT0051058-A00-E00MUM

GUARD EMERGENCY BRAKE VALVE
FT0051058-A00

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0051058-A00-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

An guard emergency brake valve is used to open/close a pneumatic circuit. The guard emergency brake valve is equipped with a double micro switch.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, refer to section 5.2.1 for test details.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Guard emergency brake valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on guard emergency brake valve and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the guard emergency brake valve P/N FT0051058-A00 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
BSPP	British Standard Parallel Pipe
Kg	Kilogram
P/N	Part number
QTY	Quantity
Vdc	DC Voltage

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

An guard emergency brake valve is used to open/close a pneumatic circuit. The guard emergency brake valve is equipped with a double micro switch.

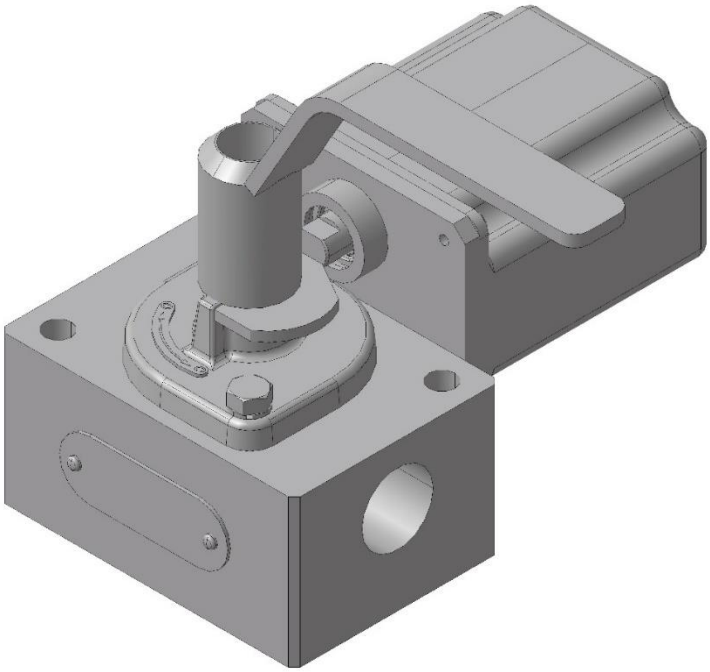

Figure 1: Guard Emergency Brake Valve, Isometric View

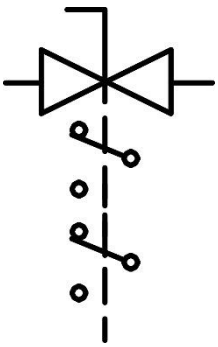

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

- Port size .....3/4" BSPP
- Handle colour .....Red
- Mass .....2 kg Approx
- Working pressure .....10 bar max
- Working temperature..... -10°C to +70°C
- Operating voltage.....110 Vdc

/// 3. OPERATIONS

The guard emergency brake valve is operated by moving the handle through 90°. The device consists of an valve body having the inlet and delivery ports. Micro switchs are protected in a cover.

3.1 CLOSE CONDITION

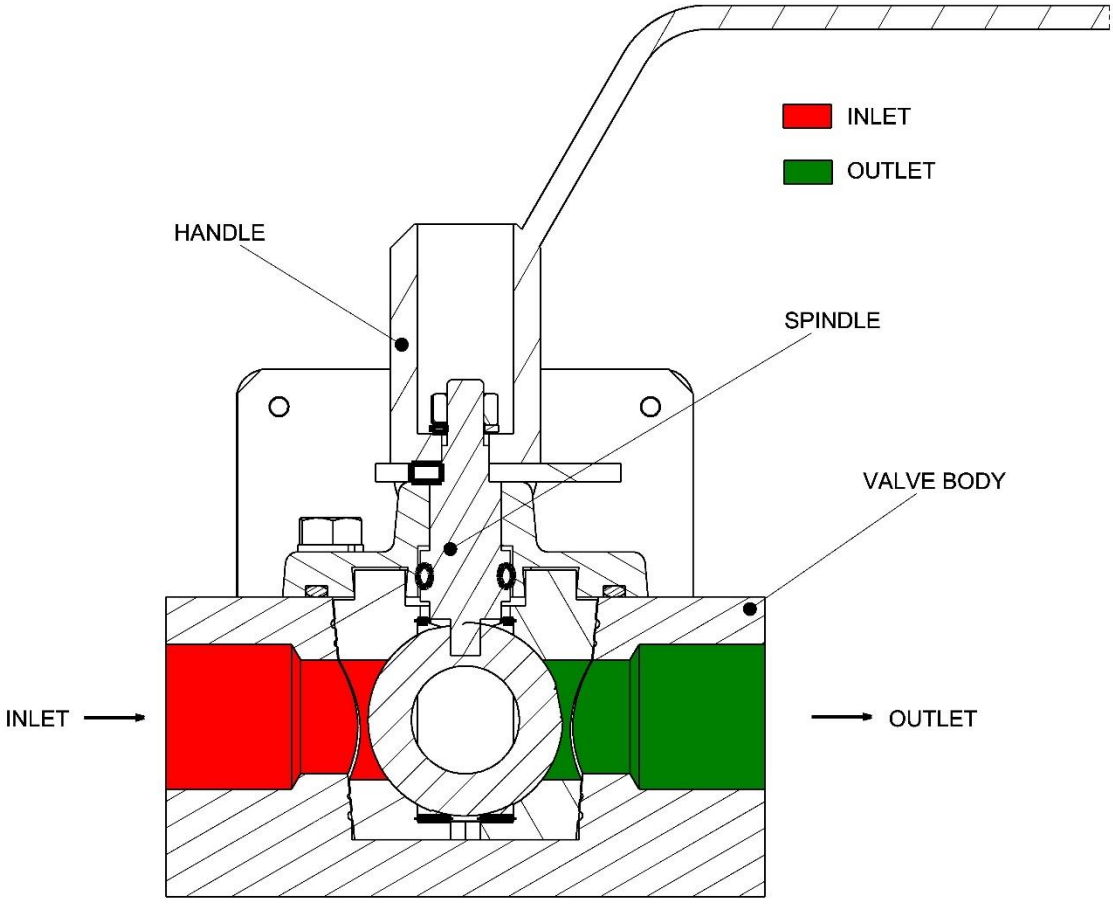

Figure 3: Guard Emergency Brake Valve, Open Condition

Refer to Figure 3

In working condition handle is in closed position. Inlet pressure is not connected to the oulet port.

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3.2 OPEN CONDITION

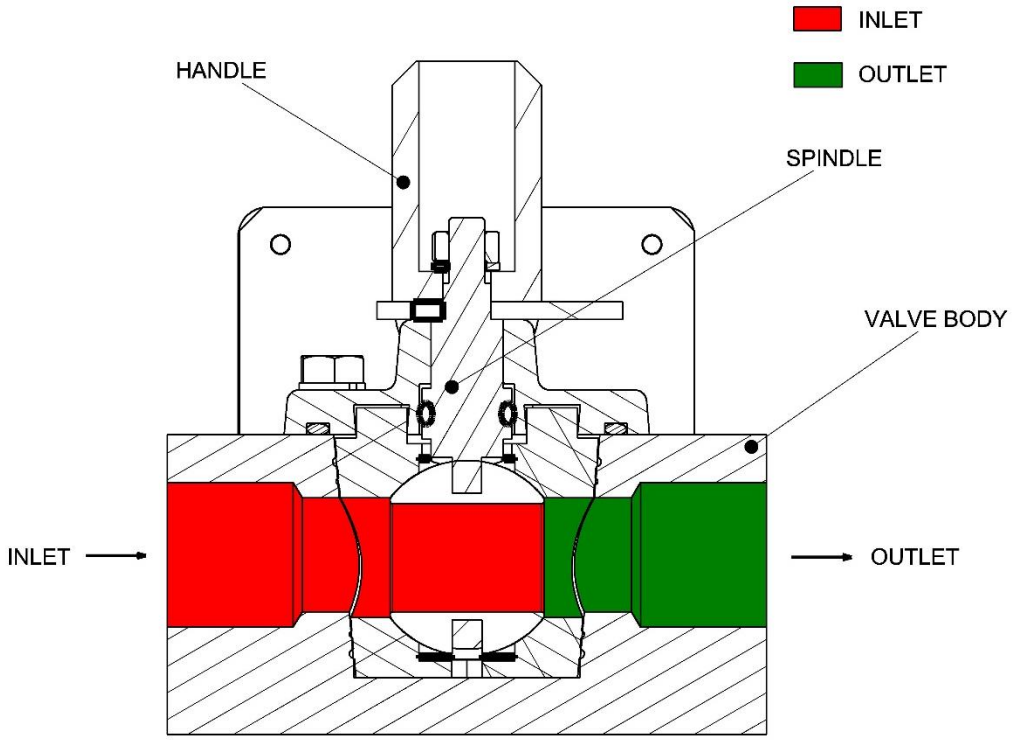

Figure 4: Guard Emergency Brake Valve, Closed Condition

Refer to Figure 4

In open condition, the handle has to be rotated to the open position. When handle is rotated it rotates the ball plug via spindle. The inlet port is connected to the outlet port.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
Screw driver	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242/243	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan.** If no system maintenance plan is provided; the device must be maintained regularly as required by the Operator's rules; the mission profile and the environmental conditions. Typical functional test periodicity (on train) : 1 year. (refer section 5.2.1).

2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 6 years.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/Handle turns free and that the micro switch gives the right indication. The test must be done with the system pressurised.
3. At the end of the test, make sure all the initial conditions are restored.

5.3 REMOVAL PROCEDURE OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 5

1. Unscrew and remove the four cheese head screws (3) and spring lock washer (4) which secures the cover (1) to the mounting plate (2) using screwdriver.
2. Disconnect electrical connection.
3. Remove pipe fittings from guard emergency brake valve.
4. Unscrew and remove the two mounting screws (5) (If available) using appropriate tool.

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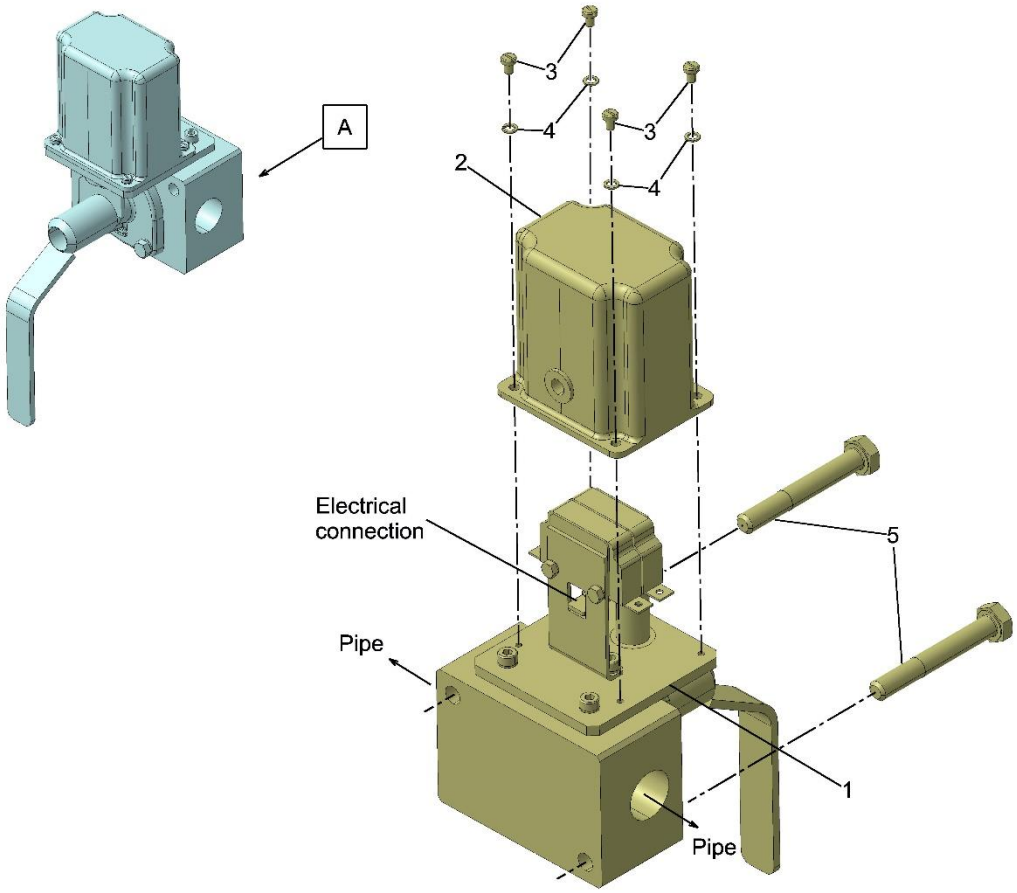

Figure 5: Guard Emergency Brake Valve, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	MOUNTING PLATE	FT0051447-000	1
2	COVER	FT0050287-000	1
3	CHEESE HD SCREW M4	917015400	4
4	SPRING LOCK WASHER	909009000	4

NOTE: Item 5 is not under the scope of WABTEC.

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 5

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Connect electrical connections to micro switchs.
3. Apply Loctite 242 on threads of four cheese head screws 93).
4. Install the four cheese head screws (3) and spring lock washer (4) which secures the cover (1) to the mounting plate (2) using screwdriver.
5. Pneumatic port connections should be BSPP fittings.
6. Do not use tuflon tape on the threaded ports.
7. Install the guard emergency brake valve with interface.
8. Secure guard emergency brake valve using two suitable screws (5) (If available) with applicable clamping torque for mounting.
9. Connect guard emergency brake valve to the pipe fitting. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
10. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6. Spare Part List

- Routine Maintenance - Spare parts not required.
- Installation: Spare parts not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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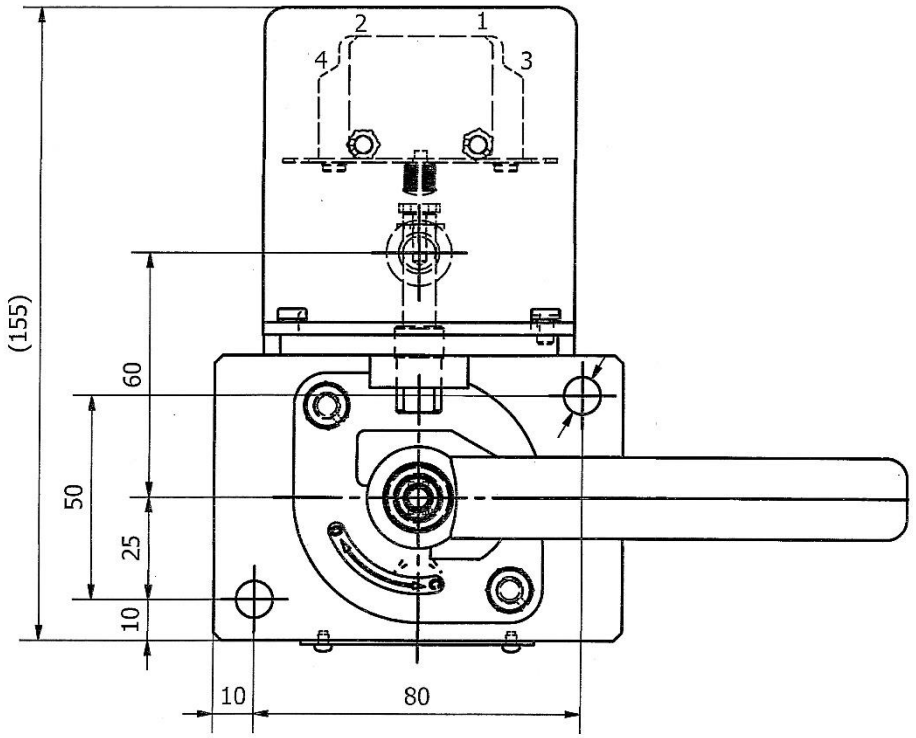
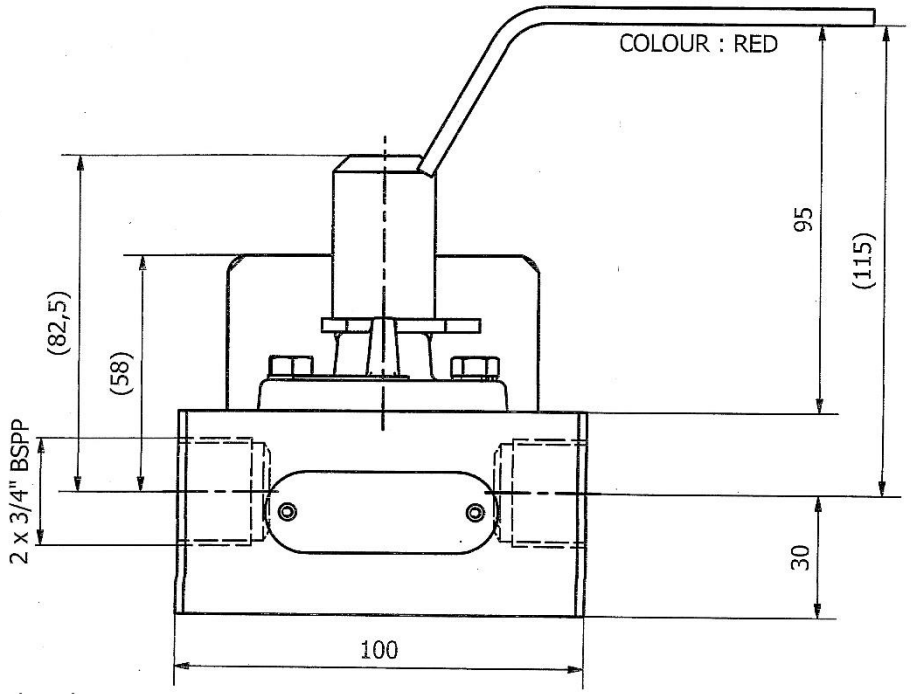
/// 8. OUTLINE DRAWING

Guard Emergency Brake Valve – FT0051058-A00





Note: Guard emergency brake valve shown in closed condition

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01.18_Drivers brake valve

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/// FT0050803-100-E00MUM

DRIVER'S BRAKE VALVE
FT0050803-100
FT0053712-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0050803-100-E00MUM.docx	C00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	03/12/2015	NEW RELEASE	.	SRC	.MK	. VC
B00	28/10/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC1675	VP	.KMS	.BSH
C00	01/11/2022	Document updated with new template and added new P/N: FT0053712-100	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Driver's Brake Valve is used for backup braking. It is operated by means of a 'Joystick' type handle, which controls the charging and discharging of the brake pipe.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

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1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

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1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

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- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Brake Valve Isolator must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Driver's Brake Valve and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Driver's Brake Valve P/N FT0050803-100 and FT0053712-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
BP	Brake Pipe
EVP	Exhaust Valve
ID	Internal Diameter
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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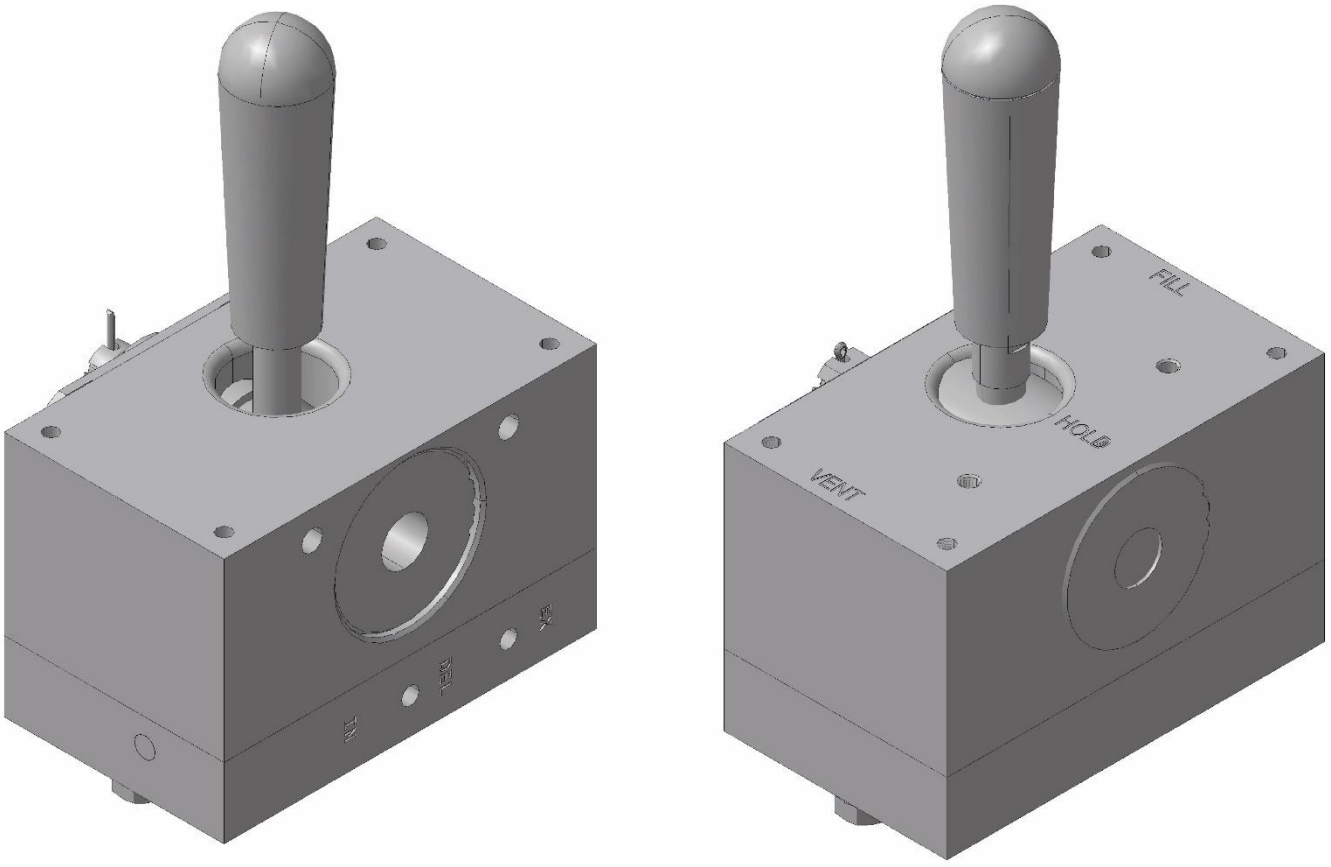
/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1

The Driver's Brake Valve is used for backup braking. It is operated by means of a 'Joystick' type handle, which controls the charging and discharging of the brake pipe.



FT0050803-100 FT0053712-100

Figure 1: Driver's Brake Valve, Isometric View

2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	FT0050803-100	FT0053712-100
Max operating pressure	5 bar	10 bar
Working pressure range	0-5 bar	0-10 bar
Mass	3.0 kg	2.85 kg

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/// 3. OPERATIONS

The driver's brake valve is a compact "ON-OFF" valve with a three position handle.

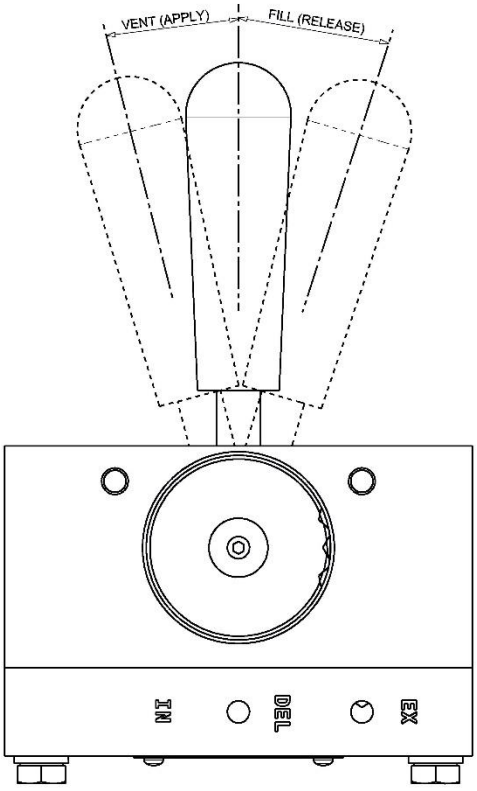

Figure 2: Driver's Brake Valve, Handle Position

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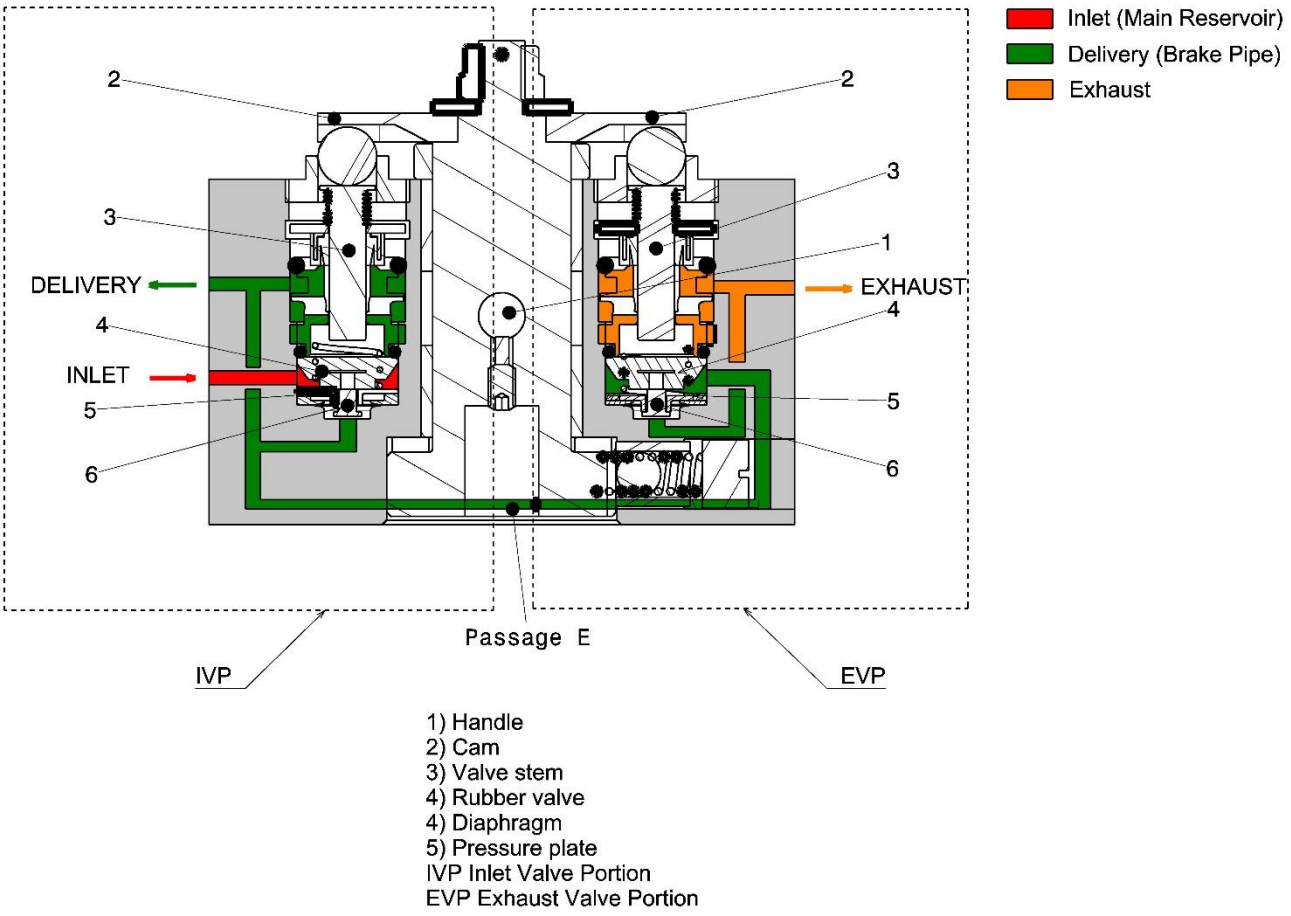

Figure 3: Driver's Brake Valve, Working Condition

Refer to Figure 2 and Figure 3

When a regulated pressure, set to the running value of the BP, is connected to its inlet port, the pressure is sealed from the delivery port, if the handle is kept in the neutral position.

If the handle is moved to the "release" position, the CAM operated valve stem in the inlet valve portion moves down to open the rubber valve and admit the inlet pressure in chamber 'A' to chambers 'B' & "C" from where it is connected to the signal port of the brake pipe relay to charge the brake pipe. The inlet valve is kept open as long as the handle is kept in release position. When the handle is moved to the release position, the CAM is designed in such a way that it continues to be free of the valve stem of the exhaust valve portion. The spring holds the exhaust valve stem up, allowing the exhaust rubber valve to be seated on its valve seat.

The output pressure from the inlet valve is connected internally to the inlet port of the exhaust valve portion, where it is sealed from atmosphere by the exhaust valve (EVP) resting on its seat. Portion of the output pressure is branched off to the bottom side of the inlet valve, to the underside of the diaphragm operated pressure plate to create a "Pressure balance" across the inlet valve.

When the handle is moved to the "Lap position" both the CAM operated inlet and exhaust valve stems are released and allow their valves to seat on the respective valve seats. In this condition the output pressure at any level is isolated from the inlet pressure on one side and also for the atmosphere on the other side.

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The same operation repeats, if the handle is moved to “Apply position”, which activates the exhaust valve stem to open the exhaust valve (EVP) and connect the output to the pressure to atmosphere, whilst leaving the inlet valve stem released.

Lapping is achieved when the handle is kept in the “Lap position” with both valves being on their seats retaining the pressure in chambers “B” & “C”.

/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME.	APPLICATION
13mm spanner	Tighten/loosen the fasteners
Torque wrench 3-14 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Thread locking
Loctite 242/243	Thread locking
Lint free cloth	Cleaning the parts
Stylmark	Torque marker

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.

2. Second Level Maintenance: overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhauled regularly as required by the Operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 4

1. Remove pneumatic connections.
2. Unscrew the handle (1) from the valve assembly (4).
3. Loosen and remove the four hex bolts (2) along with four washers (3) that attach the valve assembly (4) to the driver desk.

NOTE: Item 2, 3 and Driver desk are not under the scope of WABTEC.

4. Remove the valve assembly (4) from the driver desk.
5. Remove the parts that follow that attach the manifold (6) to the valve assembly (4) using a 13mm spanner:
   - Two bolts (8);
   - Two spring washers (7).
6. Remove the manifold (6) from the valve assembly (4).
7. Remove and **DISCARD** the four O-rings (5).

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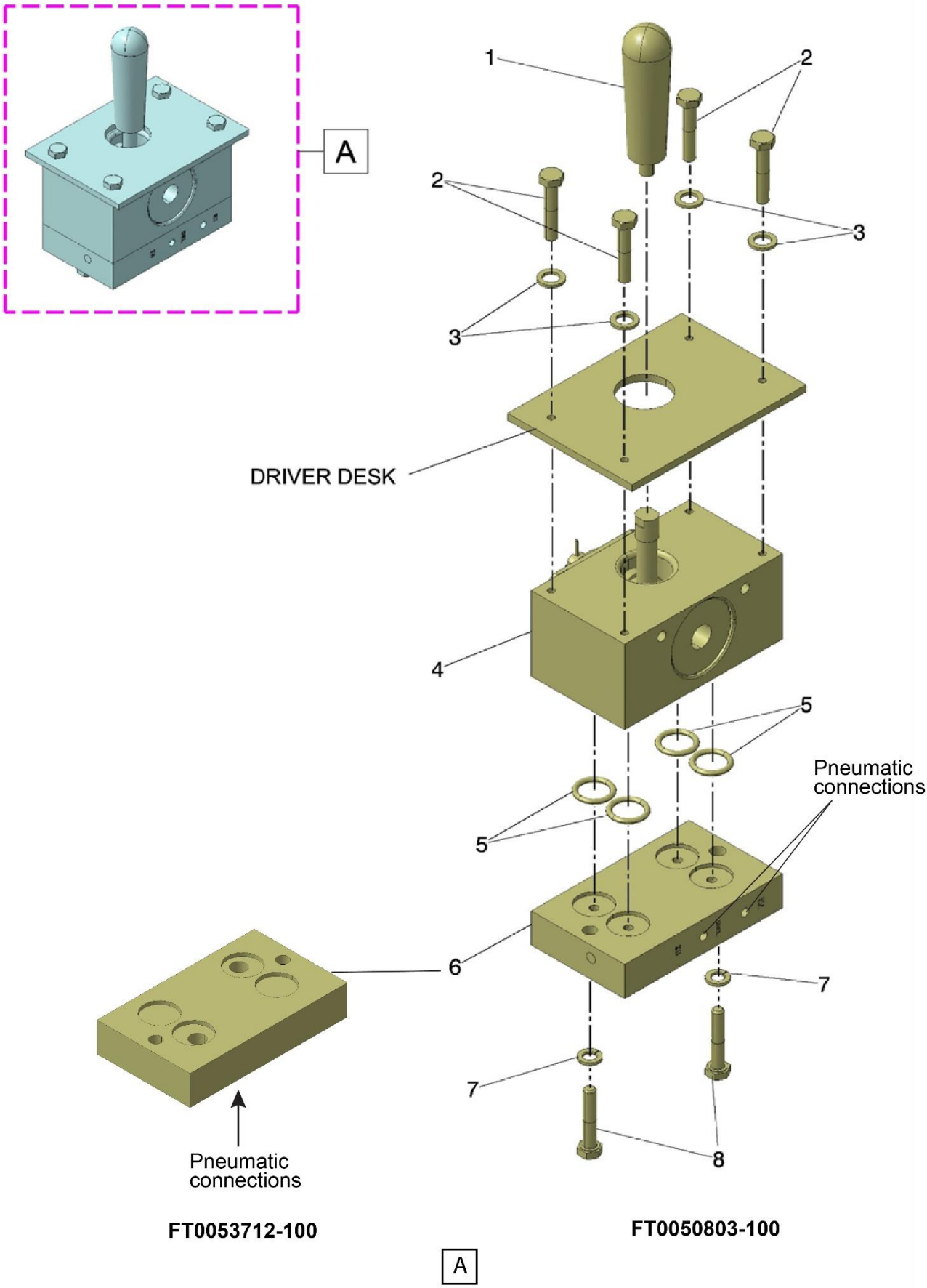

Figure 4: Driver's Brake Valve, Removal/Installation

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	HANDLE	004901000	1
4	VALVE ASSEMBLY	Refer. below table	1
5	O-RING	009702000A	4
6	MANIFOLD PLUGGED	Refer. below table	1
7	SPRING WASHER DIA 8	Refer. below table	2
8	HEX HD BOLT M8	Refer. below table	2

ITEM NO.	FT0050803-100.	FT0053712-100
4	FT0050803-101	FT0053712-110
6	FT0050839-100	AB734-68
7	909021700	909019300
8	905039700	905018100

NOTE: Item 2, 3 and Driver desk are not under the scope of WABTEC.

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 4

1. Smear Molykote M33 grease on the O-ring seating location of the manifold (6) and to the four **NEW** O-rings (5).
2. Install the four O-rings (5) on the manifold (6).
3. Apply Loctite 242 on the threaded portion of the two bolts (8).
4. Position the manifold (6) on the valve assembly (4) and secure with the parts that follow using 13mm spanner:
   - Two spring washers (7);
   - Two bolts (8).
5. Torque the two bolts (8) to 14 Nm.
6. Apply torque mark on the bolt head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

7. Secure the valve assembly (4) to the driver desk with four washers (3) and four hex bolts (2) with adequate torque.
8. Tighten the handle (1) to the valve assembly (4).
9. Connect pneumatic connections
10. Pressurize the system, switch on the electrical power and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance: Spare parts not required.

Refer to Figure 4

- Installation: The spare parts required for installation are listed in the below table:

INSTALLATION SPARE PART			
REF NO.	DESCRIPTION	PART NUMBER	QTY
5	O-RING	009702000A	4

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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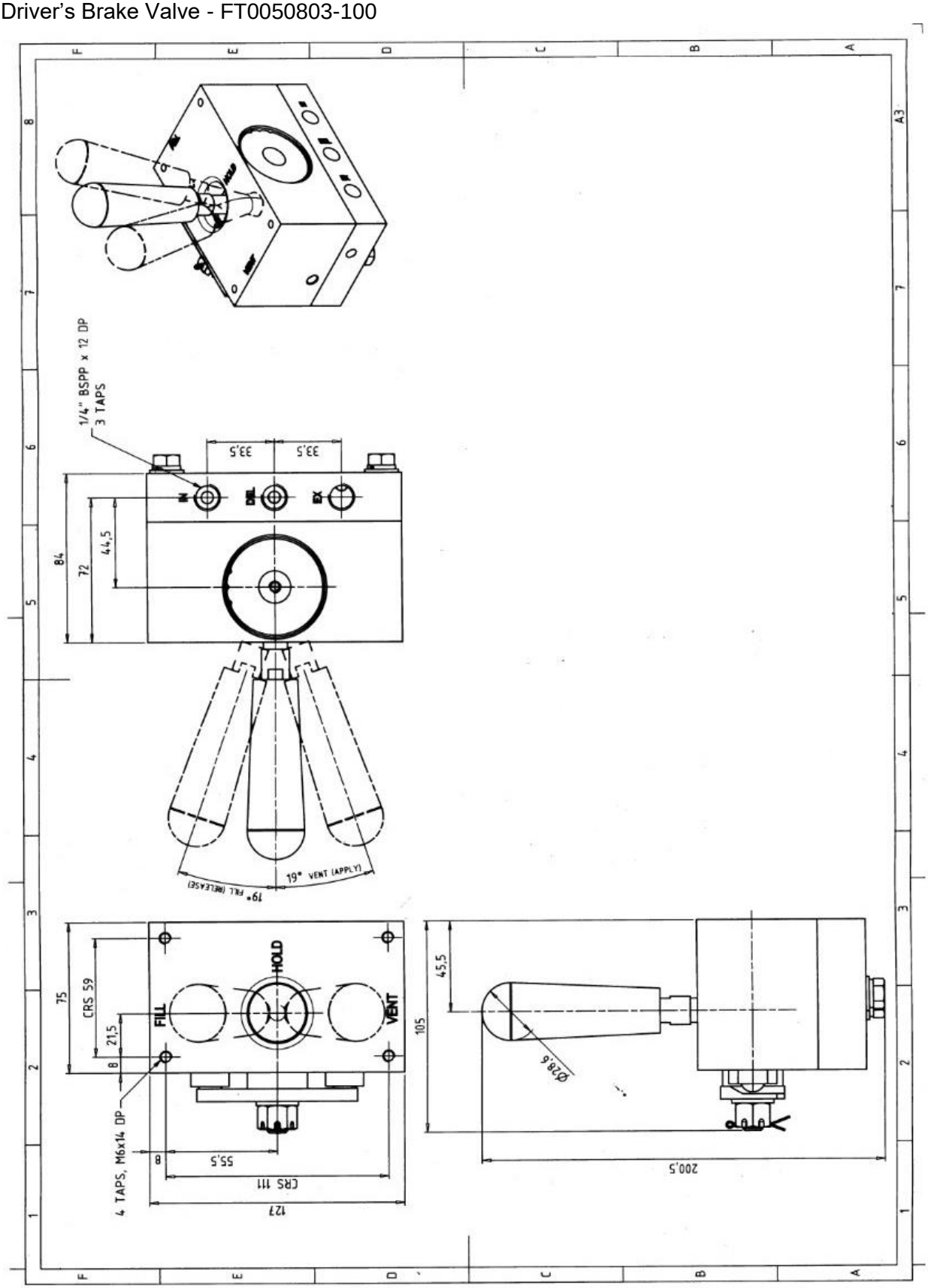
/// 8. OUTLINE DRAWING

Driver's Brake Valve - FT0050803-100



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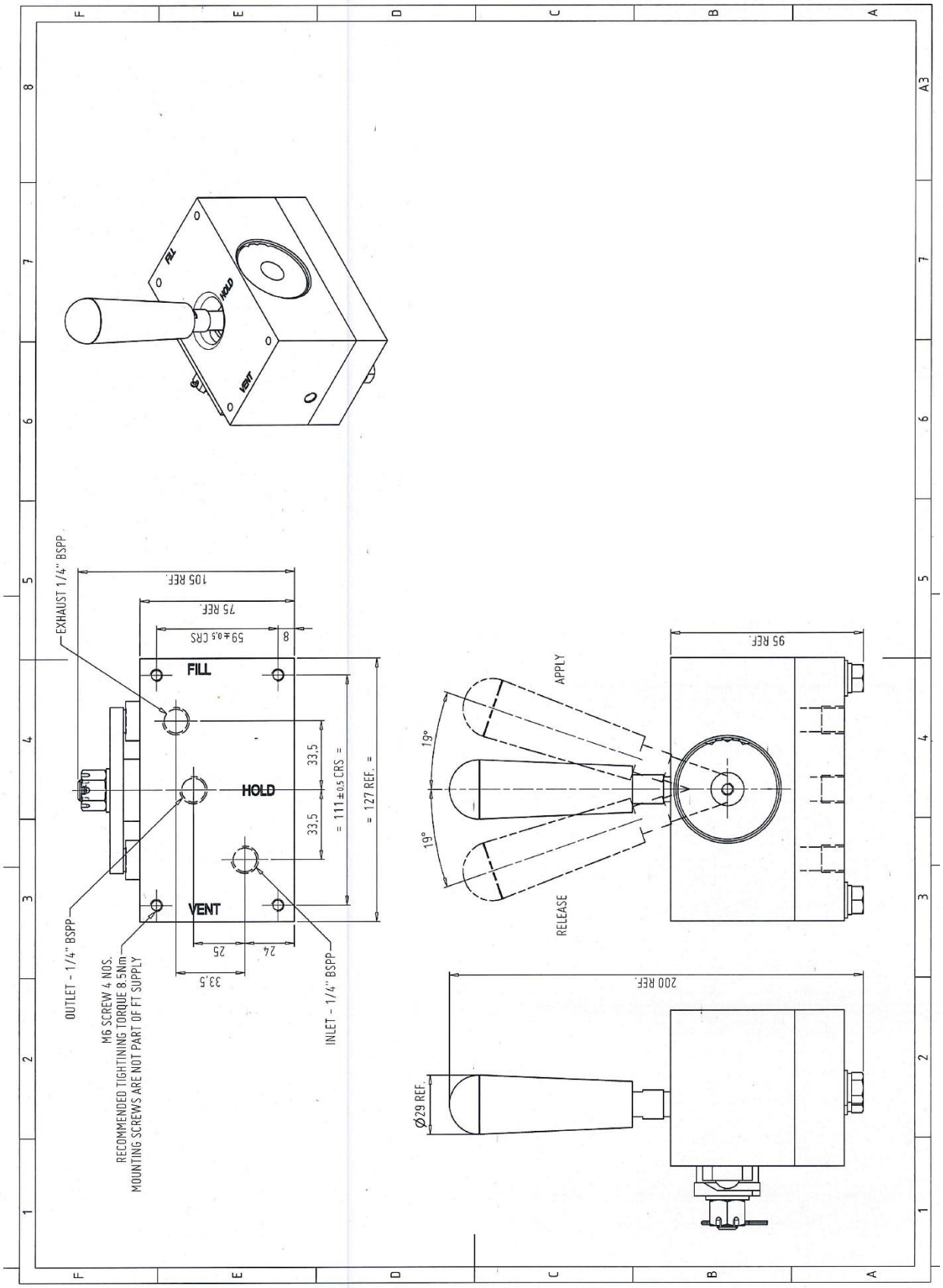

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01.20_05.18_08.09_13.16 Reservoir 2L_25L_50L_200L

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/// FT0051876-000-E00MUM

STAINLESS STEEL RESERVOIR 70L (FT0051876-000, FT0051876-001), RESERVOIR 200L (FT0053704-100), RESERVOIR 50 L (FT0053771-000) RESERVOIR 25L (FT0053705-000), RESERVOIR 15L (FT0051876-105), RESERVOIR 2L (FT0053729-000)

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0051876-000-E00MUM.docx	C00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1659	VP	KMS	.BSH
B00	01/11/2022	New P/N added: FT0053771-000, FT0053704-100, FT0053729-000 and FT0053705-000	DRC1751 /4	DC	.NRS	.BSH
C00	07/02/2023	New P/N added: FT0051876-001, FT0051876-105	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Reservoir is a pressurized vessel that contains a volume of air in defined conditions of pressure.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

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- Prior to accessing the electric parts, make sure the power is duly switched off.
- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.
- For operations under the vehicle, personnel must wear protective helmet.
- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.
- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.
- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.
- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).
- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.
- While testing the components, never exceed the maximum operating pressure limits.
- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

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- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°Cwith relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Reservoir must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on reservoir and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the reservoir for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
P/N	Part Number
QTY	Quantity
ST	Stainless
BSPP	British Standard Parallel Pipe
BSP	British Standard Pipe

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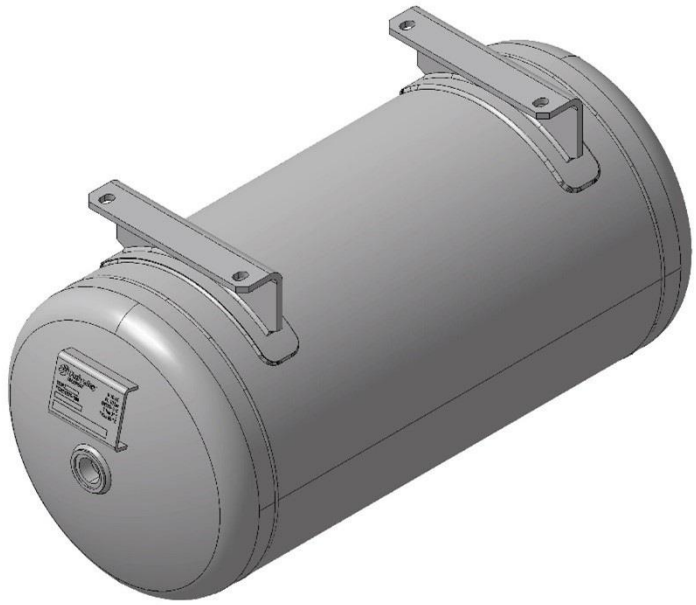
/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The Reservoir is a pressurized vessel that contains a volume of air in defined conditions of pressure.



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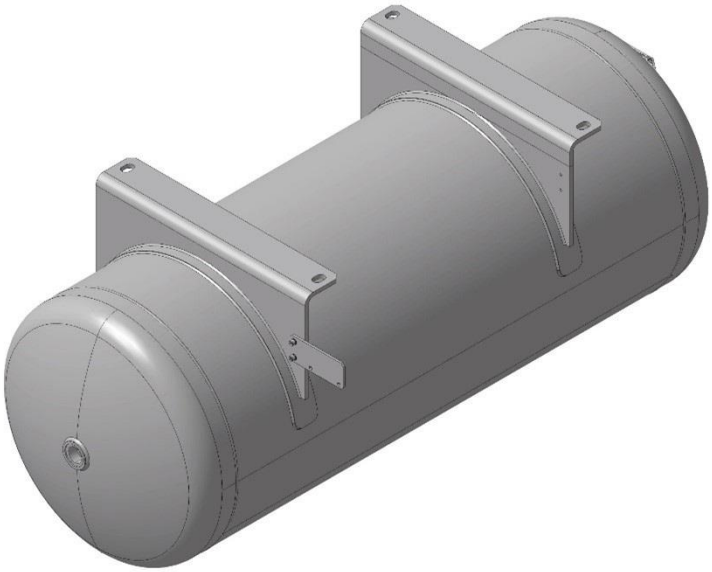
FT0051876-001

FT0053771-000



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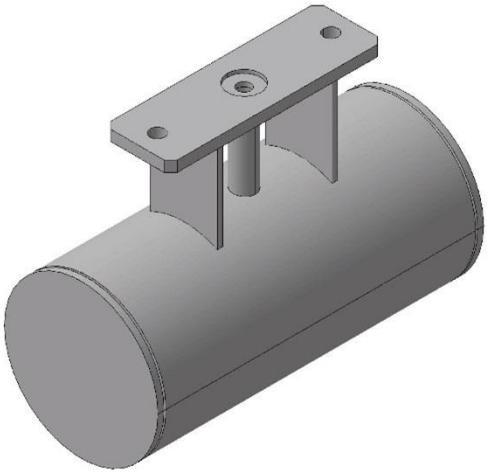

FT0053729-000

Figure 1: Reservoir, Isometric View (Sheet 1 of Sheet 2)

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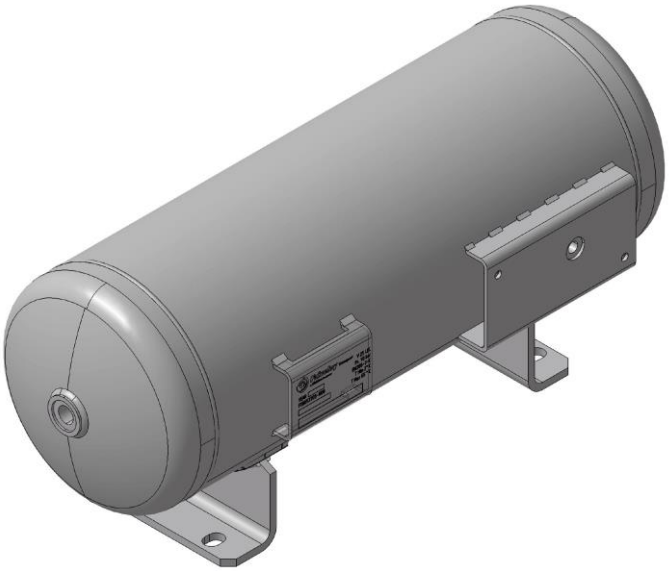

FT0053705-000

FT0051876-105

Figure 1: Reservoir, Isometric View (Sheet 2 of Sheet 2)

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	Port size	Max service pressure	Working pressure range	Mass
FT0051876-000	G1-11	10 bar	0-10 bar	36 kg
FT0051876-001	G1-11	10 bar	0-10 bar	44 kg
FT0053771-000	G1/2”	10 bar	0-10 bar	32.3 kg
FT0053704-100	1” BSP	11 bar	0-11 bar	81 kg
FT0053729-000	G1/2 -14	6 bar	0-6 bar	6 kg
FT0053705-000	G1/2 -14	10 bar	0-10 bar	21 kg
FT0051876-105	G1-11	10 bar	0-10 bar	16 kg

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/// 3. OPERATIONS

The reservoir must be used within the pressure and temperature design limits, marked onto the label and on the test report that must be kept stored. For further information refer to the drawings.

/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

The tools required for removal and installation of components are reported in the respective section /// 5 of this manual.

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

The consumables required for installation of components are reported in the respective section /// 5 of this manual.

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/// 5. MAINTENANCE PRESCRIPTIONS

CAUTION! Pressurised system!

WARNING! In case of damage DO NOT repair the St. Steel reservoir, but immediately replace it.

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan.** If no system maintenance plan is provided; the device must be maintained regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical periodicity:
   - Periodic drain as required. (refer section 5.2.1)
   - Visual check every year. (refer section 5.2.2)

2. Second Level Maintenance:
   - **Complete test** (removal, inspection, hydrostatic proof, analysis of results) as required by the Operator's rules, the mission profile and the environmental conditions. If no system maintenance plan is provided, the device must be inspected regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical maintenance periodicity: 15 years.
   - **Thickness check**
     By using an adequate probe, measure the thickness of the material on 10% of population in service.
   - **Welds inspection**
     Visually check that the welds are in perfect condition and there are no signs of corrosion or other damages. Using a boroscope, perform the same check on the internal welds. The inspection must be carried out by expert and qualified personnel according to the regulations in force on the 10% of population in service.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

CAUTION! Possible jet spray! Wear protective gloves and goggles.

WARNING! Collect the drainage waste as prescribed by the law in force, as it may contain oil.

5.2.1 PERIODIC DRAIN: AS REQUIRED

With the system under pressure, purge the reservoir unscrewing the drain plug or opening the drain cock of few turns and drain until clean air is exhausted. At the end, screw the plug. **DO NOT** unscrew the plug all the way out.

5.2.2 VISUAL CHECK: EVERY YEAR

Check that all pressurized vessels are in perfect conditions and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Visually check that the welds are in perfect conditions and there are no signs of corrosion or other damages.

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5.3 REMOVAL AND INSTALLATION PROCEDURE OF EQUIPMENT

5.3.1 RESERVOIR 2L (FT0053729-000)

CAUTION! Pressurised system! Discharge the pressure before removal.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

TOOLS AND CONSUMABLES REQUIRED

- 16 mm socket wrench
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 50 Nm
- Stylmark paint

SPARES REQUIRED

Refer to Figure 3

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	009702000A	1

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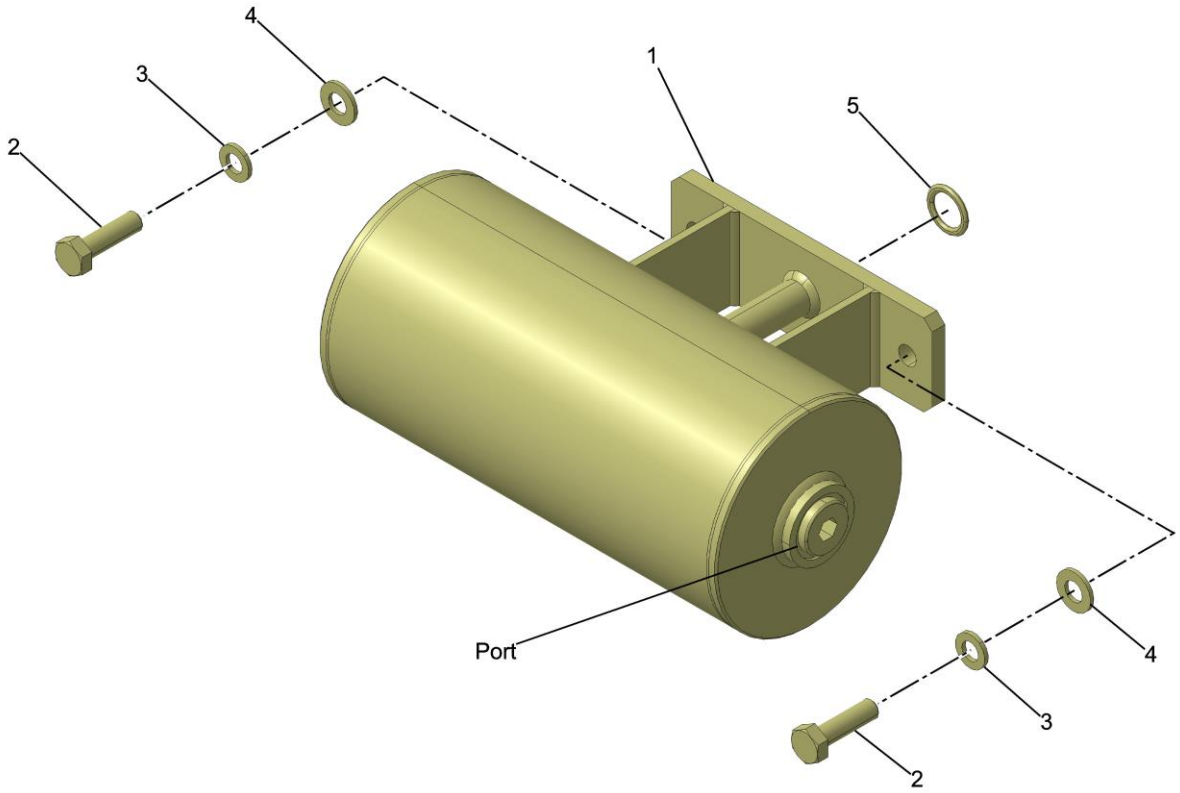

Figure 3: Reservoir 2L, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 2L	FT0053729-000	1
2	HEX HEAD SCREW M10	920021700	2
3	SPRING LOCK WASHER	909019100	2
4	PUNCHED WASHER	908010000	2
5	O-RING	009702000A	1

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REMOVAL PROCEDURE

Refer to Figure 3

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Remove the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Unscrew and remove the following parts that secures the reservoir 2L (1) to the manifold:
   - Two hex head screws M10 (2) using 16 mm socket wrench
   - Two spring lock washers (3)
   - Two punched washers (4)
2. Remove and **DISCARD** the O-ring (5) from the groove portion of the reservoir 2L (1).

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

INSTALLATION PROCEDURE

Refer to Figure 3

1. Smear Molykote M33 grease to the **NEW** O-ring (5) and to the groove portion on the reservoir 2L (1)
2. Install the **NEW** O-ring (5) to the groove portion of reservoir 2L (1).
3. Apply Loctite 242 on threads of two hex head screws M10 (2).
4. Install the following parts that secures the reservoir 2L (2) to the manifold:
   - Two hex head screws M10 (2) using 16 mm socket wrench
   - Two spring lock washers (3)
   - Two punched washers (4)
5. Torque tighten the two hex head screws M10 (2) to 27.3 Nm. Apply torque mark using Stylmark on it.
6. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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5.3.2 RESERVOIR 25L (FT0053705-000)

CAUTION! Pressurised system! Discharge the pressure before removal.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

TOOLS AND CONSUMABLES REQUIRED

- 24 mm open end spanner
- 24 mm socket wrench
- Loctite 242 or 243
- Torque wrench 211 Nm
- Stylmark paint

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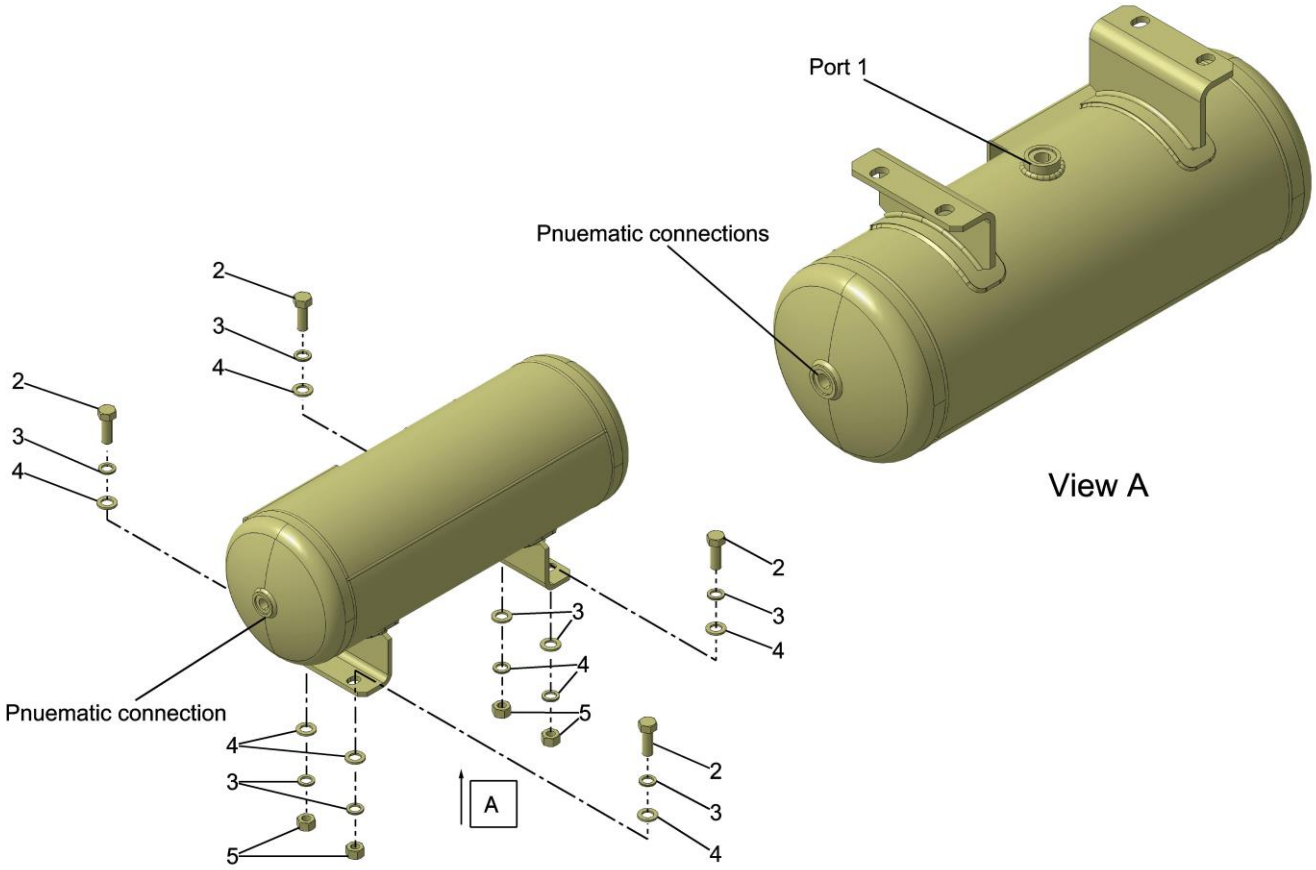

Figure 4: Reservoir 25L, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 25L	FT0053705-000	1
2	HEX HD SCREW M16	920048100	4
3	NORD LOCK WASHER	FT0026782-000	8
4	PLAIN WASHER	908020800	8
5	HEX NUT	906022900	4

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REMOVAL PROCEDURE

Refer to Figure 4

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Remove the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Make use of suitable lifting tools to support the reservoir 25L (1).
2. Disconnect the pneumatic connection from reservoir 25L (1).
3. Unscrew and remove the following parts that secures the reservoir 25L (1) to the frame:
   - Four hex head screws M16 (2)
   - Eight nord lock washers (3)
   - Eight plain washers (4)
   - Four hex nuts M16 (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to loosen four hex head screws M16 (2)
4. Remove the reservoir 25L (1) from frame.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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INSTALLATION PROCEDURE

Refer to Figure 4

1. Make use of suitable lifting tools to support the reservoir 25L (1)
2. Position reservoir 25L (1) on the frame.
3. Apply Loctite 242 on the threads of the four hex head screws M16 (2).
4. Install following parts that secures the reservoir 25L (1) to the frame:
   - Four hex head screws M16 (2)
   - Eight nord lock washers (3)
   - Eight plain washers (4)
   - Four hex nuts M16 (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to tighten hex head screws M16 (2)
5. Torque the four hex head screws M16 (2) to 211 Nm. Apply torque mark using Stylmark on it.
6. Before assembly of pipe connection perform cleaning of piping on the vehicle.
7. Connect the pneumatic connections and pipe fittings to the reservoir 25L (1).
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Install the components as per instructions in their respective system level manual where this reservoir is used for more details.

9. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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5.3.3 RESERVOIR 50L (FT0053771-000)

CAUTION! Pressurised system! Discharge the pressure before removal.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

TOOLS AND CONSUMABLES REQUIRED

- 18 mm open end spanner
- 18 mm socket wrench
- Loctite 242 or 243
- Torque wrench 10 to 50 Nm
- Stylmark paint

SPARES REQUIRED

Not applicable.

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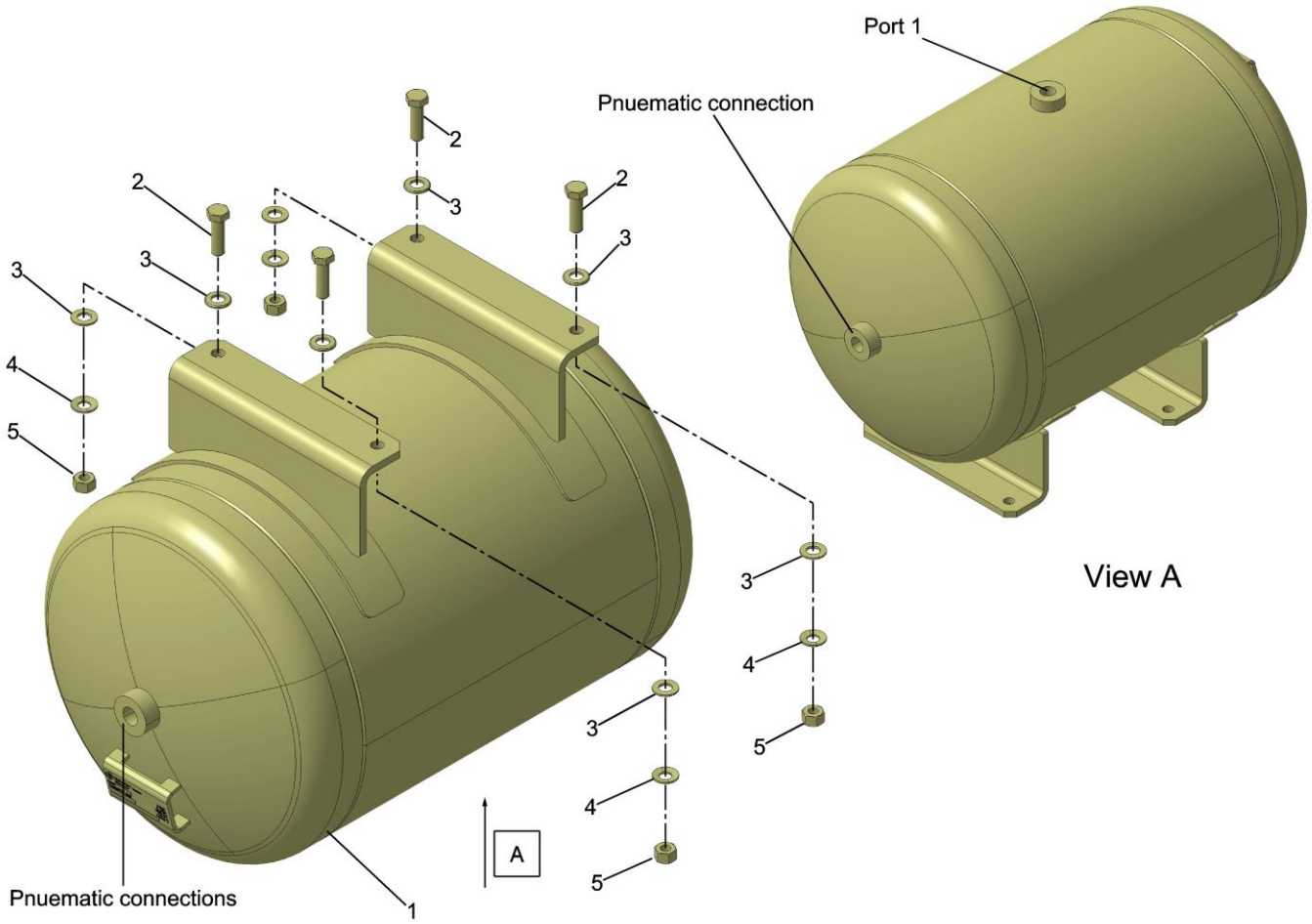

Figure 5: Reservoir 50L, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 50L	FT0053771-000	2
2	HEX HD SCREW M12	920045600	4
3	PLAIN WASHER	908021000	8
4	CONICAL WASHER	2/519044	4
5	HEX NUT M12	906022800	4

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REMOVAL PROCEDURE

Refer to Figure 5

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Remove the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Make use of suitable lifting tools to support the reservoir 50L (1).
2. Disconnect the pneumatic connections and pipe fittings from the reservoir 50L (1).
3. Remove the following parts that secures the reservoir 50L (1) to the frame:
    - Four hex head screws M12 (2)
    - Eight plain washers (3)
    - Four conical washers (4)
    - Four hex nuts M12 (5) using 18 mm spanner and wrench by holding the nut with spanner and wrench to loosen the four hex head screws M12 (2)

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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INSTALLATION PROCEDURE

Refer to Figure 5

1. Make use of suitable lifting tools to support the reservoir 50L (1).
2. Before assembly of pipe connection perform cleaning of piping on the vehicle.
3. Position reservoir 50L (1) on the frame.
4. Apply Loctite 242 on threads of the four hex head screws M12 (2).
5. Install the following parts that secures the reservoir 50L (1) to the frame:
   - Four hex head screws M12 (2)
   - Eight plain washers (3)
   - Four conical washers (4)
   - Four hex nuts M12 (5) using 18 mm spanner and wrench by holding the nut with spanner and wrench to tighten the four hex head screws M12 (2)
6. Torque the four hex head screws M12 (2) to 46.7 Nm. Apply torque mark using Stylmark on it.
7. Connect the pneumatic connections and pipe fittings to the reservoir 50L (1).
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Install the components as per instructions in their respective system level manual where this reservoir is used for more details.

9. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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5.3.4 RESERVOIR 70L (FT0051876-000, FT0051876-001)

CAUTION! Pressurised system! Discharge the pressure before removal.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

TOOLS AND CONSUMABLES REQUIRED

- 18 mm open end spanner
- 18 mm socket wrench
- Loctite 242 or 243
- Torque wrench 46.7 Nm
- Stylmark paint

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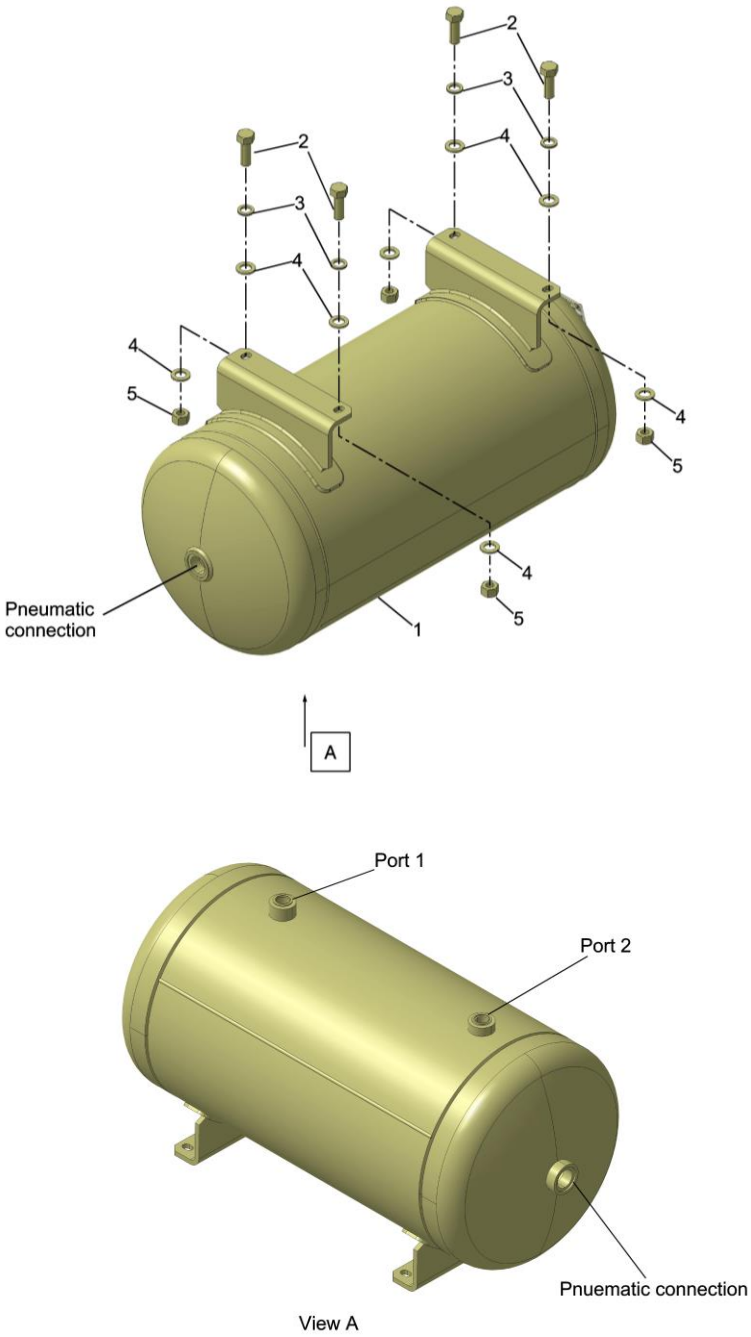

Figure 6: Reservoir 70L, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	ST. STEEL RESERVOIR 70L	See below table	1
2	HEX HEAD BOLT M12	FT0051564-002	4
3	PLAIN WASHER	908021000	4
4	WASHER	FT0020809-002	8
5	HEX NUT	906022800	4

ITEM NO.	P/N
1	FT0051876-000
	FT0051876-001

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REMOVAL PROCEDURE

Refer to Figure 6

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Remove the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Make use of suitable lifting tools to support the reservoir 70L (1).
2. Disconnect pneumatic connection and pipe fittings from reservoir 70L (1).
3. Remove the following parts that secures the reservoir 70L (1) to the frame:
    - Four hex head bolts M12 (2)
    - Four plain washers (3)
    - Eight washers (4)
    - Four hex nuts M12 (5) using 18 mm spanner and wrench by holding the nut with spanner and wrench to loosen the four hex head bolts M12 (2)
4. Remove reservoir 70L (1) from frame.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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INSTALLATION PROCEDURE

Refer to Figure 6

1. Make use of suitable lifting tools to support the reservoir 70L (1).
2. Position reservoir 70L (1) on the frame.
3. Before assembly of pipe connection perform cleaning of piping on the vehicle.
4. Apply Loctite 242 on the threads of the four hex head bolts M12 (2).
5. Install the following parts that secures the reservoir 70L (1) to the frame:
    - Four hex head bolts M12 (2)
    - Four plain washers (3)
    - Eight washers (4)
    - Four hex nuts M12 (5) using 18 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolts M12 (2)
6. Torque tighten the four hex head bolts M12 (2) to 46.7 Nm. Apply torque mark using Stylmark on it.
7. Connect pneumatic connections and pipe fittings to reservoir 70L (1).
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Install the components as per instructions in their respective system level manual where this reservoir is used for more details.

9. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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5.3.5 RESERVOIR 200L (FT0053704-100)

CAUTION! Pressurised system! Discharge the pressure before removal.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

TOOLS AND CONSUMABLES REQUIRED

- 24 mm open end spanner
- 24 mm socket wrench
- Loctite 242 or 243
- Torque wrench 211 Nm
- Stylmark paint

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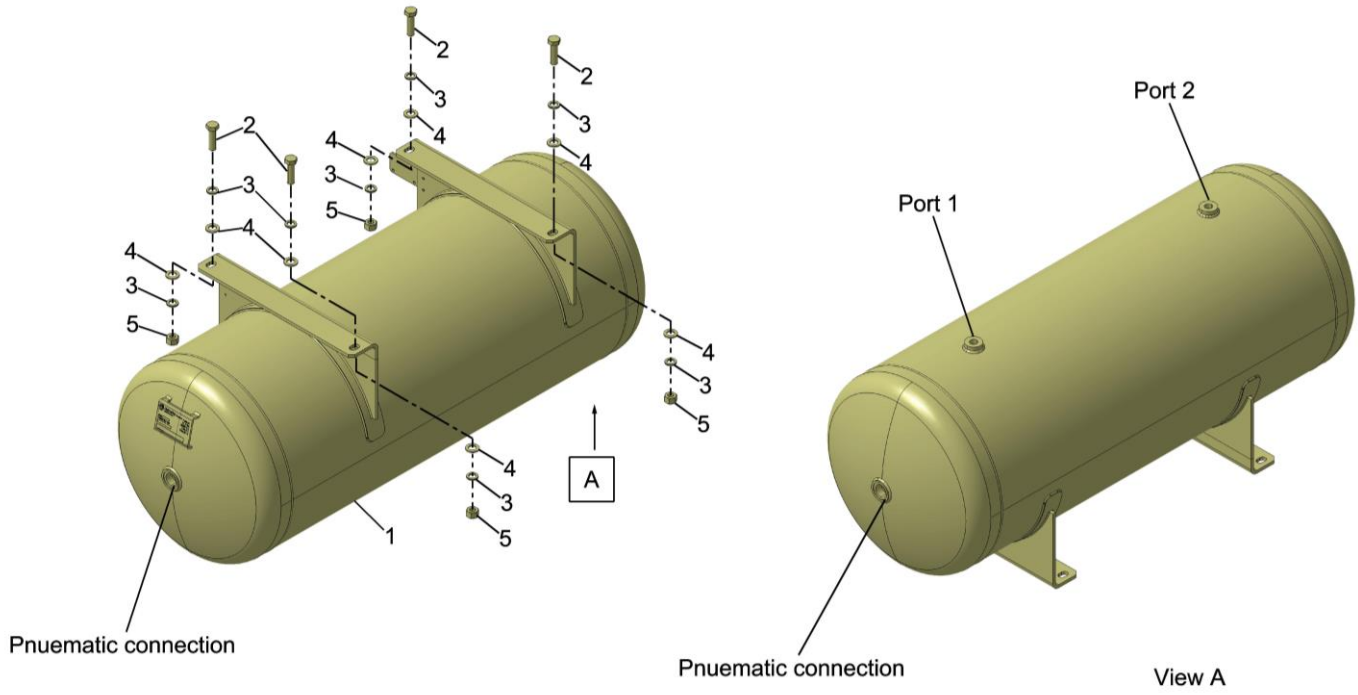

Figure 7: Reservoir 200L, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 200L	FT0053704-100	1
2	HEX HEAD BOLT M16	905024700	4
3	NORD LOCK WASHER	FT0051677-004	8
4	PUNCHED WASHER	908002000	8
5	HEX NUT	906002000	4

REMOVAL PROCEDURE

Refer to Figure 7

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Remove the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Disconnect the pneumatic connections from reservoir 200L (1).
2. Make use of suitable lifting tools to support the reservoir.
3. Remove the following parts that secures the reservoir 200L (1) to the frame:
   - Four hex head bolts M16 (2)
   - Eight nord lock washers (3)
   - Eight punched washers (4)
   - Four hex nuts M16 (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to loosen hex head bolts M16 (2)

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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INSTALLATION PROCEDURE

Refer to Figure 7

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Install the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Make use of suitable lifting tools to support the reservoir 200L (1).
2. Position reservoir 200L (1) on the frame.
3. Apply Loctite 242 on the threads of the four hex head bolts M16 (2).
4. Install the following parts that secures the reservoir 200L (1) to the frame:
    - Four hex head bolts M16 (2)
    - Eight nord lock washers (3)
    - Eight punched washers (4)
    - Four hex nuts M16 (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to tighten hex head bolts M16 (2)
5. Torque tighten the head bolts (2) to 211 Nm. Apply torque mark using Stylmark on it.
6. Connect the pneumatic connection and pipe fittings to the reservoir 200L (1).
7. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
8. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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5.3.6 Reservoir 15L (FT0051876-105)

CAUTION! Pressurised system! Discharge the pressure before removal.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

TOOLS AND CONSUMABLES REQUIRED

- 16 mm open end spanner
- 16 mm socket wrench
- Loctite 242 or 243
- Torque wrench
- Stylmark paint

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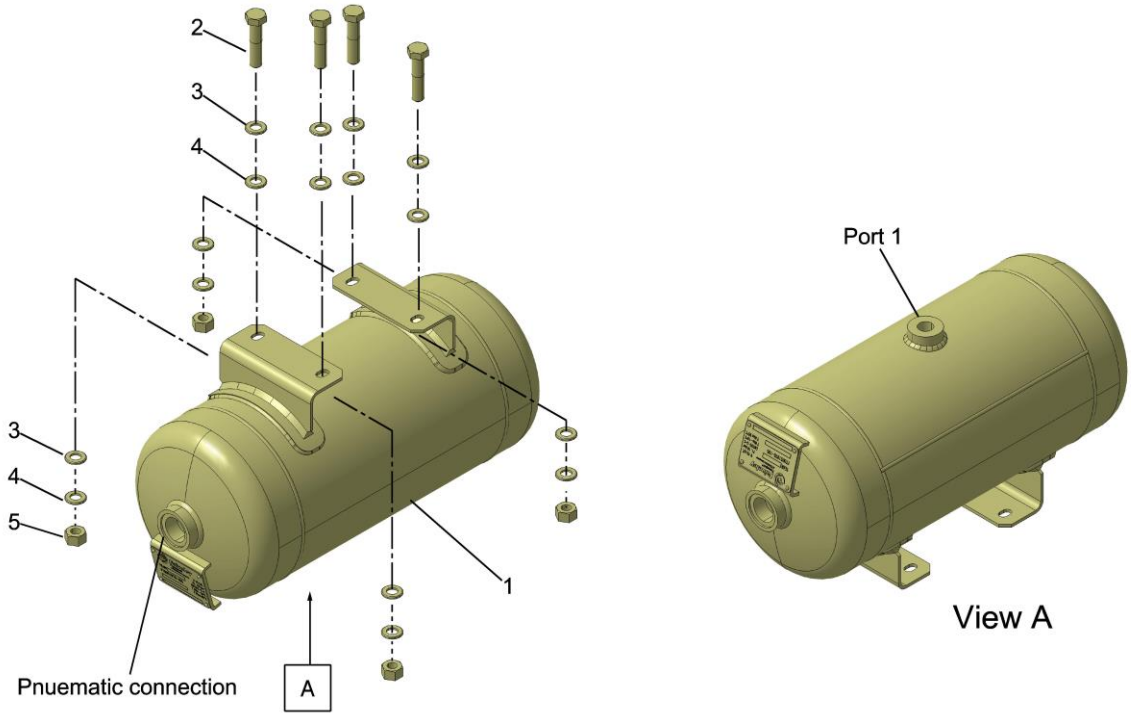

Figure 8: Reservoir 15L, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 15L	FT0051876-105	1
2	HEX HD BOLT M10	NOT WABTEC SCOPE	4
3	SPRING WASHER		8
4	WASHER		8
5	HEX NUT M10		4

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REMOVAL PROCEDURE

Refer to Figure 8

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Remove the components as per instructions in their respective system level manual where this reservoir is used for more details.

1. Make use of suitable lifting tools to support the reservoir (1).
2. Disconnect pneumatic connections and pipe fittings from reservoir (1).
3. Unscrew and remove the following parts (NOT WABTEC scope of supply) that secures the reservoir (1) to the host panel (Car builder's scope):
   - Four hex head bolts M10 (2)
   - Eight spring washers (3)
   - Eight washers (4)
   - Four hex nuts M10 (5) using 16 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolts M10 (2)
4. Remove reservoir (1) from host panel (Car builder's scope).

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

INSTALLATION PROCEDURE

Refer to Figure 8

1. Make use of suitable lifting tools to support the reservoir 5L (1).
2. Position reservoir (1) on the host panel (Car builder's scope).
3. Before assembly of pipe connection perform cleaning of piping on the vehicle.
4. Apply Loctite 242 to the threads of the four hex head bolts M10 (2).
5. Install the following parts (NOT WABTEC scope of supply) that secures the reservoir (1) to the host panel (Car builder's scope):
   - Four hex head bolts M10 (2)
   - Eight spring washers (3)
   - Eight washers (4)
   - Four hex nuts M10 (5) using 16 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolts M10 (2)
6. Torque tighten the four hex head bolts M10 (2) as per car builders instructions.
7. Connect pneumatic connections and pipe fittings to reservoir (1).
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.

NOTE: Based on end application the ports on the reservoir can be fitted with components such as vented plug, blanking plug, drain cock, auto drain valve. Install the components as per instructions in their respective system level manual where this reservoir is used for more details.

9. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the end-user premises and to the law in force in the country where the vessel is used.

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/// 6. Spare Part List

- Routine Maintenance - Spare parts not required
- Installation: The tools required for installation of components are reported in the respective section /// 5 of this manual

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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01.26_Horn control & backup brake module

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/// FT0053354-100-E00MUM

HORN CONTROL & BACKUP BRAKE MODULE FT0053354-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.SKK Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		31/10/2022
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0053354-100-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Horn Control & Backup Brake Module is an integration of EP (Solenoid) Valves, Pressure Limiting Valve, Check Valves, Relay Valves, Isolating Cocks, Filters & Reservoir.

All the components stated above are assembled to a base manifold.

The base manifold has drilled passages that connect pneumatic pressure from one component to another, also to receive and deliver pneumatic pressure from external sources.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.
- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.
- Prior to accessing the electric parts, make sure the power is duly switched off.
- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.
- For operations under the vehicle, personnel must wear protective helmet.
- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.
- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.
- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.
- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).
- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

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- While testing the components, never exceed the maximum operating pressure limits.
- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.
- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.
- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.
- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

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1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

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The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

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1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section /// 5 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

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- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Cut off angle cock with vent must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on cut off angle cock with vent and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the cut off angle cock with vent for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
BSP	British Standard Pipe
DBV	Driver Brake Valve
EP	Electro Pneumatic
MP	Main Pipe
HD	Head
HEX	Hexagonal
Kg	Kilogram
L	Litres
Nm	Newton Metre
P/N	Part Number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1

Horn Control & Backup Brake Module is an integration of EP (Solenoid) Valves, Pressure Limiting Valve, Check Valves, Relay Valves, Isolating Cocks, Filters & Reservoir.

All the components stated above are assembled to a base manifold.

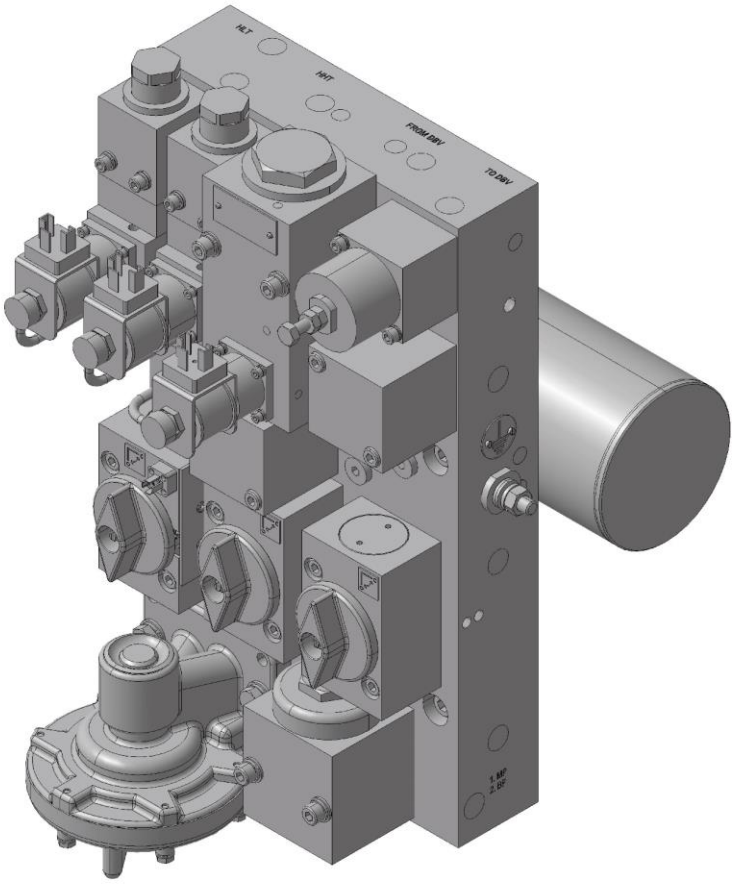

Figure 1: Horn Control & Backup Brake Module, Isometric View

2.2 TECHNICAL DATA OF THE EQUIPMENT

- Working pressure .....10 bar
- Supply voltage.....110V DC -30% / +25%
- Electrical connectors comply.....IP 65
- Weight .....40 Kg Approx

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2.3 PNUEMATIC SCHEME

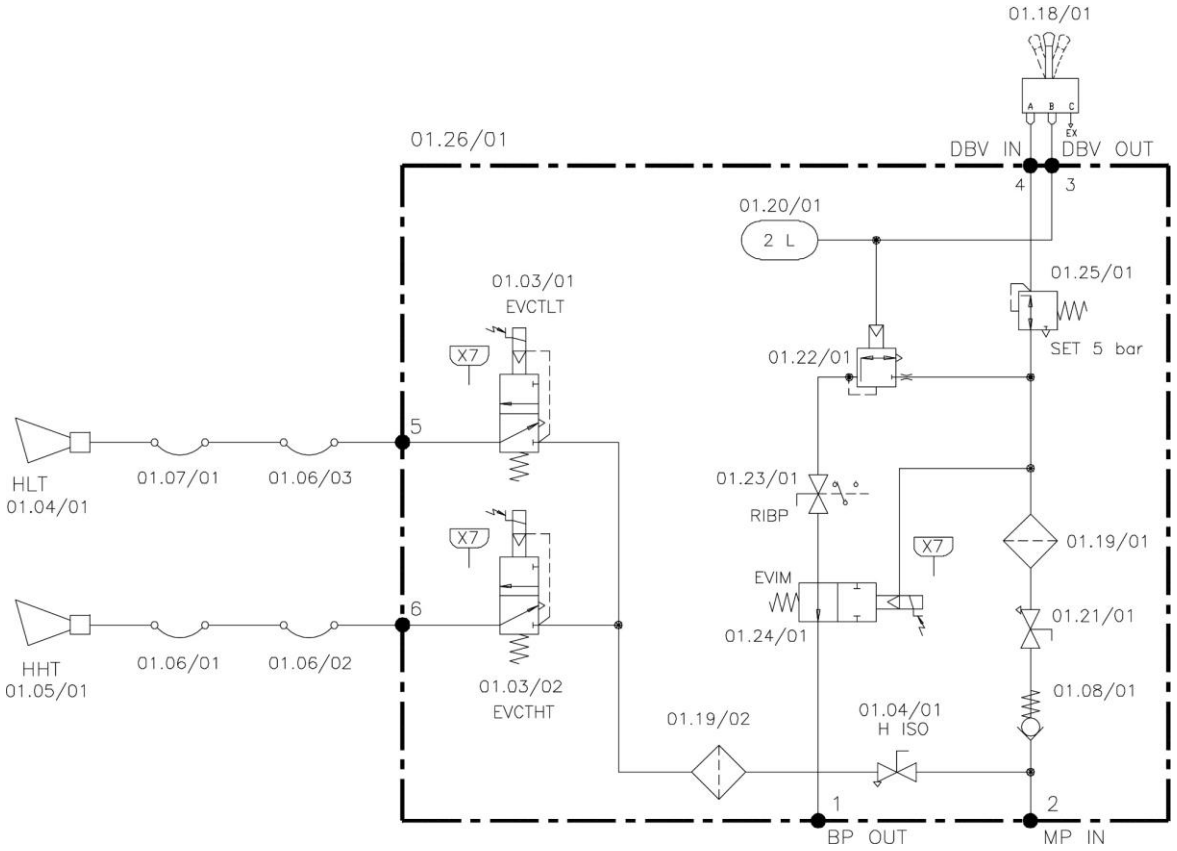

Figure 2: Horn Control & Backup Brake Module, Pneumatic Scheme

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2.4 ELECTRICAL DIAGRAM

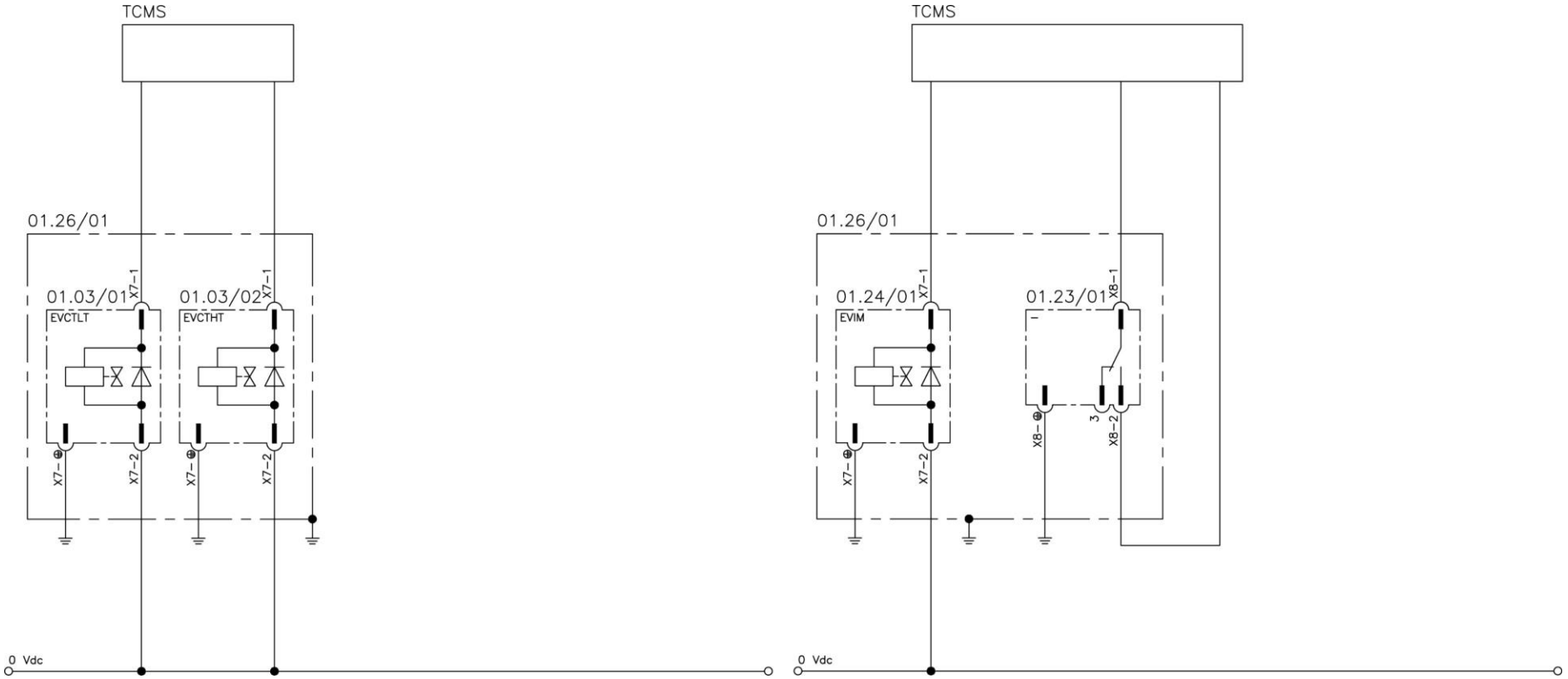

Figure 3: Horn Control & Backup Brake Module, Electrical Scheme

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/// 3. OPERATIONS

The primary functions of horn control & backup brake module are

- To provide pneumatic pressure to Horns (High & Low Tone)
- To charge and deplete brake pipe pressure during failure of Brake Electronics.

3.1 HORN CONTROL: PROVIDING PNEUMATIC PRESSURE TO HORNS (HIGH & LOW TONE)

Supply of Pressure to High Tone Horn: EP Valve EVCTHT (01.03/02) is responsible for supplying pneumatic pressure to high tone horn. EP Valve EVCTHT (01.03/02) is pneumatically connected with main pipe pressure (Port 2 – MP IN) through filter (01.19/02) and isolating cock (01.04/01). Upon receiving electrical signal, EVCTHT (01.03/02) activates and connects main pipe pressure to port 6 and further to high tone horn for generating sound.

Supply of Pressure to Low Tone Horn: EP Valve EVCTLT (01.03/01) is responsible for supplying pneumatic pressure to low tone horn. EP Valve EVCTLT (01.03/01) is pneumatically connected with main pipe pressure (Port 2 – MP IN) through filter (01.19/02) and isolating cock (01.04/01). Upon receiving electrical signal, EVCTLT (01.03/01) activates and connects main pipe pressure to port 5 and further to low tone horn for generating sound.

Filter (01.19/02): This filter is used to remove contaminants in the incoming air (MP – Port 2) and ensure there is no impurities in downstream pressure supplied to EP Valves EVCTLT (01.03/01) and EVCTHT (01.03/02).

Isolating Cock (01.04/01): This isolating cock is used to isolate EP Valves EVCTLT (01.03/01) and EVCTHT (01.03/02) from MP pressure for maintenance activities and troubleshooting.

3.2 BACKUP BRAKE CONTROL: SUPPLY OF PRESSURE TO DRIVER BRAKE VALVE (DBV) TO GENERATE BRAKE PIPE SIGNAL PRESSURE

Supply of pressure to DBV is routed through horn control and backup brake module. MP pressure (received from Port 2) is regulated and supplied to DBV (through Port 4) to generate brake pipe signal pressure.

MP pressure received from port 2 is routed through check valve (01.08), Isolating cock (01.21), Filter (01.19/01), pressure regulating valve (01.25) and finally to port 4 for DBV supply.

Check Valve (01.08): It ensures uni-directional flow and availability of sufficient pressure for BP pressure signal generation.

Isolating Cock (01.21): The isolating cock is to isolate downstream components from MP pressure from Filter (01.19/01), pressure limiting valve (01.25/01), relay valve (01.22/01) and BP isolator valve EVIM (01.24/01) for maintenance activities and troubleshooting.

Filter (01.19/01): is used to remove contaminants in the incoming air (MP – Port 2) and ensure there is no impurities in downstream pressure supplied to pressure limiting valve (01.25/01), relay valve (01.22/01) and BP isolator valve EVIM (01.24/01)

Pressure Limiting Valve (01.25): It ensures a constant preset delivery pressure of 5 Kg/cm2 to DBV through port 4 to create brake pipe signal pressure.

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3.3 BACKUP BRAKE CONTROL: GENERATION / DEPLETION OF BRAKE PIPE PRESSURE BASED ON SIGNAL PRESSURE RECEIVED FROM DBV (FROM PORT 3)

Brake pipe is generated / depleted by the relay valve (01.22/01) according to the signal pressure received from DBV via Port 3. Relay valve delivery port is pneumatically connected with brake pipe (Port 1 – BP OUT) through isolating cock RIBP (01.23/01) and Brake Pipe Isolator Valve EVIM (01.24/01).

Relay Valve (01.22/01): Relay valve receives the filtered main pipe pressure from filter (01.19/01). Relay valve (01.22/01) generates the delivery pressure according to the signal pressure received from DBV (Port 3). A 2L reservoir is attached with the signal pressure from DBV to avoid fluctuations in signal pressure.

Isolating Cock (01.23/01): Isolating cock is used to isolate relay valve (01.22/01) and brake pipe. Isolating cock (01.23/01) has a in-built microswitch to communicate the orientation of the isolation cock.

Brake Pipe Isolator Valve EVIM (01.24/01): It is used to isolate Relay Valve (01.22/01) and brake pipe. Brake pipe isolator valve EVIM (01.24/01) is supplied with signal pressure from main Pipe through filter (01.19/01). During normal / de-energized condition, Brake pipe isolator valve EVIM (01.24/01) acts as a passage and connects pneumatic pressure from relay valve (01.22/01) to brake pip (Port 1 – BP OUT). Upon energized, Brake pipe isolator valve EVIM (01.24/01) isolates relay valve (01.22/01) from brake pipe.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

The tools required for removal and installation of components are reported in the respective section /// 5 of this manual.

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

The consumables required for installation of components are reported in the respective section /// 5 of this manual.

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

CAUTION! To respect the maintenance prescription and intervals in order to not impair safety.

Make a functional check and a general overhaul as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.

For the controls below, it is not necessary to remove the equipment from the vehicle.

Pay attention to the following maintenance interval:

First level maintenance (Functional control)

For the controls below, it is not necessary to remove the equipment from the vehicle.

- Maintenance M1 to be performed every 6 months.
- Maintenance M2 to be performed every 1 months.

Second level maintenance (General overhaul)

Repair in Workshop or Replacement:

- Overhaul R1 to be performed every 6 years.
- Overhaul R2 to be performed every 12 years.

The owner can adapt this periodicity according to conditions of use, their maintenance policy and their own experiment, under their responsibility.

The maintenance schedule here proposed is based upon the best knowledge so far acquired. It must be updated / changed properly, should this necessity become evident from the service exploitation, especially where safety is concerned.

This section contains the indications of the timing and mileage for carrying out each maintenance task.

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IMPORTANT NOTES

The timing indicated both in terms of mileage and in terms of time. The one occurring first must be observed. Every task includes the tasks occurring at higher frequency.

Proposed maintenance schedule takes into account regular service condition. More severe operation and environment circumstances may require more frequent tasks.

A tolerance of +20% is admitted provided that evidence from field proves this is sustainable with no adverse effects on safety and/or reliability.

No special cleaning operations have been considered, however, depending on the installation on the vehicle, it could be necessary to remove regularly the possible deposits of dirt and debris that may affect the equipment's functionality.

Make sure that the air used to supply the system externally (e.g. through the Air Service Point Group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1, otherwise the devices will be damaged.

Important! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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THE HORN CONTROL & BACKUP BRAKE MODULE

FIRST LEVEL MAINTENANCE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	M1	M2	REF./SECTION
1ST LEVEL 6 months	Reservoir 2L	01.20	FT0053729-000	Visual Inspection & Drain	●		FT0051876-000-E00MUM
1st LEVEL 1 year	EP Valve	01.03	FT0050768-103	Monitoring of EP valve cycling to be sent to FT		●	5.1.1
	Isolating cock 3/4"	01.04 01.21	FT0050522-100	Functional Test		●	5.1.3
	Filter	01.19	FT0051672-100	Filter cartridge replacement		●	5.1.2
	Isolating cock 3/4" vented	01.23	FT0050523-101	Functional Test		●	5.1.3
	Pressure regulator 5.0 bar set	01.25	FT0051995-107	Functional check		●	FT0051995-101-E00MUM

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SECOND LEVEL MAINTENANCE

2. Second Level Maintenance: overhaul/replacement as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhauled/replaced regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	R1	R2
6 years	EP valve assy	01.03	FT0050768-103	Overhaul	●	
	Isolating cock 3/4"	01.04 01.21	FT0050522-100	Overhaul	●	
	Check valve 3/4"	01.08	FT0051874-100	Overhaul	●	
	P1K Relay valve	01.22	7811210308	Overhaul	●	
	Isolating cock 3/4" vented	01.23	FT0050523-101	Overhaul	●	
	Brake valve isolator	01.24	FT0053756-100	Overhaul	●	
	Pressure regulator 5.0 bar set	01.25	FT0051995-107	Overhaul	●	
12 years	Reservoir 2L	01.20	Ft0053729-000	Hydrostatic test		●

NOTE: Maintenance operations must be carried out by qualified personnel in authorized workshops.

NOTE: WABTEC provides an overhauling service for its own units. WABTEC performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.
The WABTEC Service Centres have the experience and technical equipment needed for performing professional overhauls

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5.1.1 MONITORING OF EP VALVE

1. The below mentioned EP valves have to be monitored.
2. The data must be shared with WABTEC on regular basis

SI. NO.	COMPONENT	REF	P/N
1	EP valve	01.03	FT0050768-103

5.1.2 FILTER

FILTER CARTRIDGE REPLACEMENT

Warning! Pressurised system! Discharge the pressure before removal.

Important! Cartridge may contain oil! Collect the drainage waste as prescribed by the law in force.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 4

ITEM NO.	DESCRIPTION	P/N	QTY
4	O-RING	2/517036	2
5	O-RING	038703000A	2
6	FILTER	FT0025144-000	2

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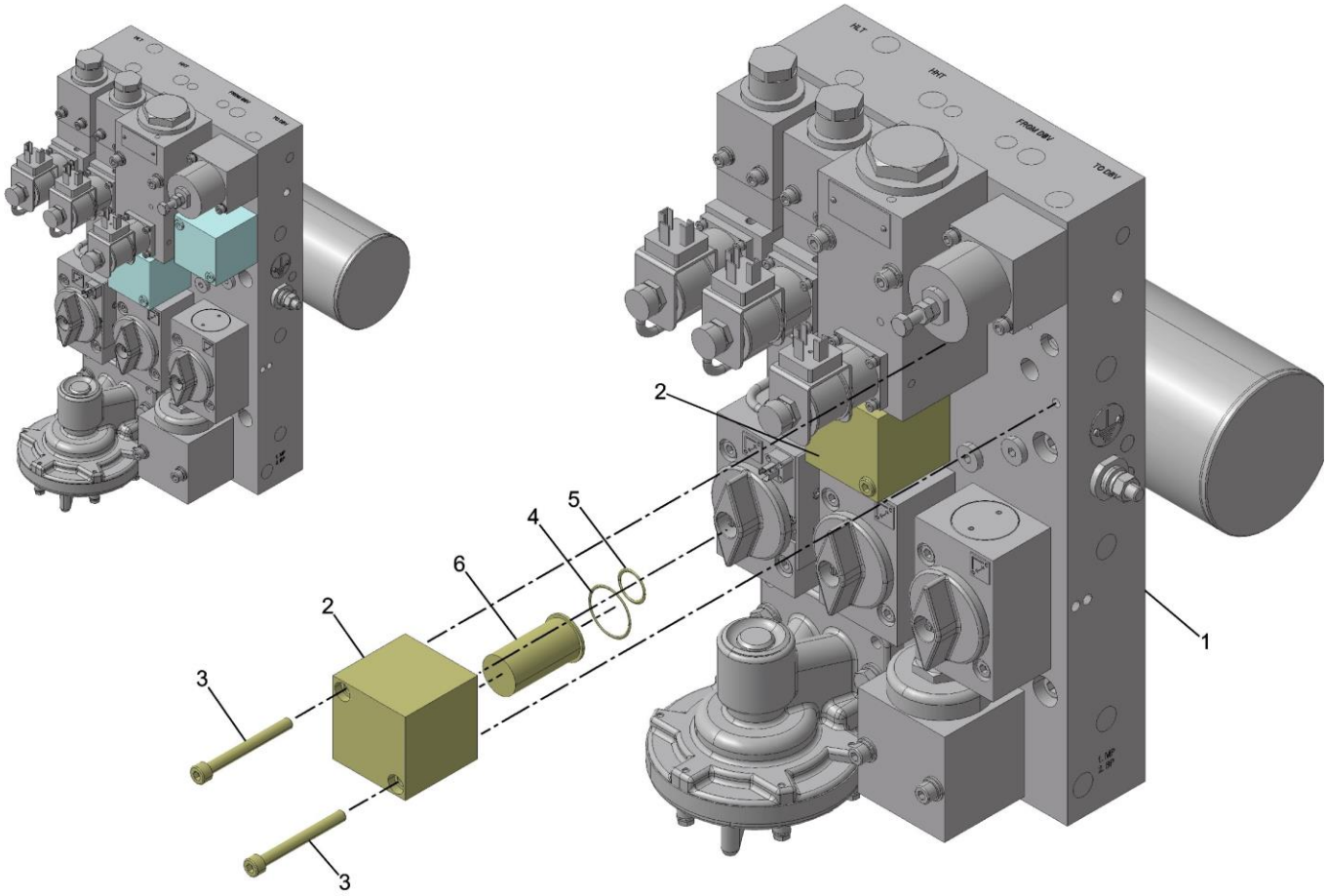

Figure 4: Filter Cartridge Replacement

ITEM NO.	DESCRIPTION	P/N
1	MANIFOLD	FT0053354-200
2	FILTER ASSY	FT0051672-100
3	HEX SOC HD CAP SCREW M8	901014000
4	O-RING	2/517036
5	O-RING	038703000A
6	FILTER	FT0025144-000

FILTER CARTRIDGE REPLACEMENT

Refer to Figure 4

1. Unscrew and remove two hex socket head cap screws (3) that attach the filter assy (2) to the manifold (1) using 6mm allen key.
2. Remove and **DISCARD** O-ring (4) and (5) from groove portion of filter assy (2).
3. Remove and **DISCARD** filter (6) from filter assy (2).
4. Install **NEW** filter (6) on the filter assy (2).
5. Smear Molykote M33 grease to the **NEW** O-ring (4) and (5) and to the groove portion of the filter assy (2).

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6. Install the **NEW** O-ring (4) and (5) to the groove portion of the filter assy (2).
7. Apply Loctite 242 on the threaded portion of the two hex socket head cap screws (3).
8. Position the filter assy (2) to the manifold (1) and secure with two hex socket head cap screws (3) using 6mm allen key.
9. Torque tighten the two hex socket head cap screws (3) to 14Nm. Apply torque mark using Stylmark on it.
10. Repeat same steps for second filter assy (2).

5.1.3 ISOLATING COCK

FUNCTIONAL TEST

Caution! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/Handle turns free and that the micro switch gives the right indication. The test must be done with the system pressurised.
3. At the end of the test, make sure all the initial conditions are restored.

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5.2 REMOVAL AND INSTALLATION PROCEDURE OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component

TOOLS AND CONSUMABLES REQUIRED

- 8 mm allen key
- Loctite 242 or 243
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable.

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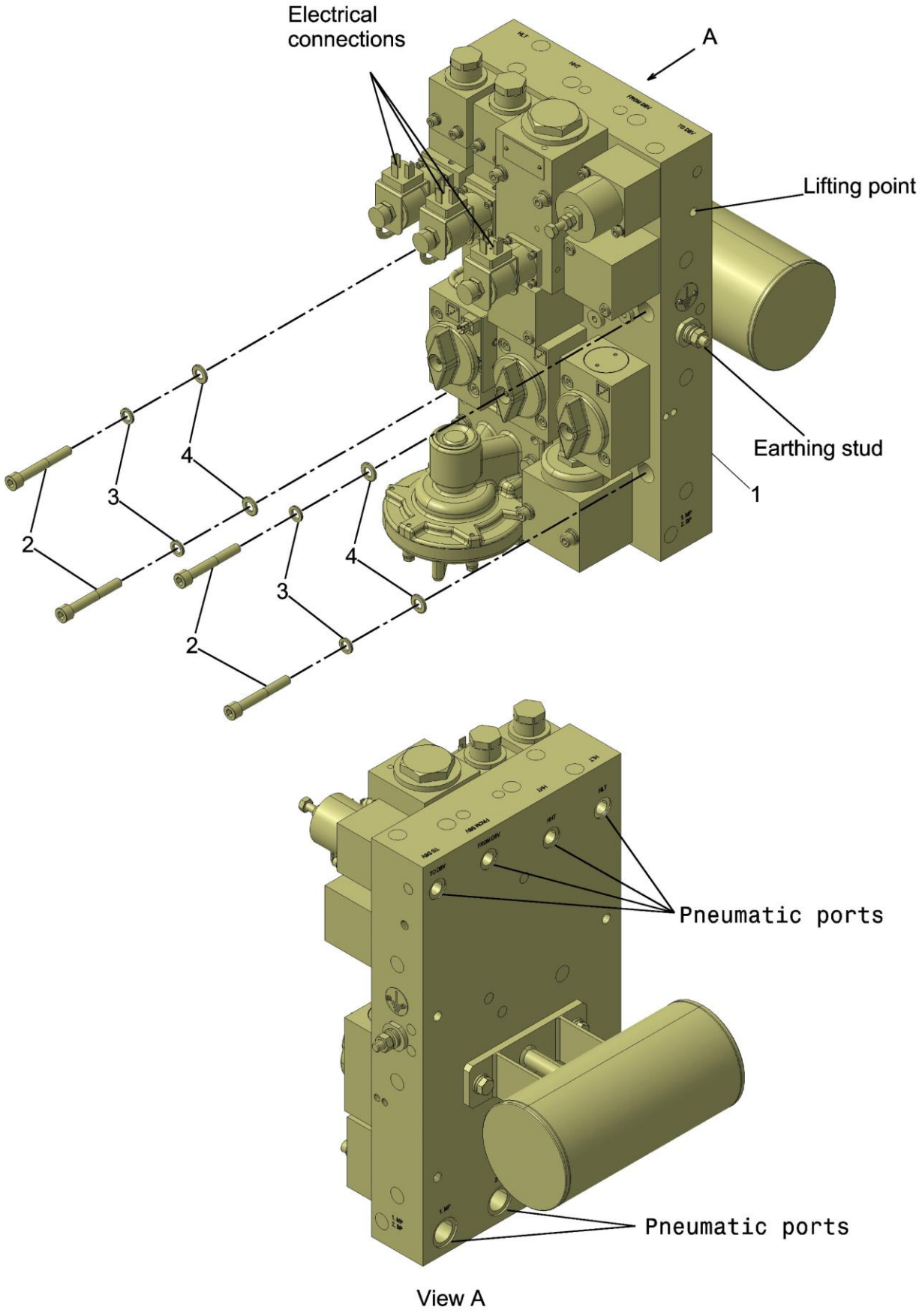

Figure 5: Removal / Installation of Horn Control & Backup Brake Module

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ITEM NO.	DESCRIPTION	P/N	QTY
1	HORN CONTROL & BACKUP BRAKE MODULE	FT0053354-110	1

Note: Item 2, 3, and 4 are not under the scope of Wabtec.

5.2.1 REMOVAL PROCEDURE

Refer to Figure 5

1. Disconnect the all electrical and pneumatic connections.
2. Disconnect earthing connections by unscrewing fasteners (Not WABTEC scope of supply) using appropriate tool.
3. Use lifting points on both sides to lift the horn control & backup brake module (1). Make use of M12 eye bolt along with chain/nylon ropes for lifting without any damage to other parts.
4. Remove the following parts that attach the horn control & backup brake module (1) to the car.
   - Four hex socket head cap screws M10 (2) using 8mm allen key
   - Four nord lock washers (3)
   - Four plain washers (4).

5.2.2 INSTALLATION PROCEDURE

Refer to Figure 5

1. Use lifting point on both sides to lift the horn control & backup brake module (1). Make use of M12 eye bolt along with chain/nylon ropes for lifting without any damage to other parts.
2. Apply Loctite 242 on threads of the four hex socket head cap screws (2).
3. Install the following parts that secures the horn control & backup brake module (1) to the car.
   - Four hex socket head cap screws M10 (2) using 8mm allen key
   - Four nord lock washers (3)
   - Four plain washers (4).
4. Torque tighten the four hex socket head cap screws (2) to 39 Nm. Apply torque mark using Stylmark on it.
5. Connect earthing connections by installing fasteners (Not WABTEC scope of supply) using appropriate tool.
6. Connect the electrical and pneumatic connections.
7. Pressurize the system, and check for leakages as per the system level procedure performed during car builder's general system check.

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5.3 REMOVAL AND INSTALLATION PROCEDURE OF PRESSURE REGULATOR

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 5 mm allen key
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 6

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	003703500A	1
6	O-RING	0015/11A	1
7	FILTER	AB578-37A	1

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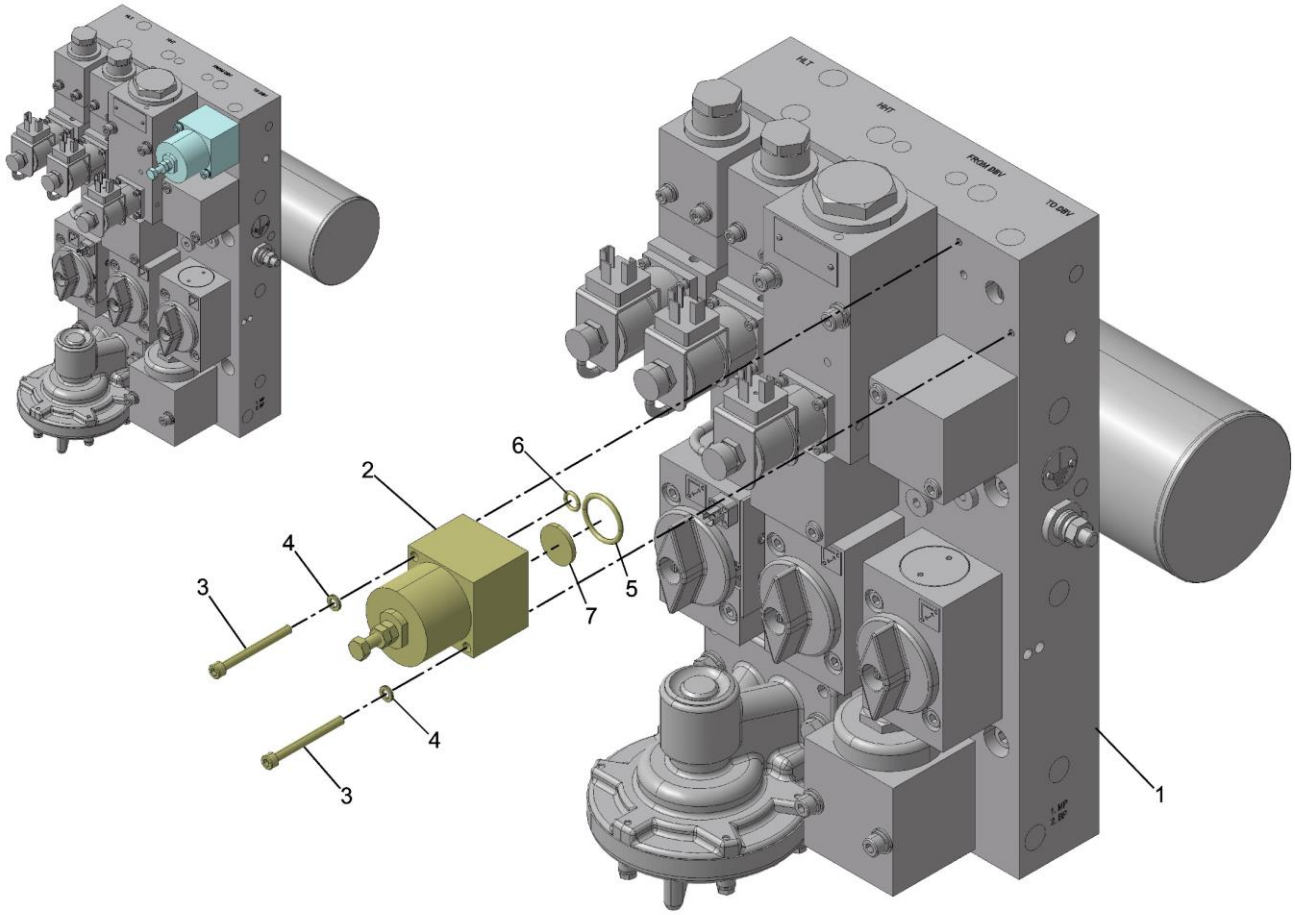

Figure 6: Removal / Installation of Pressure Regulator

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	PRESSURE REGULATOR	FT0051995-107	1
3	HEX SOCKET SCREW M6	FT0051499-004	2
4	NORDLOCK WASHER	FT0020809-003	2
5	O-RING	003703500A	1
6	O-RING	0015/11A	1
7	FILTER	AB578-37A	1

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5.3.1 REMOVAL PROCEDURE

Refer to Figure 6

1. Unscrew and remove the following parts that attach the pressure regulator (2) to the manifold (1):
   - Two hex socket screws M6 (3) using 5 mm allen key.
   - Two nord lock washers (4)
2. Remove and DISCARD the filter (7) and the O-rings (5) and (6).

5.3.2 INSTALLATION PROCEDURE

Refer to Figure 6

1. Place the **NEW** filter (7) into the inner diameter of the pressure regulator (2).
2. Smear Molykote M33 grease to the **NEW** O-ring (5) and (6) and to the groove portion of pressure regulator (2).
3. Install the **NEW** O-ring (5) and (6) into the groove portion of pressure regulator (2).
4. Apply Loctite 242 on threads of two hex socket screws (3).
5. Install the following parts that secure the pressure regulator (2) to the manifold (1).
   - Two hex socket screws M6 (3) using 5 mm allen key.
   - Two nord lock washers (4)
6. Torque tighten the two hex nuts (2) to 5.2 Nm. Apply torque mark using Stylmark on it.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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5.4 REMOVAL AND INSTALLATION PROCEDURE OF BRAKE VALVE ISOLATOR

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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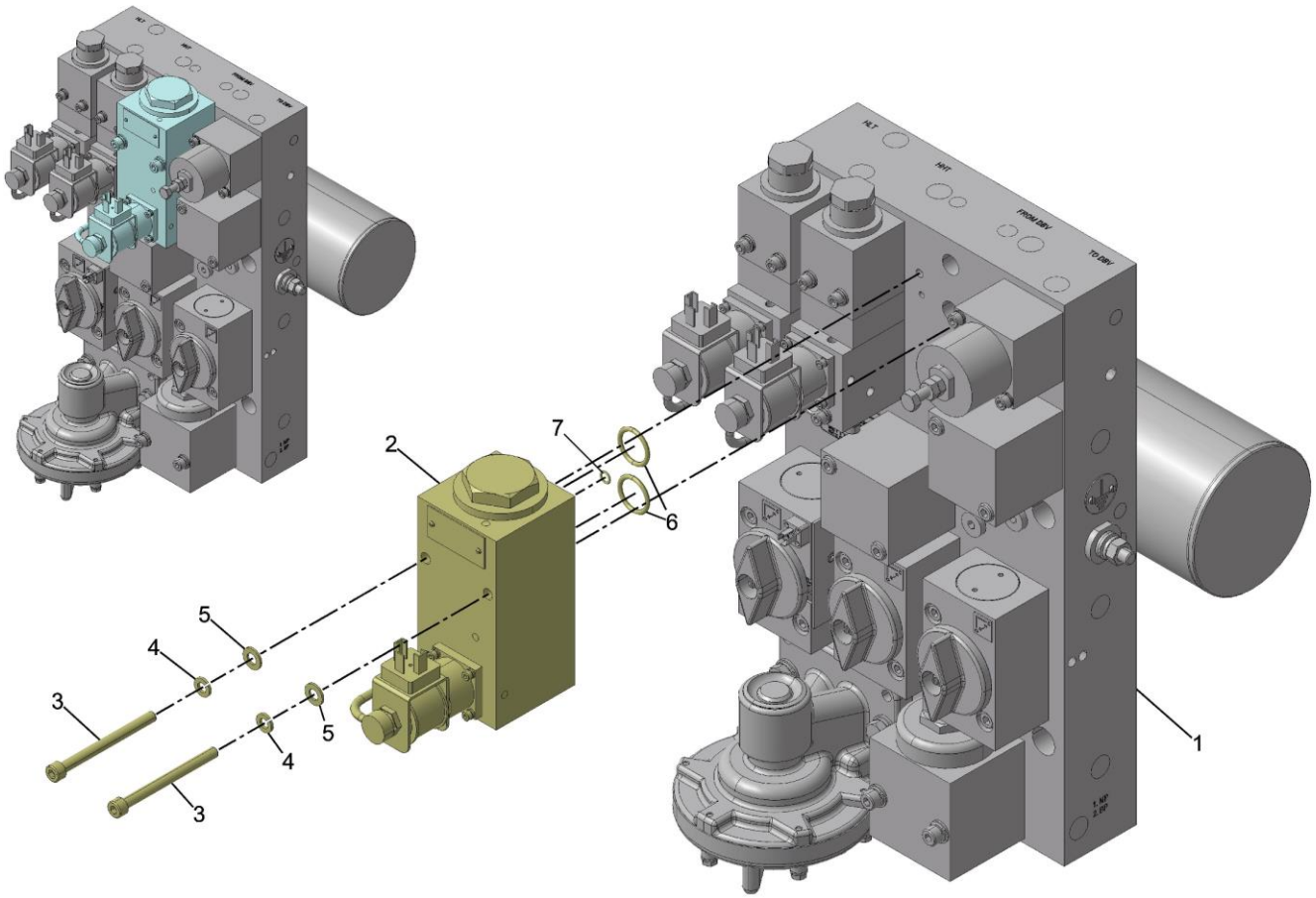

Figure 7 – Removal / Installation of Brake Valve Isolator

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	BRAKE VALVE ISOLATOR	FT0053756-100	1
3	HEX SOCKET HEAD CAP SCREW M8	901041500	2
4	SPRING LOCK WASHER	909002000	2
5	PUNCHED WAHSER	908016800	2
6	O-RING	006720000A	2
7	O-RING	010703000A	1

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5.4.1 REMOVAL PROCEDURE

Refer to Figure 7

1. Disconnect the electrical connections from the solenoid valve assy.
2. Unscrew and remove the following parts that attach the brake valve isolator (2) to the manifold (1).
   - Two hex socket head cap screws M8 (3) using 6 mm allen key.
   - Two spring lock washers (4)
   - Two punched washers (5)
3. Remove the two O-rings (6) and one O-ring (7) from brake valve isolator (2).

5.4.2 INSTALLATION PROCEDURE

Refer to Figure 7

1. Smear Molykote M33 grease to the two O-rings (6) and one O-ring (7).and to the groove portion of brake valve isolator (1).
2. Install the two O-rings (6) and one O-ring (5) on the groove portion of brake valve isolator (2).
3. Apply Loctite 242 on threads of two hex socket head cap screws (3).
4. Install the following parts that secure the brake valve isolator (2).to the manifold (1).
   - Two hex socket head cap screws M8 (3) using 6 mm allen key.
   - Two spring lock washers (4)
   - Two punched washers (5).
5. Torque tighten the two hex nuts (2) to 14 Nm. Apply torque mark using Stylmark on it.
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.5 REMOVAL AND INSTALLATION PROCEDURE OF EP VALVE ASSY

Caution! Pressurised system. Discharge the system pressure before removing any component.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

TOOLS AND CONSUMABLES REQUIRED

- 5 mm allen key
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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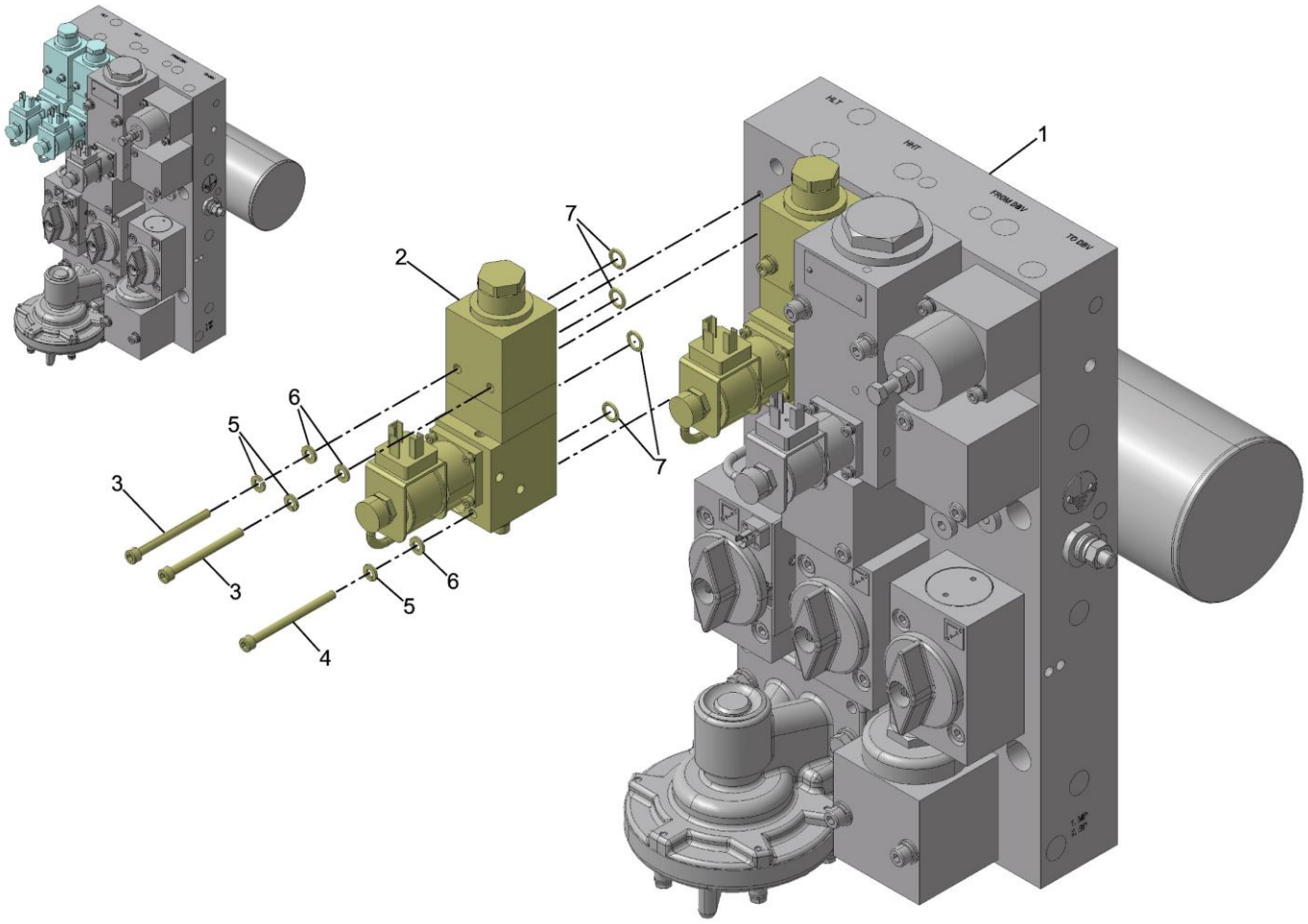

Figure 8 – Removal / Installation of EP Valve Assy

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	EP VALVE ASSY	FT0050768-103	2
3	HEX SOCKET HEAD CAP SCREW M6	901029700	4
4	HEX SOCKET HEAD CAP SCREW M6	901031200	2
5	SPRING LOCK WASHER	909007000	6
6	PUNCHED WASHER	908008000	6
7	O-RING	003703000A	8

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5.5.1 REMOVAL PROCEDURE

Refer to Figure 8

1. Disconnect the electrical connections.
2. Unscrew and remove the following parts that attach the EP valve assy (2) to the manifold (1).
   - Two hex socket head cap screws M6 (3) using 5 mm allen key.
   - One hex socket head cap screws M6 (4) using 5 mm allen key.
   - Three spring lock washers (5)
   - Three punched washers (6)
3. Remove the four O-rings (7).
4. Repeat same steps for second EP valve (2)

5.5.2 INSTALLATION PROCEDURE

Refer to Figure 8

1. Smear Molykote M33 grease to the four O-rings (7) and to the groove portion of EP valve assy (2).
2. Install the four O-rings (7) on the groove portion of EP valve assy (2).
3. Apply Loctite 242 on threads of two hex socket head cap screws (3) and one hex socket head cap screw (4).
4. Install the following parts that secure the EP valve assy (2).to the manifold (1).
   - Two hex socket head cap screws M6 (3) using 5 mm allen key.
   - One hex socket head cap screw M6 (4) using 5 mm allen key.
   - Three spring lock washers (5)
   - Three punched washers (6).
5. Torque tighten the two hex socket head cap screws (3) and one hex socket head cap screw (4) to 5.2 Nm. Apply torque mark using Stylmark on it.
6. Repeat same steps for second EP valve (2)
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.6 REMOVAL AND INSTALLATION PROCEDURE OF ISOLATING COCK

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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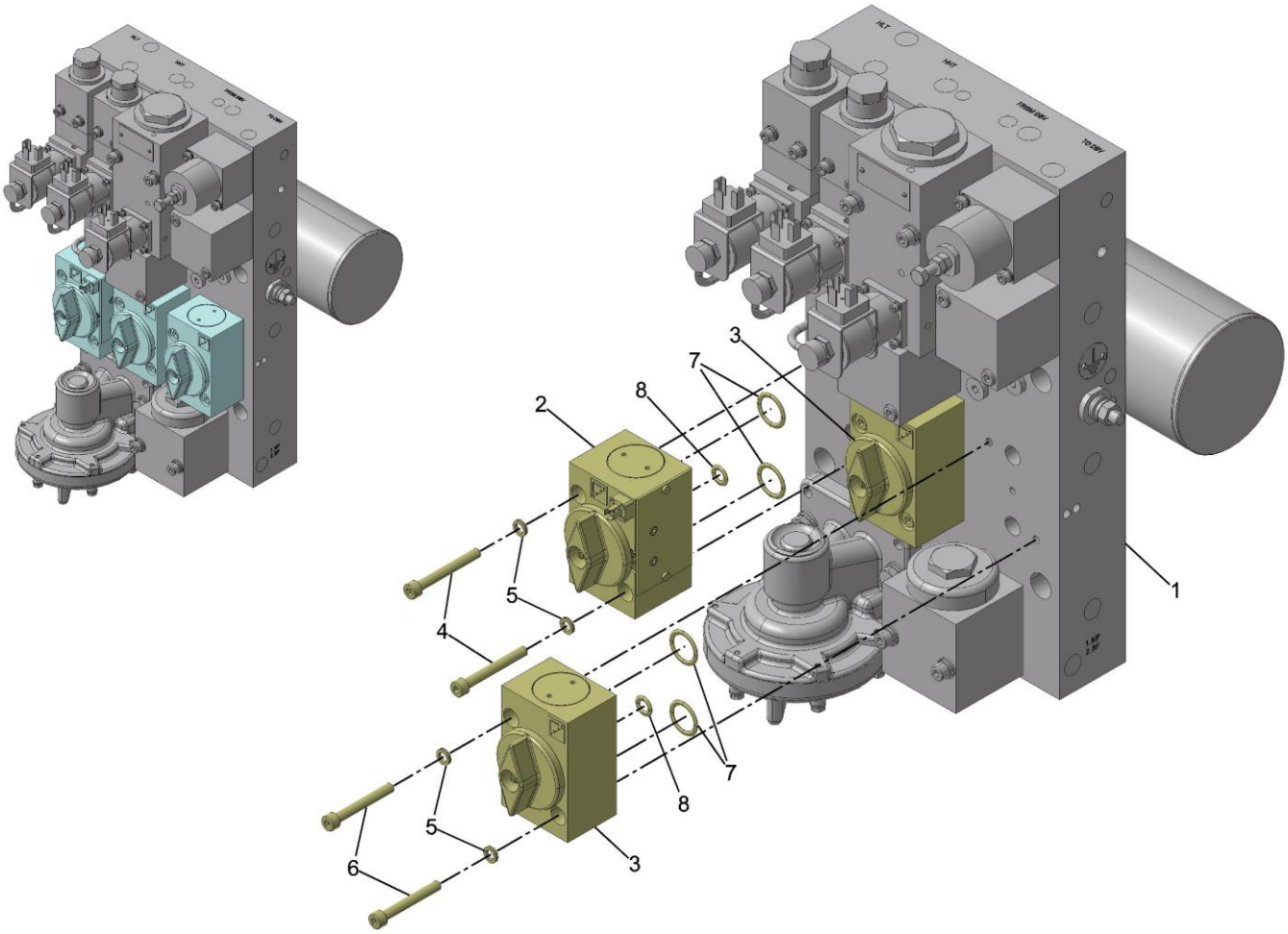

Figure 9 – Removal / Installation of Isolating Cock

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	ISOLATING COCK 3/4"	FT0050523-101	1
3	ISOLATING COCK 3/4"	FT0050522-100	2
4	HEX SOCKET HEAD CAP SCREW M8	901005000	2
5	NORD LOCK WASHER	FT0051677-001	6
6	HEX SOCKET HEAD CAP SCREW M8	901035500	4
7	O-RING	006720000A	6
8	O-RING	013701000A	3

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5.6.1 REMOVAL PROCEDURE

Refer to Figure 9

1. Unscrew and remove the following parts that attach the isolating cock (3) to the manifold (1).
   - Two hex socket head cap screws M8 (6) using 6 mm allen key.
   - Two nord lock washers (5)
2. Remove the two O-rings (7) and one O-ring (8)
3. Repeat same steps for second isolating cock (3)
4. Remove the electrical connections form isolating cock (2) using screw driver.
5. Unscrew and remove the following parts that attach the isolating cock (2) to the manifold (1).
   - Two hex socket head cap screws M8 (4) using 6 mm allen key.
   - Two nord lock washers (5)
6. Remove the two O-rings (7) and one O-ring (8)

5.6.2 INSTALLATION PROCEDURE

Refer to Figure 9

1. Smear Molykote M33 grease to the two O-rings (7) and one O-ring (8) and to the groove portion on the isolating cock (3).
2. Install the two O-rings (7) and one O-ring (8) on the groove portion of isolating cock (3).
3. Apply Loctite 242 on threads of two hex socket head cap screws (6).
4. Install the following parts that secure the isolating cock (3).to the manifold (1).
   - Two hex socket head cap screws M8 (6) using 6 mm allen key.
   - Two nord lock washers (5)
5. Torque tighten the two hex socket head cap screws (6) to 14 Nm. Apply torque mark using Stylmark on it.
6. Repeat same steps for second isolating cock (3)
7. Smear Molykote M33 grease to the two O-rings (7) and one O-ring (8) and to the groove portion on the isolating cock (2).
8. Install the two O-rings (7) and one O-ring (8) on the groove portion of isolating cock (2).
9. Apply Loctite 242 on threads of two hex socket head cap screws (4).
10. Install the following parts that secure the isolating cock (2).to the manifold (1).
    - Two hex socket head cap screws M8 (4) using 6 mm allen key.
    - Two nord lock washers (5)
11. Torque tighten the two hex socket head cap screws (6) to 14 Nm. Apply torque mark using Stylmark on it.
12. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.7 REMOVAL AND INSTALLATION PROCEDURE OF CHECK VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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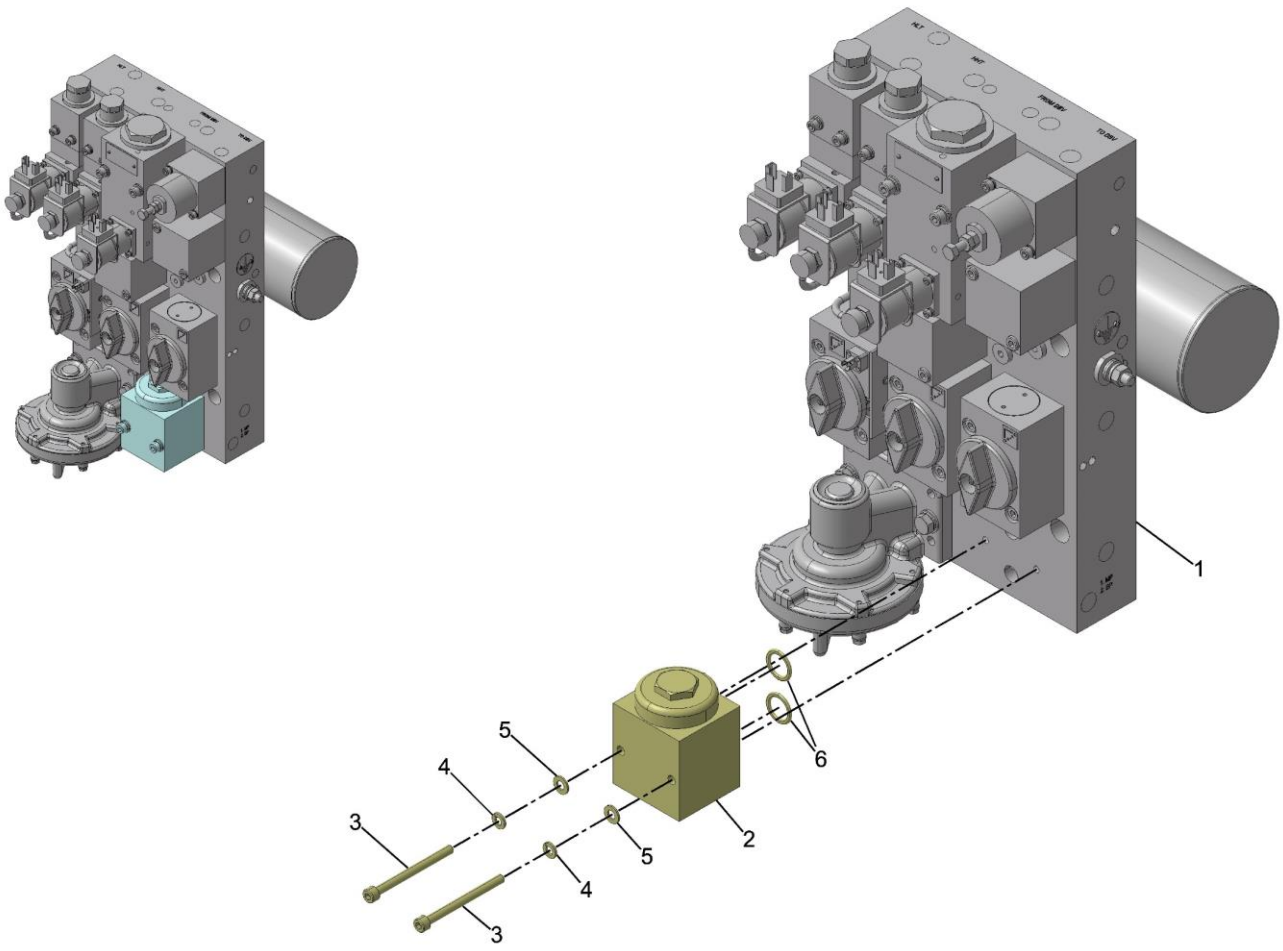

Figure 10 – Removal / Installation of Check Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	CHECK VALVE 3/4"	FT0051874-100	1
3	HEX SOCKET HD CAP SCREW M8	901041500	2
4	SPRING LOCK WASHER	909002000	2
5	PUNCHED WASHER	908016800	2
6	O-RING	006720000A	2

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5.7.1 REMOVAL PROCEDURE

Refer to Figure 10

1. Unscrew and remove the following parts that attach the check valve (2) to the manifold (1).
   - Two hex socket head cap screws M8 (3) using 6 mm allen key.
   - Two spring lock washers (4)
   - Two punched washers (5)
2. Remove the two O-rings (6) from check valve (2)

5.7.2 INSTALLATION PROCEDURE

Refer to Figure 10

1. Smear Molykote M33 grease to the two O-rings (6) and to the groove portion on the check valve (2).
2. Install the two O-rings (6) on the groove portion of check valve (2).
3. Apply Loctite 242 on threads of two hex socket head cap screws (3).
4. Install the following parts that secure the check valve (2).to the manifold (1).
   - Two hex socket head cap screws M8 (3) using 6 mm allen key.
   - Two spring lock washers (4)
   - Two punched washers (5)
5. Torque tighten the two hex socket head cap screws (6) to 14 Nm. Apply torque mark using Stylmark on it.
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.8 REMOVAL AND INSTALLATION PROCEDURE OF P1K RELAY VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 16 mm socket wrench
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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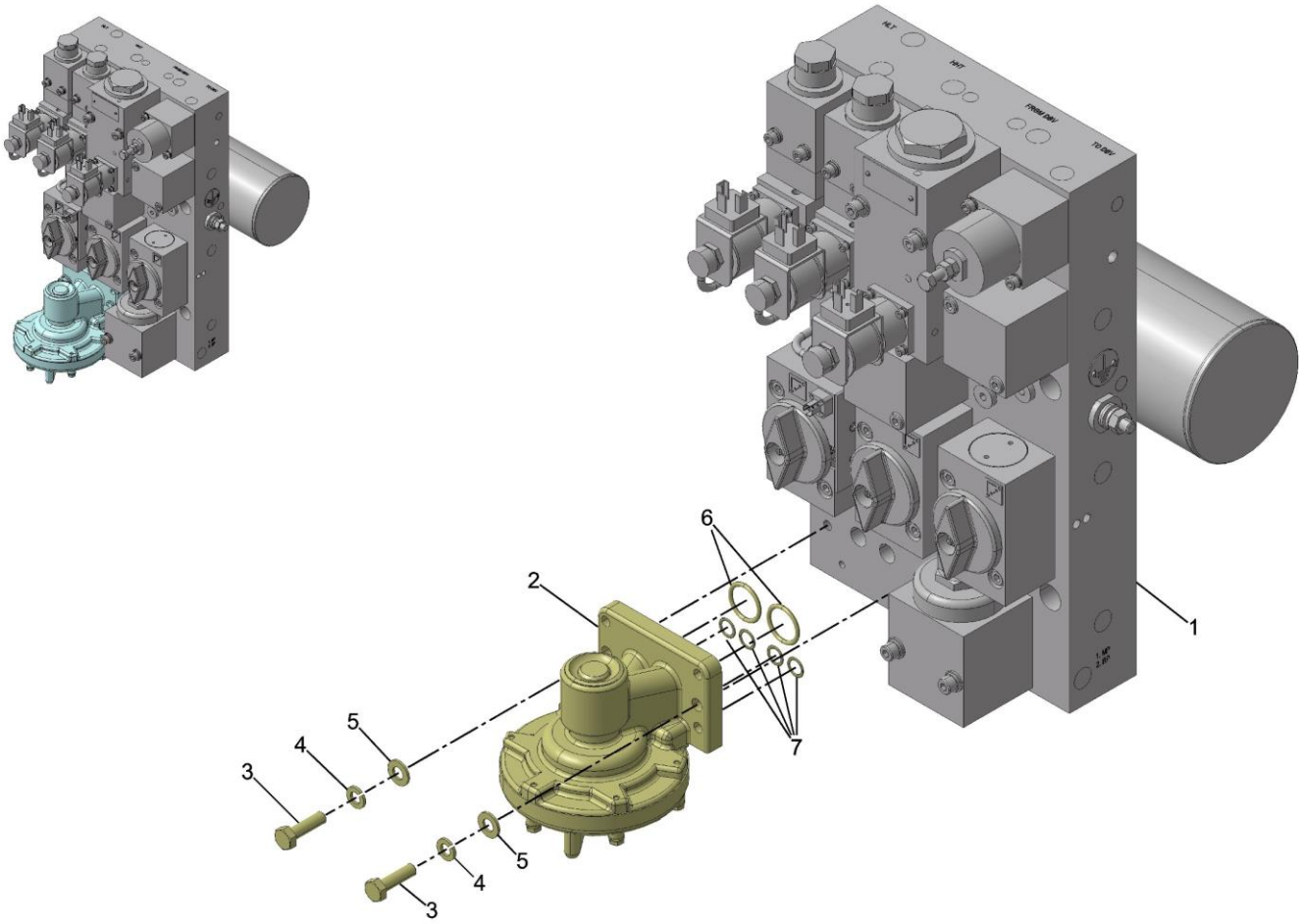

Figure 11 – Removal / Installation of P1K Relay Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	P1K RELAY VALVE	7811210308	1
3	HEX HEAD SCREW M10	920021700	2
4	SPRING LOCK WASHER	909019100	2
5	PUNCHED WASHER	908010000	2
6	O-RING	7012460408	2
7	O-RING	7050220408	4

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5.8.1 REMOVAL PROCEDURE

Refer to Figure 11

1. Unscrew and remove the following parts that attach the P1K relay valve (2) to the manifold (1).
   - Two hex head screws M10 (3) using 16 mm socket wrench.
   - Two spring lock washers (4)
   - Two punched washers (5)
2. Remove and the two O-rings (6) and four O-rings (7) from P1K relay valve (2)

5.8.2 INSTALLATION PROCEDURE

Refer to Figure 11

1. Smear Molykote M33 grease to the two O-rings (6) and four O-rings (7) and to the groove portion of P1k relay valve (2).
2. Install the two O-rings (6) and four O-rings (7) on the groove portion of P1K relay valve (2).
3. Apply Loctite 242 on threads of two hex head screws (3).
4. Install the following parts that secure the P1K relay valve (2).to the manifold (1).
   - Two hex head screws M10 (3) using 16 mm socket wrench.
   - Two spring lock washers (4)
   - Two punched washers (5)
5. Torque tighten the two hex head screws (6) to 27.3 Nm. Apply torque mark using Stylmark on it.
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.9 REMOVAL AND INSTALLATION PROCEDURE OF RESERVOIR 2L

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 16 mm socket wrench
- Molykote M33 grease
- Loctite 242 or 243
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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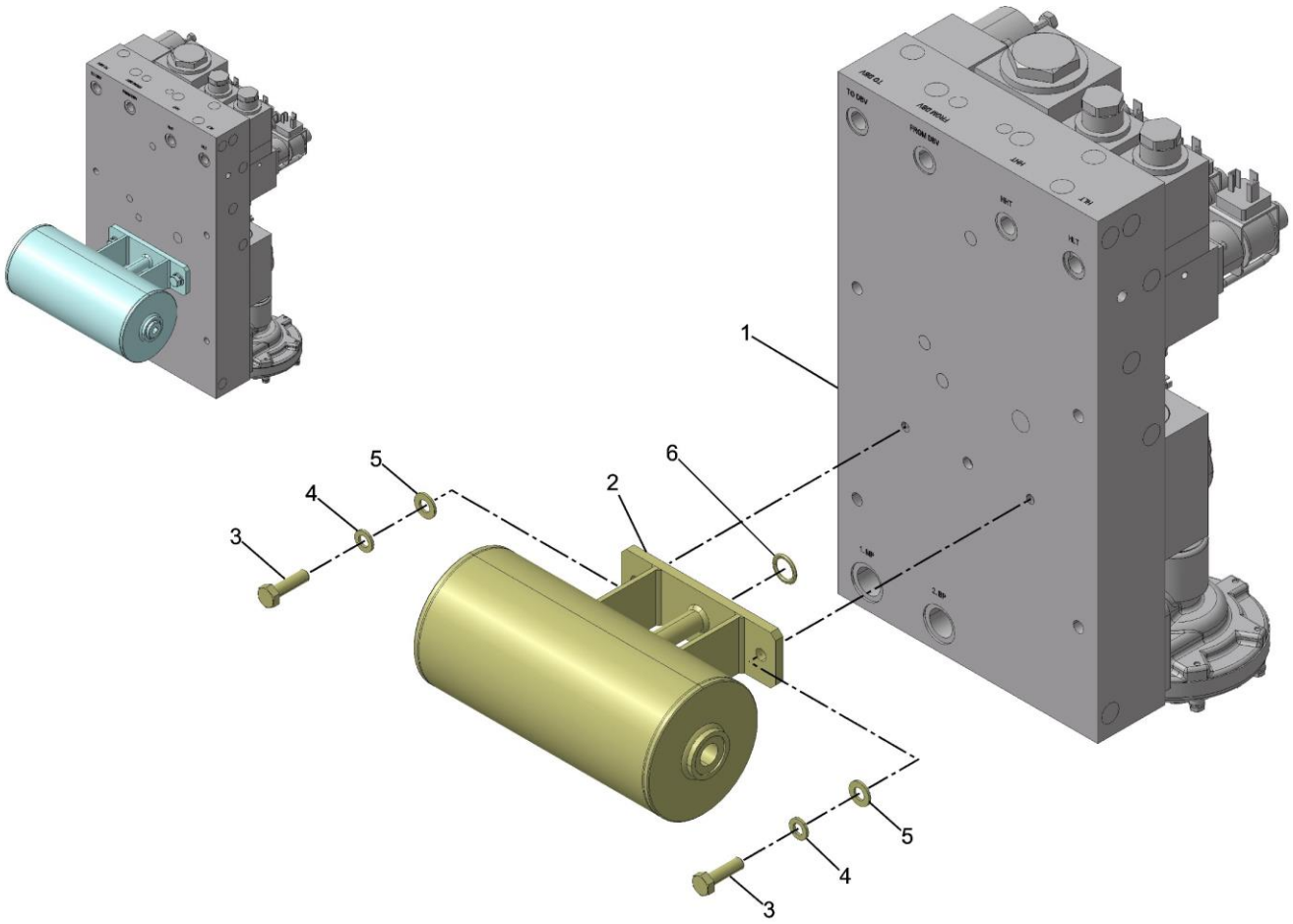

Figure 12 – Removal / Installation of Reservoir 2L

ITEM NO.	DESCRIPTION	P/N	QTY
1	MANIFOLD	FT0053354-200	1
2	RESERVOIR 2L	FT0053729-000	1
3	HEX HEAD SCREW M10	920021700	2
4	SPRING LOCK WASHER	909019100	2
5	PUNCHED WASHER	908010000	2
6	O-RING	009702000A	1

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5.9.1 REMOVAL PROCEDURE

Refer to Figure 12

1. Disconnect the pipe fittings and connections from reservoir 2L (2).
2. Unscrew and remove the following parts that attach the reservoir 2L (2) to the manifold (1).
   - Two hex head screws M10 (3) using 16 mm socket wrench.
   - Two spring lock washers (4)
   - Two punched washers (5)
3. Remove the O-rings (6) from reservoir 2L (2)

5.9.2 INSTALLATION PROCEDURE

Refer to Figure 12

1. Smear Molykote M33 grease to the O-rings (6) and to the groove portion of reservoir 2L (2)
2. Install the O-ring (6) on the groove portion of reservoir 2L (2).
3. Apply Loctite 242 on threads of two hex head screws (3).
4. Install the following parts that secure the reservoir 2L (2) to the manifold (1).
   - Two hex head screws M10 (3) using 16 mm socket wrench.
   - Two spring lock washers (4)
   - Two punched washers (5)
5. Torque tighten the two hex head screws (3) to 27.3 Nm. Apply torque mark using Stylmark on it.
6. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder’s general system check.

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/// 6. Spare Part List

- Routine Maintenance - The spare parts required for routine maintenance are reported in the single main subcomponent User Manuals: see User Manuals list in the table Preventive maintenance (First Level).

- Installation: The spare parts required for installation of subcomponents are reported in the respective section /// 5 of this manual.

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with NEW ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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02.01_02.11_1-14" Cut off angle cock with vent

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/// 607001500-E00MUM

CUT OFF ANGLE COCK WITH VENT 1 1/4" B.P 607001500
CUT OFF ANGLE COCK WITH VENT 1 1/4" F.P 607001600

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Cut Off Angle Cock facilitates closing and opening of air pipelines as required during coupling / uncoupling of Rolling Stocks and for isolation of a Coach for the purpose of shunting etc.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +47°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Cut off angle cock with vent must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on cut off angle cock with vent and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the cut off angle cock with vent for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
APPROX	Approximate
BP	Brake Pipe
BSP	British Standard Pipe
FP	Feed pipe
HEX	Hexagonal
ISO	International Organization for Standardization
Nm	Newton metre
P/N	Part number
UV	Ultraviolet
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

Cut off angle cock facilitates closing and opening of air pipelines as required during coupling / uncoupling of rolling stocks and for isolation of a coach for the purpose of shunting etc.
It is of ball type with vent and self-locking features.
The vent arrangement is provided to facilitate easy uncoupling by exhausting the air in the hose couplings during closure of the angle cock.

Figure 1: Cut Off Angle Cock, Isometric View

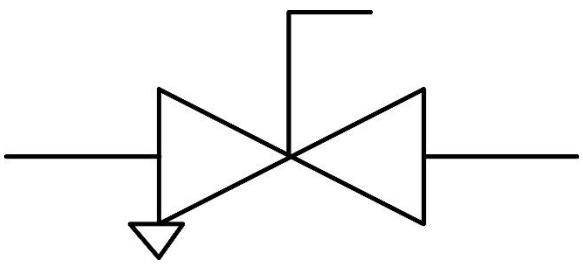

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	PORT SIZE	PORT	WORKING PRESSURE RANGE	MASS	Colour
607001500	1-1/4" BSP	BP	0 – 10 bar	4 Kg Approx	White
607001600		FP			Brunswick green

/// 3. OPERATIONS

Refer to Figure 3 and Figure 4

Cut off angle cock, a 2 piece construction, is provided at either ends of the coaching stock on brake pipeline and feed pipeline with a nominal pipe bore of dia 32 mm and attached to the coaching BP and FP lines of dia 25 mm with suitable adaptors to the angle cocks provided.

A plate spring retains the handle in particular position. During operation of the handle for open/close, it has to be lifted against the spring tension. This feature prevents accidental closure during train working.

3.1 OPEN CONDITION

When the handle is parallel to the pipe line, the Angle Cock is in "OPEN" position and when at right angle, it is in "CLOSE" position.

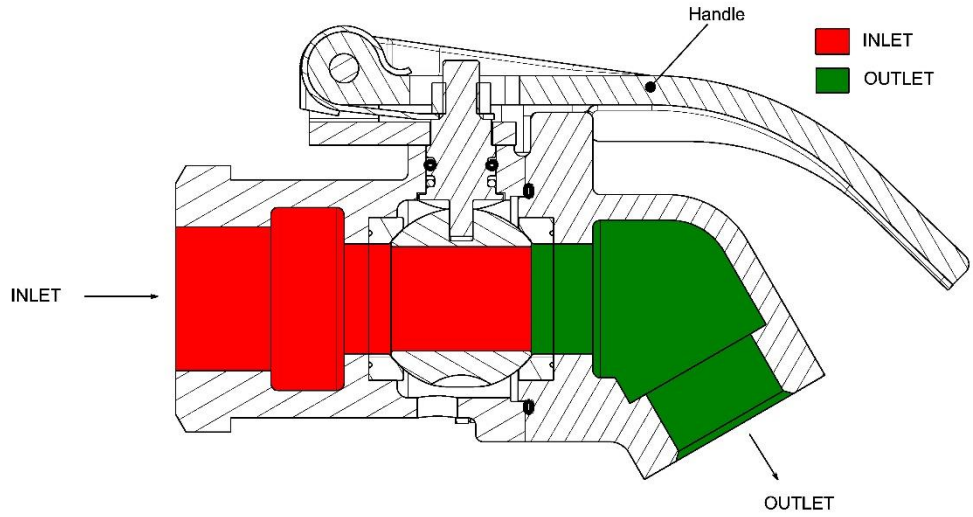

Figure 3: Cut Off Angle Cock, Open Condition

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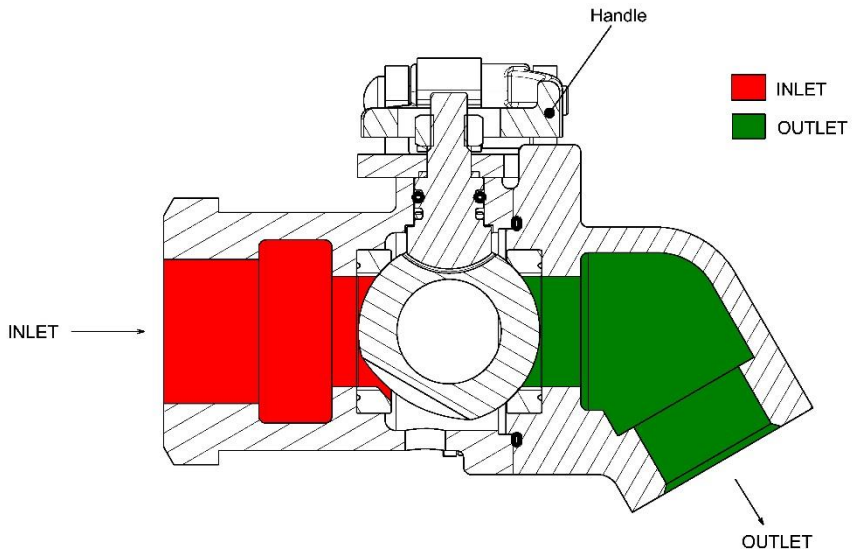
3.2 CLOSED CONDITION

When the handle is at right angle to the pipe the cock is in "CLOSE" position



1

Figure 4: Cut Off Angle Cock, Closed Condition

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
63 mm pipe wrench large	Tighten/loosen the cock
Torque wrench	Torque tighten the pneumatic fittings

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 577	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): As scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be maintained regularly as required by the operator's rules; the mission profile and the environmental conditions
   Typical **functional check** periodicity: 3 months. (refer section 5.2.1).

2. Second Level Maintenance: Unit replacement.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL CHECK

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/handle turns free. The test must be done with the system pressurized.
3. At the end of the test, make sure all the initial conditions are restored.

5.3 REMOVAL PROCEDURE OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

Refer to Figure 5

1. Remove the pneumatic connections using 63 mm pipe wrench to separate the cut off angle cock (1) from the system.
2. Set the cut off angle cock (1) aside in a protected area.

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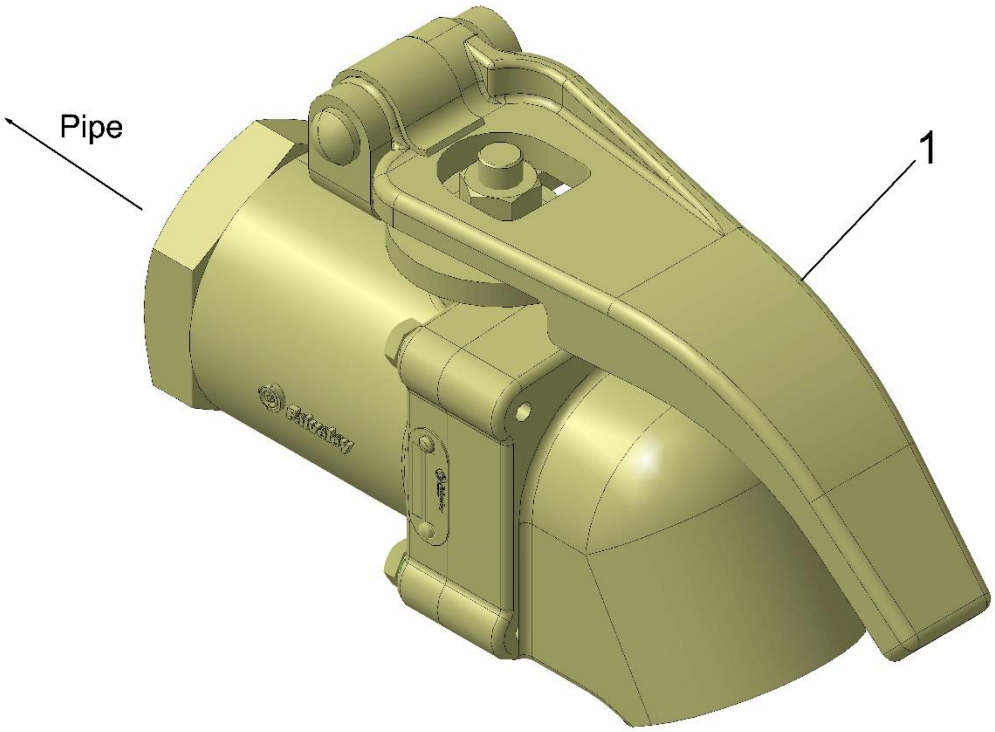

Figure 5: Cut Off Angle Cock with Vent, Removal and Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	CUT OFF ANGLE COCK	607001500	1
		607001600	

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 5

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports
4. Apply Loctite 577 to pneumatic fittings.
5. Install cut off angle cock (1) to the system.
6. Connect the pipe fittings on the port of the cut off angle cock (1). Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
7. Pressurize the system, check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance - Not applicable.
- Installation: Spare parts not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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02.15_02.16_08.14_08.16_13.29_20.01 Isolating cock

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/// FT0051880-100-E00MUM

1/2" ISOLATING COCK W/O VENT - FT0051880-100, FT0054576-100
1" ISOLATING COCK W VENT - FT0050944-100, AB670-T1h
3/4" ISOLATING COCK W VENT - AB669-T1h, FT0054572-101, -102
3/8" ISOLATING COCK W VENT - FT0054569-101, -103, AB667-T1h
1/2" & 3/8" ISOLATING COCK WITH VENT - FT0054575-100, FT0053740-000, -100
1/4" & 1" ISOLATION COCK - 2/515252, 023017000

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0051880-100-E00MUM.docx	D00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	05/01/2016	NEW RELEASE	.	SRC	KMS	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
C00	22/02/2022	Document updated with new part numbers: FT0054576-100, AB670-T1h, FT0054572-101, -102, FT0054569-101, -103, AB667-T1h, FT0054575-100.	DRC 1922	VP	.KMS	.BSH
D00	07/02/2023	Document updated with new template and added new P/Ns: FT0053740-100, FT0053740-000, 2/515252 & 023017000	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Isolating cock without vent is used to drain the reservoir pressure/pipeline pressure.

Isolating cock with drain is used to open and close a pneumatic circuit.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

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1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -20°C to +80°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

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1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 36 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -20°C to + 70°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from -20°C to 0°C during 3 months maximum and also, in summer from +25°C to +60°C during 3 months maximum).

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- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Isolating Cock must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Isolating Cock and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Isolating Cock for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
BSPP	British Standard Parallel Pipe
CLP	Closed Line Parallel
mm	millimeter
OLP	Open Line Parallel
P/N	Part number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

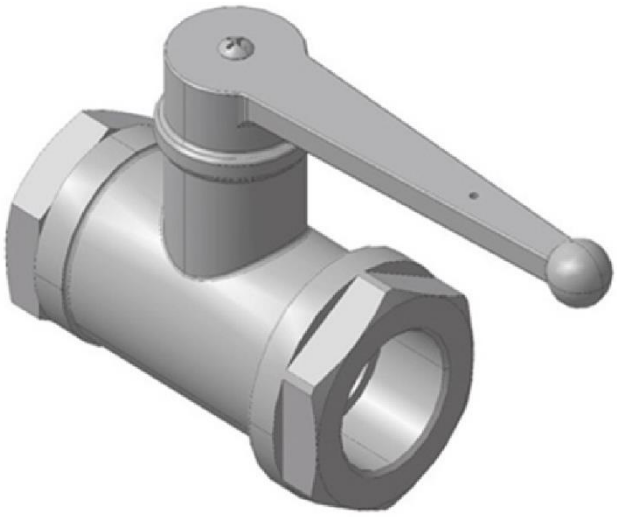
2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

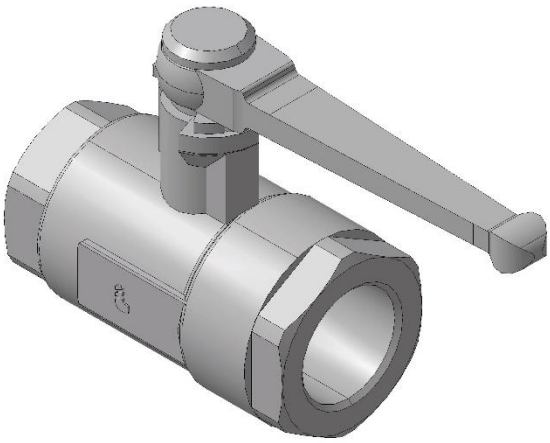
Isolating cock without vent is used to drain the reservoir pressure/pipeline pressure.

Isolating cock with drain is used to open and close a pneumatic circuit.

Isolating Cock Without vent

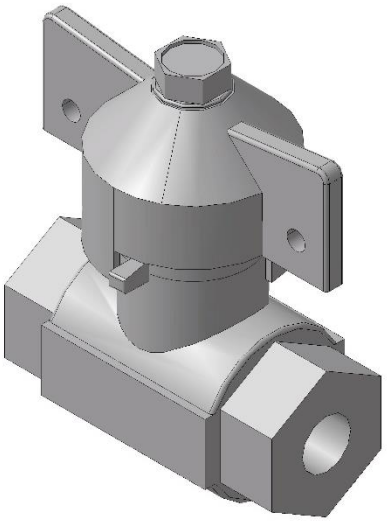


Isolating Cock With vent



Isolating Cock Without Vent

023017000



2/515252

Figure 1: Isolating Cock, Isometric View

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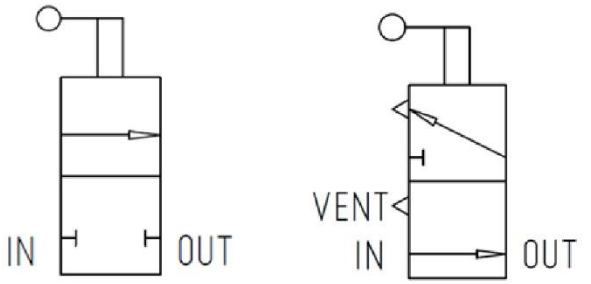

Isolating Cock Without vent Isolating Cock With vent

Figure 2: CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

2.2.1 ISOLATING COCK WITHOUT VENT

P/N	Port Size (BSPP)	Max Operating Pressure	Working Pressure Range	Type	Line Setup	Handle Color
FT0051880-100	1/2"	10 bar	0-10 bar	Without Vent	CLP	Red
FT0054576-100	1/2"	10 bar	0-10 bar	Without Vent	CLP	White
2/515252	1/4"	10 bar	0-10 bar	Without Vent	OLP	Red
023017000	1”	10 bar	0-10 bar	Without Vent	OLP	Red

2.2.2 ISOLATING COCK WITH VENT

P/N	Port Size (BSPP)	Max Operating Pressure	Working Pressure Range	Type	Line Setup	Handle Color
AB670-T1h	1"	10 bar	0-10 bar	With Vent	OLP	Red
FT0050944-100	1"	10 bar	0-10 bar	With Vent	OLP	Red
AB669-T1h	3/4"	10 bar	0-10 bar	With Vent	OLP	Red
FT0054572-101	3/4"	10 bar	0-10 bar	With Vent	OLP	White
FT0054572-102	3/4"	10 bar	0-10 bar	With Vent	OLP	Yellow
AB667-T1h	3/8"	10 bar	0-10 bar	With Vent	OLP	Red
FT0054569-101	3/8"	10 bar	0-10 bar	With Vent	OLP	White
FT0054569-103	3/8"	10 bar	0-10 bar	With Vent	OLP	Red
AB668-T1h	1/2"	10 bar	0-10 bar	With Vent	OLP	Red
FT0054575-100	1/2"	10 bar	0-10 bar	With Vent	OLP	White
FT0053740-000	3/8"	10 bar	0-10 bar	With Vent	OLP	Red
FT0053740-100	3/8"	10 bar	0-10 bar	With Vent	OLP	Red

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/// 3. OPERATIONS

3.1.1 ISOLATING COCK WITHOUT VENT (CLP)

Refer to Figure Figure 3 and Section 2.2 table

The Isolating Cock Without Vent is operated by rotating the handle. The handles can be arranged for clockwise or anti-clockwise movement and can also be arranged with the cock in the 'open' or 'closed' position when the handles are in line with the pipe.

When the handle is rotated by 90 deg the inlet pressure/reservoir volume is connected to atmosphere. When the handle is in closed condition the inlet and atmosphere are isolated from each other.

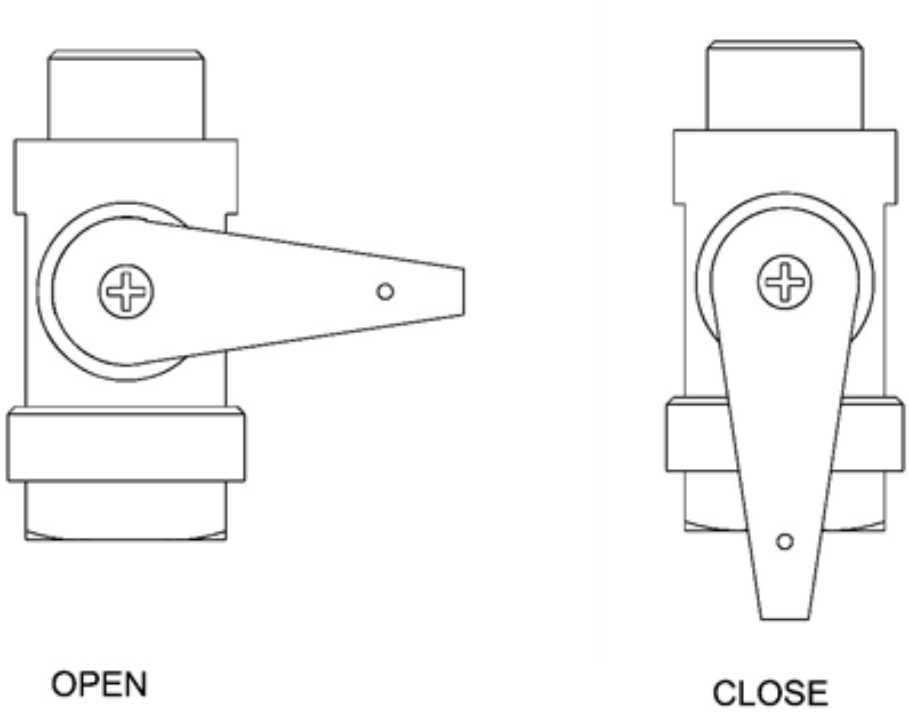

Figure 3: Isolating Cock Without Vent (CLP), Cock Handle Position

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3.1.2 ISOLATING COCK WITHOUT VENT (OLP)

Refer to Figure 4 and Section 2.2 table

The Isolating Cock Without Vent is operated by rotating the handle. The handles can be arranged for clockwise or anti-clockwise movement and can also be arranged with the cock in the 'open' or 'closed' position when the handles are in line with the pipe.

When the handle is rotated by 90 deg the inlet pressure/reservoir volume is connected to atmosphere. When the handle is in closed condition the inlet and atmosphere are isolated from each other.

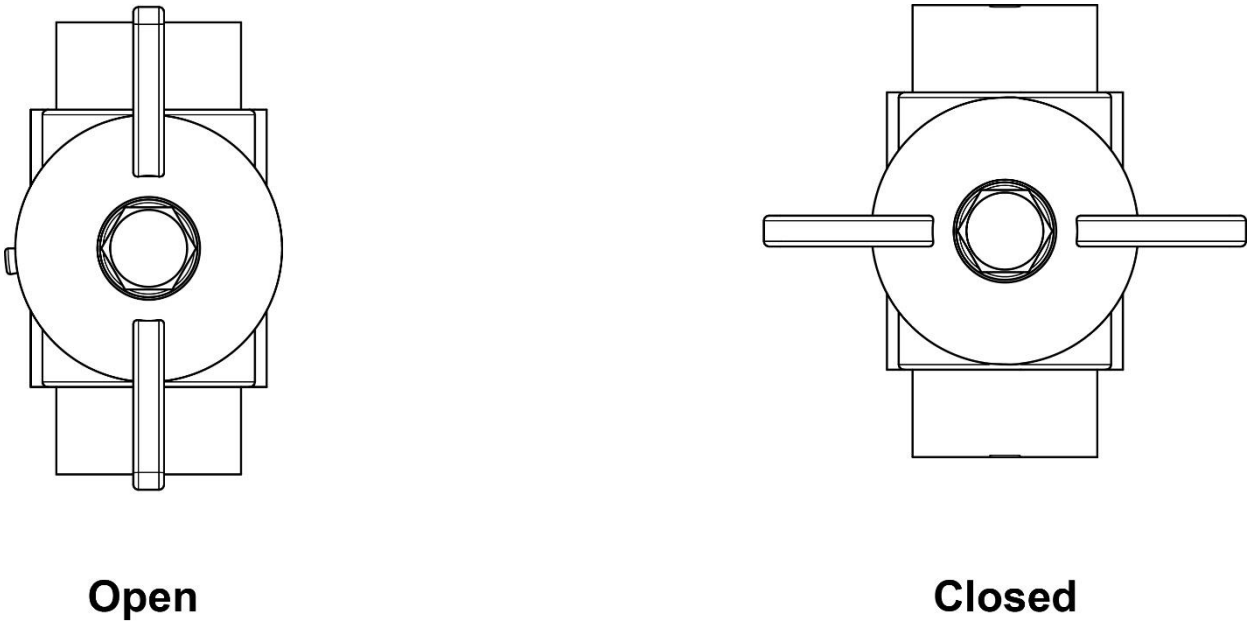

Figure 4: Isolating Cock Without Vent (OLP), Cock Handle Position

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3.1.3 ISOLATING COCK WITH VENT

Refer to Figure 5 and Section 2.2 table

The Isolating Cock With Vent is operated by rotating the handle. The handles can be arranged for clockwise or anti-clockwise movement and can also be arranged with the cock in the 'open' or 'closed' position when the handles are in line with the pipe.

When the handle is rotated by 90 deg to closed position, the outlet air is vented at the vent port. When the handle is in closed condition the inlet and outlet are isolated from each other.

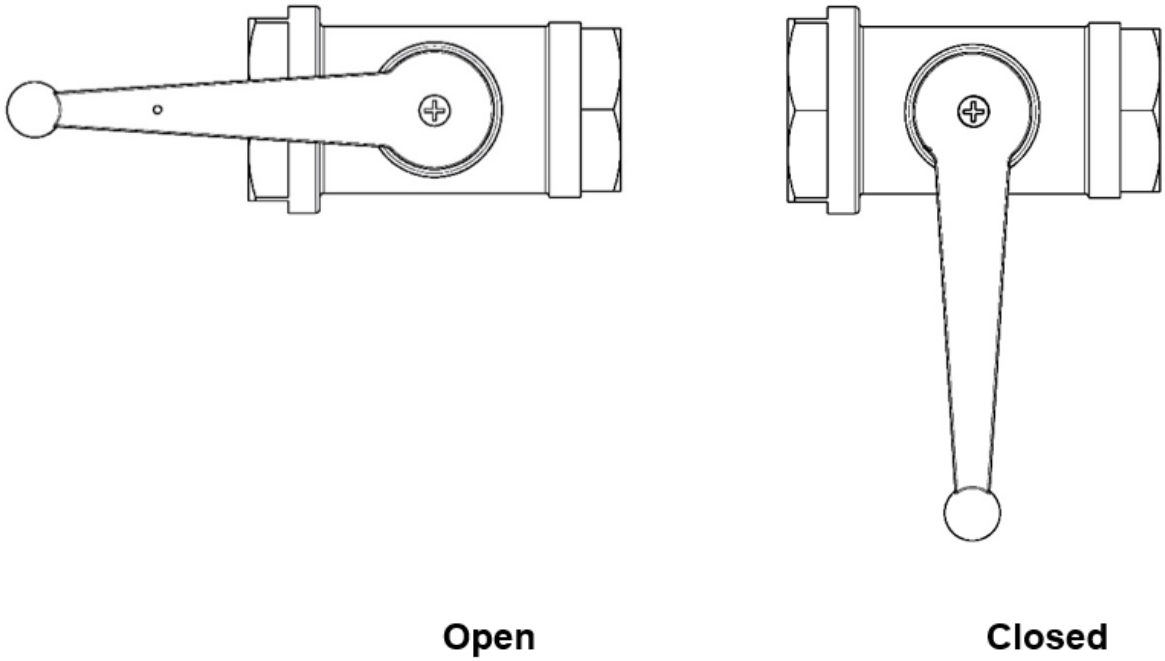

Figure 5: Isolating Cock With Vent, Cock Handle Position

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
24-46 mm spanner	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

No consumables required.

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

5.1.1 ISOLATING COCK WITHOUT VENT

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan.** If no system maintenance plan is provided; the device must be maintained regularly as required by the operator's rules; the mission profile and the environmental conditions.

2. Second Level Maintenance: not required.

5.1.2 ISOLATING COCK WITH VENT

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be maintained regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical **functional test** periodicity: 1 year. (Refer Section 5.2.1).

2. Second Level Maintenance: not required.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/handle turns free. The test must be done with the system pressurized.
3. At the end of the test, make sure all the initial conditions are restored.

5.3 REMOVAL PROCEDURE OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

Refer to Figure 6

1. Remove the Isolating Cock (1) along with dowty washer from the pipe and equipment’s using an appropriate spanner.

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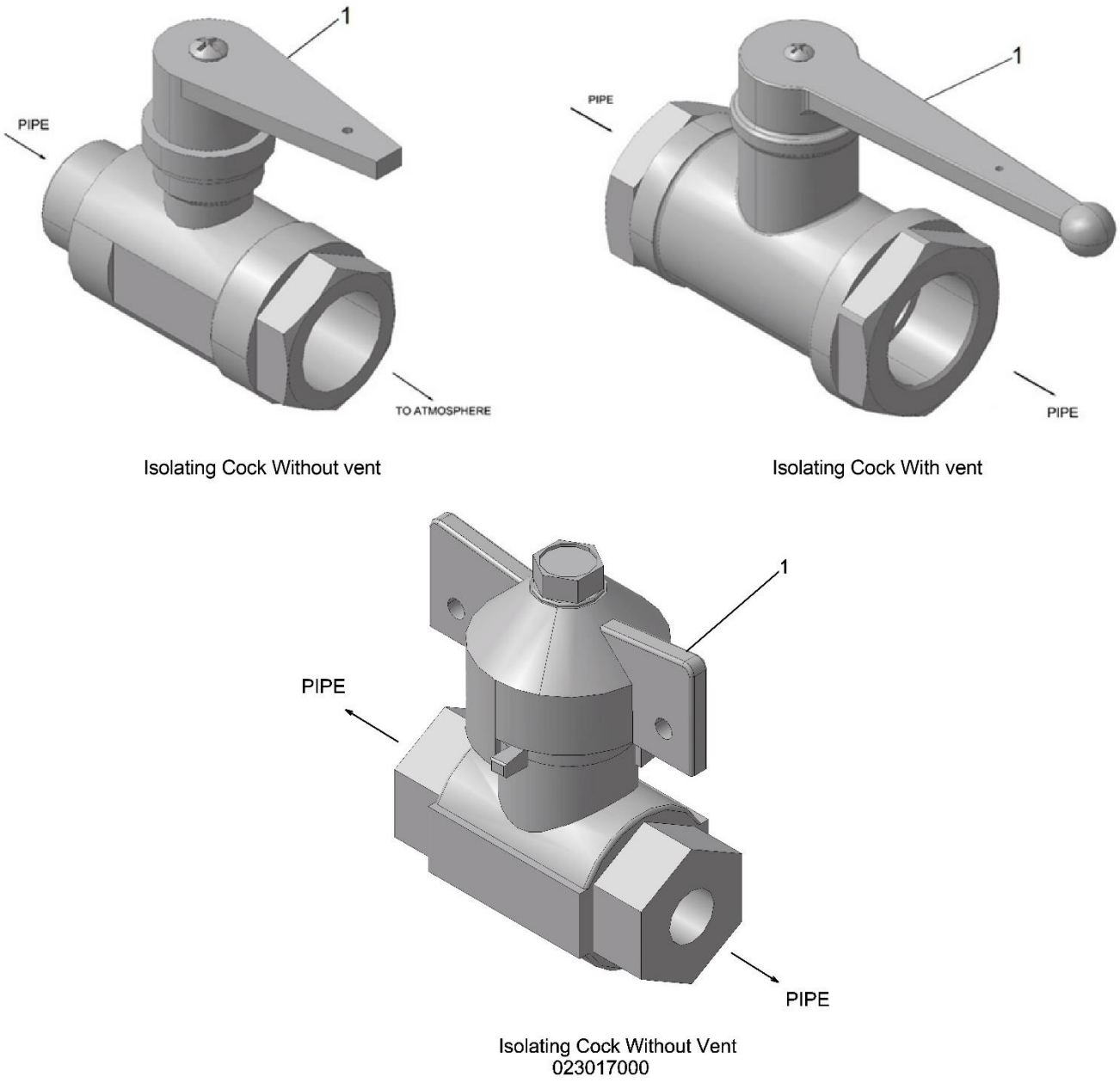

Figure 6: Isolating Cock, Removal/Installation

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 6

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Do not use tuflon tape on the threaded ports.
3. Install Drain/Isolating Cock (1) along with dowty washer to the pipe and equipment's using an appropriate spanner.
4. Make sure that the isolating cock is in parallel to the pipe line and the arrowmark inline with the compressed air flow direction.

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5. Connect the piping fitting. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
6. Pressurize the system and perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6. Spare Part List

- Routine Maintenance - Not applicable
- Installation: Spare parts not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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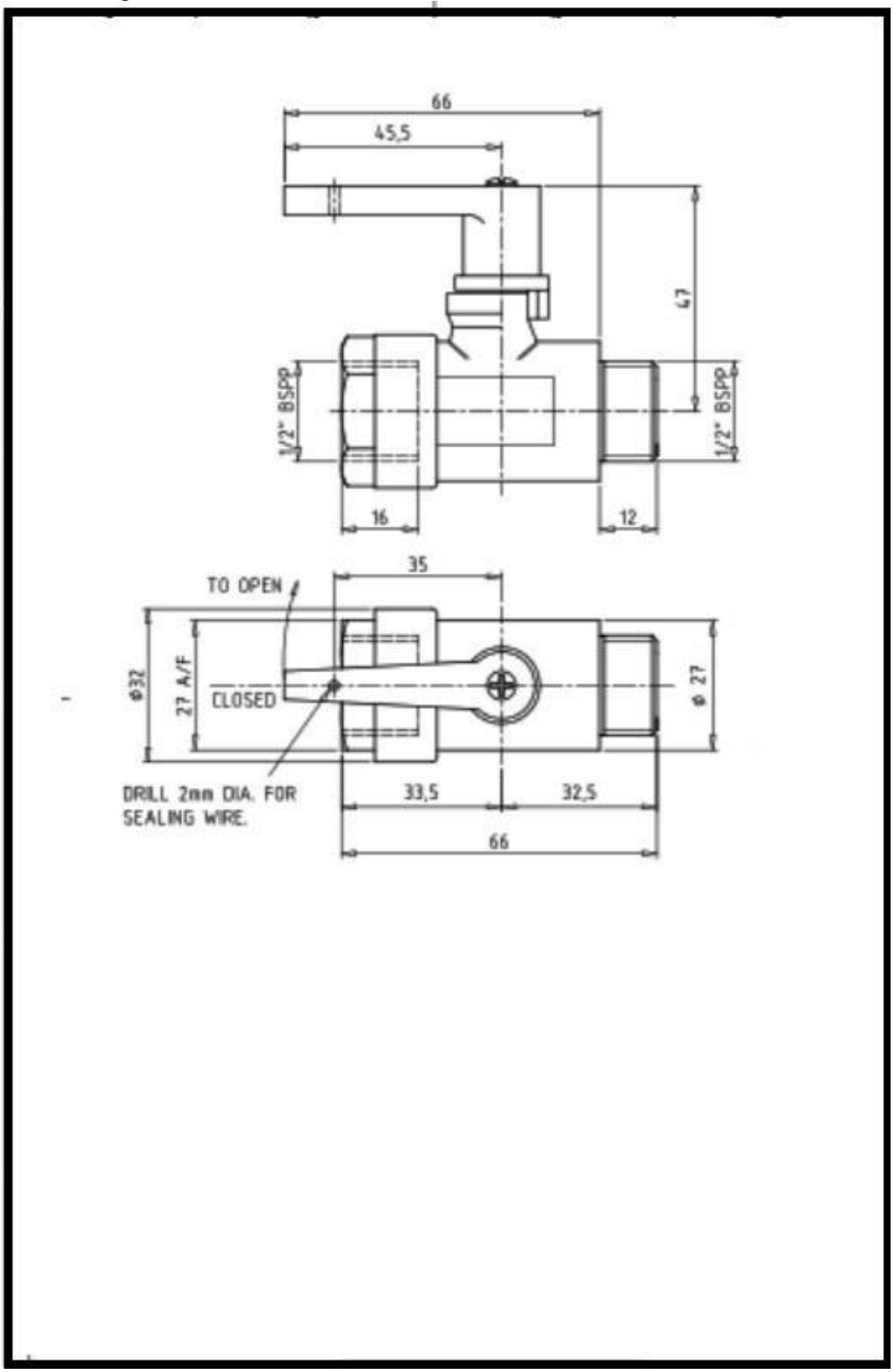
/// 8. OUTLINE DRAWING

1/2" Isolating Cock - FT0051880-100 and FT0054576-100



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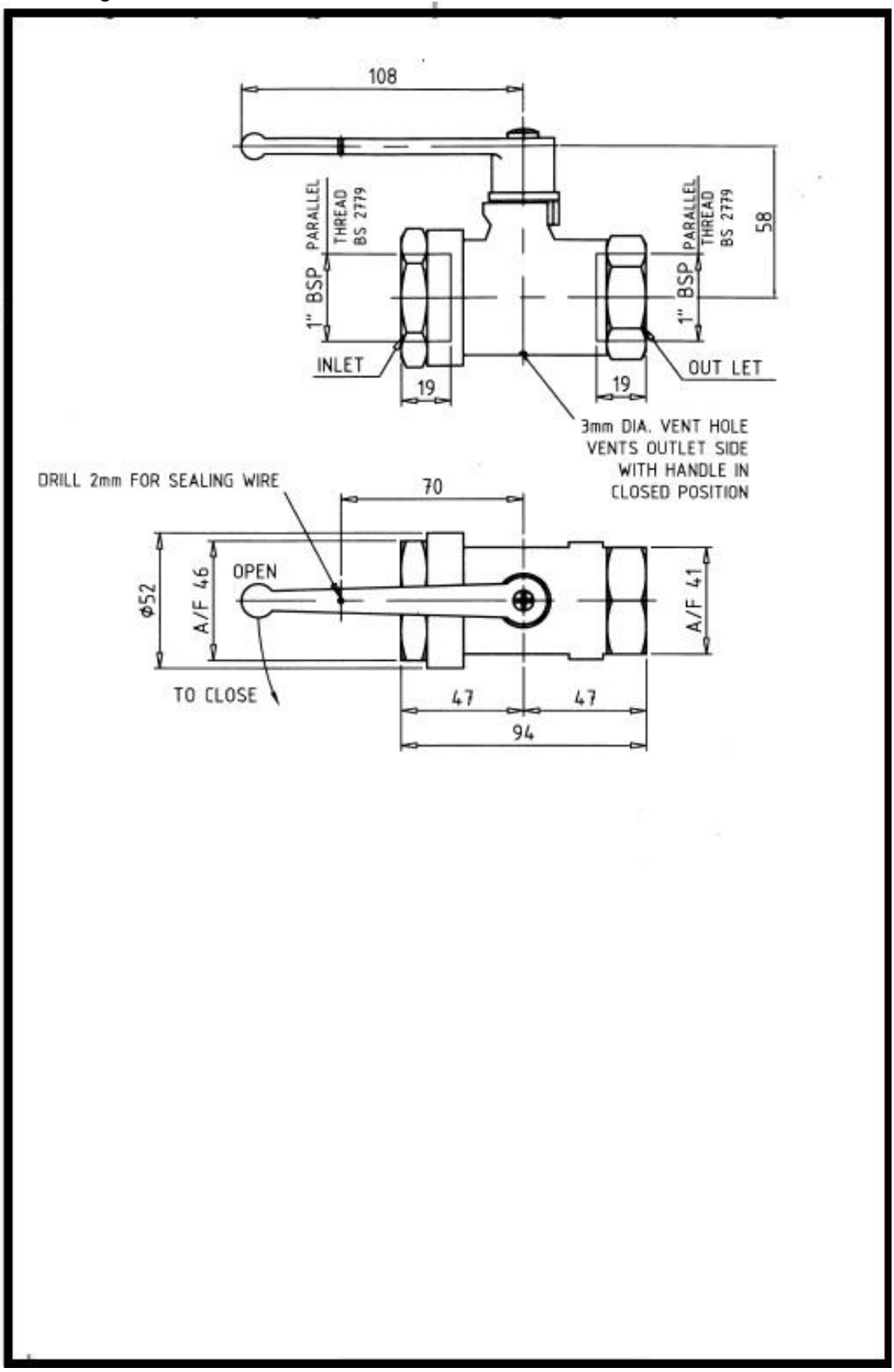
1" Isolating Cock - FT0050944-100 and AB670-T1h



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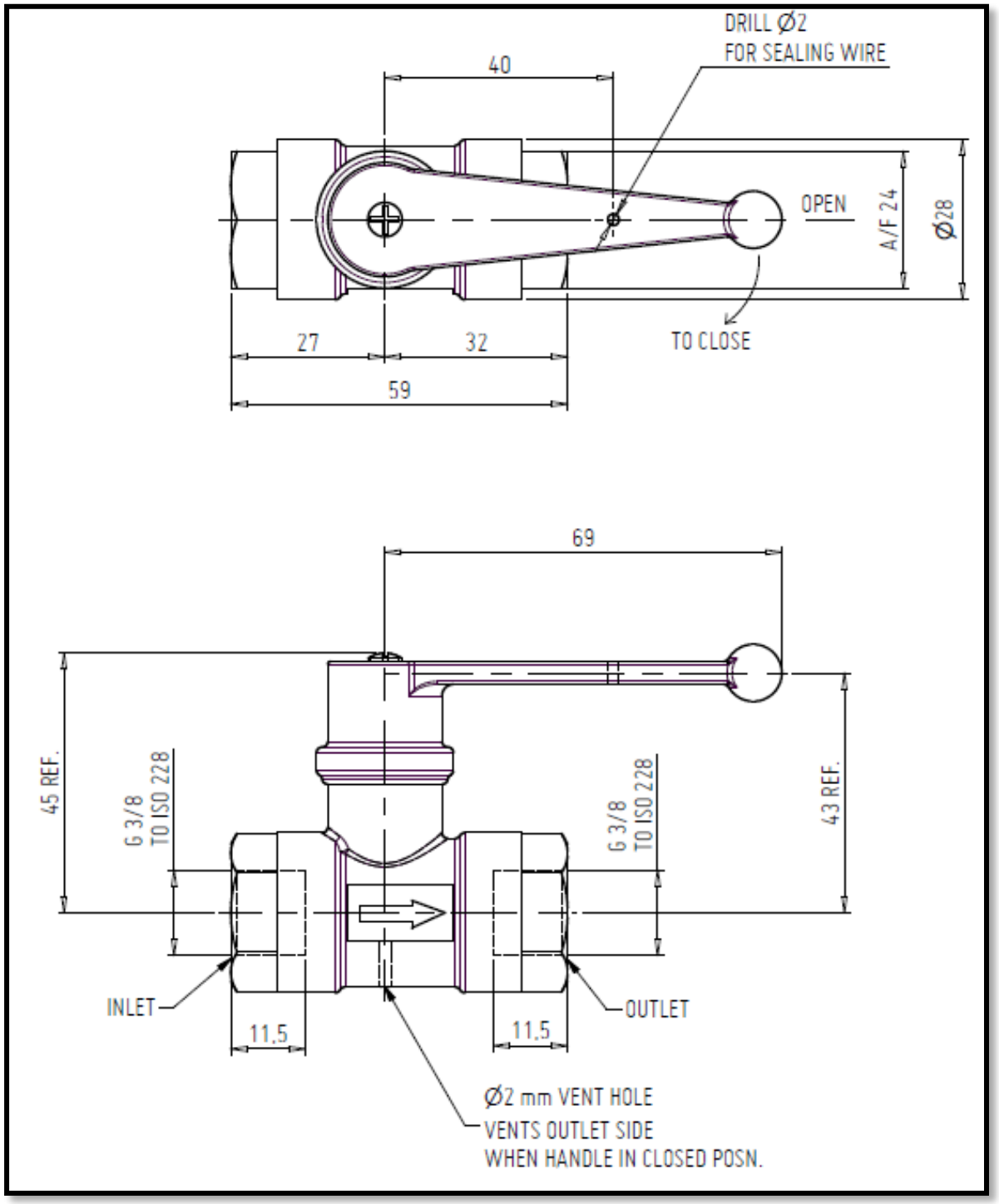
Isolating Cock 3/8” FT0054569-101 and 103, AB667-T1h



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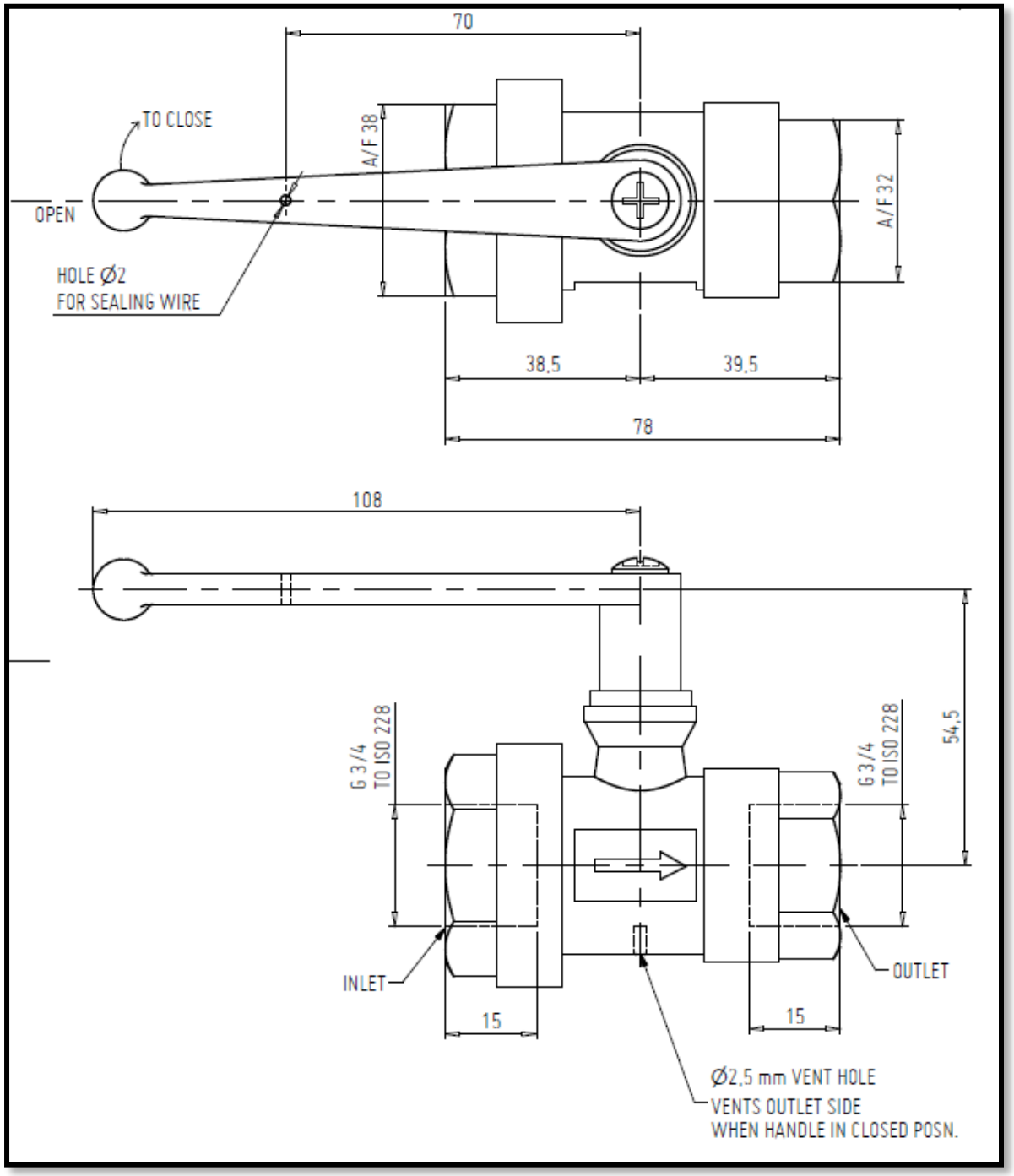
Isolating Cock 3/4” FT0054572-101 and 102, AB669-T1h



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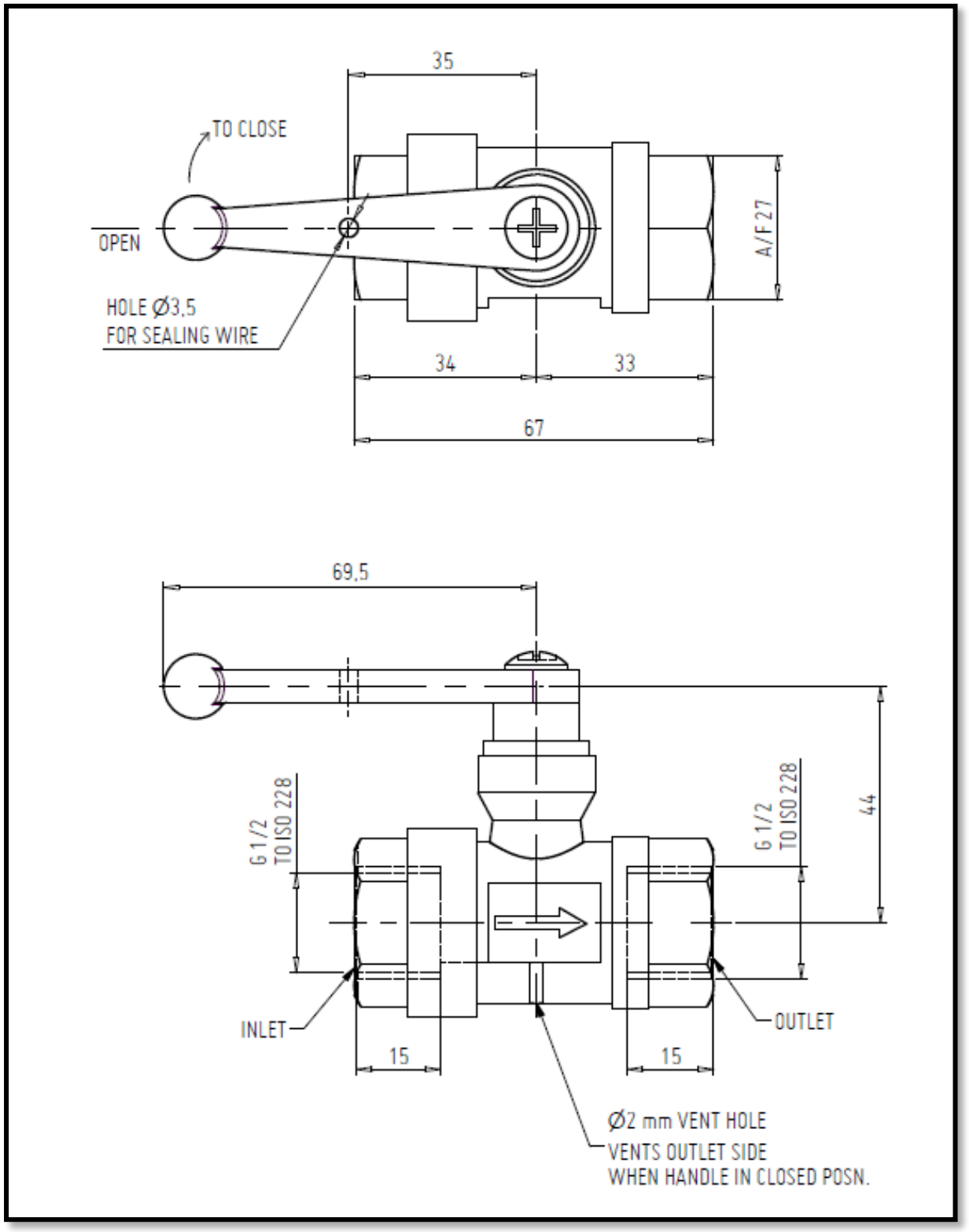
Isolating Cock 1/2” FT0054575-100



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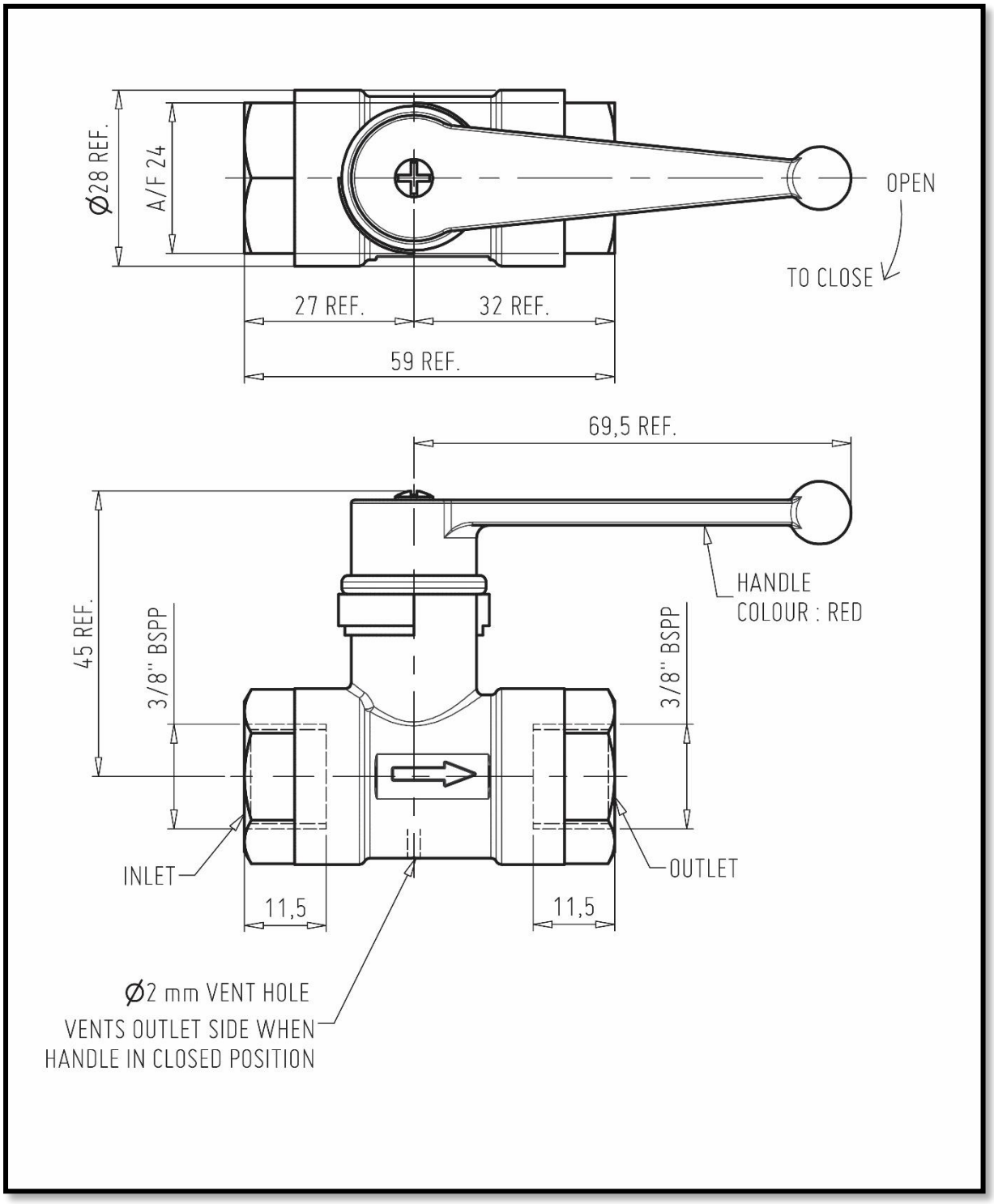
Isolating Cock 3/8” FT0053740-000



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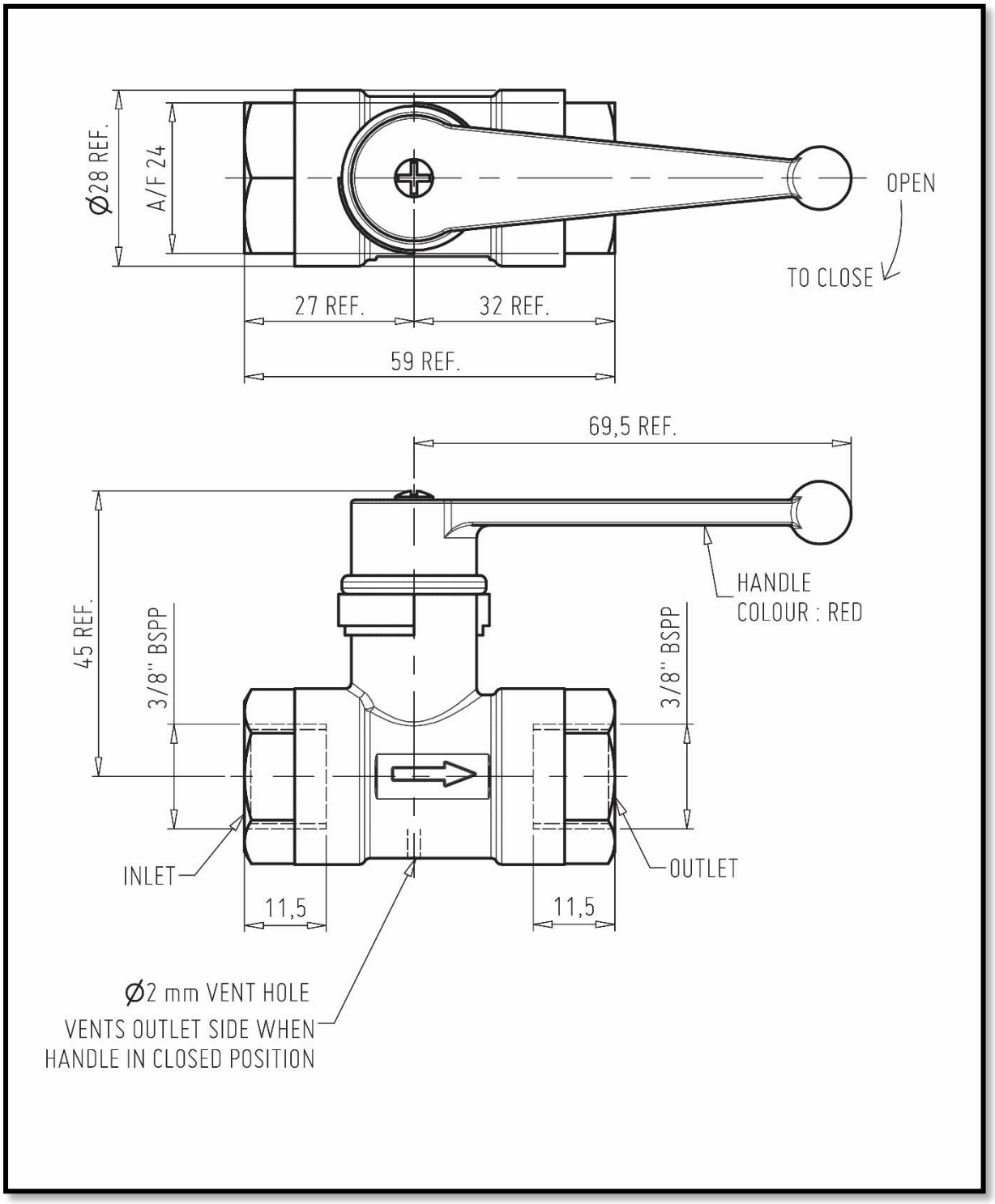
Isolating Cock 3/8” FT0053740-100



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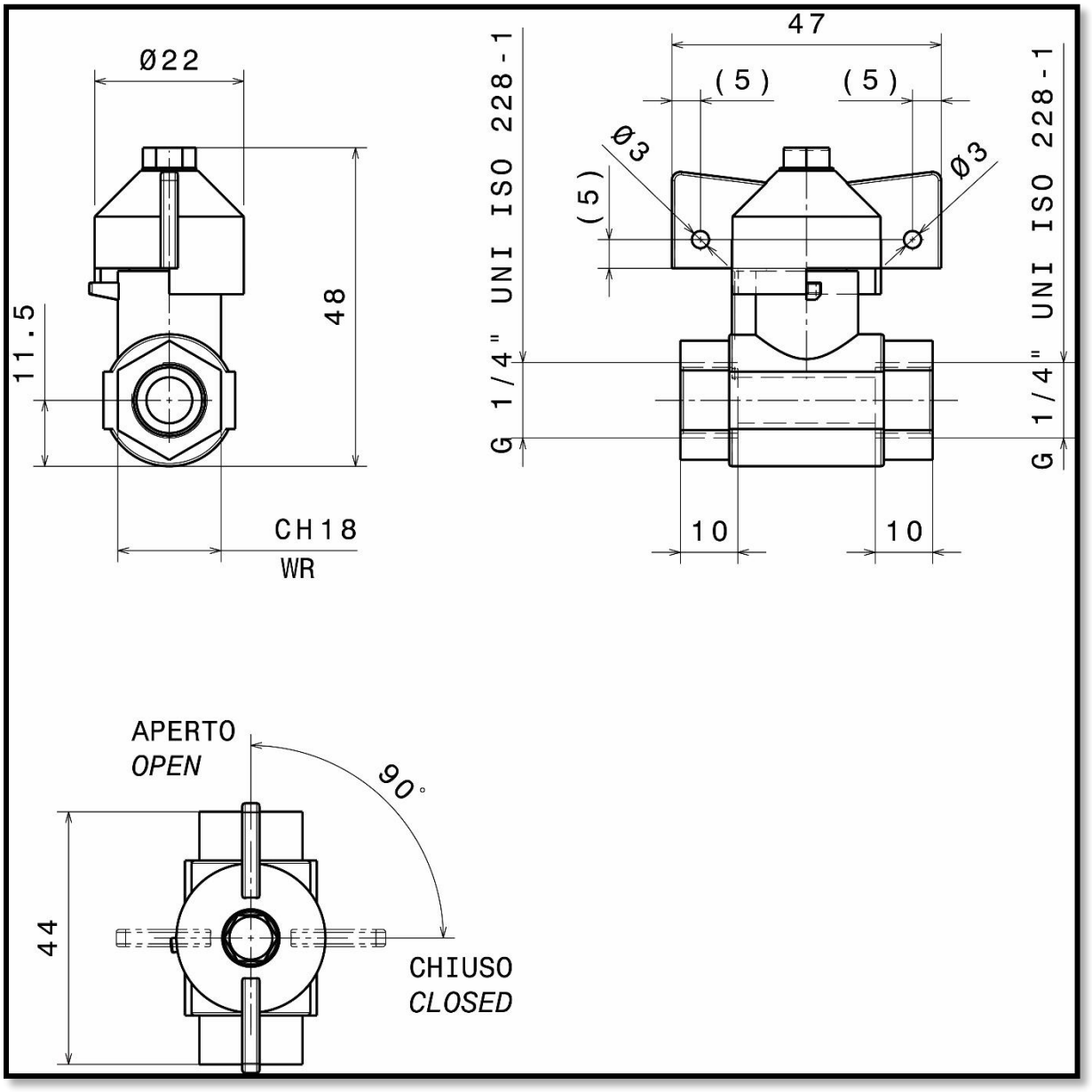
Isolating Cock 1/4” 2/515252



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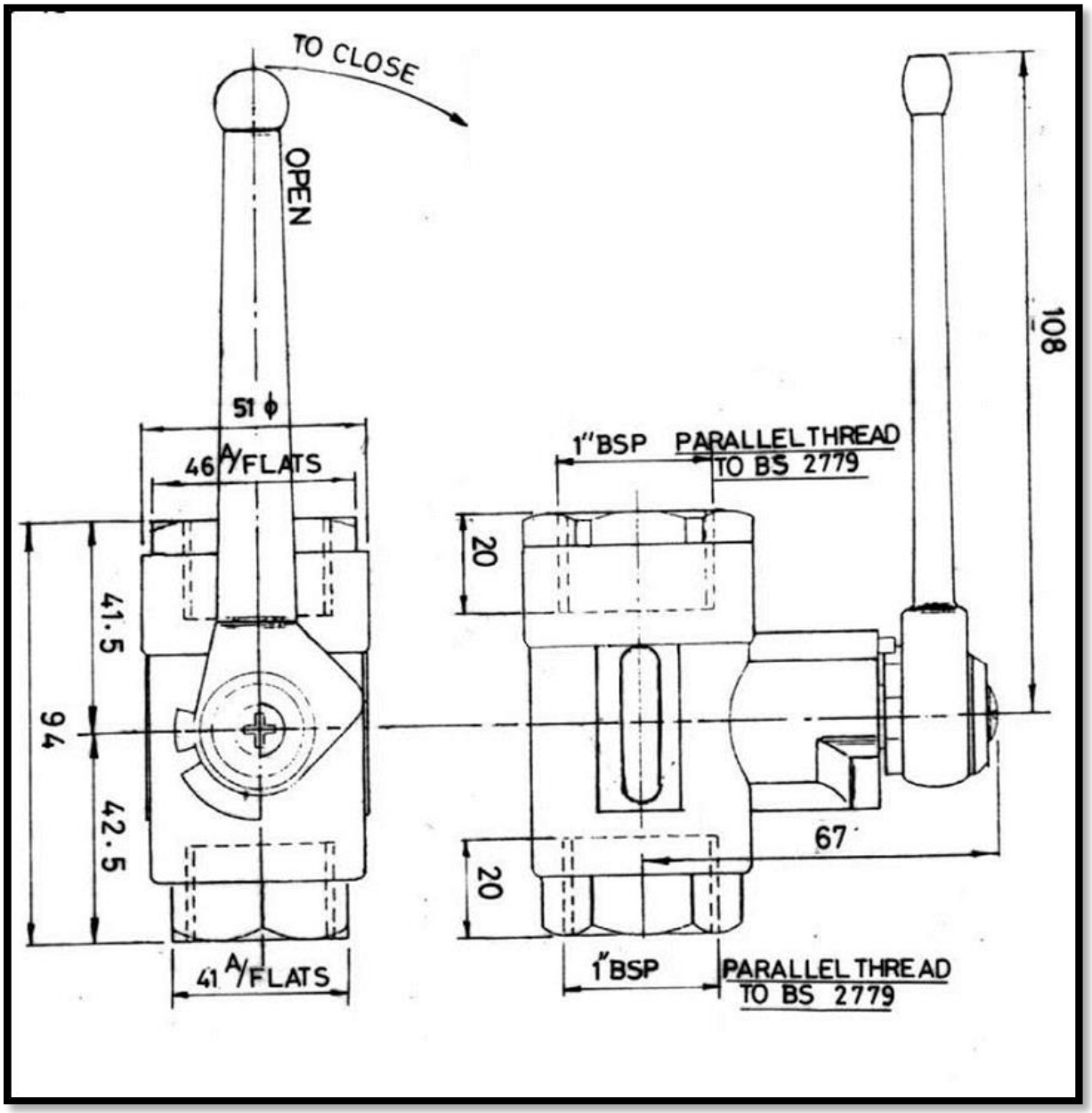
Isolating Cock Without Vent 1” 023017000



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03.01_13.196_PRESSURE TRANSDUCER

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/// 2/520076-E00MUM

PRESSURE TRANSDUCER
2/511040, 2/517121, 2/520070
2/511501, 2/514788, 2/520076
2/513084, 2/518980, 2/512562
2/513386, 2/515261
FT0024774-100
FT0029133-100

Maintenance/Use manual

ECO: DRC 1661
Compiled: VP
Checked: .JP
Approved: .AE

Date: 10/08/2021 - Revision: A00
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1661	VP	.JP	.AE
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Pressure Transducer is an electronic device that provides an electrical signal proportional to the pressure measured at the inlet port.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

FAIVELEY TRANSPORT cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing any operations ensure that the adjacent moving parts (compressors, fans, actuators, etc.) should not be in operating condition.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. FAIVELEY TRANSPORT cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

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1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every FAIVELEY TRANSPORT product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Pressure Transducer must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Pressure Transducer and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Pressure Transducer for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
Assy	Assembly
ID	Internal Diameter
mm	Millimetre
mA	Milliampere
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1

The pressure transducer is an electronic device that provides an electrical signal proportional to the pressure measured at the inlet port.

The electrical signal is variable with a proportional law over the entire measuring scale and is a direct current ranging from 4 to 20 mA.

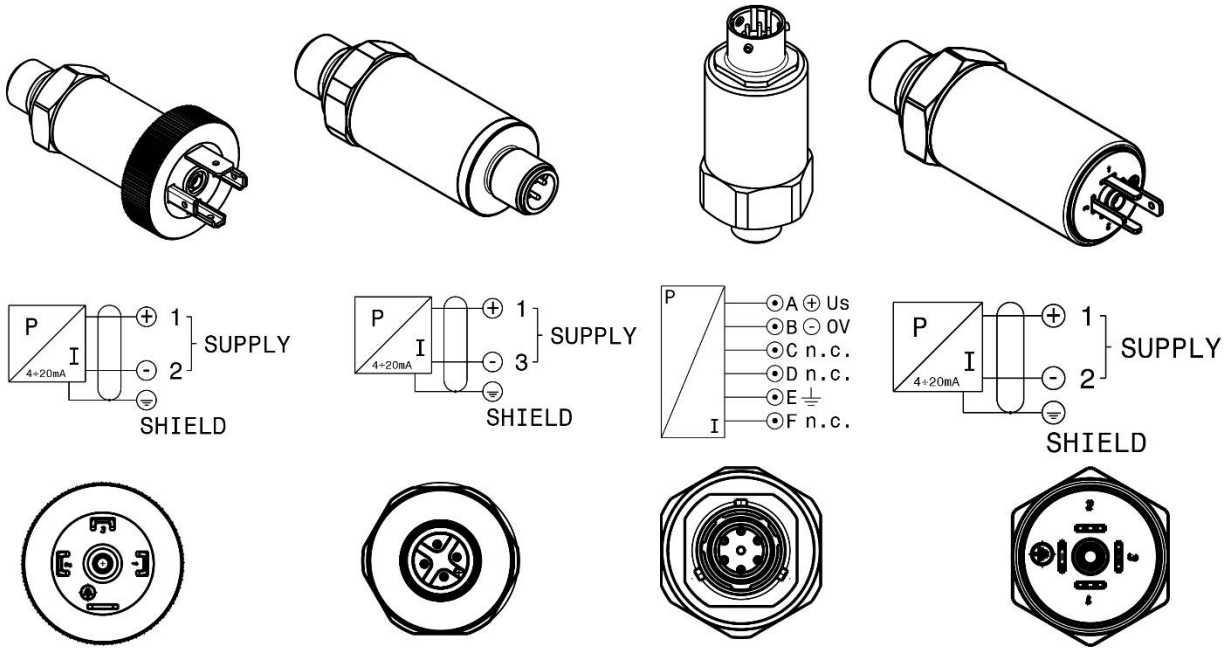

Figure 1 – Pressure Transducer, Isometric View and CETOP symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

<table>
<tr><th>PNs</th><th>RANGE [BAR]</th><th>SENSOR [ACCURACY]</th><th>PRESSURE CONNECTION G=cylindrical R=conical</th><th>TORQUE [Nm]</th><th>ELECTRICAL CONNECTION</th><th>OUTPUT</th><th>TEMPERATURE RANGE</th><th>WEIGHT [gr]</th><th>OPEN END SPANNER [mm]</th><th>IP GRADE</th></tr>
<tr><td>2/511040</td><td>0-10</td><td rowspan="15">TOTAL ERROR BAND (nonlinearity, hysteresys, repeatability, thermal error of zero and span, calibration error of zero and span, vibrational error) -20°C ÷ +70°C ± 1% FS (full scale)</td><td>G1/4”</td><td>25 ± 5</td><td rowspan="11">Male electrical plug EN175301-809-A (DIN43650-A) Mat:PA</td><td rowspan="15">Output= 4.20mA

V supply= 9.32 VDC</td><td rowspan="15">-40°C ÷ +125° C</td><td rowspan="15">80 ÷110</td><td rowspan="15">27</td><td rowspan="2">65</td></tr>
<tr><td>2/517121</td><td>0-10</td></tr>
<tr><td>2/520070</td><td>0-10</td><td>R1/4”</td><td rowspan="3">Depending on application</td></tr>
<tr><td>2/511501</td><td>0-10</td><td>R1/4”</td><td>44</td></tr>
<tr><td>2/514788</td><td>0-16</td><td rowspan="2">R1/4”</td><td rowspan="3">65</td></tr>
<tr><td>FT00247 74-100</td><td>0-16</td></tr>
<tr><td>FT00291 33-100</td><td>0-16</td><td>G1/4”</td><td>25 ± 5</td></tr>
<tr><td>2/520076</td><td>0-16</td><td>R1/4”</td><td>Depending on application</td></tr>
<tr><td>2/513084</td><td>0-5</td><td>G1/4”</td><td>25 ± 5</td></tr>
<tr><td>FT00270 49-100</td><td>0-10</td><td>R1/4”</td><td>Depending on application</td></tr>
<tr><td>2/518980</td><td>0-10</td><td>G1/4”</td><td>25 ± 5</td><td>DIN 72585</td><td>69 K</td></tr>
<tr><td>2/512562</td><td>0-10</td><td rowspan="2">R1/4”</td><td rowspan="2">Depending on application</td><td>MIL-C 26485 6 poles</td><td>67</td></tr>
<tr><td>2/513386</td><td>0-10</td><td rowspan="2">Outgoing cables; cables section 4x0,5 mm 2 69K Length: 1,5 m</td><td rowspan="2">69 K</td></tr>
<tr><td>2/515261</td><td>0-10</td><td>R1/4”</td></tr>
</table>

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/// 3.OPERATIONS

A pressure transducer is a device which converts an applied pressure into a measurable electrical signal which is linear and proportional to the applied pressure.

/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
Screw driver	Tighten the screw
27mm open end spanner	Tighten the transducer
Torque wrench (5-35 Nm)	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242	Thread locker

/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.
2. Second Level Maintenance: Not Applicable. If the pressure transducer is found faulty, to be replaced.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Before disconnecting the transducer, make sure the system is deactivated and taken to a safe state: the interruption of the signal could cause unexpected automatic reactions.

Caution! Take care to avoid ingress of dirt or debris into the system.

NOTE: The pressure transducer cannot be repaired.

Refer to Figure 2

1. Unplug the electrical connector by unscrewing screw using a screw driver.
2. Unscrew and remove the transducer using a 27mm open end spanner.

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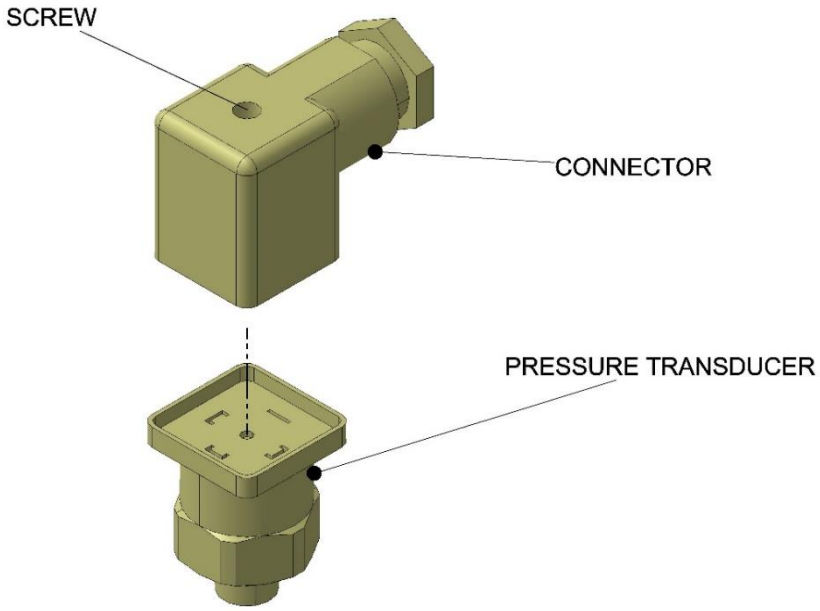

Figure 2 – Pressure Transducer, Removal/Installation

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 2

1. Apply Loctite 242 to the threads of the transducer.
2. Install the transducer using a 27mm open end spanner and a tightening torque of 25 ±5 Nm. When tightening the device, make sure not to apply any effort to the cylindrical body, but use exclusively the hex section in order to avoid permanent damage.
3. Plug the electrical connector and secure it with screw using a screw driver.
4. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check. Verify the correct electrical functionality by checking the operation of the on-board equipment.

/// 6.SPARE PART LIST

- Routine maintenance: Not required.

- Installation: The spare parts are not required.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, copper, steel, rubber, brass and stainless steel. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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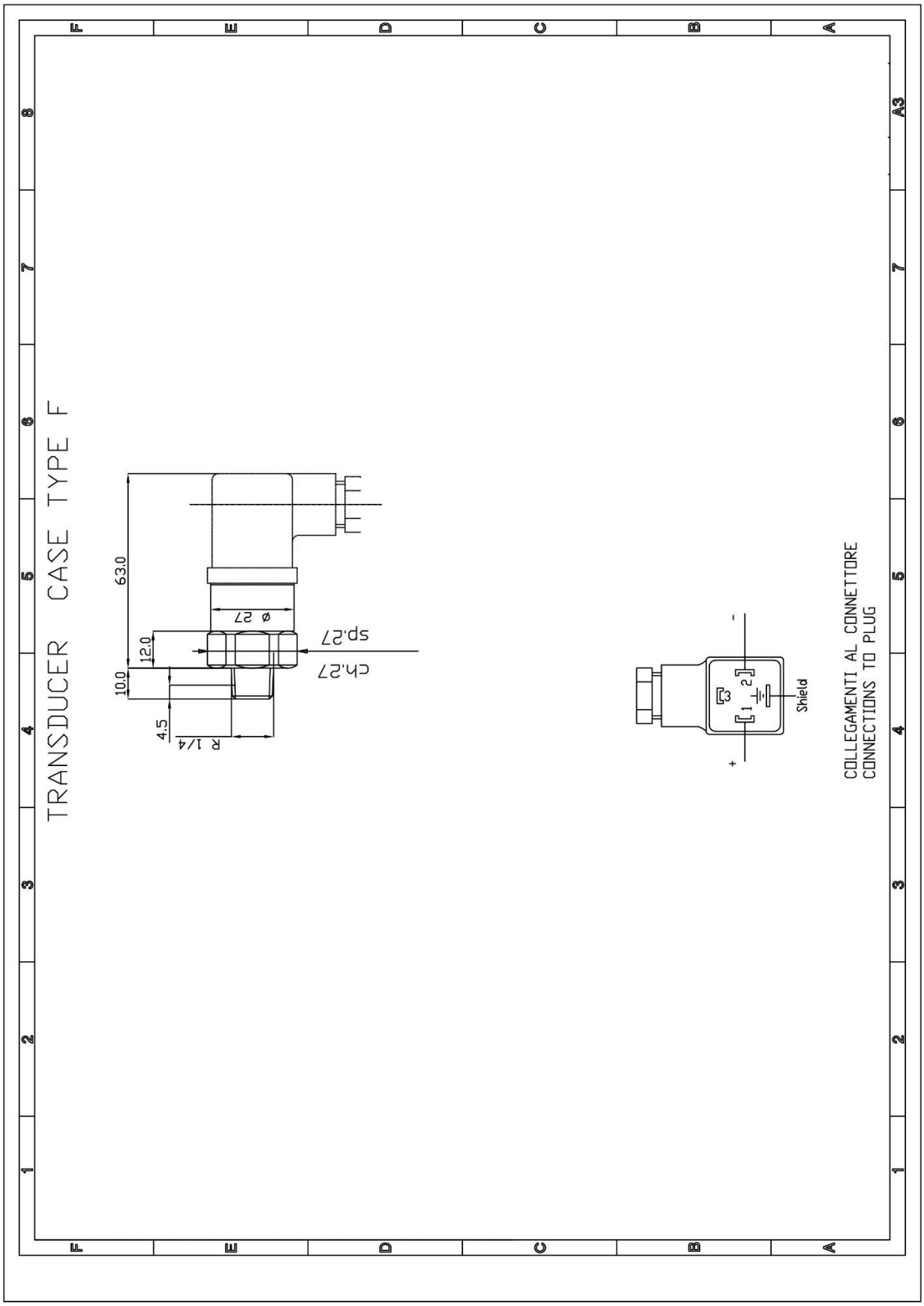
/// 8.OUTLINE DRAWING

Pressure Transducer - 2/520076



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03.04_08.07_13.36 Pressure switch

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/// FT0020043-117-E00MUM

PRESSURE SWITCH SET
FT0020043-117
FT0020046-112, -118, -119
FT0051181-114
FT0054544-100, -101, -102, -103
FT0054627-100
FT0053738-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0020043-117-E00MUM.docx	D00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	20/10/2016	NEW RELEASE	.	SRC	JP	.AE
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1661	VP	.JP	.AE
C00	19/01/2022	New P/Ns added: FT0020046-118, -119, FT0054627-100, FT0054544-100 and FT0054544-101	DRC 1992	VP	.JP	.AE
D00	01/11/2022	Document updated with new template and added new P/Ns: FT0054544-102, FT0054544-103 and FT0053738-100	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The pressure switch is a device that transforms a pneumatic signal into an electrical signal by opening or closing two electrical circuits, when the pressure is lower or higher than the given thresholds.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

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1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -25°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

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1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to + 50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

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- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Pressure Switch must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Pressure Switch and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Pressure Switch for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
HD	Head
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The pressure switch is a device that transforms a pneumatic signal into an electrical signal by opening or closing two electrical circuits, when the pressure is lower or higher than the given thresholds.

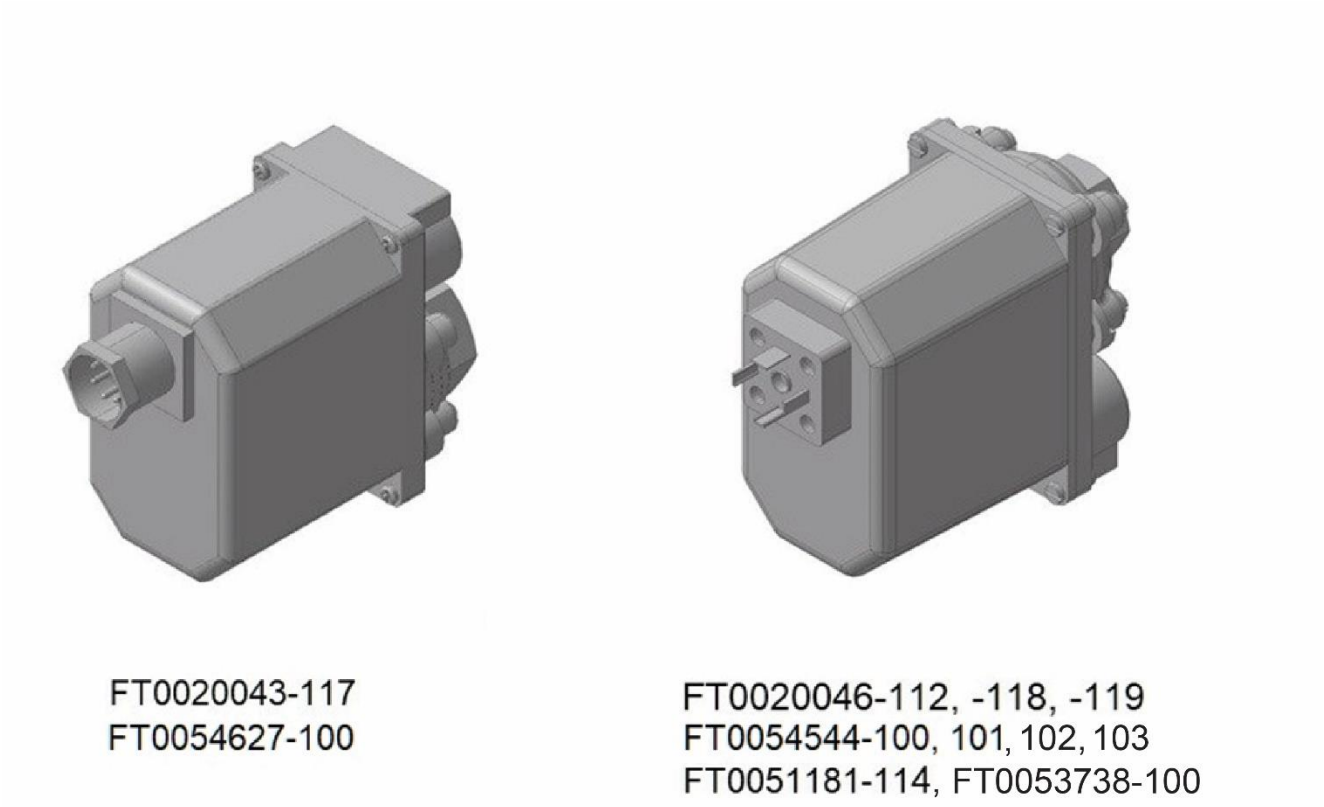

Figure 1: Pressure Switch, Isometric View

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

2.2.1 ISOLATING COCK WITHOUT VENT

Pressure switch P/N	Characteristics	Pressure Setting (bar) nominal values		
		Type	Falling Pr.	Type
FT0020043-117	Variable differential pressure switch	MCS11-SOND 910-G +S6	6.5	7.0
FT0020046-112	Variable differential pressure switch	MCS11-G+S3	7.5	9.5
FT0020046-118	Variable differential pressure switch	MCS11-G +S3	7.5	10
FT0020046-119	Variable differential pressure switch	MCS11-G +S3	8.5	10
FT0051181-114	Variable differential pressure switch	MCS11+S3	6	7
FT0054544-100	Variable differential pressure switch	MCS11+S3	3.5	5
FT0054544-101	Variable differential pressure switch	MCS11+S3	7.5	10
FT0054627-100	Variable differential pressure switch	MCS11-SOND 910-G +S6	6	7
FT0054544-102	Variable differential pressure switch	MCS11+S3	8.5	10
FT0054544-103	Variable differential pressure switch	MCS11+S3	4.0	4.5
FT0053738-100	Variable differential pressure switch	MCS11+S3	5.3	7.5

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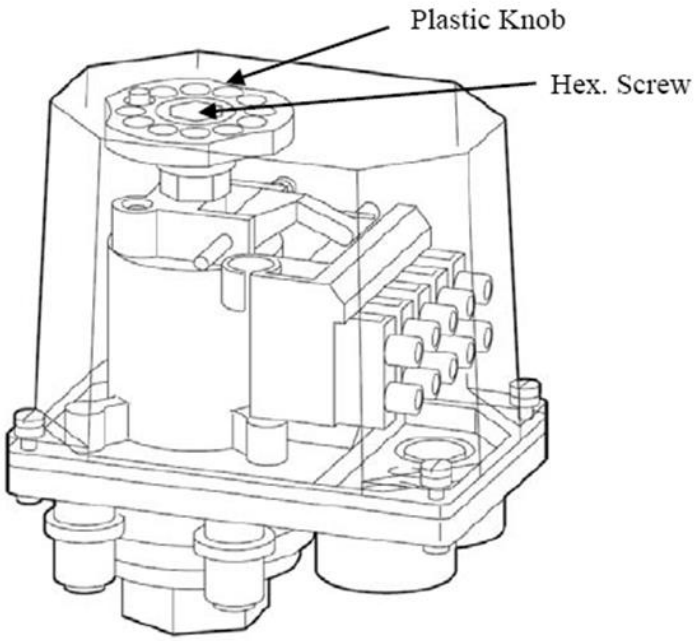
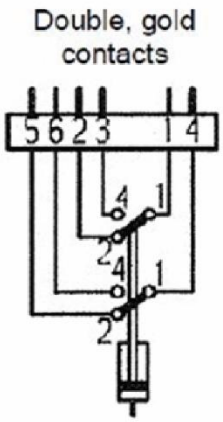
/// 3. OPERATIONS

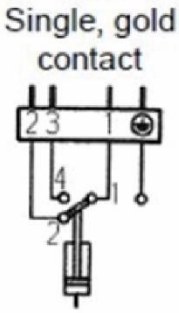
Pressure switch senses the pressure from the source and depending on the pressure settings it opens and closes the electrical circuits. The Plastic knob and the Hex. screw are used for setting the falling and rising set points respectively.





Note:
1,2,3,4,5&6 contacts are used for electrical wiring using push type terminals.
1 & 3, 4&6 - NO
1 & 2, 4&5 - NC

Low MR Pressure Switch-FT0020043-117
FT0054627-100



Note:
1,2&4 contacts are used for electrical wiring using push type terminals.
1 & 4 - NO
1 & 2 - NC

Switch Salve/Assistant and Main Compressor
FT0020046-112, -118, -119, FT0054544-100, -101, -102, 103, FT0051181-114 and FT0053738-100

Figure 3: Pressure Switch, Operating Condition

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Refer to Figure 3

Compressed air from the air supply source is fed through the input to the underside of the valve and when the pressure of the source exceeds the pressure held on the output side, the valve moves up and allows a through flow of air.

If the pressure of the air supply falls below that held on the output side of the check valve, then the valve closes, preventing a back feed.

/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
Screw driver	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

This device doesn't require any special tools.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Lubricant for parts
Loctite 577	Thread locking

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): check calibration on bench as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer to section 5.2.1.
   Typical check periodicity: 1 year.

2. Second Level Maintenance: Not Applicable. If the pressure switch is found faulty, to be replaced.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

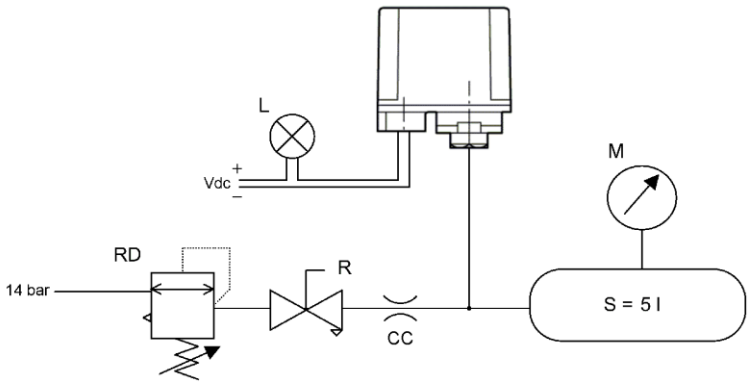
5.2.1 CALIBRATION CHECK

Caution! Pressurised system! Discharge the pressure before removal. The main reservoir pressure must be drained to remove the Check Valve.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 4, Figure 5,and Figure 6

1. Remove the pressure switch from the system and fit it onto the test bench shown here below.



CC	Calibrated choke
L	Lamp
M	Pressure gauge
R	Cut-out cock ¼”
RD	Pressure regulator
S	Reservoir cap 5l

Figure 4: Pressure Switch, Operating Condition

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2. Connect the pressure switch to a pressure line. Ensure clean dry air supply before commencing the setting.
3. Make the Electrical connections at NO or NC terminals and connect a lamp or hooter to give signal when the switch makes contact.
4. First note down the falling and rising pressure to be set.

Setting Rising Pressure:

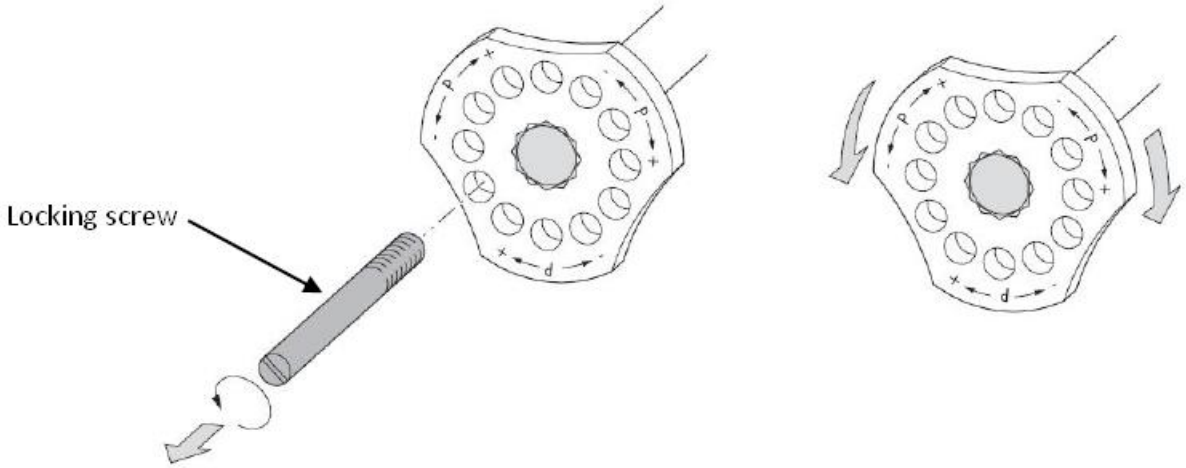

Figure 5: Pressure Switch, Operating Condition

5. Open the inlet cock slowly. Check the pressure in gauge when the pressure switch makes contact. Check if the rising pr. setting is achieved. If not remove the locking screw adjust the plastic wheel along with the Hex screw to get the required pressure by opening and closing the inlet and drain cock as required.

Setting Falling Pressure:

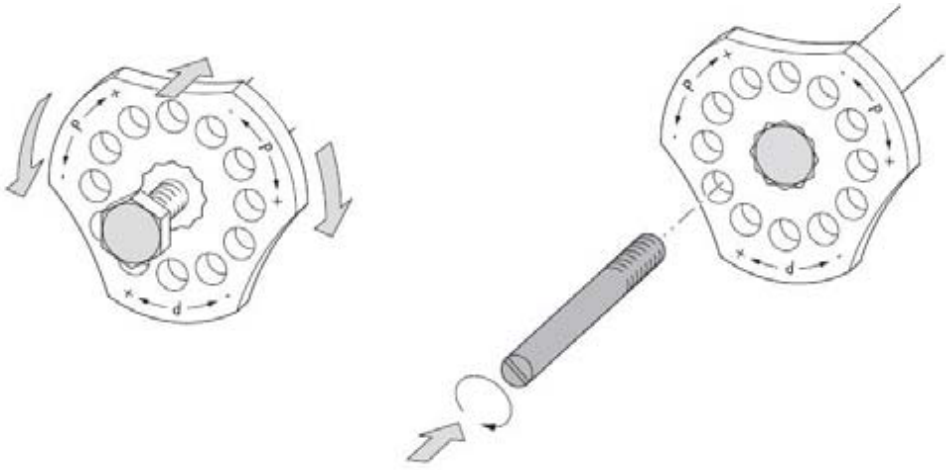

Figure 6: Pressure Switch, Operating Condition

6. Ensure the pressure is above the rising set point and close the inlet cock.
7. Through drain cock drain the pressure and note down the pressure in a gauge when the switch makes contact. Close the drain cock.
8. Check if the falling pressure setting is achieved. If not gently push the plastic knob inside and adjust the plastic knob alone to get the required falling pressure.
9. After setting the both falling and rising pressures individually, check once again both the pressures and ensure no change in the settings.
10. After necessary settings are obtained, tighten the locking screw in position using a screw driver.

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11. Drain the pressure in the test setup system and remove the Pressure switch and mark the set values.

5.3 REMOVAL PROCEDURE OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the air pressure in the system before removal, referring to the pneumatic schemes.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

For FT0020043-117 and FT0054627-100

Refer to Figure 7

1. Disconnect and remove the electrical connector.
2. Remove the plug (2) from the mounting plate.
3. Unscrew the special mounting screw (3) along with the seal (4) using an appropriate tool and remove the pressure switch (1). **DISCARD** the seal (4).
4. Remove and **DISCARD** the O-ring (5).

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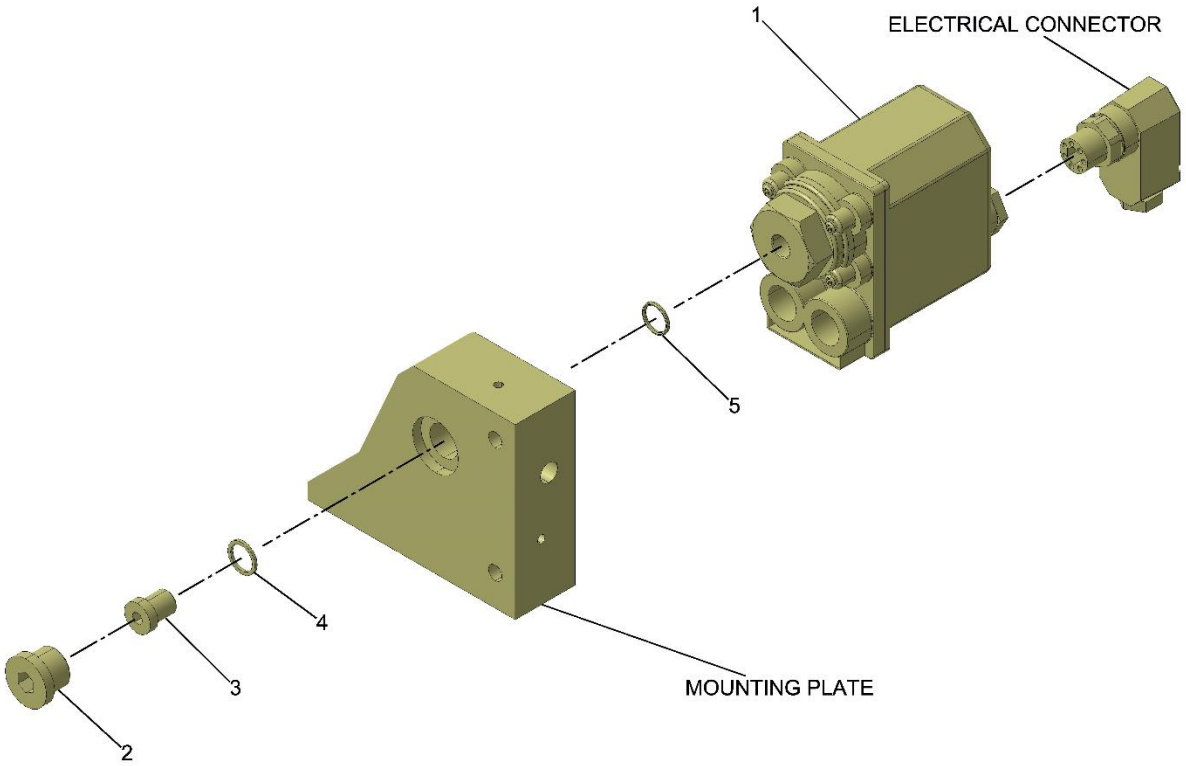

Figure 7: Pressure Switch, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PRESSURE SWITCH	Refer below table	1
2	PLUG	FT0027265-003	1
3	SPECIAL MOUNTING SCREW	1_238239	1
4	SEAL	1_513868	1
5	O RING	FT0050293-020	1

ITEM NO.	PRESSURE SWITCH P/Ns
1	FT0020043-117
1	FT0054627-100

For FT0020046-112, -118, -119, FT0054544-100 and FT0051181-114

Refer to Figure 8

1. Unscrew the screws in the DIN connector using screw driver and pull out the DIN connector.
2. Remove the plug (2) from the mounting plate.
3. Unscrew the special mounting screw (3) along with the seal (4) using an appropriate tool and remove the pressure switch (1). **DISCARD** the seal (4).
4. Remove and **DISCARD** the O-ring (5).
5. Installation Procedures of Equipment

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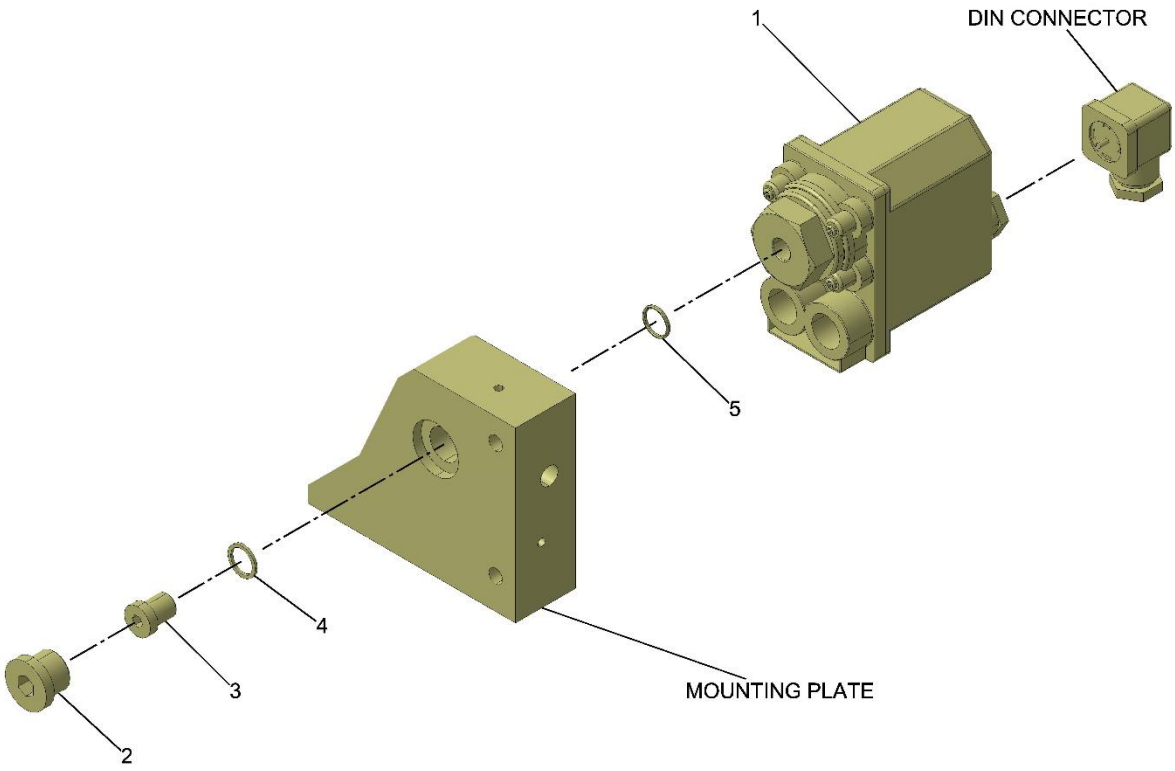

Figure 8: Pressure Switch, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PRESSURE SWITCH	Refer below table	1
2	PLUG	FT0027265-003	1
3	SPECIAL MOUNTING SCREW	1_238239	1
4	SEAL	1_513868	1
5	O RING	FT0050293-020	1

ITEM NO.	PRESSURE SWITCH P/Ns
1	FT0020046-112
1	FT0020046-118
1	FT0020046-119
1	FT0051181-114
1	FT0054544-100
1	FT0054544-101

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For FT0054544-101, -102, -103, FT0053738-100

Refer to Figure 9

1. Disconnect the electrical connection form pressure switch (1).
2. Remove the hose from tee and adaptor.
3. Unscrew and remover adaptor from pressure switch (1) using an appropriate tool and
4. Remove and **DISCARD** dowty washer from adaptor.

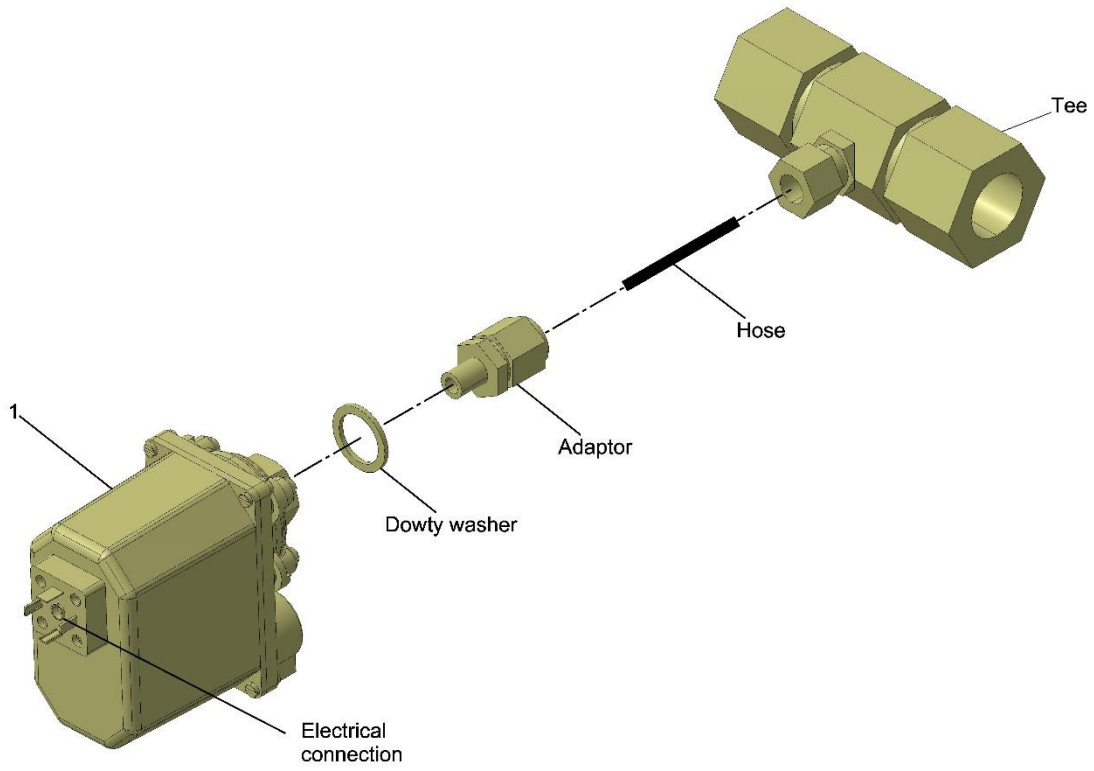

Figure 9: Pressure Switch, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PRESSURE SWITCH	Refer below table	1

ITEM NO.	PRESSURE SWITCH P/Ns
1	FT0054544-101
1	FT0054544-102
1	FT0054544-103
1	FT0053738-100

NOTE: Dowty washer is not under the scope of WABTEC.

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

For FT0020043-117 and FT0054627-100

Refer to Figure 7

1. Clean carefully the O-ring (5), the mating area on the panel and the bores.
2. Place the **NEW** seal (4) in the special mounting screw (3).
3. Smear Molykote M33 Grease on to the **NEW** O-ring (5) and install the lubricated O-ring (5) on to the mounting plate.
4. Apply Loctite 577 on the threads of the special mounting screw (3).
5. Secure the pressure switch (1) using special mounting screw (3) using an appropriate tool.
6. Secure the plug (2) on the mounting plate.
7. Connect the electrical connection.
8. Pressurize the system, check for leakages as per the system level procedure performed during car builder's general system check, switch on the electrical power and verify the correct functionality of the switch.

For FT0020046-112, -118, -119, FT0054544-100 and FT0051181-114

Refer to Figure 8

1. Clean carefully the O-ring (5), the mating area on the panel and the bores.
2. Place the **NEW** seal (4) in the special mounting screw (3).
3. Smear Molykote M33 Grease on to the **NEW** O-ring (5) and install the lubricated O-ring (5) on to the mounting plate.
4. Apply Loctite 577 on the threads of the special mounting screw (3).
5. Secure the pressure switch (1) using special mounting screw (3) using an appropriate tool.
6. Secure the plug (2) on the mounting plate.
7. Secure the screws in the DIN connector using screw driver.
8. Pressurize the system, check for leakages as per the system level procedure performed during car builder's general system check, switch on the electrical power and verify the correct functionality of the switch.

For FT0054544-101, -102, -103, FT0053738-100

Refer to Figure 9

1. Install **NEW** dowty washer on the adaptor.
2. Secure the adaptor along with dowty washer to the pressure switch (1) using an appropriate tool.
3. Connect one end of hose to the adaptor and other end to the tee.
4. Connect the electrical connections to pressure switch (1).
5. Pressurize the system, check for leakages as per the system level procedure performed during car builder's general system check, switch on the electrical power and verify the correct functionality of the switch.

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/// 6. Spare Part List

- Routine Maintenance - Not applicable
- Installation: The spare parts required for installation are:

For FT0020043-117 and FT0054627-100

Refer to Figure 7

INSTALLATION SPARE PART LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
4	SEAL	1_513868	1
5	O RING	FT0050293-020	1

For FT0020046-112, -118, -119, FT0054544-100 and FT0051181-114

Refer to Figure 8

INSTALLATION SPARE PART LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
4	SEAL	1_513868	1
5	O RING	FT0050293-020	1

NOTE:

- For FAIVELEY TRANSPORT scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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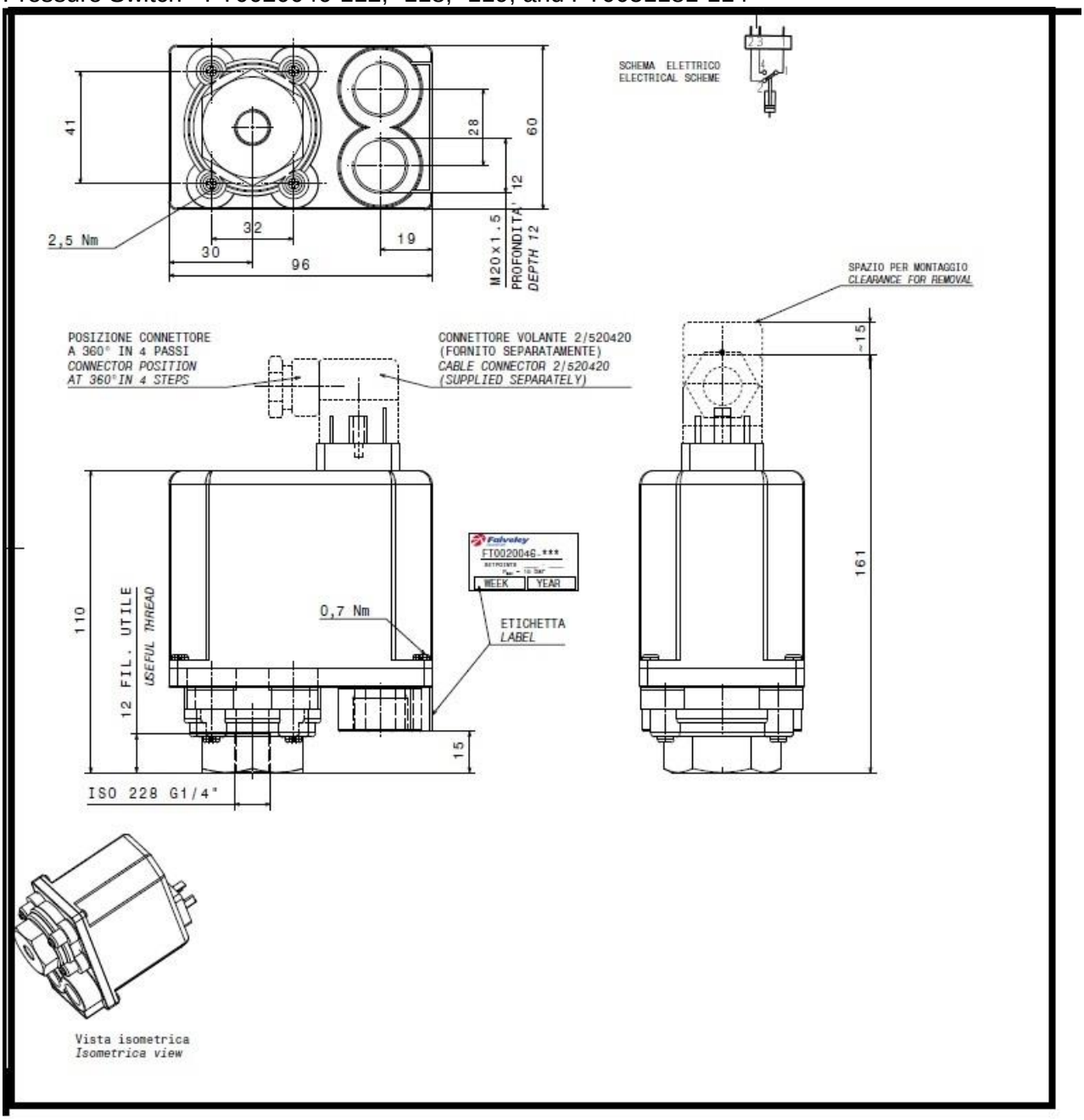
/// 8. OUTLINE DRAWING

Pressure Switch - FT0020046-112, -118, -119, and FT0051181-114



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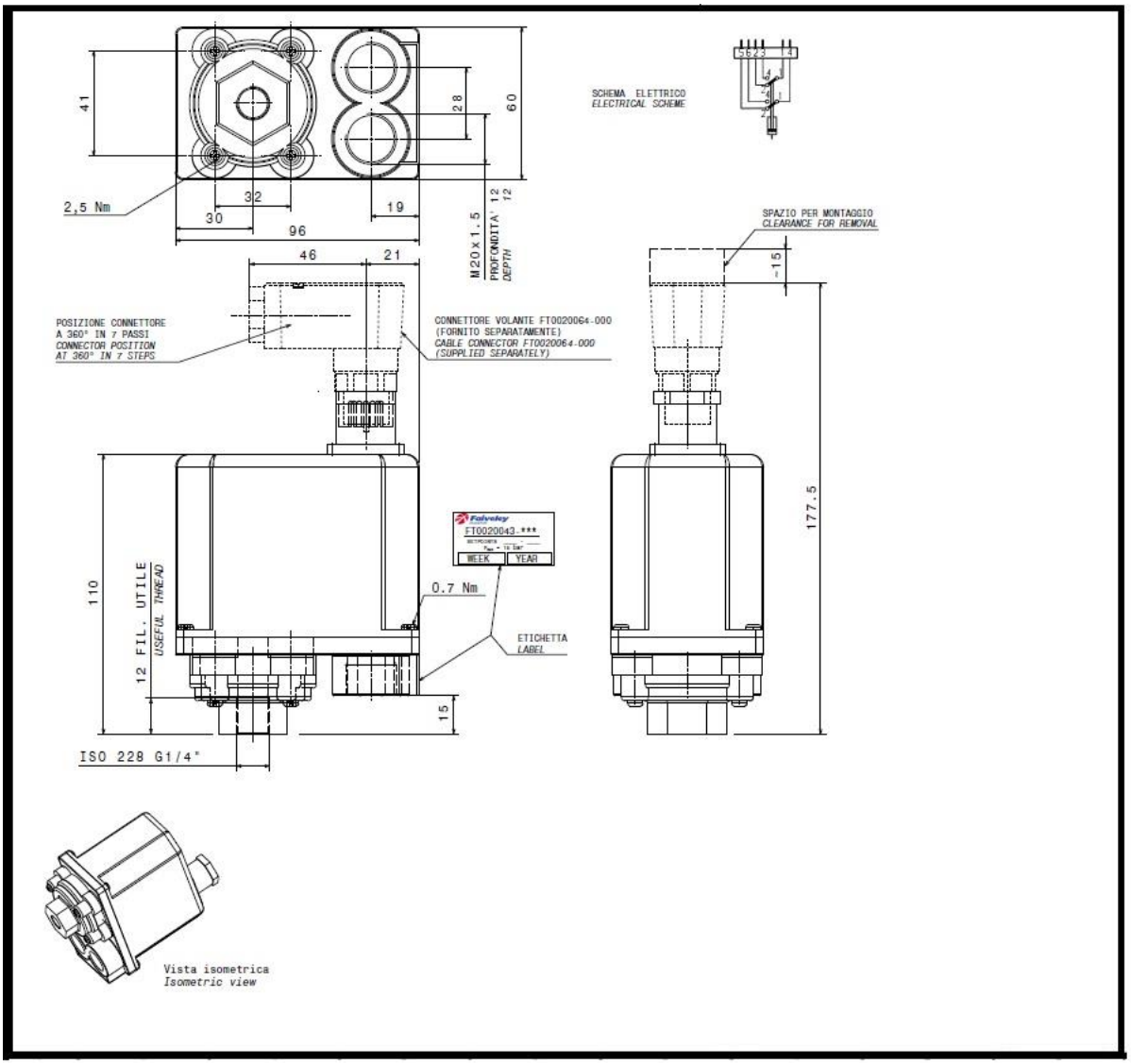
Pressure Switch - FT0020043-117 and FT0054627-100



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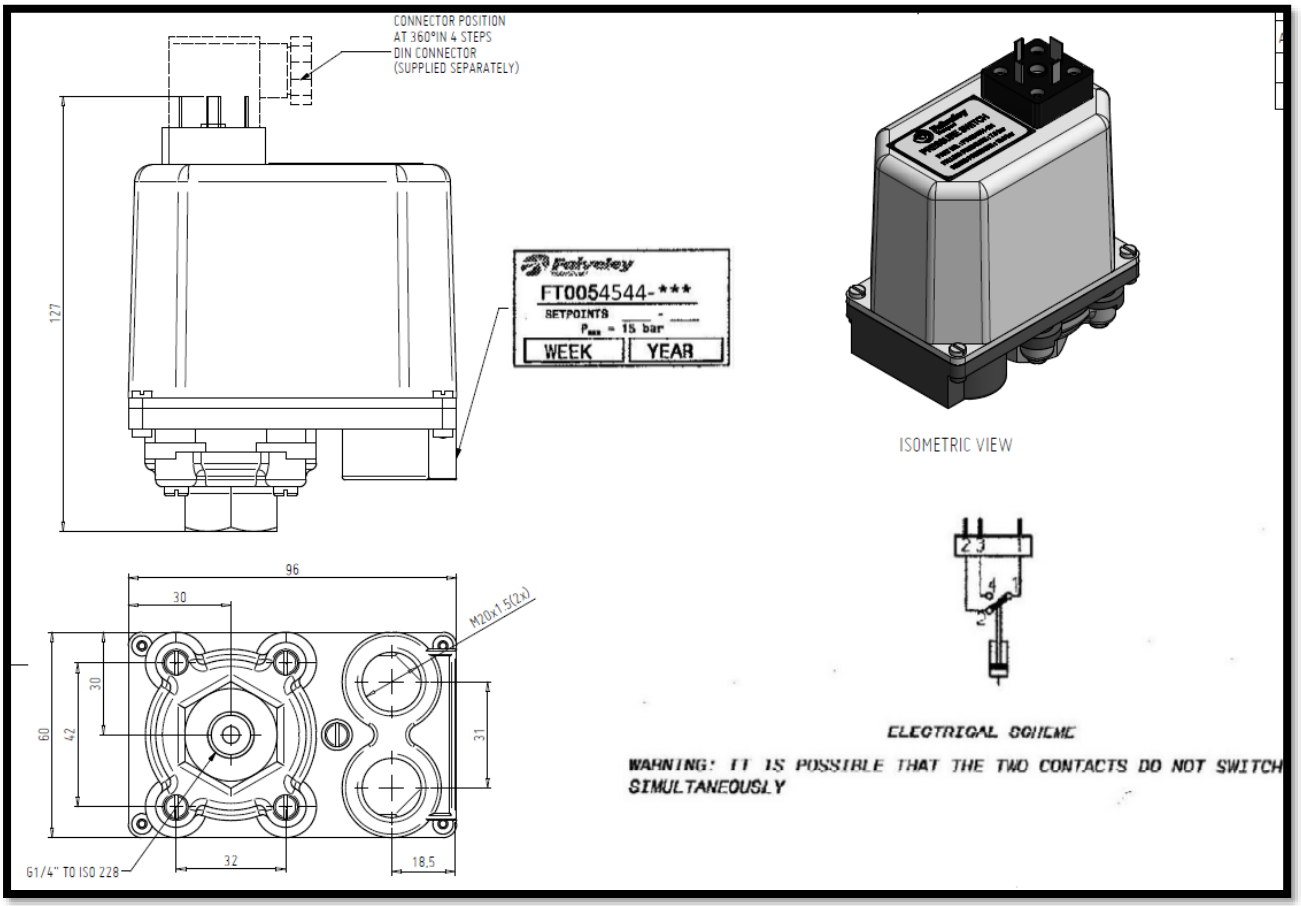
Pressure Switch - FT0054544-100, -101, -102, 103



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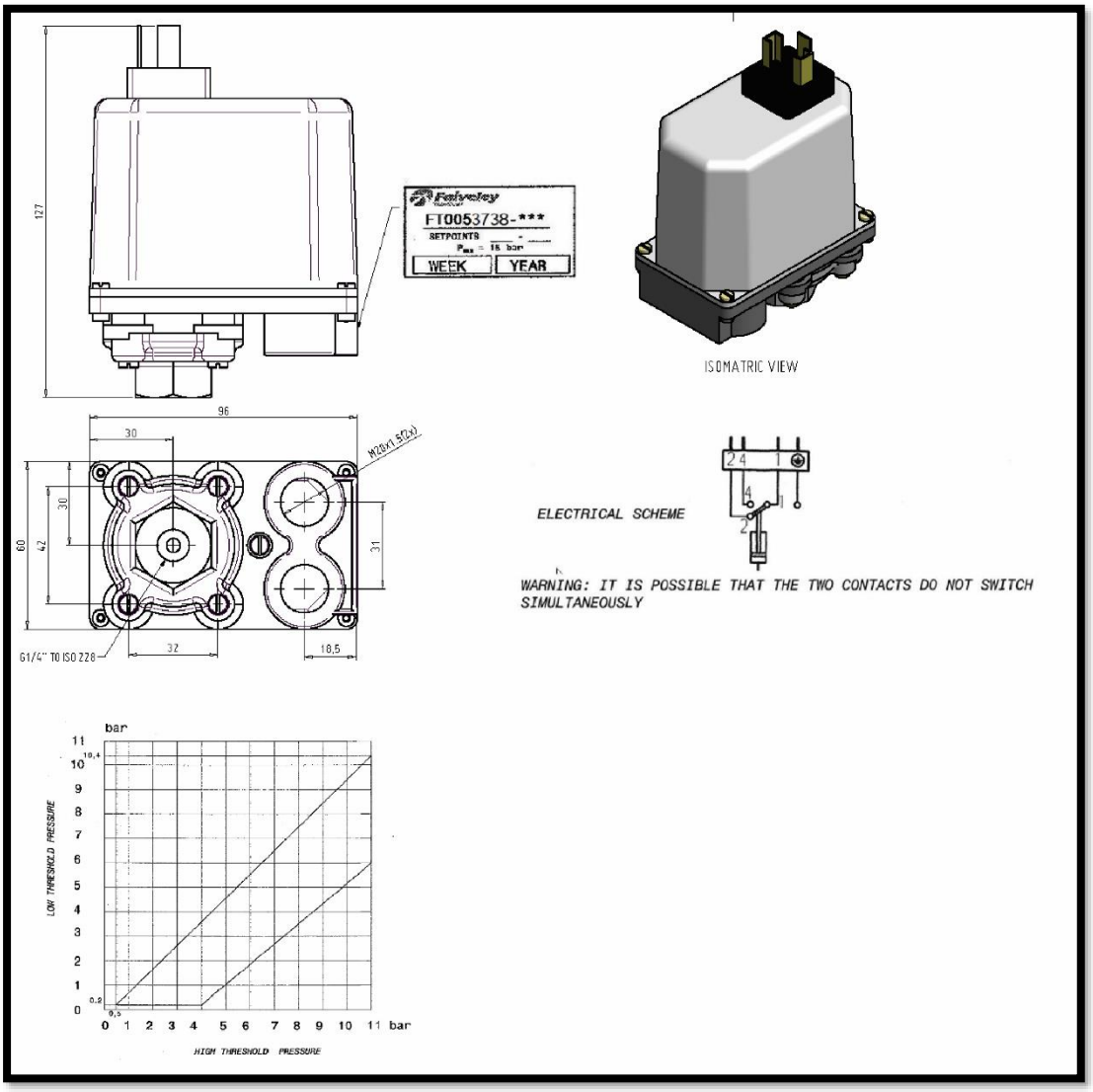
Pressure Switch - FT0053738-100



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04.01_04.02_BCE with WSP

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/// UM-457900

Brake Control Unit
BCU

Maintenance/Use manual

ECO/ECO: 20PSC0868
Compiled: **E. Bosio (Bosio Cons.)**
Checked: **claudio.murazzano**
Approved: **francesco.grilli**

Date: 03/12/2020 - Revision: A05
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
0	28/11/2005	First Issue	.	maurizio. mittino	claudio. murazzano	benedetto. francese
A	17/02/2006	Chapter 7 updated	06-1169	maurizio. mittino	claudio. murazzano	benedetto. francese
A01	07/11/2012	Chapter 3 updated	12PSC 0668	azzurra. parlato	claudio. murazzano	elisa. ruscello
A02	16/05/2013	Chapters 1 and 6 updated; chapter 11 added	12PSC 1075	E. Bosio (Bosio Cons.)	claudio. murazzano	elisa. ruscello
A03	31/10/2014	Chapter 1 updated	14PSC 0898	E. Bosio (Bosio Cons.)	claudio. murazzano	elisa. ruscello
A04	03/03/2020	General updated	20PSC 0190	E. Bosio (Bosio Cons.)	claudio. murazzano	francesco. grilli
A05	03/12/2020	Upated contamination alert	20PSC 0868	E. Bosio (Bosio Cons.)	claudio. murazzano	francesco. grilli
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/// 1. Safety precautions

In this section, the following aspects will be considered:

- Safety precautions;
- Storage conditions;
- Identification of residual risks;
- Identification of Personal Protective Equipment (PPE).

It is important to stress that even though design precautions are implemented, the respect of safety precautions, operational procedures (defined in the next sections) and the use of PPE are mandatory.

1.1 Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- FT cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.
- Place the Warning Cartel “Maintenance on going” during the maintenance activities.
- The device must be maintained when and as prescribed by FT. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorized personnel must carry out installation and maintenance.
- For maintenance activities, FT recommends using only original parts supplied by FT. This to be understood for all components and for those containing rubbers and degradable materials. Only original spare parts can be used. Product safety can only be guaranteed if genuine FT spare parts are used. Any other materials can compromise functionality and safety.

  The above considerations are valid in order to assure the results of laboratory tests and FT approval, considering both the design aspects, the production processes and materials’ supply and selection.

  FT will not be responsible for any loss of performance of the products, as well as for any damage and / or defects resulting from the use of these components, if it is not unequivocally demonstrated the exclusive use of FT original spare parts.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromate tools.
- Prior to proceeding with any operations, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Before accessing to electric parts, make sure the power is duly switched off and capacitors are discharged.
- After any maintenance operations, make sure that the component and the complete system have been restored to their original functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

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- Components must be disposed according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

1.2 Storage conditions

- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust and temperature shocks. Ambient temperature and relative humidity must be within the values prescribed inside the system maintenance manual. If no system maintenance manual is provided, the ambient temperature must be within -25°C and +50°C and the relative humidity must be within 10% and 90%.
- Take care that the packaging is protected from rodents.
- If out of their original packaging, equipment must be protected against bad weather (rain, snow, excessive humidity) and by light (UV).
- Parts must be picked off the shelf in order of time of delivery from FT (FIFO).
- Rubber parts should be protected from direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that can generate ozone, such as mercury lamps or high-voltage electrical equipment, giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapors should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- The BCU must be stored in a non-dusty environment without any of the following contaminants:
  - conductive dust,
  - fluids from any source: atmospheric phenomena, condensate dripping on the BCU, washing products, liquid dispersion from operators or passengers, etc.

  The coating of the PCBAs is uniquely designed to protect the electronics from the effect of the condensation of wet air directly on the PCBAs.

  Refer to **PD2** according to the following tables extracted from the EN 50124-01.

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Table A.4 — Definition of pollution degrees

	Dust deposit	Humidity
PD1	– no pollution – non–conductive – well protected	– dry – no condensation
PD2	– non–conductive – protected – temporary conductivity caused by condensation	– rare, short temporary condensation
PD3	– low conductivity (caused by condensation)	– frequent condensation
PD3A	– low conductivity	– damp – long time condensation
PD4	– occasionally conductive with periodic cleaning	– rain, snow, ice, fog
PD4A [a]	– occasionally conductive coming from heavy pollution	– rain, snow, ice, fog
PD4B [b]	– occasionally conductive coming from very heavy pollution	– rain, snow, ice, fog

[a] Fixed installations and track side equipment e.g. for signalling

[b] Fixed installations only

NOTE This table is cited in 4.4 and Table A.3

Table E.1 — Correlation between pollution degrees and macro-environmental conditions

	Location	Ventilation	Examples
PD1	– hermetically sealed; – inside movable equipment; – well cared–for indoor location; – location with air–conditioning.	– no ventilation; – natural ventilation; – forced ventilation with air from indoors.	– room for the signalman; – living room; office; – computer room of the signal box.
PD2	– indoor location; – limited heated location; – inside movable equipment	– natural ventilation; – forced ventilation with air from indoors.	– control cabinet in the driver cabin and the passenger compartment; – store; stairway
PD3	– indoor location; – outdoor location protected from weather conditions.	– natural ventilation; – forced ventilation with clean (filtered) air from outdoors.	– transformer station – driver cabin; – passenger compartment; – machinery compartment; – station hall.
PD3A	– indoor location; – outdoor sheltered protected from weather conditions	– forced ventilation with air from outdoors – no filters	– machinery compartment; – cable manhole; – aerial mast – inside substations – insulators in light pollution level areas [a]
PD4	– outdoor location; – underfloor of vehicle; – roof of vehicle		– pantograph, shoe gear – covered platform – insulators in medium pollution level areas [a]
PD4A	– unprotected outdoor locations		– insulators in heavy pollution level areas [a]
PD4B	– unprotected outdoor locations		– insulators in very heavy pollution level areas [a]

[a] According to IEC/TR 60815:1986.

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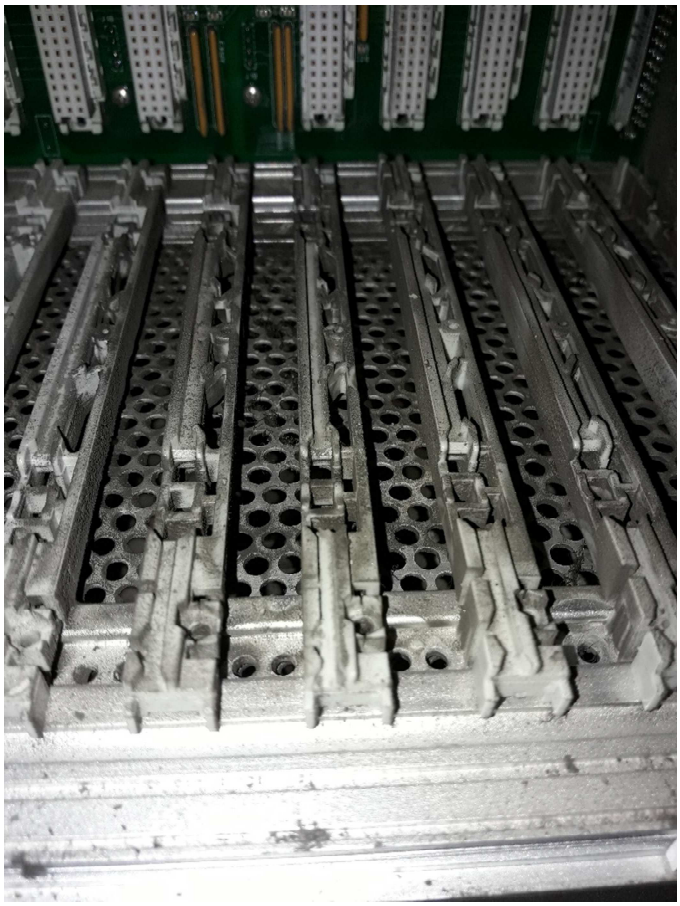
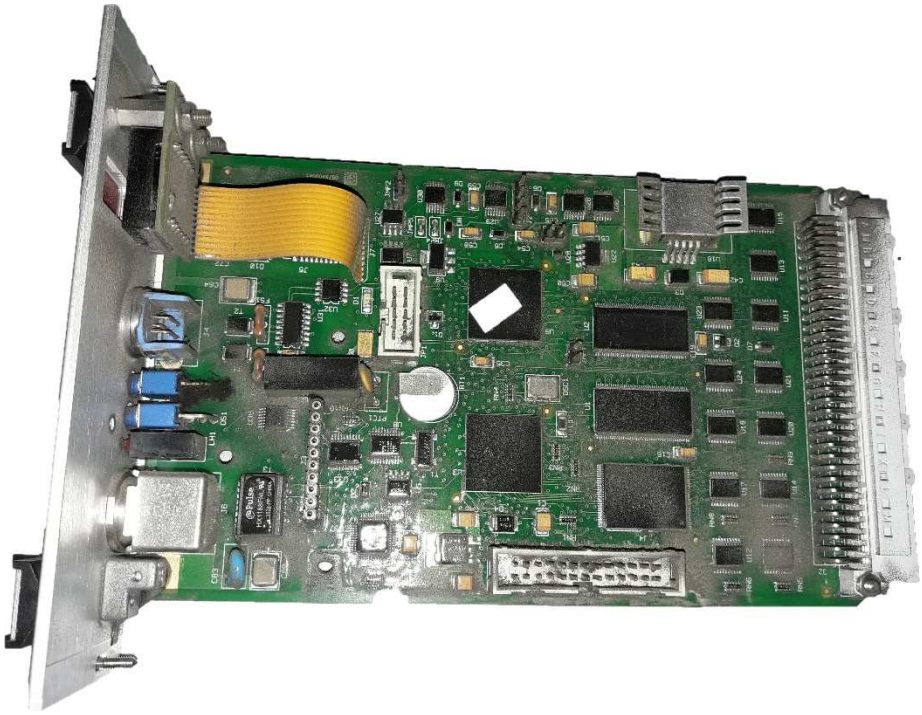
- When forced ventilation inside is used, provisions must be taken to avoid the introduction of pollution inside the BCU.

As an example, the following pictures represent an unacceptable level of dust on BCU/PCBA.





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1.3 General Prescriptions

In this paragraph, main Prescriptions are listed.
During operations description specific Prescriptions can be required.

It is recommended to perform troubleshooting activities at BCU level, due to the risk in extraction/installation and handling of the PCBA and in order to keep available the environment in which the problem occurred, which is the complete BCU.

No chemical agent to be used for in field cleaning the BCU and its cards. In case of accidental accumulation of dust, the PCBAs shall be cleaned using an antistatic brush and applying normal ESD cautions listed in this paragraph.

Severe and/or epidemic accumulation of dirty on the BCU and its cards could require specific cleaning actions, to be executed by specifically trained people in appropriate environments and to be followed by routine testing of the product and its components.

Such precautions and prescriptions are applicable also for the assistant personnel during the operations.

Pictograms	Description	Picture
	Read the BCU Manual before operations.	
	Only Personnel authorized by FT can operate on BCU and its PCBA s.	
	Electronic assemblies are ESD sensible. Observe precautions for handling and operations.	
	Switch off the BCU voltage supply line and PCBAs input supplies before operations.	
	Avoid swapping electronic PCBAs. Note: this operation not only invalids the BCU warranty, but also add a	

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Pictograms	Description	Picture
	risk of PCBA and BCU damage.	
	If two or more Operators are working together, if all of them are not referred to PE, avoid exchanging electronic assemblies (risk of ESD)	
	If two or more Operators are working together, electronic assembly can be exchanged from one Operator to another if the electronic assembly has been previously properly placed inside its ESD bag.	
	In case the BCU need to be moved from a car/place to another, it is requested to put the BCU inside a «shielding» bag before moving. Pay attention to connectors during this operation.	

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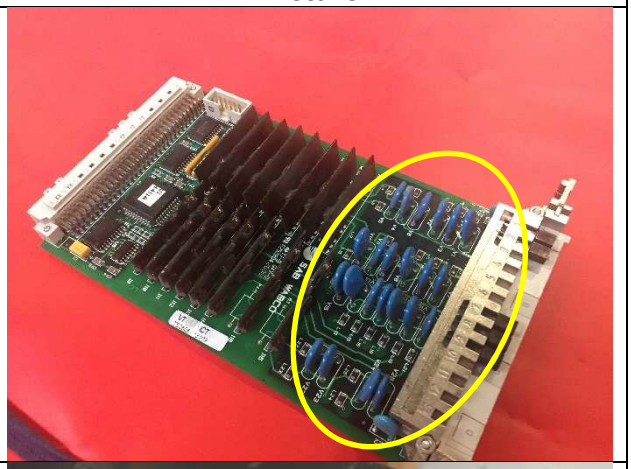
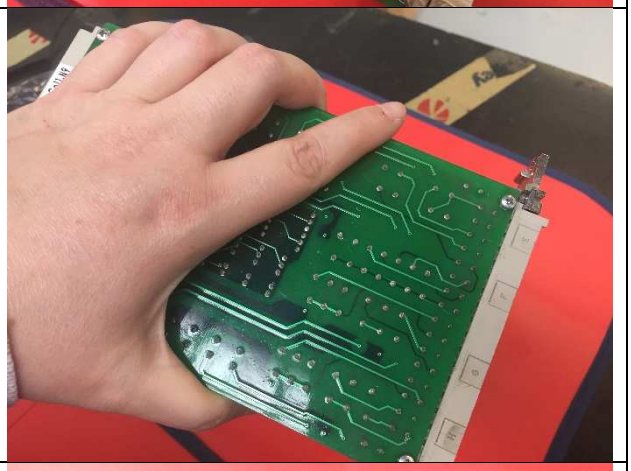
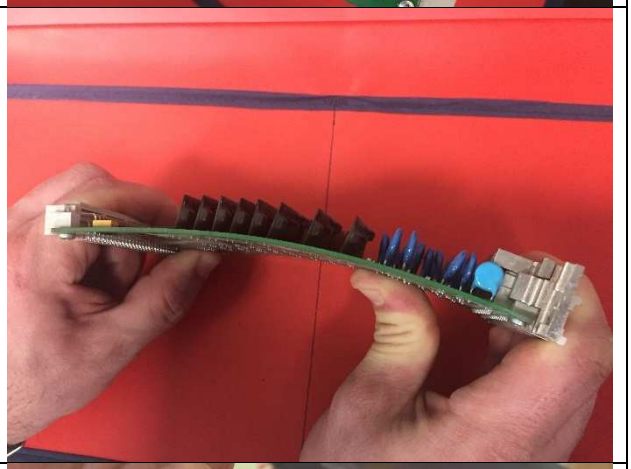
Pictograms	Description	Picture
	Do not straighten electronic components, even if you don't like their position.	
	Do not touch the surface of the PCBA, both upper side and bottom side In the picture, bottom side is shown as example.	
	Ensure the planarity of the PCBA during operations. In the picture, an example of "augmented" bending is shown. This risk is present especially when installing/removing the PCBA in/from the BCU rack.	
	Do not touch connectors' pins.	

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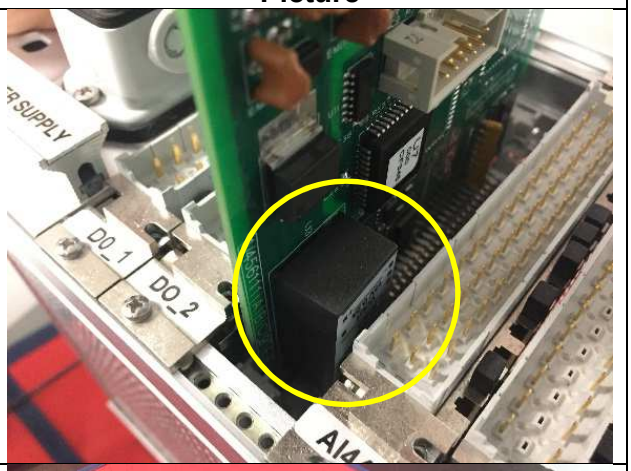
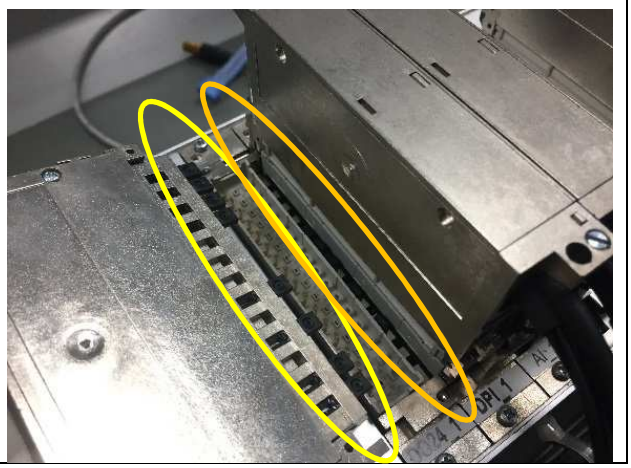
Pictograms	Description	Picture
	Ensure that during operations the PCBA and/or Operator hand does not get in contact with nearby PCBAs/parts.	
	The PCBA should be handled taking it by the PCB side or by connectors.	
	Do not apply any pressure on the PCBA during operations.	
	Before connectors' insertion, verify that code pins are coherent between flying connectors and PCBA connector.	

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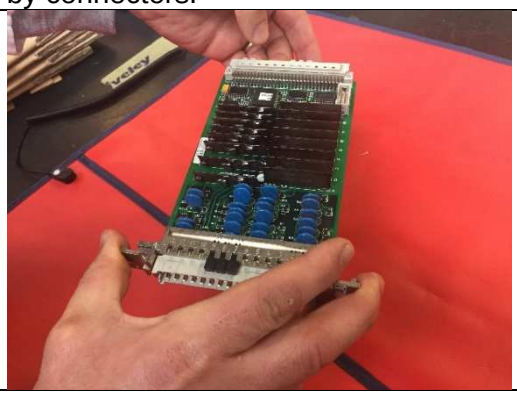
Pictograms	Description	Picture
	Before operations, ensure that the tools and equipment have been properly maintained and that calibration applicable is valid.	

Table 1-1 – General precautions

Note on PCBA handling
The PCBA should be handled taking it by the PCB side or by connectors.

CAUTION During the handling pay attention to do not touch: - Connector pins; - Components and their pins… Operator must not straighten components possibly bent.

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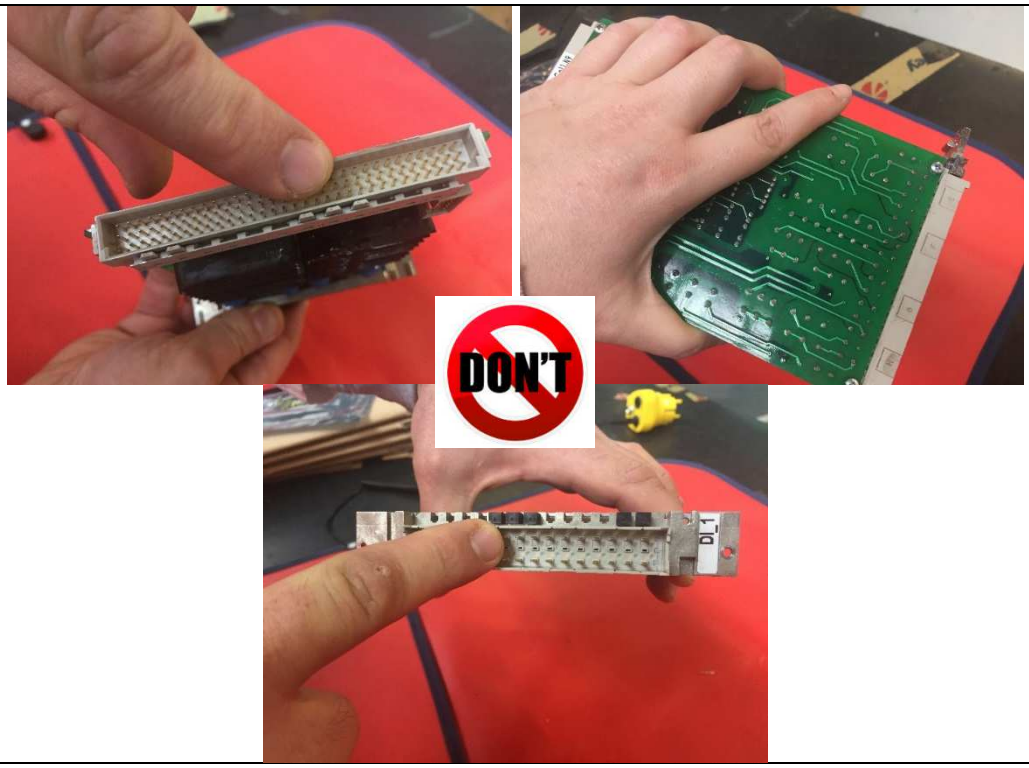

In order to avoid connector pin contamination, do not use adhesive material (such as tape) and/or styrofoam.

Table 1-2 – Common mistakes during handling

1.4 General Requirements

Electronic equipment must be handled ensuring the following conditions to minimize the risk to damage electronic assemblies are:

- Electronic assemblies must be handled in an EPA environment
- Operator must be properly trained and qualified for the operations requested and the electronic assembly handling
- Operator must wear clothes and shoes proper for the risks related to the activities
- Operator must be equipped with proper anti-static tools/equipment/garments

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When the above conditions are not guaranteed/met, the risk of electronic assemblies damage increases.
In order to limit such risk, and for process and activities involved, the following general requirements are requested.
The compliance to these requirements must be in force when performing the activities on field.

1.4.1 Authorized personnel

This document is addressed to both personnel executing activities involving electronic assemblies and personnel supporting/helping in such operations.

Only personnel trained, qualified and authorized by FT can execute activities on FT electronic assemblies Together with the necessary certifications and training foreseen for the job description, such personnel must also:

- Be trained for the execution of troubleshooting activities on the FT products/systems;
- Be trained and qualified for the execution of the operations requested and for the handling of the electronic assemblies;
- Keep accurate traceability of the activities performed and items involved, by means of dedicated checklists.

1.4.2 Tooling and Equipment

A control program for ESD tools and equipment must be established. The evidence of this control program must be recorded and archived.
It must also be provided the evidence of the management of calibration and ordinary, extraordinary, preventive maintenance with related records, owner identification, and expiration date. This is applicable to the concerned tools, equipment and material in use.

1.4.3 Warehouse Management

Components must be stocked in accordance with the prescriptions reported in the relevant Use Manuals, in their original packages and secured to avoid being hit and damaged.

1.4.4 Traceability

The operator must keep track of the BCU installed in train.
In case of BCU swapping, at least the following information must be registered:

- BCU identification
- Date and time
- Operator name
- Source TS and car, with mileage and working hours information
- Error log and event log download before the replacement
- Destination TS and car, with mileage and working hours information
- Reason of the BCU swapping
- Functional verification test of the BCU in the new location

In case of swapping of PCBA, at least the following information must be registered:

- PCBA identification
- Date and time
- Operator name
- Identification of the BCU in which the PCBA was originally installed
- Source TS and car, with mileage and working hours information
- Error log and event log download before the replacement
- Identification of the new BCU in which the PCBA is going to be installed
- Destination TS and car, with mileage and working hours information

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- Reason of the PCBA swapping
- Functional verification test of the BCU after PCBA installation

The above information must be shared with BCU manufacturer and archived for monitoring and warranty purposes.
All the BCU/ PCBA swapping information must be recorded accurately in a dedicated register with at least the above requested information.

1.4.5 Traceability Data Location

Traceability data are recorded in the BAR CODE that identifies each BCU/PCBA.

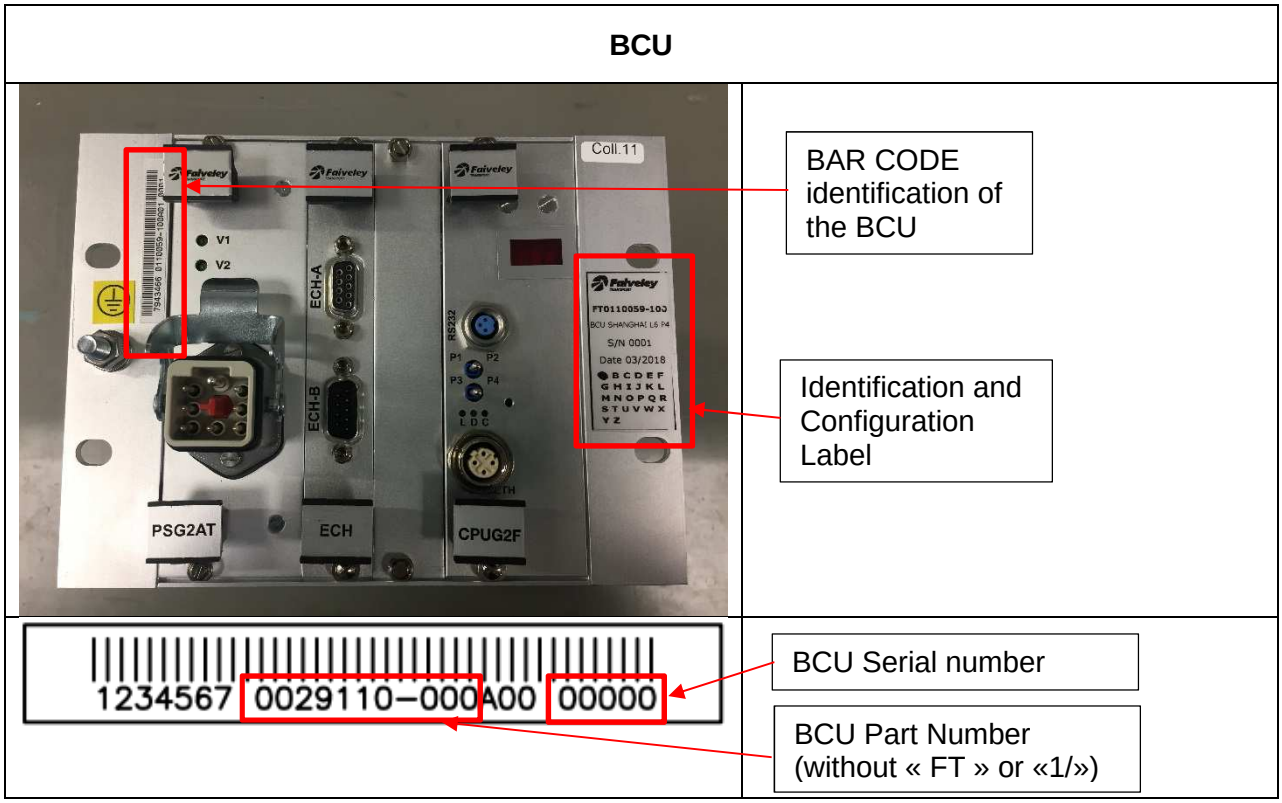

Figure 1-1 – BCU traceability data

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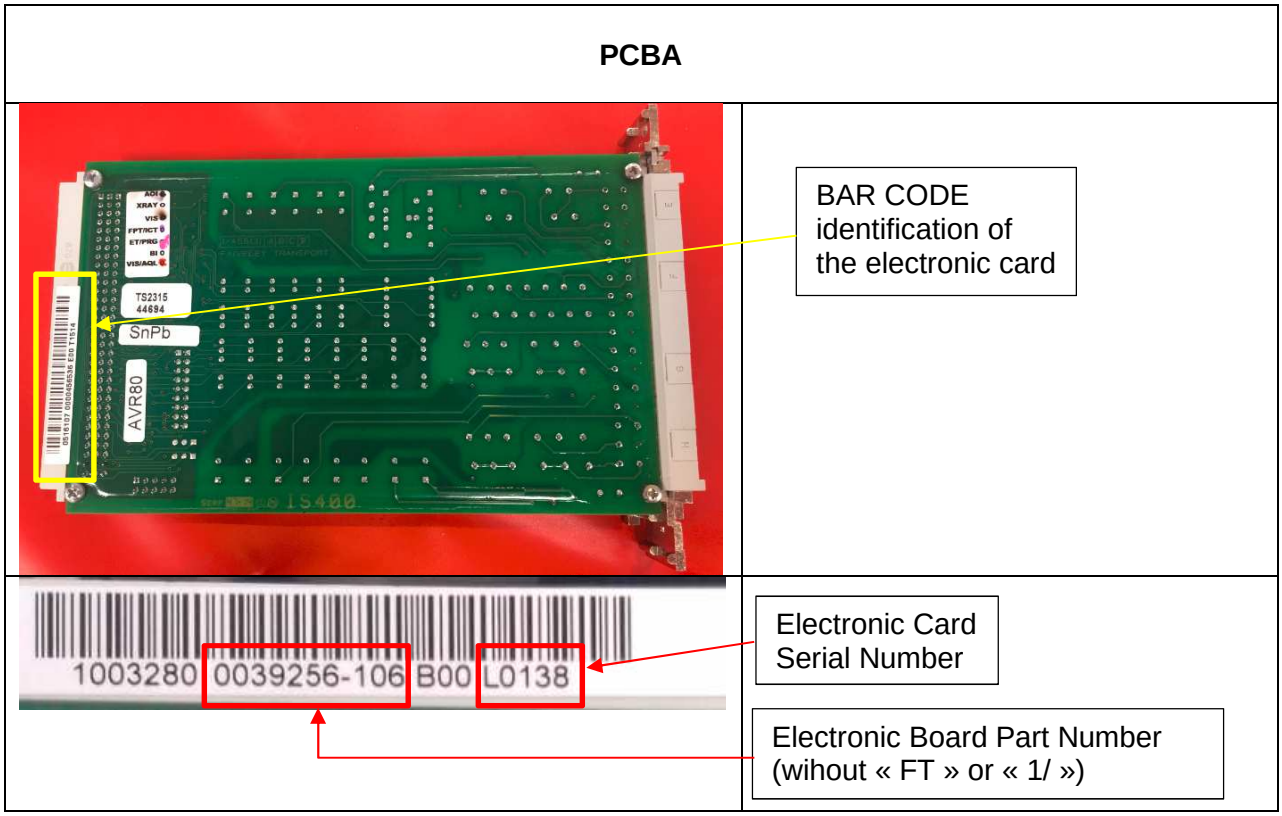

Figure 1-2 – PCBA traceability

1.4.6 Packaging and Delivery

The following general prescriptions are valid in case of delivery by air. In case of delivery by sea, please ask BCU Manufacturer for further indications.
The box under delivery should show the handling/storage indications to ensure that Logistic involved can take them into account during handling and storage phases.

Figure 1-3 - Example of Symbols for Delivery in compliance with ISO 780

1.4.7 BCU delivery

BCU should be enveloped inside ESD bubble pack and be delivered inside a box that is suited to ensure the protection of BCU and possible connectors.

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Position the BCU over anti-static bubble pack.

CAUTION:

During the operations pay attention to do not touch connector pins.

CAUTION:

While handling the BCU, pay attention to do not touch connector pins. It must be ensured that the connector hook retention is not put over the connector.

Wrap the product and seal with adhesive tape.

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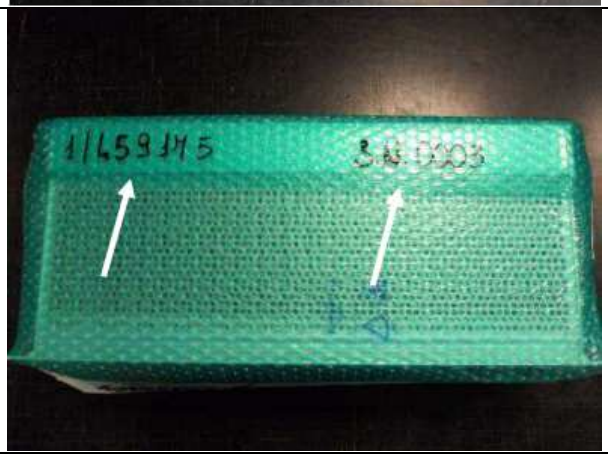
 	Wrap the product and seal with adhesive tape.
	On the protective sheet write : - Part number - Serial number - NCR reference, if any.

Table 1-3 – BCU packaging

The delivery BOX must have proper filling material to ensure content integrity during the shipment of the parts under delivery.
Foam bags are one of the possible examples of protective filling material.

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Figure 1-4 - Example of protective filling material

1.4.8 PCBAs delivery

PCBAs must be protected by environmental, motion and storage hazards. For this reason, the package should be proper to protect the parts by the concerned risks. PCBAs, when outside their BCU, must be always stocked inside an ESD bag. ESD bags allowed are the « shielding » type. Such bags are « silver » colored and have an expiration date indicated. Operator must manage the due date of the bags.

For packaging the PCBA, the Anti-Static Service Kit is needed.

The Anti-Static Service Kit consists of :

- An anti-static carpet
- An anti-static bracelet

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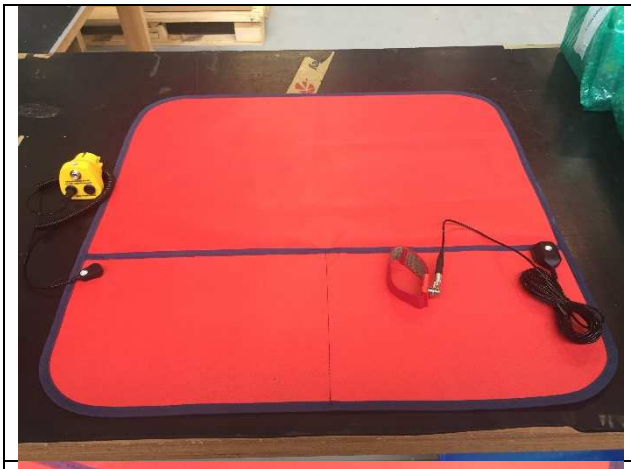	Anti-Static Kit.
	Anti-static bracelet.
	PE connection of Anti-static carpet and bracelet.
	Example of connection to PE.

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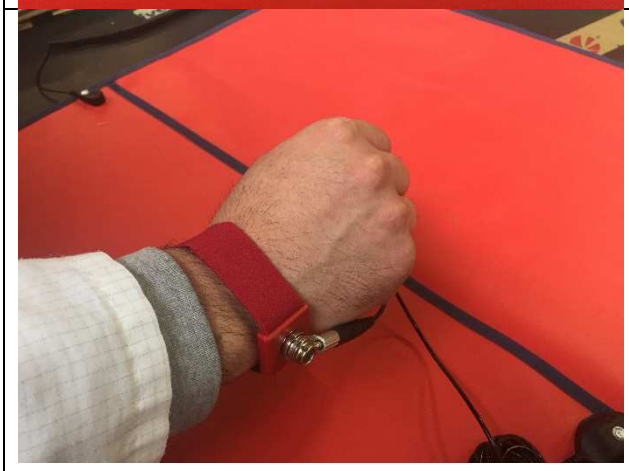
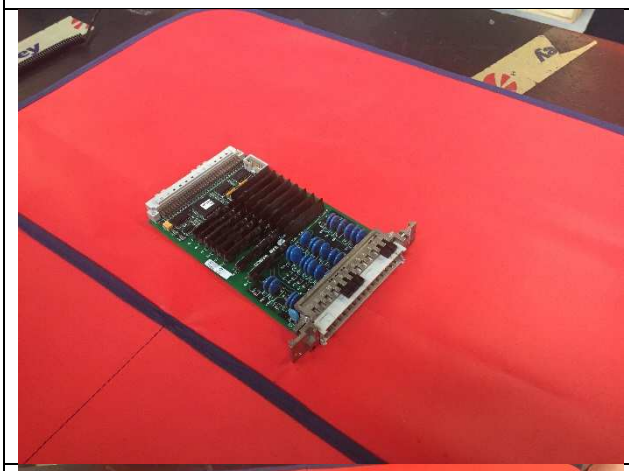
	In case it is not possible to connect the socket to PE, it is possible to connect the jack to PE.
	After the connection to PE of the Anti-Static Kit, Operator must wear the antistatic bracelet before handle PCBAs. **CAUTION:** For all the following actions, the Operator must wear the anti-static bracelet.
	With anti-static bracelet on, the Operator can take the PCBA and place it on the anti-static carpet.
	Put the PCBA inside the shielding bag.

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	Bend the exceeding part of the ESD bag.
	Use anti-static bubble pack.

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	Pack the antistatic bag with the antistatic bubble pack. **CAUTION:** Do not apply pressure on the PCBA.
	CAUTION: *Do not apply pressure on the PCBA.*
	Fix the anti-static bubble pack with FT tape. **CAUTION:** Do not apply pressure on the PCBA.

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	Fix the anti-static bubble pack with tape. **CAUTION:** Do not apply pressure on the PCBA.
	Put the package inside a box of the proper size. **CAUTION:** Do not apply pressure on the PCBA.
	Close the box, writing on it the following information: - Part number - Serial number - NCR reference, if any.

Table 1-4 – Individual PCBA packaging

The PCBAs, packed as above, must be placed inside a delivery BOX with the proper size depending on the amount them to be delivered. The delivery BOX must have proper filling material to ensure the integrity during the shipment of the parts under delivery.
Foam bags are one of the possible examples of protective filling material.

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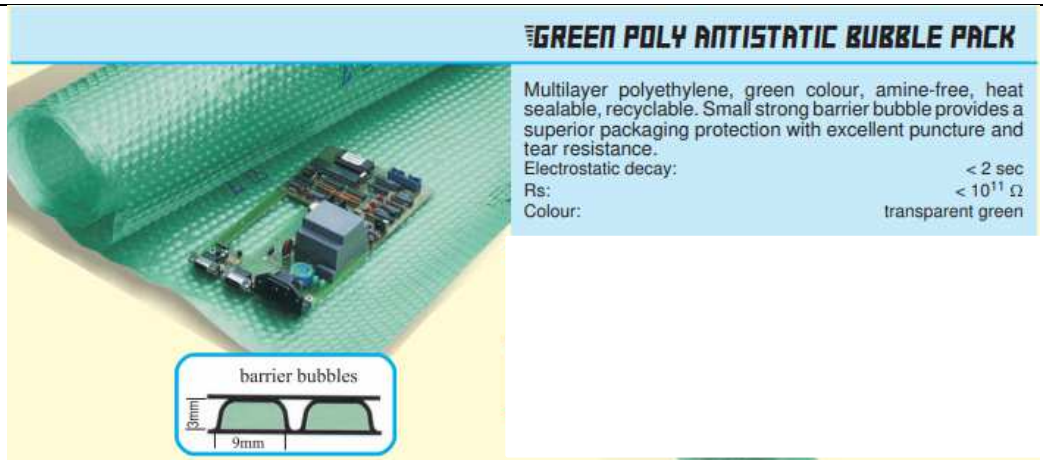
Figure 1-5 - Example of protective filling material

1.4.9 Examples of anti-static materials

§ IEC 61340

Anti-static bubble pack	

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Shielding bags	 Shielding bags are available in different sizes, in order to contain the single PCBA or the complete BCU. It is suggested to procure bags for both the single PCBA and the BCU, in order to have them available in case of need.
Portable Anti-Static Kit	The Portable Field Service Kit protects installed electronic components from static damage as a result of normal handling during field maintenance and repair. It has two pockets and one 10mm press stud for Wrist-strap and Grounding cord connection. - 3 Layer Mat RED/BLACK color, 600x600mm dim. - Surface resistance Rs < 10^9Ω - Point to ground resistance Rg < 10^9Ω - 1 adjustable wrist strap + 1 grounding cord 3m length
Protective clothing / T-shirts	

Table 1-5 - Proposed anti-static materials

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1.4.10 On field activities

It is recommended to perform troubleshooting activities at BCU level, due to the risk in extraction/installation and handling of the PCBA and in order to keep available the environment in which the problem occurred, which is the complete BCU.

In case of lack of BCU warranty stock, every time activities at PCBA level are requested it is mandatory to record all traceability information of the PCBAs involved, all the operations executed with such PCBAs and related accurate description.

Such precautions and prescriptions are applicable also for the assistant personnel during the operations (§ 1.3).

The Operator must be equipped with equipment, clothing and shoes proper for the activities foreseen and related risks (including ESD).
In case PCBA handling and/or BCU transferring/deposition, the following materials must be available during operations :

- Anti Static KIT
- «Shielding» bag of the proper size, for both PCBA and BCU

In the following paragraphs, minimum precautions during removal/installation of BCU/PCBAs on field are listed.

1.5 Identification of residual risks

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off and capacitors are discharged.

1.6 Identification of PPE

When performing any maintenance operation on the BCU on the rack, it is mandatory the use of the following PPE:

- Antistatic/ESD shoes;
- Antistatic/ESD gloves;
- Antistatic wrist straps.

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1.7 **Acronyms**

BOM	Bill Of Materials
EMI	Electro-Magnetic Interface
EN	European Norm
EPA	Electrostatic-Protected Area
ESD	Electrostatic Discharge
BCU	Friction Brake Electronic Control Unit
FT	Faiveley Transport
IEC	International Electrotechnical Commission
INT	Intermediate (skill level)
ISO	International Organization for Standardization
LACMTA	Los Angeles County Metropolitan Transportation Authority
LRV	Light Rail Vehicle
PC	Personal Computer
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembled
PE	Potential Earth
PPE	Personal Protective Equipment
TDE	Technical Description
TS	Train Set
UV	Ultraviolet
WSP	Wheel Slide Protection

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/// 2. Description of equipment

The BCU is used to control the brakes and provide WSP control for complete trains, individual cars or individual bogies.

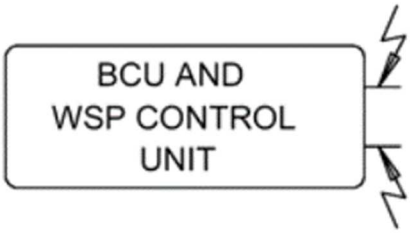

Figure 6: ISO symbol

/// 3. Main features and data

- Operating temperature:

External	Internal Cubicle	Air surrounding PCBAs	according to EN50155: 2007-07 art. 2.1.2 Tab.: 1
-25 ÷ 45 °C	-25 ÷ 70 °C (*)	-25 ÷ 85 °C	Class T3
-40 ÷ 50 °C	-40 ÷ 70 °C (*)	-40 ÷ 85 °C	Class TX

(*) **Important note**! The temperature influences reliability. Higher temperature means lower reliability.

(*) **Important note**! The Internal Cubicle temperature has to be ensured by the train manufacturer.

- Relative humidity:..... 75% mean (according to EN50155: 2007-07 art. 2.1.4)
  95% for 30 days in the year continuously
- Mass: ..... 3.2 kg (short rack)
  7 kg (standard/long rack)
- Power supply: ..... 24 to 110 Vdc nominal (according to EN50155: 2007-07 art. 3.1.1)
- IP protection degree:..... IP20 according to EN 60529
- This device is available with many configurations. Hereafter is reported the standard BCU configuration according to system applications. For further information refer to the specific documentation.
  - Electropneumatic Application (direct brake valve control)
    Direct Brake Valve control is commonly used on EMU/DMU and Electropneumatic Mass Transit application. One Electronic Brake Control Unit is normally used to control one bogie or one car. The main system characteristics are:
    - PWM train wire brake command;
    - pressure regulated using charge/discharge on-off valves;
    - electric brake blending controlled by Brake Control Unit;
    - brake force blending & sharing using a dedicated communication network;
    - independent control unit for WSP system including a specific set of PCBAs;
    - Vehicle Logic interface via communication network or train wires;
    - Monitoring of the pure pneumatic back-up system (via auxiliary brake pipe).

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- Electropneumatic Application (driver's brake valve control)

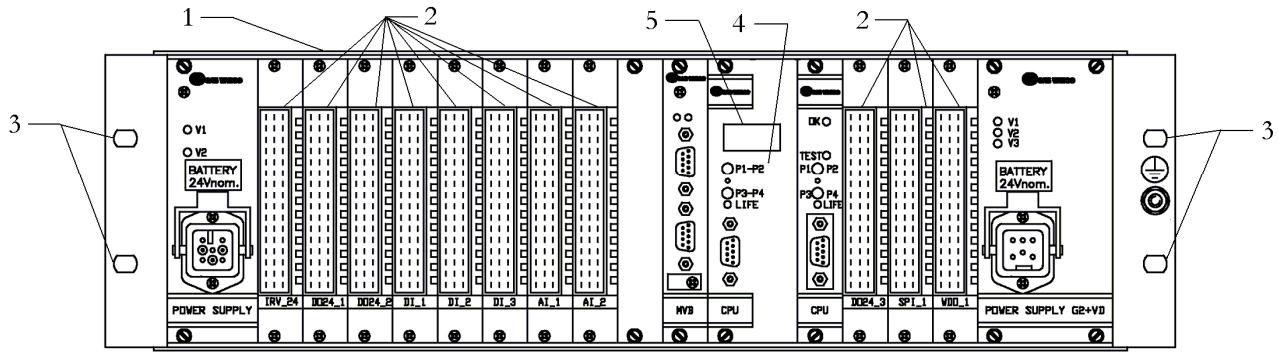
  Driver's Brake Valve control is commonly used on Loco brake control and on EMU/DMU using brake pipe system for service brake. One Electronic Brake Control Unit is normally used to control the loco or each EMU/DMU car. The main system characteristics are:
  - PWM brake controller command;
  - main pipe pressure regulated using charge/discharge on-off valves;
  - electric brake blending controlled by Brake Control Unit;
  - independent control unit for WSP system including a specific set of PCBAs;
  - Vehicle Logic interface via "communication bus" or "wires connection";
  - pure pneumatic back-up brake pipe pressure control system or alternative redundant electronic control.
- Hydraulic applications

  Hydraulic brake system is commonly used on LRV and Tram applications.

  The main system characteristics are:
  - digital or PWM brake controller command;
  - hydraulic analogue valve brake control;
  - electric blending controlled by Brake Control Unit;
  - software WSP module;
  - vehicle logic interface via communication network or train wires.

/// 4. Description of Function/Operation

Refer to Figure 7.



1	Rack	4	Push-button
2	PCBA	5	Display
3	Fixing Points		

Figure 7: functional scheme

The GEMINI 2 control unit is typically composed by a sub-rack (1) with a motherboard mounted on the back side and a set of plug-in cards (2) that can be inserted and extracted without dismounting the rack.

The unit is packed in a standard 19" sub-rack containing Europe1-type PCBAs (100 mm x 160 mm).

The sub-rack width is standard (19" / 84 TEs). The physical dimensions are provided by the specification.

The sub-rack can be fitted with handles. Fixation points (3) allow to install it into the supporting structure.

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In most cases, the front panel of the CPU contains a four-digit alphanumeric display (5) for the local indication of errors. The errors buffer can be browsed and reset using pushbuttons (4).

The display unit contains also the RS-232 connector for connection to the portable terminal.

The remote access to the GEMINI 2 control unit is provided for:

- Internal parameters verification and modification;
- Diagnostic data and fault table downloading
- Service and maintenance
- System set-up and tuning during installation.

Some actions can be limited to authorized personnel only.

A monitoring software program is available as an option for easy access to the internal data via portable computer. The operator interface allows both graphic and alphanumeric interaction with the system; the content is customized according to the application. With this tool, the operator can visualize the full range of brake system data, i.e. input and output status, brake control and WSP behavior, pressure values, weight and traction interface data.

The PCBAs with external connections (digital input/output, communication, analogue input/output) are provided with built-in protection and filtering devices for interfacing the signal and power lines from the vehicle electrical installation.

Each PCBA is provided with one connector on the backside to interface the motherboard, plus one or more front connectors to interface the vehicle electrical installation according with the application requirements. All connectors are fitted with a unique pattern of insertion keys that prevents a PCBA to be inserted in the wrong bus position and a mating connector to be interfaced with the wrong PCBA.

All interface plug-in units are connected to the motherboard. This PCBA is the support for the interconnecting bus signals and the power supply lines that are distributed to the plug-in units. It is mounted on the backside of the sub-rack.

The system is divided into several voltage areas identified as ground, battery, peripherals and logics. The voltage areas are galvanically insulated from each other.

This insulation is designed with particular care for avoiding interferences and propagation of electrical noise.

The design allows the BCU equipment to meet the mutual insulation, electromagnetic compatibility and personnel safety requirements of the applicable normative and to control the propagation of damages induced by external faults.

Input and output signals, connecting the BCU to other equipment, are protected by filtering stages for immunity against over-voltages, surges, transients and radio-frequency interference and for avoiding the propagation (emission) of electrical noise in the outside environment.

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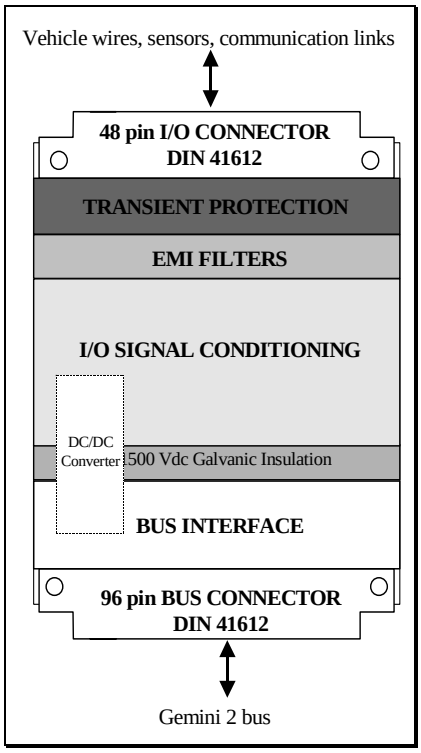

Figure 8: Plug-in internal structure

4.1 Functioning

Note. Below are listed all the standard functions. Depending on specific application, some of them may be not implemented

BCU functions:

1. Brake Application Control

   The BCU generates the brake application command taking into consideration the characteristics of the traction motors, the vehicle parameters, the braking mode, the system availability, etc.

   The required operating mode is implemented by the application software as a state machine. The program recognises the operating state from the states of the input signals received from the vehicle and traction logic and from the brake system.

   In each state the BCU performs a set of actions defined by the system requirements. Transitions to different states are driven by the same set of signals: when the transition is not acceptable the program moves to the relevant error state where all the necessary countermeasures are taken, and error messages are generated and distributed.

   Braking modes:

   - *Blending.* The BCU can implement two approaches for dynamic brake blending: Programmed Blend and Continuous Blend.
   - *Cross-Blending.* It is an extension of the blending approach described above: whenever the motor bogies dynamic brakes are not providing their maximum effort during service braking, part of the trailer bogies' friction braking effort can be allocated to the dynamic braking of the motor bogies.

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- *Load Compensation.* The load compensation function aims at regulating the braking effort as a function of the vehicle load to obtain a resulting deceleration repeatable over the full range of passenger loads.

  The load compensation is implemented by a closed loop reaction of a pressure signal that is function of the vehicle load.

  The BCU can read an analogue signal generated by a pressure transducer. The value is then processed by the BCU to regulate the brake application force for a retardation independent by the vehicle load for service and emergency braking.

  In case of security braking the BCU does not intervene with this function.

2. Wheel Slide Protection - WSP

   Wheel Slide Protection is a technology dependent function because the standard requirements and the brake system characteristics are related to actuator types, reaction times, mechanical dimensions, braking efforts and safety conditions.

   GEMINI 2 manages the complete WSP system as a ”stand-alone” system as well as in conjunction with a brake control system.

3. Train Bus Interface

   Some common bus solutions for fast a reliable information exchange are:

   - RS232
   - RS485
   - C.A.N. (Computer Area Network) ISO/DIS 11898 standard
   - MVB/WTB (Multi Vehicle Bus/Wire Train Bus) TCN 9 332 (IEC 1375 project) standard
   - LON Echelon distributed Local Operating Network

4. Air conditioning control

   The *GEMINI 2* process unit has the computing power needed for complex temperature control functions. In addition to standard hardware interfaces, this system is able to manage typical air conditioning sub systems as air compressors, heat control devices, temperature sensors and set points.

   The requests imposed by the set-points are compared with the data coming from the sensors in order to drive temperature control devices taking into account system behaviours and ambient characteristics. Using the local bus for sensor data collection and remote heat actuators is an alternative to classic distributed wired system.

5. Power converters control

   The GEMINI 2 platform can be used as supervisor of the power generation system. This mixed hardware/software architecture applied to high-power electronic components system provides such advantages as:

   - Real time check-up
   - Preventive maintenance
   - Fault storage
   - Maintenance assistance
   - Monitoring
   - Diagnostic interfacing
   - Remote control.

6. System Monitoring

   - Diagnostics

     The equipment is fitted with a built-in power-on self-test (POST) routine.

     All identified malfunctions are displayed and stored into non-volatile memory and the relative fault signals are issued.

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Routine execution is started manually or triggered by the system conditions. Additional diagnostic routines are continuously executed by the system during its operation in order to promptly detect any hardware and/or software fault.

Malfunctions are classified as major faults and minor faults.

Typically, in case of a major fault, brake control is disabled and the vehicle is not allowed to restart; a minor fault signal, instead, does not prevent vehicle operation.

The definitions of the contents of the two categories is project dependent and is defined at system design time.

- Long Term Error Storage

  Hardware and software error information and ancillary data is stored into non-volatile memory. Data are then accessible through a display located on the rack front panel and through the portable terminal via serial link. The operator can browse the error list and delete errors that have been corrected.

4.2 Open Architecture

Refer to Figure 4.

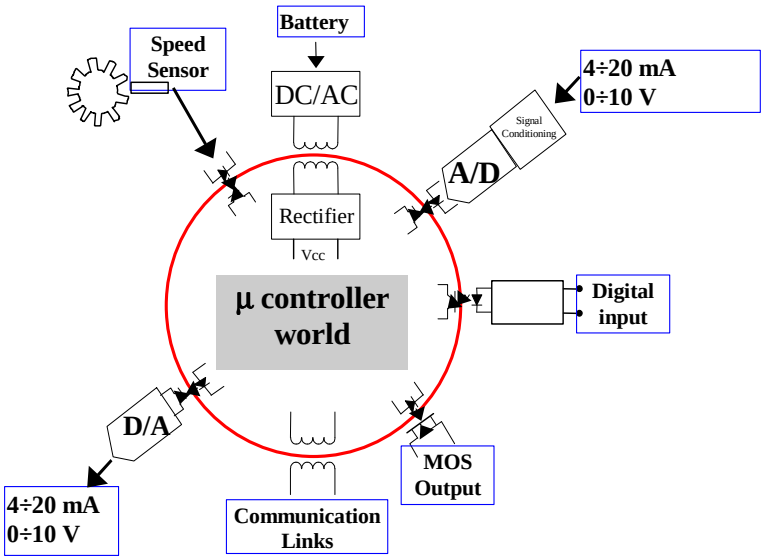

Figure 9: Gemini 2 interfaces structure

The system is designed to optimise the functional allocation, the intrinsic safety provision and the self-diagnostic functions.

This target is met by:

- allocating all the system resources (e.g. RAM, ROM, E²PROM memories, watchdog functions) in a single plug-in unit;
- using galvanically isolated power supplies for the different functions of the CPU plug-in unit (e.g. digital section, analogue input/output);
- isolating galvanically the different functions of the equipment;
- using “wide-range” digital interfaces able to be connected to all types of battery voltage (from 24 to 110 Vdc nom) without any plug-in adapting.
- using HYBRID and SMD technologies for production quality and reliability increasing and delivery time decreasing.
- interconnecting the plug-in units through a fast bus;

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- adding a filtering stages to each external interface to minimise the external electromagnetic interference and improve the signal-noise ratio;
- providing a hardware section with software support continuously checking the behaviour of the CPU and generating a correct operation status signal.

4.3 **Software**

The software structure is based on *GEMINI 2*, a generic platform for railway application control units.

The “modular” approach in the *GEMINI 2* structure gives the opportunity to use this platform for:

- electropneumatic brake systems;
- electrohydraulic brake systems;
- electromechanical brake systems;
- vehicle diagnostic and logic systems;
- WSP systems;
- conditioning systems;
- single/multi voltage power supply (25÷65 kW).

The architecture of the system allows configurations with redundant units when the system requirements ask for equipment failure tolerance.

When used as a vehicle control unit, the platform generates a set of commands transformed into mechanical brake application in the hydraulic, electromechanical or pneumatic power unit and actuators.

4.4 **Standard Software**

The standard software is classified in three major groups

1. System Software: it is composed by two modules.
   - Operating System: it is a certified module common to all the applications based on the GEMINI 2 product range. It is a real time executive program that executes the application software.
   - Monitoring Module: it provides all the utilities necessary to the man-machine interface with portable terminals used during the vehicle commissioning and during troubleshooting by maintenance operators.
2. Standard Software: it comprises all the modules that do not require any specific adaptation to the vehicle characteristics or customer requests. The software is developed together with the associated hardware product. The module is tested when installed for the first time, then the test results are documented and proposed for the other installations and “standardisation”.
3. Application Software: it is generated to answer the customer requirements.

The BCU is provided with Software Protection systems:

a) Voltage supervisor: checks the logic power supply in order to start the CPU operations, at the power up time, only when the logic power results to be stable and to stop the CPU operations when logic power supply goes out of minimum correct values.

b) Watchdog circuit: a software independent timer able to put the micro-controller into an "unconditional exception" status. This timer has to be refreshed by software in order to prevent the "unconditional jump" to this status. That is to avoid, due to hardware/software problems:
   - the execution of software instructions out of operating system supervision;
   - the execution of software instructions out of the assigned memory space;
   - the execution of infinite loop software instructions.

   According to the application software, the unconditional "watchdog exception" status could be managed by a dedicated software diagnostic code.

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c) LIFE circuit: it is a software independent timer able to:
   - put the control unit bus in the idle status;
   - put, where it is applicable, the output drivers into a fixed condition (normally open). Standard output PCBAs, by using of LIFE bus signal, have a dedicated circuit for outputs de-activation.

   As for watchdog circuit, the life timer has to be refreshed by software in order to prevent the above conditions. That is to prevent, due to hardware/software problems, the interface PCBAs latching to an unpredicted status.

d) Task time monitoring: Standard Operating System is able to count the CPU time of each scheduled task. In case of total time exceeds the predicted (as fixed internal constant) value an internal "exception" put the software into an unconditional status. According to the application software, the unconditional "task overtime exception" status could be managed by a dedicated software diagnostic code.

e) Memory integrity monitoring: some memory check is available as:
   - program memory integrity: by checksum at software download time;
   - parameter database integrity: by checksum at parameter download time;
   - Bus Integrity: by PCBA code check at bootstrap time.

4.5 Environmental requirement

The BCU must be installed in a non-dusty environment without any of the following contaminants:

- **conductive dust,**
- **fluids from any source: atmospheric phenomena, condensate dripping on the BCU, washing products, liquid dispersion from operators or passengers, etc.**

The coating of the PCBAs is uniquely designed to protect the electronics from the effect of the condensation of wet air directly on the PCBAs.

Refer to PD2 according to the following tables extracted from the EN 50124-01.

Table A.4 — Definition of pollution degrees

	Dust deposit	Humidity
PD1	– no pollution – non–conductive – well protected	– dry – no condensation
PD2	– non–conductive – protected – temporary conductivity caused by condensation	– rare, short temporary condensation
PD3	– low conductivity (caused by condensation)	– frequent condensation
PD3A	– low conductivity	– damp – long time condensation
PD4	– occasionally conductive with periodic cleaning	– rain, snow, ice, fog
PD4A [a]	– occasionally conductive coming from heavy pollution	– rain, snow, ice, fog
PD4B [b]	– occasionally conductive coming from very heavy pollution	– rain, snow, ice, fog

[a] Fixed installations and track side equipment e.g. for signalling

[b] Fixed installations only

NOTE This table is cited in 4.4 and Table A.3

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Table E.1 — Correlation between pollution degrees and macro-environmental conditions

	Location	Ventilation	Examples
PD1	– hermetically sealed; – inside movable equipment; – well cared–for indoor location; – location with air–conditioning	– no ventilation; – natural ventilation; – forced ventilation with air from indoors.	– room for the signalman; – living room; office; – computer room of the signal box.
PD2	– indoor location; – limited heated location; – inside movable equipment	– natural ventilation; – forced ventilation with air from indoors.	– control cabinet in the driver cabin and the passenger compartment; – store; stairway
PD3	– indoor location; – outdoor location protected from weather conditions.	– natural ventilation; – forced ventilation with clean (filtered) air from outdoors.	– transformer station – driver cabin; – passenger compartment; – machinery compartment; – station hall.
PD3A	– indoor location; – outdoor sheltered protected from weather conditions	– forced ventilation with air from outdoors – no filters	– machinery compartment; – cable manhole; – aerial mast – inside substations – insulators in light pollution level areas [a]
PD4	– outdoor location; – underfloor of vehicle; – roof of vehicle		– pantograph, shoe gear – covered platform – insulators in medium pollution level areas [a]
PD4A	– unprotected outdoor locations		– insulators in heavy pollution level areas [a]
PD4B	– unprotected outdoor locations		– insulators in very heavy pollution level areas [a]

[a] According to IEC/TR 60815:1986.

When forced ventilation inside is used, provisions must be taken to avoid the introduction of pollution inside the BCU.

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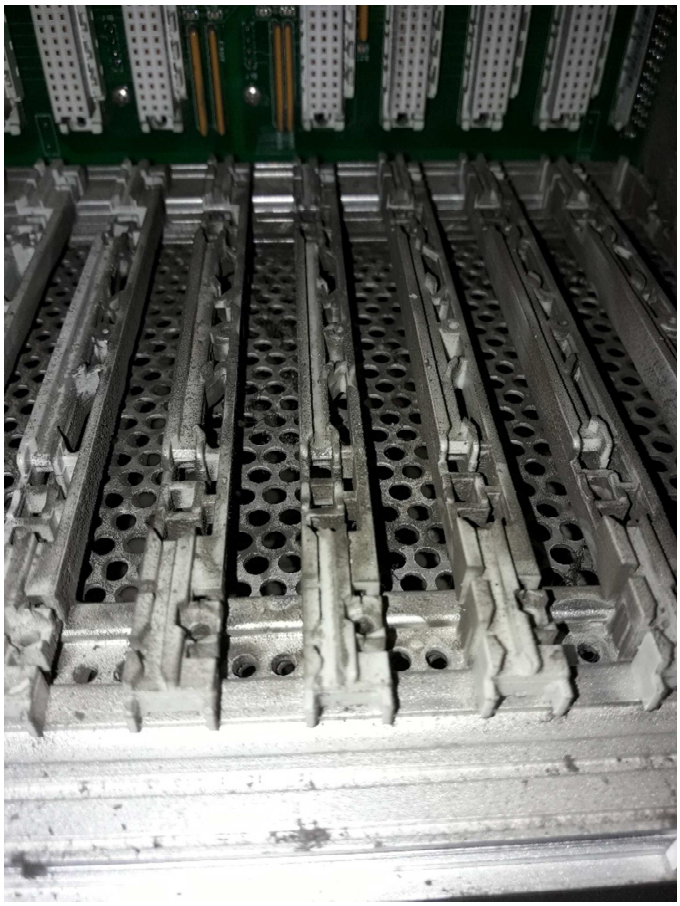
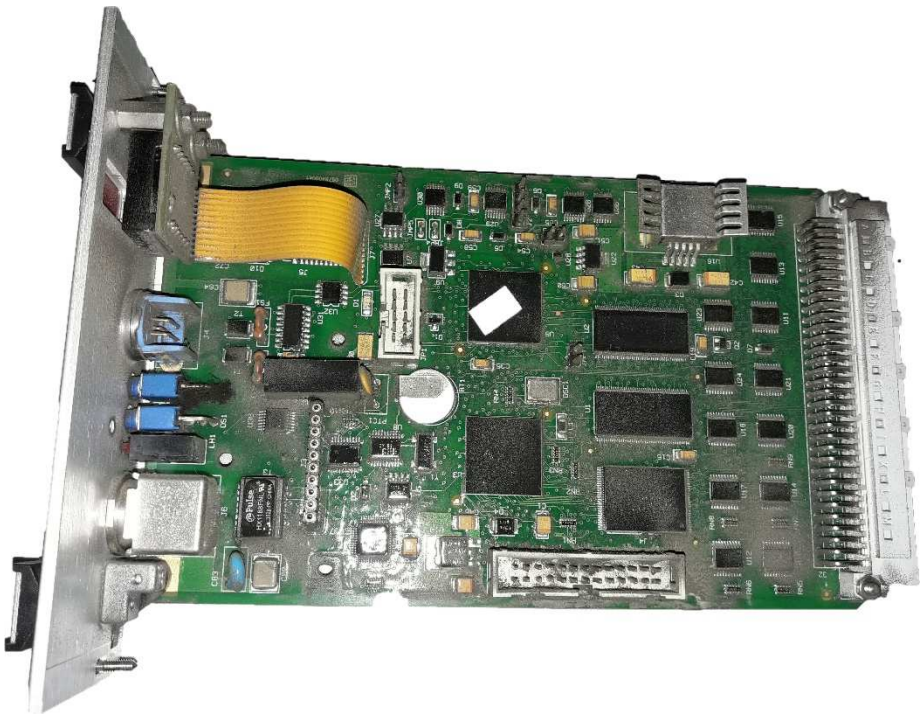
As an example, the following pictures represent an unacceptable level of dust on BCU/PCBA.





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/// 5. Maintenance prescriptions

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): not required.
2. Second Level Maintenance: not required.

/// 6. Routine maintenance

This device doesn't require any light maintenance.

In case of failure the BCU must be repaired by qualified personnel in authorised workshops.

/// 7. Removal procedure

The BCU must be installed in a non-dusty environment without any of the following contaminants:

- **conductive dust,**
- **fluids from any source: atmospheric phenomena, condensate dripping on the BCU, washing products, liquid dispersion from operators or passengers, etc.**

The coating of the PCBAs is uniquely designed to protect the electronics from the effect of the condensation of wet air directly on the PCBAs.

Refer to PD2 according to the tables reported in paragraph 4.5.

When forced ventilation inside a cabinet is used, provisions must be taken to avoid the introduction of pollution inside the BCU.

In case of accidental accumulation of dust, the PCBAs shall be cleaned using an antistatic brush and applying normal ESD cautions (refer to paragraph /// 1).

GENERAL NOTE: Pictures reported in paragraphs hereafter are for illustrative purpose only. They may vary depending on application.

CAUTION! Respect all the safety precaution listed in paragraph /// 1 and in the specific operation of the following paragraphs.

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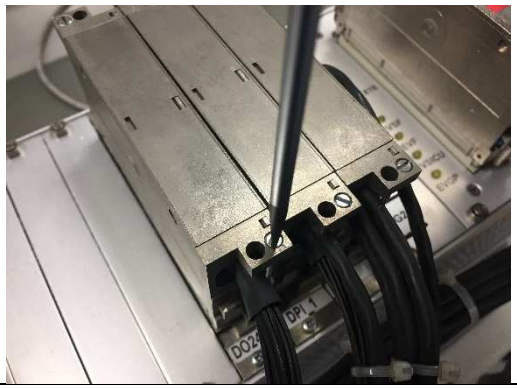
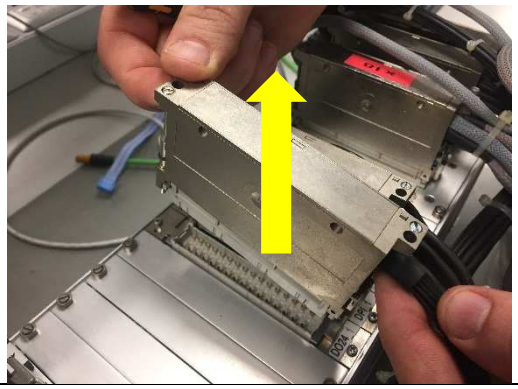
7.1 BCU removal procedure

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs which receive signals from train (for example, the Digital Input PCBA). **WARNING:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.
5.	After the confirmation that no voltage is applied to the BCU and to its PCBAs, unscrew the mating connector fastening screws and remove the mating connectors from the BCU.  
	Remove the fastening screws of the BCU and remove the BCU from its installation frame. **NOTE**: Fastening screws are application dependent, out of FT scope of supply.

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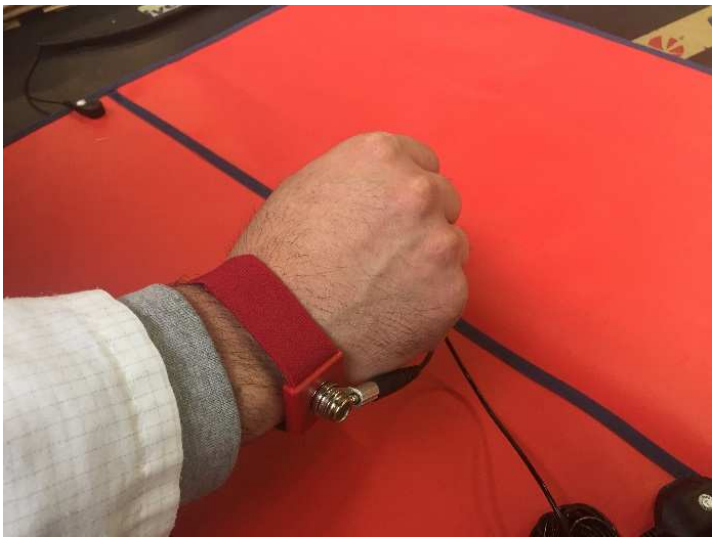
7.2 Removal procedure for PCBA with extraction tool

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs that receive signals from train (for example, the Digital Input PCBA). **WARNING:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.
5.	Connect the anti-static Kit to PE and wear anti-static bracelet.  **Note:** The anti-static carpet, properly preserved and kept, is needed as surface on which placing the PCBA during the activities e outside of an EPA area.

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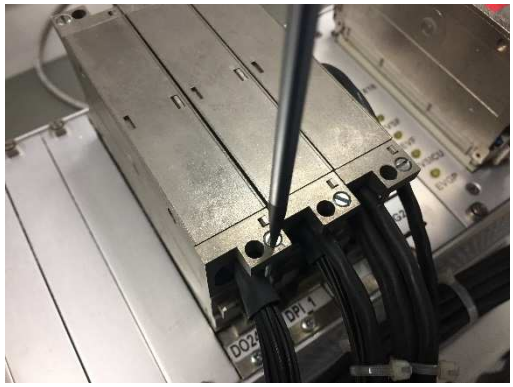
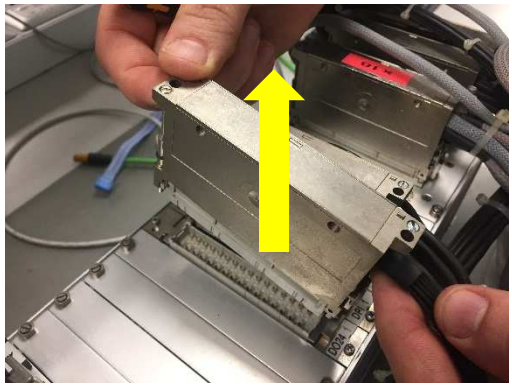
6.	After the confirmation that there is not voltage applied to the BCU and its PCBAs, unscrew the mating connector fastening screws and remove the mating connector from the PCBA.   **WARNING:** In case there is a doubt that the PCBAs nearby may receive voltage from the train, remove the mating connectors also of the nearby PCBAs.
7.	Unscrew the PCBA interface plate with the proper screwdriver, depending on the PCBA: - Philips PH1 type - Flat 0,6 x 3,5 Keep the screws since they will be used again.

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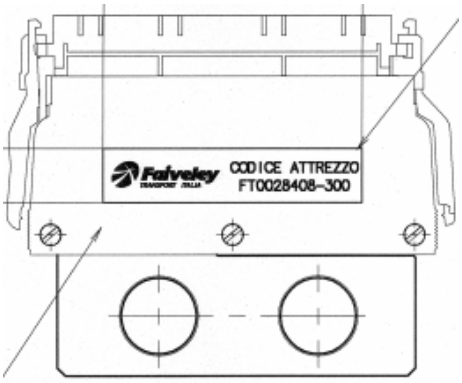
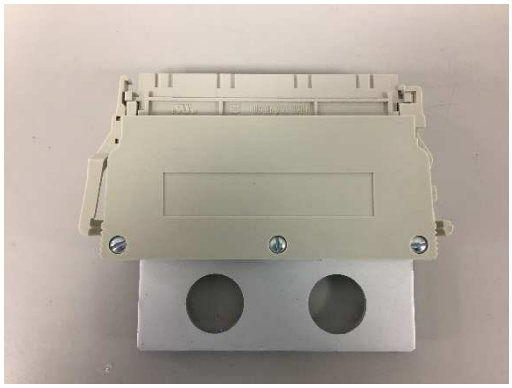
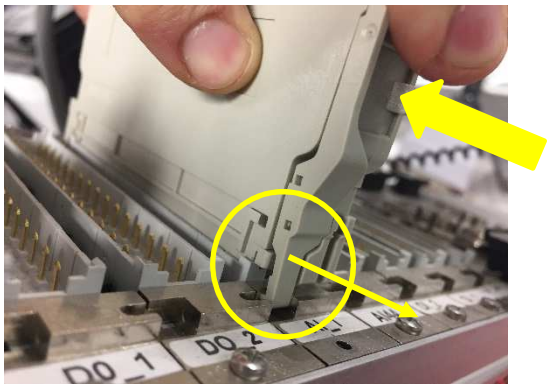
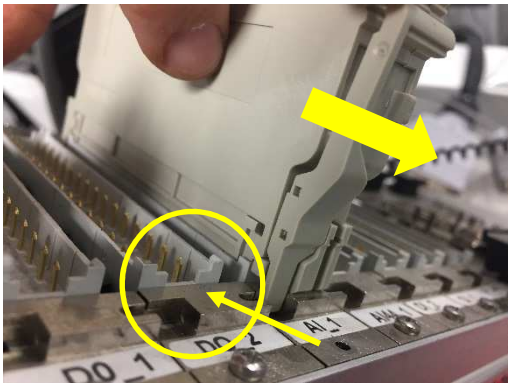
8.	Insert the extraction tool, part number FT0028408-300.









CAUTION:

During this operation, do not touch any connector pins.

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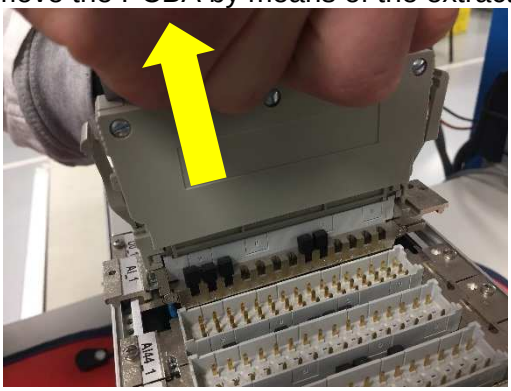
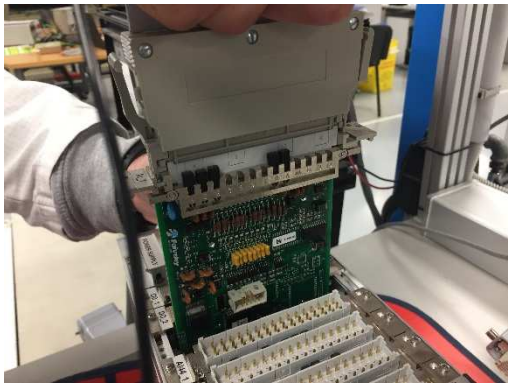
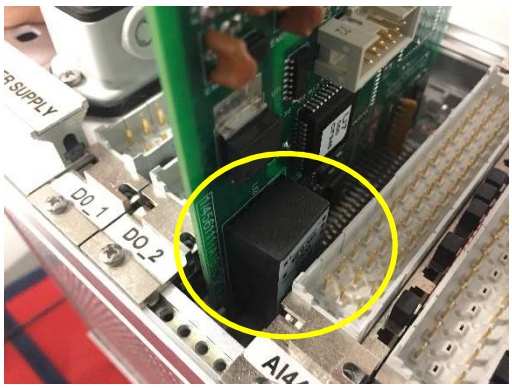
9.	Remove the PCBA by means of the extraction tool.   **WARNING :** 1) During this operation, Operator must ensure that the PCBA and/or his hand does not get in contact with the nearby PCBAs.  2) It is reminded that it is mandatory to ensure that the BCU PCBAs must not be energized and/or receive voltage from train during these operations. 3) The PCBA must be removed carefully. 4) During this operation, the planarity of the PCBA must be ensured.

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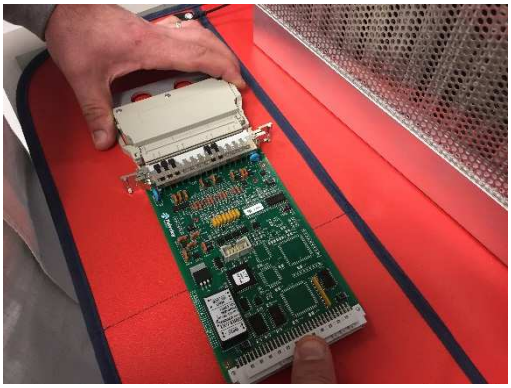
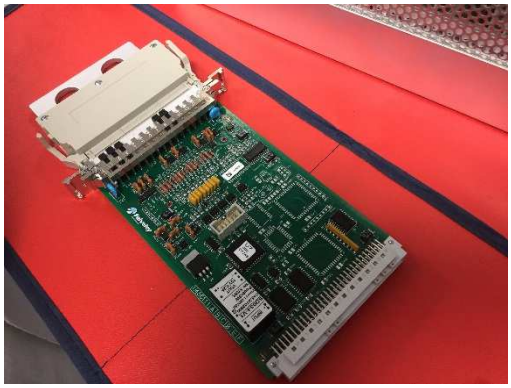
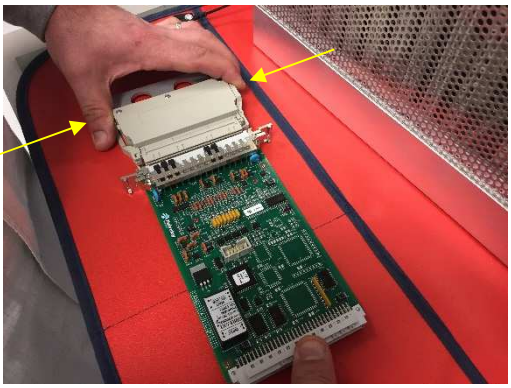
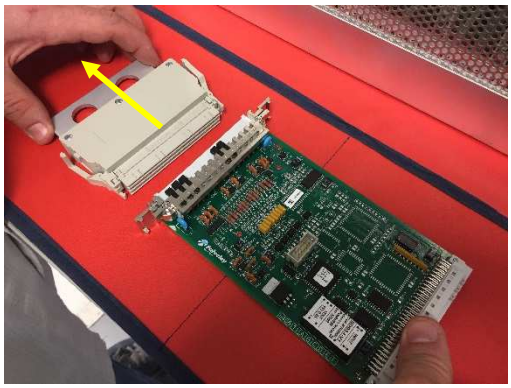
10.	By means of the extraction tool, place the PCBA over the antistatic carpet.   **CAUTION**: 1) Do not touch the connectors' pins. 2) Do not apply pressure on the PCBA. 3) Ensure the PCBA planarity.
11.	Remove the extraction tool.   **CAUTION**: 1) Do not touch the connectors' pins. 2) Do not apply pressure on the PCBA. 3) Ensure the PCBA planarity.

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12.	If the PCBA must be moved, place the PCBA inside the antistatic bag before moving it (Refer to paragraph /// 1 for handling prescription for the PCBA). Bend the exceeding part of the antistatic bag. Placing the PCBA inside an antistatic bag is also necessary in case the PCBA is not installed back in the BCU in short time.

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7.3 Removal procedure for PCBA with front plate and extraction levers (e.g. CPU, MVB, Echelon)

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs that receive signals from train (for example, the Digital Input PCBA). **WARNING:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.
5.	Connect the anti-static Kit to PE and wear anti-static bracelet. **Note:** The anti-static carpet, properly preserved and kept, is needed as surface on which placing the PCBA during the activities performed outside of an EPA area.

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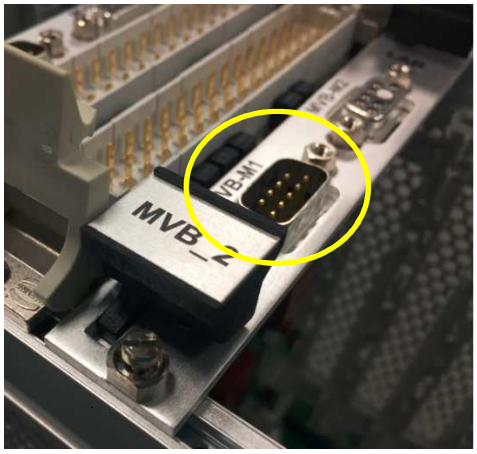
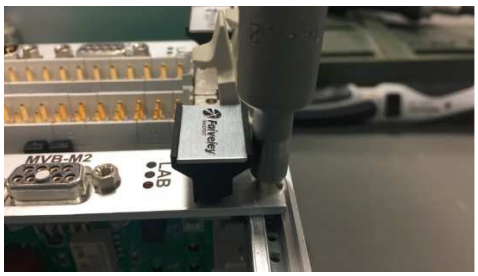
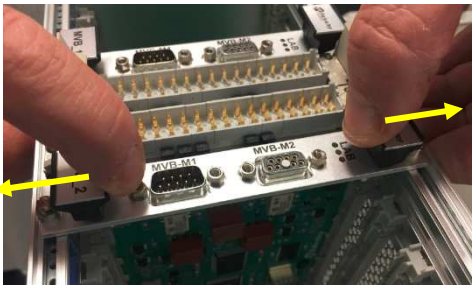
6.	After the confirmation that there is not voltage applied to the BCU and its PCBAs, unscrew the mating connectors fastening screws and remove the mating connectors from the PCBA.  **WARNING:** In case there is a doubt that the PCBAs nearby may receive voltage from the train, remove the mating connectors also of the nearby PCBAs.
7.	Unscrew the PCBA interface plate with the proper screwdriver, depending on the PCBA: - Philips PH1 type - Flat 0,6 x 3,5  Keep the screws since they will be used again.
8.	Push the lateral levers as shown in the picture: 

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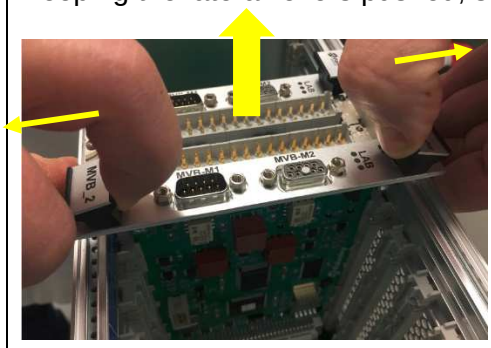
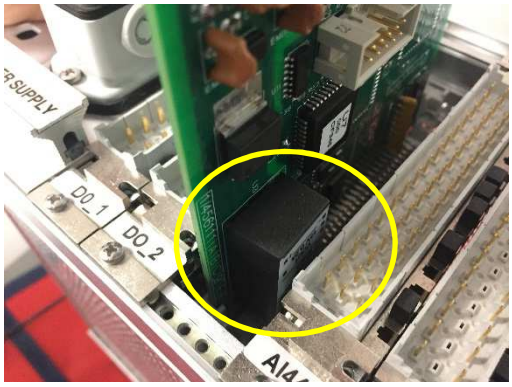
9.	Keeping the lateral levers pushed, slide the PCBA out of the rack:  **WARNING :** 1) During this operation, Operator must ensure that the PCBA and/or his hand does not get in contact with the nearby PCBAs.  2) It is reminded that it is mandatory to ensure that the BCU PCBAs must not be energized and/or receive voltage from train during these operations. 3) The PCBA must be removed carefully. 4) During this operation, the planarity of the PCBA must be ensured.

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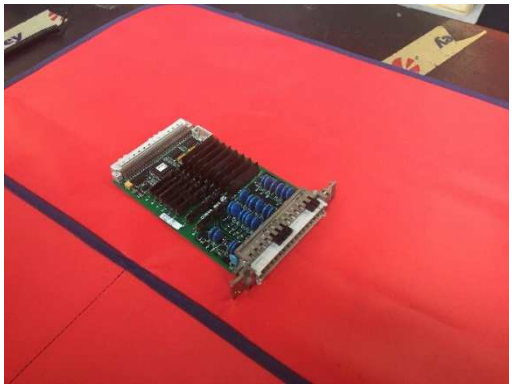
10.	Place the PCBA over the antistatic carpet.  **CAUTION**: 1) Do not touch the connectors' pins. 2) Do not apply pressure on the PCBA. 3) Ensure the PCBA planarity.
11.	If the PCBA must be moved, place the PCBA inside the antistatic bag before its moving (Refer to paragraph /// 1 for the handling prescription for the PCBA). Bend the exceeding part of the antistatic bag. Placing the PCBA inside an antistatic bag is also necessary in case the PCBA is not installed back in the BCU in short time.

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7.4 Removal procedure for PCBA with extraction levers

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs that receive signals from train (for example, the Digital Input PCBA). **WARNING:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.
5.	Connect the anti-static Kit to PE and wear anti-static bracelet. **Note:** The anti-static carpet, properly preserved and kept, is needed as surface on which placing the PCBA during the activities performed outside of an EPA area.

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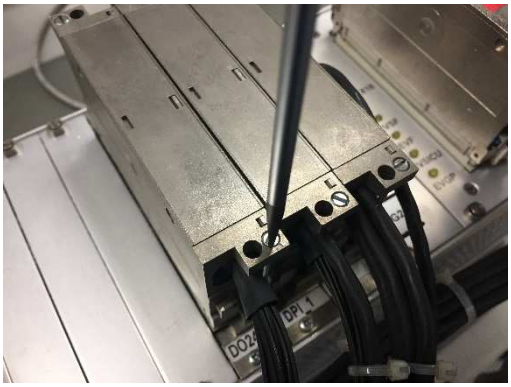
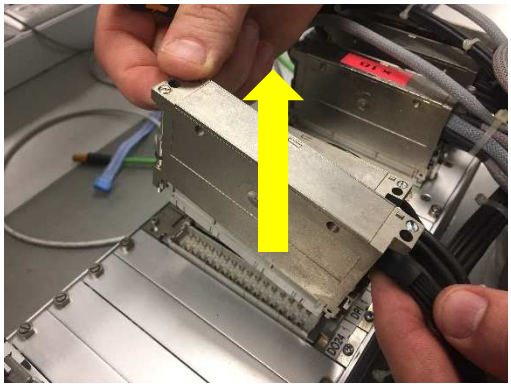
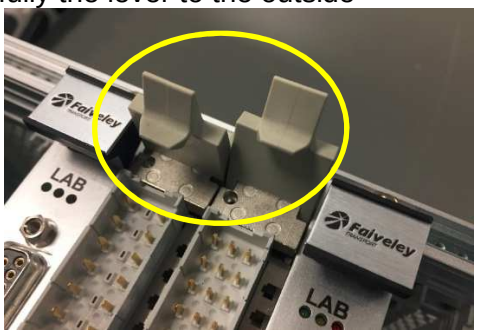
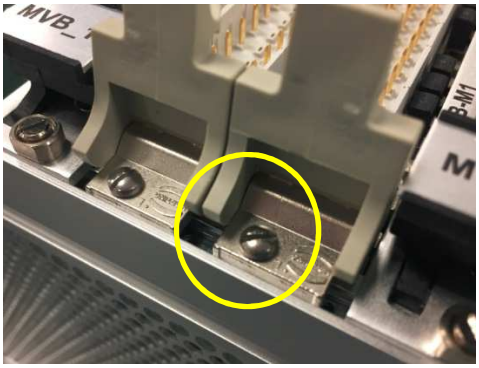
6.	After the confirmation that there is not voltage applied to the BCU and its PCBAs, unscrew the mating connectors fastening screws and remove the mating connectors from the BCU.   **WARNING:** In case there is a doubt that the PCBAs nearby may receive voltage from the train, remove the mating connectors also of the nearby PCBAs.
7.	**NOTE**: do not push forcefully the lever to the outside  Unscrew the PCBA interface plate with the proper screwdriver, depending on the PCBA: - Philips PH1 type - Flat 0,6 x 3,5  Keep the screws since they will be used again.

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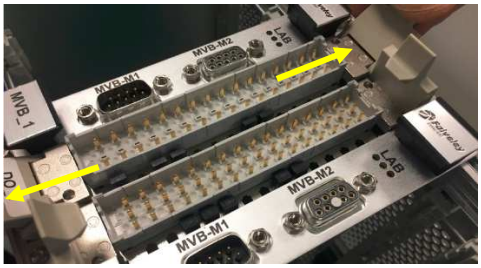
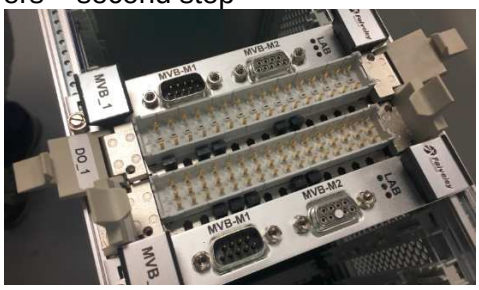
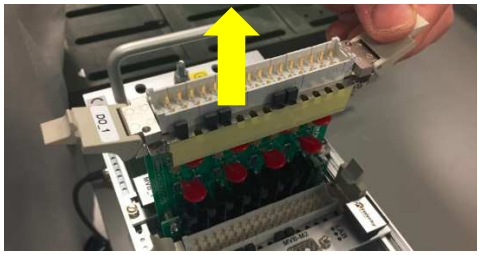
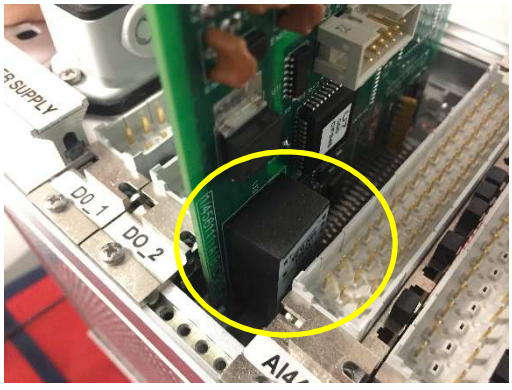
8.	Push carefully the lateral levers as shown in the picture – first step. 
9.	Push down the lateral levers – second step 
10.	Slide the card out of the rack.  **WARNING :** 1) During this operation, Operator must ensure that the PCBA and/or his hand does not get in contact with the nearby PCBAs.  2) It is reminded that it is mandatory to ensure that the BCU PCBAs must not be energized and/or receive voltage from train during these operations. 3) The PCBA must be removed carefully. 4) During this operation, the planarity of the PCBA must be ensured.

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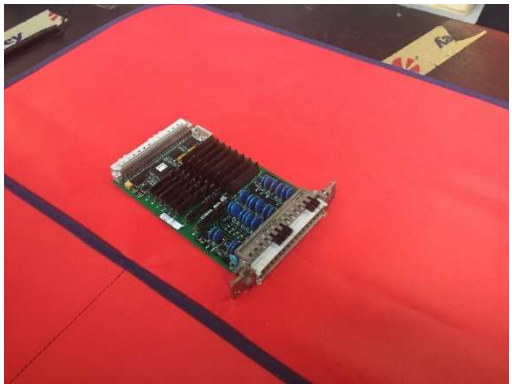
11.	Place the PCBA over the antistatic carpet.  **CAUTION**: 1) Do not touch the connectors' pins. 2) Do not apply pressure on the PCBA. 3) Ensure the PCBA planarity.
12.	If the PCBA must be moved to another place, put the PCBA inside the antistatic bag before its moving (Refer to paragraph /// 1 for the handling prescription for the PCBA). Bend the exceeding part of the antistatic bag. Placing the PCBA inside an antistatic bag is also necessary in case the PCBA is not installed back in the BCU in short time.

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/// 8. Installation procedure

The BCU must be installed in a non-dusty environment without any of the following contaminants:

- **conductive dust,**
- **fluids from any source: atmospheric phenomena, condensate dripping on the BCU, washing products, liquid dispersion from operators or passengers, etc.**

The coating of the PCBAs is uniquely designed to protect the electronics from the effect of the condensation of wet air directly on the PCBAs.

Refer to PD2 according to the tables reported in paragraph 4.5.

When forced ventilation inside a cabinet is used, provisions must be taken to avoid the introduction of pollution inside the BCU.

GENERAL NOTE: Pictures reported in paragraphs hereafter are for illustrative purpose only. They may vary depending on application.

CAUTION! Respect all the safety precaution listed in paragraph /// 1 and in the specific operation of the following paragraphs.

8.1 BCU installation procedure

1.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
2.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
3.	Verify that the voltage supply is not available at the mating connectors of the PCBAs which receive signals from train (for example, the Digital Input PCBA). **WARNING:** 1) In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.
4.	After confirmation that there is not voltage in input to the BCU and its PCBAs, install the BCU in the frame.
5.	Apply the fastening elements of the BCU in the cubicle.

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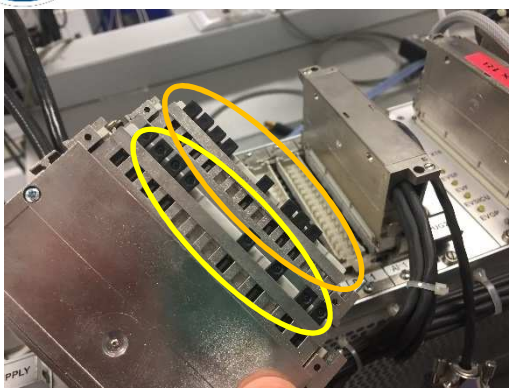
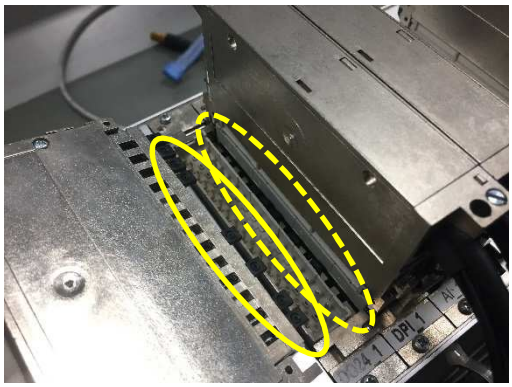
6.	Apply earthing and the wiring to the BCU **according to FT0127292-ID0-E00TIN**, On earthing connections apply a 5.2 Nm torque. Ensure the parts involved in the earthing connection are clean.
7.	Apply the fastening elements of the BCU to the frame.
8.	 Verify the coherence between the mechanical key of the mating connector with the mechanical key of the PCBA interface connector. Each PCBA has its dedicated mechanical key.  

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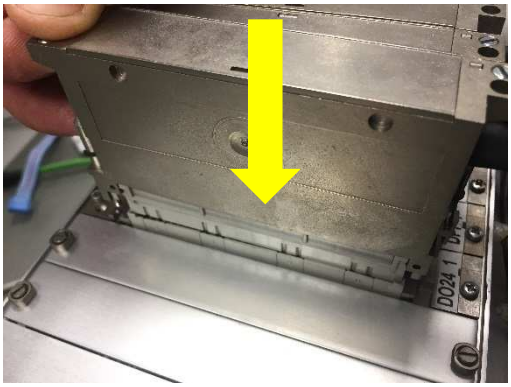
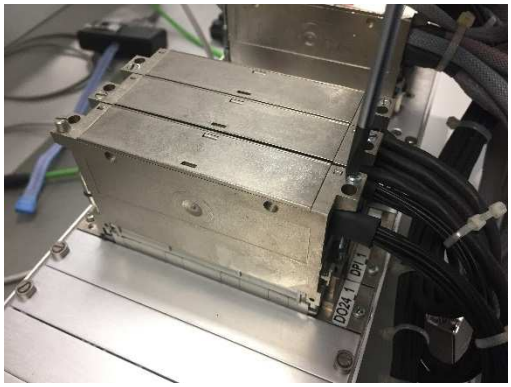
9.	Insert the right mating connector to each PCBA, one by one. After, screw the fastening screws of the mating connector.   **CAUTION:** 1) Before the insertion of the mating connector, verify that it is the correct one for the PCBA. 2) Before the insertion of the mating connector, verify it does not have any voltage applied.
10.	Enable the supply voltage to the BCU and the input voltages to the PCBAs. When all train systems are correctly initialized, perform a complete brake test (procedure not included in this document).

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8.2 Installation procedure for PCBA with extraction tool

An PCBA can be only replaced by another one with the same part number and the new PCBA must be placed in the same BCU slot, in accordance with BCU drawings and BOM.
It is recommended to replace one PCBA at a time. The following steps refer to the replacement of a single PCBA.

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs that receive signals from train (for example, the Digital Input PCBA). ***WARNING*:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.

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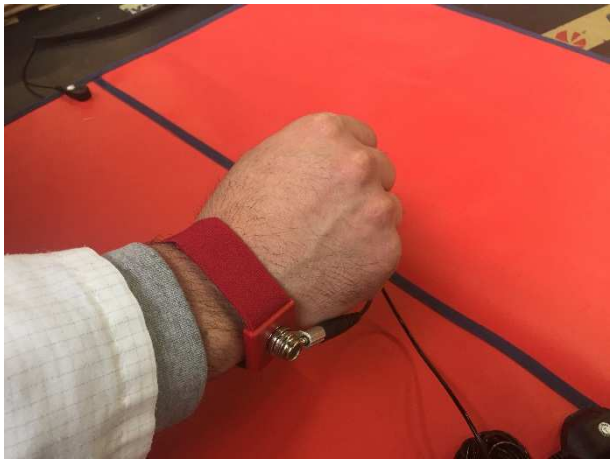
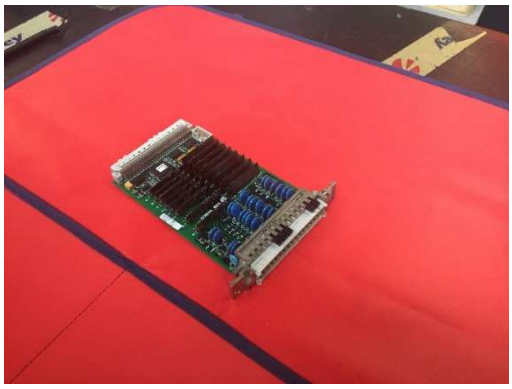
5.	Connect the anti-static kit to PE and wear anti-static bracelet.  **Note:** The anti-static carpet, properly preserved and kept, is needed as surface on which placing the PCBA during the activities performed outside an EPA area.
6.	Confirm there is not voltage supply to the BCU and as input of the PCBAs. **WARNING:** In case there is a doubt that the PCBAs nearby may receive voltage from the train, remove the mating connectors also of the nearby PCBAs.
7.	Remove the PCBA from the antistatic bag and place it on the antistatic carpet. (Refer to paragraph /// 1 for the handling prescription for the PCBA).  ***CAUTION*** **:** Do not touch connector pins.

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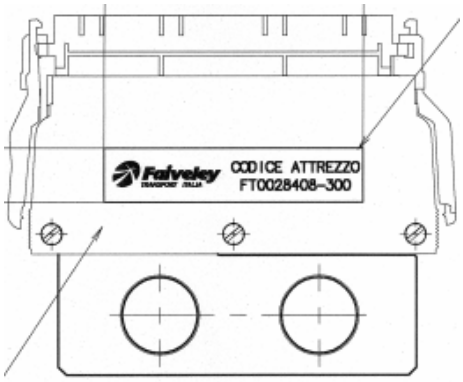
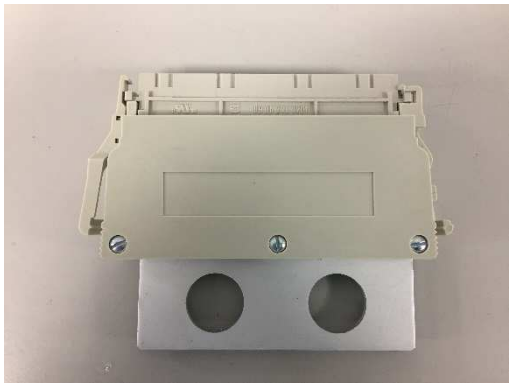
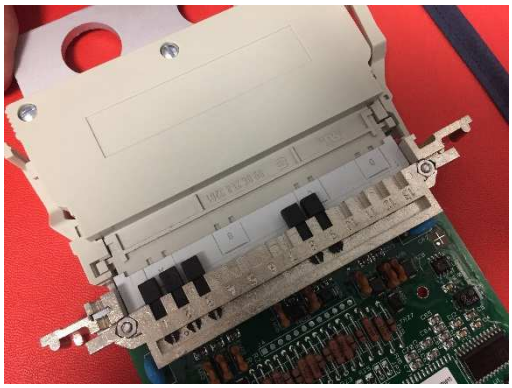
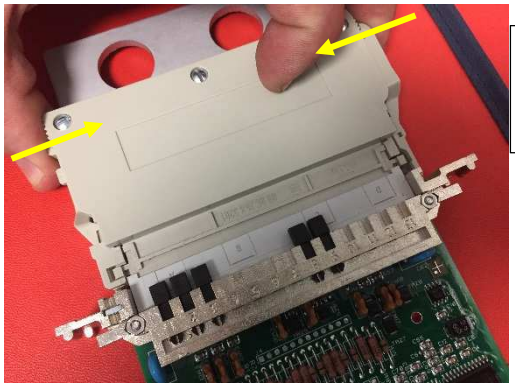
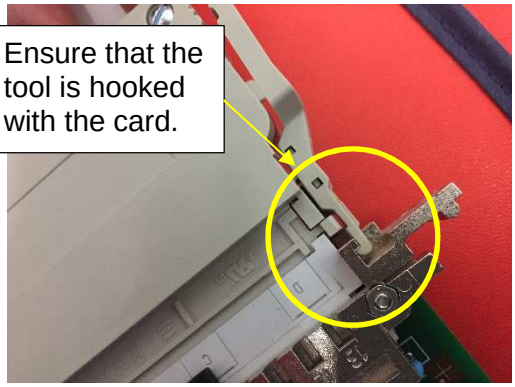
8. Align the extraction tool (part number FT0028408-300) with the PCBA interface connector and insert carefully the extraction tool.











CAUTION:

1) Insert the extraction tool with care.
2) Pay attention not to damage connector and its pins.

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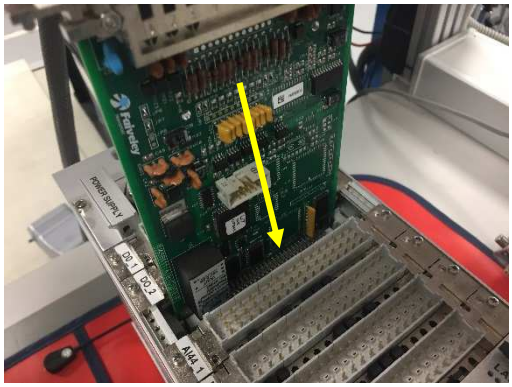
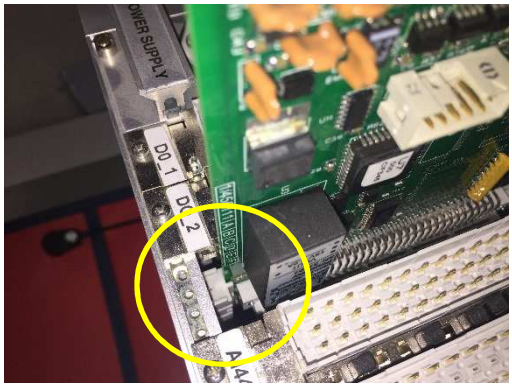
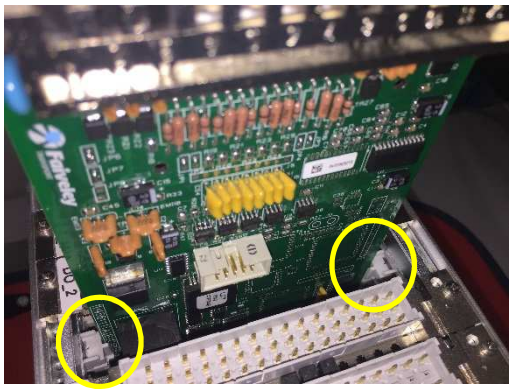
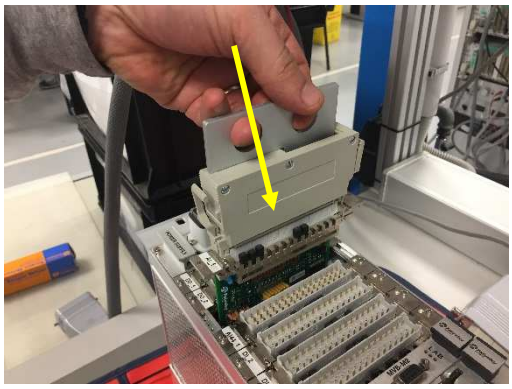
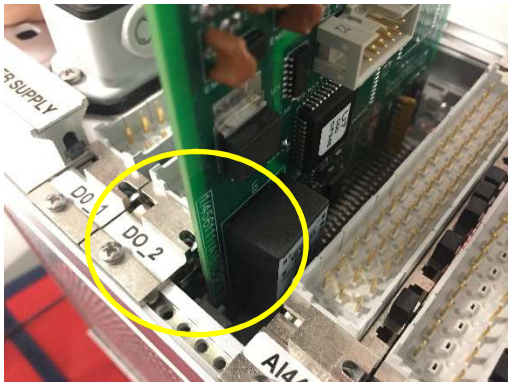
9. Insert with care the electronic card into its dedicated slot in BCU, verifying that the PCB is properly inside the rack insertion guides.

CAUTION:

1) During this operation, DO NOT touch the connector pins
2) Insert the PCBA with care.
3) During this operation, the planarity of the PCBA must be ensured.

4) During this operation, Operator must ensure that the PCBA and/or his hand does not get in contact with the nearby parts.



5) It is reminded that it is mandatory to ensure that all the BCU PCBAs have not voltage applied (risk to damage the PCBA)

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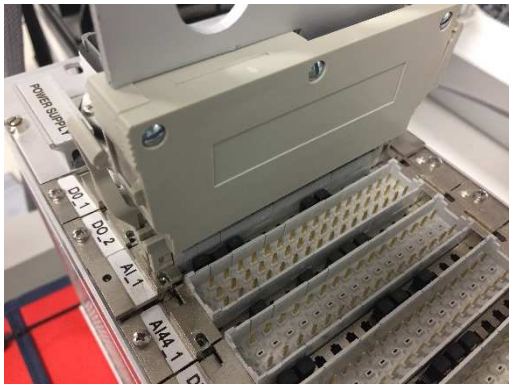
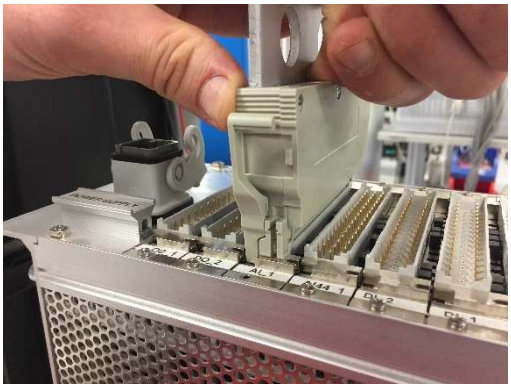
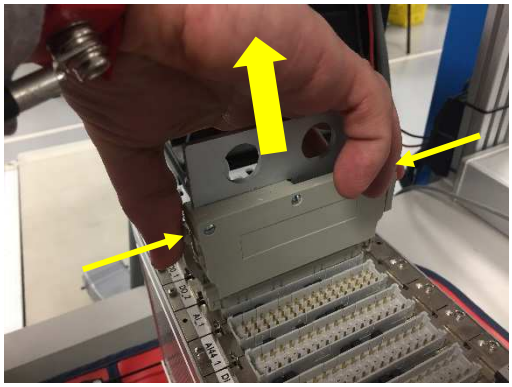
10.	Insert the PCBA almost completely; the last step must be done with care.   CAUTION: In case during this operation the PCBA seems blocked, do not apply extra force and slide the PCBA back out of the BCU, verifying that the PCB is correctly slide through the rack guides and that the mechanical keys of the two connectors match; then insert again the PCBA, slowly. Never apply any extra force. The correct insertion of the PCBA is confirmed by the characteristic “click” which confirms the insertion of its connector in the counterpart on the backplane.
11.	Remove the extraction tool.  **CAUTION :** Do this operation with care in order to do not damage the PCBA interface connector and its pins.

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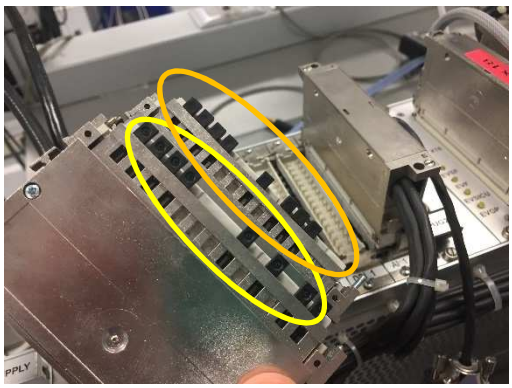
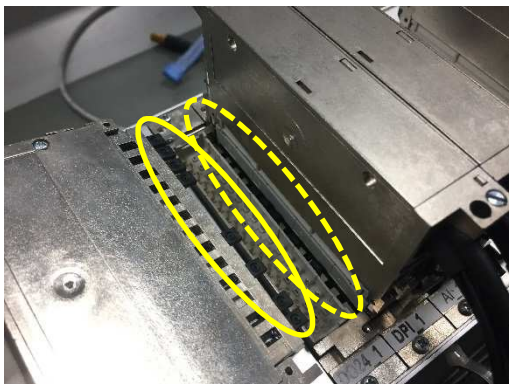
12.	Start screwing (but not completely) the PCBA fastening screws with the appropriated screwdriver, depending on the PCBA: - Philips PH1 type - Flat type 0,6 x 3,5 With a calibrated torque-wrench, screw applying 0,5 Nm torque. **CAUTION:** Verify that the tool calibration is still valid at the moment of the operations.
13.	Verify the coherence between the mechanical key of the mating connector with the mechanical key of the PCBA interface connector. Each PCBA has its dedicated mechanical key.  

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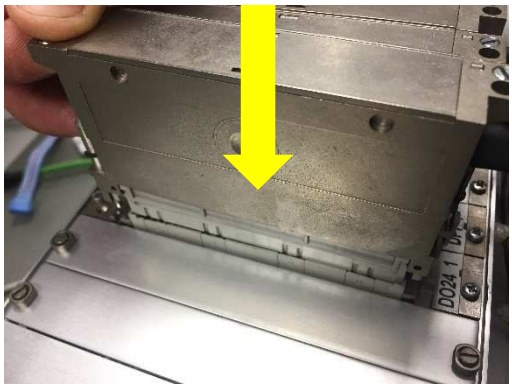
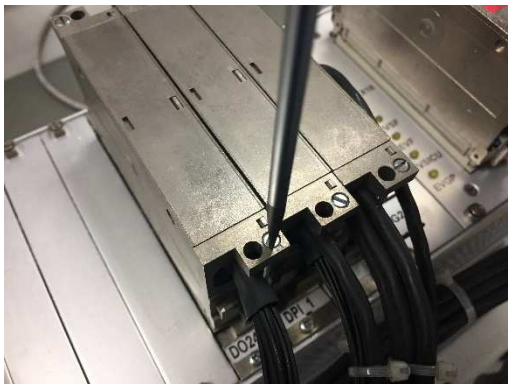
14.	Insert the right mating connector to each PCBA, one by one. After, screw the fastening screws of the mating connector.   **CAUTION:** 1) Before the insertion of the mating connector, verify that it is the correct connector for the PCBA. 2) Before the insertion of the mating connector, verify it does not have voltage applied.
15.	Enable the supply voltage to the BCU and the input voltages to the PCBAs. When all train systems are correctly initialized, perform a complete brake test (procedure not included in this document).

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8.3 Installation procedure for PCBA frontal plate (e.g. CPU, MVB, Echelon and similar)

An PCBA can be only replaced by another one with the same part number and the new PCBA must be placed in the same BCU slot, in accordance with BCU drawings and BOM.
It is recommended to replace one PCBA at a time. The following steps refer to the replacement of a single PCBA.

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs that receive signals from train (for example, the Digital Input PCBA). ***WARNING*:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.

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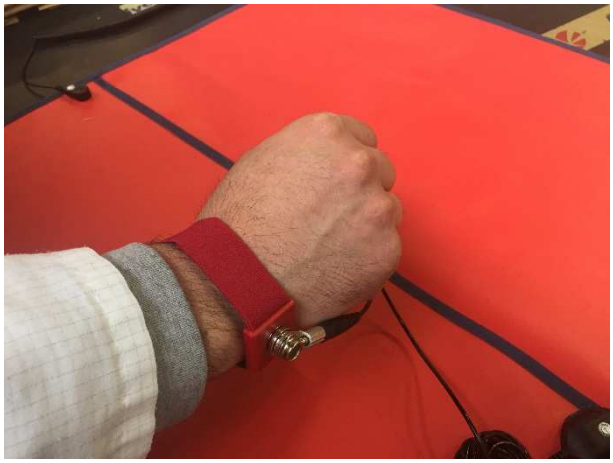
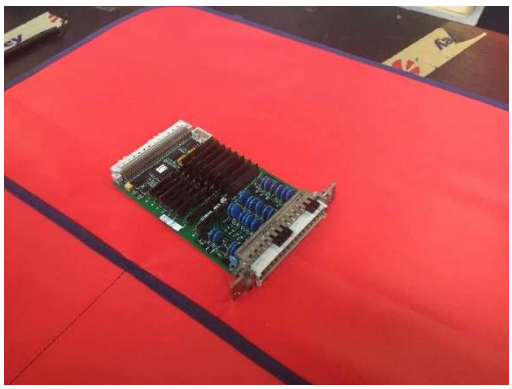
5.	Connect the anti-static kit to PE and wear anti-static bracelet.  **Note:** The anti-static carpet, properly preserved and kept, is needed as surface on which placing the PCBA during the activities performed outside an EPA area.
6.	Confirm there is not voltage supply to the BCU and as input of the PCBAs. **WARNING:** In case there is a doubt that the PCBAs nearby may receive voltage from the train, remove the mating connectors also of the nearby PCBAs.
7.	Remove the PCBA from the antistatic bag and place it on the antistatic carpet. (Refer to paragraph /// 1 for the handling prescription for the PCBA).  ***CAUTION* :** Do not touch connector pins.

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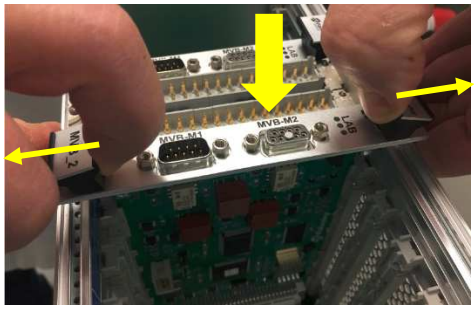
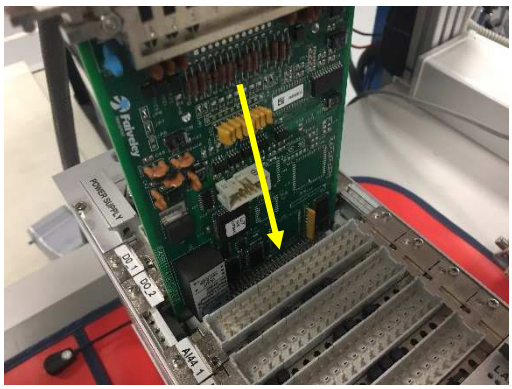
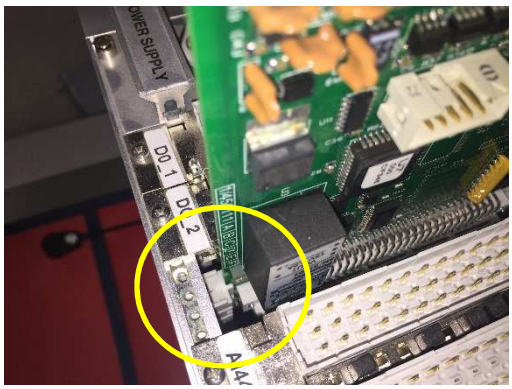
8.	Keeping the PCBA from the lateral levers and keeping them pushed, insert with care the electronic card into its dedicated slot in BCU, verifying that the PCB is properly inside the rack insertion guides.



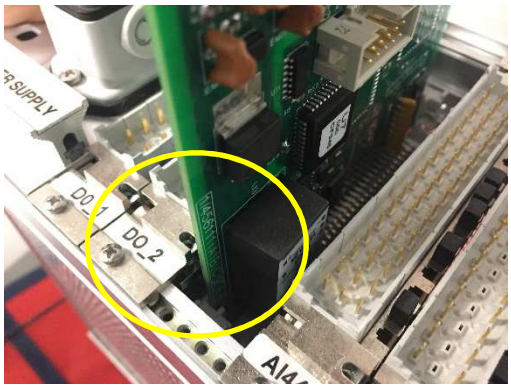




CAUTION:

1) During this operation, DO NOT touch the connector pins
2) Insert the PCBA with care.
3) During this operation, the planarity of the PCBA must be ensured.

4) During this operation, Operator must ensure that the PCBA and/or his hand does not get in contact with the nearby parts.



5) It is reminded that it is mandatory to ensure that all the BCU PCBAs have not voltage applied (risk to damage the PCBA).

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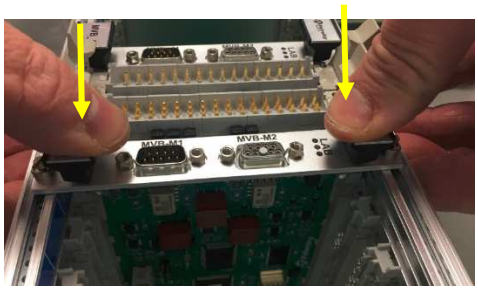
9.	Push the lateral levers down.  CAUTION: In case during this operation the PCBA seems blocked, do not apply extra force and slide the PCBA back out of the BCU, verifying that the PCB is correctly slide through the rack guides and that the mechanical keys of the two connectors match; then insert again the PCBA, slowly. Never apply any extra force. The correct insertion of the PCBA is confirmed by the characteristic “click” which confirms the insertion of its connector in the counterpart on the backplane.

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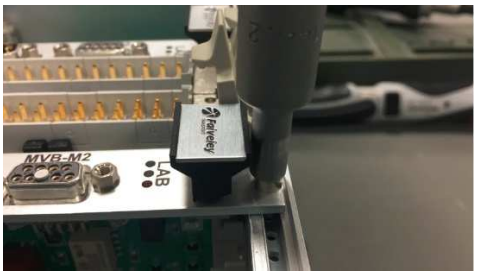
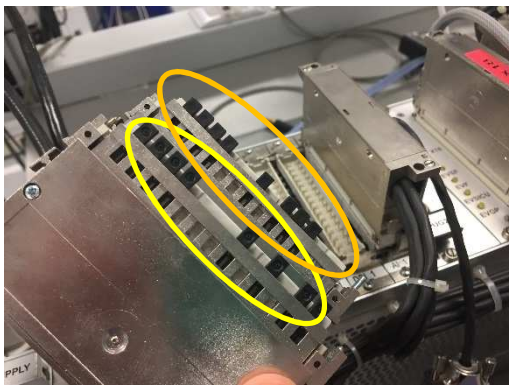
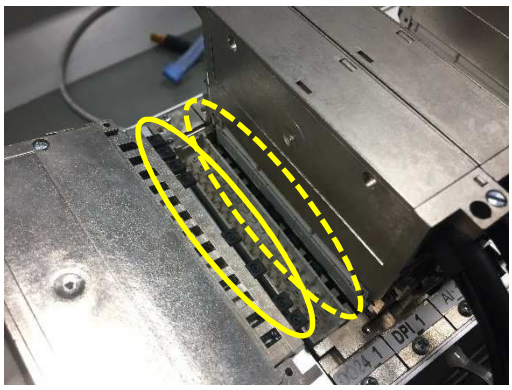
10.	Start screwing (but not completely) the PCBA fastening screws with the appropriated screwdriver, depending on the PCBA: - Philips PH1 type - Flat type 0,6 x 3,5  With a calibrated torque-wrench, screw applying 0,5 Nm torque. **CAUTION:** Verify that the tool calibration is still valid at the moment of the operations.
11.	Verify the coherence between the mechanical key of the mating connector with the mechanical key of the PCBA interface connector. Each PCBA has its dedicated mechanical key.  

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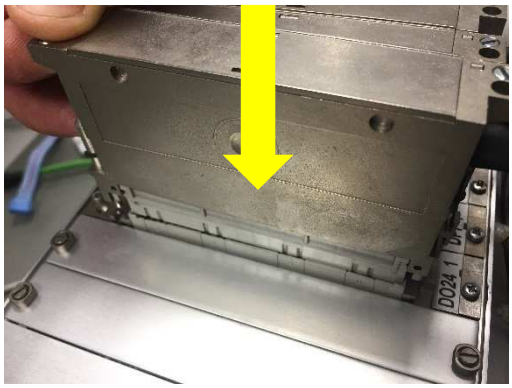
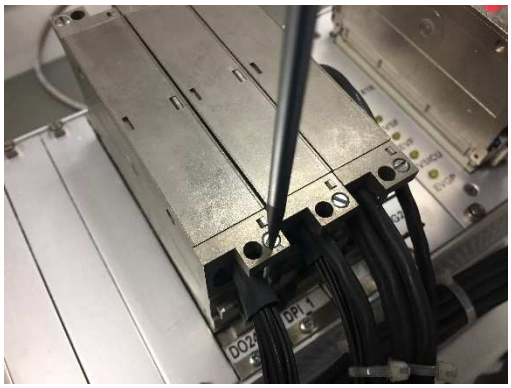
12.	Insert the right mating connector to each PCBA, one by one. After, screw the fastening screws of the mating connector.   **CAUTION:** 1) Before the insertion of the mating connector, verify that it is the correct connector for the PCBA. 2) Before the insertion of the mating connector, verify it does not have voltage applied.
13.	Enable the supply voltage to the BCU and the input voltages to the PCBAs. When all train systems are correctly initialized, perform a complete brake test (procedure not included in this document).

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8.4 Installation procedure for PCBA with lateral levers

An PCBA can be only replaced by another one with the same part number and the new PCBA must be placed in the same BCU slot, in accordance with BCU drawings and BOM.
It is recommended to replace one PCBA at a time. The following steps refer to the replacement of a single PCBA.
The Operator is responsible of his actions.

1.	Verify the BCU is connected to PE
2.	Switch-off the BCU power supply by means of the train switch placed on the BCU voltage supply line. In case the main switch is not available, turn-off the train power supply.
3.	Verify that the BCU is turned-off and that the supply voltage is not available on the mating connector of the power supply.
4.	Verify that the voltage supply is not available at the mating connectors of the PCBAs that receive signals from train (for example, the Digital Input PCBA). ***WARNING*:** In case it is not possible to do this check without disconnecting the connector, turn-off the train power supply.

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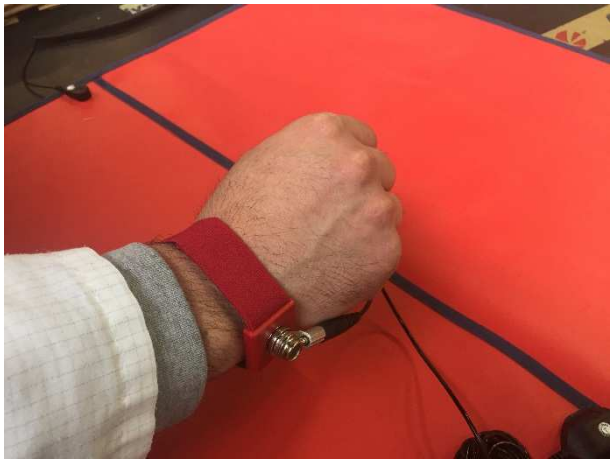
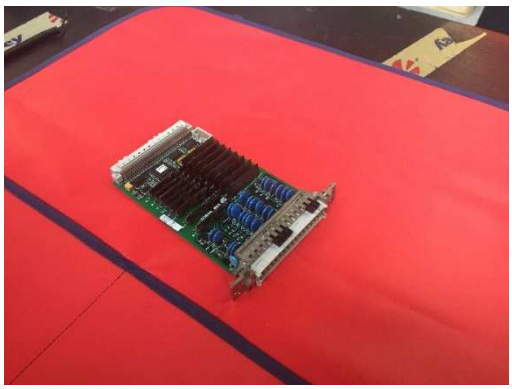
5.	Connect the anti-static kit to PE and wear anti-static bracelet.  **Note:** The anti-static carpet, properly preserved and kept, is needed as surface on which placing the PCBA during the activities performed outside an EPA area.
6.	Confirm there is not voltage supply to the BCU and as input of the PCBAs. **WARNING:** In case there is a doubt that the PCBAs nearby may receive voltage from the train, remove the flying connectors also of the nearby PCBAs.
7.	Remove the PCBA from the antistatic bag and place it on the antistatic carpet. (Refer to paragraph /// 1 for the handling prescription for the PCBA).  ***CAUTION* :** Do not touch connector pins.

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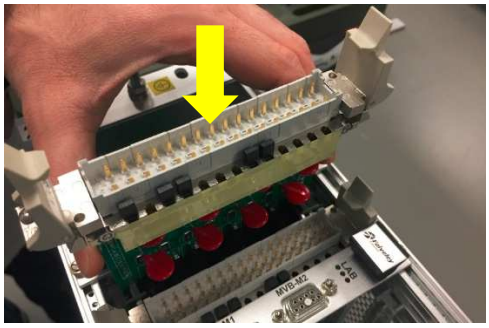
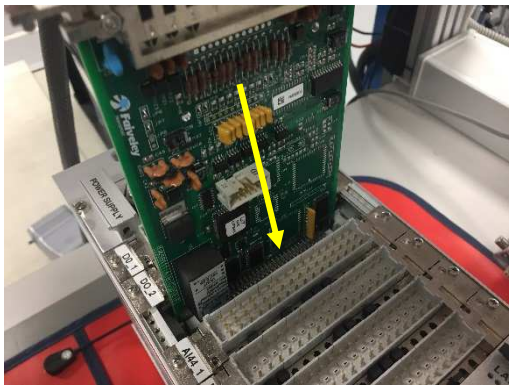
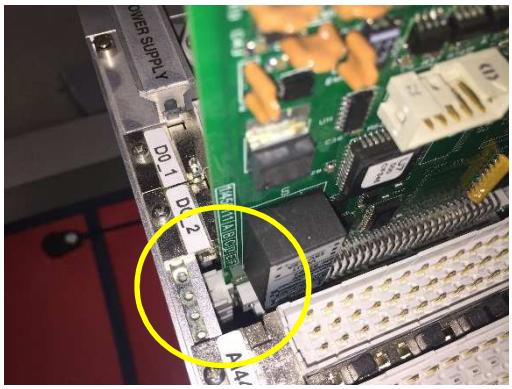
8.	With the lateral levers perpendicular, insert with care the electronic card into its dedicated slot in BCU, verifying that the PCB is properly inside the rack insertion guides.



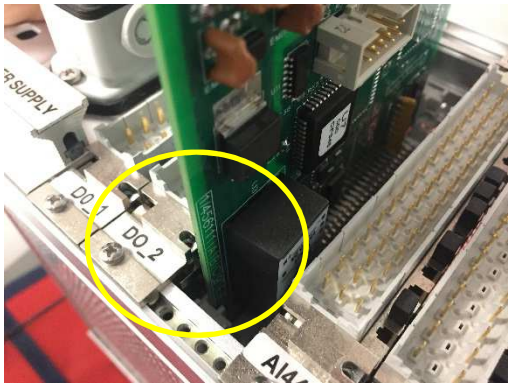




CAUTION:

1) During this operation, DO NOT touch the connector pins
2) Insert the PCBA with care.
3) During this operation, the planarity of the PCBA must be ensured.

4) During this operation, Operator must ensure that the PCBA and/or his hand does not get in contact with the nearby parts.



5) It is reminded that it is mandatory to ensure that all the BCU PCBAs have not voltage applied (risk to damage the PCBA).

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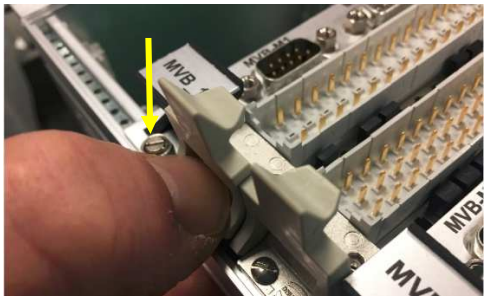
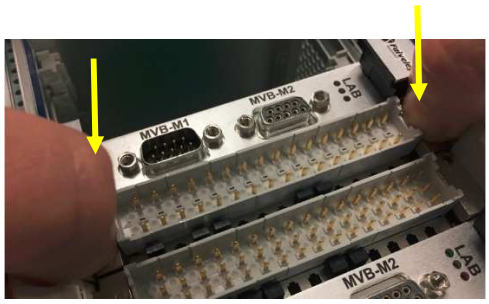
9.	Push down the electronic card by the front panel.   CAUTION: In case during this operation the PCBA seems blocked, do not apply extra force and slide the PCBA back out of the BCU, verifying that the PCB is correctly slide through the rack guides and that the mechanical keys of the two connectors match; then insert again the PCBA, slowly. Never apply any extra force. The correct insertion of the PCBA is confirmed by the characteristic “click” which confirms the insertion of its connector in the counterpart on the backplane.

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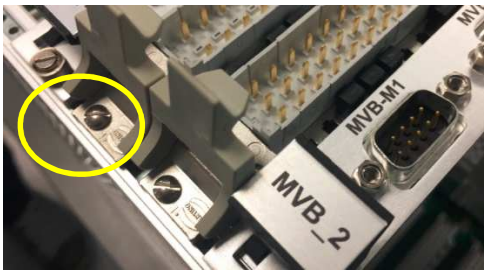
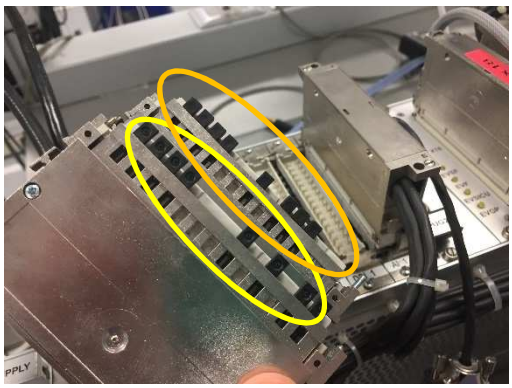
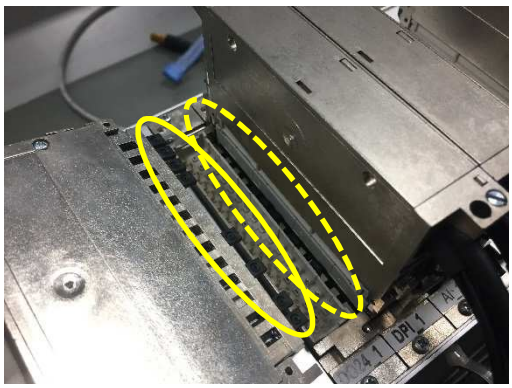
10.	Start screwing (but not completely) the PCBA fastening screws with the appropriated screwdriver, depending on the PCBA: - Philips PH1 type - Flat type 0,6 x 3,5  With a calibrated torque-wrench, screw applying 0,5 Nm torque. **CAUTION:** Verify that the tool calibration is still valid at the moment of the operations.
11.	Verify the coherence between the mechanical key of the mating connector with the mechanical key of the PCBA interface connector. Each PCBA has its dedicated mechanical key.  

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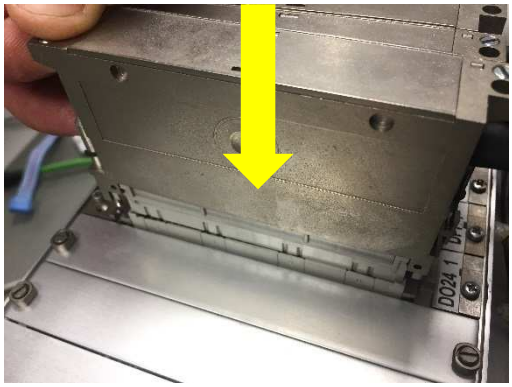
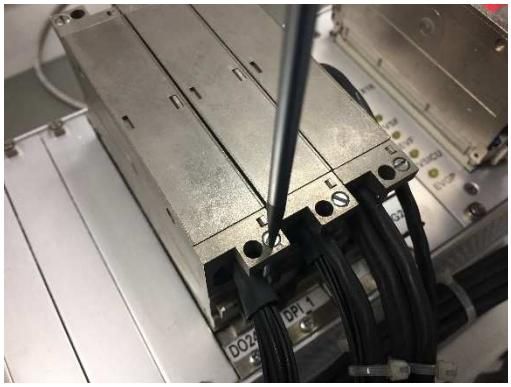
12.	Insert the right mating connector to each PCBA, one by one. After, screw the fastening screws of the mating connector.   **CAUTION:** 1) Before the insertion of the flying connector, verify that it is the correct connector for the PCBA. 2) Before the insertion of the flying connector, verify it does not have voltage applied.
13.	Enable the supply voltage to the BCU and the input voltages to the PCBAs. When all train systems are correctly initialized, perform a complete brake test (procedure not included in this document).

/// 9. Spare parts

- **Routine Maintenance** – Not applicable.
- **Installation** – Spare parts not required.

/// 10. Special tools

During the PCBAs' manipulation possibly wear a conductive bracelet connected to earth.

In order to extract PCBAs the use of the PCBA extractor tool (part number FT0028408-300) is mandatory.

/// 11. Disposal

The device is mainly composed by the following materials: aluminum, resin filled fiberglass, plastic, rubber, steel, copper.

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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04.21_04.22_04.23_04.25_Brake module

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/// FT0053702-100-E00MUM

ICF Trainset (Train 18)
BRAKE MODULE - DTC
FT0053702-100
BRAKE MODULE - MC/MC2/MC3
FT0053702-101
BRAKE MODULE - TC
FT0053702-102
BRAKE MODULE - NDTC
FT0053702-103

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		31/10/2022
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0053702-100-E00MUM.docx	A00	RELEASE

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Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	01/11/2022	NEW RELEASE	DRC1751 /4	DC	NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Brake module is a module that consists of pneumatic and electro-pneumatic valves, transducers, pressure switch and test points to effectively manage braking operations.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +47°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section /// 5 for functional test details.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Brake module DTC, MC/MC2/MC3, TC, and NDTC must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Brake module DTC, MC/MC2/MC3, TC, and NDTC used in the ICF Trainset (Train 18) project, this document speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the brake module DTC, MC/MC2/MC3, TC, and NDTC P/N FT0053702 - 100,101,102,103 respectively for the service and the maintenance staff

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
BCE	Brake Control Electronics
BSPP	British Standard Parallel Pipe
BP	Brake Pipe
DTC	Driving Trailer Car
EP	Electro Pneumatic
EVF	Elettro Valvola Fernatura (brake electro valve)
EVSB	Elettro Valvola Sblocco (unlock electro valve)
EVSF	Pressure release Magnet Valve
EVSOCC	Elettro Valvola Soccorso (safety electro valve)
HD	Head
HEX	Hexagonal
ICF	Integral Coach Factor
MC	Motor car
MP	Main Pipe
NDTC	
Nm	Newton Metre
P/N	Part Number
PCF	Brake Cylinder Pressure Switch
QTY	Quantity

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REF	Scheme Reference
SEC No.	Section Number
TC	Trailer Car
Assy	Assembly
BCE	Brake Control Electronics

/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1

The brake module DTC, MC/MC2/MC3, TC, and NDTC supplies the output pressure through a main relay valve, piloted by an electro-pneumatic circuitry (magnet valves and pressure transducer operated in closed loop by the BCE). In ICF Trainset (Train 18) project, the philosophy chosen is based on direct pilot. This philosophy is realised through EVF, EVSB and EVSF valves.

The brake module assembly is mounted in the underframe of the car body.

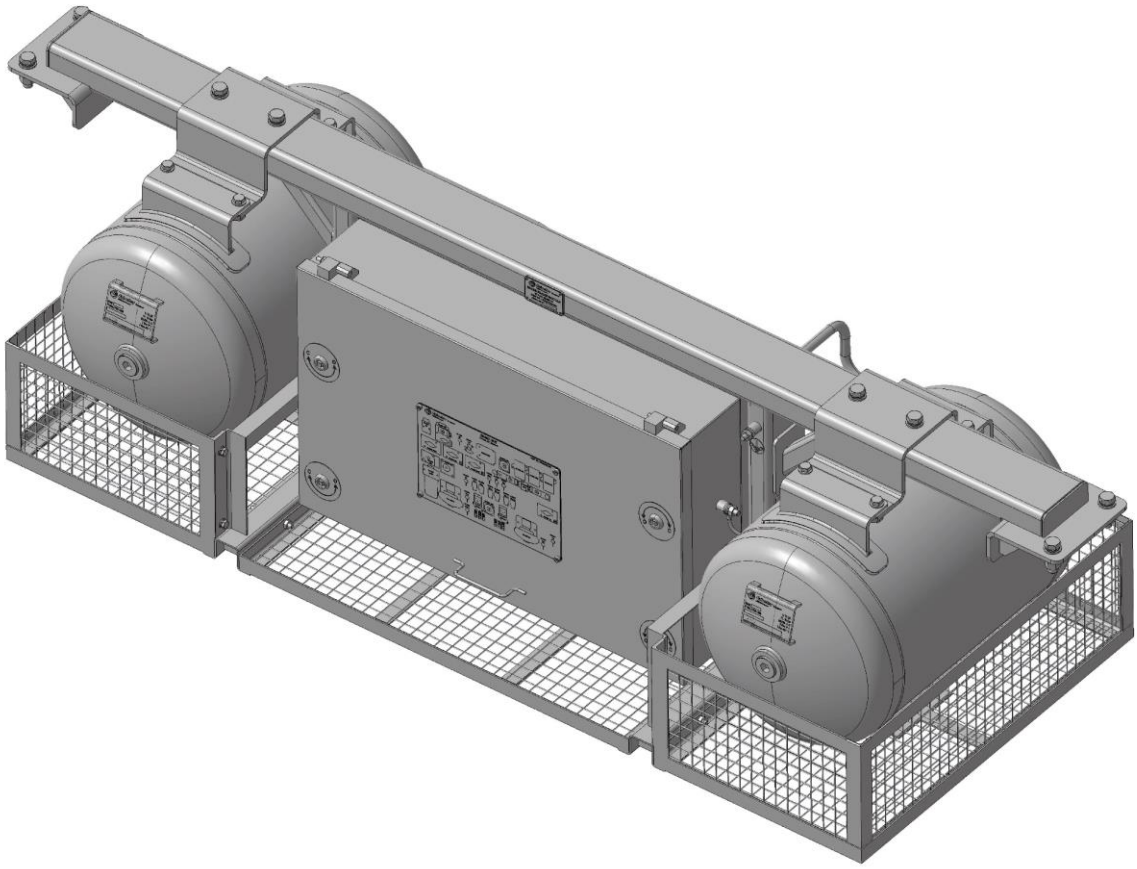

Figure 1: Brake Module DTC, MC/MC2/MC3, TC, and NDTC, Isometric View

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2.2 TECHNICAL DATA OF THE EQUIPMENT

TYPE OF CAR	P/N	MAX OPERATING PRESSURE	WORKING PRESSURE RANGE	OPERATING TEMPERATURE	WEIGHT
BRAKE MODULE - DTC	FT0053702-100	10 bar	0-10 bar	-10°C + 70°C	305 kg
BRAKE MODULE - MC, MC2, MC3	FT0053702-101				
BRAKE MODULE - TC	FT0053702-102				295 kg
BRAKE MODULE - NDTC	FT0053702-103				305 kg

The brake module DTC, MC/MC2/MC3, TC, and NDTC car are same w.r.t interface, except as shown in the below table.

COMPONENT	SCHEME REF.	BRAKE MODULE DTC	BRAKE MODULE MC, MC2, MC3	BRAKE MODULE TC	BRAKE MODULE NDTC
TEST POINT 1/4" BSPP	03.02	Available	Not available		
VARIABLE PRESSURE REGULATOR	04.35	FT0053765-102	FT0053765-103	FT0053765-104	FT0053765-105
MAIN FRAME	-	FT0053745-000	FT0053745-000	FT0053745-002	FT0053745-000

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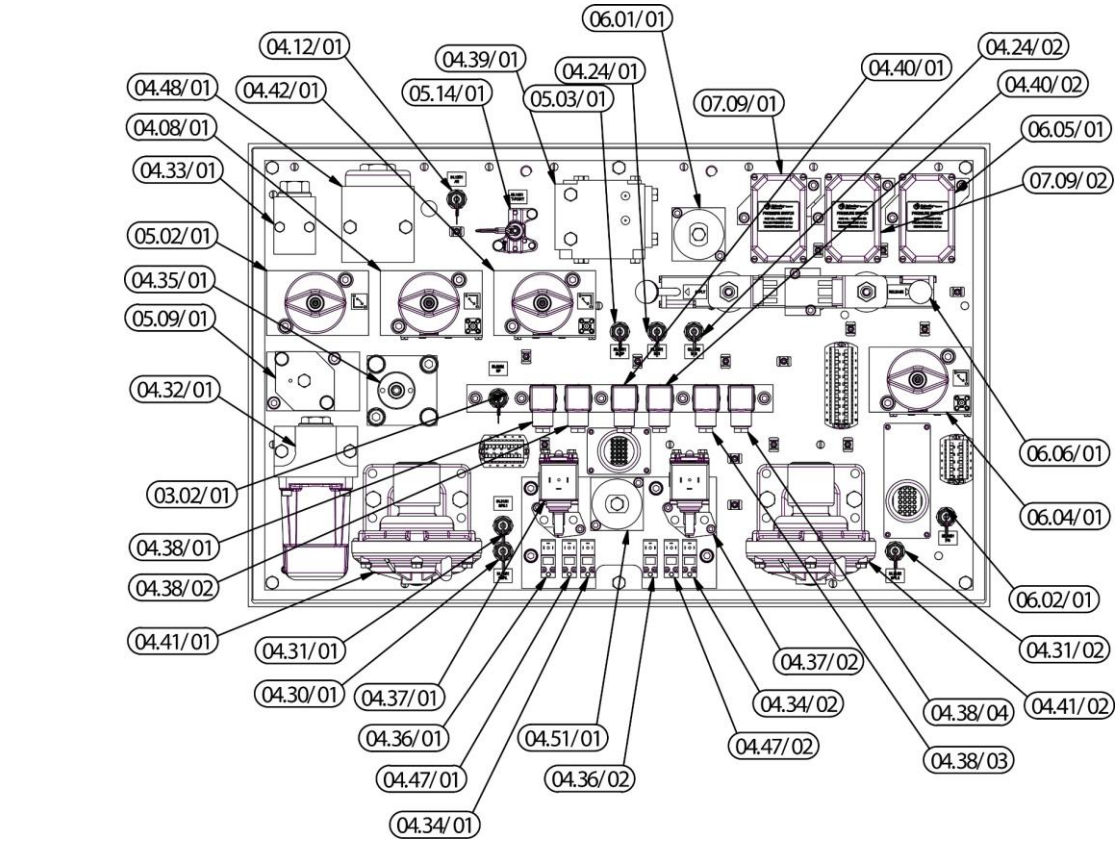
2.3 BRAKE PANEL OUTLINE VIEW AND PARTS LIST

2.3.1 BRAKE PANEL DTC



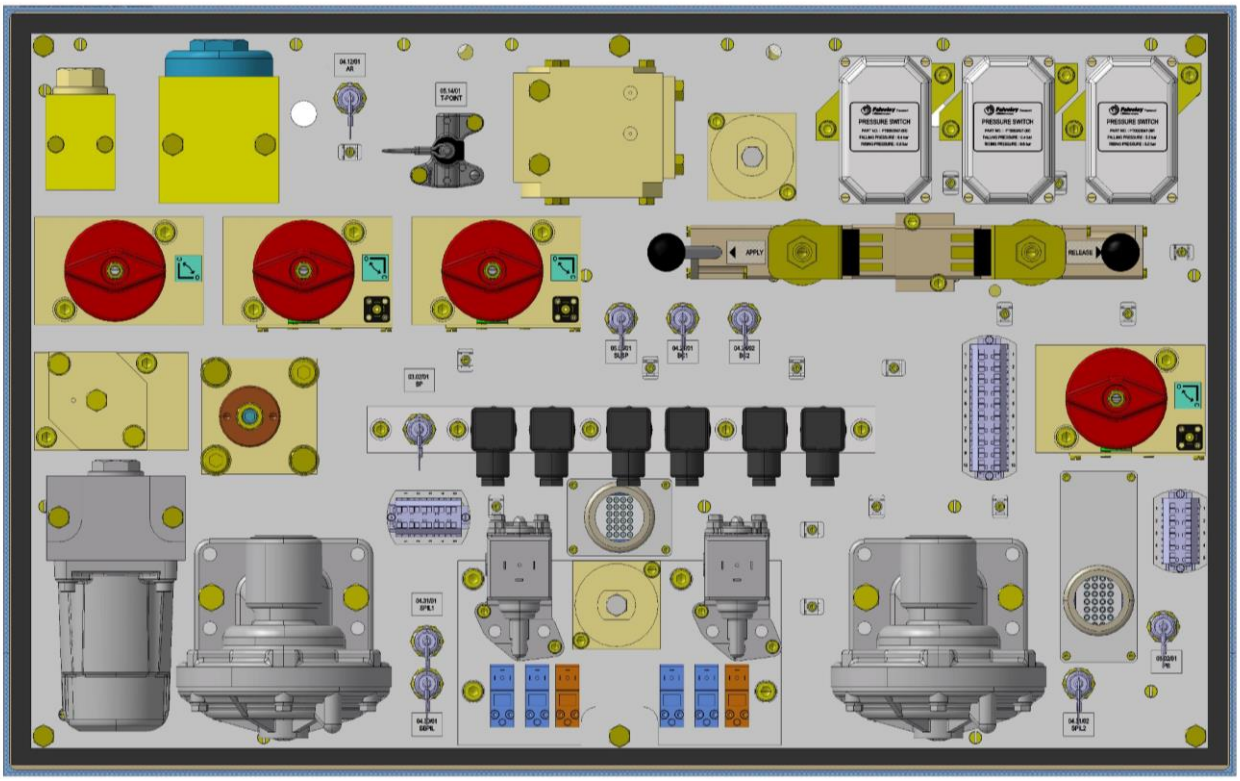


Figure 2: Front View (Cover not shown)

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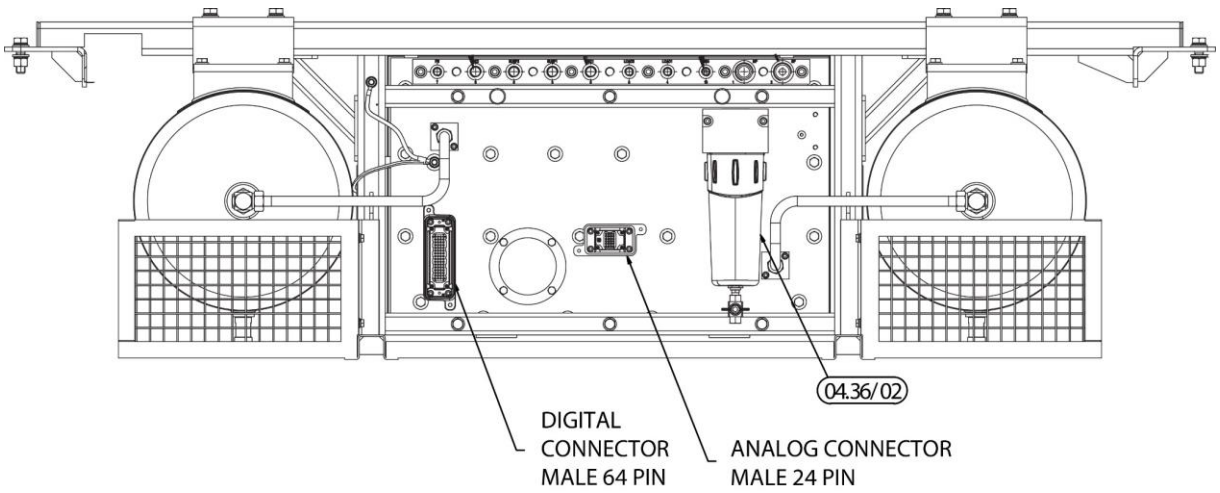

Figure 3: Rear View

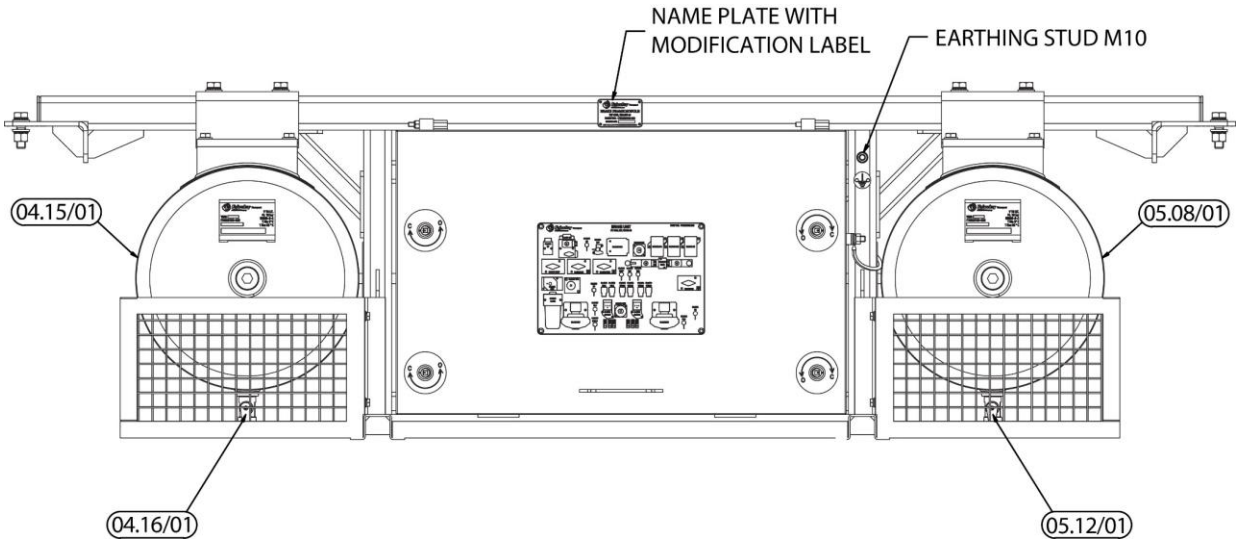

Figure 4: Front View

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BRAKE PANEL DTC – FT0053702-100			
SCHEME REF.	**NOTATION**	**DESCRIPTION**	**QTY**
03.02	-	TEST POINT 1/4" BSPP	1
04.07	-	FILTER 1"	1
04.08	RIPF	CUT-OUT COCK WITH MICRO SWITCH	1
04.12	-	TEST POINT 1/4" BSPP	1
04.15	-	RESERVOIR 70 LITRES	1
04.16	-	DRAIN COCK	1
04.24	-	TEST POINT 1/4" BSPP	2
04.30	-	TEST POINT 1/4" BSPP	1
04.31	-	TEST POINT 1/4" BSPP	2
04.32	-	N-JMR DISTRIBUTOR	1
04.33	-	CHECK VALVE 1/2"	1
04.34	EVF	EP VALVE - EVF (APPLICATION)	2
04.35	VPR	VARIABLE PRESURE REGULATOR	1
04.36	EVSF	EP VALVE – EVSF (RELEASE)	2
04.37	EVSOC	EP VALVE – EVSOCC (EMERGENCY)	2
04.38	TPIL	PRESSURE TRANSDUCER	2
04.39	-	AVERAGING RELAY VALVE	1
04.40	TPL	PRESSURE TRANSDUCER	2
04.41	-	RELAY VALVE P2K	2
04.42	RIBK	CUT-OUT COCK WITH MICRO SWITCH	1
04.47	EVSB	EP VALVE (EVSB)	2
04.48	-	CHECK VALVE 3/4"	1
04.51	-	PRESSURE REGULATOR	1
05.02	-	CUT-OUT COCK	1
05.03	-	TEST POINT 1/4" BSPP	1
05.08	-	RESERVOIR 70 LITRES	1
05.09	-	CHARGING CHECK VALVE	1
05.12	-	DRAIN COCK	1
05.14	TTP	FLANGED LOAD SIMULATION TEST POINT	1
06.01	-	PRESSURE REGULATOR	1
06.02	-	TEST POINT 1/4" BSPP	1
06.04	RIPB	CUT-OUT COCK WITH MICRO SWITCH	1
06.05	PBPS	PRESSURE SWITCH	1
06.06	EVFSA / EVFSR	LATCHED SOLENOID VALVE	1
07.09	PCF	PRESSURE SWITCH	2

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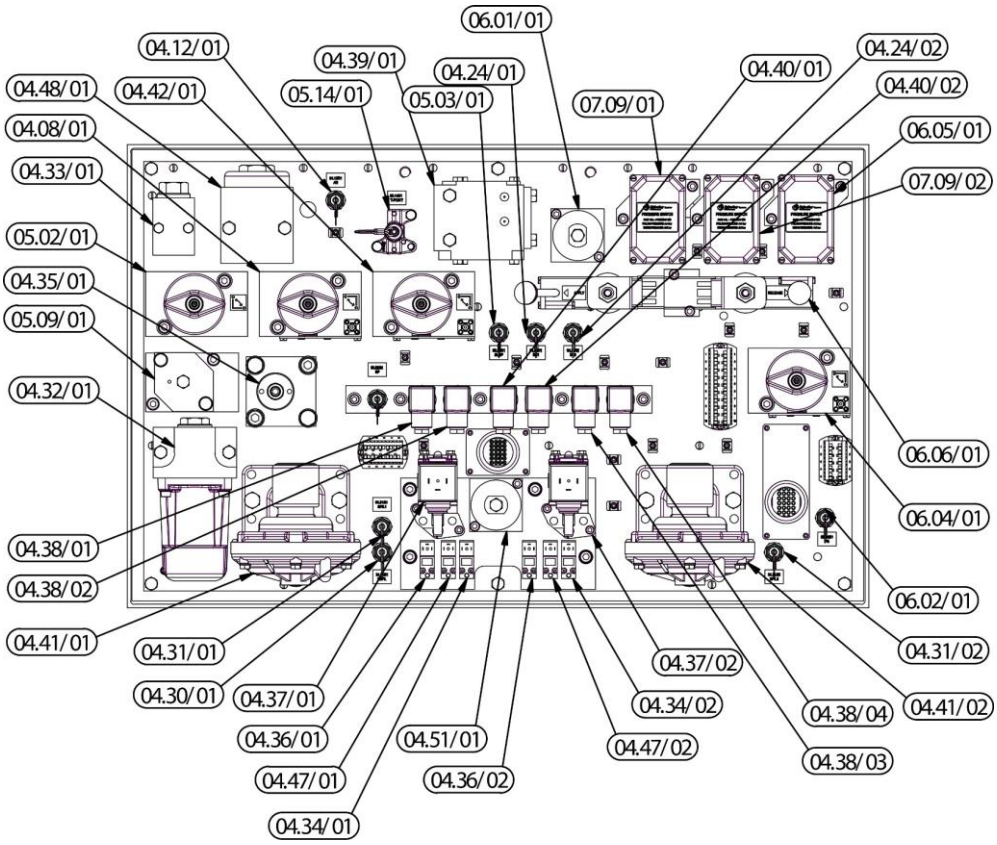
2.3.2 BRAKE PANEL MC/MC2/MC3, TC AND NDTC.



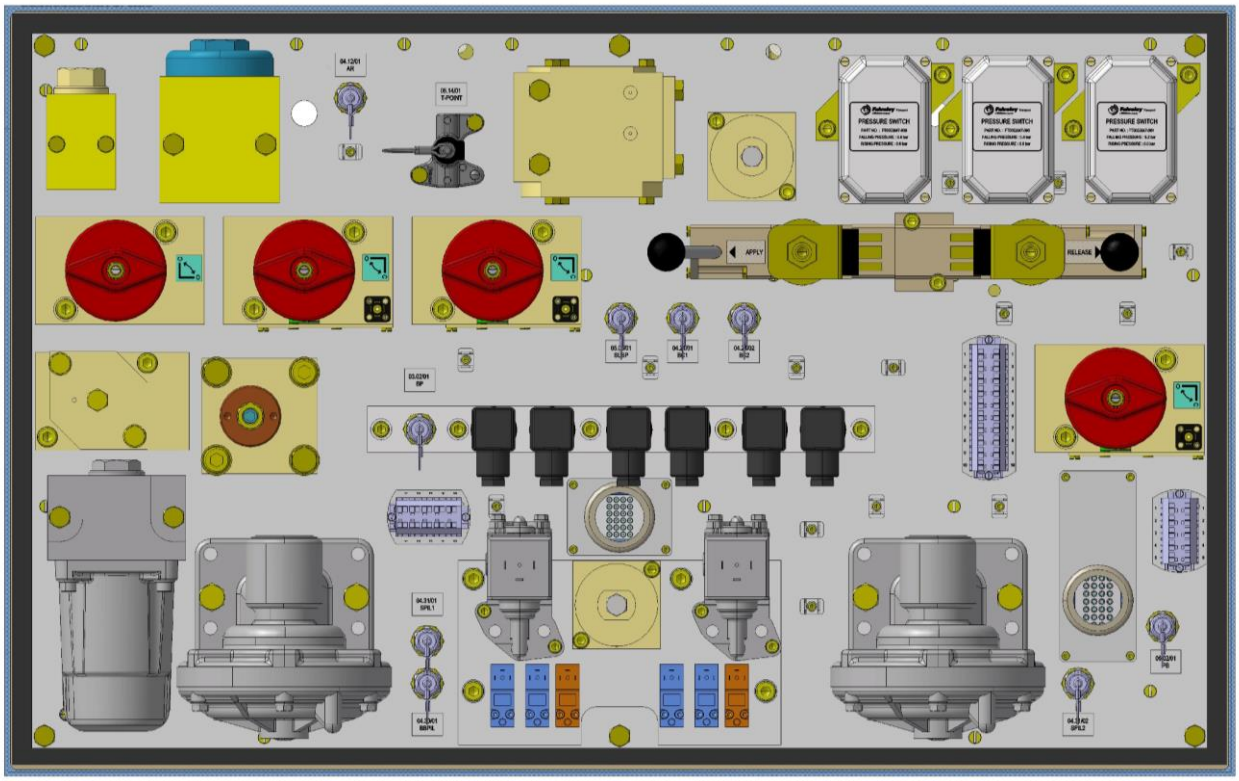


Figure 5: Front View (Cover not shown)

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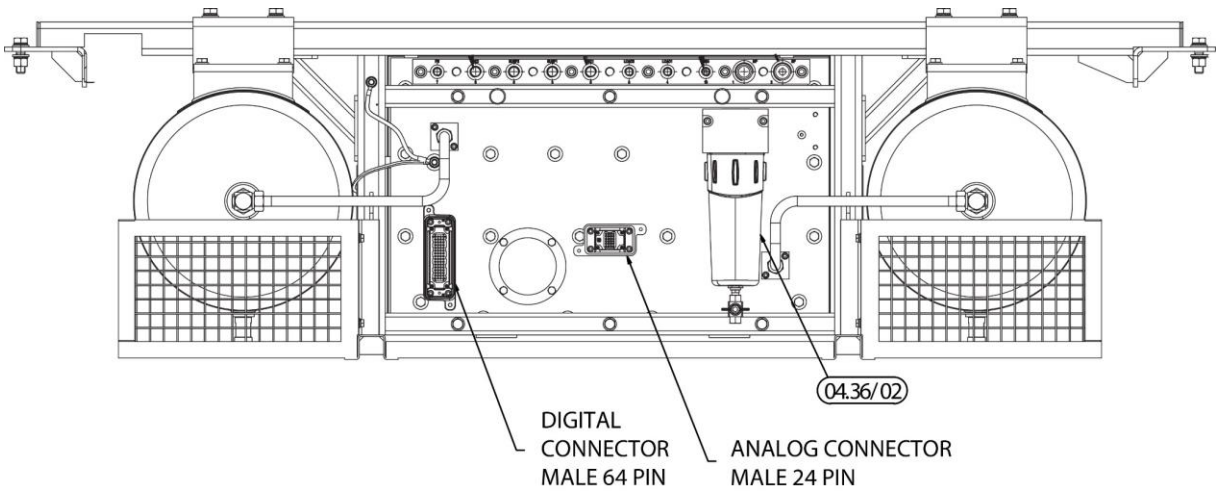

Figure 6: Rear View

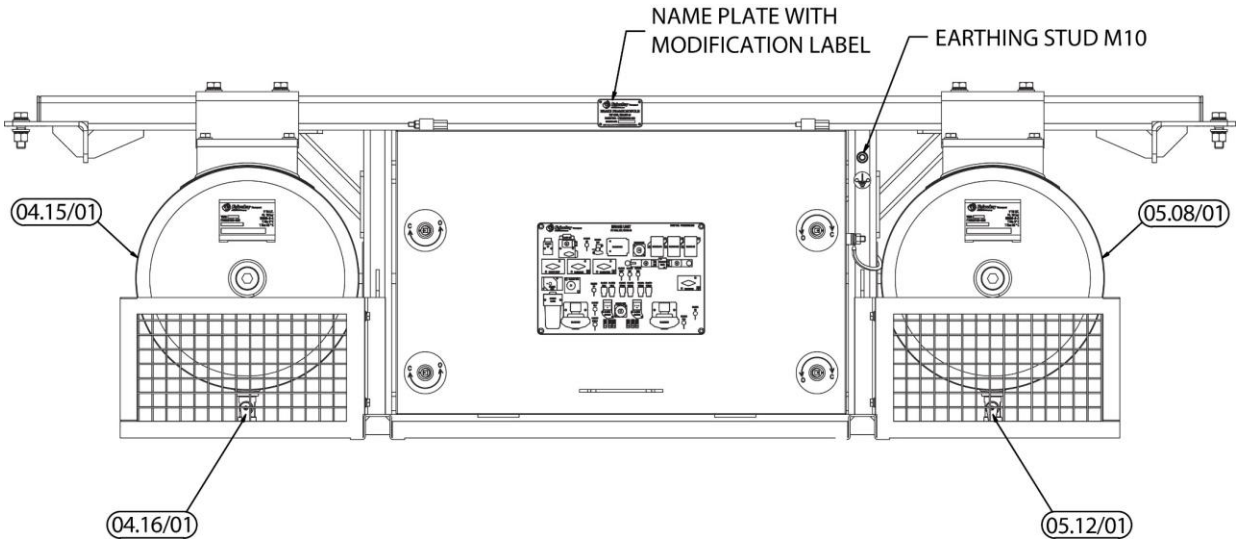

Figure 7: Front View

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BRAKE PANEL MC/MC2/MC3, TC AND NDTC – FT0053702-101, -102, -103			
SCHEME REF.	**NOTATION**	**DESCRIPTION**	**QTY**
04.07	-	FILTER 1"	1
04.08	RIPF	CUT-OUT COCK WITH MICRO SWITCH	1
04.12	-	TEST POINT 1/4" BSPP	1
04.15	-	RESERVOIR 70 LITRES	1
04.16	-	DRAIN COCK	1
04.24	-	TEST POINT 1/4" BSPP	2
04.30	-	TEST POINT 1/4" BSPP	1
04.31	-	TEST POINT 1/4" BSPP	2
04.32	-	N-JMR DISTRIBUTOR	1
04.33	-	CHECK VALVE 1/2"	1
04.34	EVF	EP VALVE (APPLICATION)	2
04.35	VPR	VARIABLE PRESURE REGULATOR	1
04.36	EVSF	EP VALVE (RELEASE)	2
04.37	EVSOC	EP VALVE (EMERGENCY)	2
04.38	TPIL	PRESSURE TRANSDUCER	2
04.39	-	AVERAGING RELAY VALVE	1
04.40	TPL	PRESSURE TRANSDUCER	2
04.41	-	RELAY VALVE P2K	2
04.42	RIBK	CUT-OUT COCK WITH MICRO SWITCH	1
04.47	EVSB	EP VALVE (EVSB)	2
04.48	-	CHECK VALVE 3/4"	1
04.51	-	PRESSURE REGULATOR	1
05.02	-	CUT-OUT COCK	1
05.03	-	TEST POINT 1/4" BSPP	1
05.08	-	RESERVOIR 70 LITRES	1
05.09	-	CHARGING CHECK VALVE	1
05.12	-	DRAIN COCK	1
05.14	TTP	FLANGED LOAD SIMULATION TEST POINT	1
06.01	-	PRESSURE REGULATOR	1
06.02	-	TEST POINT 1/4" BSPP	1
06.04	RIPB	CUT-OUT COCK WITH MICRO SWITCH	1
06.05	PBPS	PRESSURE SWITCH	1
06.06	EVFSA / EVFSR	LATCHED SOLENOID VALVE	1
07.09	PCF	PRESSURE SWITCH	2

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2.4 PNUEMATIC SCHEME

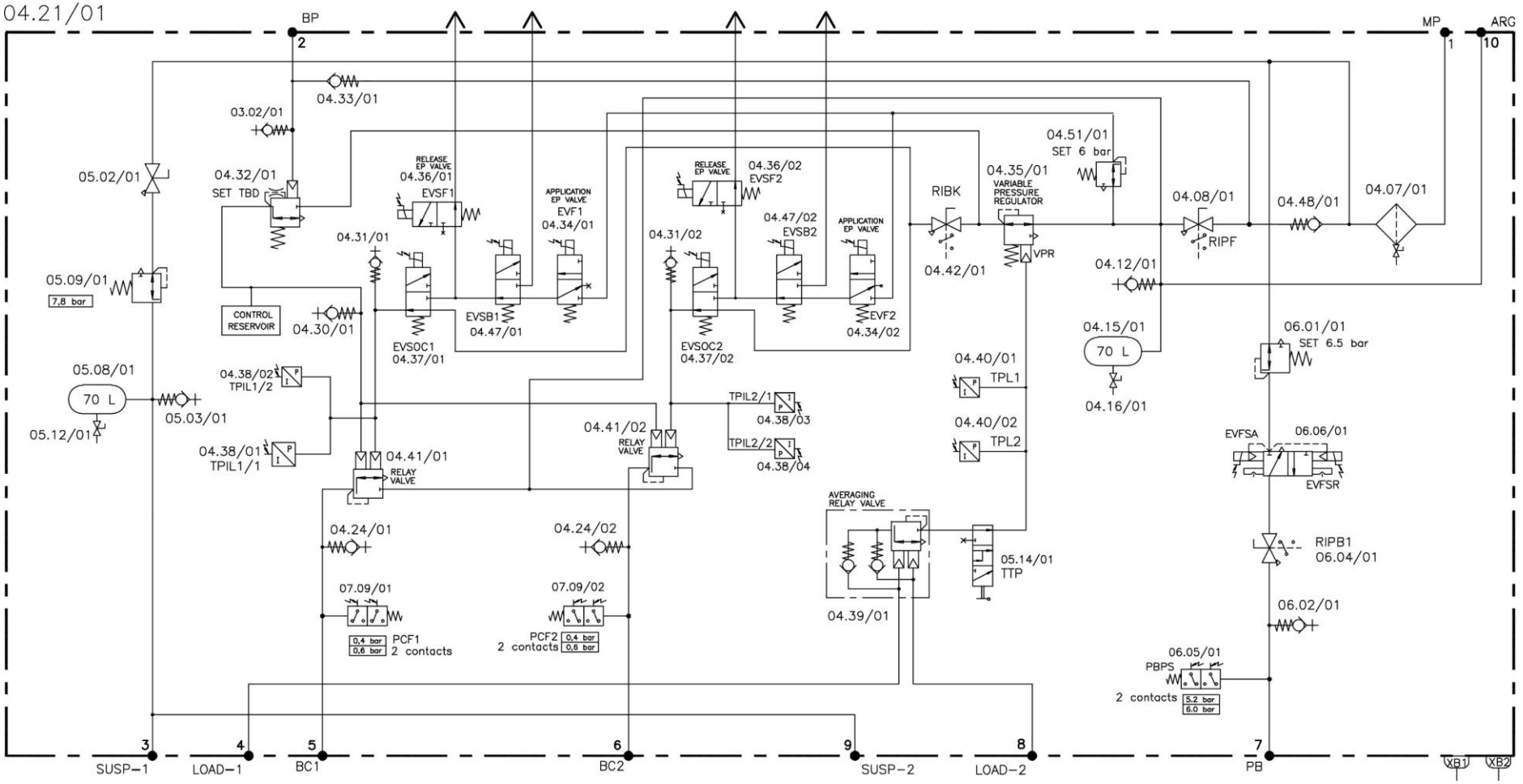

Figure 8: Brake Module DTC, Pneumatic Scheme

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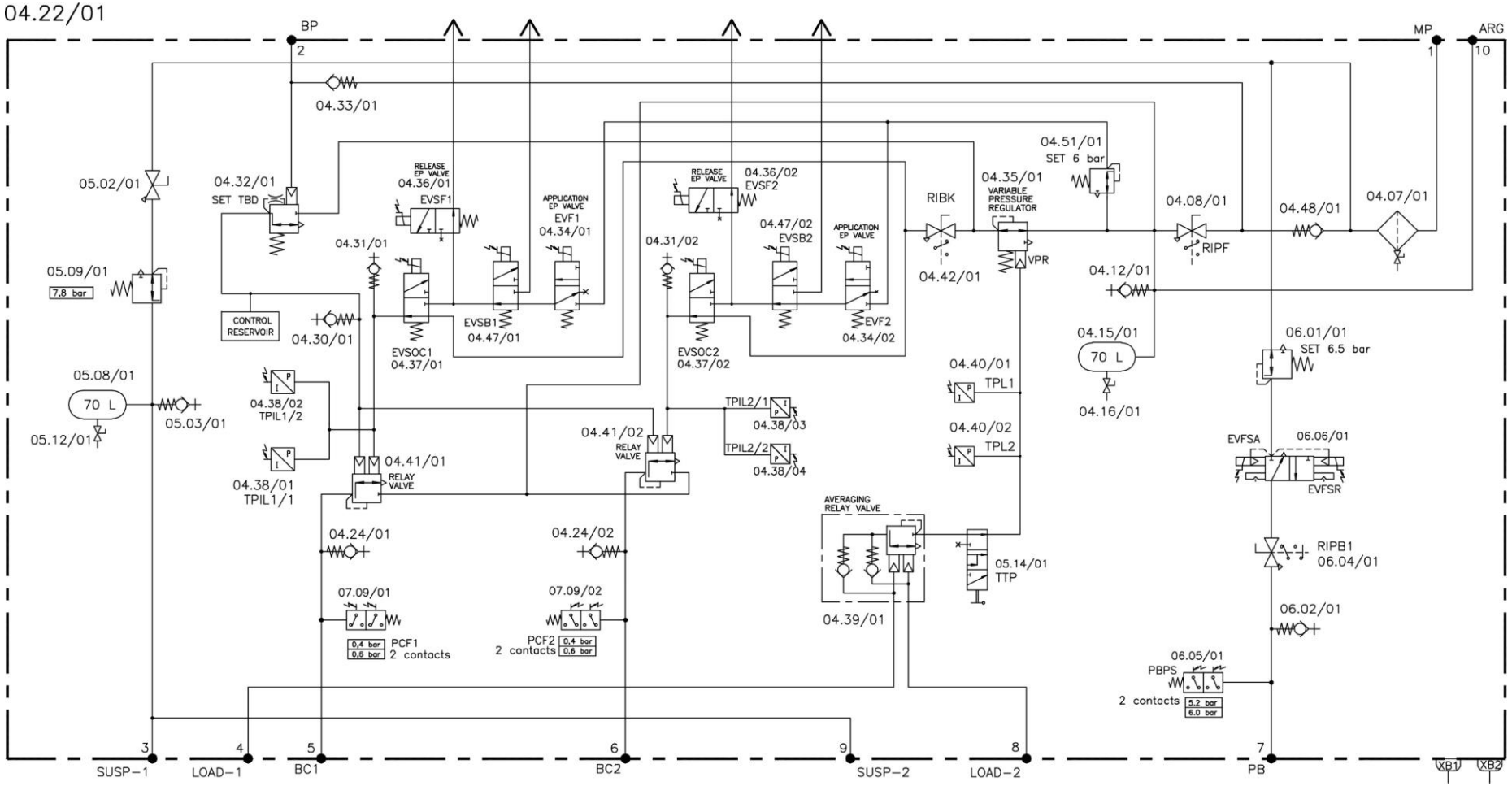

Figure 9: Brake Module MC/MC2/MC3, Pneumatic Scheme

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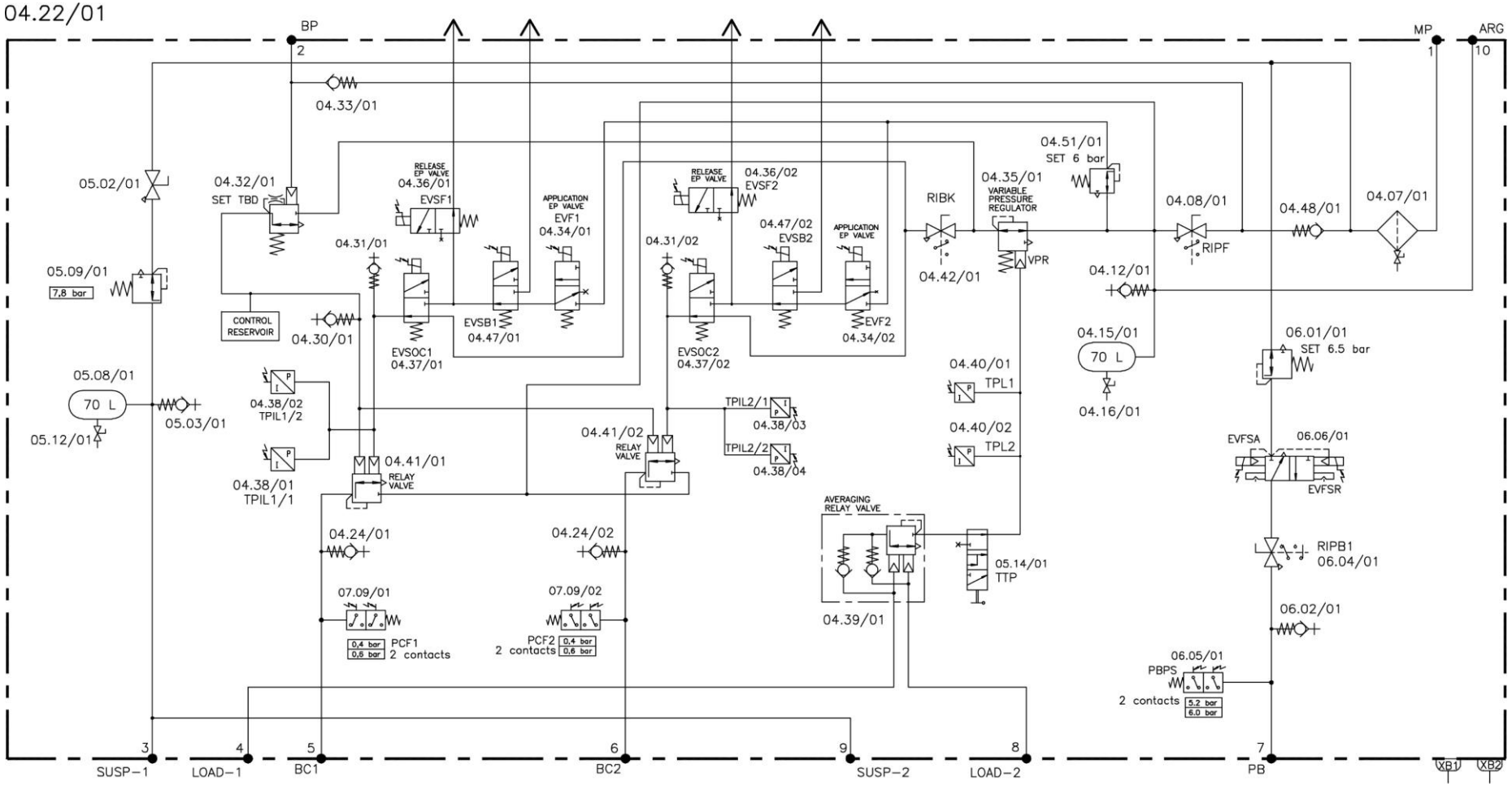

Figure 10: Brake Module TC, Pneumatic Scheme

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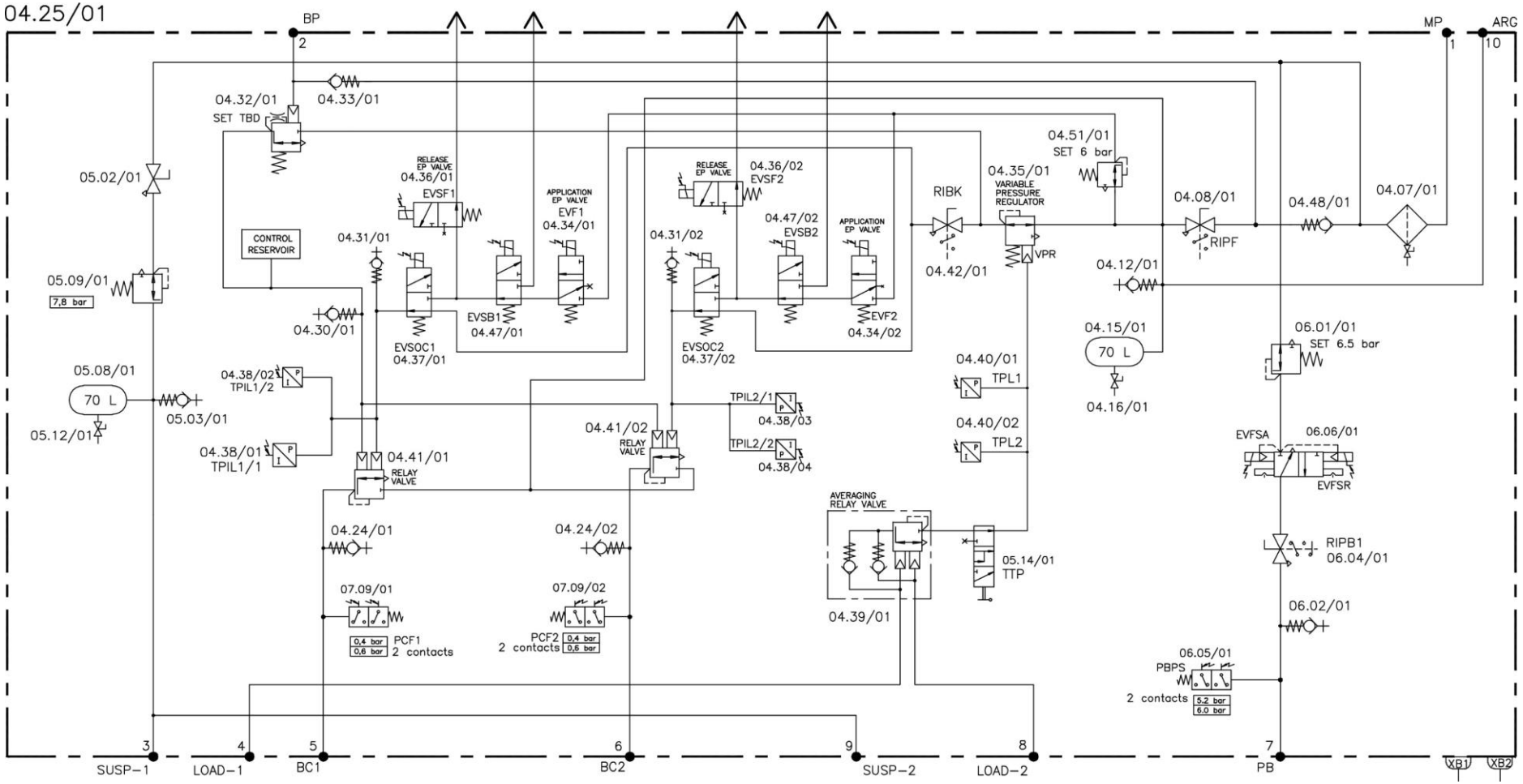

Figure 11- Brake Module NDTC, Pneumatic Scheme

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2.5 ELECTRICAL DIAGRAM

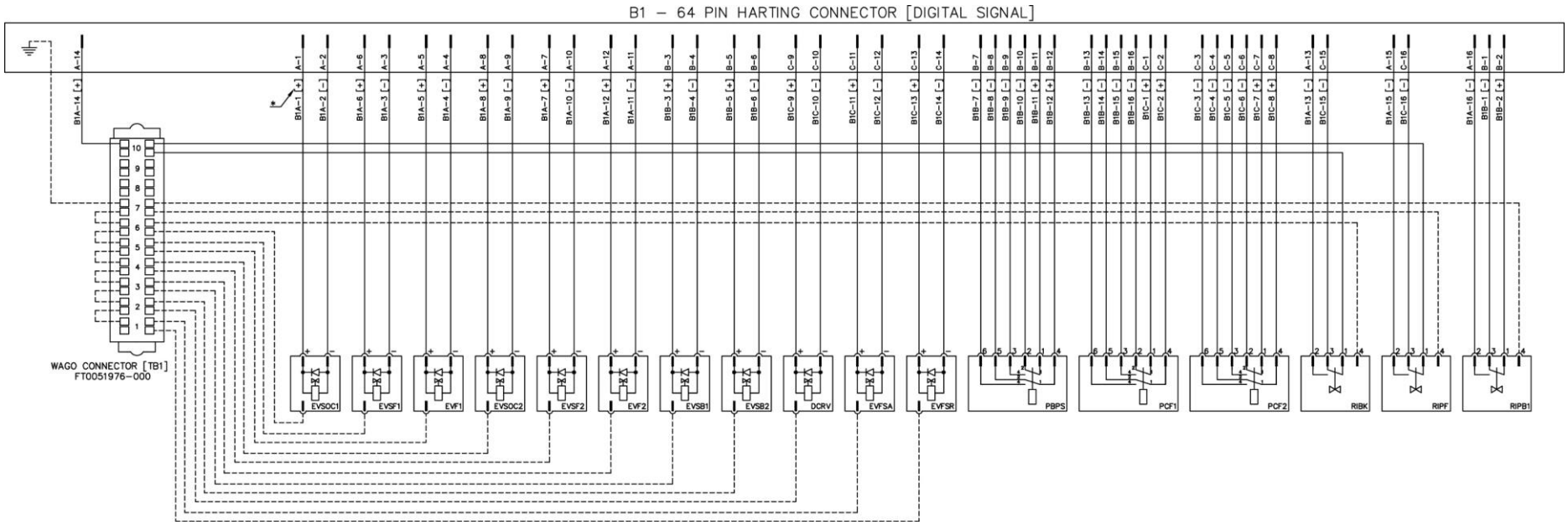

Figure 12: Brake Module DTC, MC/MC2/MC3, TC and NDTC (sheet 1 of 2)

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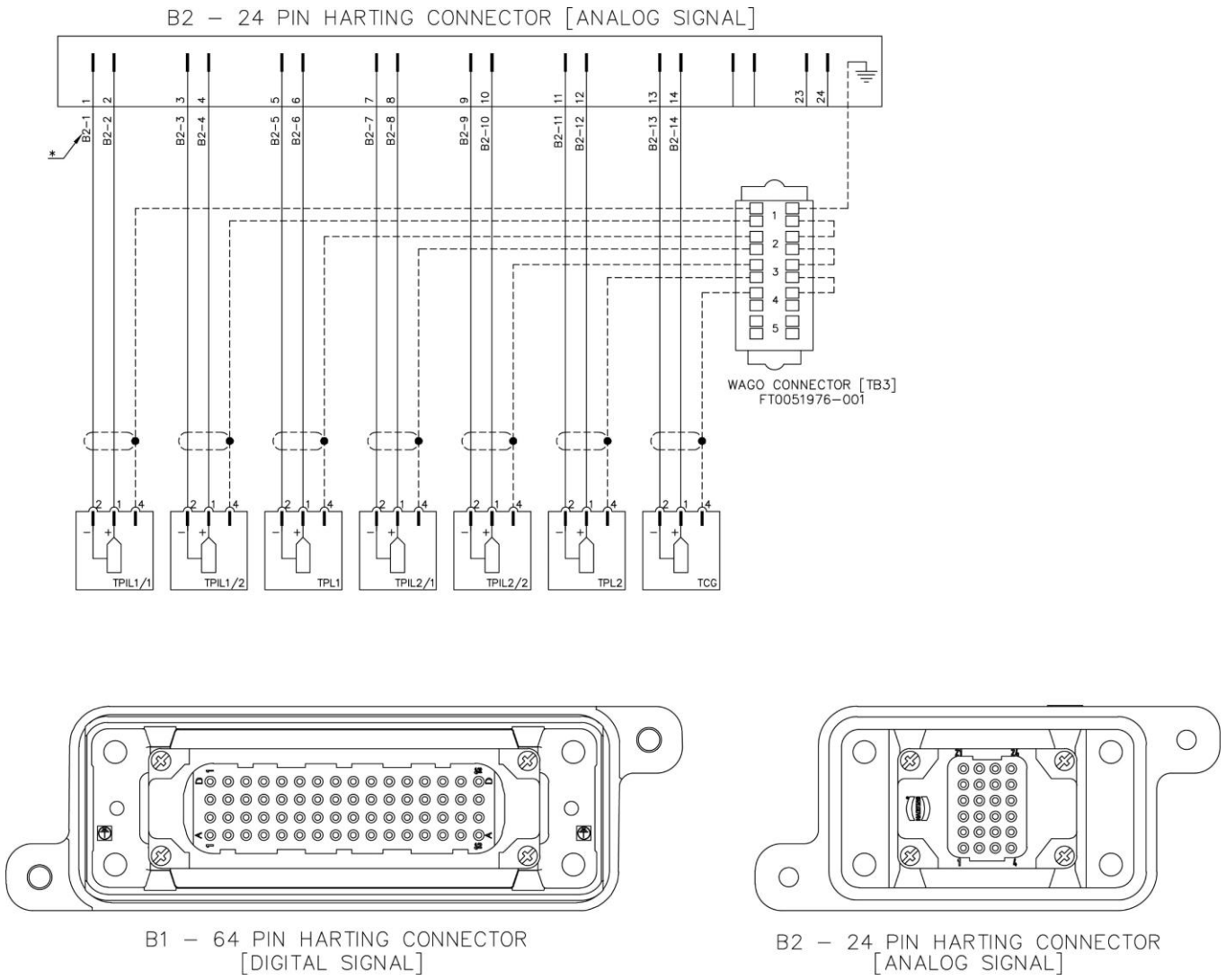

Figure 13: Brake Module DTC, MC/MC2/MC3, TC and NDTC (sheet 2 of 2)

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/// 3. OPERATIONS

The brake module is composed of a frame, a brake panel and two reservoir at a volume of 70 liters each.

The brake module is under-frame mounted. It is supplied as a ready for installation on the train with four mounting points. The reservoir is mounted as 'positive mounting' type. The front side of the brake panel is fitted with a cover, which is secured by means of locks. The components on the brake panel are mounted elegantly for better maintenance access. The concept of "All in one" is used in brake module, which means the maintenance or railway staff can access all valves at one place.

Brake panel performs the following functions

- EP Service brake application and release
- Emergency brake application and release in following conditions
    - With no suspension pressure
    - With suspension pressure
    - To crush load
- Backup brake application release

3.1 ELECTRO-PNEUMATIC SERVICE BRAKING:

The service braking is done as partial or full integration of the dynamic braking. It is composed of the following elements:

- Brake Control Unit – BCU
- EP Brake module

BCU receives and processes the brake demand.

The BCUs read also the averaged car loads measured through a load pressure transducer (04.38 and 04.40) within the brake module assembly, and then it calculates the braking force.

The friction brake force that is actuated by the electro pneumatic brake is defined by the difference between the total braking force request and the dynamic force applied by traction. The BCU will integrate, when necessary, making up the shortfall in dynamic brake with the electro pneumatic brake.

Whenever the brake demand request is received by BCU from TCMS, it will energise the pressure RELEASE (EVSF 04.36) and pressure APPLY magnet valves (EVF 04.34) simultaneously to admit regulated MP pressure into one chamber of the control port RELAY VALVE (04.41), which will move to open position to admit a larger flow rate of MP pressure into the brake cylinders. As soon as the signals from the transducer (TPL1 04.40) in the control port reaches the brake demand signal, the BCU de-energises the pressure APPLY magnet valve to lap and hold the BC pressure.

When the brake demand signal is withdrawn, either partially or fully during a brake release, the pressure RELEASE magnet valve is de-energised by BCU to vent the control pressure from control port RELAY VALVE which intern exhaust the actual BC output pressure from bogie. The transducers and the BCU work as a closed loop servo to accurately control the BC output depending upon the brake demand. As explained earlier the BC output is always load weighed.

The EMERGENCY magnet valve (04.37) is controlled by the emergency brake loop around the train and is continuously energised during normal service. Since the control pressure is supplied through VPR/LPP valve (04.35), the output pressure from the other control port relay valve is load weighed in all conditions in emergency brake.

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3.2 EMERGENCY BRAKING:

The emergency brake is a fail-safe brake with the maximum deceleration. It is caused by de-energise-to-apply EMERGENCY magnet valve (04.37)

These EMERGENCY magnet valve (04.37) are part of the train-lined emergency brake control loop. In the case of de-energizing of the emergency brake control loop all emergency brake valves are open and the air from the brake reservoirs flows directly to the RELAY VALVE (04.41) that feeds the brake cylinders, so that this brake application is purely pneumatic.

During emergency brake the brake force is limited by the variable pressure regulating valve VPR/LPP (04.35) due to the average pressure of the air spring. Under deflated air spring conditions, the emergency brake level defaults to crush (maximum preset level corresponding to crush load).

3.3 BACKUP BRAKE APPLICATION

In twin pipe brake system (MP and BP) whenever the EP brake fails the driver can able to apply the brake throughout the train by operating the drivers brake valve (01.18) provided inside drivers cabin. This backup brake module purely pneumatic braking and no EP brake involved.

To apply purely pneumatic brake driver must move the drivers brake valve handle position from HOLD to VENT. The pilot pressure of P1K relay valve (01.22) vents to atmosphere. Which inturns deplete the brake pipe pressure by venting through P1K relay valve (01.22).

Hence the drop in BP pressure will be sensed by N-JMR distributor (04.32) valve provided in each brake panel which inturns create a pilot pressure to operate P2K relay valve to generate the brake cylinder pressure to apply brake.

3.4 BRAKE MODULE ARCHITECTURE:

The brake Module is a compact equipment consisting of the magnet valves, pneumatic relays and transducers working together to achieve required functionality as required. Brake module is capable of receiving inputs from BCU or TCMS or train line wire as per the system architecture and feedback the transducer outputs

Brake module is composed of valve mounted manifold with cover, port header and mounting pads. The unit is under-frame mounted. It is supplied as a complete assembly that is ready for installation on the train with four mounting points. The front side of the unit is fitted with a cover, which is secured by means of fasteners. The components on the unit are mounted elegantly for better maintenance access.

Unit has a header fitted on the rear face of the unit with all the pneumatic ports in one line, which eases the pneumatic interface with customer. There is an electrical connector at the rear of the unit for both digital and analog signals.
Identification label is fixed on the cover replicating the components mounted inside the front face of the unit for easy identification.

The Brake Module DTC, MC/MC2/MC3, TC and NDTC car same w.r.t interface, except the setting of VPR and test point as shown in paragraph 2.2.

Compressed air is supplied to unit through port MP & air output port BC is connected to the brake cylinder. The suspension pressure from the bogie, based on weight of the bogie is supplied to unit through port LP. Ports DV-AR and DV-BC are blanked in the header for any future upgradations.

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Unit supplies the output pressure through a relay valve, piloted by an electro-pneumatic circuitry (magnet valves and pressure transducer operated in closed loop by the BCU). In this project, the philosophy chosen is based on direct pilot. This philosophy is realised through EVF (Application) and EVSF (Release) valves.

Details of components in brake module are explained below,

EVF: This magnet valve is 12 V dc driven to control charging of BC as per the command from BCU. This is of 3/2 NC type and energised during brake application.

EVSF: This magnet valve is 12 V dc driven to control release of BC as per the command of BCU. This magnet valve is of 3/2 NO type. This magnet valve is generally de-energised, it is energised during brake application and holding.

EVSB: This magnet valve is 110 V dc driven to control release of brake cylinder pressure in case of service application power failure of EVF/ EVSF magnet valves in energised condition. This is of 3/2 NO type.

EVSOC: This magnet valve is 110 V dc driven magnet valve kept generally at energised state to block the BC signal generated by LPP. This is generally connected to the safety loop of the train. In case of any failure in safety loop, this magnet valve de-energises and applies emergency brake. This is of 3/2 NO type.

Relay Valve: P2K relay valve takes two separate inputs, one from EVF magnet valve for service brake application and another from EVSOC magnet valve for emergency brake application. MP is connected to the input port of the relay valve. Based on the input signals received from magnet valves, MP is converted into BC pressure.

LPP (VPR): LPP is the limiting valve with variable pre-set values as per the BC requirements to give controlled outputs as per the inputs received from the LP port (i.e.) suspension load pressure signal.

TTP: This is a special type test point used to check the performance of the unit to the changing pressure of the suspension without loading the train with sandbags but simulating through an external pressure source.

TPIL: This is a dedicated transducer with current output of 4-20 mA for pressure ranging from 0-10 bar is used to know the BC pilot value. This transducer is equipped with internal pressure to current converter.

TPL: This is a dedicated transducer with current output of 4-20 mA for pressure ranging from 0-10 bar is used to measure the average suspension load value. This transducer is equipped with internal pressure to current converter.

RIPF: The isolation of the complete car brake control will be signaled to the train via the micro-switch provided with the cock RIPF (ref. 04.08). In this case all the brakes are isolated in the car, leading to parking brake also.

In case the emergency brake function requires to be isolated in one car, the cock with microswitch RIPF (ref. 04.08), on the brake module could perform the isolation of the service brake and of the emergency brake at car level. It is not possible to isolate at car level the emergency brake and at the same time maintaining the service brake available in those bogies.

RIBK: In case the service brake function requires to be isolated in one car, the cock with micro -switch RIBK (ref. 04.42) on the brake could perform the isolation of the service brake and emergency brake in the involved car. It is car builder responsibility to interlock RIBK signal to TCMS.

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RIPB: Isolation cock with electrical contact RIPB1 (ref 06.04) are provided inside brake panel & out of brake panel respectively, which allows to isolate the parking brake module. It is car builder responsibility to interlock RIPB signal with TCMS.

PBPS: Parking brake status can be detected by one hard-wired pressure switch PBPS (ref. 06.05). It is car builder responsibility to interlock PBPS signal with TCMS

PCF: The output pressure to brake cylinders is always monitored by a pressure switch PCF. It is car builder responsibility to interlock PCF signal with TCMS.

/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

The tools required for removal and installation of components are reported in the respective section /// 5 of this manual.

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

The consumables required for installation of components are reported in the respective section /// 5 of this manual.

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

CAUTION! To respect the maintenance prescription and intervals in order to not impair safety.

Make a functional check and a general overhaul as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.

For the controls below, it is not necessary to remove the equipment from the vehicle.

Pay attention to the following maintenance interval:

First level maintenance (Functional control)

For the controls below, it is not necessary to remove the equipment from the vehicle.

- Maintenance M1 to be performed every 3 months.
- Maintenance M2 to be performed every one year.

Second level maintenance (General overhaul)

Repair in Workshop or Replacement:

- Overhaul R1 to be performed every 6 years.
- Overhaul R2 to be performed every 12 years.

The owner can adapt this periodicity according to conditions of use, their maintenance policy and their own experiment, under their responsibility.

The maintenance schedule here proposed is based upon the best knowledge so far acquired. It must be updated / changed properly, should this necessity become evident from the service exploitation, especially where safety is concerned.

This section contains the indications of the timing and mileage for carrying out each maintenance task.

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IMPORTANT NOTES

The timing indicated both in terms of mileage and in terms of time. The one occurring first must be observed. Every task includes the tasks occurring at higher frequency.

Proposed maintenance schedule takes into account regular service condition. More severe operation and environment circumstances may require more frequent tasks.

A tolerance of +20% is admitted provided that evidence from field proves this is sustainable with no adverse effects on safety and/or reliability.

No special cleaning operations have been considered, however, depending on the installation on the vehicle, it could be necessary to remove regularly the possible deposits of dirt and debris that may affect the equipment's functionality.

Make sure that the air used to supply the system externally (e.g. through the Air Service Point Group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1, otherwise the devices will be damaged.

Important! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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BRAKE MODULE DTC, MC/MC2/MC3, TC AND NDTC

FIRST LEVEL MAINTENANCE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	M1	M2	REF./SECTION
1ST LEVEL 3 months	Filter	04.07	FT0044798-100	Periodical drain	•		FT0044798-100-E00MUM
1st LEVEL 1 year	Filter	04.07	FT0044798-100	Filter cartridge replacement		•	
	Cut-out cock with drain and micro	04.08 04.42 06.04	FT0050523-100	Functional Test		•	FT0050523-100-E00MUM
	Variable pressure regulator	04.35	FT0053765-102 FT0053765-103 FT0053765-104 FT0053765-105	Functional test and replacement of filter		•	FT0053765-100-E00MUM
	Isolating cock 3/4" vented	05.02	FT0050522-102	Functional Test		•	FT0050522-102-E00MUM
	EP valve (application) EVF	04.34	2/518056	Monitoring of magnet valve cycling to be sent to FT		•	5.3.1
	EP valve (release) EVSF	04.36	2/515811			•	
	Magnet valve type 3/2	04.37	7811200708			•	
	EP valve (EVSB)	04.47	FT0127517-127			•	
	St. Steel reservoir 70L	04.15 05.08	FT0053750-000	Visual inspection and drain		•	5.3.2
	Drain cock 1/2"	04.16 05.12	FT0051880-100	Checked during draining of reservoir		•	

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	Brake Module	04.21 04.22 04.23 04.25	FT0053702-100 FT0053702-101 FT0053702-102 FT0053702-103	Replacement of breather		●	5.3.3
	N-JMR Distributor (SET 4.5 bar)	04.32	7288351648	Functional Check		●	9171_J00
	Two control port relay valve (P2K)	04.41	7840530108	Functional Test		●	3416 N3
	Pressure regulator	04.51 06.01	FT0051995-105	Functional Test		●	FT0051995-101-E00MUM
	Charging check valve 7.8 bar set	05.09	AB746-W20/BFX	Functional Test		●	AB746-W20-E00MUM
	Pressure switch (PBPS) 5.2/6.0 bar	06.05	FT0051877-103	Functional Test		●	FT0051877-100-E00MUM
	Pressure switch assy (PCF)	07.09	FT0051877-200	Functional test on bench		●	FT0051877-100-E00MUM

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SECOND LEVEL MAINTENANCE

2. Second Level Maintenance: overhaul/replacement as scheduled in **the system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled/replaced regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	R1	R2
6 years	Check valve 3/4"	04.48	FT0051874-100	Overhaul	●	
	Cut-out cock with drain and micro	04.08 04.42 06.04	FT0050523-100	Overhaul	●	
	Check valve 1/2"	04.33	FT0051875-100	Overhaul	●	
	Variable pressure regulator	04.35	FT0053765-102 FT0053765-103 FT0053765-104 FT0053765-105	Overhaul	●	
	Isolating cock 3/4" vented	05.02	FT0050522-102	Overhaul	●	
	Ep valve (application) EVF	04.34	2/518056	Replacement	●	
	Ep valve (release) EVSF	04.36	2/515811	Replacement	●	
	Magnet valve Typ 3/2 - VE3 (Emergency) EVSOCC	04.37	7811200708	Replacement	●	
	EP valve (EVSB)	04.47	FT0127517-127	Replacement	●	
	N-JMR Distributor (SET 4.5 bar)	04.32	7288351648	Overhaul	●	
	Averaging relay valve	04.39	AB 587-T6	Overhaul	●	
	Two control port relay valve (P2K)	04.41	7840530108	Overhaul	●	
	Pressure regulator	04.51 06.01	FT0051995-105	Overhaul	●	

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	Charging check valve 7.8 bar set	05.09	AB746-W20/BFX	Replacement	•	
	Pressure switch (PBPS) 5.2/6.0 bar	06.05	FT0051877-103	Replacement	•	
	Latched solenoid valve	06.06	013006500	Overhaul	•	
	Pressure switch assy (PCF)	07.09	FT0051877-200	Replacement	•	
12 years	St. Steel reservoir 70L	05.08	FT0053750-000	Hydrostatic Test		•

NOTE: Maintenance operations must be carried out by qualified personnel in authorized workshops.

NOTE: WABTEC provides an overhauling service for its own units. WABTEC performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.
The WABTEC Service Centres have the experience and technical equipment needed for performing professional overhauls

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5.2 ACCESS TO BREAK PANEL FRONT COVER (OPENING/CLOSING)

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the electrical connector from the rear side of the unit.

Caution! Before removing any component / sub assembly from the unit, ensure that the system pressure is fully drained.

Refer to Figure 14 and Figure 15

Opening of front cover

1. Unlock the compression latch at four places to open the cover using 8 mm square key.
2. Keep cover in open condition by using holder and latch eye.

Note: Rotation angle to open compression latch is 195 deg.

3. Unplug respective DIN connectors before removing the electrical valves.

Closing of front cover

1. Ensure all the DIN connectors are fixed with respective electrical valves.
2. Secure the holder back before closing cover.
3. Lock the compression latch at four places to secure the cover using 8 mm square key.

Note: Compression latch is closed when slot is in horizontal position.

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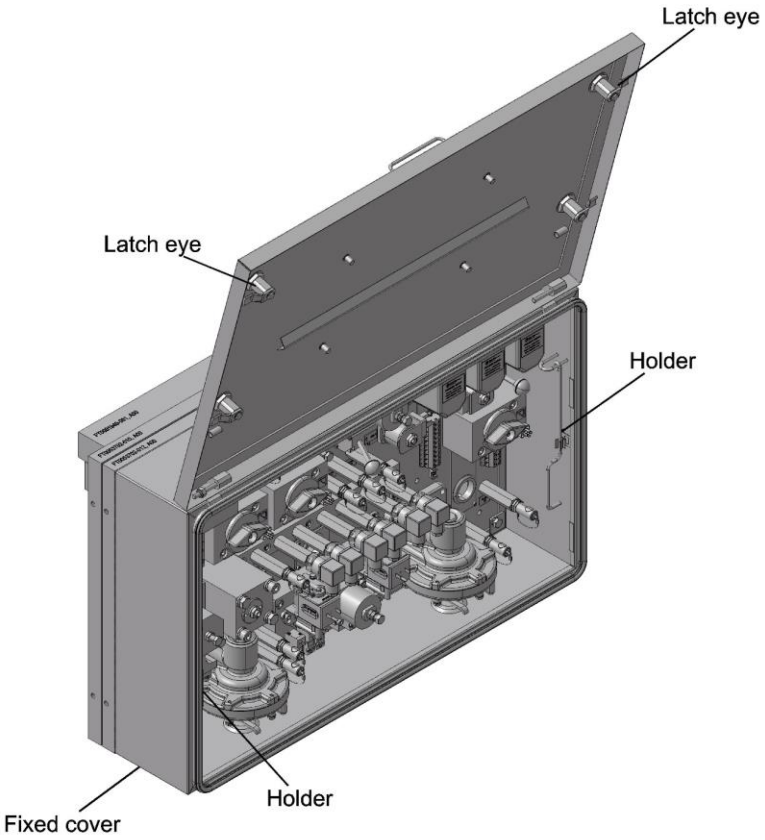

Figure 14: Brake Panel Front Cover Opening/Closing

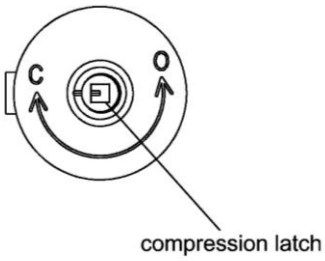

Figure 15: Compression latch

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5.3 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.3.1 MONITORING OF EP VALVE

1. The below mentioned EP valves have to be monitored.
2. The data must be shared with WABTEC on regular basis

Sl. NO.	COMPONENT	REF	P/N
1	EP valve (application) EVF	04.34	2/518056
2	EP valve (release) EVSF	04.36	2/515811
3	EP Valve - EVSOCC – VE3	04.37	7811200708
4	EP valve (EVSB)	04.47	FT0127517-127

5.3.2 RESERVOIR

VISUAL INSPECTION

Warning! When performing any test or work on devices or equipment while they are on the vehicle (on CAR TEST, etc) special precautions must be taken to ensure that vehicle movement will not occur which could result in injury to personnel and/or damage to the equipment.

Refer to Figure 16

1. Verify all the mounting hardware are secure.
2. No visual signs of damage.
3. Visually check that the welds are in perfect conditions and there are no signs of corrosion or other damages If any leaks or damage are present, replace the component.

DRAINING

CAUTION! Possible jet spray! Wear protective gloves and goggles.

WARNING! Collect the drainage waste as prescribed by the law in force, as it may contain oil.

Refer to Figure 16

1. Open the drain cock (1) in the main reservoirs and check that the MP pressure goes to 0 bar through the pressure gauges.
2. Open the drain cock (1) to discharge the reservoir (2). **DO NOT** unscrew the plug all the way out.
3. Check the drain cock (1) and reservoir (2) for any leaks as per system level procedure or damage are present, if any replace the component.
4. At the end, screw the plug.

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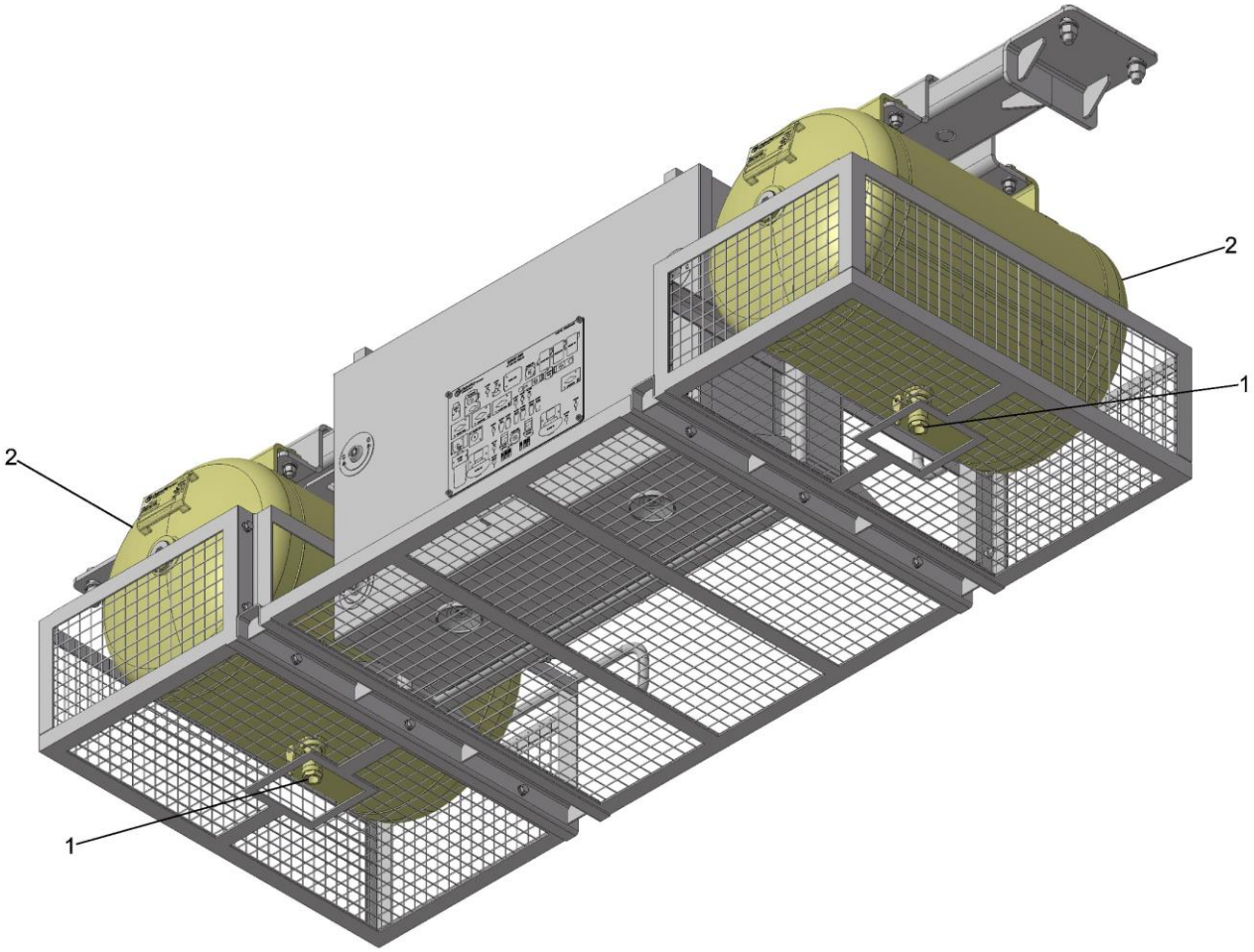

Figure 16: Visual Inspection/Draining, Reservoir

ITEM NO.	DESCRIPTION	P/N	QTY
1	DRAIN COCK 1/2"	FT0051880-100	1
2	RESERVOIR 70 LITRES	FT0053750-000	1

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5.3.3 REPLACEMENT OF BREATHER

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 7 mm socket wrench
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint
- Lint free cloth

SPARES REQUIRED

Refer to Figure 17

ITEM NO.	DESCRIPTION	P/N	QTY
3	BREATHER	FT0050252-000	2

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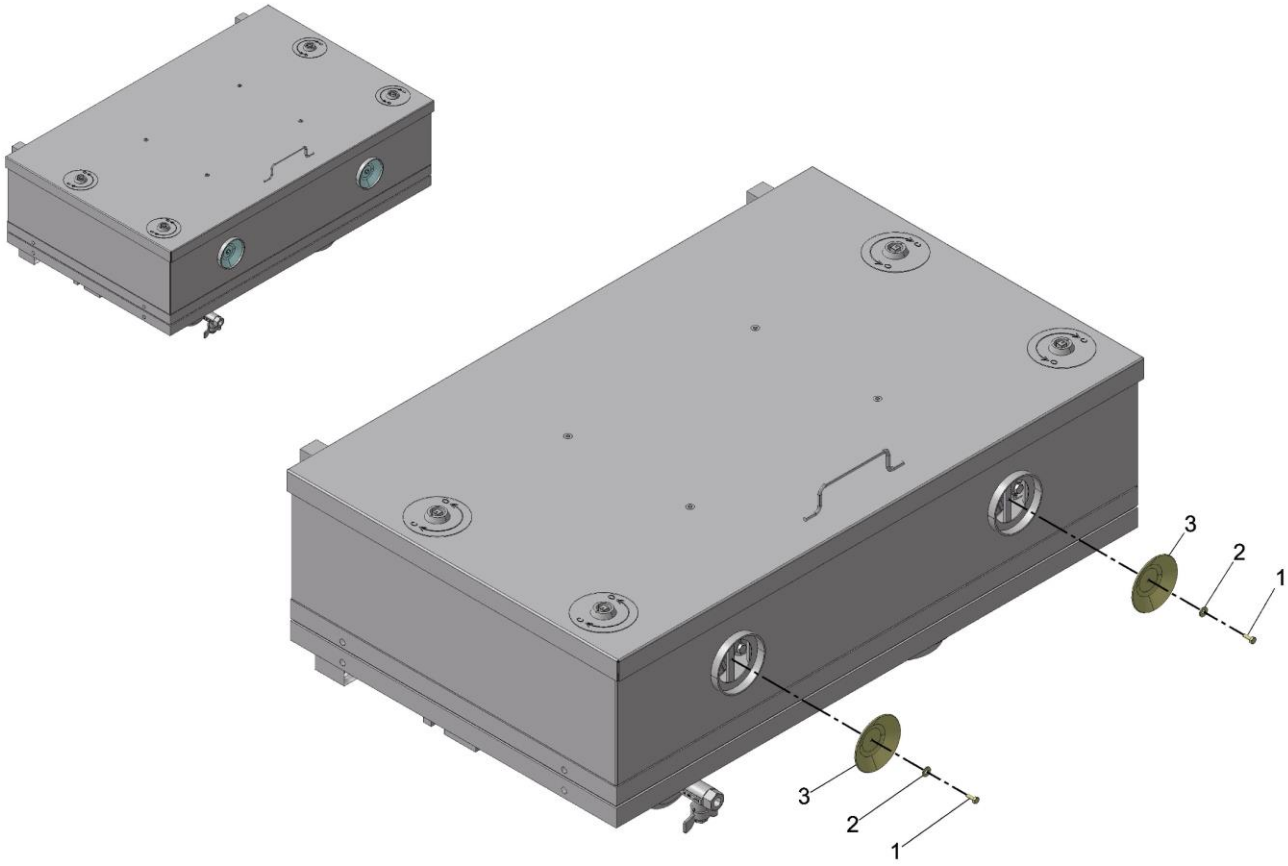

Figure 17: Replacement of Breather

REPLACEMENT OF BREATHER

Refer to Figure 17

1. Remove and **DISCRAD** the breather (3) at 2 places by unscrewing the two hex head screws (1) and two plain washers (2) using 7 mm socket wrench.
2. Clean the breather seating area and its surrounding with a lint free cloth.
3. **REPLACE** the breather (3) and assemble onto the seating area.
4. Apply Loctite 242 on thread of two hex head screws (1).
5. Tighten the two hex head screws (1) with plain washers (2) using 7 mm socket wrench
6. Torque tighten the two hex head screws (1) to 2.1 Nm.
7. Apply torque mark on the fastener head using STYLMARK paint.

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5.4 REMOVAL AND INSTALLATION PROCEDURE OF BRAKE MODULE FROM CAR

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 24mm socket wrench
- Loctite 242 or 243
- Torque wrench 211 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable.

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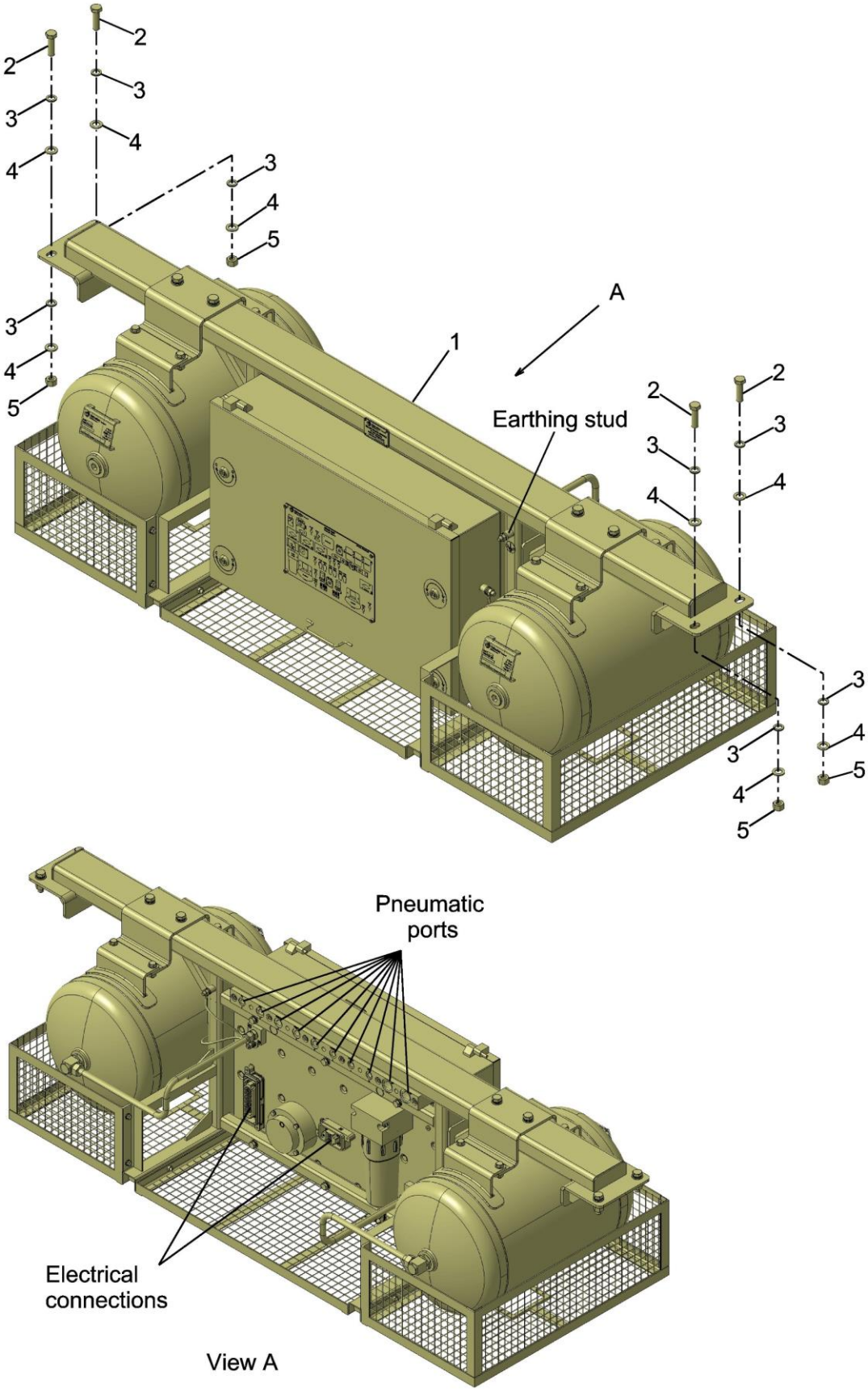

Figure 18: Removal / Installation of Brake Module

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ITEM NO.	DESCRIPTION	P/N	QTY
1	BRAKE MODULE - DTC	FT0053702-100	1
1	BRAKE MODULE - MC, MC2, MC3	FT0053702-101	1
1	BRAKE MODULE - TC	FT0053702-102	1
1	BRAKE MODULE - NDTC	FT0053702-103	1

Note: Item 2, 3, and 4 are not under the scope of Wabtec.

REMOVAL PROCEDURE BRAKE MODULE FROM CAR

Refer to Figure 18

1. Disconnect the all electrical and pneumatic connections.
2. Disconnect earthing connections by unscrewing fasteners (Not Wabtec scope of supply) using appropriate tool.
3. Lift the brake module (1) from the car using adequate lifting tool.
4. Remove the following parts that attach the Brake Module (1) to the car:
   - Four hex head bolts (2).
   - Eight nord lock washers (3).
   - Eight plain washers (4).
   - Four hexagonal nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to loosen the hex head bolts (2).

INSTALLATION PROCEDURE OF BRAKE MODULE TO CAR

Refer to Figure 18

1. Install the brake module (1) on the car using adequate lifting tool.
2. Apply Loctite 242 on threads of the four hex head bolts (2).
3. Install the following parts that secures the Brake Module (1) to the car.
   - Four hex head bolts (2).
   - Eight nord lock washers (3).
   - Eight plain washers (4).
   - Four hexagonal nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolts (2).
4. Torque tighten the four hex head bolts (2) to 211 Nm. Apply torque mark using Stylmark on it.
5. Connect earthing connections by installing fasteners (Not Wabtec scope of supply) using appropriate tool.
6. Connect the electrical and pneumatic connections.
7. Pressurize the system, switch on the electrical power and check for leakages as per the system level procedure performed during car builder's general system check.

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5.5 REMOVAL AND INSTALLATION PROCEDURE OF TEST POINTS ¼" BSPP

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 19 mm socket wrench
- Molykote M33 or M55 grease
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 19

ITEM NO.	DESCRIPTION	P/N	QTY
3	DOWTY SEAL	0018-19A	9
5	O-RINGS	013705000A	9

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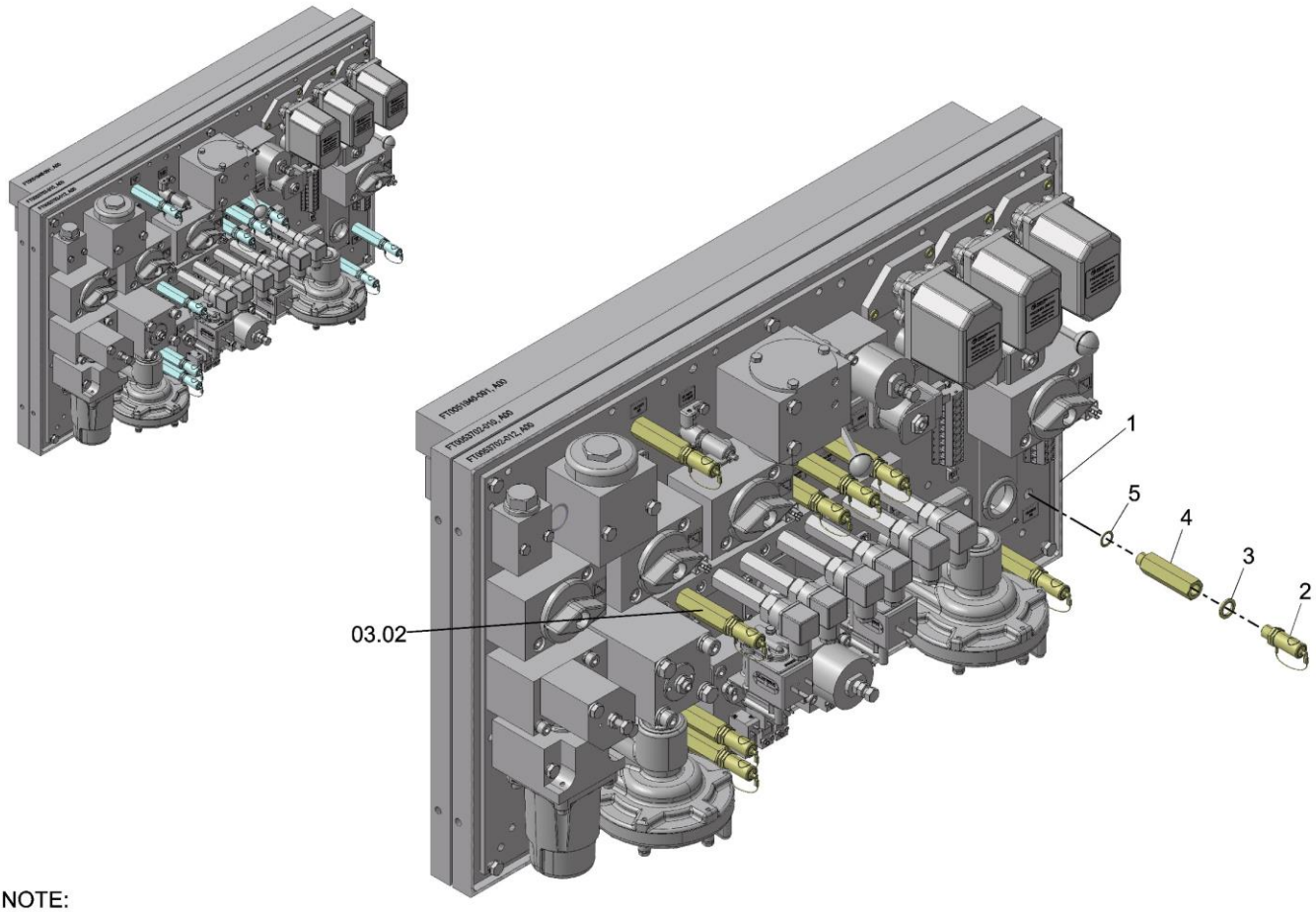

Figure 19: Removal / Installation of Test Point ¼" BSPP

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	TEST POINT ¼" BSPP	7000083008	9
3	DOWTY SEAL	0018-19A	9
4	EXT CONNECTOR	FT0051934-000	9
5	O-RINGS	013705000A	9

Note: Test point ¼" BSPP (Ref. 03.02) available only in DTC.

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REMOVAL OF TEST POINTS

Refer to Figure 19

1. Remove cover as per section 5.2.
2. Remove the following parts from the tri plate assembly (1).
   - Test point ¼" BSPP (2)
   - Dowty seal (3)
   - EXT connector (4) using 19 mm socket wrench
   - O-ring (5)
3. **DISCARD** the O-ring (5) and dowty seal (3).
4. Follow the same steps for remaining eight test points ¼" BSPP (2).

INSTALLATION OF TEST POINTS

Refer to Figure 19

1. Smear Molykote M33 grease to the **NEW** O-ring (5) and to the groove of EXT connector (4).
2. Install the **NEW** O-ring (5) to the groove portion of EXT connector (4)
3. Install **NEW** dowty seal (3) to the groove portion of test point ¼" BSPP (2).
4. Install the following parts to tri plate assembly (1).
   - EXT connector (4) using 19 mm socket wrench. Torque tighten to 23 Nm. Apply torque mark using Stylmark on it.
   - Test point ¼" BSPP (2) with adequate torque. Apply torque mark using Stylmark on it.
5. Follow the same steps for remaining eight test points ¼" BSPP (2).
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
7. Close and secure brake panel cover. Refer section 5.2

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5.6 REMOVAL AND INSTALLATION PROCEDURE OF CHECK VALVE ½”

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 10mm socket wrench
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 20

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	006701000A	2

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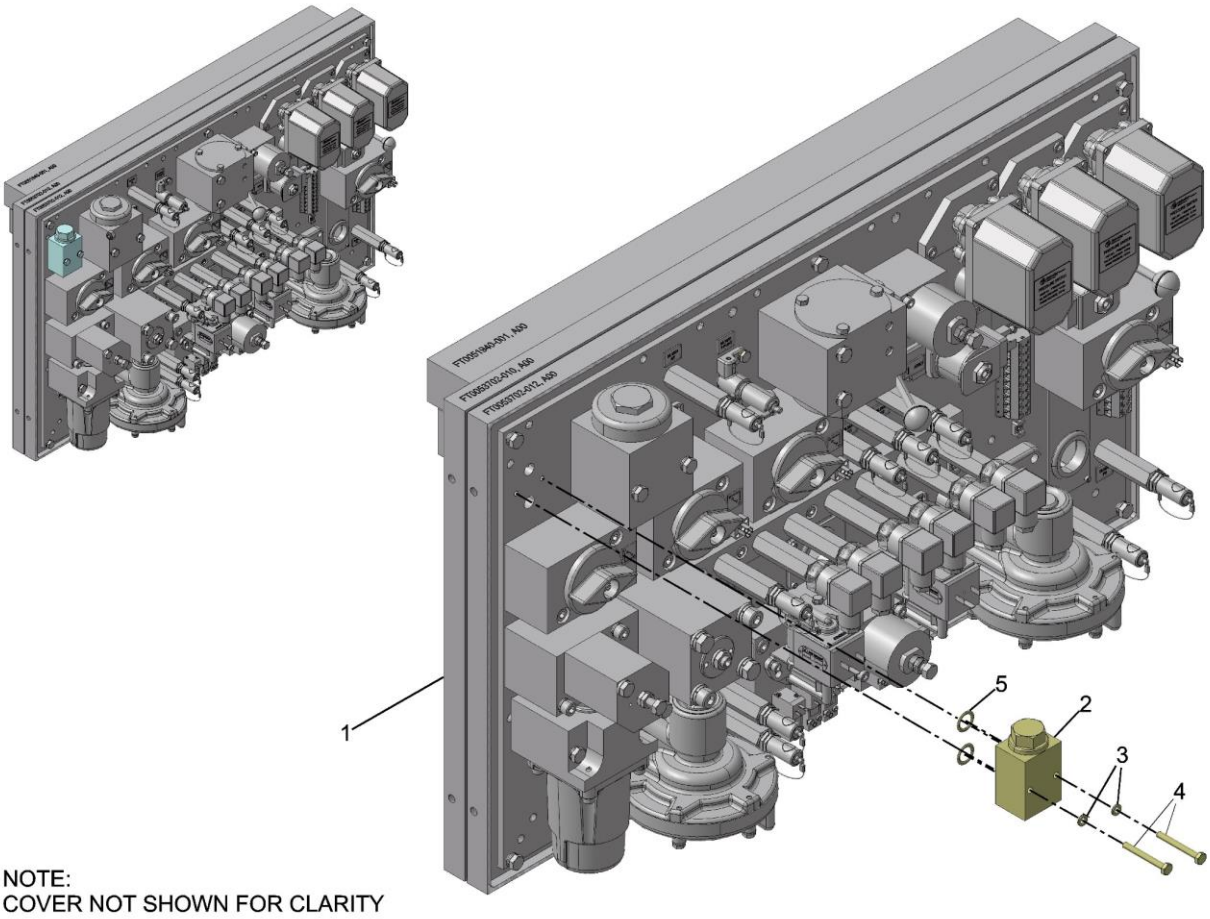

Figure 20 – Removal / Installation of Check Valve ½”

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	CHECK VALVE ½”	FT0051875-100	1
3	NORD LOCK WASHER	FT0051677-000	2
4	HEX HD BOLT M6	905019600	2
5	O-RING	006701000A	2

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REMOVAL OF CHECK VALVE ½"

Refer to Figure 20

1. Remove cover as per section 5.2
2. Remove the following parts that attach the check valve ½" (2) to the tri plate assy (1):
   - Two hex head bolts (4) using 10mm socket wrench.
   - Two nord lock washers (3).
3. Remove and **DISCARD** the two O-rings (5) from check valve ½" (2).

INSTALLATION OF CHECK VALVE ½"

Refer to Figure 20

1. Smear Molykote M33 grease to the two **NEW** O-rings (5) and to the groove portion of the check valve ½" (2).
2. Install the two **NEW** O-rings (5) to the groove portion of the check valve ½" (2).
3. Apply Loctite 242 on threads of the two hex head bolts (4).
4. Install the following parts that secures the check valve ½" (2) to the tri-plate assy (1):
   - Two hex head bolts (4) using 10mm socket wrench
   - Two nord lock washers (3)
5. Torque tighten the two hex head bolts (4) to 5.2 Nm. Apply torque mark using Stylmark on it.
6. Close and secure brake panel cover. Refer section 5.2.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
8. For further information refer device manual FT0051875-100-E00MUM

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5.7 REMOVAL AND INSTALLATION PROCEDURE OF CHECK VALVE ¾”

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 13mm socket wrench
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 21

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	006720000A	2

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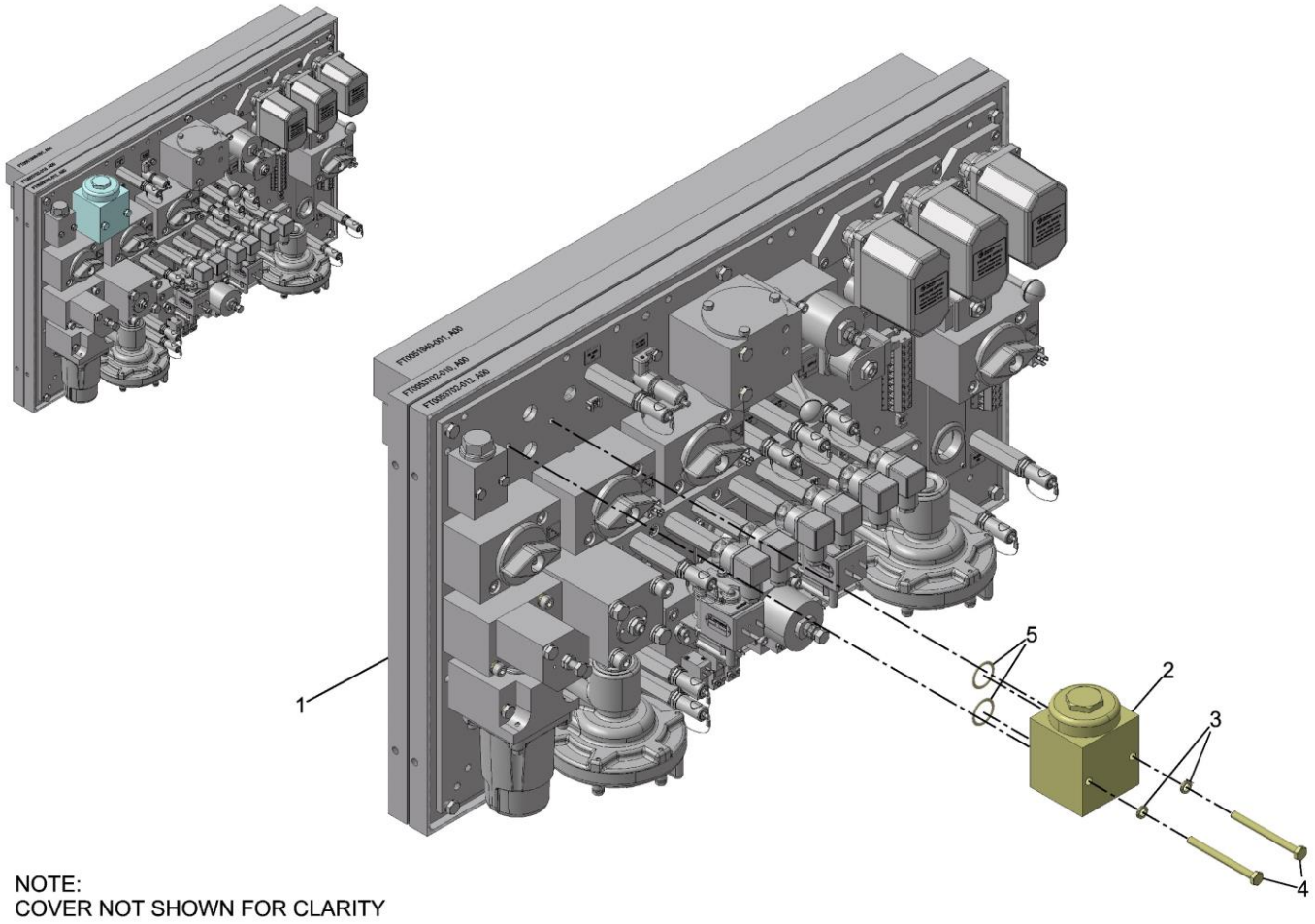

Figure 21 – Removal / Installation of Check Valve ¾”

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	CHECK VALVE ¾”	FT0051874-100	1
3	NORD LOCK WASHER	FT0051677-001	2
4	HEX HD BOLT M8	905027900	2
5	O-RING	006720000A	2

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REMOVAL OF CHECK VALVE ½"

Refer to Figure 21

1. Remove cover as per section 5.2
2. Remove the following parts that attach the check valve ¾" (2) to the tri plate assy (1):
   - Two hex head bolts (4) using 13mm socket wrench.
   - Two nord lock washers (3).
3. Remove and **DISCARD** the two O-rings (5) from check valve ¾" (2).

INSTALLATION OF CHECK VALVE ½"

Refer to Figure 21

1. Smear Molykote M33 grease to the two **NEW** O-rings (5) and to the groove portion of the check valve ¾" (2).
2. Install the two **NEW** O-rings (5) to the groove portion of the check valve ¾" (2).
3. Apply Loctite 242 on threads of the two hex head bolts (4).
4. Install the following parts that secures the check valve (2) to tri-plate assy (1):
   - Two hex head bolts (4) using 13mm socket wrench
   - Two nord lock washers (3)
5. Torque tighten the two hex head bolts (4) to 14 Nm. Apply torque mark using Stylmark on it.
6. Close and secure brake panel cover. Refer section 5.2.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
8. For further information refer device manual FT0051874-100-E00MUM.

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5.8 REMOVAL AND INSTALLATION PROCEDURE OF T-TEST POINT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 10 mm socket wrench
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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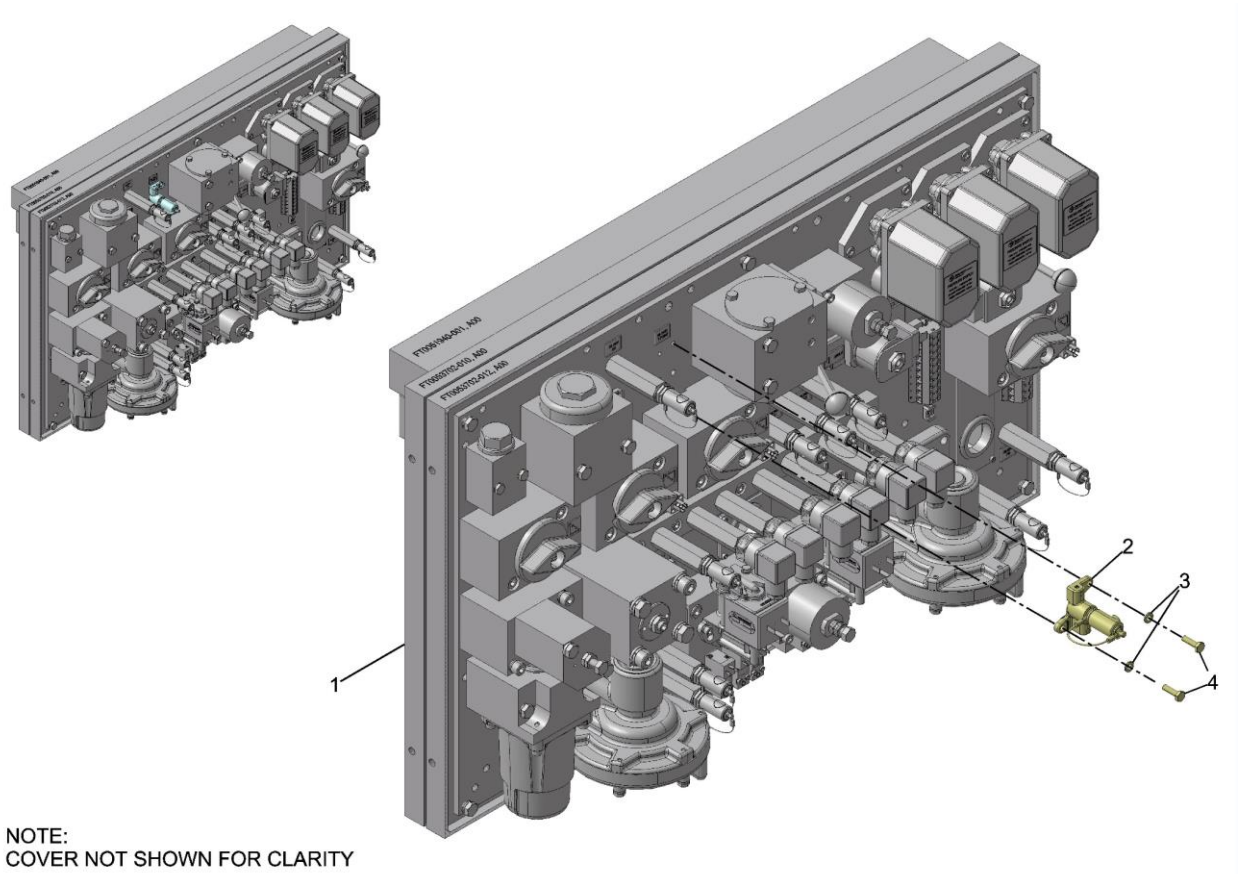

Figure 22 – Removal / Installation of T-Test Point

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	T-TEST POINT	FT0013186-000	1
3	NORD LOCK WASHER	FT0051677-000	2
4	HEX HD BOLT M6	905016000	2

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REMOVAL OF T-TEST POINT

Refer to Figure 22

1. Remove cover as per section 5.2
2. Remove the following parts that attach the T-test point (2) to tri-plate assy (1):
   - Two hex head bolt (4) using 10 mm socket wrench
   - Two nord lock washers (3)

INSTALLATION OF T-TEST POINT

Refer to Figure 22

1. Apply Loctite 242 on threads of the two hex head bolts (4).
2. Install following parts that secures the T-test point (2) to tri-plate assy (1):
   - Two hex head bolts (4) using 10 mm socket wrench.
   - Two nord lock washers (3)
3. Torque tighten the two hex head bolts (4) to 5.2 Nm. Apply torque mark using Stylmark on it.
4. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
5. Close and secure brake panel cover. Refer section 4.2.
6. For further information refer device manual FT0013186-000-F10MUM

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5.9 REMOVAL AND INSTALLATION PROCEDURE OF AVERAGING RELAY VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 13mm socket wrench
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 5 to 35 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 23

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	0015-30A	3

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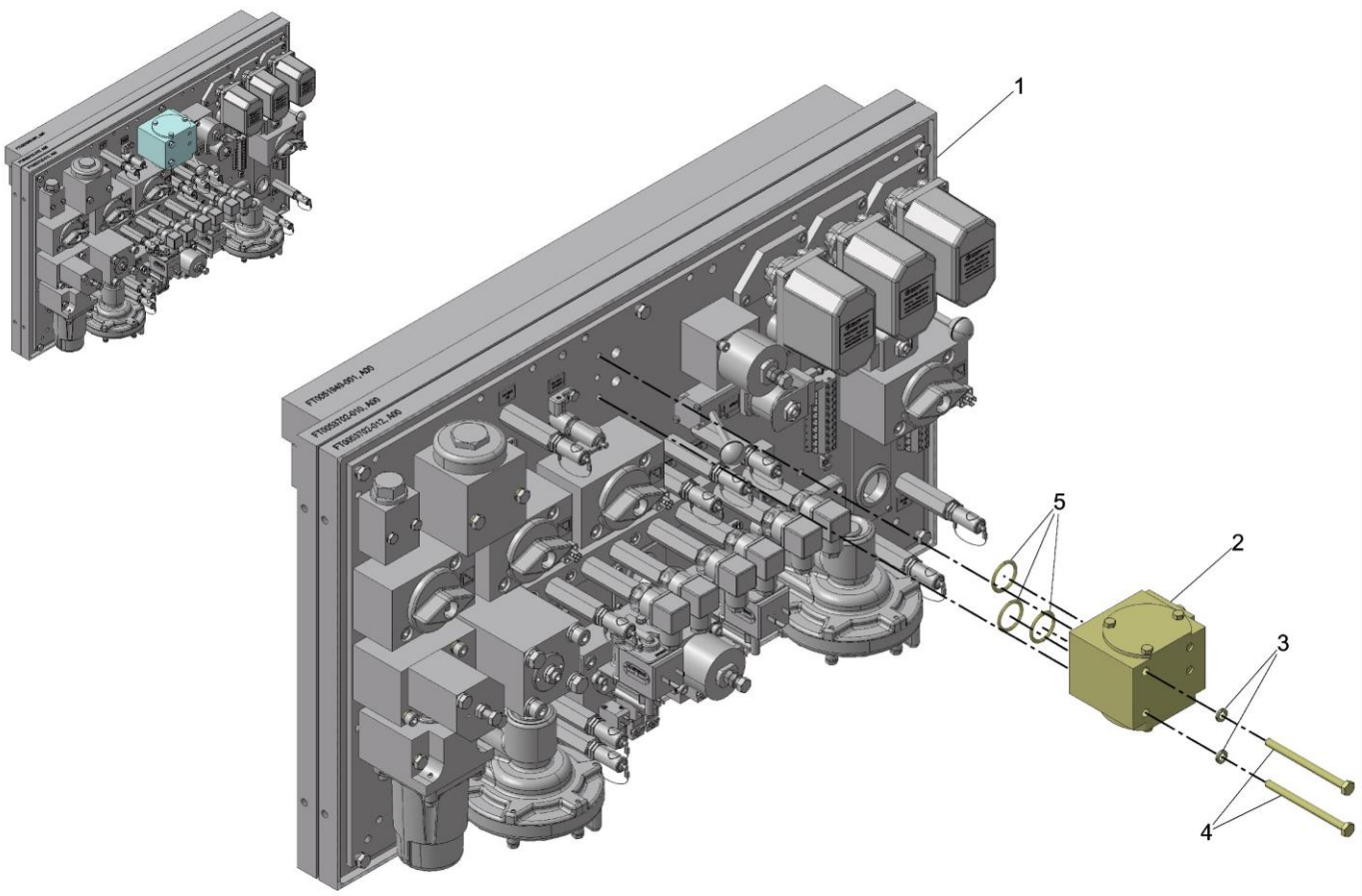

Figure 23 – Removal / Installation of Averaging Relay Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	AVERAGING RELAY VALVE	AB587-T6	1
3	NORD LOCK WASHER	FT0051677-001	2
4	HEX HD BOLT M8	905037000	2
5	O-RING	0015-30A	3

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REMOVAL OF AVERAGING RELAY VALVE

Refer to Figure 23

1. Remove cover as per section 5.2
2. Remove the following parts that attach the averaging relay valve (2) to tri-plate assy (1):
   - Two hex head bolts (4) using 13mm socket wrench
   - Two nord lock washers (3)
3. Remove and **DISCARD** the three O-rings (5) from the averaging relay valve (2).

INSTALLATION OF AVERAGING RELAY VALVE

Refer to Figure 23

1. Smear the Molykote M33 grease to the three **NEW** O-rings (5) and to the groove portion of averaging relay valve (2).
2. Place the three **NEW** O-rings (5) on the bottom face of the averaging relay valve (2).
3. Apply Loctite 242 on threads of the two hex head bolts (4).
4. Install the following parts that secures the averaging relay valve (2) to tri-plate assy (1):
   - Two hex head bolts (4) using 13mm socket wrench
   - Two nord lock washers (3)
5. Torque tighten the two hex head bolts (4) to 14 Nm. Apply torque mark using Stylmark on it.
6. Close and secure brake panel cover. Refer section 5.2.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
8. For further information refer device manual AB587-T6-E00MUM.

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5.10 REMOVAL AND INSTALLATION PROCEDURE OF LIMITING VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 5 mm allen key
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 24

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	0015-11A	2
6	O-RING	003703500A	2
7	FILTER	AB578-37A	2

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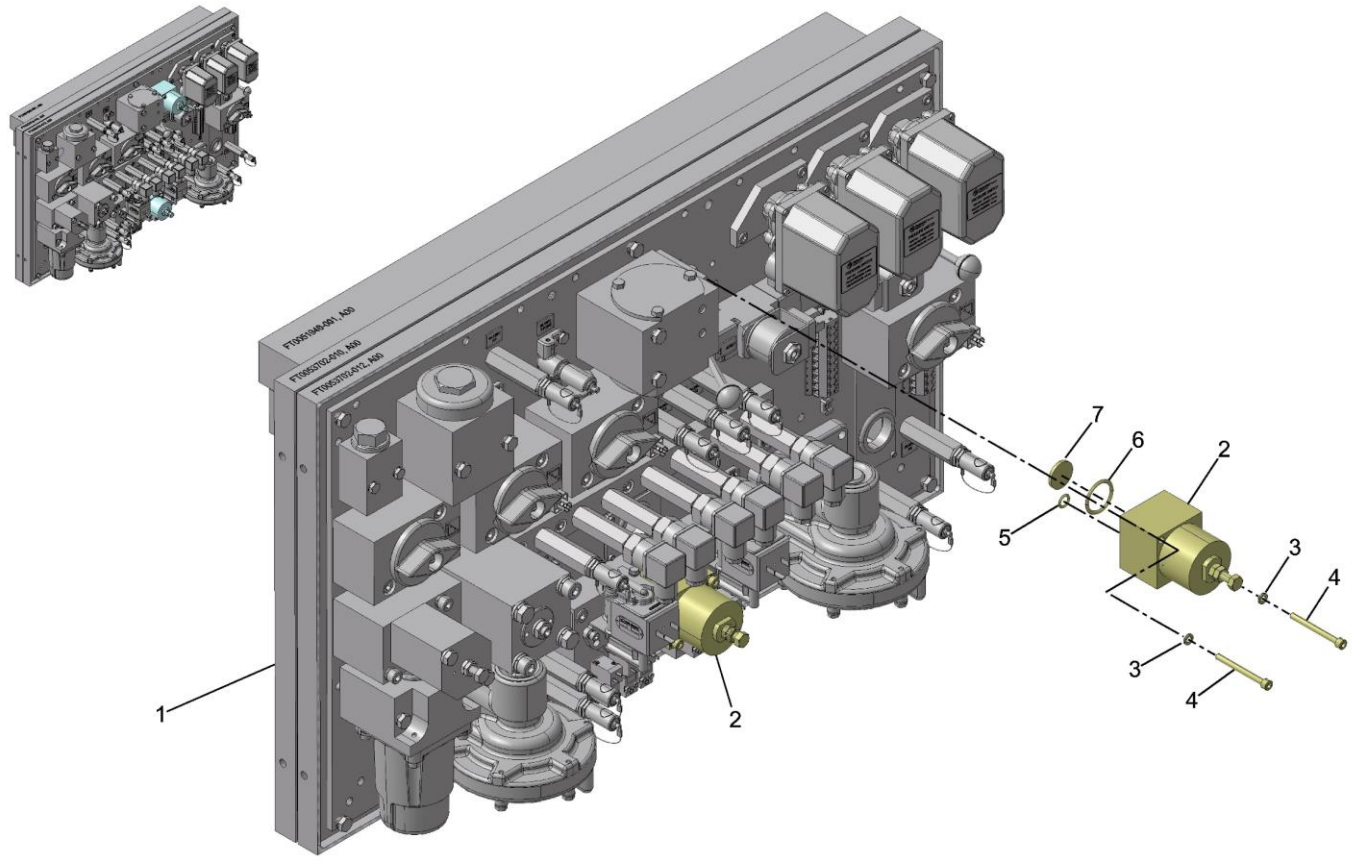

NOTE:
COVER NOT SHOWN FOR CLARITY

Figure 24 – Removal / Installation of Limiting Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	LIMITING VALVE	FT0051995-105	2
3	NORD LOCK WASHER	FT0020809-003	4
4	HEX SOCKET SCREW M6	FT0051499-004	4
5	O-RING	0015-11A	2
6	O-RING	003703500A	2
7	FILTER	AB578-37A	2

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REMOVAL OF LIMITING VALVE

Refer to Figure 24

1. Remove cover as per section 5.2
2. Remove the following parts that attach the limiting valve (2) to tri-plate assy (1):
   - Two head socket screws (4) using 5mm allen key
   - Two nord lock washers (3)
3. Remove and **DISCARD** the O-ring (5), O-ring (6) and filter (7) from the limiting valve (2).
4. Follow the same steps for second limiting valve (2)

INSTALLATION OF LIMITING VALVE

Refer to Figure 24

1. Install a **NEW** filter (7) to the limiting valve (2).
2. Smear Molykote M33 grease on **NEW** O-rings (5) and (6) and on the groove portion of the limiting valve (2).
3. Install the **NEW** O-rings (5) and (6) on the limiting valve (2).
4. Apply Loctite 242 to the threads of the two hex socket screws (4).
5. Install the following parts that secures the limiting valve (2) to tri-plate assy (1):
   - Two hex socket screws (4) using 5mm allen key
   - Two nord lock washers (3)
6. Torque tighten the two hex socket screws (4) to 5.2 Nm. Apply torque mark using Stylmark on it.
7. Follow the same steps for second limiting valve (2)
8. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
9. Close and secure brake panel cover. Refer section 5.2.
10. For further information refer device manual FT0051995-101-E00MUM.

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5.11 REMOVAL AND INSTALLATION PROCEDURE OF PRESSURE SWITCH

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 4 mm allen key
- Socket spanner
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 25

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
3	O RING	011701500A	3
5	DOWTY SEAL	0018-19A	3
7	GROMMET	034703000	3

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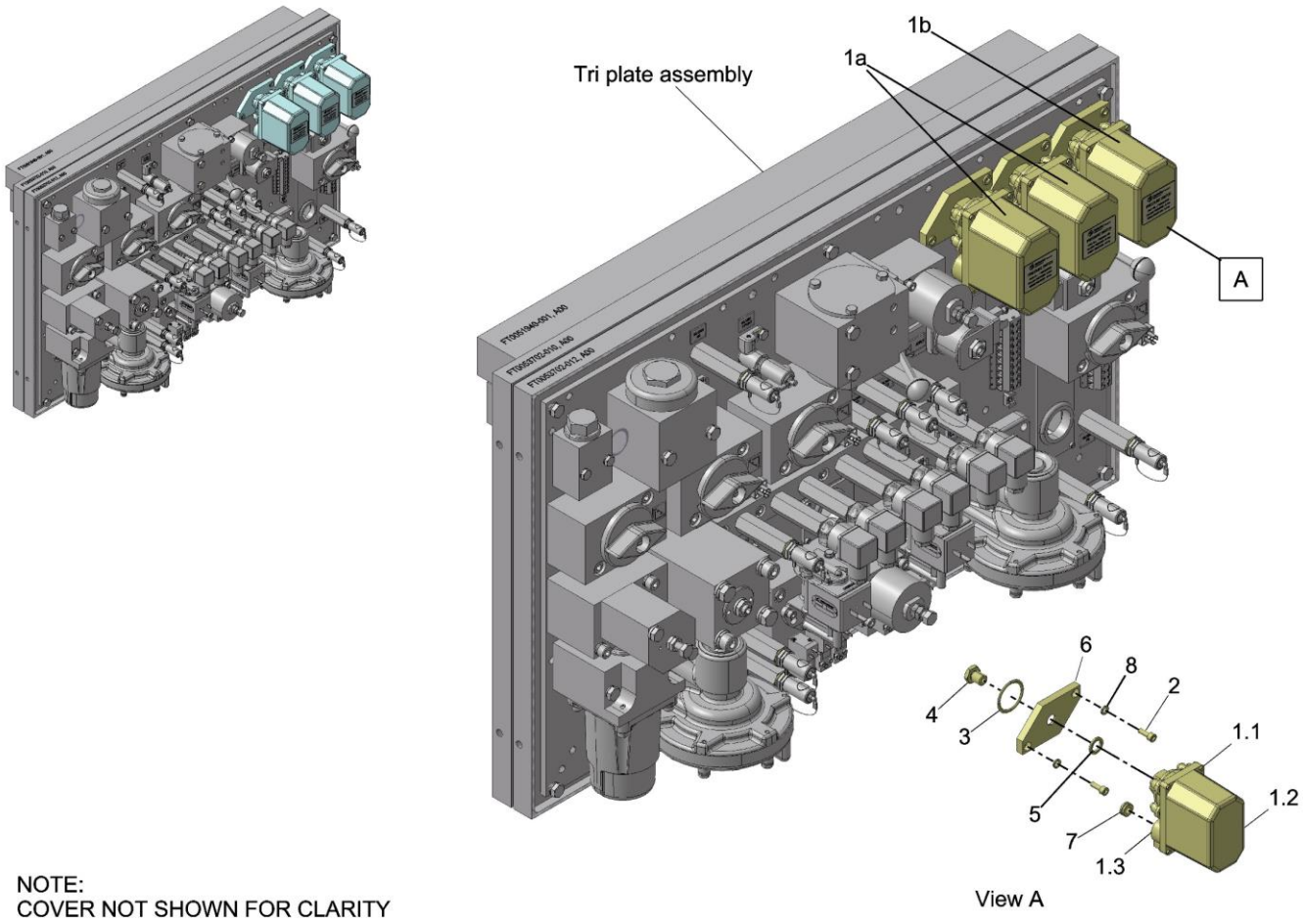

Figure 25 – Removal / Installation of Pressure Switch

ITEM NO.	DESCRIPTION	P/N	QTY
1	PRESSURE SWITCH	Refer below table	1
2	HEX SOC HD CAP SCREW M6	901021000	2
3	O RING	011701500A	3
4	ADAPTOR	FT0052875-000	1
5	DOWTY SEAL	0018-19A	3
6	MOUNTIG PLATE	FT0052871-000	1
7	GROMMET	034703000	3
8	NORD LOCK WASHERS	FT0051677-000	2

NOTE: Item 1.1 thru 1.3 are sub parts of pressure switch (Item 1).

ITEM NO.	P/N	QTY
1a	FT0051877-100	2
1b	FT0051877-103	1

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REMOVAL OF PRESSURE SWITCH

Refer to Figure 25

1. Remove cover as per section 5.2
2. Open the cover (1.2) by unscrewing the four cheese head screws (1.1) with a flat screw driver. Loosen the screws in the terminal block and pull out the electrical wires.
3. Unscrew the two hex soc head cap screws M6 (2) and nord lock washers (8) using 4 mm allen key and remove the pressure switch assy along with the mounting plate (6) from the tri plate assembly.
4. Remove and **DISCARD** the O-ring (3) from mounting plate (6).
5. Hold the pressure switch assy in the fixture
6. Unscrew the adaptor (4) using socket spanner and remove the mounting plate (6) from the body (1.3).
7. Remove and **DISCARD** the grommet (7) from the body (1.3).
8. Remove and **DISCARD** the dowty seal (5) from the body (1.3).
9. Follow the same process for remaining two pressure switches (1a).

INSTALLATION OF PRESSURE SWITCH

Refer to Figure 25

1. Place the **NEW** dowty seal (5) on the body (1.3).
2. Install the **NEW** grommet (7) on to the body (1.3).
3. Apply Loctite 242 on threads of the adaptor (4).
4. Secure the mounting plate (6) on the pressure switch assy with the adaptor (4) using the socket spanner.
5. Clean carefully the O-ring seating zone on the mating part.
6. Smear Molykote M33 grease on the **NEW** O-ring (3) and to the groove portion of mounting plate (6).
7. Install the **NEW** O-ring (3) onto the groove of mounting plate (6).
8. Apply Loctite 242 on threads of the two hex soc head cap screws M6 (2).
9. Secure the whole pressure switch assy back on to the tri plate assembly with the two M6 screws (2) using 4mm allen key.
10. Torque tighten the two hex socket head cap screws (2) to 5.2 Nm. Apply torque mark using Stylmark on the two M6 screws (2).
11. Connect electrical wires back to the pressure switch and tighten the screws.
12. Apply Loctite 242 on threads of the four cheese head screws (1.1).
13. Secure the cover (1.2) to the pressure switch with the four cheese head screws (1.1) using flat screw driver.
14. Follow the same steps for remaining two pressure switches (1a)
15. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check. Verify the correct electrical functionality by checking the operation of the on-board equipment
16. Close and secure brake panel cover. Refer section 5.2.
17. For further information refer device manual FT0051877-100-E00MUM.

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5.12 REMOVAL AND INSTALLATION PROCEDURE OF CUT-OUT COCK WITH MICRO SWITCH

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Screw driver
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 26

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	006720000A	8

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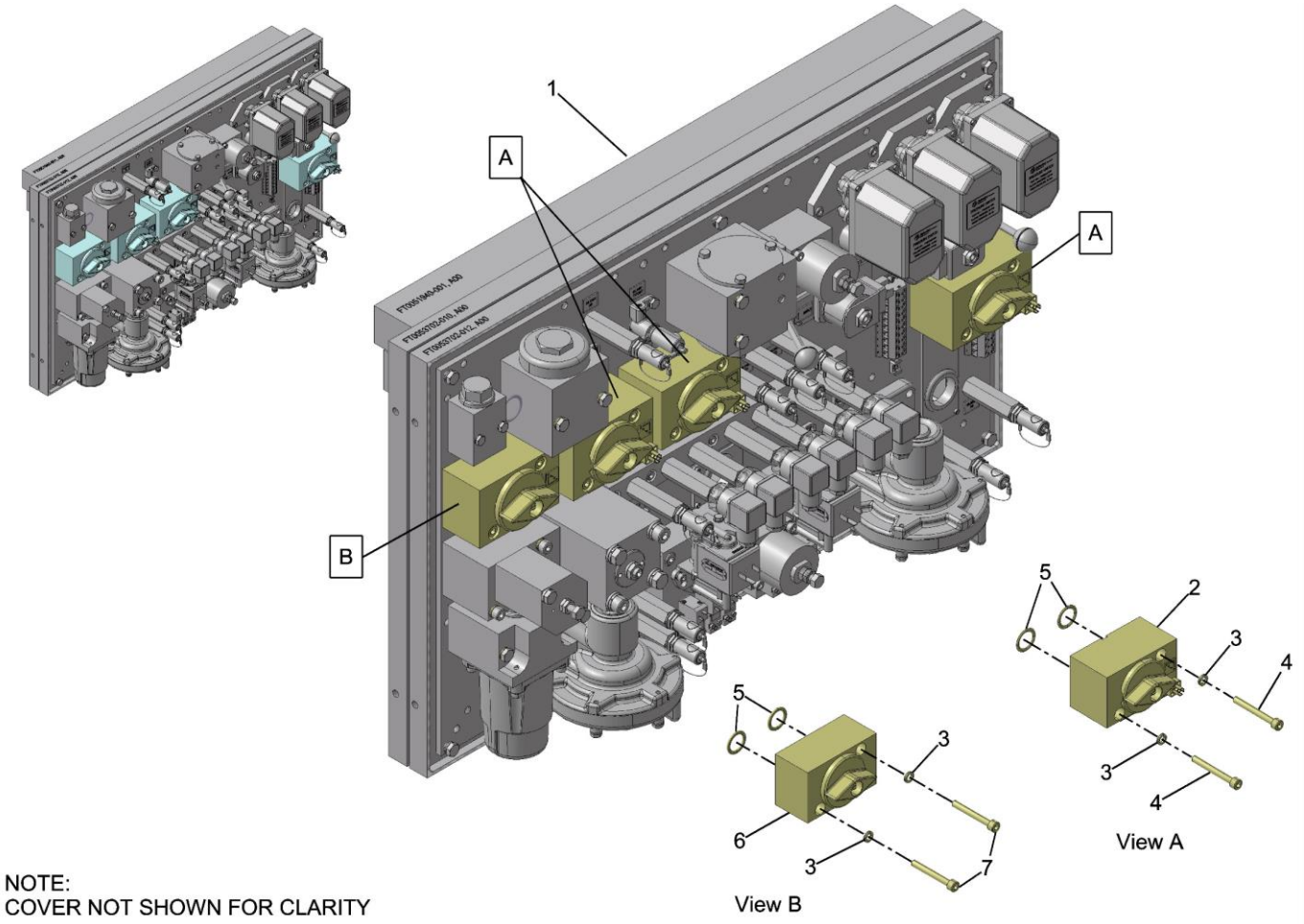

Figure 26 – Removal / Installation of Cut-Out Cock with Micro Switch

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	CUT-OUT COCK WITH MICRO SWITCH"	FT0050522-102	3
3	NORD LOCK WASHER	FT0051677-001	8
4	HEX SOCKET HEAD CAP SCREW M8	901035500	6
5	O-RING	006720000A	8
6	CUT-OUT COCK WITH DRAIN	FT0050522-100	1
7	HEX SOCKET HEAD CAP SCREW M8	901035500	2

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REMOVAL OF CUT-OUT COCK WITH MICRO SWITCH

Refer to Figure 26

1. Remove cover as per section 5.2
2. Remove the following parts that attach the cut-out cock (6) to tri-plate assy (1):
   - Two hex soc head cap screws (7) using 6mm allen key
   - Two nord lock washers (3)
3. Remove and **DISCARD** the two O-rings (5) from the cut-out cocks (6).
4. Remove the electrical connections from cu-out cock (2) using screw driver.
5. Remove the following parts that attach the cut-out cock (2) to tri-plate assy (1):
   - Two hex soc head cap screws (4) using 6mm allen key
   - Two nord lock washers (3)
6. Remove and **DISCARD** the two O-rings (5) from the cut-out cocks (2).
7. Follow the above steps 4 to 6 for remaining two cut-out cocks (2).

INSTALLATION OF CUT-OUT COCK WITH MICRO SWITCH

Refer to Figure 26

1. Smear Molykote M33 grease to the two **NEW** O-rings (5) and to the groove portion of the cut out cock (2)
2. Apply Loctite 242 on threads of two hex soc head cap screws (4) and (7).
3. Install the following parts that secures the cut-out cock (6) to tri-plate assy (1):
   - Two hex soc head cap screws (7) using 6mm allen key
   - Two nord lock washers (3)
4. Torque tighten the two hex soc head cap screws (7) to 14 Nm. Apply torque mark using Stylmark on it.
5. Install the following parts that secures the cut-out cock (2) to tri-plate assy (1):
   - Two hex soc head cap screws (4) using 6mm allen key
   - Two nord lock washers (3)
6. Torque tighten the two hex soc head cap screws (4) to 14 Nm. Apply torque mark using Stylmark on it.
7. Connect the electrical connections and tighten using screw driver.
8. Follow the above steps 5 to 7 for remaining two cut-out cocks (2).
9. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
10. Close and secure brake panel cover. Refer section 5.2.
11. For further information refer device manual FT0050522-102-E00MUM.

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5.13 REMOVAL AND INSTALLATION PROCEDURE OF LATCHED SOLENOID VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 5 mm allen key
- Screwdriver
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 3 to 14 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 27

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	001710500A	3

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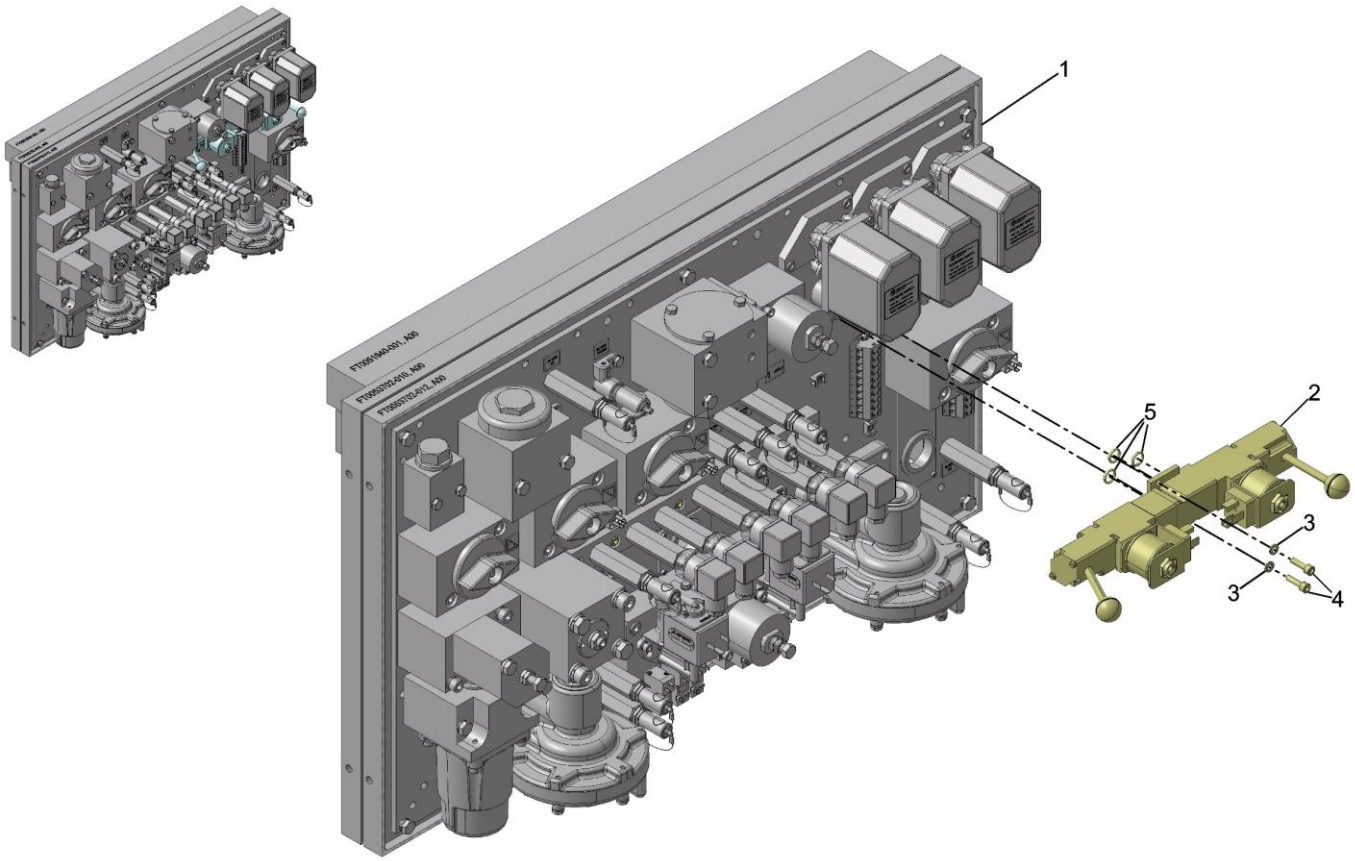

NOTE:
COVER NOT SHOWN FOR CLARITY

Figure 27 – Removal / Installation of Latched Solenoid Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	LATCHED SOLENOID VALVE	013006500	1
3	NORD LOCK WASHER	FT0051677-000	2
4	HEX SOC HD CAP SCREW M6	901035000	2
5	O-RINGS	001710500A	3

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REMOVAL OF LATCHED SOLENOID VALVE

Refer to Figure 27

1. Remove cover as per section 5.2
2. Unplug and disconnect the electrical connection from the latched solenoid valve (2) using a screwdriver.
3. Unscrew and remove the following parts that attach the latched solenoid valve (2) to the tri-plate assy (1):
   - Two hex soc head cap screws (4) using 5mm allen key
   - Two nord lock washers (3)
4. Remove and **DISCARD** the three O-rings (5) from the latched solenoid valve (2).

INSTALLATION OF LATCHED SOLENOID VALVE

Refer to Figure 27

1. Smear Molykote M33 grease to the three **NEW** O-rings (5) and to the groove portion of latched solenoid valve (2).
2. Install the three **NEW** O-rings (5) to the groove portion of latched solenoid valve (2).
3. Install the latched solenoid valve (2) along with three O-rings (5) to the tri-plate assy (1). Make sure it is seated properly.
4. Apply Loctite 242 on threads of the two hex soc head cap screws (4).
5. Install the following parts that secures the latched solenoid valve (2) to the tri-plate assy (1):
   - Two hex soc head cap screws (4) using 5mm allen key
   - Two nord lock washers (3)
6. Torque tighten the two hex soc head cap screws (4) to 5.2 Nm. Apply torque mark using Stylmark on it.
7. Plug and connect the electrical connections to the latched solenoid valve (2) using a screwdriver.
8. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
9. Close and secure brake panel cover. Refer section 5.2.

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5.14 REMOVAL AND INSTALLATION PROCEDURE OF CHARGING CHECK VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 28

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	003703500A	2

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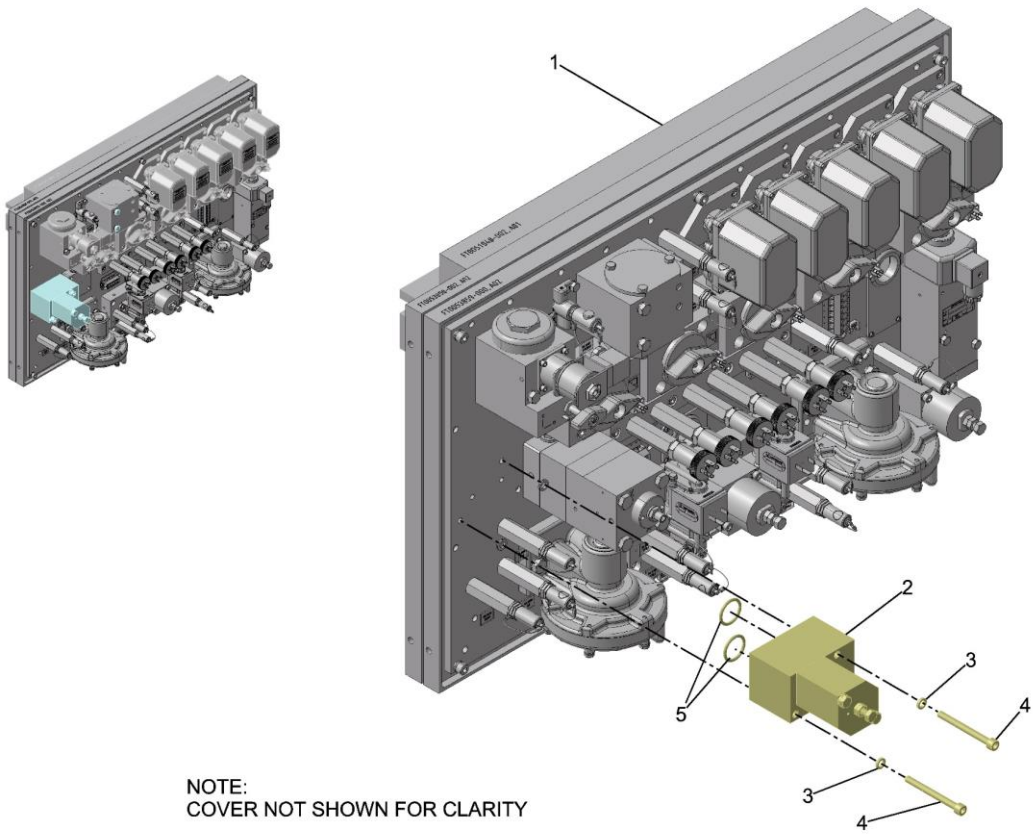

Figure 28 – Removal / Installation of Charging Check Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	CHARGING CHECK VALVE	AB746-W20/BFX	1
3	NORD LOCK WASHERS	FT0051677-001	2
4	HEX SOC HD CAP SCREWS M8	901041400	2
5	O-RINGS	003703500A	2

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REMOVAL OF CHARGING CHECK VALVE

Refer to Figure 28

1. Remove cover as per section 5.2
2. Remove the following parts that attach the charging check valve (2) to the tri-plate assy (1):
   - Two hex soc head cap screws (4) using 6mm allen key
   - Two nord lock washers (3)
3. Remove and **DISCARD** the two O-rings (5) from the charging check valve (2).

INSTALLATION OF CHARGING CHECK VALVE

Refer to Figure 28

1. Smear Molykote M33 grease to the two **NEW** O-rings (5) and to the groove portion of the charging check valve (2).
2. Install the two **NEW** O-rings (5) to the groove portion of the charging check valve (2).
3. Apply Loctite 242 to the threads of the two hex soc headcap screws (4).
4. Install the following parts that secures the charging check valve (2) to the tri-plate assy (1):
   - Two hex soc head cap screws (4) using 6mm allen key
   - Two nord lock washers (3)
5. Torque tighten the two hex soc head screws (4) to 14 Nm. Apply torque mark using Stylmark on it.
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
7. Close and secure brake panel cover. Refer section 5.2.
8. For further information refer device manual AB746-W20-E00MUM.

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5.15 REMOVAL AND INSTALLATION PROCEDURE OF VARIABLE PRESSURE REGULATOR

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 16 mm socket wrench
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 14 to 68 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 29

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RINGS	0015-6A	2
6	O-RING	0015-36A	1
7	FILTER	AB578-37A	1

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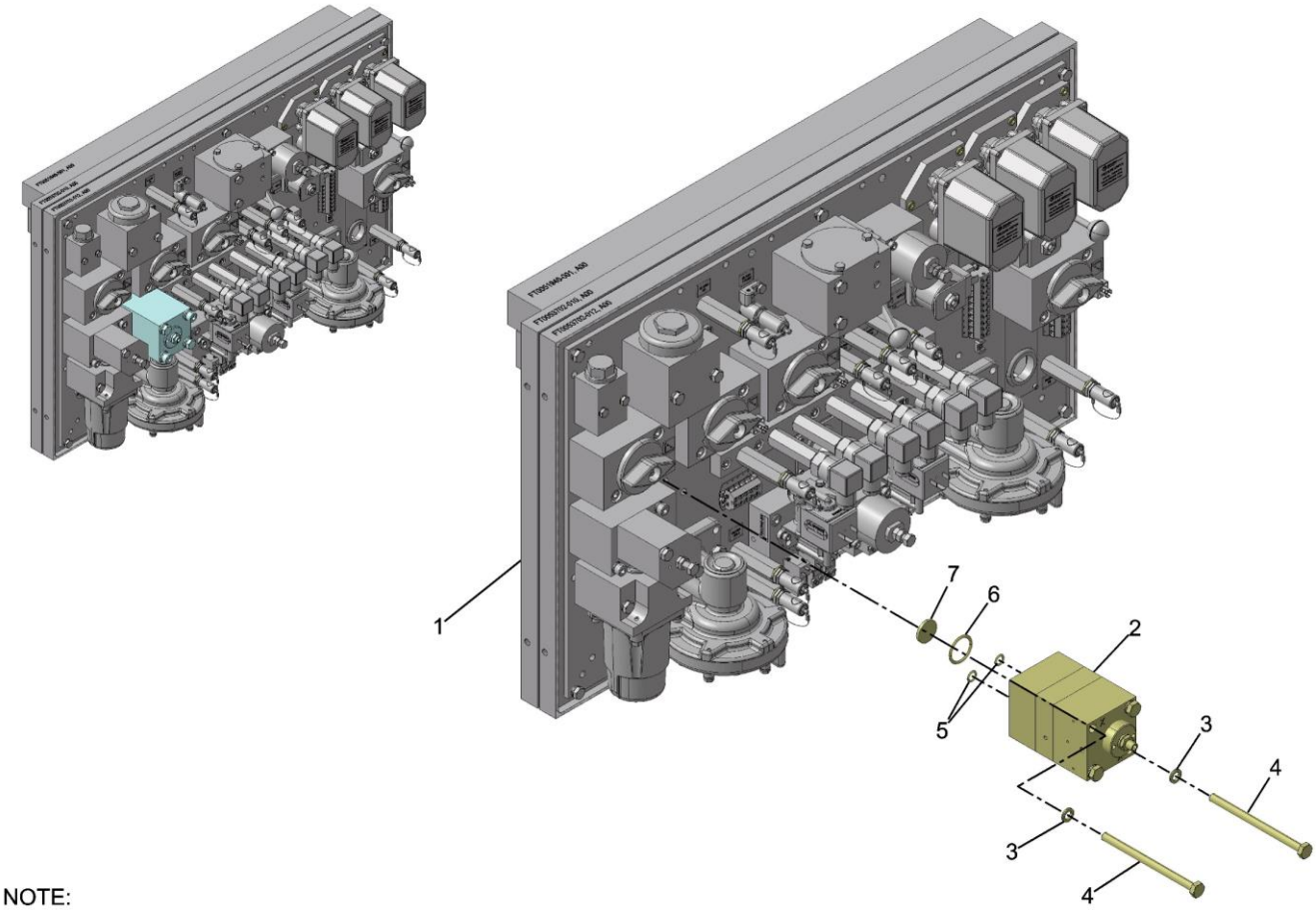

NOTE:
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Figure 29 – Removal / Installation of Variable Pressure Regulator

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053859-220	1
2	VARIABLE PRESSURE REGULATOR	REFER BELOW TABLE	1
3	WASHER	FT0020809-004	2
4	HEX HD BOLT M10	FT0051564-007	2
5	O-RINGS	0015-6A	2
6	O-RING	0015-36A	1
7	FILTER	AB578-37A	1

BRAKE MODULE	ITEM NO. 2
DTC	FT0053765-102
MC/MC2/MC3	FT0053765-103
TC	FT0053765-104
NDTC	FT0053765-105

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REMOVAL OF VARIABLE PRESSURE REGULATOR

Refer to Figure 29

1. Remove cover as per section 5.2
2. Remove the following parts that attach the variable pressure regulator (2) to the tri plate assy (1):
   - Two hex head bolts (4) using 16 mm socket wrench
   - Two washers (3)
3. Remove and **DISCARD** the filter (7), two O-rings (5), and O-ring (6) from the variable pressure regulator (2).

INSTALLATION OF VARIABLE PRESSURE REGULATOR

Refer to Figure 29

1. Smear Molykote M33 grease to the two **NEW** O-rings (5) and to the groove portion on the bottom side of the variable pressure regulator (2).
2. Install the two **NEW** O-rings (5) into the groove of the variable pressure regulator (2).
3. Place the **NEW** filter (7) into the inner diameter on the centre of the bottom side on the variable pressure regulator (2).
4. Smear Molykote M33 grease to the **NEW** O-ring (6) and to the groove portion on the bottom side of the variable pressure regulator (2).
5. Insert the **NEW** O-ring (6) to the bottom side of the variable pressure regulator (2).
6. Apply Loctite 242 on the threads of two hex head bolts (4).
7. Locate the variable pressure regulator (2) on tri plate assy (1) such that the inlet, delivery and pilot ports of variable pressure regulator (2) are matched with the Brake panel ports.
8. Install the following parts that secures the variable pressure regulator (2) to the tri plate assy (1):
   - Two bolts (4) using 16mm socket wrench
   - Two washers (3)
9. Torque the two bolts (4) to 27.3 Nm. Apply torque mark using Stylmark on it.
10. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
11. Close and secure brake panel cover. Refer section 5.2.
12. For further information refer device manual FT0053765-100-E00MUM.

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5.16 REMOVAL AND INSTALLATION PROCEDURE OF N-JMR DISTRIBUTOR

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 13 mm socket wrench
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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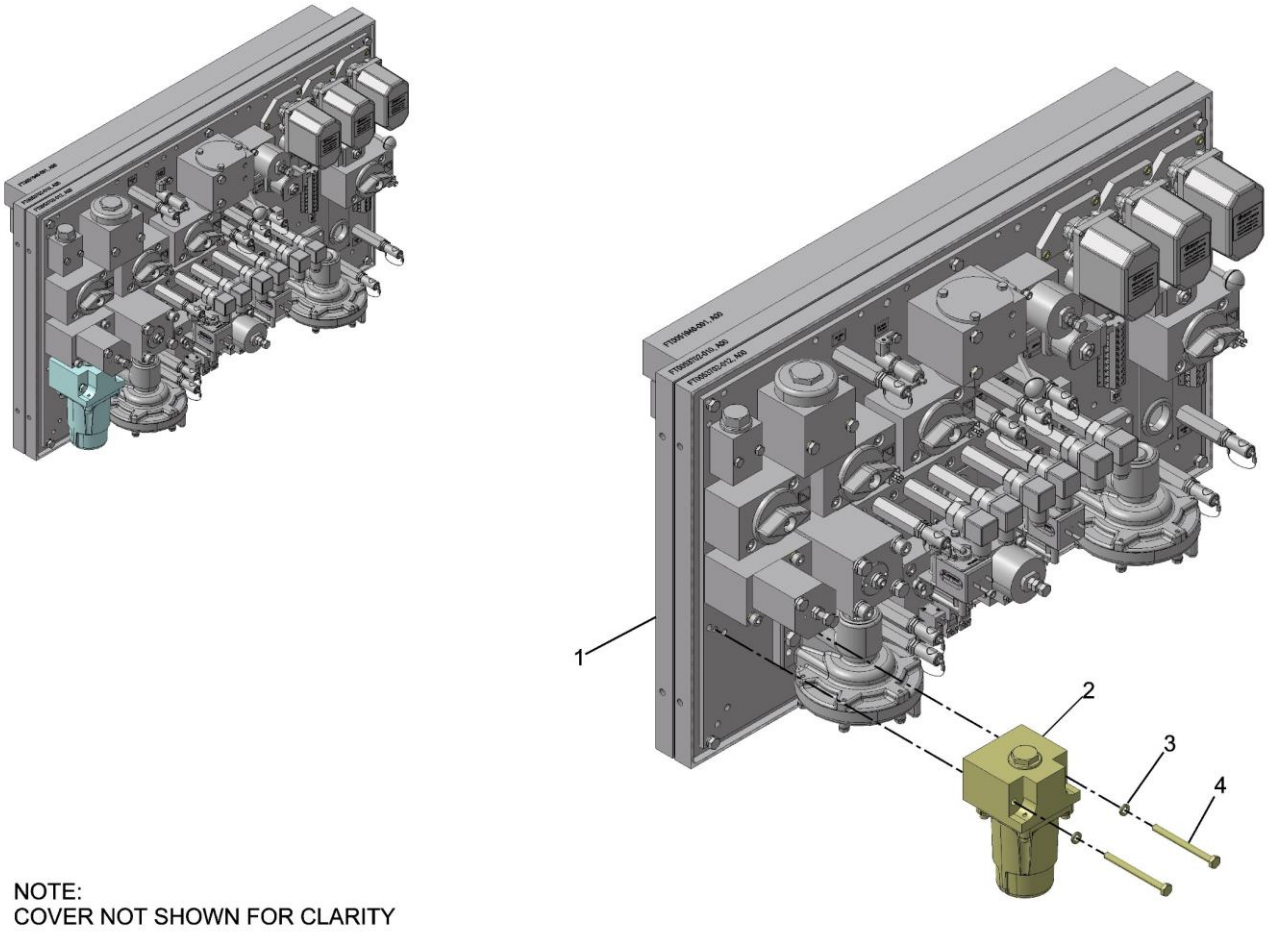

Figure 30 – Removal / Installation of N-JMR Distributor

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	N-JMR DISTRIBUTOR	7288351648	1
3	NORD LOCK WASHER	FT0051677-001	2
4	HEX HD BOLT M8	905027900	2

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REMOVAL OF N-JMR DISTRIBUTOR

Refer to Figure 30

1. Remove cover as per section 5.2
2. Remove the following parts that attach the N-JMR distributor (2) to tri-plate assy (1):
   - Two hex head bolts (4) using 13mm socket wrench
   - Two washers (3)

INSTALLATION OF N-JMR DISTRIBUTOR

Refer to Figure 30

1. Apply Loctite 242 to the threads of the two hex head bolts (4).
2. Install the following parts that secures the N-JMR distributor (2) to tri-plate assy (1):
   - Two hex head bolts (4) using 13mm socket wrench
   - Two washers (3)
3. Torque tighten the two hex head bolts (4) to 14 Nm. Apply torque mark using Stylmark on it.
4. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
5. Close and secure brake panel cover. Refer section 5.2.
6. For further information refer device manual 9171

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5.17 REMOVAL AND INSTALLATION PROCEDURE OF TWO CONTROL PORT RELAY VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 16 mm socket wrench
- Loctite 242 or 243
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 31

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RINGS	7012460408	4
6	O-RINGS	7050220408	8

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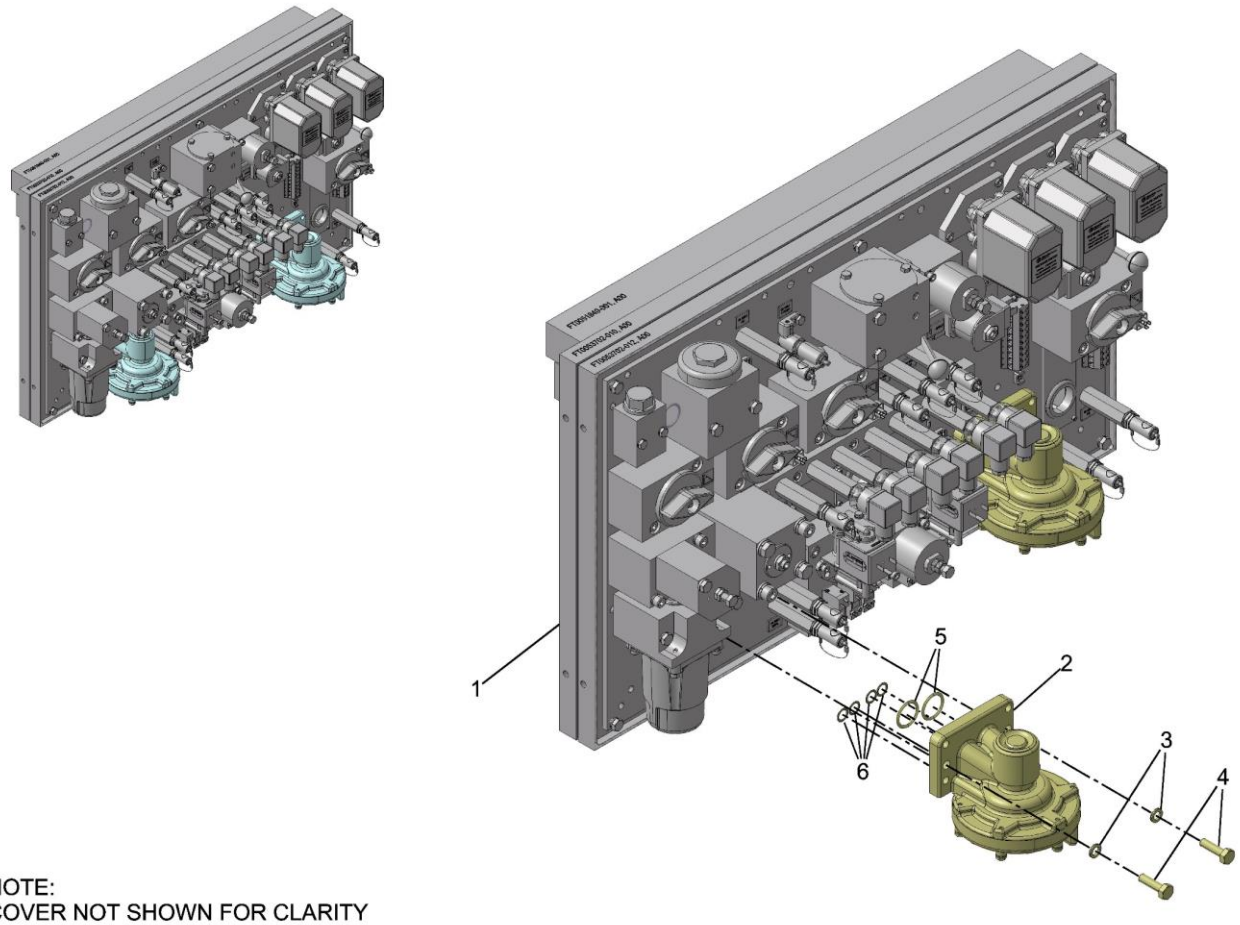

Figure 31 – Removal / Installation of Two Control Port Relay Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	TWO CONTROL PORT RELAY VALVE	FT0128287-100	2
3	NORD LOCK WASHER	FT0051677-002	4
4	HEX HD SCREW M10	920021700	4
5	O-RINGS	7012460408	4
6	O-RINGS	7050220408	8

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REMOVAL OF TWO CONTROL PORT RELAY VALVE

Refer to Figure 31

1. Remove cover as per section 5.2
2. Remove the following parts that attach the two control port relay valve (2) to tri-plate assy (1):
   - Two hex head screws (4) using 16mm socket wrench
   - Two nord lock washers (3)
3. Remove and **DISCARD** two O-rings (5) and four O-rings (6) from the two control port relay valve (2).
4. Follow the same steps for second two control port relay valve (2).

INSTALLATION OF TWO CONTROL PORT RELAY VALVE

Refer to Figure 31

1. Smear Molykote M33 grease on two **NEW** O-rings (5) and four O-rings (6) and on the groove portion two control port relay valve (2).
2. Install the two **NEW** O-rings (5) and four O-rings (6) on the groove portion of two control port relay valve (2).
3. Apply Loctite 242 on threads of the two hex head screws (4).
4. Install the following parts that secures the two control port relay valve (2) to tri-plate assy (1):
   - Two hex head screws (4) using 16 mm socket wrench
   - Two nord lock washers (3)
5. Torque tighten the two hex head screws (4) to 27.3 Nm. Apply torque mark using Stylmark on it.
6. Follow the same steps for second two control port relay valve (2).
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
8. Close and secure brake panel cover. Refer section 5.2.
9. For further information refer device manual 3416 N3.

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5.18 REMOVAL AND INSTALLATION PROCEDURE OF EP GROUP ASSY VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 32

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RINGS	01370100A	4

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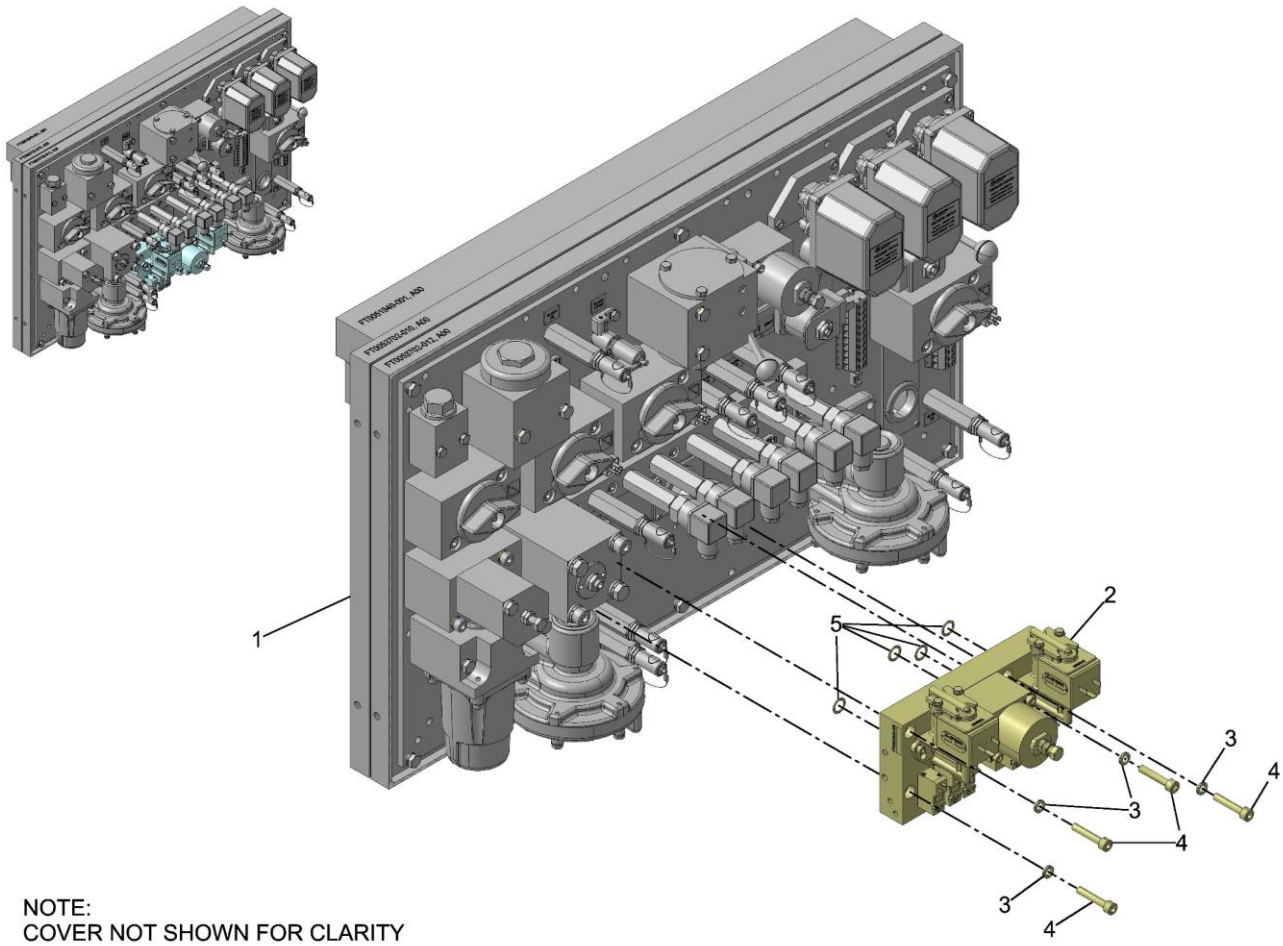

Figure 32 – Removal / Installation of EP Group Assy

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	EP GROUP ASSY	FT0053646-100	1
3	NORD LOCK WASHER	FT0051677-001	4
4	HEX SOC HEAD CAP SCREW M8	901007000	4
5	O-RINGS	01370100A	4

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REMOVAL OF EP GROUP ASSY

Refer to Figure 32

1. Remove cover as per section 5.2
2. Disconnect and remove the electrical connectors.
3. Remove the following parts that attach the EP group assy (2) to the tri-plate assy (1):
   - Four hex soc head cap screws (4) using 6mm allen key
   - Four nord lock washers (3)
4. Remove and **DISCARD** the four O-rings (5) from the EP group assy (2).

INSTALLATION OF EP GROUP ASSY

Refer to Figure 32

1. Smear Molykote M33 grease on four **NEW** O-rings (5) and to the groove portion of the EP group assy (2).
2. Install four **NEW** O-rings (5) on the groove portion of the EP group assy (2).
3. Apply Loctite 242 on threads of the four hex soc head cap screws (4).
4. Install the following parts that secure Ep group assy (2) to the tri-plate assy (1):
   - Four hex soc head cap screws (4) using 6mm allen key
   - Four nord lock washers (3)
5. Torque tighten the four hex soc head cap screws (4) to 14 Nm. Apply torque mark using Stylmark on it.
6. Plug the electrical connectors.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
8. Close and secure brake panel cover. Refer section 5.2.

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5.19 REMOVAL AND INSTALLATION PROCEDURE OF EP VALVE - EVSOCC – VE3

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 4 mm allen key
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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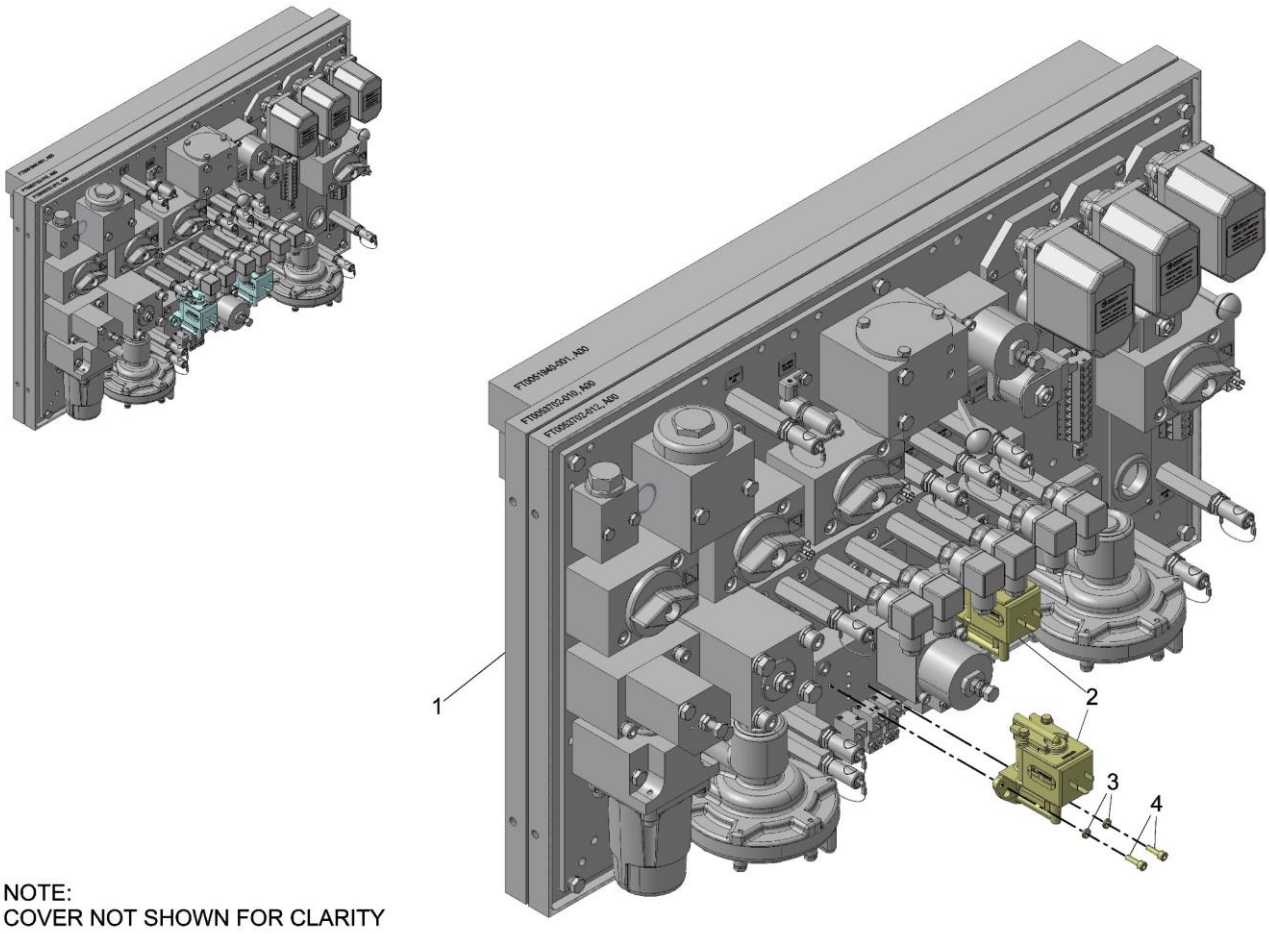

Figure 33 – Removal / Installation of EP Valve - EVSOCC – VE3

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	EP VALVE - EVSOCC – VE3	7811200708	2
3	NORD LOCK WASHER	FT0051677-005	4
4	HEX SOC HEAD CAP SCREW M5	901031900	4

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REMOVAL OF EP VALVE - EVSOCC – VE3

Refer to Figure 33

1. Remove cover as per section 5.2
2. Unplug the DIN connector from the EP valve (2).
3. Remove the following parts that attach the EP valve (2) to the tri-plate assy (1):
   - Two hex soc head cap screws (4) using 4mm allen key
   - Two nord lock washers (3)
4. Repeat the same steps for second EP valve (2).

INSTALLATION OF EP VALVE - EVSOCC – VE3

Refer to Figure 33

1. Apply Loctite 242 on threads of the two hex soc head cap screws (4).
2. Install the following parts that secure the EP valve (2) on the tri plate assy (1):
   - Two hex soc head cap screws (4) using 4 mm allen key
   - Two nord lock washers (3)
3. Torque tighten the two hex soc cap screws (4) to 4.1 Nm. Apply torque mark using Stylmark on it.
4. Plug the DIN connector to the EP valve (2).
5. Repeat the steps for second EP valve (2).
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
7. Close and secure brake panel cover. Refer section 5.2.
8. For further information refer device manual FT0012869-001-F22MUM

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5.20 REMOVAL AND INSTALLATION PROCEDURE OF EP VALVE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 2.5 mm allen key
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Not applicable

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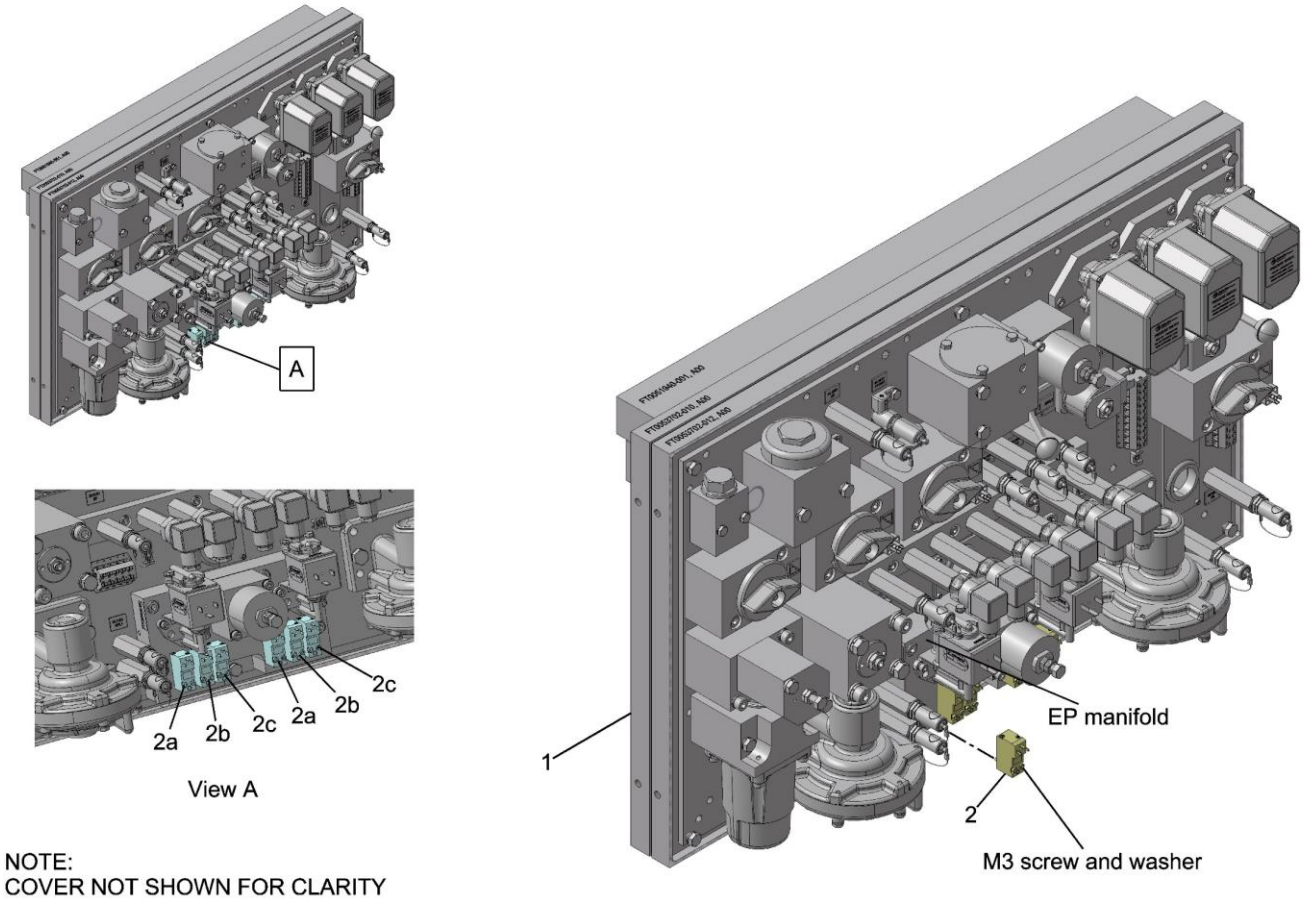

Figure 34 – Removal / Installation of EP Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	EP VALVE	REFER BELOW TABLE	1

ITEM NO.	DESCRIPTION	P/N	QTY
2a	EP VALVE EVSF	2/515811	2
2b	EP VALVE EVSB	FT0127517-127	2
2c	EP VALVE EVF	2/518056	2

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REMOVAL OF EP VALVE

Refer to Figure 34

1. Remove cover as per section 5.2
2. Unplug the DIN connector from the EP valve (2).
3. Unscrew and remove two M3 screws and washers using 2.5 mm allen key to separate the EP valve (2) from EP group manifold:
4. Repeat the same steps for remaining EP valves (2a, 2b and 2c).

INSTALLATION OF EP VALVE

Refer to Figure 34

1. Apply Loctite 242 to the threads of the two M3 screws.
2. Install the two M3 screws and washers using 2.5 mm allen key to secure the EP valve (2) to EP group manifold.
3. Torque tighten the two M3 screws to 0.6 Nm. Apply torque mark using Stylmark on it.
4. Plug the DIN connector to the EP valve (2).
5. Repeat the same steps for remining EP valves (2a, 2b and 2c).
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
7. Close and secure brake panel cover. Refer section 5.2.
8. For further information refer device manual 515182-E00MUM.

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5.21 REMOVAL AND INSTALLATION PROCEDURE OF TRANSDUCER BASE

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- Screw driver
- 5 mm allen key
- 19 mm spanner
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 35

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RINGS	009702000A	7
6	O-RINGS	013705000A	6

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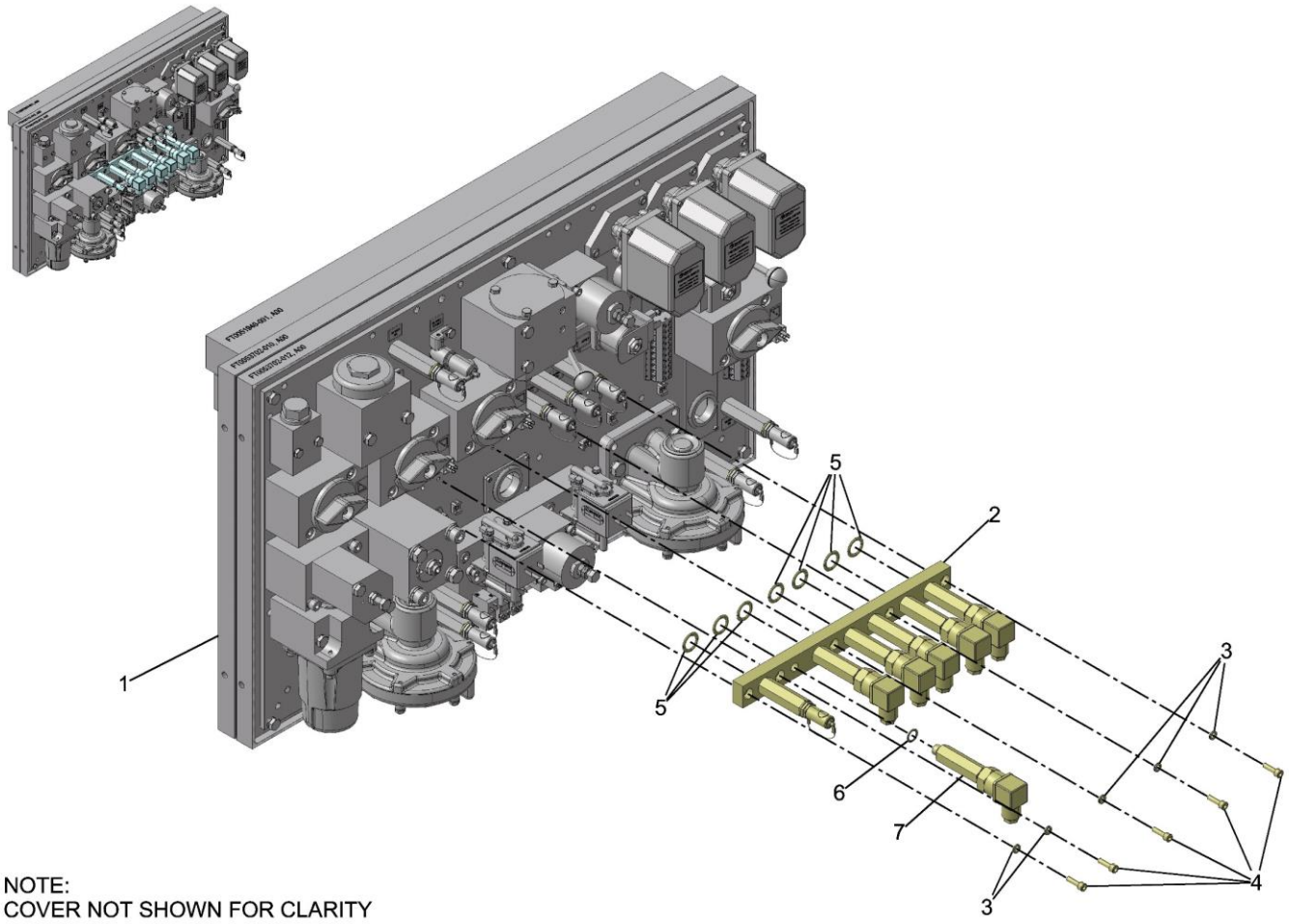

Figure 35 – Removal / Installation of Transducer Base

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	TRANSDUCER BASE	FT0051948-010	1
3	NORD LOCK WASHER	FT0051677-000	5
4	HEX SOC HD CAP SCREW M6	901035000	5
5	O-RINGS	009702000A	7
6	O-RINGS	013705000A	6
7	EXT.CONNECTOR	FT0051934-000	6

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REMOVAL OF TRANSDUCER BASE

Refer to Figure 35

1. Remove cover as per section 5.2
2. Unplug the DIN connector from pressure transducer using a screw driver.
3. Remove the following parts that attach the transducer base (2) to the tri-plate assy (1):
   - Five hex soc head cap screws (4) using 5mm allen key
   - Five nord lock washers (3)
4. Remove and **DISCARD** seven O-rings (5) from groove portion of the transducer base (2).
5. Remove EXT connector (7) along with pressure transducer using 19 mm spanner.
6. Remove and **DISCARD** O-ring (6) from groove portion of the EXT connector (7).
7. Repeat the above steps 5 and 6 to remaining five EXT connectors (7).

INSTALLATION OF TRANSDUCER BASE

Refer to Figure 35

1. Smear Molykote M33 grease to the six **NEW** O-rings (5) and to the groove portion of the transducer base (2).
2. Install the seven **NEW** O-rings (5) to the groove portion of the transducer base (2).
3. Smear Molykote M33 grease to the **NEW** O-rings (6) and to the groove portion of the EXT connector (7).
4. Install the **NEW** O-rings (6) to the groove portion of the EXT connector (7).
5. Install EXT connector (7) along with pressure transducer to the transducer base (2) using 19 mm spanner.
6. Torque tighten the EXT connector (7) to 23 Nm. Apply torque mark using Stylmark on it.
7. Repeat the above steps 3 to 6 to remaining five EXT connectors (7)
8. Apply Loctite 242 to the threads of the four hex soc cap screws (4).
9. Install the transducer base (2) on the tri-plate assy (1) and secure with the following parts
   - Five hex soc head cap screws (4) using 5mm allen key
   - Five washers (3)
10. Torque tighten the five hex soc head cap screws (4) to 5.2 Nm. Apply torque mark using Stylmark on it.
11. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
12. Close and secure brake panel cover. Refer section 5.2.

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5.22 REMOVAL AND INSTALLATION PROCEDURE OF PRESSURE TRANSDUCER

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 19 mm spanner
- 27 mm open end spanner
- Loctite 577
- Molykote M33 or M55 grease
- STYLMARK paint

SPARES REQUIRED

Not applicable.

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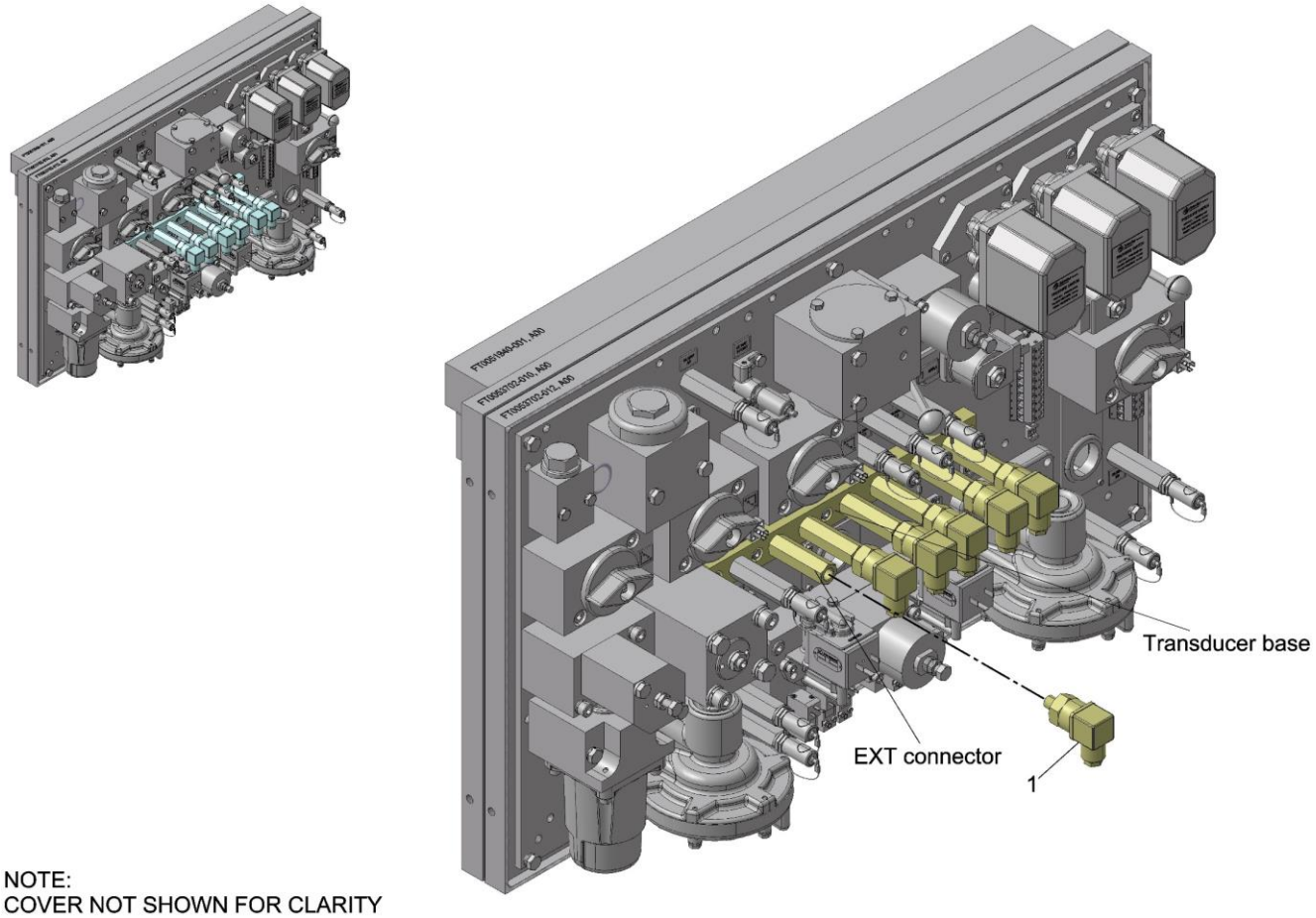

Figure 36 – Removal / Installation of Pressure Transducer

ITEM NO.	DESCRIPTION	P/N	QTY
1	PRESSURE TRANSDUCER	2/520070	6

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REMOVAL OF PRESSURE TRANSDUCER

Refer to Figure 36

1. Remove cover as per section 5.2
2. Unplug the DIN connector from pressure transducer (1) using a screw driver.
3. Holding EXT connector using 19 mm spanner and remove pressure transducer (1) using 27 mm open end spanner.
4. Follow the same steps for the remaining five pressure transducers (1).

INSTALLATION OF PRESSURE TRANSDUCER

Refer to Figure 36

1. Apply Loctite 577 on threads of the pressure transducer (1).
2. Holding EXT connector using 19 mm spanner and install pressure transducer (1) using 27 mm open end spanner.

NOTE: When tightening the device, make sure not to apply any effort to the cylindrical body, but use exclusively the hex section in order to avoid permanent damage.

3. Torque tighten pressure transducer (1) to adequate torque. Apply torque mark using Stylmark on it
4. Plug the DIN connector to pressure transducer (1) using the screw driver.
5. Follow the same steps for the remaining five pressure transducer (1).
6. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
7. Close and secure brake panel cover. Refer section 5.2.
8. For further information refer to device manual 2/520076-E00MUM.

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5.23 REMOVAL AND INSTALLATION PROCEDURE OF FILTER

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 6 mm allen key
- Loctite 242 or 243
- Torque wrench 1 to 20 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 37

ITEM NO.	DESCRIPTION	P/N	QTY
2	MP FILTER	FT0044798-100	1

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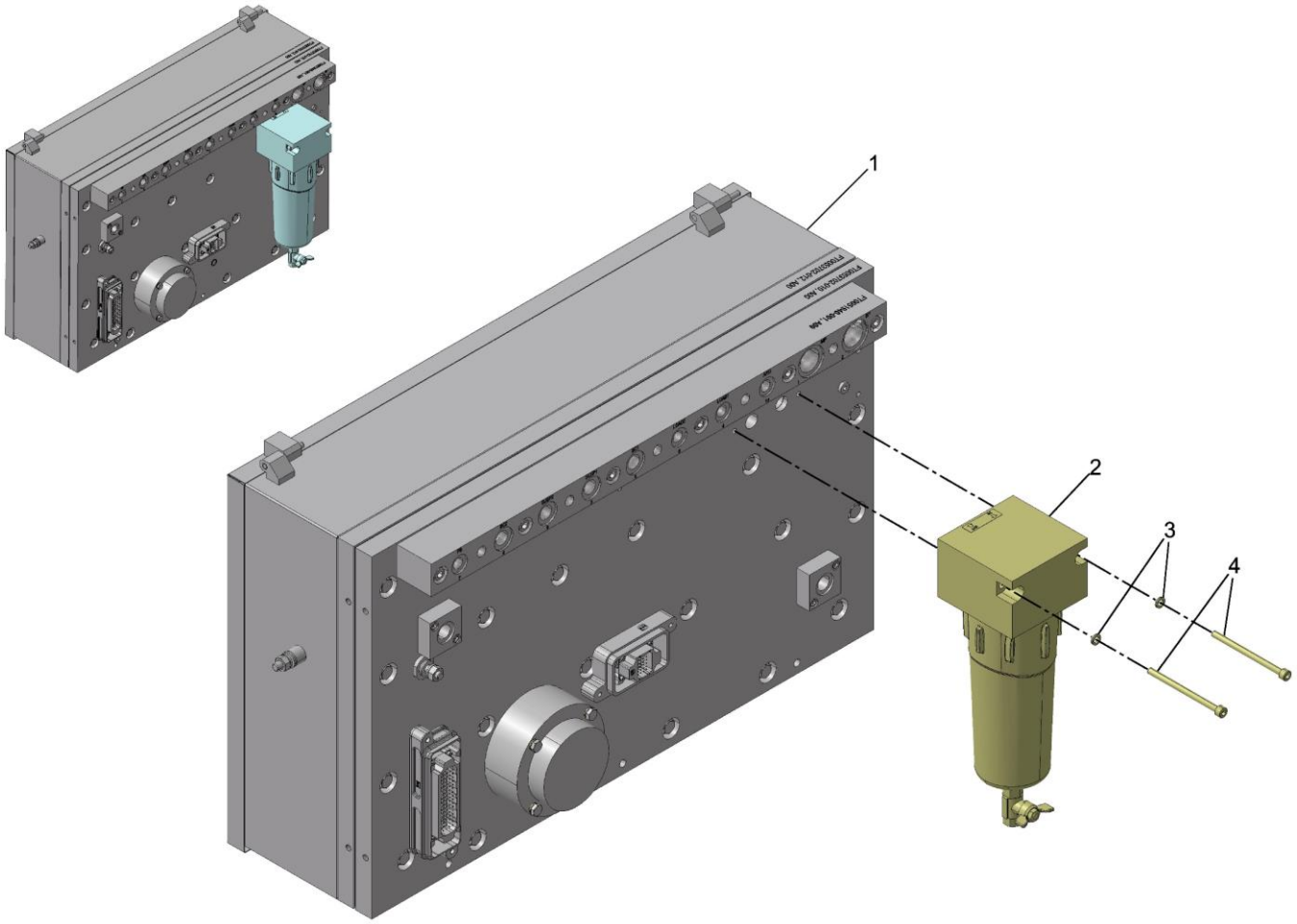

Figure 37 – Removal / Installation of Filter

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	MP FILTER	FT0044798-100	1
3	NORD LOCK WASHER	FT0051677-001	2
4	HEX SOC HD CAP SCREW M8	901039000	2

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REMOVAL OF FILTER

Refer to Figure 37

1. Remove the following parts that attach the filter (2) to the tri plate assy (1):
   - Two nord lock washers (3).
   - Two hex soc head cap screws (4) using a 6mm allen key.
2. Remove the filter (2) from the tri plate assy (1).

INSTALLATION OF FILTER

Refer to Figure 37

1. Apply Loctite 242 to threads of the two hex soc head cap screws (4).
2. Install the following parts that secure the filter (2) to the tri plate assy (1):
   - Two nord lock washers (3).
   - Two hex soc head cap screws (4) using a 6mm allen key.
3. Torque the two hex soc head cap screws (4) to 14 Nm. Apply torque mark using Stylmark on it.
4. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
5. For replacement of the filter cartridge and further information refer to the device manual FT0044798-100-E00MUM

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5.24 REMOVAL AND INSTALLATION PROCEDURE OF PORT HEADER

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 8 mm allen key
- Loctite 242 or 243
- Molykote M33 or M55 grease
- Torque wrench 1 to 50 Nm
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 38

ITEM NO.	DESCRIPTION	P/N	QTY
5	O-RING	003703500	10

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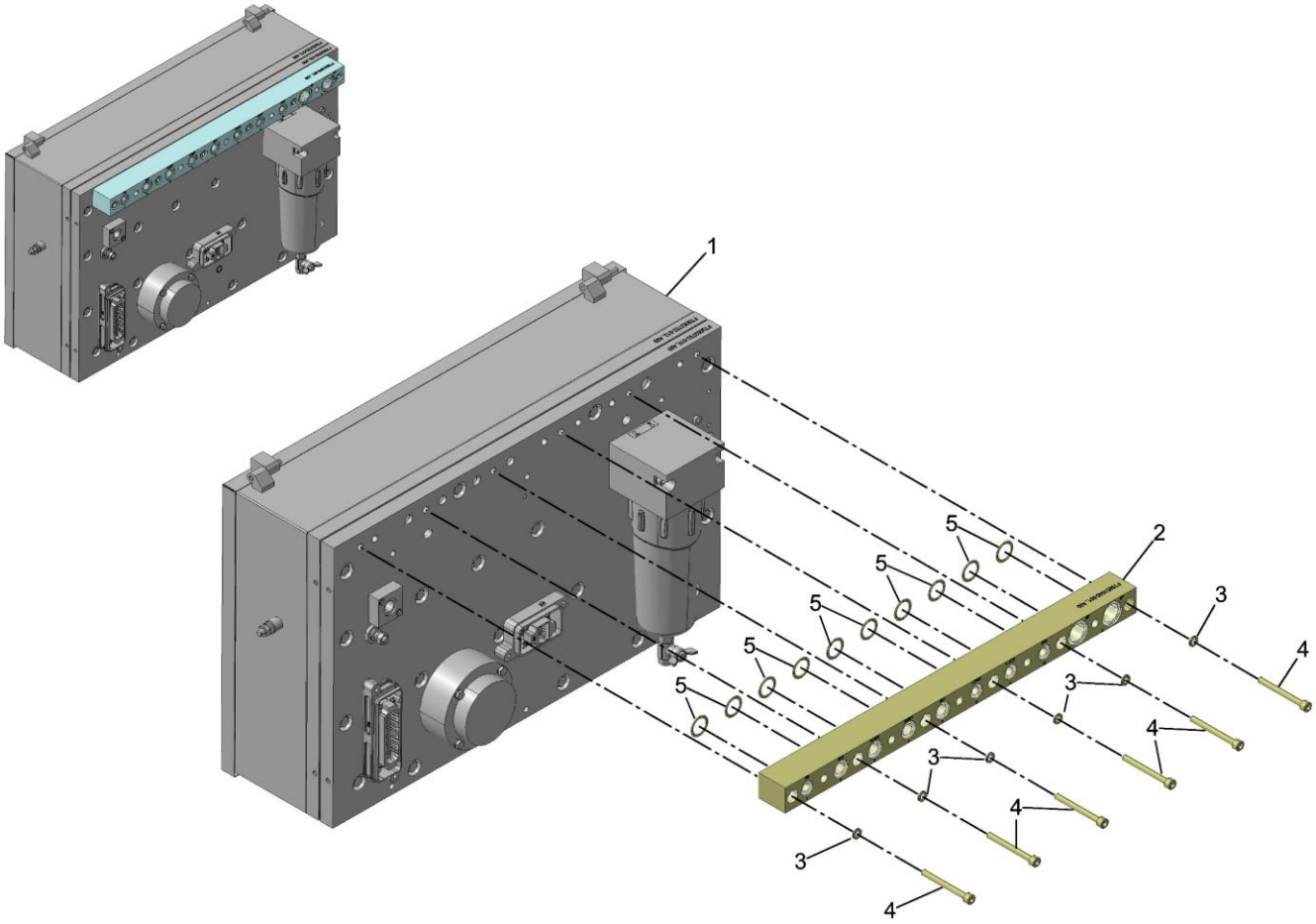

Figure 38 – Removal / Installation of Port Header

ITEM NO.	DESCRIPTION	P/N	QTY
1	TRI PLATE ASSEMBLY	FT0053702-220	1
2	PORT HEADER	FT0051940-001	1
3	NORD LOCK WASHER	FT0051677-002	6
4	HEX SOC HD SCREW M10	901033800	6
5	O-RING	003703500	10

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REMOVAL OF PORT HEADER

Refer to Figure 38

1. Remove the pneumatic connections.
2. Remove the following parts that attach the port header (2) to the tri plate assy (1):
   - Six hex soc head screws (4) using 8mm allen key
   - Six nord lock washers (3)
3. Remove and **DISCARD** ten O-rings (5) from groove portion of the port header (2).

INSTALLATION OF PORT HEADER

Refer to Figure 38

1. Smear Molykote M33 grease to the ten **NEW** O-rings (5) and to groove portion of the port header (2).
2. Install ten **NEW** O-rings (5) on the groove portion of the port header (2).
3. Apply Loctite 242 on threads of the six hex soc head screws (4).
4. Install the following parts that secure port header (2) to the tri plate assy (1).
   - Six hex soc head screw (4) using 8mm allen key
   - Six nord lock washers (3)
5. Torque tighten the six hex soc head screws (4) to 27.3 Nm. Apply torque mark using Stylmark on it.
6. Connect the pneumatic connections.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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5.25 REMOVAL AND INSTALLATION PROCEDURE OF RESERVOIR 70L AND DRAIN COCK

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

TOOLS AND CONSUMABLES REQUIRED

- 13 mm socket wrench
- 18 mm spanner and socket wrench
- 27 mm open end spanner
- Loctite 577
- Loctite 242
- Molykote M33 or M55 grease
- STYLMARK paint

SPARES REQUIRED

Refer to Figure 39

ITEM NO.	DESCRIPTION	P/N	QTY
11	SEAL	009702500	2

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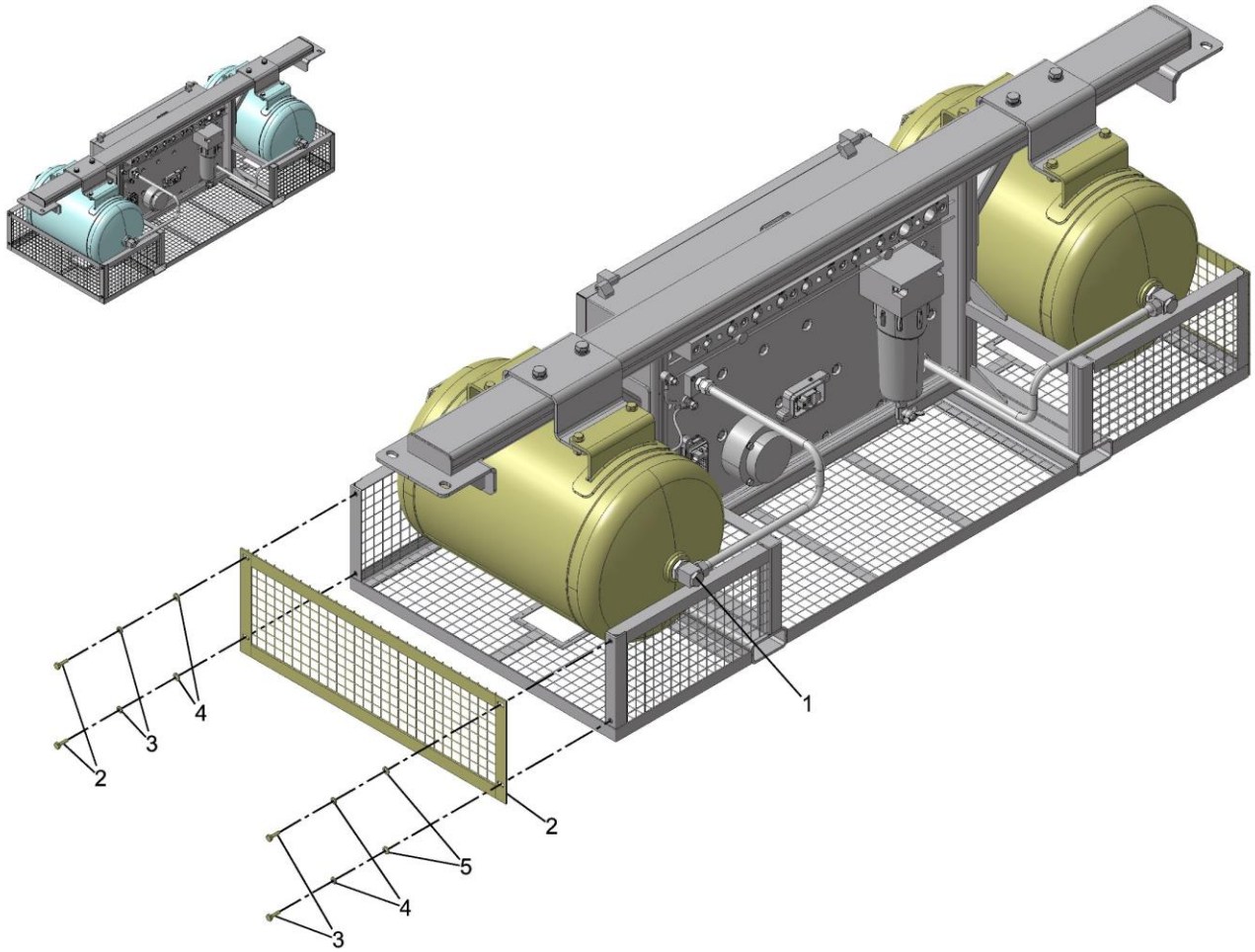

Figure 39 – Removal / Installation of Reservoir 70L (Sheet 1 of Sheet 2)

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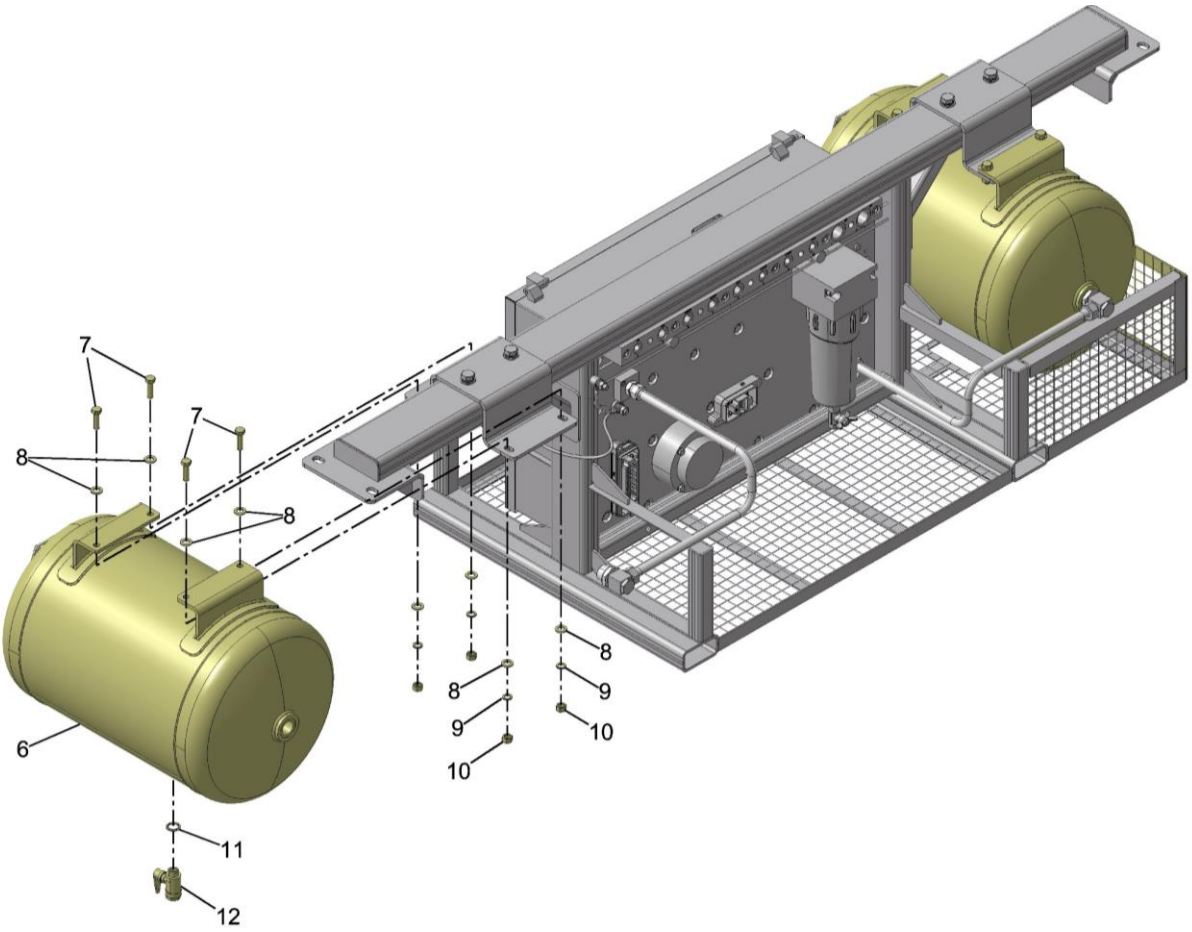

Figure 39 – Removal / Installation of Reservoir 70L (Sheet 2 of Sheet 2)

ITEM NO.	DESCRIPTION	P/N	QTY
1	BANJO FITTING 1/2" BSP	FT0052168-001	2
2	MESH	-	2
3	HEX HEAD SCREW	-	8
4	LOCK WASHER	-	8
5	WASHER	-	8
6	RESERVOIR 70L	FT0053750-000	2
7	HEX HD BOLT M12	905023900	8
8	PLAIN WASHER	908012000	16
9	NORD LOCK WASHER	FT0051677-003	8
10	HEX NUT	906003000	8
11	SEAL	009702500	2
12	DRAIN COCK	FT0051880-100	2

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REMOVAL OF RESERVOIR

Refer to Figure 39

1. Make use of suitable lifting tools to support the reservoir.
2. Remove the banjo fitting (1) from reservoir (6) using appropriate tool.
3. Unscrew and remove the following parts that attach the mesh (2) to the frame
   - Four hex head screws (3) using 13mm socket wrench
   - Four lock washers (4)
   - Four washers (5)
4. Unscrew and remove the following parts that attach the reservoir (6) to the frame:
   - Four hex head bolts (7)
   - Eight plain washers (8)
   - Four nord lock washers (9)
   - Four hex nuts (10). using 18 mm spanner and wrench by holding the nut with spanner and wrench to loosen the hex head bolt (7).
5. Remove the reservoir (6) from frame.

Note: To remove reservoir (6), lift the reservoir (6) upwards and then slide away from the frame channel.

6. Follow the same steps for the remaining reservoir (6).

REMOVAL OF DRAIN COCK

Refer to Figure 39

1. Unscrew and remove the drain cock (12) from the reservoir (6) using 27 mm open end spanner.
2. Remove and **DISCARD** seal (11) from the drain cock (12).
3. Follow the same steps for the remaining drain cock on another reservoir (12)

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INSTALLATION OF DRAIN COCK

Refer to Figure 39

1. Install the **NEW** seal (11) on groove portion of the drain cock (12).
2. Apply Loctite 577 on threads of the drain cock (12).
3. Install the drain cock (12) on the reservoir (6) using 27 mm open end spanner.
4. Torque tighten the drain cock (12) to appropriate torque. Apply torque mark using Stylmark on it
5. Follow the same steps for the remaining drain cock (12)

INSTALLATION OF RESERVOIR

Refer to Figure 39

1. Make use of suitable lifting tools to support the reservoir.
2. Position reservoir (6) on the frame.
3. Apply Loctite 242 on the threaded portion of the four hex head bolts (7).
4. Install the following parts that secure the reservoir (6) to the frame.
   - Four hex head bolts (7)
   - Eight plain washers (8)
   - Four nord lock washers (9)
   - Four hex nuts (10) using 18 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolt (7).
5. Torque tighten the four hex head bolts (7) to 46.7 Nm. Apply torque mark using Stylmark on it.
6. Connect the banjo fitting (1) to reservoir (6) using appropriate tools.
7. During installation of the reservoir (1) take care to the following prescriptions:
   - The reservoir must be installed as prescribed, following the rules in force and respecting the prescriptions given in the applicable technical drawings.
   - The reservoir must be protected from the projection of stones and ballast and other materials, caused by the train run.
   - The reservoir must be installed by means of adequate fixing belts as prescribed by EN286-4 and electrically insulated from them by anticorrosion strips, as prescribed by the same norm.
   - The reservoir must be fixed to a frame firmly mounted on the structure of the vehicle. Anomalous vibrations and relative displacements between the fixing points and between reservoir and the pneumatic ports are not admitted.
8. Apply Loctite 242 on the threaded portion of the four hex head screws (3).
9. Install the following parts that secure the mesh (2) to the frame.
   - Four hex head screws (3) using 13mm socket wrench
   - Four lock washers (4)
   - Four washers (5)
10. Torque tighten the hex head screw (3) to appropriate torque. Apply torque mark using Stylmark on it.
11. Follow the same steps for the remaining reservoir (6).
12. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

NOTE: Refer, in any case, to the rules in force at the End-user premises and to the law in force in the country where the vessel is used.

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/// 6. Spare Part List

- Routine Maintenance - The spare parts required for routine maintenance are reported in the single main subcomponent User Manuals: see User Manuals list in the table Preventive maintenance (First Level).

- Installation: The spare parts required for installation of subcomponents are reported in the respective section /// 5 of this manual.

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with NEW ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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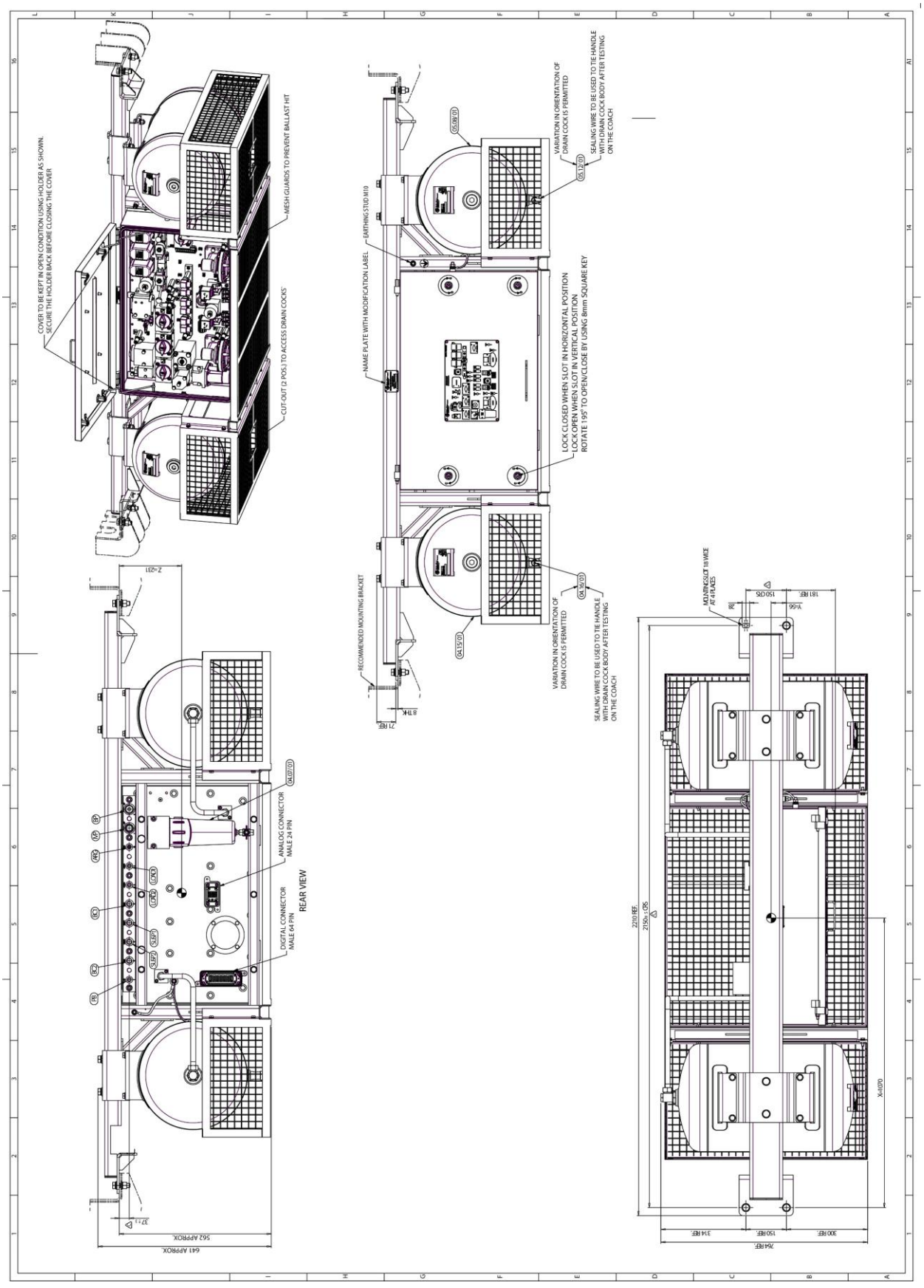
/// 8. OUTLINE DRAWING

Brake Module DTC - FT0053702-100



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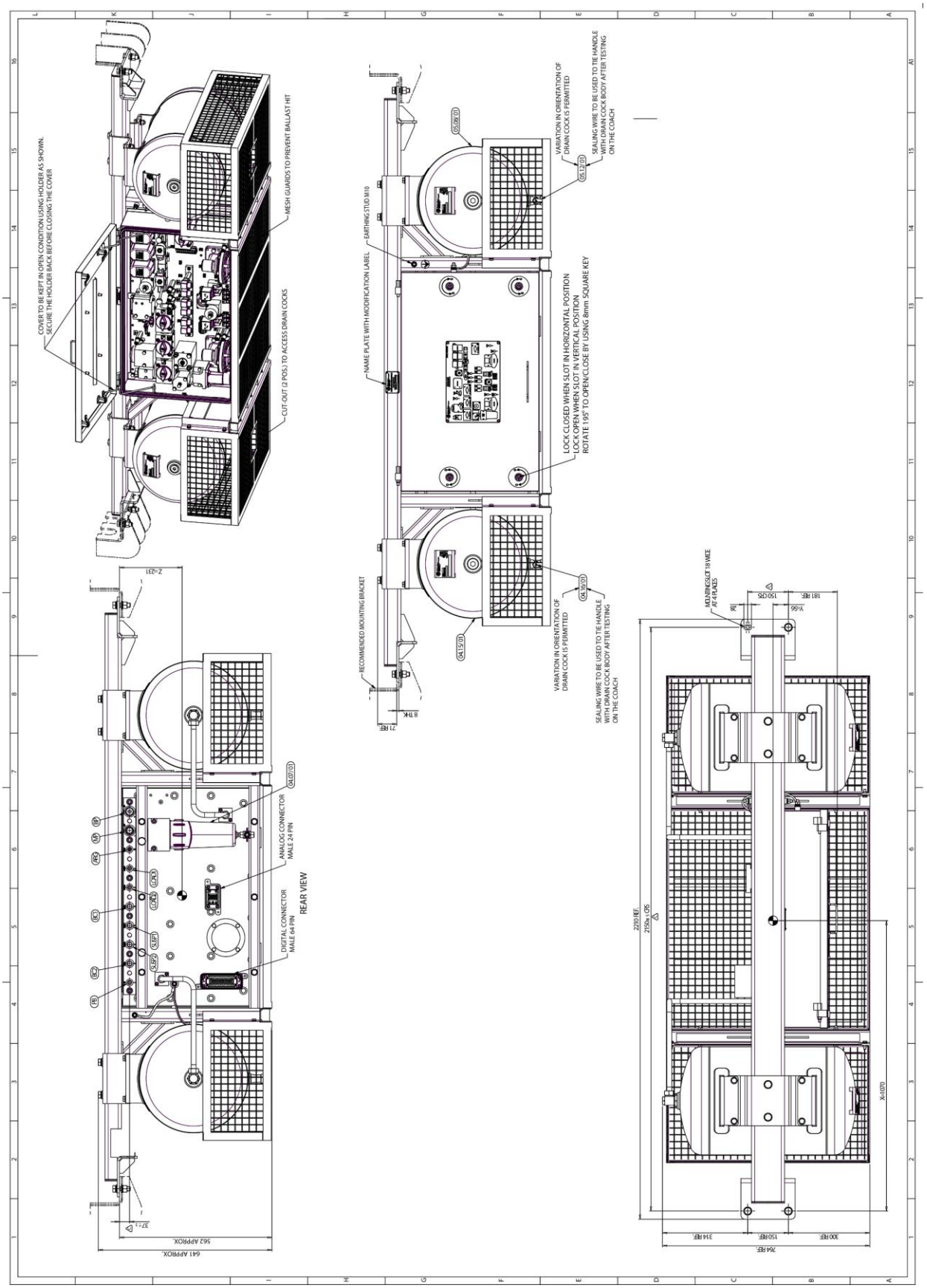
Brake Module MC/MC2/MC3 - FT0053702-101
Brake Module TC - FT0053702-102
Brake Module NDTC - FT0053702-103



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05.01_.07_Air suspension frame assy

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/// FT0053353-100-E00MUM

AIR SUSPENSION FRAME ASSY - DE FT0053353-100
AIR SUSPENSION FRAME ASSY - NDE FT0053353-101

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.RRK Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0053353-100-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Air suspension frame assembly is used to supply air suspension pressure to the bellows of each bogies.

Air suspension frame assembly is an integration of Duplex check valve, Isolating cock, Drain valve, Dump valve and reservoir 50L.

All the components stated above are routed through pipe.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.
- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.
- Prior to accessing the electric parts, make sure the power is duly switched off.
- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.
- For operations under the vehicle, personnel must wear protective helmet.
- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.
- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.
- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.
- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).
- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.
- While testing the components, never exceed the maximum operating pressure limits.

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- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section /// 5 for functional test details.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Air suspension frame assembly DE and NDE must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on air suspension frame assembly DE and NDE and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the air suspension frame assembly DE and NDE P/N FT0053353-100, -101 respectively for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
BSP	British Standard Pipe
BSPP	British Standard Parallel Pipe
DE	Driver End
NDE	Non-Driving End
HD	Head
HEX	Hexagonal
Kg	Kilogram
L	Litres
Nm	Newton Metre
P/N	Part Number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The air suspension frame assembly DE and NDE is used to supply air suspension pressure to the bogies.

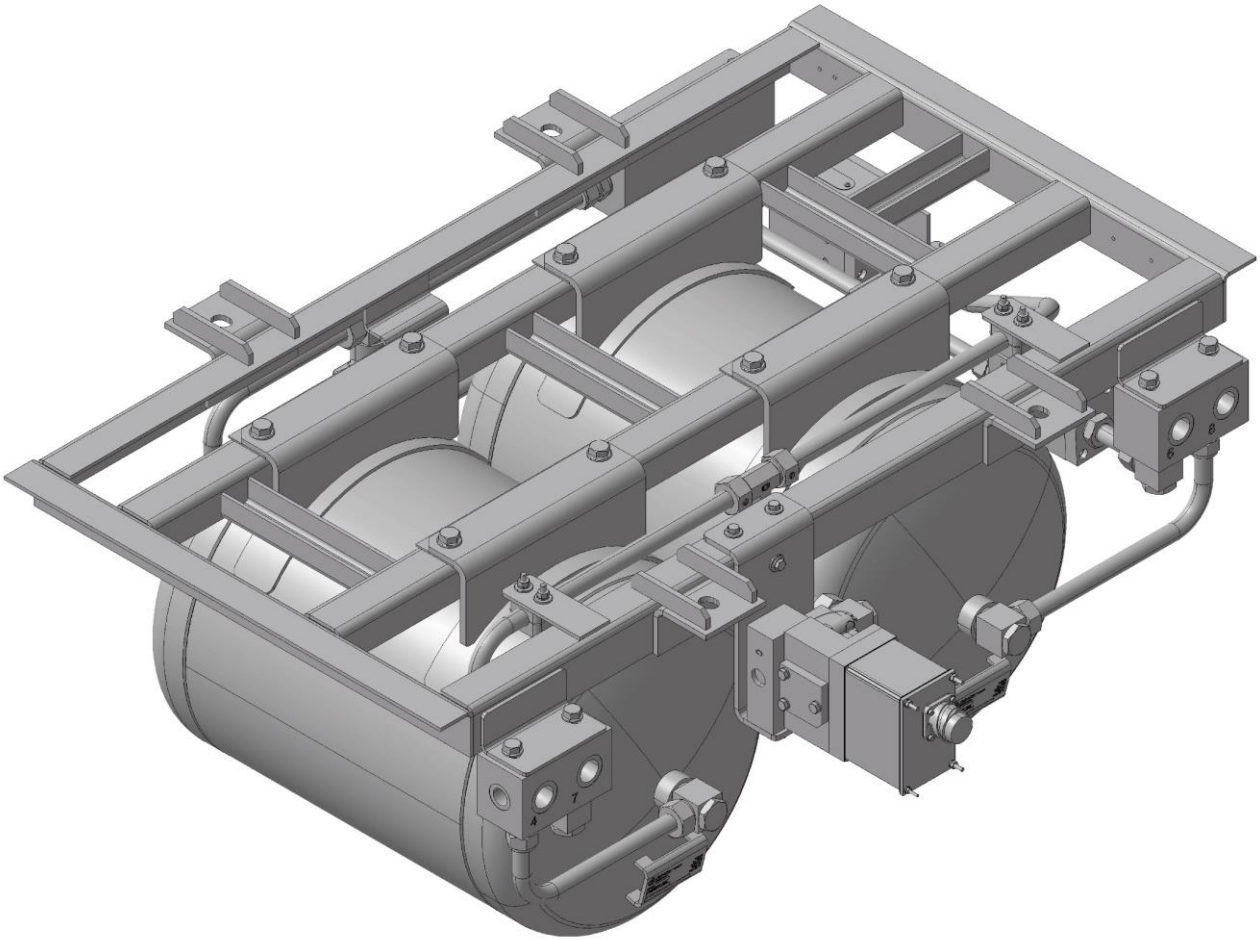

Figure 1: Air Suspension Frame Assembly DE, Isometric View

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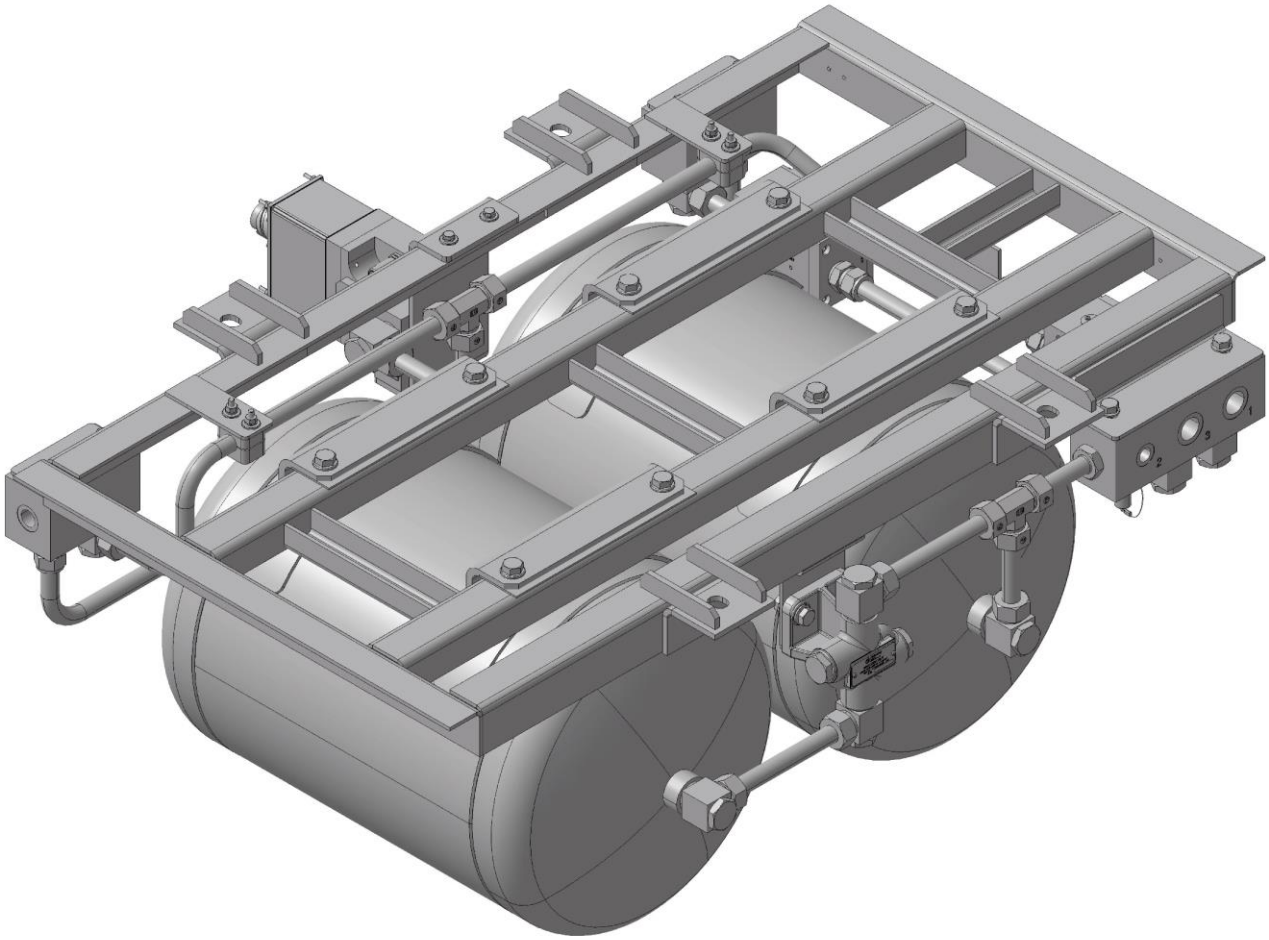

Figure 2: Air Suspension Frame Assembly NDE, Isometric View

2.2 TECHNICAL DATA OF THE EQUIPMENT

TYPE OF CAR	P/N	MAX WORKING PRESSURE	Equipment Protected	WEIGHT
AIR SUSPENSION FRAME ASSY - DE	FT0053353-100	10 bar	IP65	130 kg
AIR SUSPENSION FRAME ASSY - NDE	FT0053353-101			

The air suspension frame assembly DE and NDE car are same w.r.t interface, except as shown in the below table.

COMPONENT	SCHEME REF.	AIR SUSPENSION FRAME ASSEMBLY DE	AIR SUSPENSION FRAME ASSEMBLY NDE
1/2" ISOLATING COCK	04.45 05.06	FT0050822-102	FT0050822-103
FRAME	-	FT0053691-000	FT0053691-001

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2.3 PNUEMATIC SCHEME

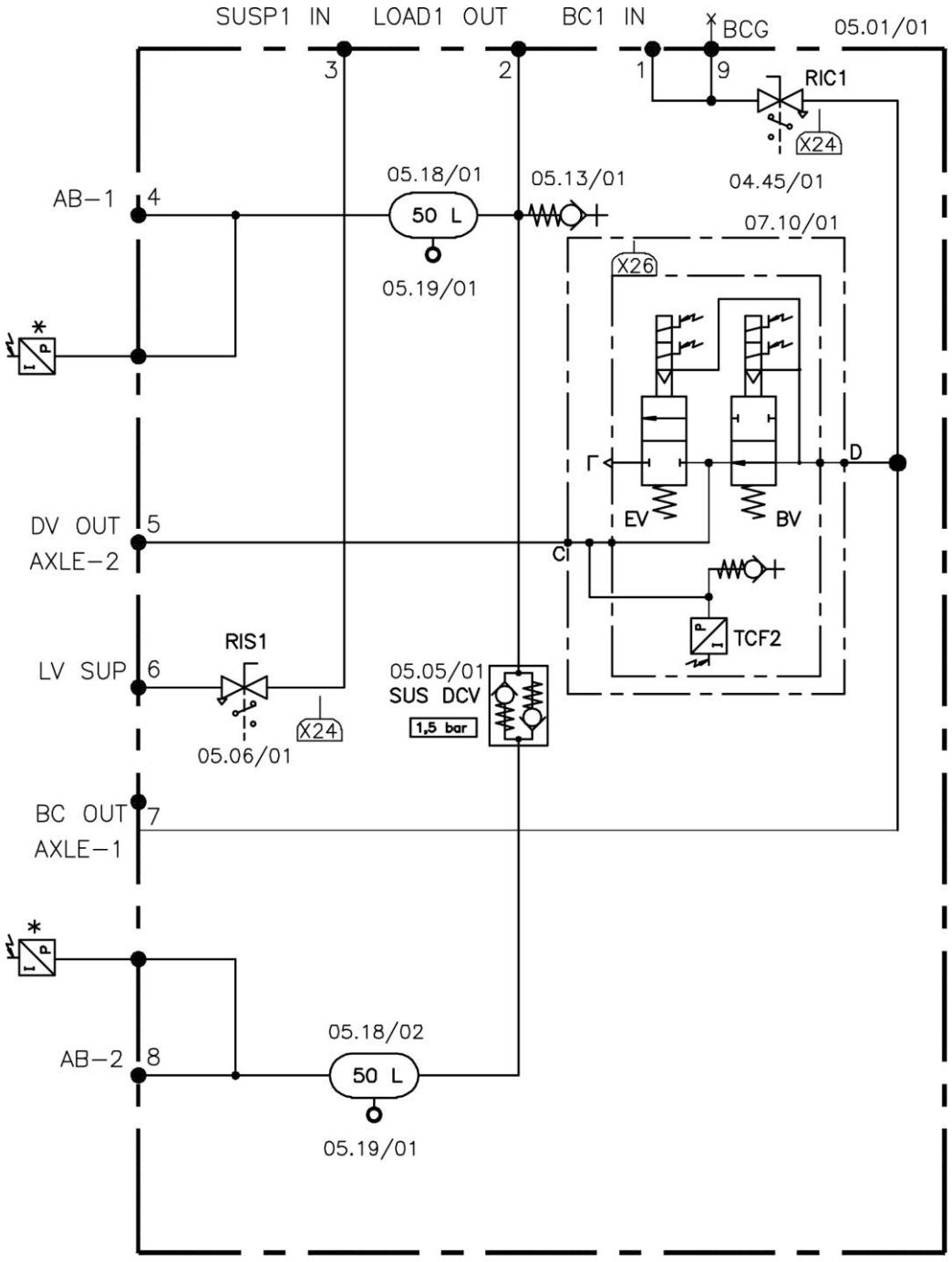

Figure 3: Air Suspension Frame Assembly DE, Pneumatic Scheme

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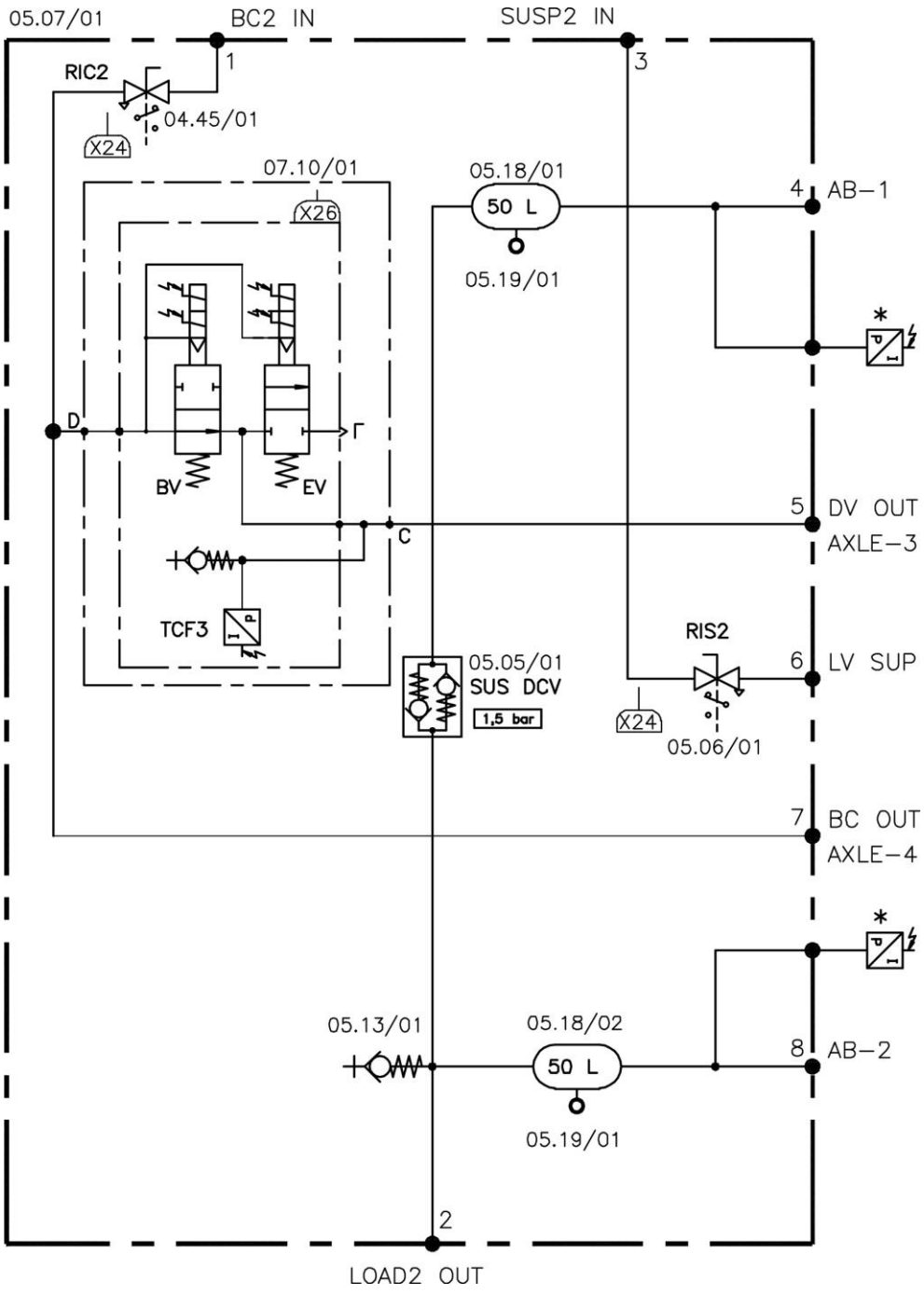

Figure 4: Air Suspension Frame Assembly NDE, Pneumatic Scheme

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2.4 ELECTRICAL DIAGRAM

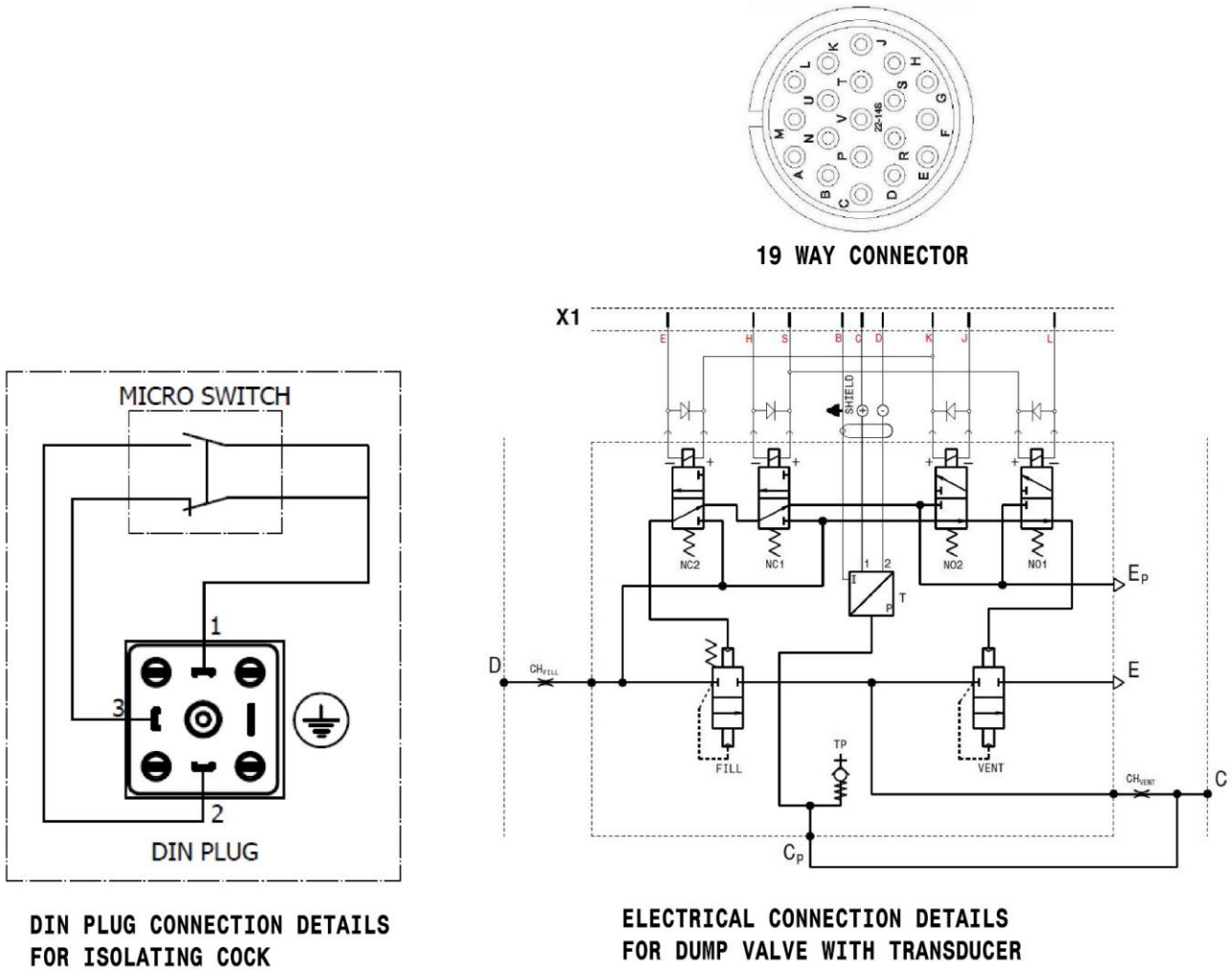

Figure 5: Air Suspension Frame Assembly DE and NDE, Electrical Diagram

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/// 3. OPERATIONS

3.1 DUMP VALVE

The dump valve is used to prevent the wheel blocking in situations of low adhesion between wheel and rail. It is used to regulate the pressure in the brake cylinders in order to maximize the braking effort for any given wheel/rail interface coefficient of friction, thus achieving the shortest stopping distance and preventing wheel flats.

3.2 DUPLEX CHECK VALVE

The Duplex Check Valve is used to prevent any air flow between the two air spring suspension bellows until it exceeds the set differential pressure.

3.3 RESERVOIR

The St. Steel Reservoir is a pressurized vessel that contains a volume of air in defined conditions of pressure.

3.4 ISOLATING COCK

The Isolating Cock with Drain & Micro Switch is used to open/close a pneumatic circuit. Micro switch is used to convey the cock condition to the operator. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
16mm socket wrench	Torque tighten the pipe fittings
16mm spanner	Tighten/loosen the pipe fittings
18mm socket wrench	Torque tighten the pipe fittings
18mm spanner	Tighten/loosen the pipe fittings
24mm socket wrench	Torque tighten the pipe fittings
24mm spanner	Tighten/loosen the pipe fittings
27mm spanner	Tighten/loosen the pipe fittings
30mm spanner	Tighten/loosen the pipe fittings

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242/243	Sealant for fasteners
Loctite 577	Sealant for fittings
Stylmark	Torque marker

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

CAUTION! To respect the maintenance prescription and intervals in order to not impair safety.

Make a functional check and a general overhaul as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.

For the controls below, it is not necessary to remove the equipment from the vehicle.

Pay attention to the following maintenance interval:

First level maintenance (Functional control)

For the controls below, it is not necessary to remove the equipment from the vehicle.

- Maintenance M1 to be performed every one year.

Second level maintenance (General overhaul)

Repair in Workshop or Replacement:

- Overhaul R1 to be performed every 6 years.
- Overhaul R2 to be performed every 12 years.

The owner can adapt this periodicity according to conditions of use, their maintenance policy and their own experiment, under their responsibility.

The maintenance schedule here proposed is based upon the best knowledge so far acquired. It must be updated / changed properly, should this necessity become evident from the service exploitation, especially where safety is concerned.

This section contains the indications of the timing and mileage for carrying out each maintenance task.

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IMPORTANT NOTES

The timing indicated both in terms of mileage and in terms of time. The one occurring first must be observed. Every task includes the tasks occurring at higher frequency.

Proposed maintenance schedule takes into account regular service condition. More severe operation and environment circumstances may require more frequent tasks.

A tolerance of +20% is admitted provided that evidence from field proves this is sustainable with no adverse effects on safety and/or reliability.

No special cleaning operations have been considered, however, depending on the installation on the vehicle, it could be necessary to remove regularly the possible deposits of dirt and debris that may affect the equipment's functionality.

Make sure that the air used to supply the system externally (e.g. through the Air Service Point Group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1, otherwise the devices will be damaged.

Important! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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THE AIR SUSPENSION FRAME ASSEMBLY DE AND NDE

FIRST LEVEL MAINTENANCE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	M1	REF./SECTION
1ST LEVEL 1 year	1/2" Isolating cock with drain & micro switch	05.06 04.45	FT0050822-102 FT0050822-103	Functional Test	•	FT0050822-102-E00MUM
	Surge reservoir 50L	05.18	FT0053771-000	Visual inspection and drain	•	5.1.1
	Drain valve	05.19	702010600	Functional check	•	5.1.2

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SECOND LEVEL MAINTENANCE

2. Second Level Maintenance: overhaul/replacement as scheduled in **the system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled/replaced regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	R1	R2
6 years	Duplex check valve	05.05	FT0051153-A00	Overhaul	•	
	1/2" Isolating cock with drain & micro switch	05.06 04.45	FT0050822-102 FT0050822-103	Overhaul	•	
	Drain valve	05.19	702010600	Replacement	•	
	Dump valve	07.10	FT0126060-100	Overhaul	•	
12 years	Surge reservoir 50L	05.18	FT0053771-000	Hydrostatic test		•

NOTE: Maintenance operations must be carried out by qualified personnel in authorized workshops.

NOTE: WABTEC provides an overhauling service for its own units. WABTEC performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.
The WABTEC Service Centres have the experience and technical equipment needed for performing professional overhauls

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5.1.1 RESERVOIR

VISUAL INSPECTION

Warning! When performing any test or work on devices or equipment while they are on the vehicle (on CAR TEST, etc) special precautions must be taken to ensure that vehicle movement will not occur which could result in injury to personnel and/or damage to the equipment.

Refer to Figure 6

1. Verify all the mounting hardware are secure.
2. No visual signs of damage.
3. Visually check that the welds are in perfect conditions and there are no signs of corrosion or other damages If any leaks or damage are present, replace the component.

DRAINING

CAUTION! Possible jet spray! Wear protective gloves and goggles.

WARNING! Collect the drainage waste as prescribed by the law in force, as it may contain oil.

Refer to Figure 6

1. Check the drain valve (2) and reservoir 50L (1) for any leaks as per system level procedure or damage are present and drain the reservoir 50L (1) by pulling the lever on drain valve (2) to drain water from reservoir 50L (1).

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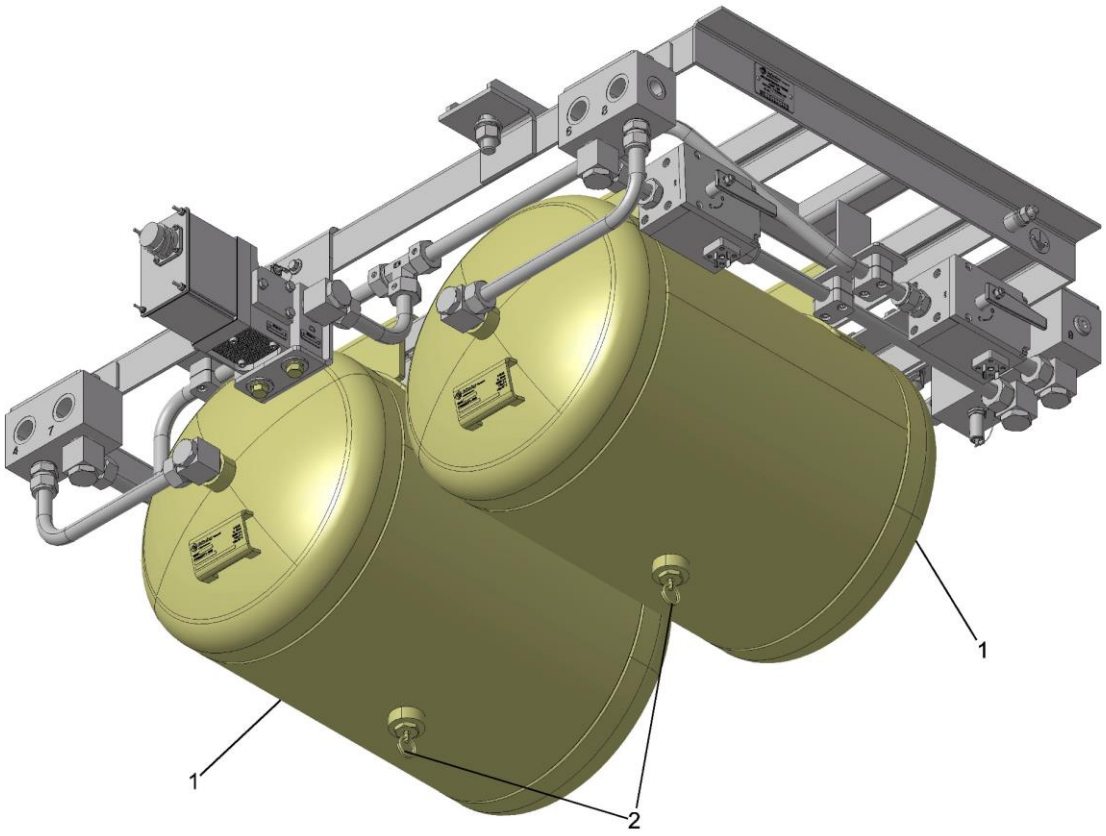

Figure 6: Visual Inspection/Draining, Reservoir

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 50L	FT0053771-000	2
2	DRAIN VALVE	702010600	2

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5.1.2 DRAIN VALVE

FUNCTIONAL CHECK

Caution! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the drain valve and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob move properly. The test must be done with the system pressurised.
3. At the end of the test, make sure all the initial conditions are restored.

5.2 REMOVAL AND INSTALLATION PROCEDURE OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

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5.2.1 REMOVAL PROCEDURE

Refer to Figure 7

1. Disconnect the all electrical and pneumatic connections.
2. Disconnect earthing connections by unscrewing fasteners (Not Wabtec scope of supply) using appropriate tool.
3. Use lifting point to lift the air suspension frame assy (1) from the car using adequate lifting tool.
4. Remove the following parts that attach the air suspension frame assy (1) to the car:
   - Four hex head bolts (2).
   - Eight nord lock washers (3).
   - Eight plain washers (4).
   - Four hexagonal nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to loosen the hex head bolts (2).

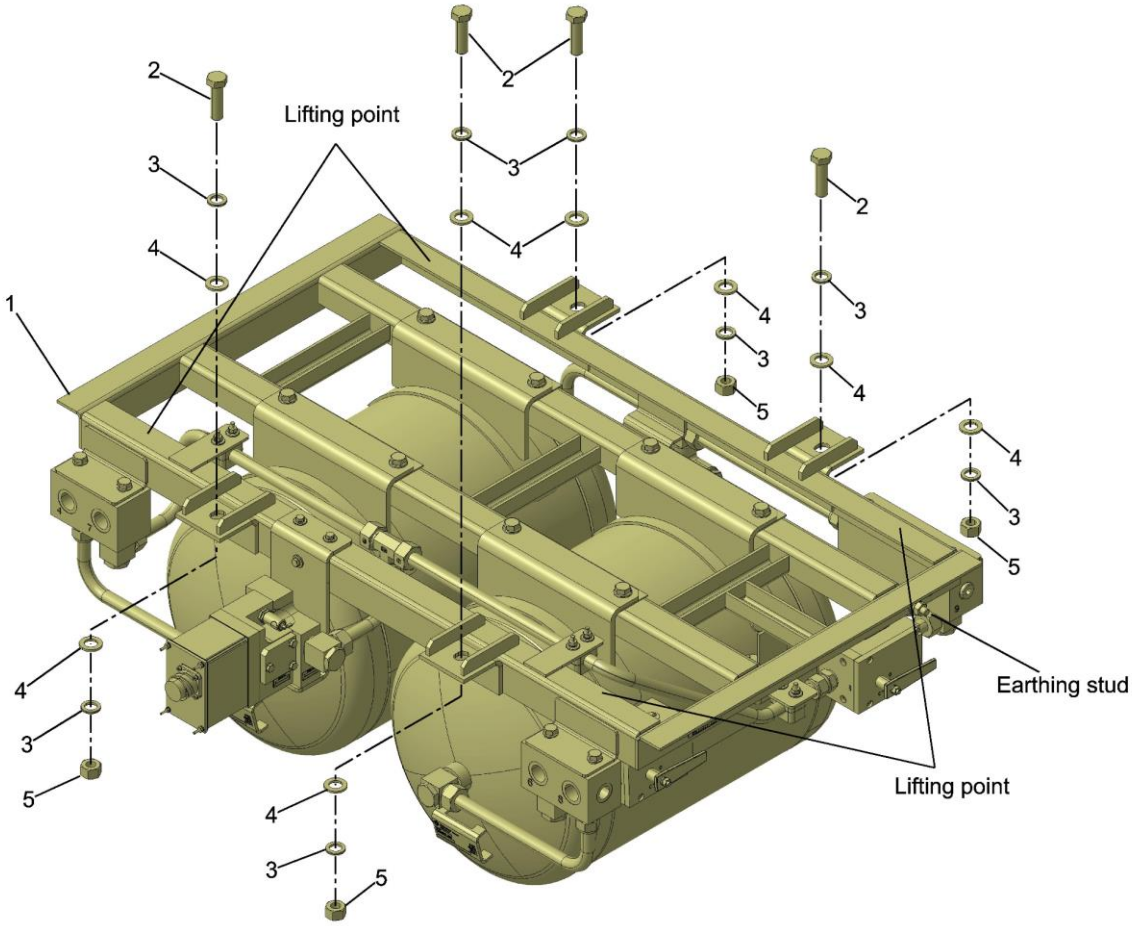

Figure 7: Removal / Installation of Air Suspension Frame Assy

ITEM NO.	DESCRIPTION	P/N	QTY
1	AIR SUSPENSION FRAME ASSY DE	FT0053353-100	1
2	AIR SUSPENSION FRAME ASSY NDE	FT0053353-101	1

Note: Item 2, 3, 4 and 5 are not under the scope of Wabtec.

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5.2.2 INSTALLATION PROCEDURE

Refer to Figure 7

1. Install the air suspension frame assy (1) on the car using adequate tool.
2. Apply Loctite 242 on threads of the four hex head bolts (2).
3. Install the following parts that secures the air suspension frame assy (1) to the car.
   - Four hex head bolts (2).
   - Eight nord lock washers (3).
   - Eight plain washers (4).
4. Four hexagonal nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolts (2).
5. Torque tighten the four hex head bolts (2) to 211 Nm. Apply torque mark using Stylmark on it.
6. Connect earthing connections by installing fasteners (Not Wabtec scope of supply) using appropriate tool.
7. Connect the electrical and pneumatic connections.
8. Pressurize the system, switch on the electrical power and check for leakages as per the system level procedure performed during car builder's general system check.

5.3 REMOVAL AND INSTALLATION PROCEDURE OF DUMP VALVE

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

5.3.1 REMOVAL PROCEDURE

Refer to Figure 8

1. Unplug the electrical connections from connector.
2. Disconnect the banjo fitting ½" BSP (6) from dump valve (1) using 30mm spanner
3. Unscrew and remove the following parts that attach the dump valve (1) to the dump valve bracket (5).
   - Two hex head screws (2) using 16 mm socket wrench.
   - Two conical washers (3)
   - Two washers (4).

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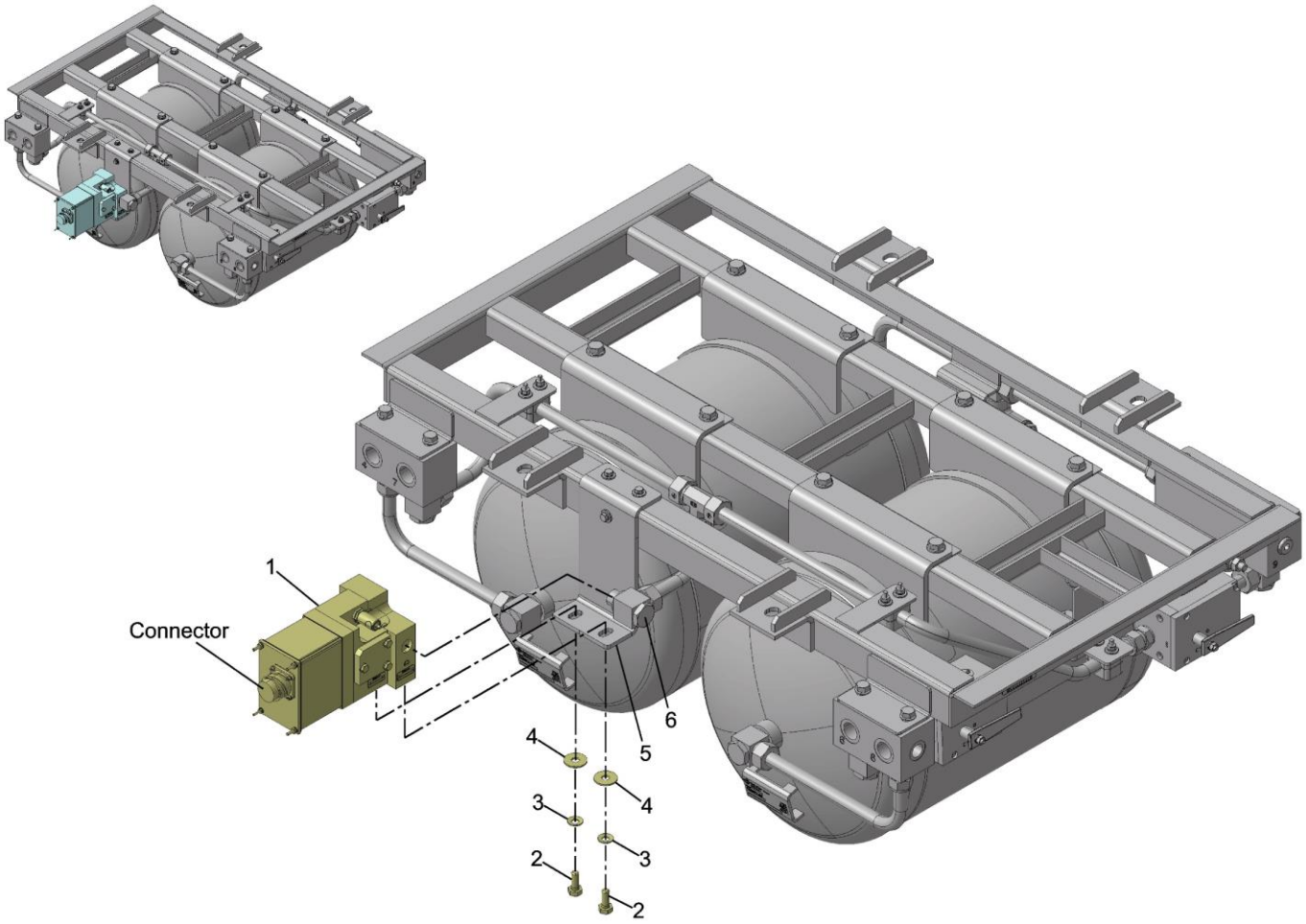

Figure 8: Removal / Installation of Dump Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	DUMP VALVE	FT0126060-100	1
2	HEX HD SCREW M10	920045400	2
3	CONICAL WASHER	2/519043	2
4	WASHER	FT0030003-036	2
5	DUMP VALVE BRACKET	FT0054991-000	1
6	BANJO FITTING ½" BSP	FT0052168-001	1

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5.3.2 INSTALLATION PROCEDURE

Refer to Figure 8

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242 on threads of the two hex head screws (2).
5. Install the following parts that attach the dump valve (1) to the dump valve bracket (5).
   - Two hex head screws (2) using 16 mm socket wrench.
   - Two conical washers (3)
   - Two washers (4).
6. Torque tighten the two hex head screws (2) to 27.3 Nm. Apply torque mark using Stylmark on it.
7. Apply Loctite 577 on the banjo fitting ½" BSP (6).
8. Connect the banjo fitting ½" BSP (6) to dump valve (1) using 30mm spanner and lock it using the driving torque indicated by the fitting manufacturer.
9. Plug the electrical connections on connector.
10. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
11. For further information refer device manual FT0126060-100-E00MUM

Note: Fittings can be reused from old dump valve (1).

5.4 REMOVAL AND INSTALLATION PROCEDURE OF RESERVOIR 50L

Caution! Pressurised system. Discharge the system pressure before removing any component.

Generic risk

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

5.4.1 REMOVAL PROCEDURE

Refer to Figure 9

1. Disconnect the banjo fitting ½" BSP (6) using 30mm spanner on both the sides of reservoir 50L (1).
2. Remove the following parts that attach the reservoir 50L (1) to the frame.
   - Four hex head screws (2)
   - Eight plain washers (3)
   - Four conical washers (4)
   - Four hex nuts (5) using 18 mm spanner and wrench by holding the nut with spanner and wrench to loosen hex head screw (2).
3. Follow the same steps for second reservoir 50L (1)

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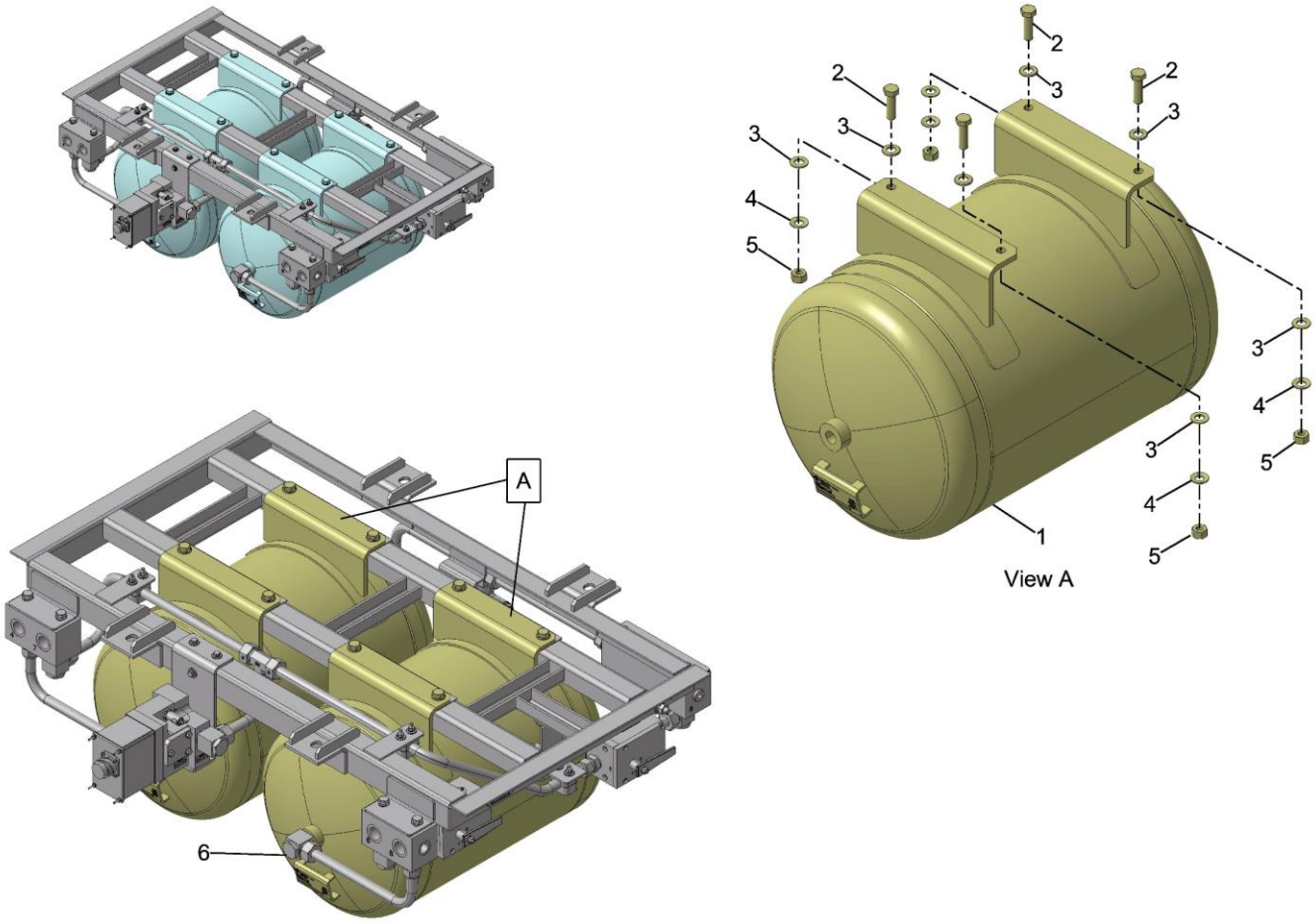

Figure 9: Removal / Installation of Reservoir 50L

ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 50L	FT0053771-000	2
2	HEX HD SCREW M12	920045600	4
3	PLAIN WASHER	908021000	8
4	CONICAL WASHER	2/519044	4
5	HEX NUT	906022800	4
6	BANJO FITTING 1/2" BSP	FT0052168-001	2

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5.4.2 INSTALLATION PROCEDURE

Refer to Figure 9

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Position reservoir 50L (1) on the frame.
5. Apply Loctite 242 on threads of the four hex head screws (2).
6. Install the following parts that secures the reservoir 50L (1) to the frame.
   - Four hex head screws (2)
   - Eight plain washers (3)
   - Four conical washers (4)
   - Four hex nuts (5) using 18 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head screw (2).
7. Torque the four hex head screws (2) to 46.7 Nm. Apply torque mark using Stylmark on it.
8. Apply Loctite 577 on the banjo fitting ½" BSP (6).
9. Connect banjo fittings ½” BSP (6) using 30mm spanner and lock it using the driving torque indicated by the fitting manufacturer.
10. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.
11. For further information refer device manual FT0051876-000-E00MUM

Note: Fittings can be reused from old reservoir 50L (1).

5.5 REMOVAL AND INSTALLATION PROCEDURE OF ISOLATING COCK

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. Close the Isolating cock that has to be removed to drain the outlet pressure, and the inlet side cock of the two-port Relay Valve to be closed before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

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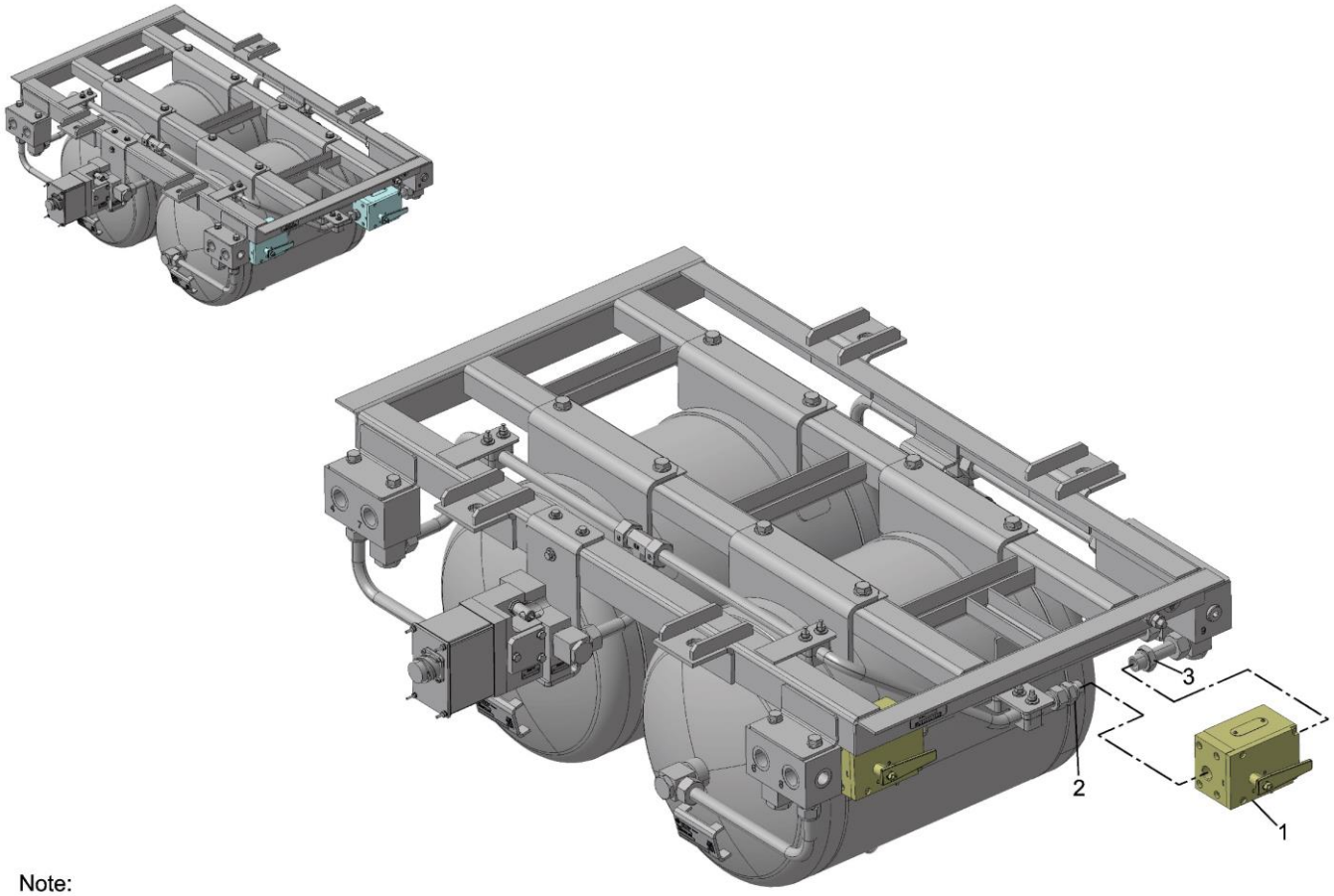
5.5.1 REMOVAL PROCEDURE

Refer to Figure 10

1. Remove the electrical connections from isolating cock (1) by using screw driver.
2. Disconnect the fitting ½" BSP (3) by using 30 mm spanner and straight connector (2) using 27 mm spanner from the Isolating Cock (1) inlet and delivery ports.
3. Remove the isolating cock (1) from the system.



Note:
Image is for illustrated purpose location of isolating cock varies for DE and NDE

Figure 10: Removal / Installation of Isolating Cock (illustrated example)

ITEM NO.	DESCRIPTION	P/N	QTY
1	ISOLATING COCK	REFER BELOW TABLE	2
2	STRAIGHT CONNECTOR	FT0052167-001	2
3	FITTING 1/2"BSP	FT0053772-000	2

AIR SUSPENSION FRAME ASSY.	ITEM 1
DE	FT0050822-102
NDE	FT0050822-103

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5.5.2 INSTALLATION PROCEDURE

Refer to Figure 10

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports
4. Install the Isolating Cock (1) to the customer interface, which is under car builder scope.
5. Apply Loctite 577 on the fitting ½" BSP (3).
6. Connect the fitting ½" BSP (3) by using 30 mm spanner and straight connector (2) using 27 mm spanner to the Isolating Cock (1) inlet and delivery ports.
7. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
8. Connect the electrical connection.
9. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
10. For further information refer device manual FT0050822-102-E00MUM.

Note: Fittings can be reused from old Isolating Cock (1).

5.6 REMOVAL AND INSTALLATION PROCEDURE OF DUPLEX CHECK VALVE

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. The Suspension pressure has to be isolated to remove the Duplex Check Valve.

5.6.1 REMOVAL PROCEDURE

Refer to Figure 11

1. Disconnect the L-banjo fitting (6) and T banjo (7) from duplex check valve (1) using 30mm spanner.
2. Remove the following parts that attach the duplex check valve (1) to frame:
   - Two hex head screws (2)
   - Two conical washers (3)
   - Four plain washers (4)
   - Two hex nuts (5). using 16 mm spanner and wrench by holding the nut with spanner and wrench to loosen hex head screw (2).

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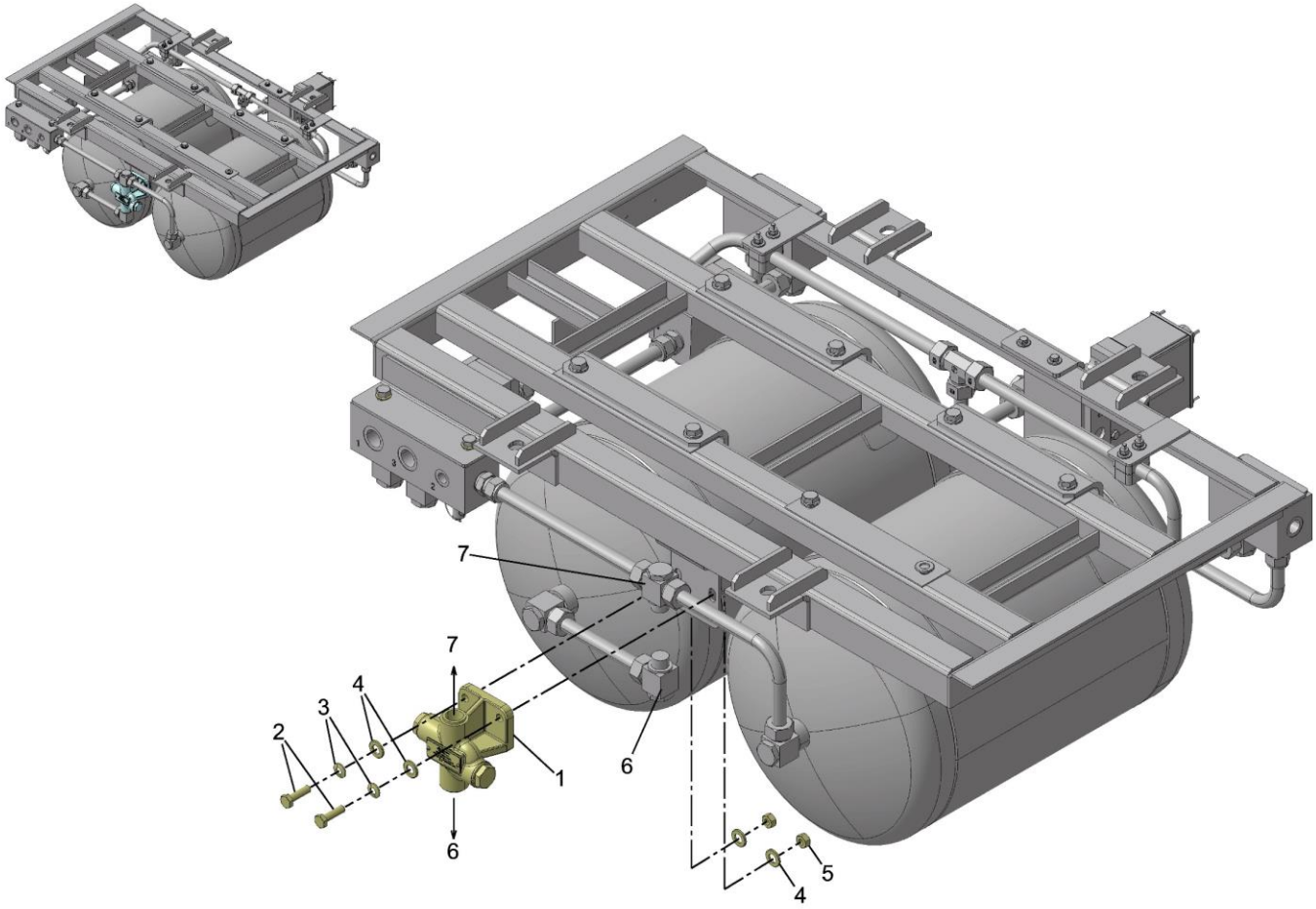

Figure 11: Removal / Installation of Duplex Check Valve

ITEM NO.	DESCRIPTION	P/N	QTY
1	DUPLEX CHECK VALVE	FT0054993-100	1
2	HEX HD SCREW M10	920043300	2
3	CONICAL WASHER	2/519043	2
4	PLAIN WASHER	908020600	4
5	HEX NUT	906021500	2
6	L-BANJO FITTING	FT0052168-001	1
7	T-BANJO	FT0053833-000	1

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5.6.2 INSTALLATION PROCEDURE

Refer to Figure 11

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242 on threads of the two hex head screws (2).
5. Install the following parts that secures the duplex check valve (1) to the frame.
   - Two hex head screws (2)
   - Two conical washers (3)
   - Four plain washers (4)
   - Two hex nuts (5) using 16 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head screw (2).
6. Torque tighten the two hex head screws (2) to 27.3 Nm. Apply torque mark using Stylmark on it.
7. Apply Loctite 577 on the L banjo fitting (6) and T banjo (7).
8. Connect the L banjo fitting (6) and T banjo (7) using using 30 mm spanner to the duplex check valve (1).
9. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
10. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
11. For further information refer device manual FT0054993-100-E00MUM.

Note: Fittings can be reused from old duplex check valve (1).

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5.7 REMOVAL AND INSTALLATION PROCEDURE OF DRAIN VALVE

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. The Suspension pressure has to be isolated to remove the Duplex Check Valve.

5.7.1 REMOVAL PROCEDURE

Refer to Figure 12

1. Drain the reservoir 50L (2) by pulling the lever on drain valve (1) to drain water from reservoir 50L (2).
2. Unscrew and remove drain valve (1) form reservoir 50L (2) by using 24mm spanner.
3. Follow the same steps for second drain valve (1).

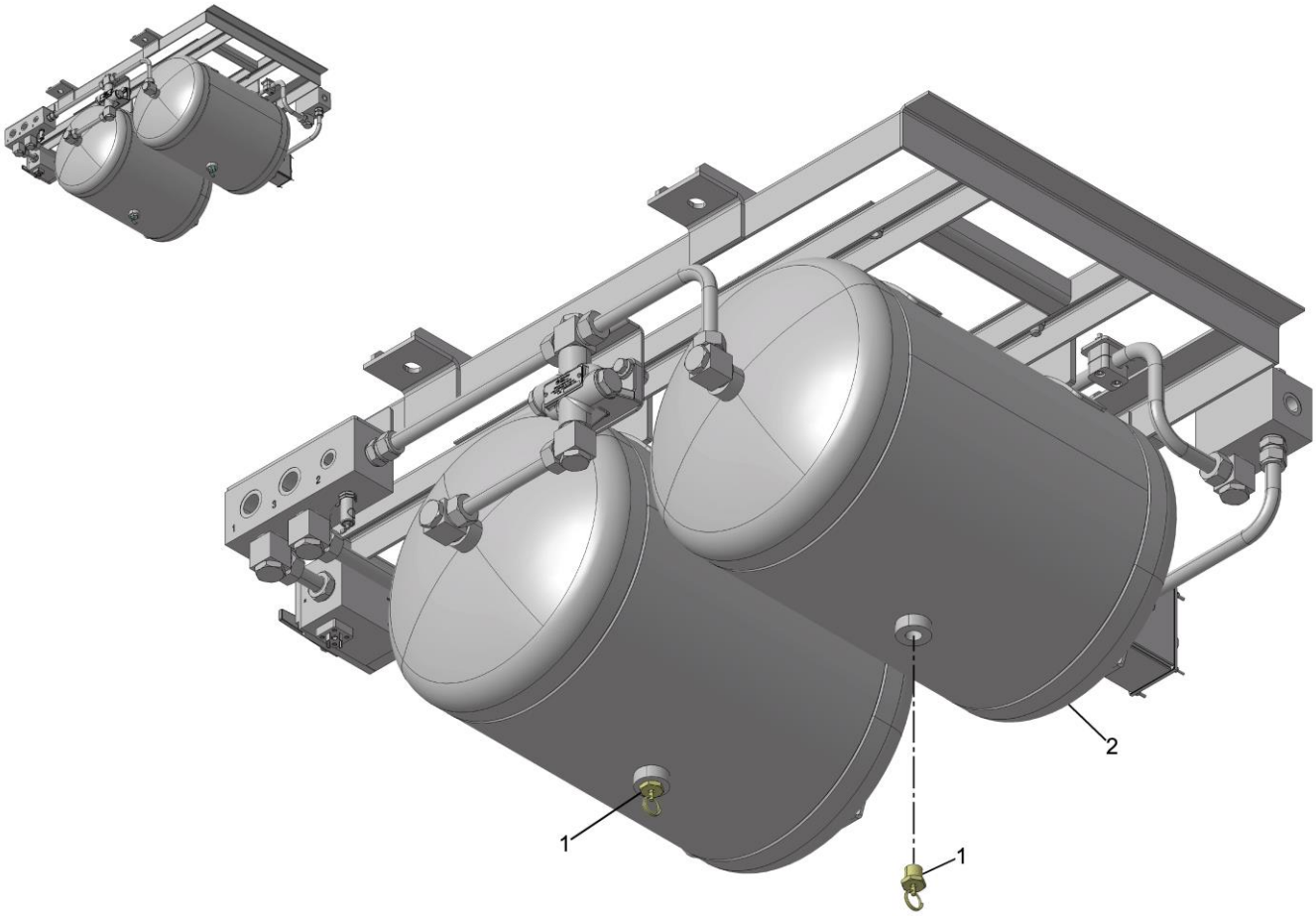

Figure 12: Removal / Installation of Drain Valve

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ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 50L	FT0053771-000	2
2	DRAIN VALVE	702010600	2

5.7.2 INSTALLATION PROCEDURE

Refer to Figure 12

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Do not use tuflon tape on the threaded ports.
3. Install the drain valve (1) to the reservoir 50L (2) using 24 mm spanner.
4. Torque tighten the drain valve (1) using the driving torque indicated by the fitting manufacturer.
5. Follow the same steps for second drain valve (1).
6. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance - The spare parts required for routine maintenance are reported in the single main subcomponent User Manuals: see User Manuals list in the table Preventive maintenance (First Level).

- Installation: Spare parts not required.

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with NEW ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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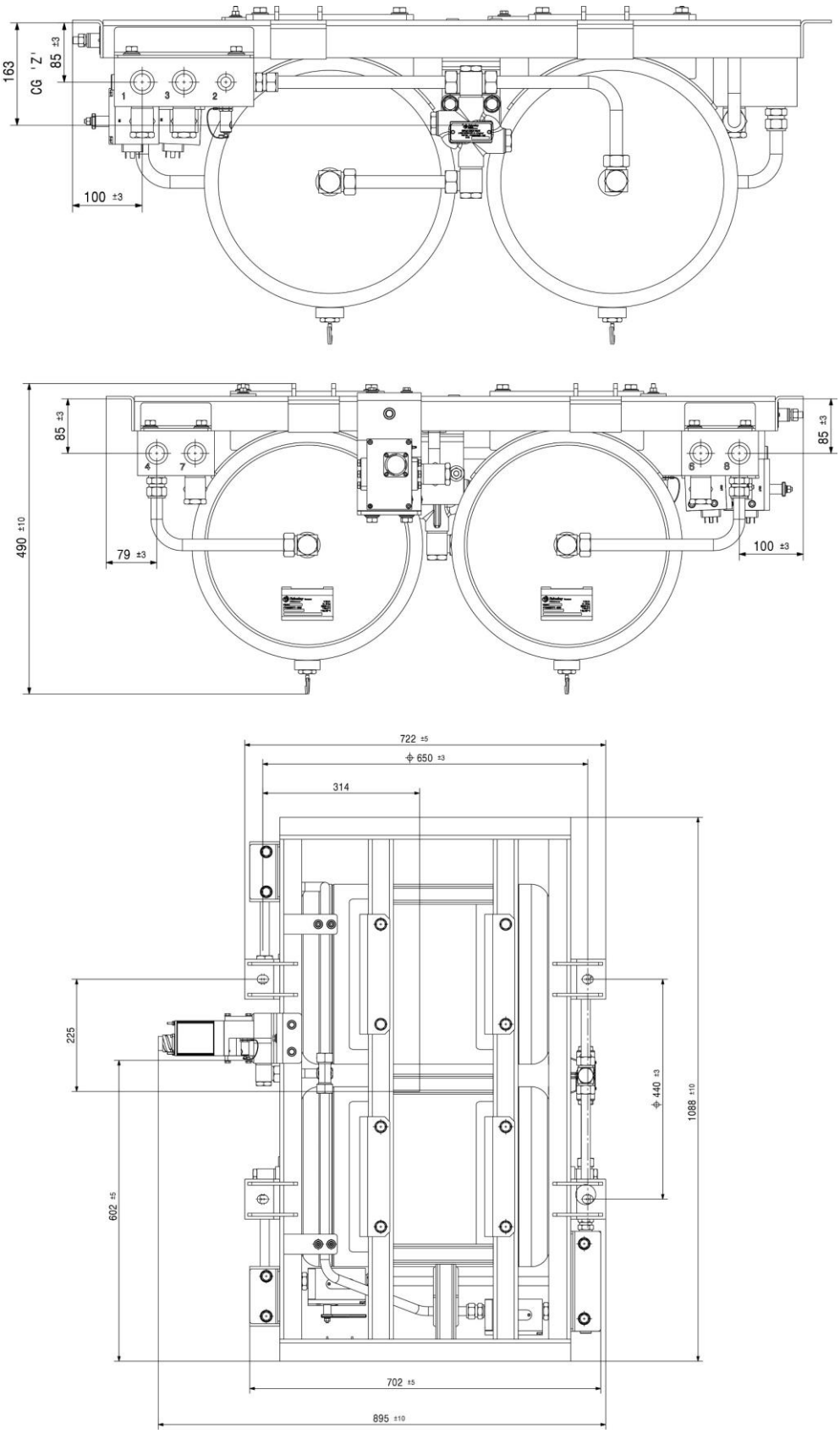
/// 8. OUTLINE DRAWING

Air Suspension Frame Assy - DE– FT0053353-100



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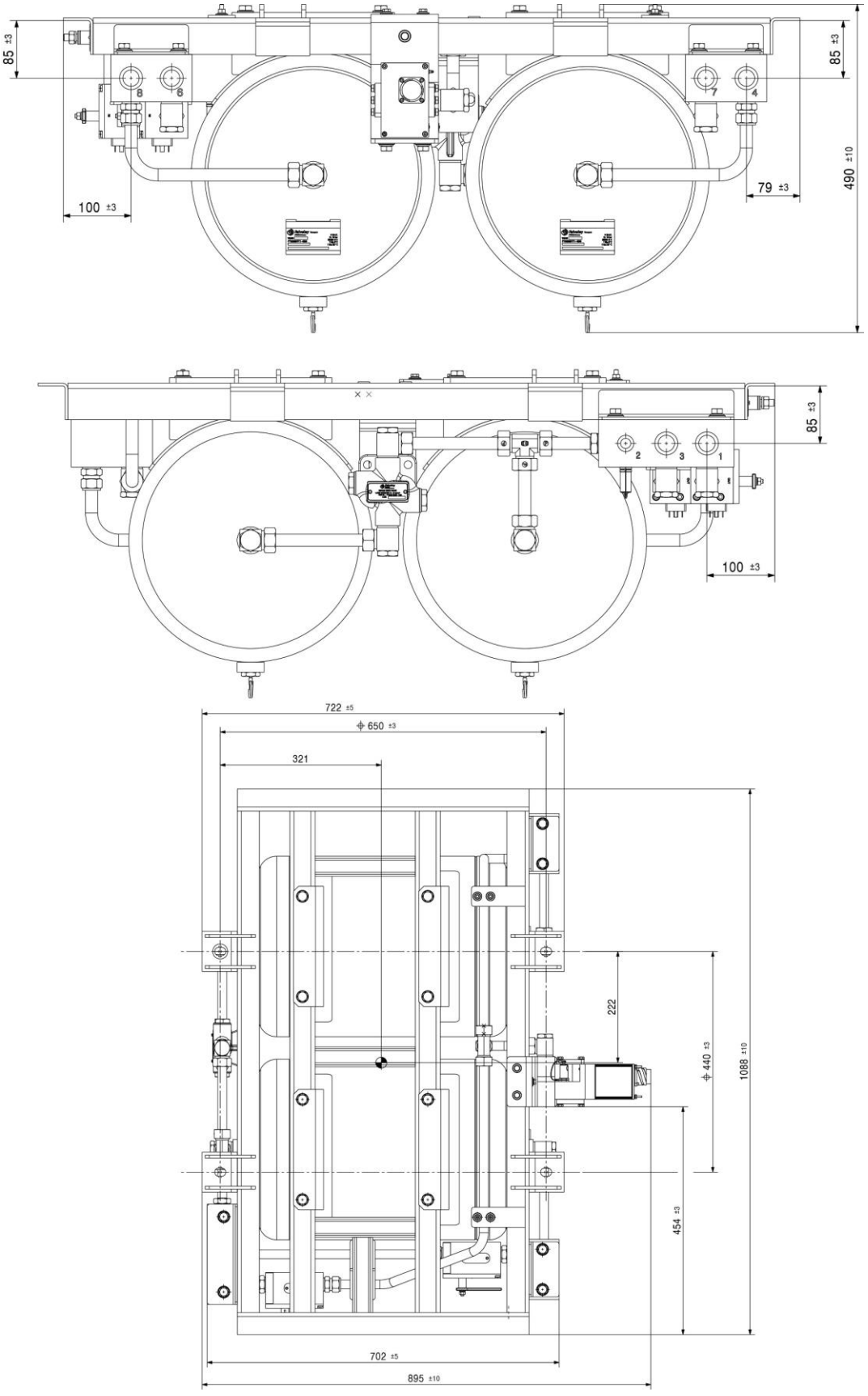
Air Suspension Frame Assy - NDE– FT0053353-101



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05.04_Leveling valve

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/// 038001500-E00MUM

LEVELING VALVE ASSY RH
038001500
LEVELING VALVE ASSY LH
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LEVELING VALVE
038001000

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.NRS Systems Engineer, Engineering		
Approved:	.BSH Manager, Engineering		
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
038001500-E00MUM.docx	B00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	19/01/2022	NEW RELEASE	DRC 1922	VP	KMS	.BSH
B00	01/11/2022	Document updated with new template and added new P/N added: 038001000	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Leveling Valve Assy ensures that coupling height between vehicles in a train remains constant, irrespective of vehicle loading, by controlling the feed or exhaust of compressed air to or from the vehicle suspension bellows in proportion to the loading.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Leveling Valve Assy must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Leveling Valve and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Leveling Valve Assy for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
BSPP	British Standard Parallel Pipe
HD	Head
HEX	Hexagonal
mm	millimeter
Nm	Newton meter
P/N	Part number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The Leveling Valve Assy ensures that coupling height between vehicles in a train remains constant, irrespective of vehicle loading, by controlling the feed or exhaust of compressed air to or from the vehicle suspension bellows in proportion to the loading.

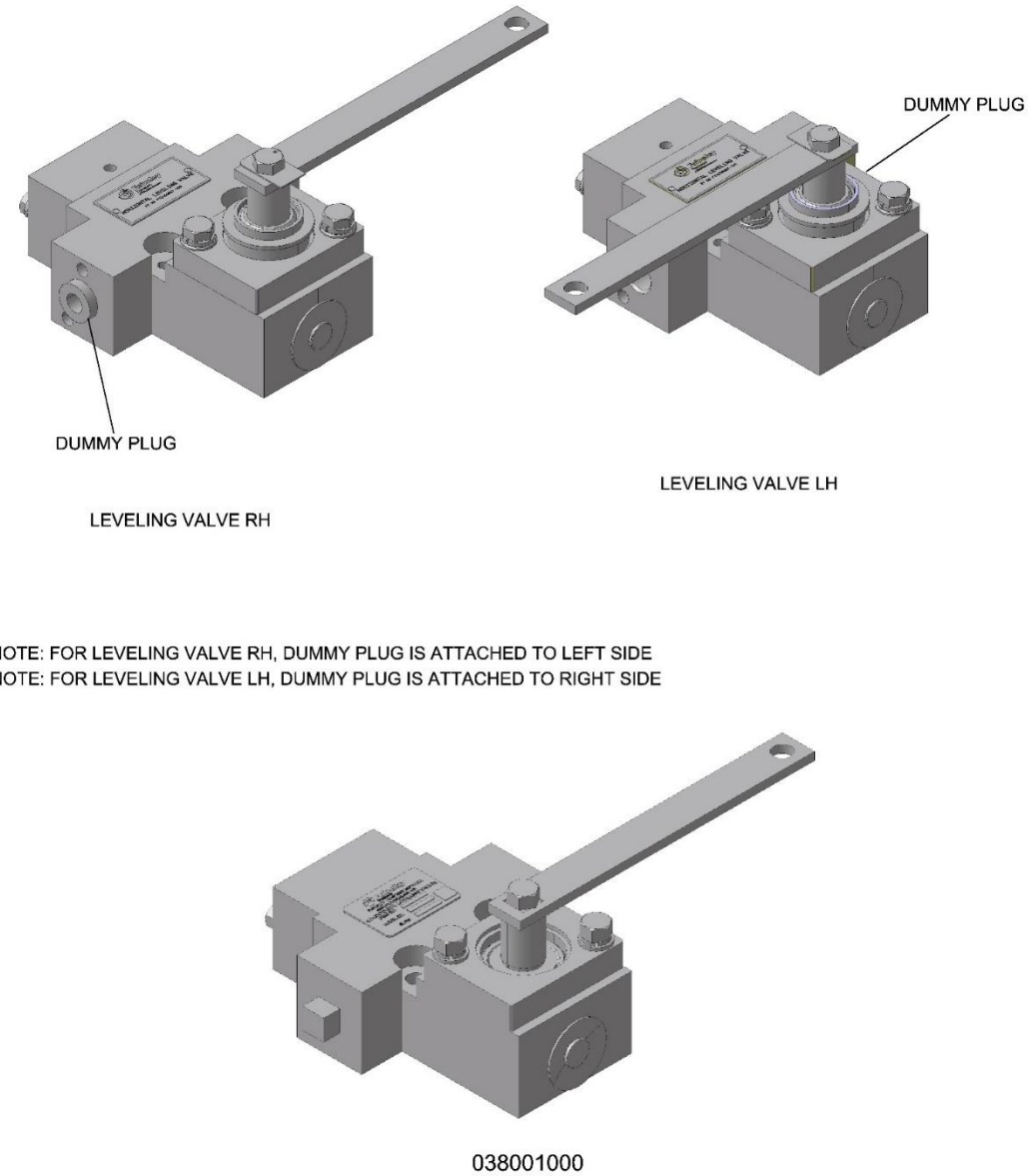

Figure 1: Leveling Valve Assy, Isometric View

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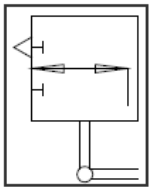

Figure 2: CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	038001500	038001600	038001000
Weight	2.0 kg	2.0 kg	2.0 kg
Working pressure	10 Bar	10 Bar	10 Bar
Range	0-10 Bar	0-10 Bar	0-10 Bar
Port size	3/8" BSPP		3/4' BSPT

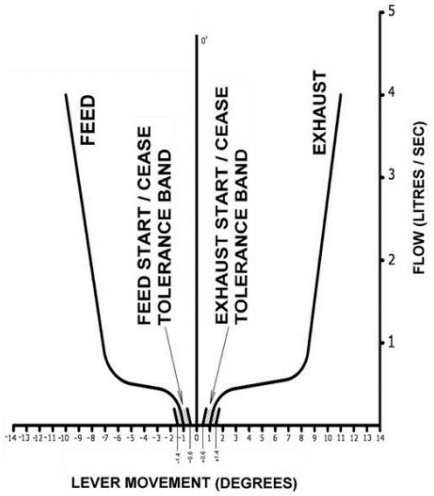

Figure 3: Leveling Valve Assy, Performance Graph

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/// 3. OPERATIONS

3.1 LAP POSITION

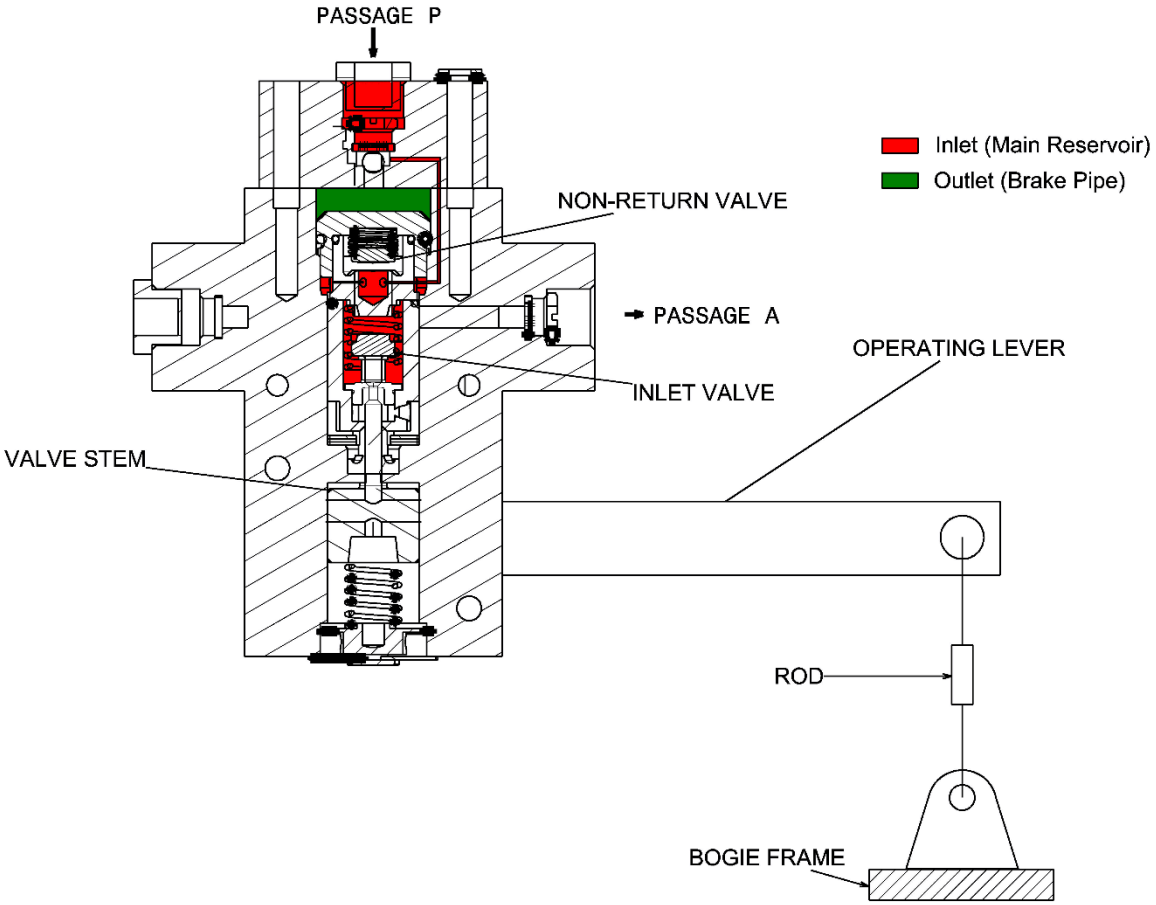

Figure 4: Leveling Valve, LAP Position

Refer to Figure 4

The Leveling valve is shown in the ‘lap’ position i.e. vehicle ‘ride height’ is stable. In this position the operating lever, which is linked to the bogie frame, is maintained in a horizontal position by an adjustable control rod. Non-return valve and inlet valve are closed and the air passage in hollow valve stem, which is in contact with the underside of inlet valve is sealed.

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3.2 OPEN POSITION

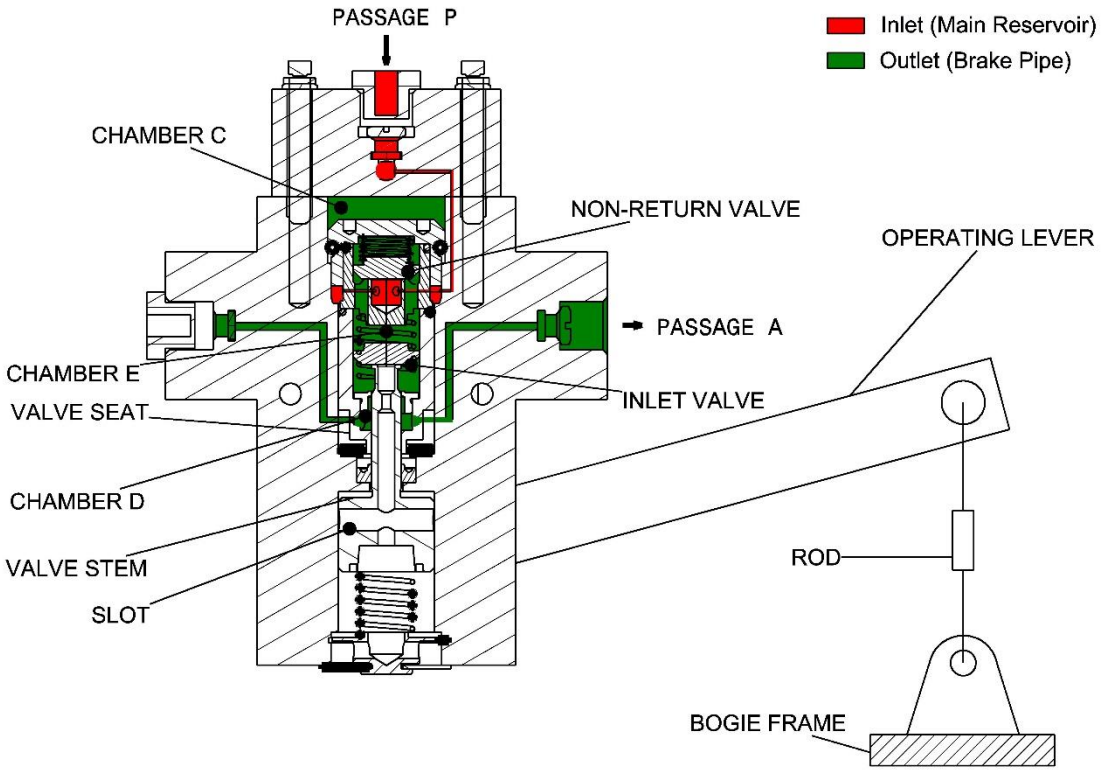

Figure 5: Leveling Valve, Open Position

Refer to Figure 5

When the vehicle is loaded the vehicle body, together with Leveling valve body, sinks with respect to the bogie frame. Consequently, because the right hand end of the operating lever is constrained by the control rod, roller pin, and cam roller, tend to rotate with respect to the Leveling valve body in an anti-clockwise direction. The rotation of the roller pin and cam roller acting in the slot, forces hollow valve stem to rise and lift inlet valve from the valve seat. Compressed air, which enters chamber (E) from the vehicle compressed air system whenever non-return valve is open, flows into chamber (D) resulting in a drop of pressure in chamber (E), and consequently in chamber (C). As air pressure drops in chamber (C) the higher air pressure in passage (P) pushes non-return valve from its seat allowing compressed air to flow from inlet passage (P) via chambers (C, E, D) and passage (A) to the suspension bellows.

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3.3 EXHAUST POSITION

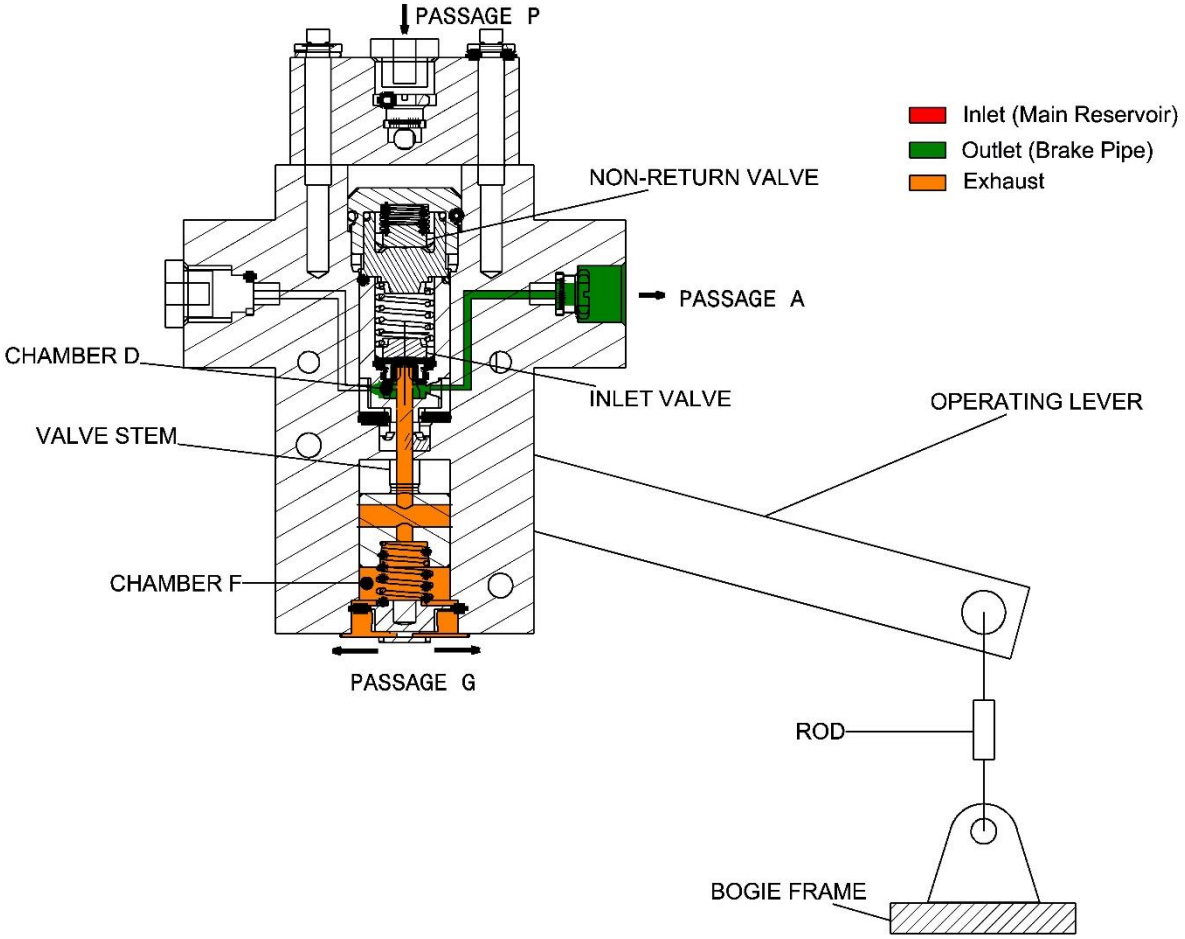

Figure 6: Leveling Valve, Exhaust Position

Refer to Figure 6

When the vehicle is unloaded the vehicle body, together with the Leveling valve body, rises with respect to the bogie frame. Consequently, because the right hand end of the operating lever is constrained by the control rod, roller pin and cam roller (located in the valve stem) tend to rotate with respect to the Leveling valve body in a clockwise direction. The rotation of roller pin and cam roller, acting in the slot forces the tip of hollow valve stem to lose contact with the face of the inlet valve. Inlet valve remains closed and compressed air from the suspension bellows vents to atmosphere via passage (A), chamber (D), hollow valve stem, chamber (F), a hole through the head of the hollow valve stem and passage (G).

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
Screw driver	To tighten/loosen choke
13mm Socket wrench	To tighten/loosen fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242 or 243	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): usually not required. If prescribed in the system maintenance plan, perform a visual inspection every year.

2. Second Level Maintenance: Overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided; the device must be overhauled regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

If prescribed in the system maintenance plan, perform a visual inspection every year as described hereafter:

1. Remove all traces of dirt and deposit.
2. Inspect accurately the valve in order to check there are no signs of damage or wear.
3. With pressurized system check for leakages.

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5.3 REMOVAL PROCEDURE OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

Refer to Figure 7

1. Disconnect the installation lever assembly connecting the Leveling Valve levers. Then disconnect the pipe connections from the Leveling valve (1). Carefully avoid the ingress of dirt or particles in the piping.
2. Remove the two M8 hex head bolts (2) with the two washers (3) using a 13mm socket wrench and isolate the Leveling Valve (1) from the host panel, which is under car builder scope.
3. Use the screw driver to remove the two chokes (4) from the Leveling Valve (1).
4. Remove the two nylon filters (5).

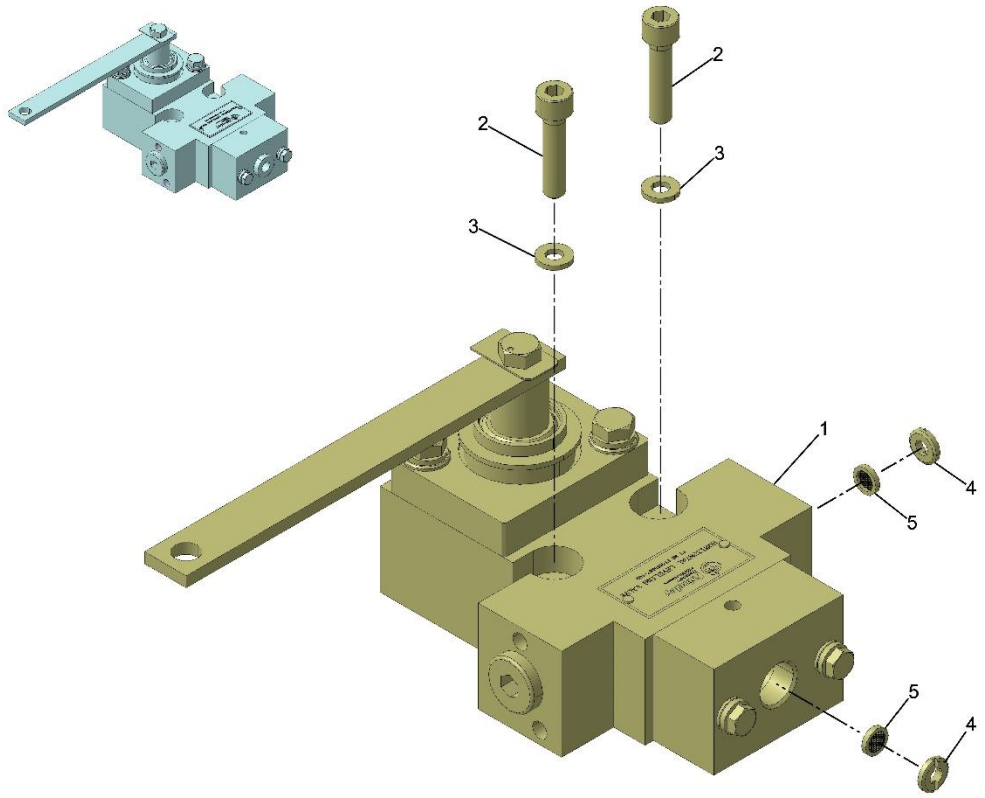

Figure 7: Isolating Cock, Removal/Installation

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ITEM NO	DESCRIPTION	PART NUMBER			QTY
		038001500	038001600	038001000	
1	LEVELING VALVE ASSY	Refer below table		038001000	1
4	CHOKE	038403000		038808100	2
5	NYLON FILTER	038601000		038601200	2

ITEM NO	DESCRIPTION	PART NUMBER
1	LEVELING VALVE ASSY RH	038001500
1	LEVELING VALVE ASSY LH	038001600

Note: Item 2 and 3 are not under the scope of WABTEC.

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 7

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Clean the two nylon filters (5) with an air jet. If found that the filter is fully soiled, replace with **NEW** filters (5) in the inlet and delivery ports.
5. Install the two nylon filters (5) to the Leveling Valve (1).
6. Install the two chokes (4) into the two nylon filters (5) on the Leveling Valve (1) and tighten it with the screw driver.
7. Apply Loctite 242 on threads of the two hex head screws (2).
8. Install the Leveling valve (1) onto customer interface, which is under car builder scope. Secure it with the two M8 hex head bolts (2) and the washers (3) using a 13mm socket wrench and with applicable clamping torque for mounting.
9. Connect the lever to the bogie.
10. Connect the piping fitting. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
11. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance - Spare parts not required.
- Installation: Spare parts required for installation are listed in the below table:

Refer to Figure 7

INSTALLATION SPARE PARTS LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
5	NYLON FILTER	038601200	2
5	NYLON FILTER	038601000	2

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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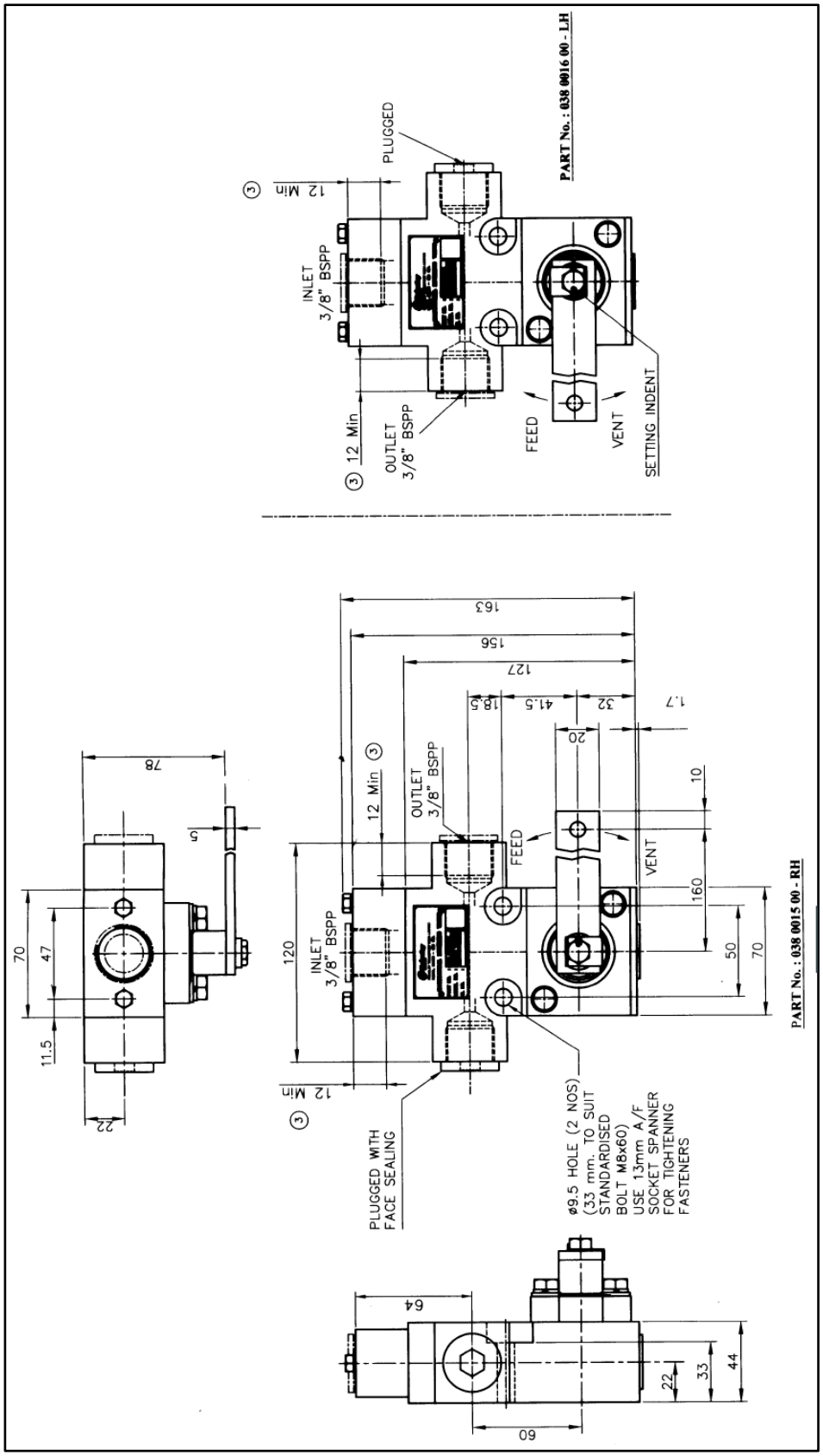
/// 8. OUTLINE DRAWING

Leveling Valve Assy RH & LH - 038001500 & 038001600



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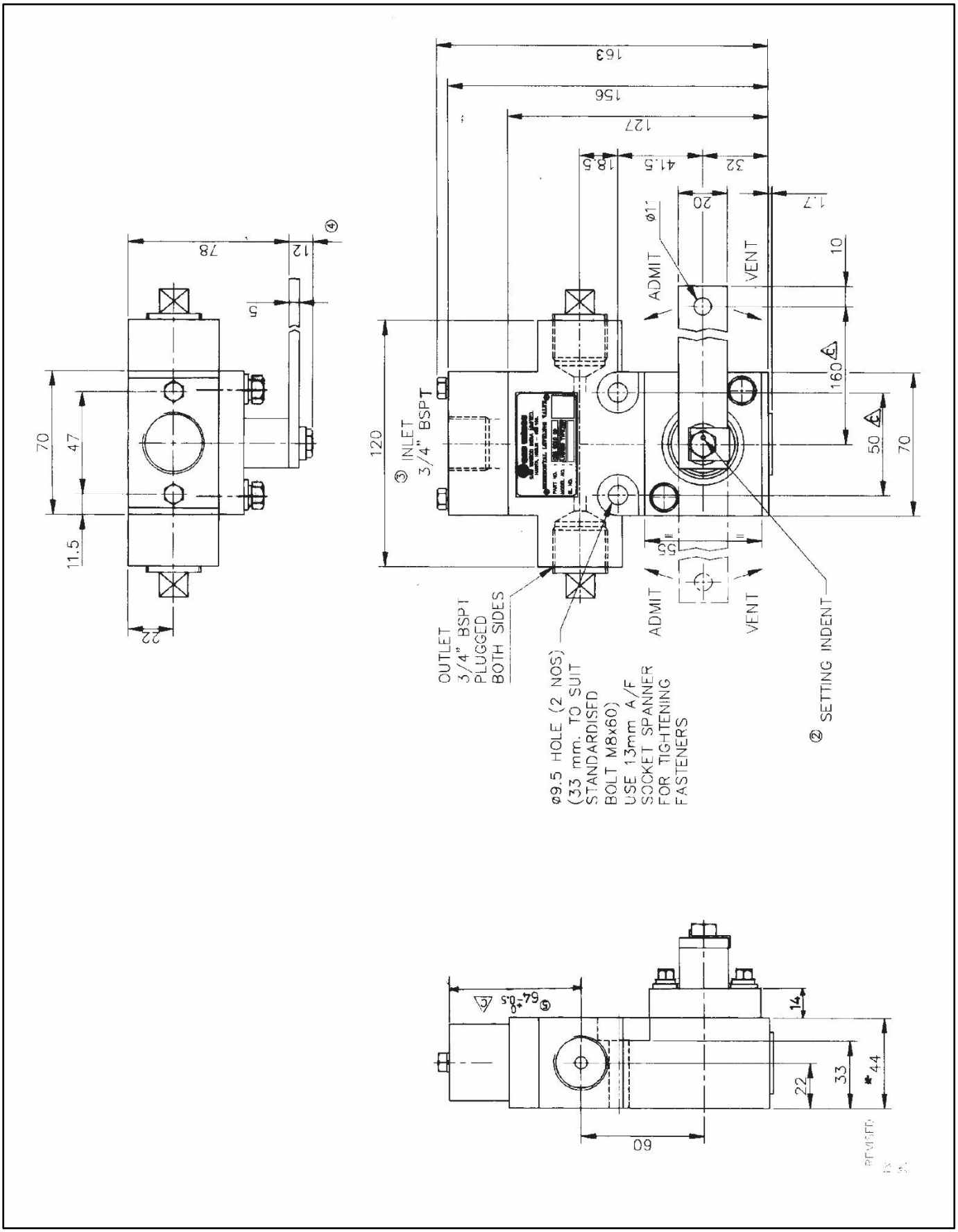
Leveling Valve – 038001000



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07.02_PHONIC WHEEL

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Date/Date: 26/04/16 - Issue/Revision: A00
Maintenance/Use manual
Maintenance/Use manual
ECO/ECO: .

↗ 1/449195-E00MUM

PHONIC WHEEL
To P/N. 1/449195

Compiled/Compiled: SRC
Checked/Checked: .MK
Approved/Approved: .VC

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REVISIONS / Revision						
Issue Revision	Date Date	Description Description	ECO ECO	Compiled Compiled	Checked Checked	Approved Approved
A00	26/04/16	NEW RELEASE	.	SRC	.MK	.VC
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Summary

1 SAFETY PRECAUTIONS 4
2 DESCRIPTION OF THE EQUIPMENT 5
3 MAIN FEATURES AND DATA 5
4 DESCRIPTION OF FUNCTION/OPERATION 5
5 MAINTENANCE PRESCRIPTIONS 6
6 ROUTINE MAINTENANCE 6
7 REMOVAL PROCEDURE 6
8 INSTALLATION PROCEDURE 6
9 SPARE PARTS 7
10 SPECIAL TOOLS 7
11 DISPOSAL 7

Symbols

Warning/Caution. The rule must be strictly observed.

Information, recommendation.

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1 Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- The device must be maintained when and as prescribed.
- Authorised personnel must carry out installation and maintenance.
- Only original spare parts can be used.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to accessing electric parts, make sure the power is duly switched off.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, however take care as there could be residual pressure.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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2 Description of the equipment

The Phonic wheel is a device that is used in association with speed sensor in order to ensure there is no wheel sliding in the vehicle.

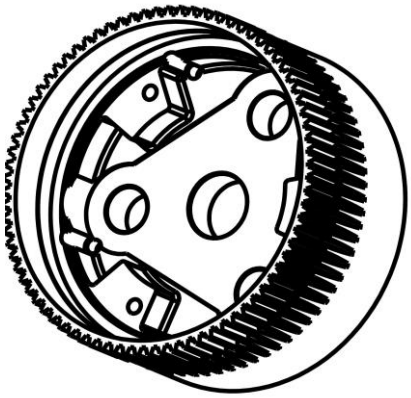

Figure 1: External view

3 Main features and data

- Mass: ..... 5.03 kg

4 Description of function/operation

Refer *Figure 2*

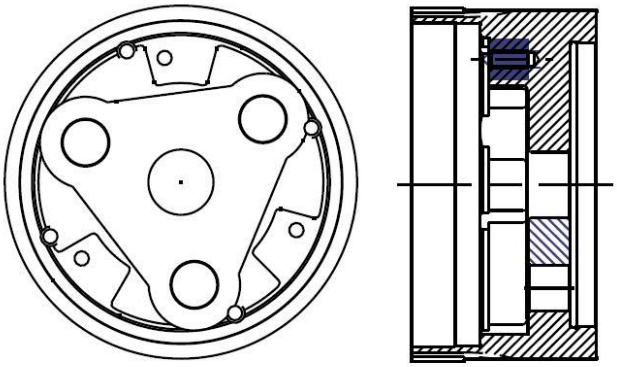

Figure 2: Sectional View and Parts List

The Phonic wheel is toothed wheel of SG iron fixed on the end of the axle. Phonic Wheel fitted on one axle end of each wheel in combination with the speed sensor feeds the signal to the Wheel Slide Protection Unit. The WSP Unit in turn energizes through Dump Valve cabling instantly and operates the particular wheel slide Dump Valve provided in the Brake Cylinder circuit of the particular wheel. It also has the provision for housing the friction plate.

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5 Maintenance prescriptions

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): not required.
2. Second Level Maintenance: not required.

6 Routine maintenance

This device doesn't require any light maintenance.

7 Removal procedure

Refer to *Figure 3*

1. Undo the M20 bolts (3).
2. Remove and discard the Tab washer (4).
3. Remove the Phonic wheel (2) by pulling it from the axle.

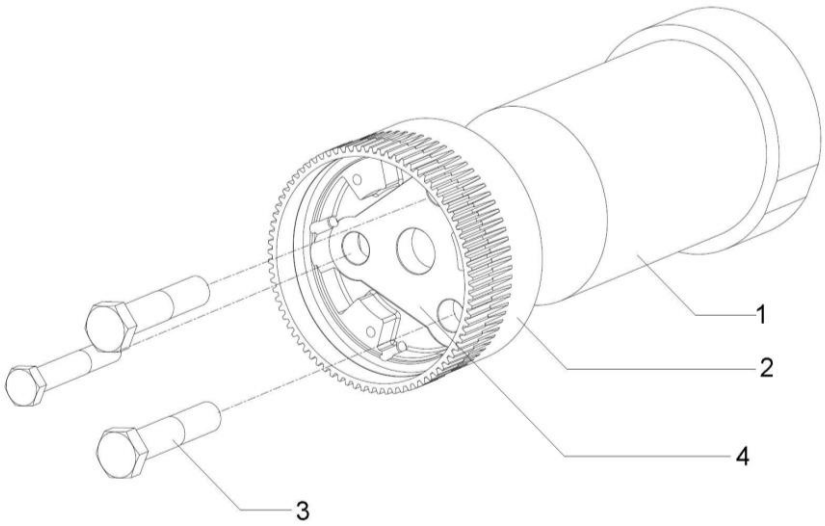

Figure 3: installation/removal procedure

8 Installation procedure

Refer to *Figure 3*

1. Fix the Phonic wheel (2) on the axle (1) by push fit.
2. Fix the new tab washer (4) on the phonic wheel.
3. Secure the Phonic wheel (2) on to the axle by means of M20 bolts (3).

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9 Spare parts

- **Routine Maintenance** – Spare parts not required.
- **Installation** – With reference to the exploded view of Figure 3, paragraph 7, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
4	Tab Washer	Not in Scope of FT	1

10 Special tools

No special tools required for servicing and installation.

11 Disposal

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the laws in force in the Country where the component is used.

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07.03_S-VEL SPEED SENSORS with Shims

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/// FT0024981-101-E00MUM

DOUBLE SPEED SENSOR
FT0024981-101

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT	Maintenance/Use manual	
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	.

Compiled:	GRech (Segula) Design Engineer, Engineering		27/07/2022
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Approved:	francesco.grilli Manager, Engineering		27/07/2022
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0024981-101-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	27/07/2022	First Issue	.	GRech (Segula)	claudio.murazzano	francesco.grilli
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/// 1. Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.
- Place the Warning Cartel “Maintenance on going” during the maintenance activities.
- The device must be maintained when and as prescribed by Faiveley Transport. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorised personnel must carry out installation and maintenance.
- For maintenance activities Faiveley Transport recommends to use only original parts supplied by Faiveley Transport. This to be understood for all components and, in particular, for those containing rubbers and degradable materials. Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.

  The above considerations are valid in order to assure the results of laboratory tests and Faiveley approval, taking into account both the design aspects, the production processes and materials’ supply and selection.

  Faiveley will not be responsible for any loss of performance of the products, as well as for any damage and / or defects resulting from the use of these components, if it is not unequivocally demonstrated the exclusive use of Faiveley original spare parts.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Before accessing to electric parts, make sure the power is duly switched off.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

NOTE. For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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NOTE. Faiveley Transport reserves the right to modify its equipment or the content of this manual at any time without giving any communication.

1.1 Storage conditions

- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust, temperature shocks and direct source of heat such as boilers, radiators and direct sunlight. The ambient temperature and humidity values must be the ones reported in the brake system maintenance manual. If the brake system maintenance manual is not foreseen, the ambient temperature must be within -25°C and +25°C and the relative humidity must be within 10% and 65%.
- If the storage is below 15°C, handle carefully all the stored products as they may have stiffened and become susceptible to distortion. The temperature of product taken from such low-temperature storage should be raised to approximately 30°C throughout their mass, before the products are put into service.
- Rubber parts, if out of their original packaging, must be kept in black bags, to avoid ingress of light. If out of their original packaging, equipment must be protected against bad weather and light (UV).
- Rubber parts should be protected from light sources, in particular direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury lamps or high-voltage electrical equipment giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap.
- Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.
- Take care that the packaging is protected from rodents.
- Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:
    - pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
    - prior to the installation of a pneumatic or electro-pneumatic component on the vehicle:
        - if the date of manufacture or last overhaul dates back more than:

          6 months: safety valves;
          18 months: brake manipulator, distributor, emergency valves, magnet valves, emergency push-button valve;
          36 months: all other equipment;

          the equipment must undergo a functional test according to the applicable procedure. If the functional test fails, the product must be overhauled and then a functional test must be performed before installing it on the system.
        - if the component has not been used for more than the overhaul/replacement periodicity, it must be overhauled and then tested with the applicable functional

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test before the installation on the system or replaced with a new one if overhaul is not foreseen for the component.

- No component can be used if the prescription above is not followed. The disposal must be done according to the applicable regulations.
- All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.
- All the protective plugs must be removed only at the time of installation.
- Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.
- Parts must be picked off the shelf in order of time of manufacture.

1.2 Cleaning instruction

- While cleaning or drying parts, do not use high-pressure air jets and/or water jets.
- While cleaning filters or cooler fins, use adequate vacuum cleaner.
- Prior to proceed to any operation, like dismounting, perform a thorough external cleaning of the component. Clean with an approved cleaning solvent (SW 435). After that, clean only the threaded part with SW 305, if glue will be applied.
- During the cleaning phase, provide to remove all the old marking signs made by a solid paste (STYLMARK paint, for example) by using a cutter only if the used paste is already polymerized (solid) by taking care not to damage the surrounding parts and the surface coating/painting , if foreseen; then clean with cleaner Metal Cleaner, applying it on a cloth. If the paint paste is still wet, just use the Metal Cleaner, applying it on a cloth. When the old marking signs are not made by a solid paste (Round tip paint marker, for example) use the cleaner Metal Cleaner, applying it on a cloth.

NOTE. Alcohol, solvent and soap are strictly prohibited for threaded part when glue (whatever it is, a threadlocker, an anti-seize compound or a sealant) is required.

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1.3 Warning message

Messages and warning symbols are useful to have a clear focus of something strictly related to the maintenance
actions, so they are reported, if foreseen, before every actions. Messages and warning symbols in this document are as follows:

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and /or and/or to damage to the unit or the environment.

Note: Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.

1.4 List of abbreviations

Abbreviation	Meaning
FT	Faiveley Transport
P/N	Part Number
REF	Reference
IP	Ingress protection
mm	millimeter
V	Voltage
kg	Kilogram
ISO	International Organization for Standardization

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/// 2. Description of equipment

The double speed sensor is a device used to measure the speed of an axle of the train at bogie level.

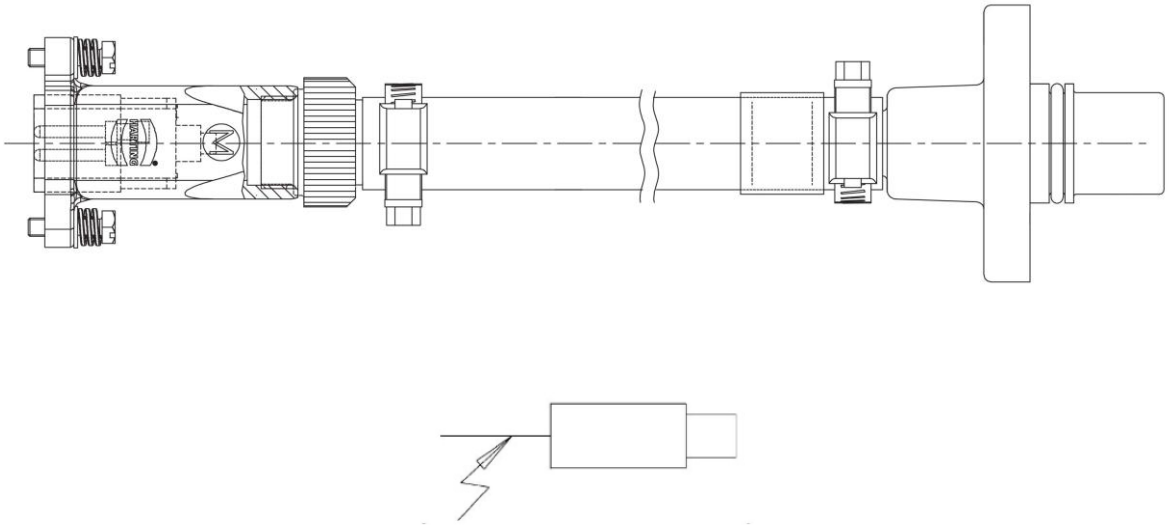

Figure 1: External view and ISO symbol

/// 3. Main features and data

- Mass: .....0.7 kg ± 5%
- Nominal Voltage:.....15V + 5% - 10%
- IP Protection .....IP66/IP67 According to EN 60529: 1991, EN 60529/A1:2000
- Salt Mist .....According to EN 50155:2007 class ST4

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/// 4. Description of the Function/Operation

Refer to Figure 1 and Figure 2

The double speed sensor can be installed in any angle maintaining the radial position between the sensor probe and the phonic wheel. It counts the number of rotations of the phonic wheel and sends the corresponding speed value.

The double speed sensor has two transducers.

4.1 Operation Principle

The operation principle of speed sensor in subject is based on the magnetic flux variation. The sensor is composed of:

- An element sensitive to flux variation;
- A signal amplification circuit;
- An internal powering circuit;

The sensor is mechanically positioned to be sensitive to the flux variations resulting from the phonic wheel geometry: the flux variation causes a signal change at the cells output, which is suitably conditioned by the electronic circuitry inside the sensor.
The sensor is terminated by a “two-wire” interface where:

- a current signal is generated assuming two constant and defined values, according to the two possible flux conditions;
- the electronic control unit is powering the circuit and it is implementing a circuit to detect signal changes. A square-wave signal is finally generated, whose frequency is proportional to the wheel rotation frequency and to its “teeth” number.

By measuring this frequency, the control electronic can evaluate the axle speed and then the wheel speed, i.e. the vehicle speed and detect the sliding or skidding conditions of the axles.

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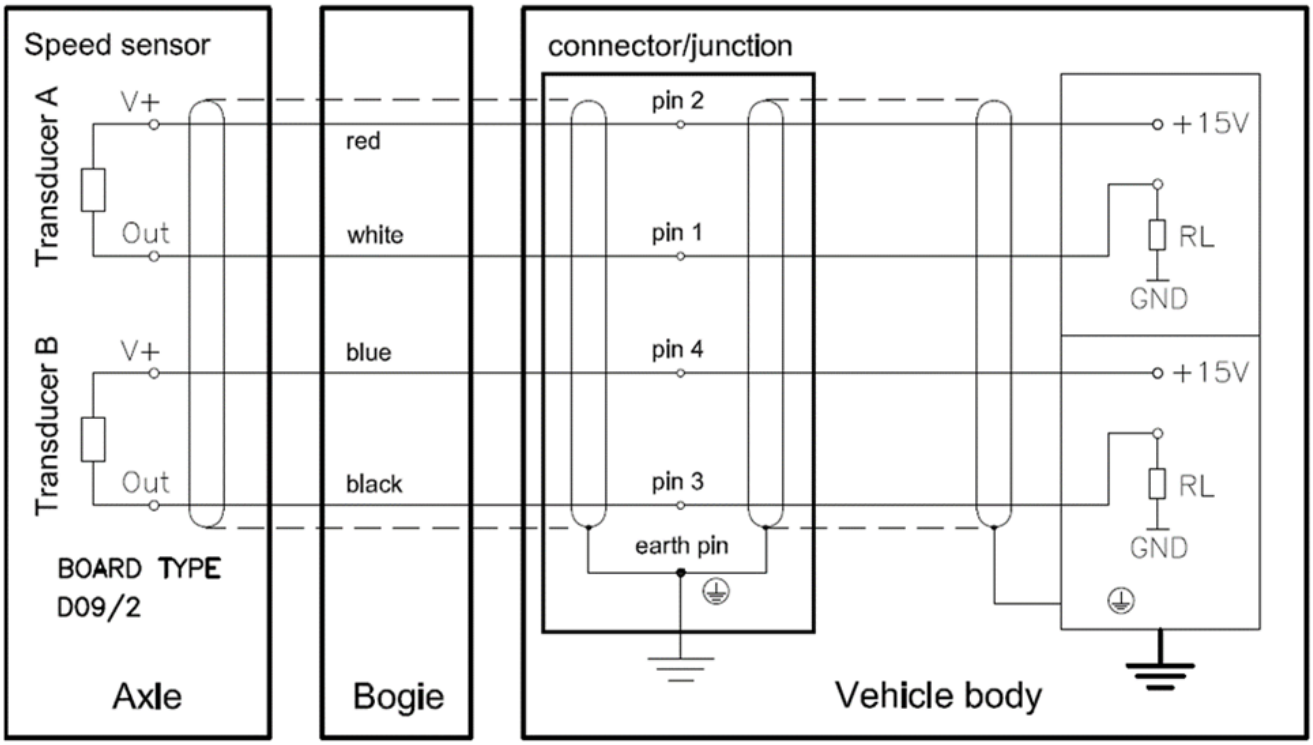

Figure 2: functional scheme (Double speed sensor pins connection)

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/// 5. Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance)**: not required.
2. **Second Level Maintenance**: not required.

CAUTION! Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more 36 months

/// 6. Routine maintenance

This device doesn't require any light maintenance.

/// 7. Removal procedure

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. Fixing screws and electrical connection of the single-core cable are application dependent.

Refer to Figure 3

1. Unplug the connector (2).
2. Unscrew the fixing screws (1).
3. Release the device (3) from the system.

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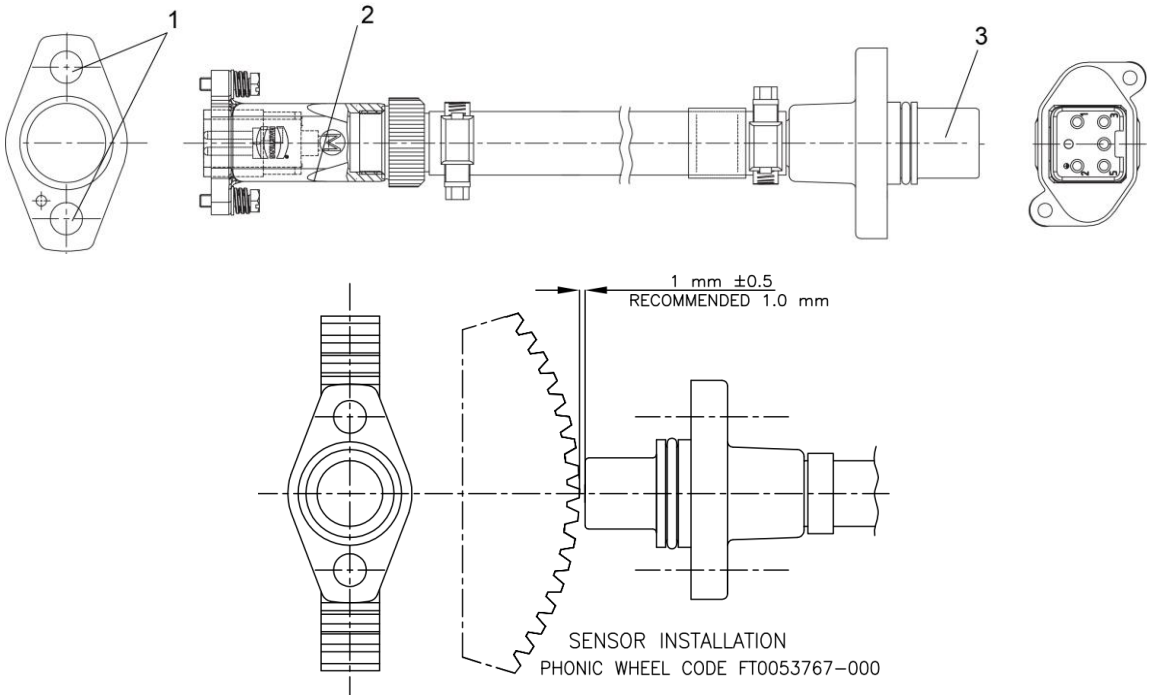

Figure 3: installation/removal procedure

NOTE. Fittings are application dependent.

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/// 8. Installation Procedure

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 3:

1. Install the device (3) on the system taking care that it maintains the radial position between the sensor probe and the phonic wheel and fix the screws (1).
2. Check that the air gap between the speed sensor and the phonic wheel tooth is 1 mm ± 0.5 mm (1mm recommended).
3. Plug the connector (2).

NOTE. The connector should be installed on the vehicle BODY. In case of installation on bogie, a specific qualification is necessary.

NOTE. Recommended flexible conduit minimum bending radius: 85 mm.

/// 9. Spare parts

- **Routine Maintenance** – Not applicable
- **Installation** - Spare parts not required

/// 10. Special Tools

No special tools required for servicing and installation.

/// 11. Disposal

The device is mainly composed by the following materials: aluminium alloy, stainless steel, rubber, iron, brass.

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

/// 12. Data sheets and material safety data

Not applicable

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07.11_DUMP VALVE TYPE DV12 DC

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/// FT0126060-100-E00MUM

Dump Valve DV-12 DC & SC

DV-12DC FT0126060-100..107 (With Bracket)
DV-12DC FT0126050-100..107 (Without Bracket)
DV-12SC FT0126510-100..107 (With Bracket)
DV-12SC FT0126500-100..107 (Without Bracket)

Maintenance/Use manual

ECO/**ECO**: **.**
Compiled: **WITEC**
Checked: **alessandro.capezzera**
Approved: **francesco.grilli**

Date: 31-05-2021 - Revision: A00
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	31-05-2021	First Issue	.	WITEC	alessandro.capecchi	francesco.grilli
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/// 1. Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.
- Place the Warning Cartel "Maintenance on going" during the maintenance activities.
- The device must be maintained when and as prescribed. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorised personnel must carry out installation and maintenance.
- Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Before accessing to electric parts, make sure the power is duly switched off.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

IMPORTANT! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

IMPORTANT! Faiveley Transport reserves the right to modify its equipment or the content of this manual at any time without giving any communication.

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1.1 Storage conditions

- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust, temperature shocks and direct source of heat such as boilers, radiators and direct sunlight. The ambient temperature and humidity values must be the ones reported in the brake system maintenance manual. If the brake system maintenance manual is not foreseen, the ambient temperature must be within - 25°C and +25°C and the relative humidity must be within 10% and 65%.
- If the storage is below 15°C care should be exercised during the handling of stored products as they may have stiffened and become susceptible to distortion if not handled carefully. The temperature of product taken from such low-temperature storage should be raised to approximately 30°C throughout their mass, before the products are put into service.
- Rubber parts, if out of their original packaging, must be kept in black bags, to avoid ingress of light. If out of their original packaging, equipment must be protected against bad weather and light (UV).
- Rubber parts should be protected from light sources, in particular direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury lamps or high-voltage electrical equipment giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap.
- Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.
- Take care that the packaging are protected from rodents.
- Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:
    - pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
    - prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than:
        - **6 months:** safety valves;
        - **18 months:** brake manipulator, distributor, emergency valves, magnet valves for brake control, emergency push-button valve;
        - **36 months:** all other equipment.

- No component can be used after the date of expiration. It must be disposed of according to the applicable regulations.
- All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.
- All the protective plugs must be removed only at the time of installation.
- Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.

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- Parts must be picked off the shelf in order of time of manufacture.

1.2 Warning messages

Messages and warning symbols in this document are as follows:

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and/or and/or to damage to the unit or the environment.

NOTE: Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.

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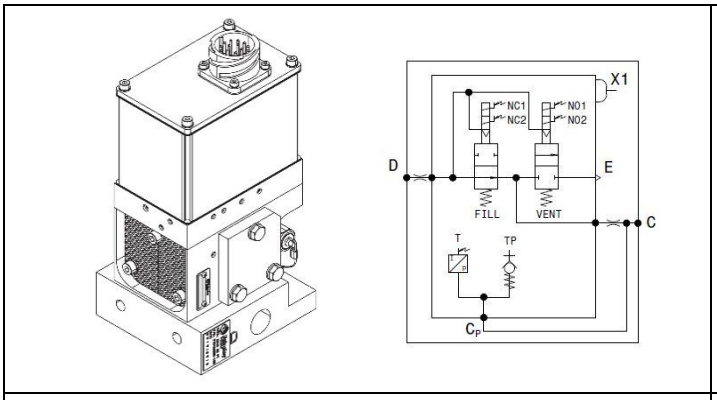
/// 2. Description of equipment

The dump valve is used to prevent the wheel blocking in situations of low adhesion between wheel and rail. It is used to regulate the pressure in the brake cylinders in order to maximize the braking effort for any given wheel/rail interface coefficient of friction, thus achieving the shortest stopping distance and preventing wheel flats. According to P/N it can be fitted with bracket, transducer, test point.



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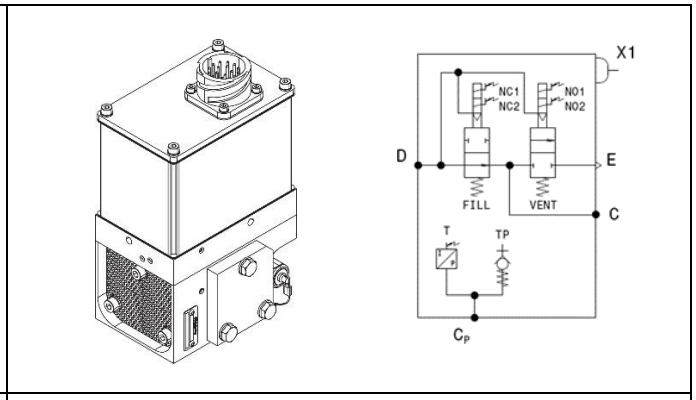

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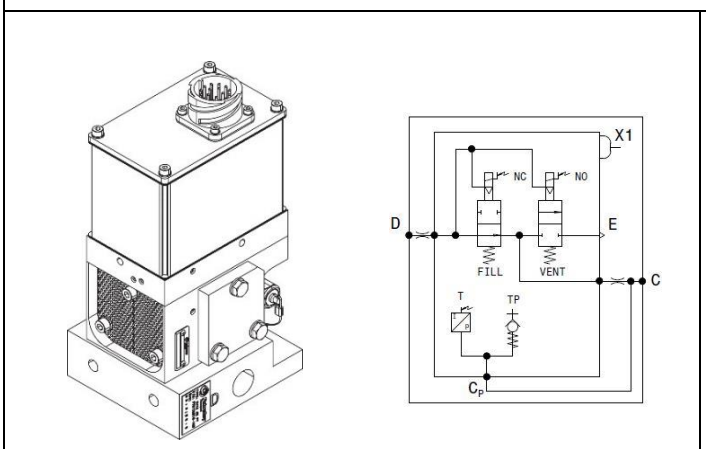

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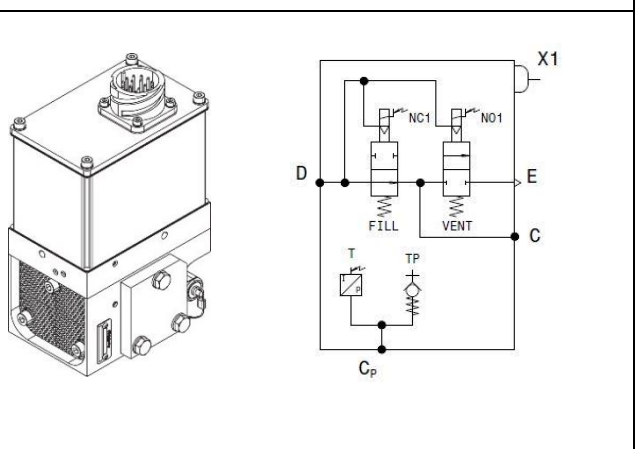

FT0126500-100

Pipes	
Feed	D
Delivery	C
Exhaust	E
Pressure Signal	C_P

Figure 1: External view and ISO symbol

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/// 3. Main features and data

This device is available with many characteristics. The following table lists all the part numbers to which this document applies and their relative characteristics.

P/N DV12 WITH BRACKET	TYPE	P/N DV12 WITHOUT BRACKET	PRESSURE TRANSDUCER P/N	TEST POINT P/N	TEST POINT TYPE	FEED CHOKE	DELIVERY CHOKE	MASS WITH BRACKET	MASS WITHOUT BRACKET
FT0126060-100	DV12 DC PT	FT0126050-100	FT0126082-101	FT0027358-000	INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126060-101	DV12 DC PT	FT0126050-101	FT0126082-101	700 008 2508	STANDARD	Ø6	Ø9	2.95 kg	2 kg
FT0126060-102	DV12 DC PT	FT0126050-102	FT0126082-101	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.95 kg	2 kg
FT0126060-103	DV12 DC PT	FT0126050-103	FT0126082-101	FT0026571-000	PLUG INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126060-104	DV12 DC	FT0126050-104	FT0026571-000 (PLUG)	FT0027358-000	INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126060-105	DV12 DC	FT0126050-105	FT0026571-000 (PLUG)	700 008 2508	STANDARD	Ø6	Ø9	2.95 kg	2 kg
FT0126060-106	DV12 DC	FT0126050-106	FT0026571-000 (PLUG)	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.95 kg	2 kg
FT0126060-107	DV12 DC	FT0126050-107	FT0026571-000 (PLUG)	FT0026571-000	PLUG INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126510-100	DV12 SC PT	FT0126500-100	FT0126082-101	FT0027358-000	INOX	Ø6	Ø9	2.9 kg	2 kg
FT0126510-101	DV12 SC PT	FT0126500-101	FT0126082-101	700 008 2508	STANDARD	Ø6	Ø9	2.9 kg	2 kg
FT0126510-102	DV12 SC PT	FT0126500-102	FT0126082-101	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.9 kg	2 kg
FT0126510-103	DV12 SC PT	FT0126500-103	FT0126082-101	FT0026571-000	PLUG INOX	Ø6	Ø9	2.9 kg	2 kg
FT0126510-104	DV12 SC	FT0126500-104	FT0026571-000 (PLUG)	FT0027358-000	INOX	Ø6	Ø9	2.9 kg	2 kg
FT0126510-105	DV12 SC	FT0126500-105	FT0026571-000 (PLUG)	700 008 2508	STANDARD	Ø6	Ø9	2.9 kg	2 kg
FT0126510-106	DV12 SC	FT0126500-106	FT0026571-000 (PLUG)	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.9 kg	2 kg
FT0126510-107	DV12 SC	FT0126500-107	FT0026571-000 (PLUG)	FT0026571-000	PLUG INOX	Ø6	Ø9	2.9 kg	2 kg

Table 1: Different setting of the P/Ns

- Exhaust section .....Ø 12 mm
- Connections pipe.....G ½”
- Working temperature:.....-40°C / +60°C

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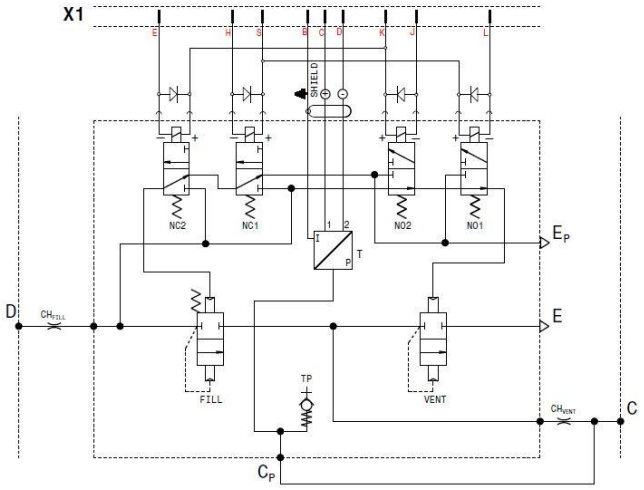
- Supply voltage.....24 V_{DC} (+25% / -30%)
- Power consumption.....5 W for each control channel
- Working pressure .....0.2 ÷ 6 bar
- Duty cycle (t_{ON}).....100%
- Electric-pneumatic scheme



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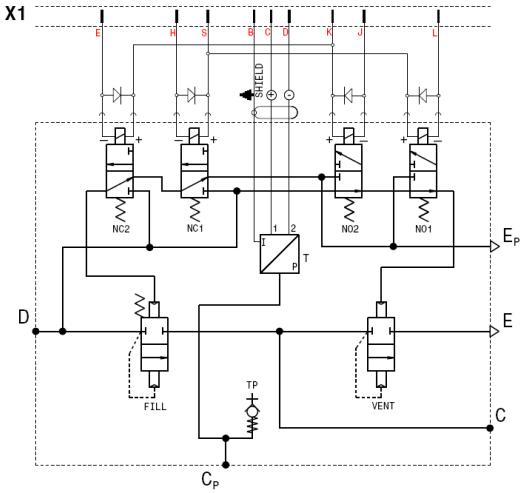

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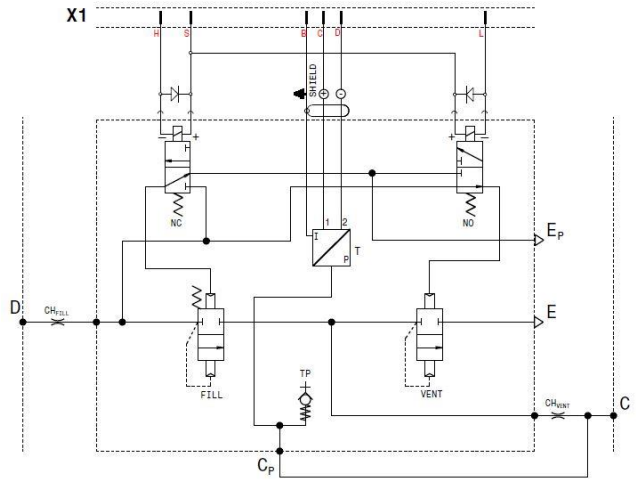

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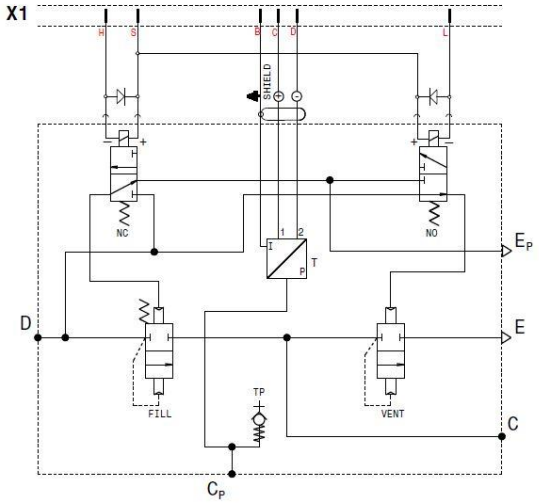
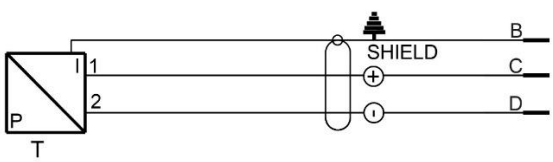


FT0126500-100

- Pressure transducer electric scheme:



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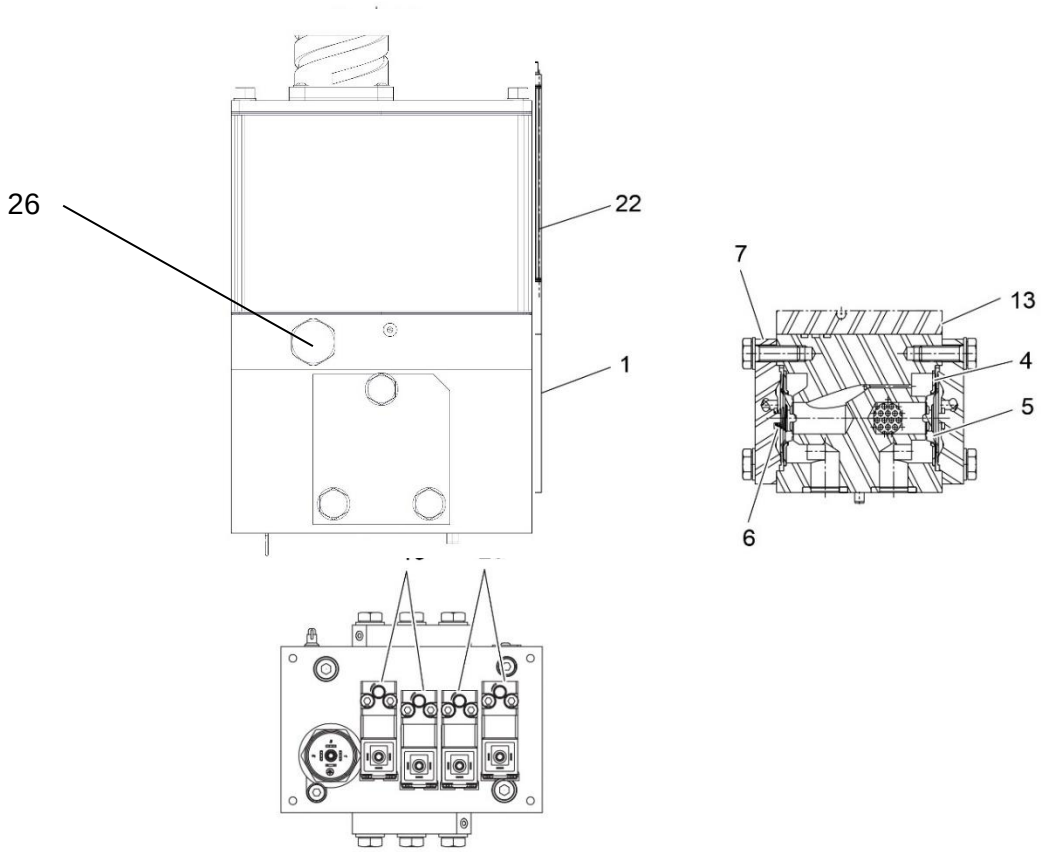
/// 4. Description of the Function/Operation

Refer to 26 Osmotic plug

Figure 2.

NOTE. The following picture has been used for illustrative purposes only. It can be different according to P/Ns listed in paragraph /// 3.



1	Complete body
4	Plate
5	Membrane
6	Spring
7	Complete cover
13	Complete plate
19	Magnet valves NC
20	Magnet valves NO
22	Liner cover
26	Osmotic plug

Figure 2: Functional scheme

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NOTE.

- Dump valve DV12 DC type with bracket (FT0126060-100) and without bracket (FT0126050-100) have double coil and 4 magnet valves inside.
- Dump valve DV12 SC type with bracket (FT0126510-100) and without bracket (FT0126500-100) have single coil and 2 magnet valves inside.

The valve consists of a body (1) with two complete covers (7) housing, one membrane (5) with plate (4) for side and a spring (6) and located on feel side of valve.The control of the valve is done by valves (19) and (20) mounted on the valve's plate (13). This allows three-point regulation of the brake cylinder pressure.

An osmotic plug (26) if fitted to discharge the overpressure inside to the liner cover.

The valve is equipped with two couples of magnet-valves (19) and (20) housed into the liner cover (22). One couple for safety and availability reasons (in case of fail of one magnet-valve there is a back-up one). Each of them is made of one normally open magnet-valve and one normally closed one.

If none of the valve coils are powered the braking cylinder is pressurized regularly. If the inlet valve coil is powered, the pressure in the braking cylinder is held to the existing value. Only if, both coils are powered, the brake cylinder is vented (exhaust position) and the brake cylinder pressure decreases.

Where fitter the in-built test point enables the diagnostics and maintenance activities and the transducer acts as the interface between the dump valve and the brake cylinder control devices.

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/// 5. Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance)**: osmotic plug visual check as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 1 year.
2. **Second Level Maintenance** : Overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhaul regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 6 years.

NOTE. Repair and overhaul must be carried out by qualified personnel in authorised workshops.

NOTE. FTI provides an overhauling service for its own units. FTI performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.

The FTI Service Centers have the experience and technical equipment needed for performing professional overhauls.

CAUTION! Equipment either stored on-the-shelf or mounted on inoperative vehicles must be overhauled or replaced after 5 years from the date of manufacture or of last overhaul, since rubber parts age out even in optimum storage conditions.

Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than (indicate only the applicable periodicity) 18 months (brake manipulator, distributor, emergency valves, magnet valves for brake control, emergency push-button valve, safety valve) OR 36 months (all other equipment).

CAUTION! Overhaul or replacement periodicity must include both the years of functioning and the years of storage on-the-shelf or mounting on inoperative vehicles.

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/// 6. Routine maintenance

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 3.

1. Check carefully that the osmotic plug (1) is clean and free from damage.
2. **DO NOT clean the osmotic plug**, if necessary, replace it as described hereafter:
   a) Unscrew the osmotic plug (1) using a 19mm spanner and discard it.
   b) Screw a new osmotic plug (1) P/N FT0126921-000 using a dynamometric key with 19mm open end. Tightening torque 0.7±0.1 Nm.

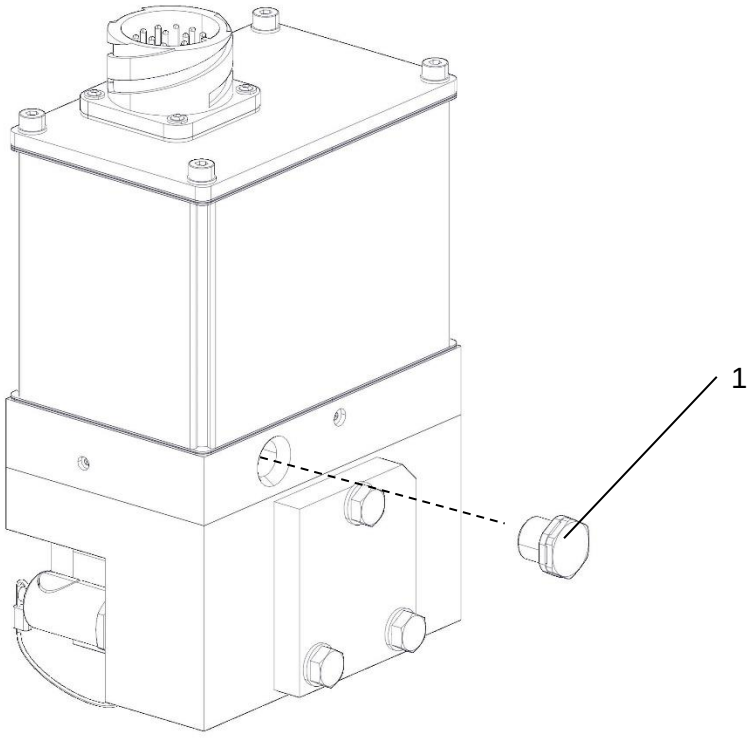

Figure 3: osmotic plug

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/// 7. Removal procedure

7.1 Removal procedure for valve with bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. The following picture has been used for illustrative purposes only. It can be different according to P/Ns listed in paragraph /// 3.

Refer to Figure 4.

3. Unplug the electrical connections from connector (1).
4. Release the pipes (3) and remove the device (2) with the complete support (4) from the system.

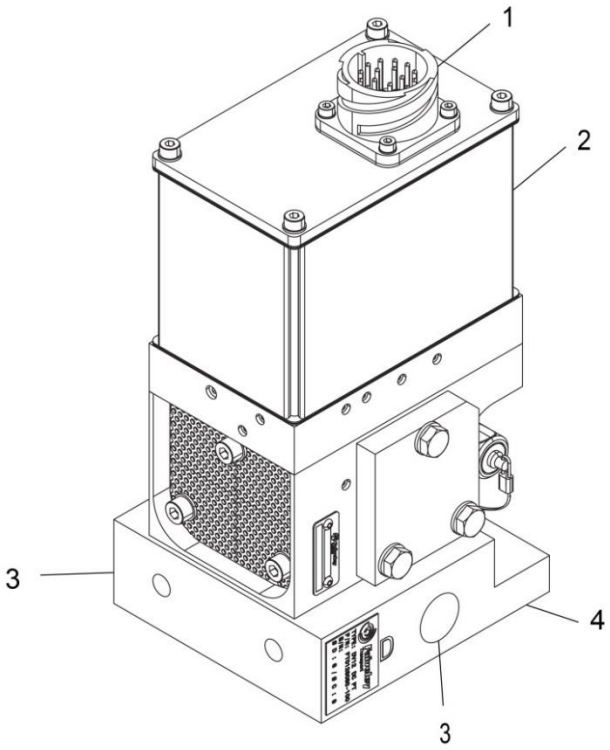

Figure 4: Installation/removal procedure for valve with bracket

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7.2 Removal procedure of valve from bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. The following procedure can be used both to remove the device from the bracket on the system and to remove the device from the bracket off train.

NOTE. The following picture has been used for illustrative purposes only. It can be different according to P/Ns listed in paragraph 3.

Refer to Figure 5.

1. Unplug the electrical connections from connector (1).
2. Unscrew the two screws M8x40 (3) with the two conic washers M8 (4) and detach the device (2) from the complete support (5).
3. Remove the fill choke (6) and vent choke (7) from the complete support (5) by using the special tool 053177.
4. Remove and discard the o-rings (8), (9), and (10).

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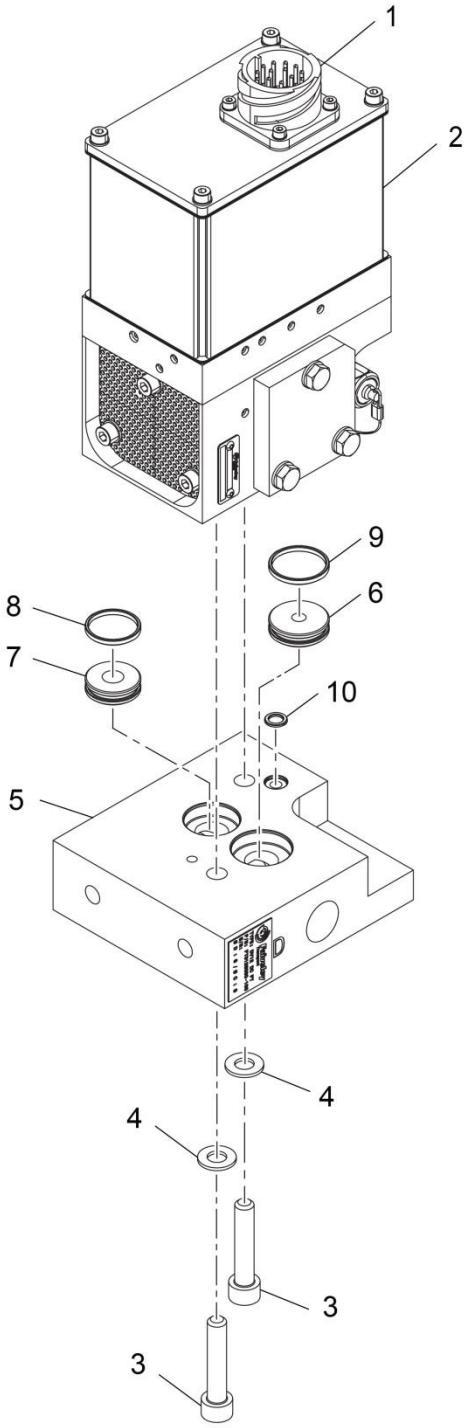

Figure 5: installation/removal procedure of valve from bracket

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/// 8. Installation Procedure

8.1 Installation procedure for valve with bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 4.

1. Re-install the device (2) with complete support (4) on system and connect the pipes (3).
2. Plug the electrical connections on connector (1).
3. Pressurise the system and check for leakages by using a water soap solution.

8.2 Installation procedure of valve on bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. The following procedure can be used both to remove the device from the bracket on the system and to remove the device from the bracket off train.

Refer to Figure 5.

1. In case the component has the o-rings (8), (9), and (10) already installed in place, analyse them and:
   - if they have signs of damage or wear, replace them with new ones according to the codes reported in paragraph 9 and lubricate them with a light amount of grease type Uniflor 8512S;
   - if they are intact and in proper condition, slightly lubricate them with grease type Uniflor 8512S and proceed with point 3.
2. In case the component doesn't have the o-rings (8), (9), and (10) already installed in the place in which they are foreseen, put in place new o-rings according to P/Ns indicated in paragraph 9 and slightly lubricate them with grease type Uniflor 8512S.
3. Re-fit the fill choke (6) and vent choke (7) to the complete support (5).
4. Re-install the device (2) on complete support (5) and secure it with the two screws M8x40 (3) and the two conic washers M8 (4).
5. Tightening torque the two screws M8x40 (3) to 14 Nm.
6. Plug the electrical connections to 17 contact connector (1).
7. Pressurise the system and check for leakages by using a water soap solution.

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/// 9. Spare parts

- **Routine Maintenance** - With reference to the exploded view of Figure 3, paragraph /// 6, ONLY IF NECESSARY, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
1	Osmotic plug	FT0126921-000	1

- **Installation**
  - With reference to the exploded view of Figure 4, paragraph 7.1, no spare parts are required for installation.
  - With reference to the exploded view of Figure 5, paragraph 7.2, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
8	O-ring	2/517031	1
9	O-ring	2/517032	1
10	O-ring	2/517022	1
-	Uniflor 8512S	3000.00.550	as need

- **Screws**
  - With reference to the exploded view of Figure 4, paragraph 7.1, no screws are required for installation.
  - With reference to the exploded view of Figure 5, paragraph 7.2, the screws required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
3	Screw M8x40	FT0040158-031	2
4	Conic washer M8	FT0020338-000	2

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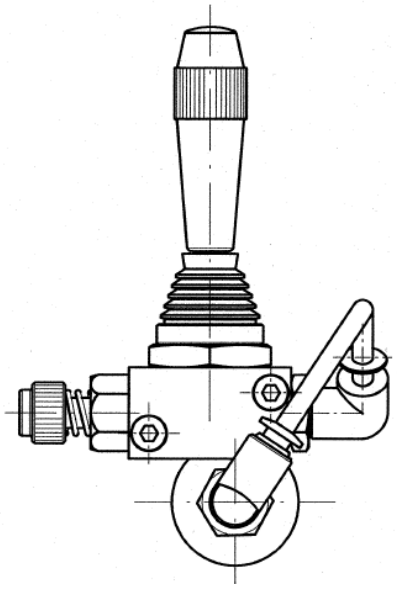
/// 10. Special Tools

To remove the chokes, use the special tool 053177.



/// 11. Disposal

The device is mainly composed by the following materials: aluminium alloy, stainless steel, rubber. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

/// 12. Data sheets and material safety data

See document 3000.00.550_All6 for the safety data sheet for the product **Uniflor 8512S**.

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08.01_Auxiliary compressor frame assy

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/// FT0053703-100-E00MUM

AUXILIARY COMPRESSOR FRAME ASSY
FT0053703-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		01/11/2022
Checked:	.SM Systems Engineer, Engineering		
Approved:	.AE Manager, Engineering		
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0053703-100-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Auxiliary Compressor Frame Assy is intended to provide compressed air for the pantograph applications.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +0°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section /// 5 for functional test details..

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +0°C to + 50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

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Auxiliary compressor frame assy must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Auxiliary compressor frame assy and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Auxiliary compressor frame assy P/N FT0053703-100 respectively for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
ACU	Auxiliary Compressor Unit
BSP	British Standard Pipe
BSPP	British Standard Parallel Pipe
MP	Main Pipe
HD	Head
HEX	Hexagonal
Kg	Kilogram
L	Litres
Nm	Newton Metre
P/N	Part Number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1

The Auxiliary Compressor Frame Assy is intended to provide compressed air for the pantograph applications

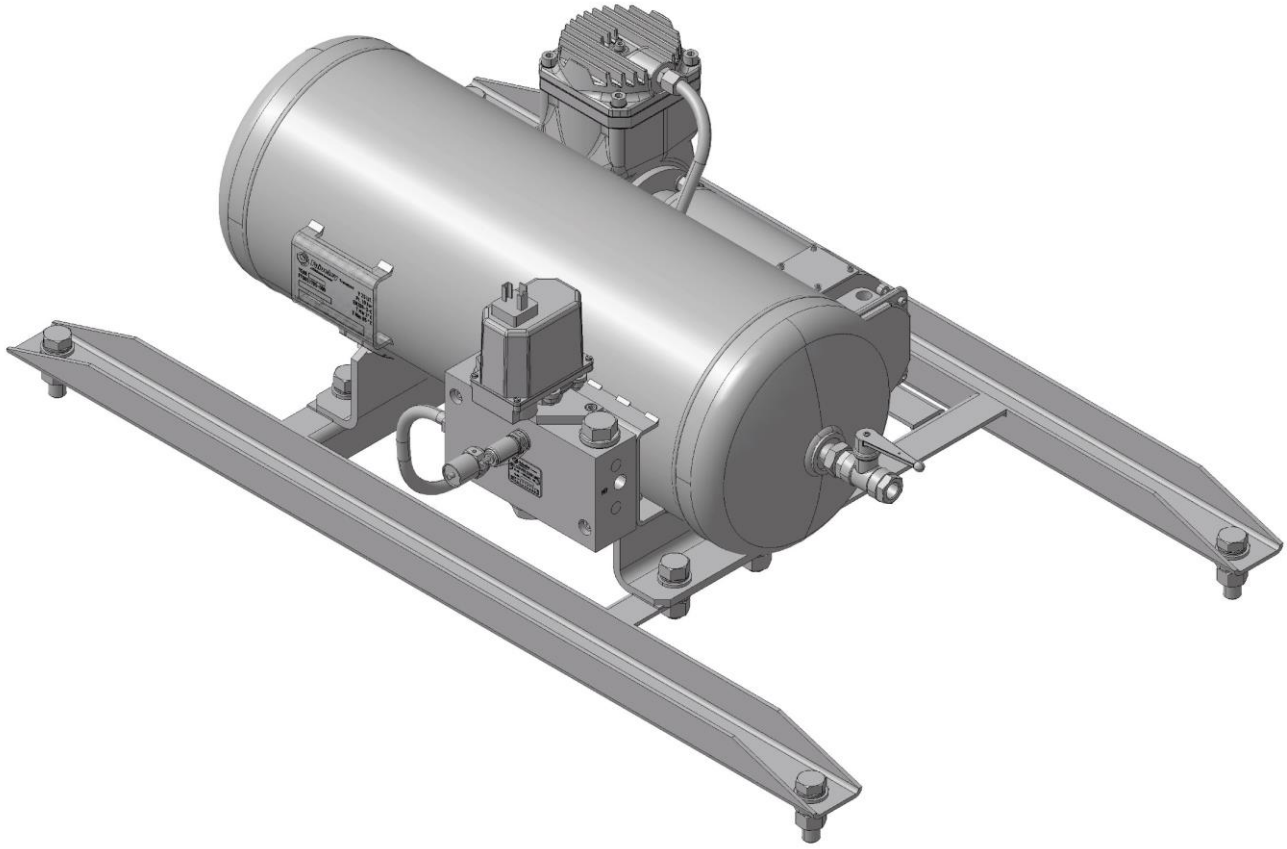

Figure 1: Auxiliary Compressor Frame Assy, Isometric View

2.2 TECHNICAL DATA OF THE EQUIPMENT

- Nominal working pressure.....7 bar
- Operating temperature range.....+3°C / + 47°C
- Power supply.....110 Vdc
- Air delivery @5 bar.....70 l/min ± 7%
- Current absorption @5 bar.....7.5 A
- Absorbed power @5 bar .....900 W
- Weight .....60 Kg ±5%
- Speed at 110 Vdc and 6 Bar .....2400 Rpm

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2.3 PNUEMATIC SCHEME

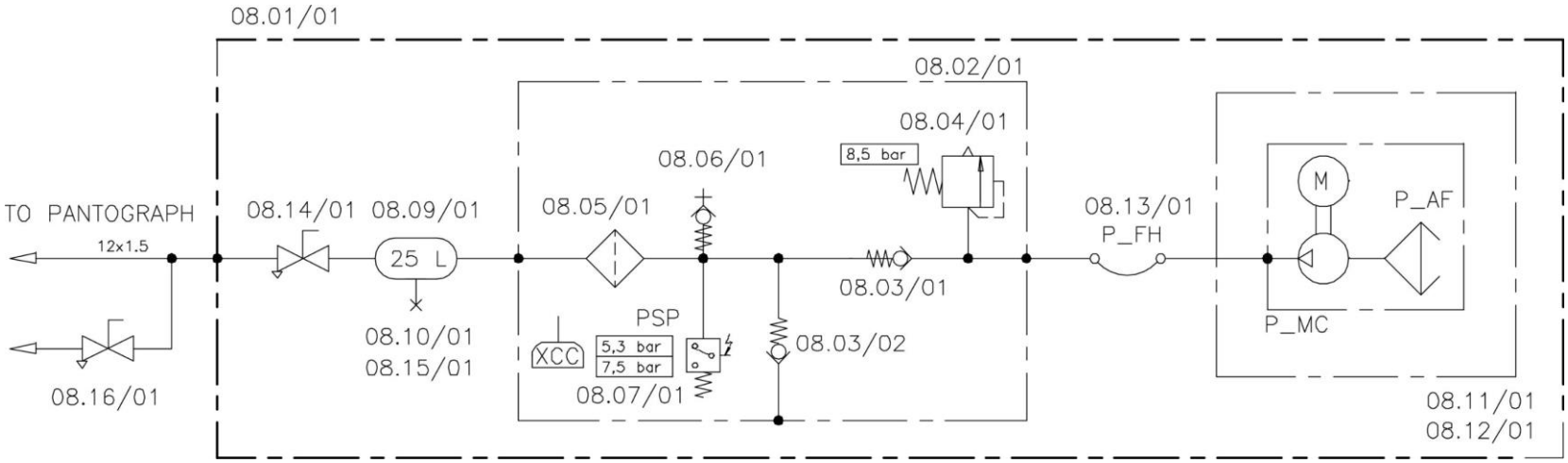

Figure 2: Auxiliary Compressor Frame Assy, Pneumatic Scheme

ACU REF. 08.01	
SCHEME REF.	**DESCRIPTION**
08.02	ACU manifold assembly
08.03	Check valve 1/2"
08.04	Safety valve set at 8.5 bar
08.05	Air filter
08.06	Test point
08.07	Pressure switch 5.3 bar to 7.5 bar
08.09	Reservoir 25L
08.10	Screwed vented plug
08.11	Auxiliary compressor buran 0
08.12	Vibration damper
08.13	Hose
08.14	Isolating cock with drain 3/8"
08.15	Seal (for ½" BSP thread)

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2.4 ELECTRICAL DIAGRAM

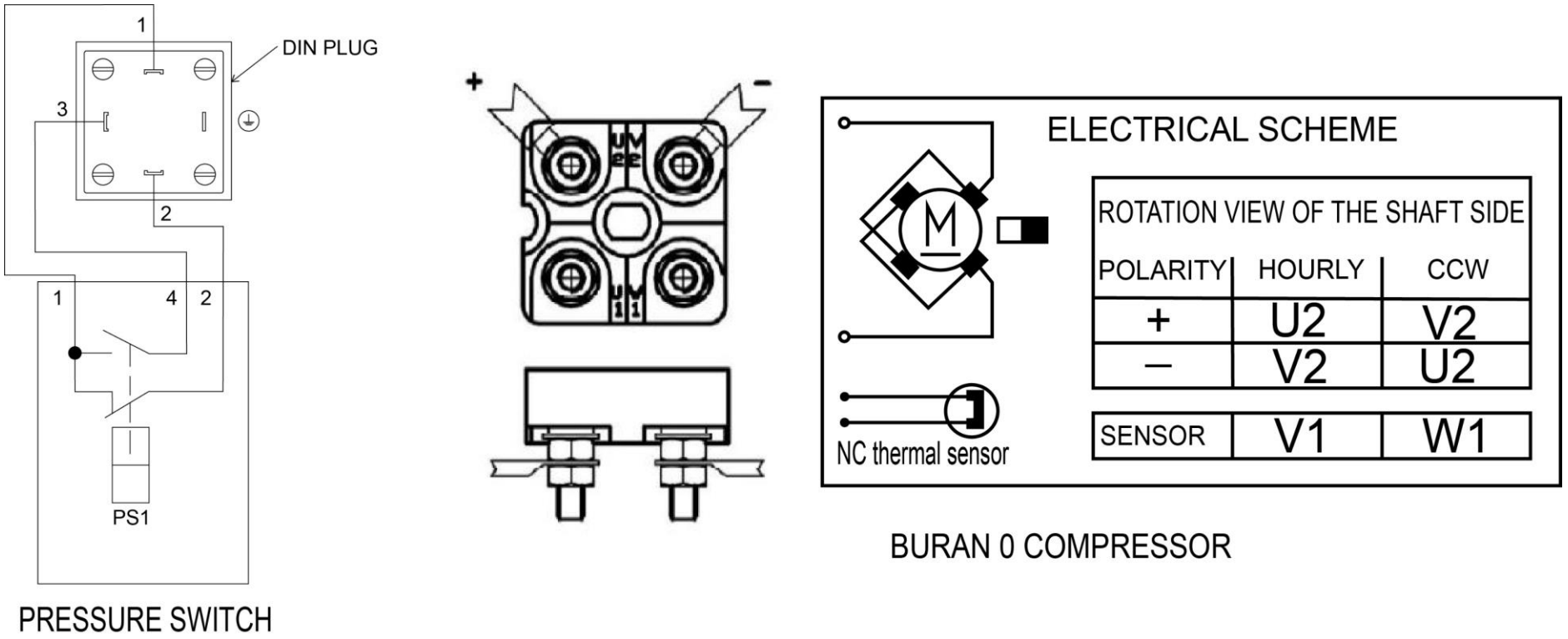

Figure 3: Auxiliary Compressor Frame Assy, Electrical Scheme

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/// 3. OPERATIONS

Refer to

3.1 COMPRESSOR

It is a single stage oil free type and is used for the production of the compressed air supplied to low flow user systems as, for example, the pantograph lift unit.
The compressor is mounted on the frame by means of elastic dampers in order to cut the vibrations, an air filter is placed on the inlet duct in order to remove dust before the compression.

3.2 MAIN FRAME

In order to have a group that has fixed to the rolling stock all the components are assembled on a steel frame with Faiveley identification label and ground connection point.

3.3 SAFETY VALVE

Safety valves protect the air system against air pressure increasing above the normal working range by opening to release the compressed air.
It is set at 8,5 ± 3% bar, at this pressure the valve starts to open, then it is fully open at setting pressure plus 10%.

3.4 CHECK VALVE

Two check valves are available in the system, one is used to isolate the train main line while the auxiliary compressor is filling the circuit in order to lift the pantograph, the other excludes part of the pneumatic plate and the auxiliary compressor when the main air generation unit is able to keep raised the pantograph.

3.5 TEST POINT

It can be used to measure the pressure before maintenance operations or whenever the pressure level must be checked.

3.6 ISOLATING COCK

Isolating cock is used to open and close a pneumatic circuit.
In order to isolate and discharge the pneumatic circuit of the pantograph during maintenance, the equipment plate is provided with a cock which can do both operations.

3.7 PRESSURE SWITCH

The pressure switch is a device that transforms a pneumatic signal into an electrical signal by opening or closing two electrical circuits, when the pressure is lower or higher than the given thresholds.

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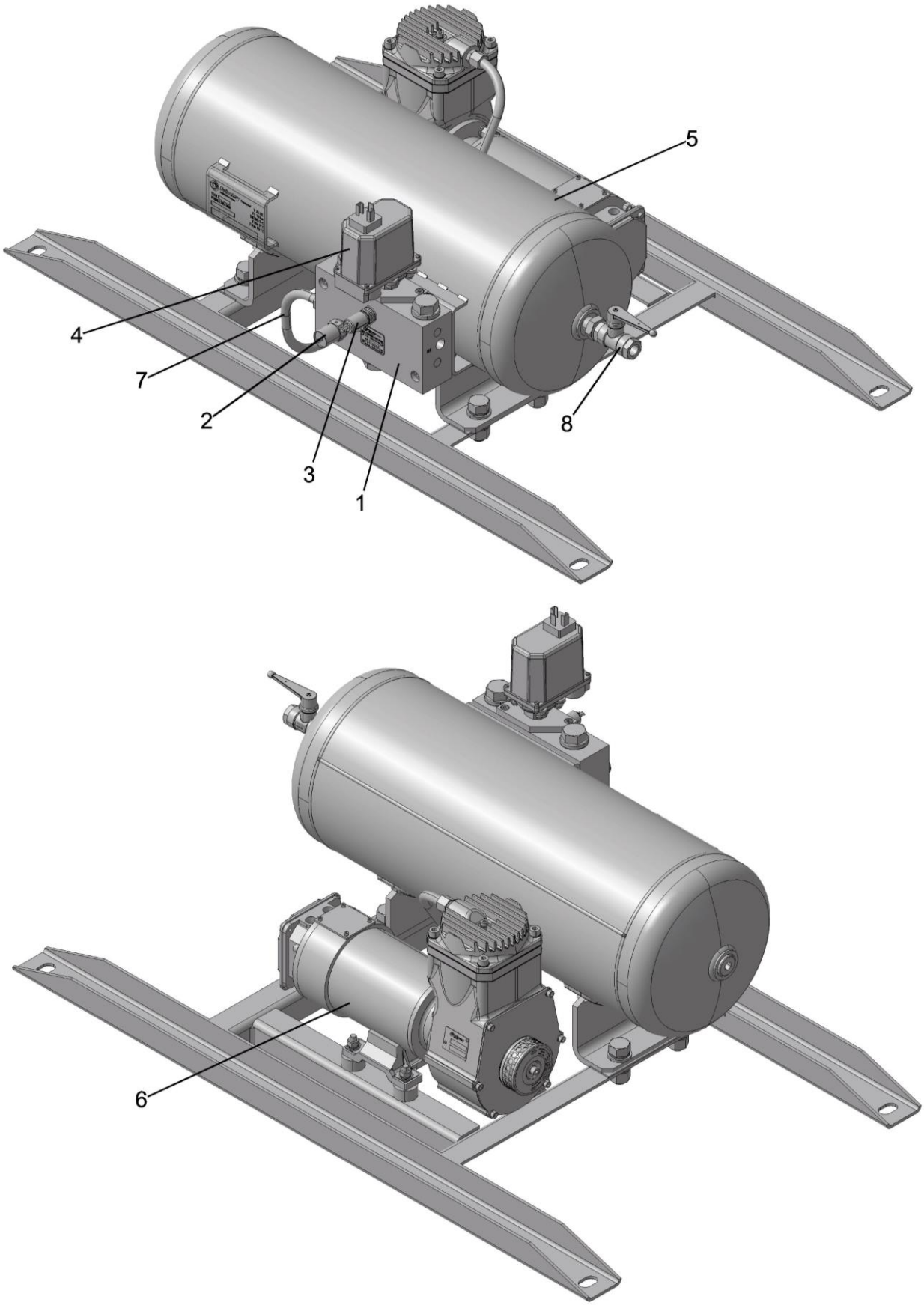

Figure 4: Auxiliary Compressor Frame Assy, Major Components

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SCHEME REF.	ITEM REF. (FIG 4)	DESCRIPTION	P/N	QTY
08.02	1	ACU manifold assembly	FT0053737-100	1
08.04	2	Safety valve set at 8.5 bar	024003000	1
08.06	3	Test point	FT0027358-000	1
08.07	4	Pressure switch 5.3 bar to 7.5 bar	FT0053738-100	1
08.09	5	Reservoir 25L	FT0053705-000	1
08.11	6	Auxiliary compressor buran 0	FT0026423-102	1
08.13	7	Hose	FT0052371-000	1
08.14	8	Isolating cock with drain 3/8"	FT0053740-100	1

/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
6 mm allen key	Tighten/loosen the fastners
13 mm socket wrench	Tighten/loosen the fastners
24 socket wrench	Tighten/loosen the fastners
24 mm Spanner	Tighten/loosen the fastners
27 mm Spanner	Tighten/loosen the fastners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242/243	Sealant for fasteners
Loctite 577	Sealant for pipe fittings
Molykote M33	Lubricant for parts
Stylmark	Torque marker

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

CAUTION! To respect the maintenance prescription and intervals in order to not impair safety.

Make a functional check and a general overhaul as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.

For the controls below, it is not necessary to remove the equipment from the vehicle.

Pay attention to the following maintenance interval:

First level maintenance (Functional control)

For the controls below, it is not necessary to remove the equipment from the vehicle.

- Maintenance M1 to be performed every one month.
- Maintenance M1 to be performed every 6 months.
- Maintenance M2 to be performed every one year.
- Maintenance M3 to be performed every 6 years.

Second level maintenance (General overhaul)

Repair in Workshop or Replacement:

- Overhaul R1 to be performed every 4 years.
- Overhaul R2 to be performed every 6 years.
- Overhaul R3 to be performed every 12 years.

The owner can adapt this periodicity according to conditions of use, their maintenance policy and their own experiment, under their responsibility.

The maintenance schedule here proposed is based upon the best knowledge so far acquired. It must be updated / changed properly, should this necessity become evident from the service exploitation, especially where safety is concerned.

This section contains the indications of the timing and mileage for carrying out each maintenance task.

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IMPORTANT NOTES

The timing indicated both in terms of mileage and in terms of time. The one occurring first must be observed. Every task includes the tasks occurring at higher frequency.

Proposed maintenance schedule takes into account regular service condition. More severe operation and environment circumstances may require more frequent tasks.

A tolerance of +20% is admitted provided that evidence from field proves this is sustainable with no adverse effects on safety and/or reliability.

No special cleaning operations have been considered, however, depending on the installation on the vehicle, it could be necessary to remove regularly the possible deposits of dirt and debris that may affect the equipment's functionality.

Make sure that the air used to supply the system externally (e.g. through the Air Service Point Group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1, otherwise the devices will be damaged.

Important! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

THE AUXILIARY COMPRESSOR FRAME ASSY

FIRST LEVEL MAINTENANCE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions.

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Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	M1	M2	M3	M4	REF./SECTION
1st LEVEL 1 month	Air filter	08.05	029602000	Cleaning of Filter	●				UM-006114200
1st LEVEL 6 months	Auxiliary compressor buran 0	08.11	FT0026423-102	Inspection and cleaning		●			FT0026423-102-E00MUM
1st LEVEL 1 year	Safety valve set at 8.5 bar	08.04	024003000	Functional test			●		FT0051763-100-E00MUM
	Pressure switch 5.3 bar to 7.5 bar	08.07	FT0053738-100	Functional test			●		FT0020043-117-E00MUM
	Reservoir 25L	08.09	FT0053705-000	Visual inspection and drain			●		5.1.1
	Auxiliary compressor buran 0	08.11	FT0026423-102	Air filter replacement			●		FT0026423-102-E00MUM
	Hose	08.13	FT0052371-000	Visual inspection			●		FT0052371-000-E00MUM
	Isolating cock with drain 3/8"	08.14 08.16	FT0053740-100	Functional Test			●		FT0051880-100-E00MUM
1st LEVEL 6 years	Auxiliary compressor buran 0	08.11	FT0026423-102	electric motor cleaning and carbon brushes inspection				●	FT0026423-102-E00MUM

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SECOND LEVEL MAINTENANCE

2. Second Level Maintenance: overhaul/replacement as scheduled in **the system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled/replaced regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

MAINTENANCE LEVEL	COMPONENT	REF	ASSEMBLY P/N	TASK	R1	R2	R3
4 years	Safety valve set at 8.5 bar	08.04	024003000	Replacement	●		
6 years	Check valve 1/2"	08.03	-	Overhaul		●	
	Pressure switch 5.3 bar to 7.5 bar	08.07	FT0053738-100	Replacement		●	
	Auxiliary compressor buran 0	08.11	FT0026423-102	Overhaul		●	
	Vibration damper	08.12	FT0039890-000	Replacement		●	
	Hose	08.13	FT0052371-000	Replacement		●	
	Isolating cock with drain 3/8"	08.14 08.16	FT0053740-100	Overhaul		●	
12 years	Reservoir 25L	08.09	FT0053705-000	Hydrostatic Test			●

NOTE: Maintenance operations must be carried out by qualified personnel in authorized workshops.

NOTE: WABTEC provides an overhauling service for its own units. WABTEC performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.
The WABTEC Service Centres have the experience and technical equipment needed for performing professional overhauls

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5.1.1 RESERVOIR 25L

VISUAL INSPECTION

Warning! When performing any test or work on devices or equipment while they are on the vehicle (on CAR TEST, etc) special precautions must be taken to ensure that vehicle movement will not occur which could result in injury to personnel and/or damage to the equipment.

Refer to Figure 5

1. Verify all the mounting hardware are secure.
2. No visual signs of damage.
3. Visually check that the welds are in perfect conditions and there are no signs of corrosion or other damages If any leaks or damage are present, replace the component.

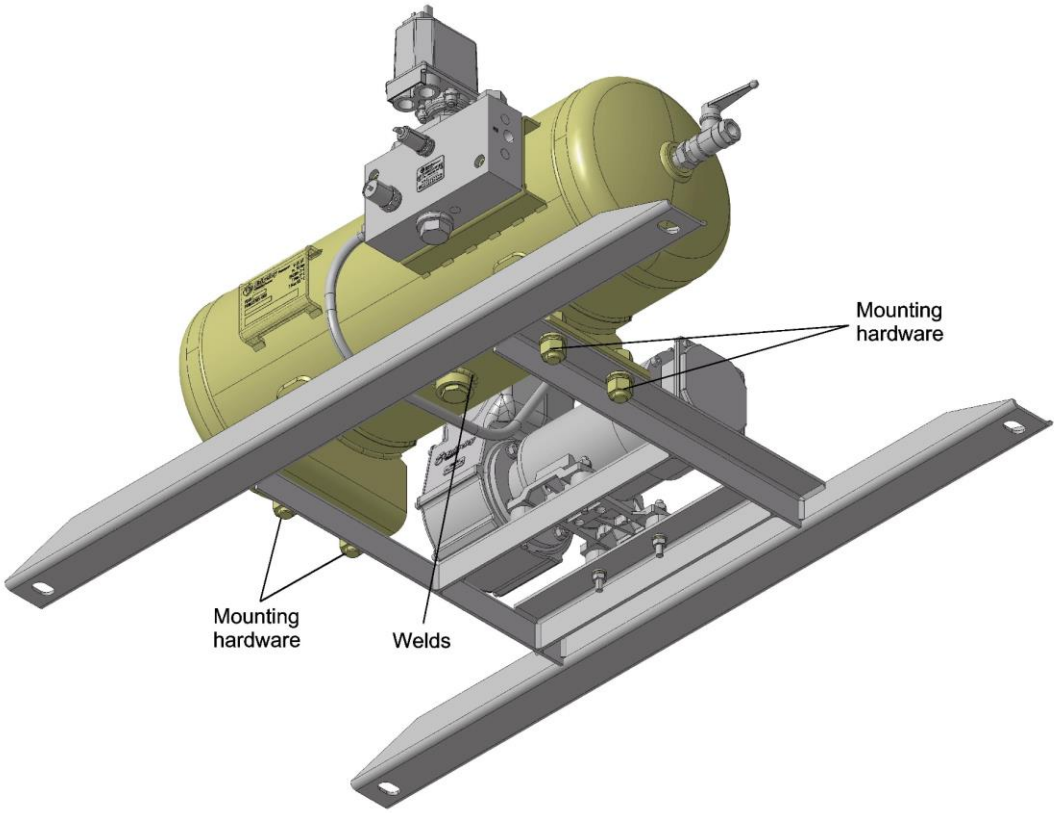

Figure 5: Visual Inspection, Reservoir 25L

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DRAINING

CAUTION! Possible jet spray! Wear protective gloves and goggles.

WARNING! Collect the drainage waste as prescribed by the law in force, as it may contain oil.

Refer to Figure 6

1. Check the leakage between the vented plug (2) and reservoir 25L (1) there should not be any leaks.
2. Unscrew the vented plug (2) in the main reservoir 25L (1) and check that the MP pressure goes to 0 bar through the pressure gauges.
3. Unscrew the vented plug (2) to discharge the reservoir 25L (1). **DO NOT** unscrew the plug all the way out.
4. Check the vented plug (2) and reservoir 25L (1) for damage are present, if any replace the component.
5. At the end, screw the plug.

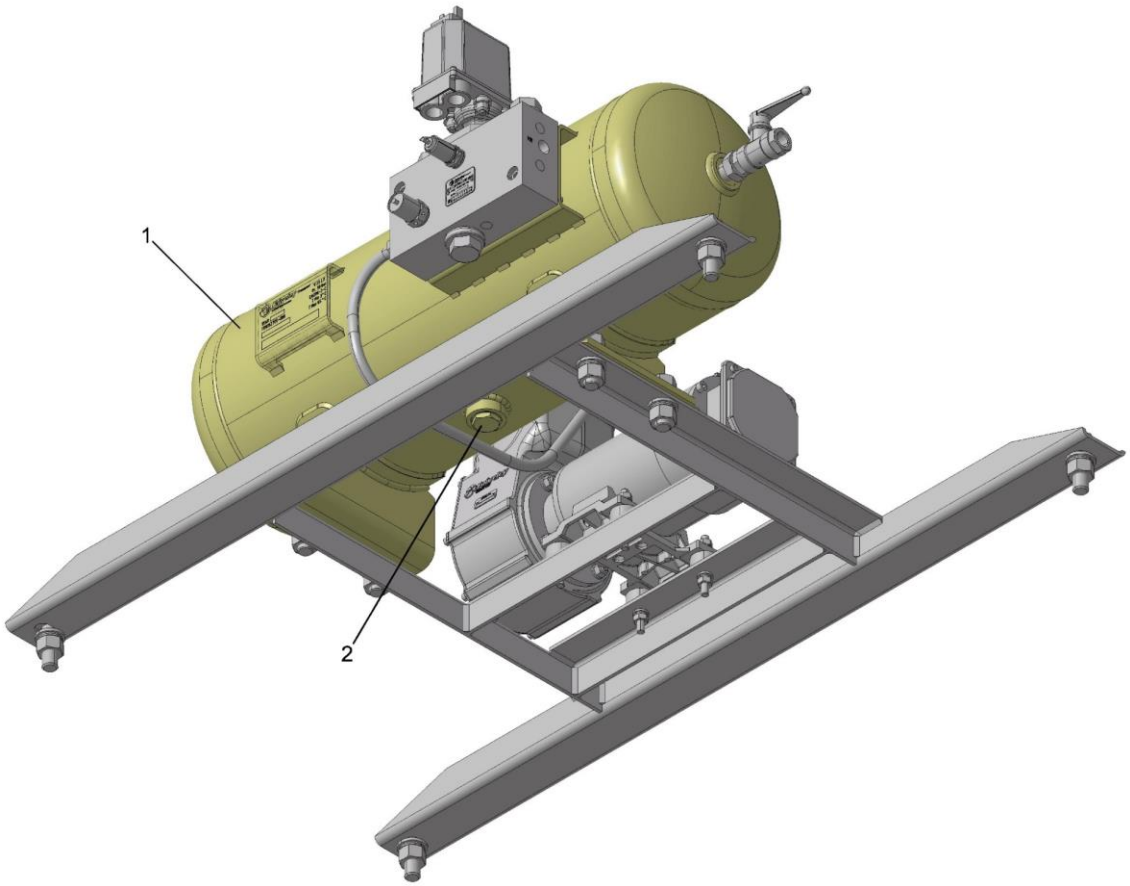

Figure 6: Draining, Reservoir 25L

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ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 25L	FT0053705-000	1
2	VENTED PLUG	016812000	1

5.2 REMOVAL AND INSTALLATION PROCEDURE OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

5.2.1 REMOVAL PROCEDURE

Refer to Figure 7

1. Disconnect the all electrical and pneumatic connections.
2. Make use of suitable lifting tool to support the auxiliary compressor frame assy (1).
3. Remove the following parts that attach the auxiliary compressor frame assy (1) to the car:
   - Four hex head bolts (2).
   - Eight nord lock washers (3).
   - Eight plain washers (4).
   - Four hexagonal nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to loosen the hex head bolts (2).

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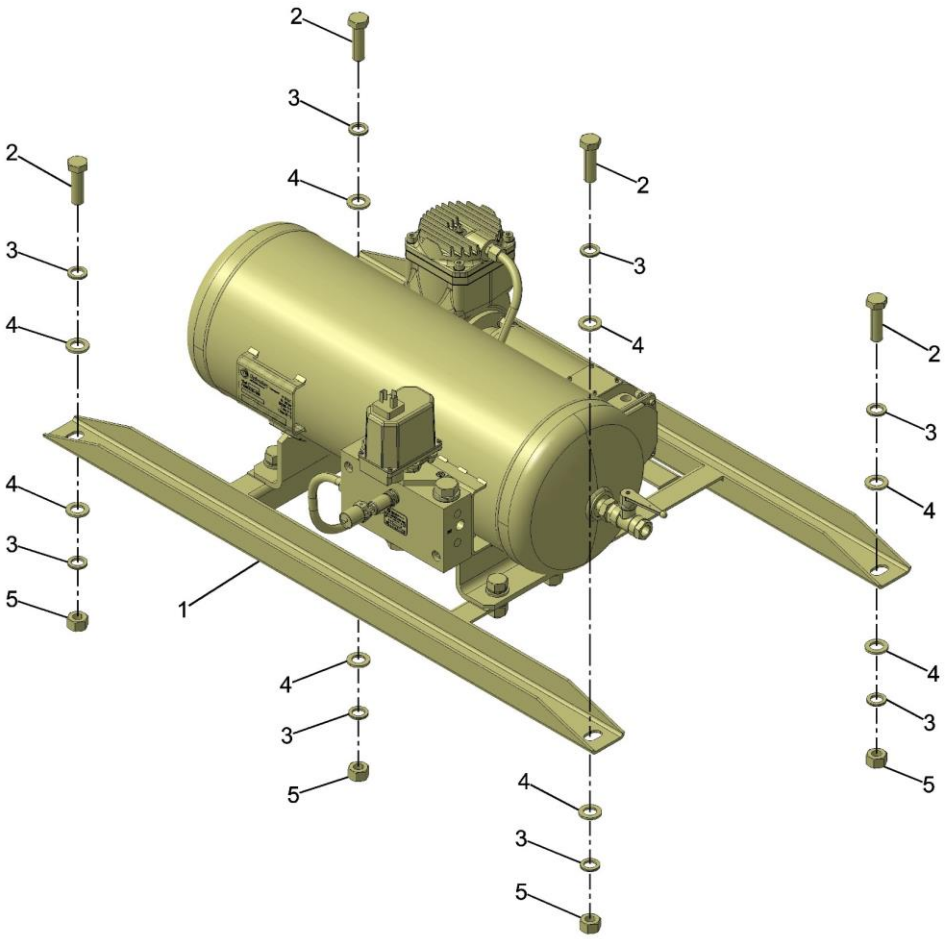

Figure 7: Removal / Installation of Auxiliary Compressor Frame Assembly

ITEM NO.	DESCRIPTION	P/N	QTY
1	AUXILIARY COMPRESSOR FRAME ASSEMBLY	FT0053703-100	1

Note: Item 2, 3, 4 and 5 are not under the scope of Wabtec.

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5.2.2 INSTALLATION / REASSEMBLY PROCEDURE

Refer to Figure 7

1. Make use of suitable lifting tools to support the auxiliary compressor frame assy (1) on the car.
2. Apply Loctite 242 on threads of the four hex head bolts (2).
3. Install the following parts that secures the auxiliary compressor frame assy (1) to car.
   - Four hex head bolts (2)
   - Eight nord lock washers (3).
   - Eight plain washers (4).
   - Four hexagonal nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to tighten the hex head bolts (2).
4. Torque tighten the four hex head bolts (2) to 211 Nm. Apply torque mark using Stylmark on it.
5. Connect the electrical and pneumatic connections.
6. Pressurize the system, switch on the electrical power and check for leakages as per the system level procedure performed during car builder's general system check.

5.3 REMOVAL AND INSTALLATION PROCEDURE OF AUXILIARY COMPRESSOR BURAN 0

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Heavy components;
- Lifting equipment, straps, harnesses

WARNING! The compressor has hot surfaces! Wait until the item has cooled down or use suitable protection.

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

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5.3.1 REMOVAL PROCEDURE

Refer to Figure 8

1. Disconnect the electrical and pneumatic connections from the compressor (1).
2. Unscrew and remove the following parts that attach the compressor (1) to the frame (5).
   - Four hex nuts (2) using 13 mm socket wrench.
   - Four nord lock washers (3)
   - Four spring washers (4).
   -

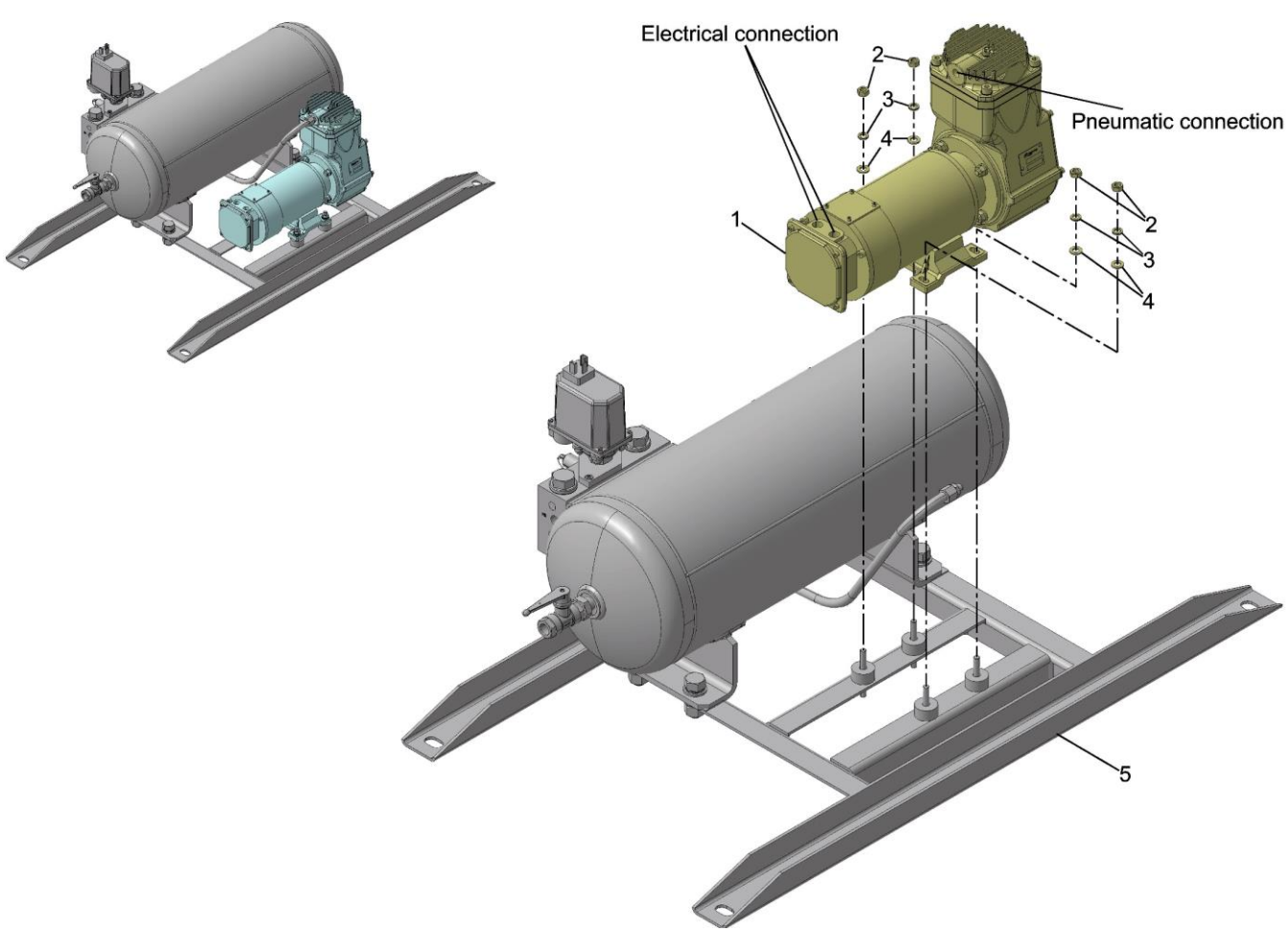

Figure 8: Removal / Installation of Compressor Assembly

ITEM NO.	DESCRIPTION	P/N	QTY
1	AUXILIARY COMPRESSOR BURAN 0	FT0026423-102	1
2	HEX NUT M8	906019600	4
3	NORD LOCK WASHER	FT0020809-001	4
4	SPRING WAHSER	909020600	4
5	FRAME	FT0053736-000	1

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5.3.2 INSTALLATION / REASSEMBLY PROCEDURE

Refer to Figure 8

1. Apply Loctite 242 on threads of the four hex nuts (2).
2. Install the following parts that attach the compressor assembly (1) to the frame (5).
   - Four hex nuts (2) using 13 mm socket wrench.
   - Four nord lock washers (3)
   - Four spring washers (4).
3. Torque tighten the two hex nuts (2) to 14 Nm. Apply torque mark using Stylmark on it.
4. Pneumatic port connections should be BSPP fittings.
5. Do not use tuflon tape on the threaded ports.
6. Apply Loctite 577 on threads of pipe fittings.
7. Connect the electrical connection and pneumatic connection to the compressor assembly (1).
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
9. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
10. For further information refer device manual FT0026423-102-E00MUM

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5.4 REMOVAL AND INSTALLATION PROCEDURE OF RESERVOIR 25L AND ISOLATING COCK WITH DRAIN 3/8"

Warning! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;
- Lifting equipment

Caution! Pressurised system. Discharge the system pressure before removing any component.

WARNING! The vessel handling must be done through an opposite lifting sling and with appropriate anti-shock measures. It is forbidden lifting or moving vessels tying other parts like sockets or brackets.

5.4.1 REMOVAL PROCEDURE OF ISOLATING COCK WITH DRAIN 3/8"

Refer to Figure 9

1. Remove piping from isolating cock with drain 3/8” (6) using an appropriate tool.
2. Unscrew and remove isolating cock with drain 3/8” (6) from reservoir 25L (1) using 24 mm open end spanner by holding hex nipple (8) with 27 mm spanner

5.4.2 REMOVAL PROCEDURE RESERVOIR 25L

1. Unscrew and remove vented plug (9) from reservoir 25L (1) using 26 mm spanner.
2. Remove and **DISCARD** seal (10) from reservoir 25L (1).
3. Disconnect the pipe fittings and connections from reservoir 25L (1).
4. Unscrew and remove the following parts that attach the reservoir 25L (1) to the frame (7).
   - Four hex head screws (2)
   - Eight nord lock washers (3)
   - Eight plain washers (4)
   - Four hex nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to loosen hex head screw (2).
5. Remove the reservoir 25L (1) from frame (7).

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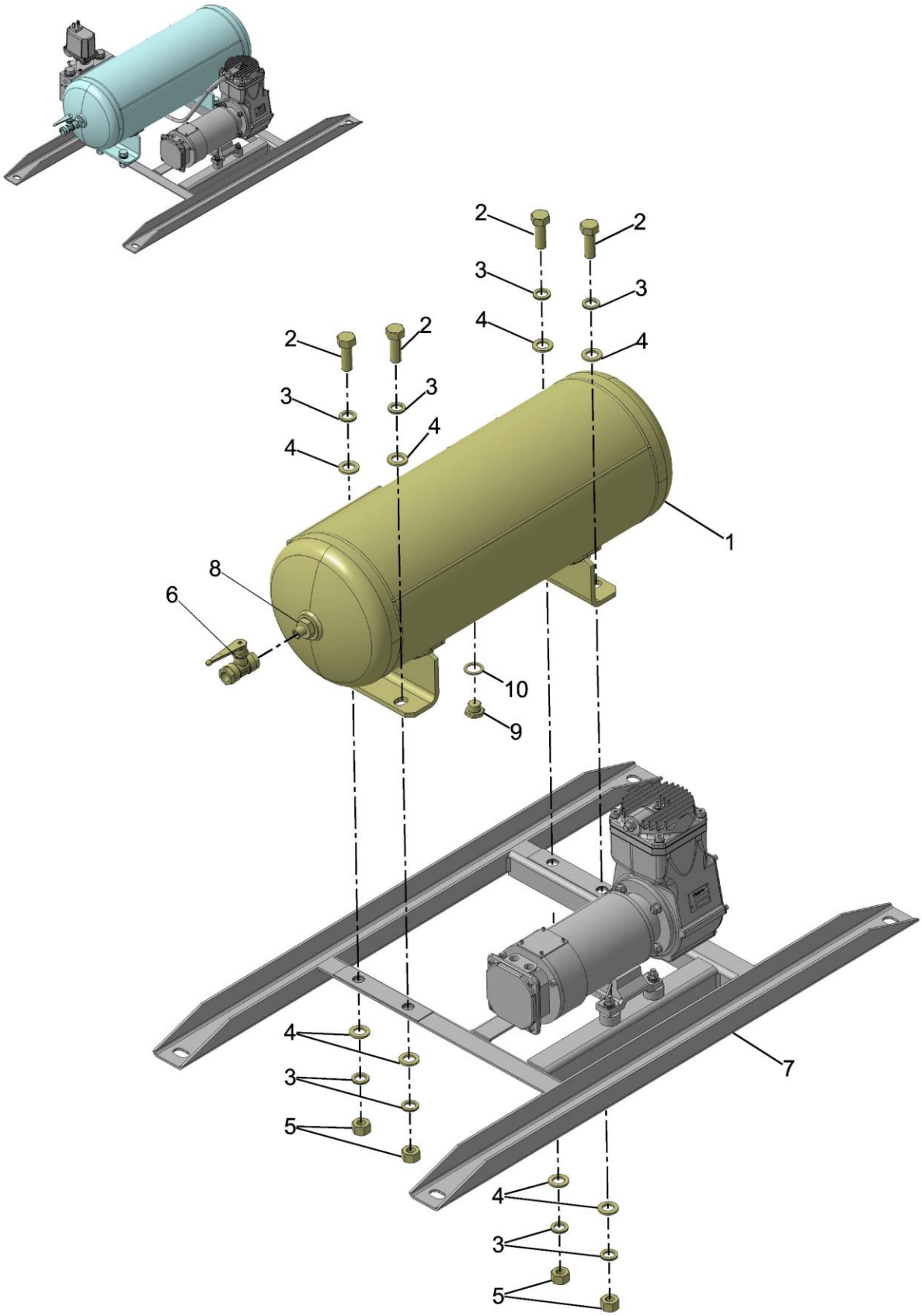

Figure 9: Removal / Installation of Reservoir 25L and Isolating Cock with drain 3/8"

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ITEM NO.	DESCRIPTION	P/N	QTY
1	RESERVOIR 25L	FT0053705-000	1
2	HEX HD SCREW M16	920048100	4
3	NORD LOCK WASHER	FT0026782-000	8
4	PLAIN WASHER	908020800	8
5	HEX NUT	906022900	4
6	ISOLATING COCK WITH DRAIN 3/8"	FT0053740-000	1
7	FRAME	FT0053736-000	1
8	HEX NIPPLE	FT0052154-005	1
9	VENTED PLUG	016812000	1
10	SEAL	0018-16S	1

5.4.3 INSTALLATION / REASSEMBLY PROCEDURE OF PROCEDURE OF RESERVOIR 25L

Refer to Figure 9

1. Make use of suitable lifting tools to support the reservoir 25L (1)
2. Position reservoir 25L (1) on the frame (7).
3. Apply Loctite 242 on the threaded portion of the four hex head screws (2).
4. Install following parts that secure the reservoir 25L (1) to the frame (7).
   - Four hex head screws (2)
   - Eight nord lock washers (3)
   - Eight plain washers (4)
   - Four hex nuts (5) using 24 mm spanner and wrench by holding the nut with spanner and wrench to tighten hex head screw (2).
5. Torque tighten the four hex head screws (2) to 211 Nm. Apply torque mark using Stylmark on it.
6. Install NEW seal (10) on the vented plug (9)
7. Install the vented plug (9) along with NEW seal (10) on the reservoir 25L (1) using 26 mm spanner.
8. Before assembly of pipe connection perform cleaning of piping on the vehicle.
9. Connect pipe fittings. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
10. Do not use tuflon tape on the threaded ports.
11. Pressurize the system and check that the pressurized vessel is in perfect condition and there are no signs of corrosion or other damages. Check that all the fixing points are correctly fitted and secured. Finally check for leakages as per the system level procedure performed during car builder's general system check.
12. For further information refer device manual FT0051876-000-E00MUM.

5.4.4 INSTALLATION / REASSEMBLY PROCEDURE OF PROCEDURE OF RESERVOIR 25L

Refer to Figure 9

1. Install isolating cock with drain 3/8" (6) on the reservoir (1) using 24 mm open end spanner by holding hex nipple (8) with 27 mm spanner.
2. Torque tighten the isolating cock with drain 3/8" (6) to appropriate torque. Apply torque mark using Stylmark on it.
3. Before assembly of pipe connection perform cleaning of piping on the vehicle.
4. Do not use tuflon tape on the threaded ports.
5. During piping installation hold the isolating cock with drain 3/8" (6) rigidly and tighten the pipe fitting.

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6. Make sure that the isolating cock with drain 3/8” (6) is in parallel to the pipe line and the arrowmark inline with the compressed air flow direction.
7. Connect the pipe fittings. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
8. Pressurize the system and perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder’s general system check.
9. For further information refer device manual FT0051880-100-E00MUM..

5.5 REMOVAL AND INSTALLATION PROCEDURE OF ACU MANIFOLD ASSY

Warning! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Warning! Disconnect the power supply before disassembling.

Caution! Pressurised system. Discharge the system pressure before removing any component.

5.5.1 REMOVAL PROCEDURE

Refer to Figure 10

1. Remove the electrical and pneumatic connections from ACU manifold assembly (1).
2. Unscrew and remove the following parts that attach the ACU manifold (1) to the reservoir (5).
   - Two hex socket head cap screw (2) using 6 mm allen key.
   - Two nord lock washers (3)
3. Remove and **DISCARD** O-ring (4) from ACU manifold (1)
4. Remove the ACU manifold (1) from the reservoir (5).

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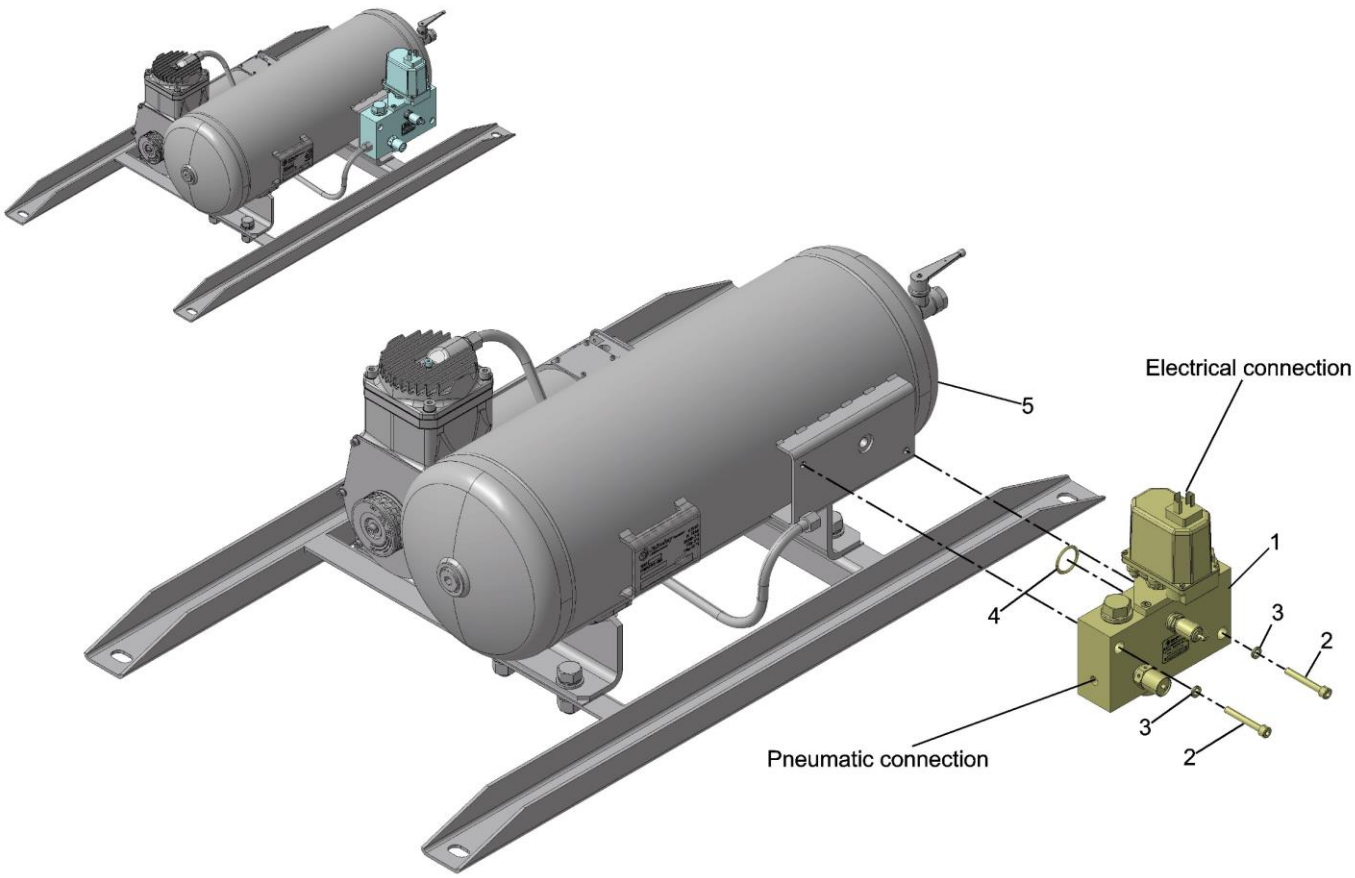

Figure 10: Removal / Installation of ACU Manifold Assembly

ITEM NO.	DESCRIPTION	P/N	QTY
1	ACU MANIFOLD ASSY	FT0053737-100	1
2	HEX SOCKET HEAD CAP SCREW M8	901039800	2
3	NORDLOCK WASHER	FT0020809-001	2
4	O-RING	003703500A	1
5	RESERVOIR 25L	FT0053705-000	1

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5.5.2 INSTALLATION / REASSEMBLY PROCEDURE

Refer to Figure 10

1. Smear Molykote M33 grease to the **NEW** O-rings (4) and to the groove portion of the ACU manifold assembly (1).
2. Install the **NEW** O-ring (4) on the groove portion of the ACU manifold assembly (1).
3. Apply Loctite 242 on threads of the two hex socket head cap screws (2).
4. Install the following parts that attach the ACU manifold (1) to the reservoir (5).
   - Two hex socket head cap screw (2) using 6 mm allen key.
   - Two nord lock washers (3)
5. Torque tighten the two hex socket head cap screws (2) to 14 Nm. Apply torque mark using Stylmark on it.
6. Before assembly of pipe connection perform cleaning of piping on the vehicle.
7. Pneumatic ports connection should be BSPP fittings.
8. Do not use tuflon tape on the threaded ports.
9. Apply Loctite 577 on threads of pipe fittings.
10. Connect the electrical and pneumatic connection to the ACU manifold assembly (1).
11. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
12. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

5.6 REMOVAL AND INSTALLATION PRESSURE SWITCH 5.3 BAR TO 7.5 BAR

Please refer to the FT0020043-117-E00MUM.

5.7 REMOVAL AND INSTALLATION OF SAFETY VALVE SET AT 8.5 BAR

Please refer to the FT0051763-100-E00MUM

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/// 6. Spare Part List

- Routine Maintenance - The spare parts required for routine maintenance are reported in the single main subcomponent User Manuals: see User Manuals list in the table Preventive maintenance (First Level).

- Installation: The spare parts required for ACU manifold assy are listed in the below table:

Refer to Figure 9

REF.	DESCRIPTION	P/N	QTY
10	SEAL	0018-16S	1

Refer to Figure 10

REF.	DESCRIPTION	P/N	QTY
4	O-RING	003703500A	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with NEW ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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13.01_AIR GENERATION AND TREATMENT UNIT

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/// FT0053718-100-E00MUM

TRAINSET 18

AIR GENERATION AND TREATMENT UNIT
FT0053718-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	KN Design Engineer, Engineering		01/04/2023
Checked:	.JP Systems Engineer, Engineering		01/04/2023
Approved:	.AE Manager, Engineering		01/04/2023
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0053718-100-E00MUM.docx	A02	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	07/06/2022	First release	.	SMC	.JP	.AE
A01	10/13/2022	Updated based on LCC alignment	.	SMC	.JP	.AE
A02	01/04/2023	Document updated with detailed maintenance procedures and illustrated views using new template	DRC1751 /4	KN	.JP	.AE
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The air generation unit consists basically of a railway well proven oil free piston compressor and air treatment unit, i.e air dryer and prefilter units. It provides compressed air useful for various train functions like brake, suspension, horn etc. compressed air passes through prefilter and air dryer.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

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- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise, the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

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1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.

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- Traces of overheating occurs if the component is not working within operating temperature 0°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

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- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from 0°C to +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from +3°C to 25°C during 3 months maximum and also, in summer from +25°C to +47°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

AGTU must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on AGTU and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the AGTU P/N FT0053718-100 respectively for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
AGTU	Air Generation and Treatment Unit
HD	Head
HEX	Hexagonal
SOC	Socket
Kg	Kilogram
L	Litres
Nm	Newton Metre
P/N	Part Number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1

The Air Generation and Treatment Unit consist basically of a railway well proven oil free piston compressor and air treatment unit, i.e., air dryer and filter units. It provides compressed air useful for various train functions like Brake, Suspension, CCD, WFL, Horn etc. Compressed air passes through Water separator and Air dryer. The filtration of air takes place while passing through these assemblies.
The air compressor is driven by a three-phase motor (415Vac/ 50Hz) via a direct flexible coupling.
The compressor is reciprocating piston type.
Furthermore, in each group there are:

- Air intake filter
- Air dryer
- Minimum pressure valve
- Safety valve
- Drain valve
- Final filter
- Water separator

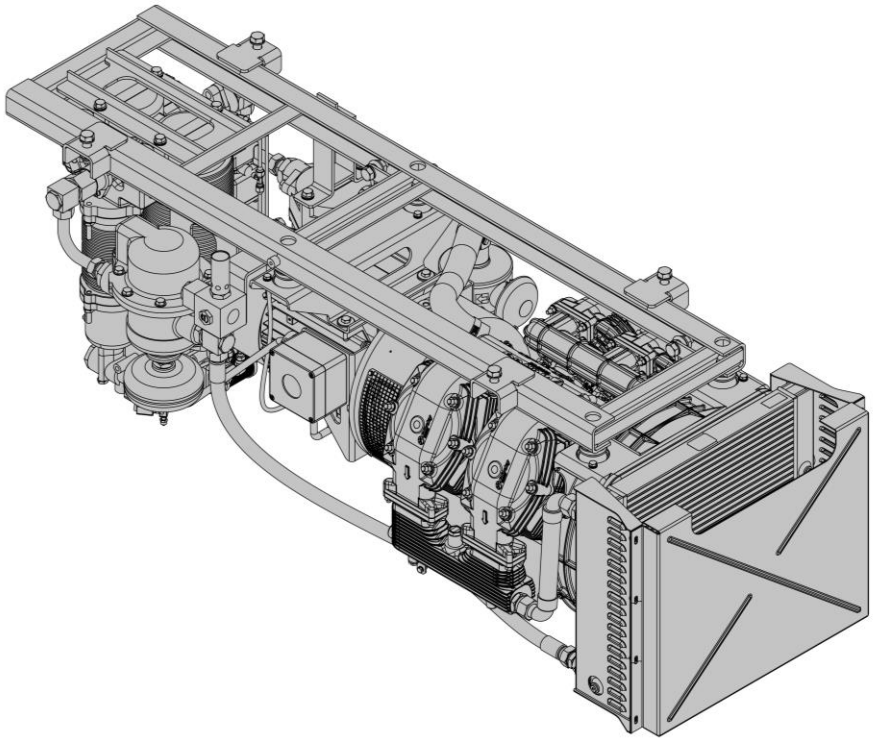

Figure 1: Air Generation and Treatment Unit, Isometric View

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2.2 TECHNICAL DATA OF THE EQUIPMENT

FEATURES	VALUE	UNIT	TOLERANCE
FREE AIR DELIVERY BEFORE AIR DRYER AT 9 BAR	900	L/min	±7%
FREE AIR DELIVERY AFTER AIR DRYER AT 9 BAR	720	L/min	±7%
COMPRESSOR ROTATION SPEED	960	rpm	±4%
WORKING PRESSURE RANGE	8.5 to 10	bar	
SHAFT POWER AT 9 BAR	8.5	kW	±7%
DELIVERED AIR QUALITY AFTER AIR DRYER (ISO 8503)	3-3-N.A		
TEMPERATURE OPERATING RANGE (*) APPLICABLE ONLY WITH HEATING SOLUTION	+3 TO +50 -10 TO 50 (*)	°C	±2°C
DELIVERED AIR TEMPERATURE	AMBIENT +15	°C	
DUTY CYCLE	30 TO 100%		
OPERATING MODE	START/STOP		
START PER HOUR	MAXIMUM 20		
ALLOWED SUPPLY HARMONIC DISTORTION	15 MAX	%	
MAX 3 PHASE VOLTAGE Dv/dt	500 MAX	V/µS	
ELECTRICAL POWER CONSUMPTION AT 10 BAR (INPUT POWER)	10	kW	±7%
ELECTRIC POWER SUPPLY	415	Vac	±5%
	50	Hz	±2
NOMINAL CURRENT 7 BAR	17	A	±5%
PEAK CURRENT AT START UP	< 300	A	
MOTOR IP PROTECTION (IEC 34-5)	IP 55		
MOTOR INSULATION CLASS (IEC 85)	H		
AUXILARY VOLTAGE SUPPLY WITH TOLERANCE	110	V DC	-30% / +25%
AUXILARY POWER ABSORPTION (110 V dc)	150	W	
WEIGHT	330	kg	±5%
MOUNTING FRAME MADE OF CARBON STEEL WITH PAINTED	RAL 7016 CLASS 40-70%		

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2.3 PNUEMATIC SCHEME

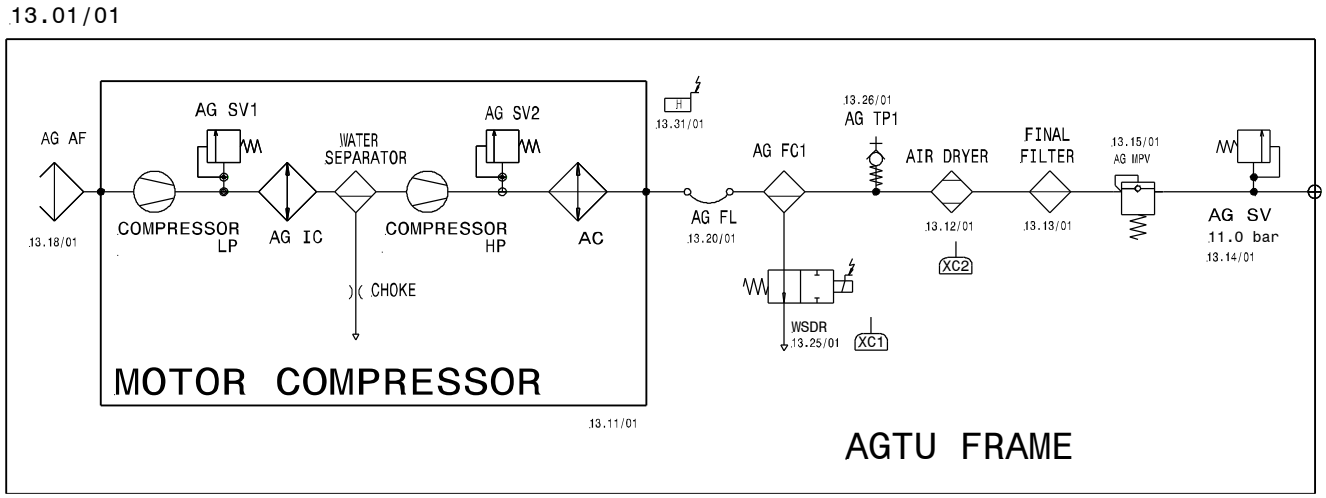

Figure 2: AGTU, Pneumatic Scheme

Ref. No.	Figure Ref.	Description
13.18	AG AF	AIR INTAKE FILTER
13.11	MOTOR COMPRESSOR	MOTOR COMPRESSOR BURAN 10 6P
	AG SV1	SAFETY VALVE
	AG SV2	SAFETY VALVE
	AG IC	INTER COOLER
	AC	AFTER COOLER
13.20	AG FL	HOSE -COMPRESSOR OUTLET
13.24	AG FC1	WATER SEPERATOR WITH DRAIN VALVE
	LP	LOW PRESSURE

Ref. No.	Figure Ref.	Description
	HP	HIGH PRESSURE
13.25	WSDR	DRAIN VALVE FOR WATER SEPERATOR
13.15	AG MPV	MINIMUM PRESSURE VALVE
13.13	FINAL FILTER	FINAL FILTER
13.12	AIR DRYER	AIR DRYER
	XC1	CONNECTOR 1
	XC2	CONNECTOR 2
13.14	AG SV	SAFETY VALVE 11 BAR SET
13.26	AG TP1	TEST POINT
13.31	H	HOUR COUNTER

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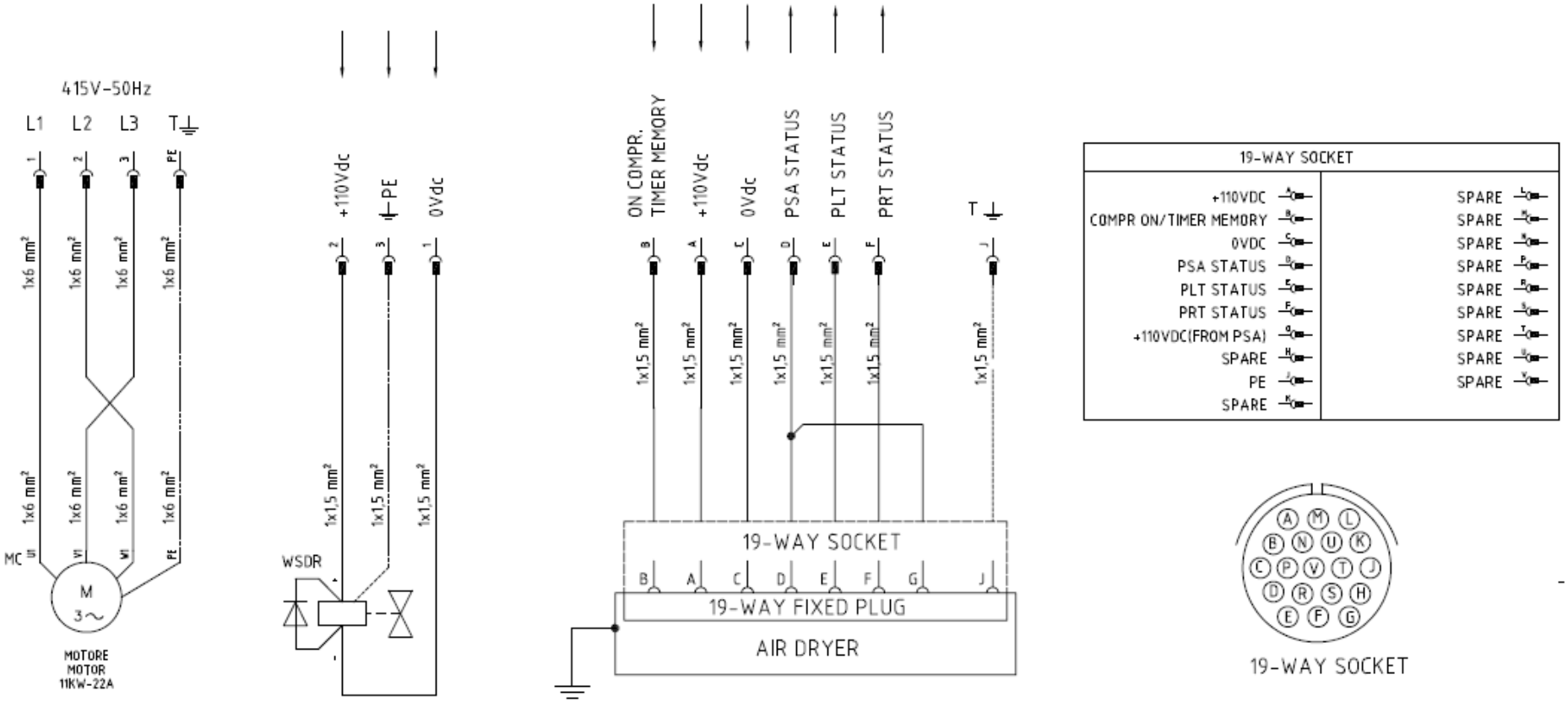
2.4 ELECTRICAL DIAGRAM



Note: The mentioned Electrical scheme is only for reference and latest system document to be referred

Figure 3: AGTU, Electrical Scheme (sheet 1 of 2)

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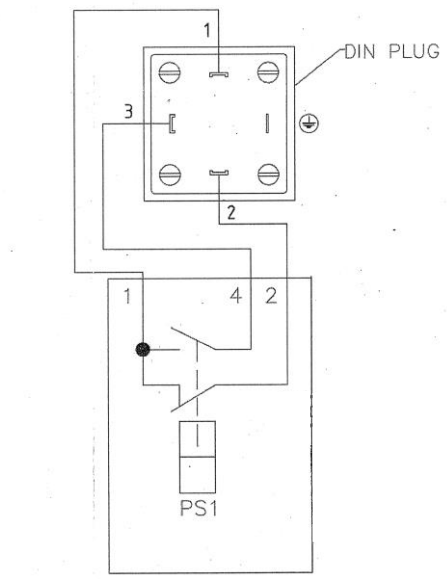
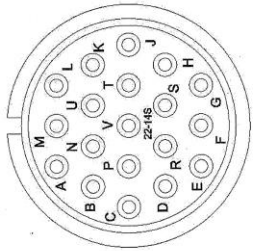
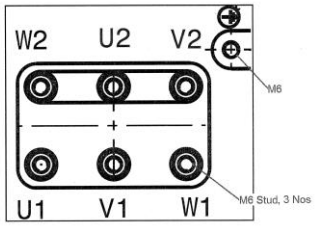


DIN CONNECTOR DETAILS FOR WATER SEPARATOR ELECTRICAL CONNECTION



19 WAY CONNECTOR FOR AIR DRYER



MOTOR TERMINAL DETAILS

Figure 4: AGTU, Electrical Scheme (sheet 2 of 2)

Figure Ref.	Description
WSDR	DRAIN VALVE FOR WATER SEPERATOR
M	ELECTRIC MOTOR

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2.5 MAJOR COMPONENTS

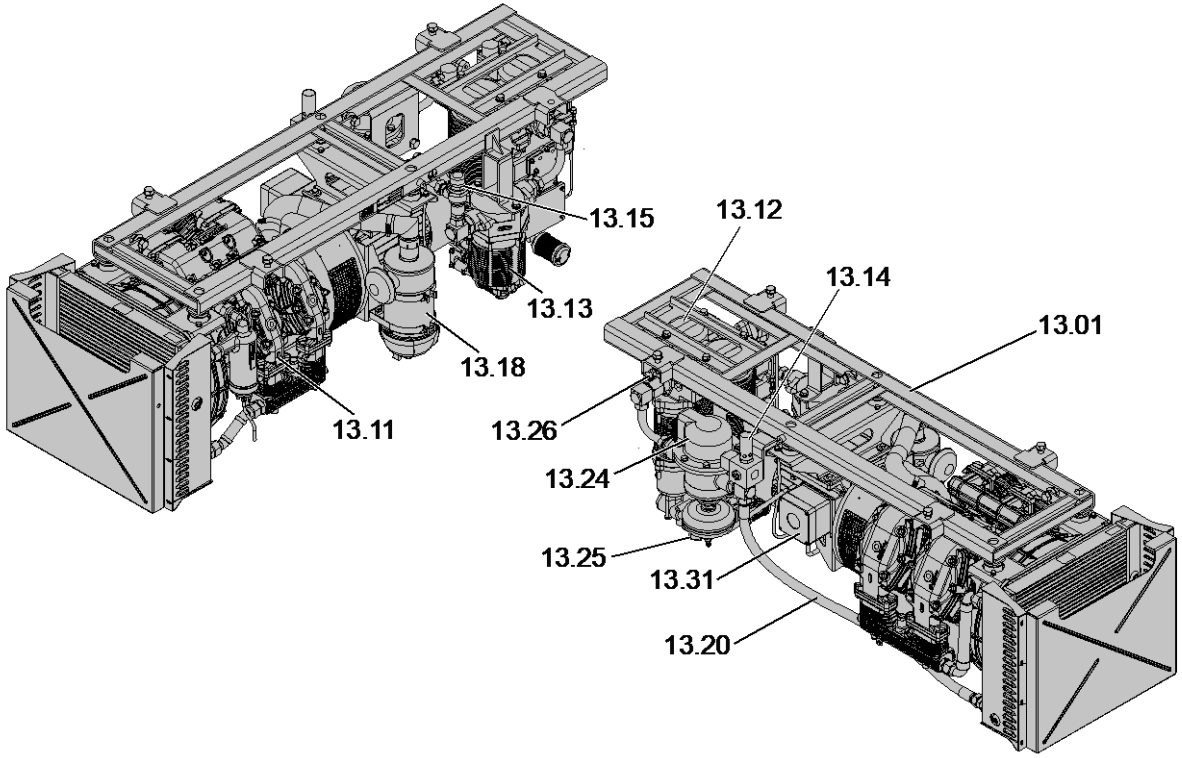

Figure 5: AGTU, Major Components

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SCHEME REF.	DESCRIPTION	P/N	QTY	DOC. REF.
13.01	AGTU	FT0053718-100	1	FT0053718-100-E00MUM
13.11	BURAN 10 COMPRESSOR WITH 6 POLE MOTOR	FT0055009-100	1	FT0055009-100-E00MUM
13.12	AIR DRYER	FT0053022-100	1	FT0053022-100-E00MUM
13.13	FINAL FILTER	FT0051762-100	1	FT0051762-100-E00MUM
13.14	SAFETY VALVE 11 BAR	FT0052383-100	1	FT0053157-100-E00MUM
13.15	MINUMUM PRESSURE VALVE	2/517329	1	517329-E00MUM
13.18	AIR FILTER KIT	1/320658	1	UM-320658
13.20	HOSE 3/4"	FT0052297-000	1	UM-028006000
13.24	WATER SEPARATOR	FT0053017-100	1	FT0053017-100-E00MUM
13.25	DRAIN VALVE FOR WATER SEPARATOR	FT0025443-102	1	FT0025443-100-E00MUM
13.26	TEST POINT	FT0027358-000	1	NA
13.31	HOUR COUNTER	FT0055486-100	1	NA

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/// 3. OPERATIONS

Refer to Figure 6

3.1 MOTOR COMPRESSOR TYPE BURAN

3.1.1 GENERAL DESCRIPTION

The air generation system is made of a 2 stages piston compressor type Buran 10. Each stage includes a safety valve, a cooler and a drain valve. Drain valve will exhaust liquid water when compressor stops.

The air compressor is driven by a three-phase motor (415Vac/ 50Hz) with six poles via a direct flexible coupling. The flexible coupling between the motor and compressor is rated for the maximum duty cycle and cyclic torque variations, which can be expected from the reciprocating compressor.

The air supply unit is operated by means of a pressure governor managed by customer.

Compressor cut in = 6.0 kg/cm2 and cut off = 7.0 kg/cm2

NOTE:
Depends upon customer requirement set value will be made by customer.

3.1.2 COOLING

One axial fan connected to the crankshaft allows internal components ventilation as so as compressed air cooling. Compressed air flows through one combined cooler. Refer below image for fan flow direction.

NOTE:
Direction of cooling flow is important for compressor performance.

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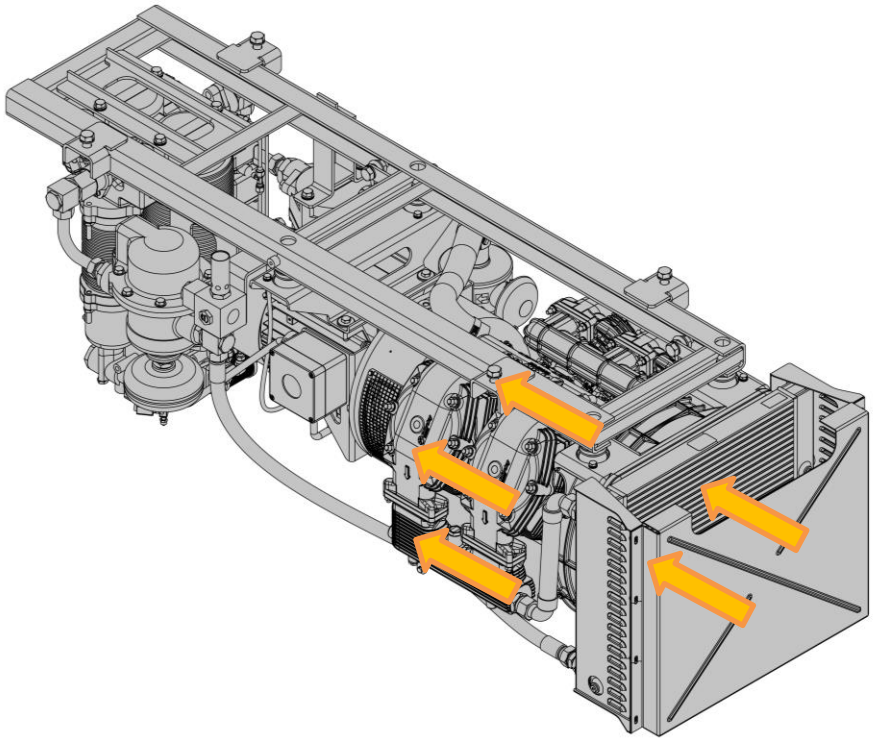

3.1.3 COMPRESSOR ELECTRIC MOTOR

The main electric motor is 6 poles, 3 phases, AC induction motor.

3.1.4 INTAKE AIR FILTER

The intake air filter has a first cyclonic separation followed by a replaceable filtering element.

3.1.5 MOTOR-COMPRESSOR MOUNTING

Buran is fixed to the main frame through 4 points by means of dampers. Dampers are made of rubber and are conical type.

3.1.6 WATER DRAINING

Buran compressor is not-lubricated type and oil is not present in compressed air; therefore, no tank for collection of drained water is provided.
The function of drain valve as follows:

- Drain of water condensed in the coolers.
- Depressurization of the compressor to make easier compressor re-start.
- Depressurized of the compressor for maintenance operations.

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3.1.7 SAFETY VALVE

In order to protect the compressor against over pressure two safety valves are foreseen: one after the low stage (set at 4 bar) and one after the high stage (set at 20 bar).
The safety valve automatically monitors the upper tolerance limits of working pressure. If the working pressure rises too far, the valve rod will open the exhaust port and vent the compressed air to atmosphere.

3.1.8 PRE FILTER

Contaminated air enters the Pre-filter housing and undergoes mechanical air/liquid separation by centrifugal action. The bulk liquids are collected into a quiet sump area for discharge through a drain valve which operates on the half-cycle of the dryer. With the condition of a continuously running compressor, actuation is every 60 seconds. Air continuing on route to the dryer passes through a high efficiency coalescing filter element. The large capacity element functions to coalesce the oil and water aerosols to liquid droplets that are drained away. Coalesced liquids drainage is accomplished by a second drain valve. The two identical drain valves are designed to be fail safe in their operation. That is accomplished by utilizing intermediate sumps which are sized to minimize the air loss associated with draining. A secondary function of the coalescing element is the filtering of solids contaminates. Particulates that are captured in fibres of the coalescing element can reduce the service life of the element. That impact is minimized by the large size of the element.

3.1.9 AIR DRYER

The twin tower air dryer is an air drying system comprising two air dryer towers connected by a common inlet manifold with integral pre-coalescer and common outlet manifold. The system also includes an electric timer which controls the system cycle and allows the unit to ‘regenerate’ only when a predetermined pressure of approximately 5.2 bar (75 psi) is reached and the compressor or any compressor in the consist, is loaded (pumping). Until such time, both air dryer towers allow a maximum flow of air to pass and charge the entire train or system.

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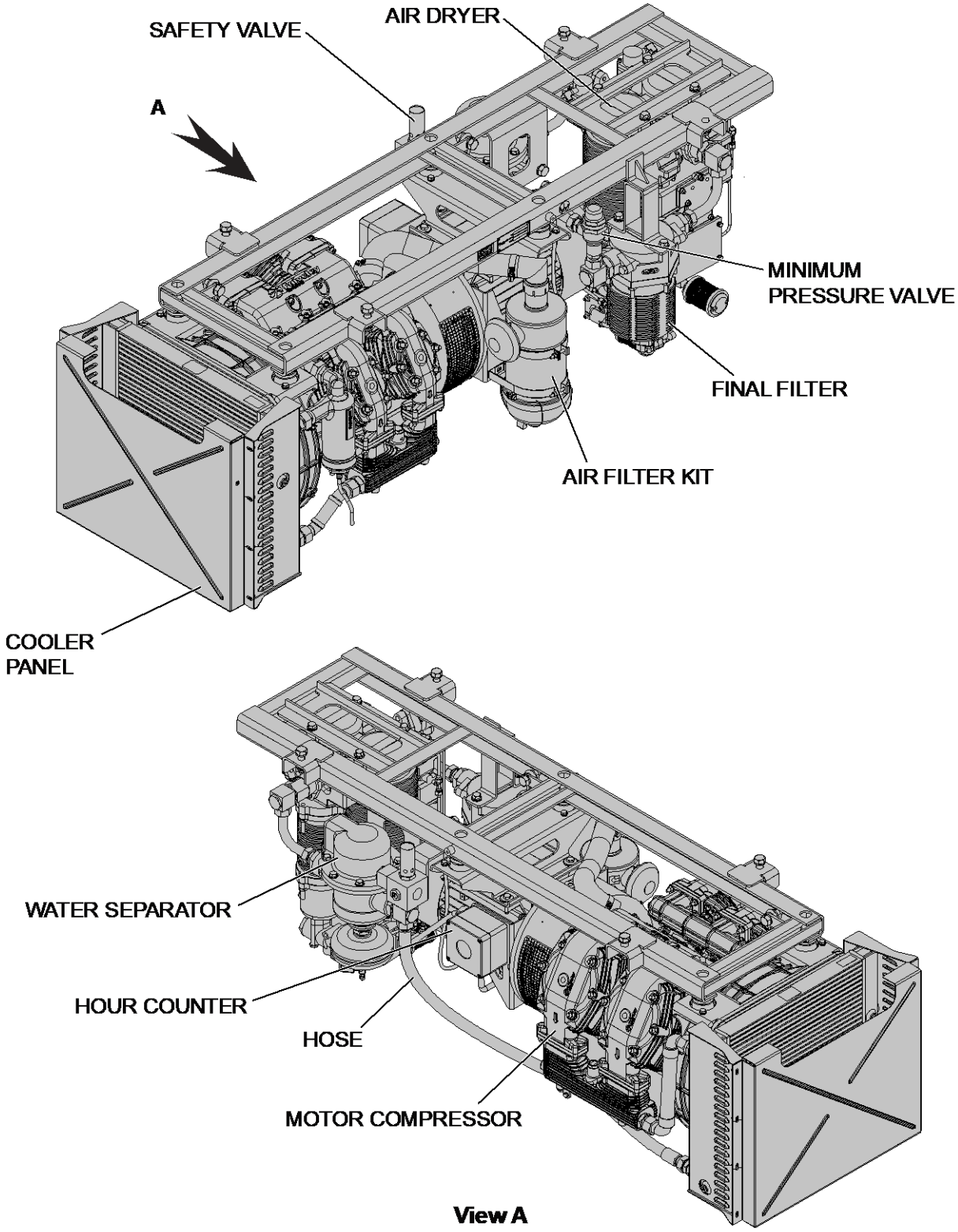

Figure 6: Air Generation and Treatment Unit, Major Components

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
10mm spanner	Tighten/loosen the fasteners
13mm spanner	Tighten/loosen the fasteners
15mm spanner	Tighten/loosen the fasteners
17mm spanner	Tighten/loosen the fasteners
18mm spanner	Tighten/loosen the fasteners
24mm spanner	Tighten/loosen the fasteners
30mm spanner	Tighten/loosen the fasteners
36mm spanner	Tighten/loosen the fittings
50mm spanner	Tighten/loosen the fittings
10mm socket wrench	Tighten/loosen the fasteners
13mm socket wrench	Tighten/loosen the fasteners
18mm socket wrench	Tighten/loosen the fittings
24mm socket wrench	Tighten/loosen the fittings
Screwdriver	Tighten/loosen the fasteners
Torque wrench 2.5-11 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242	Thread locking
Loctite 577	Sealant for pipe fittings
Stylmark	Torque marker
Molykote supergliss or WD-40	Cleaning

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

CAUTION! To respect the maintenance prescription and intervals in order to not impair safety.

Make a functional check and a general overhaul as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.

For the maintenance procedures, it is not necessary to remove the equipment from the vehicle.

The owner can adapt this periodicity according to conditions of use, their maintenance policy and their own experiment, under their responsibility.

The maintenance schedule here proposed is based upon the best knowledge so far acquired. It must be updated / changed properly, should this necessity become evident from the service exploitation, especially where safety is concerned.

This section contains the indications of the timing and mileage for carrying out each maintenance task.

IMPORTANT NOTES

The timing indicated both in terms of mileage and in terms of time. The one occurring first must be observed. Every task includes the tasks occurring at higher frequency.

Proposed maintenance schedule takes into account regular service condition. More severe operation and environment circumstances may require more frequent tasks.

The mentioned AGTU operating hours and calendar time are to be considered whichever comes earlier for maintenance.

The Parts manuals provided only for reference for additional information. The mentioned operating hours/ calendar time are only for reference and final value to be considered with AGTU user manual.

No special cleaning operations have been considered, however, depending on the installation on the vehicle, it could be necessary to remove regularly the possible deposits of dirt and debris that may affect the equipment's functionality.

During dismantling the nuts in any assembly, if it is found jammed or hard to remove, it is recommended to clean the projected nut end threads by using Molykote supergliss or WD-40 to clean the deposited muddy particles. Despite this precaution, if the metal end of the stud gets loosened, then clean the metal end of the stud and assemble with Loctite 270.

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AIR GENERATION AND TREATMENT UNIT

FIRST LEVEL MAINTENANCE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

OPERATING HOURS	CALENDER TIME	COMPONENT	REF.	ASSEMBLY P/N	TASK	REF./ SECTION
320 hours	2 months	Air intake filter	13.18	1/320658	Cleaning of filter	UM-320658
		Air dryer	13.12	FT0053022-100	Functional test	FT0053022-100-E00MUM
		Final filter	13.13	FT0051762-100	Functional test	FT0051762-100-E00MUM
		Motor compressor Buran 10 6P	13.11	FT0055009-100	Water separator drain	5.2.1
		Water separator drain valve	13.25	FT0025443-102	Functional test	5.2.2
1000 hours	6 months	Air Generation and Treatment Unit	13.01	FT0053718-100	Visual inspections and cleaning	5.2.3
		Motor compressor Buran 10 6P	13.11	FT0055009-100	Cleaning of cooler and visual inspection of compressor	328600-E00MUM
				FT0055009-100	Water separator drain cleaning	5.2.4
		Hose 3/4”	13.20	FT0052297-000	Visual inspection	UM-028006000
2000 hours	1 year	Air intake filter	13.18	1/320658	Filter replacement	UM-320658

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2000 hours	1 year	Safety valve 11 bar	13.14	FT0052383-100	Functional test on bench	FT0053157-100-E00MUM
		Air dryer	13.12	FT0053022-100	Desiccant visual inspection & coalescent filter replacement	FT0053022-100-E00MUM
		Final filter	13.13	FT0051762-100	Filter replacement	FT0051762-100-E00MUM
		Water separator drain valve	13.25	FT0025443-102	Functional test	FT0025443-100-E00MUM
4000 hours	2 years	Motor compressor Buran 10 6P	13.11	FT0055009-100	Verification of pistons rings LP & HP and change if require	FT0052441-102-E00TIN
		Compressor suction hose	-	FT0105239-001	Verification if damage replacement made	5.11
6000 hours	3 years	Drain valve for water separator	13.25	FT0025443-102	Periodical replacement	FT0025443-100-E00MUM

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SECOND LEVEL MAINTENANCE

2. Second Level Maintenance: overhaul/replacement as scheduled in **the system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled/replaced regularly as required by the operator's rules, the mission profile and the environmental conditions.

Typical periodicity:

OPERATING HOURS	CALENDER TIME	COMPONENT	REF.	ASSEMBLY P/N	TASK
6000 hours	3 years	Water separator	13.24	FT0053017-100	Overhaul
		Final filter	13.13	FT0052318-100	Overhaul
		Air dryer	13.12	FT0053022-100	Overhaul and desiccant and coalescent filter replacement
		Hose 3/4”	13.20	FT0052297-000	Replacement
		Safety valve 11 bar	13.14	FT0052383-100	Replacement
12000 hours	6 years	Minimum pressure valve	13.15	2/517329	Replacement
		Motor compressor Buran 10 6P	13.11	FT0055009-100	Overhaul
		Air Generation and Treatment Unit	13.01	FT0053718-100	Overhaul
		Motor	-	-	Overhaul

NOTE: Maintenance operations must be carried out by qualified personnel in authorized workshops.

NOTE: WABTEC provides an overhauling service for its own units. WABTEC performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.
The WABTEC Service Centres have the experience and technical equipment needed for performing professional overhauls.

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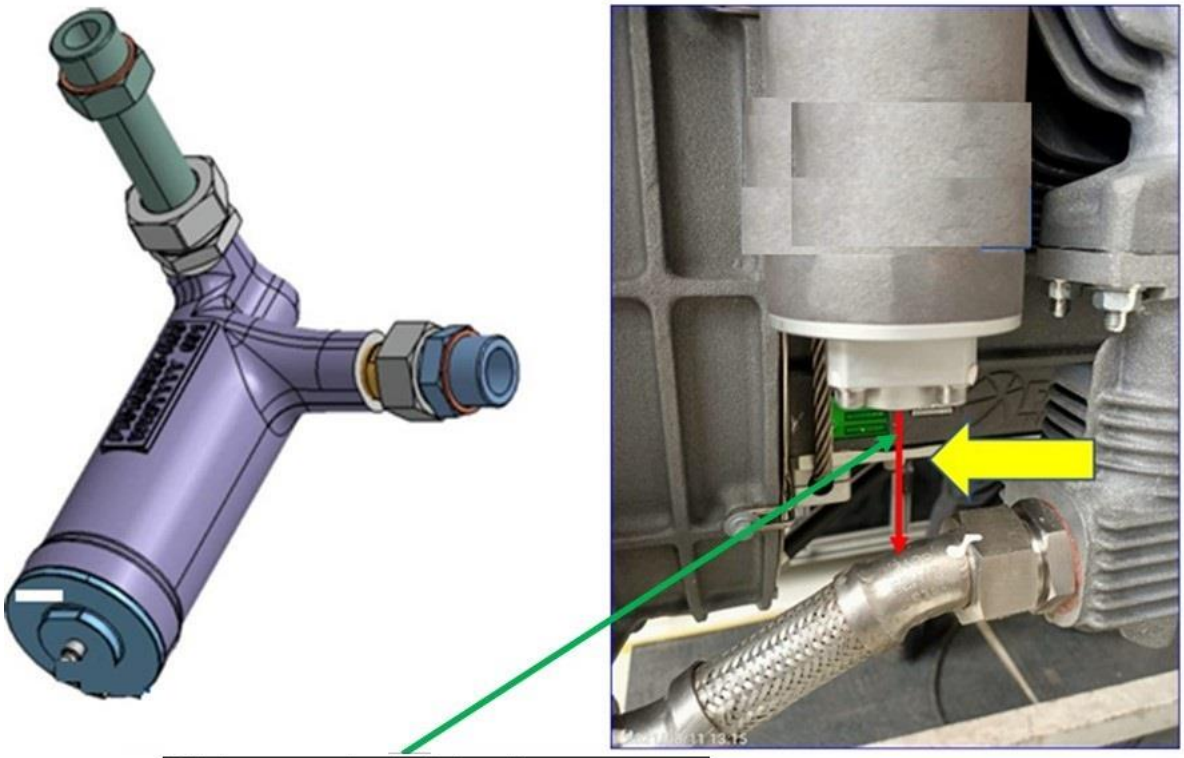
5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 320 HOURS / 2 MONTHS: WATER SEPARATOR DRAIN VERIFICATION:

5.2.1.1 Preliminary checks - Water separator working:

Ensure the AGTU is in working condition and verify the water + air mixture is being drained from the water separator drain.

Refer below water separator drain location.



Water separator drain location:
When AGTU is in working condition- water +air mixture is noticed

1. In order to ensure effective draining function from water separator, an updated drain valve is designed.
2. When compressor is ON, the air pressure pushes the piston downwards and piston comes in contact with seal.
3. The seal does not allows the compressor air to escape and allows the air leak through 1mm hole.
4. When compressor is OFF, due to the spring force piston moves upwards and allows the water to escape through bypass port.

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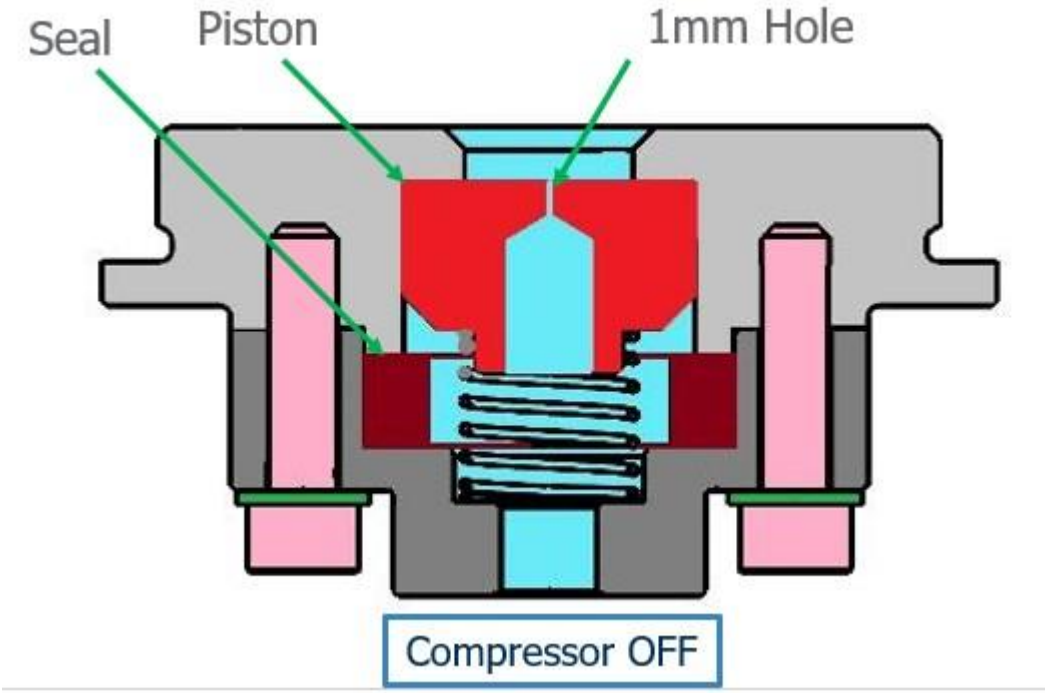

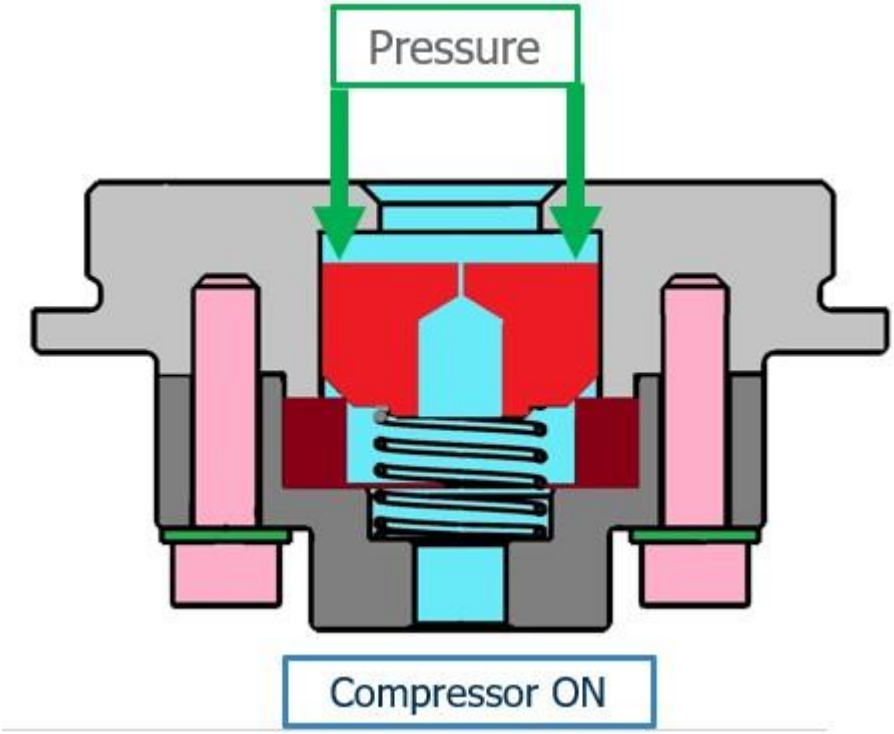

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5.2.1.2 Water separator drain is not working:

1. Whenever the AGTU is in working condition, water separator drain will always drain the water + air mixture.
2. If, no drain is noticed during verification, stop AGTU and check for any abnormality like abnormal noise. If, no abnormality noticed, remove the drain portions

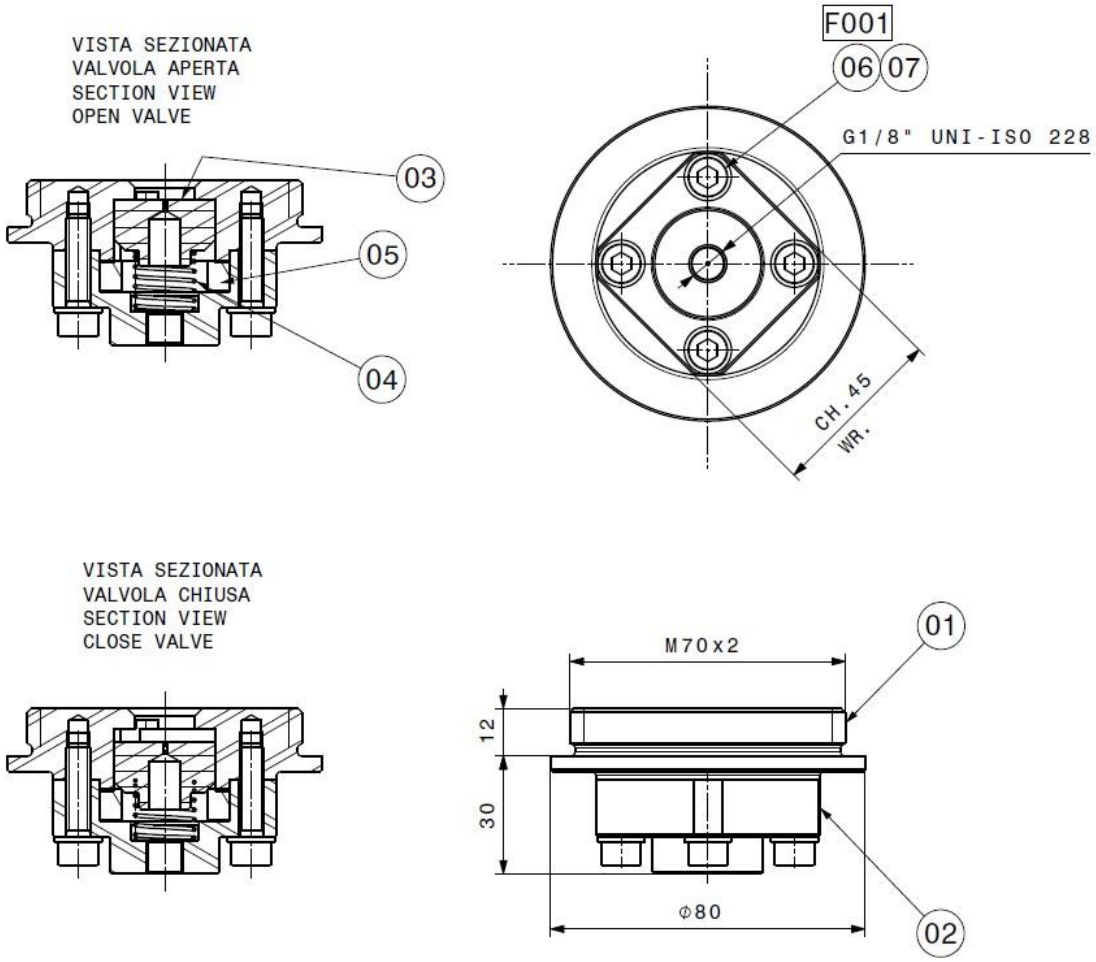

Figure 7: Removal of Water Separator Drain

ITEM NO.	DESCRIPTION	P/N	QTY
1	SEPARATOR FILTER COVER	FT0110696-000	1
2	DRAINAGE VALVE MANIFOLD	FT0110697-000	1
3	DRAINAGE VALVE PISTON	FT0110698-000	1
4	SPRING	1/156070	1
5	DRAINAGE VALVE SEAT	FT0106690-000	1
6	SCREW M6X25	FT0030007-039	4
7	CONTACT WASHER	2/519041	4

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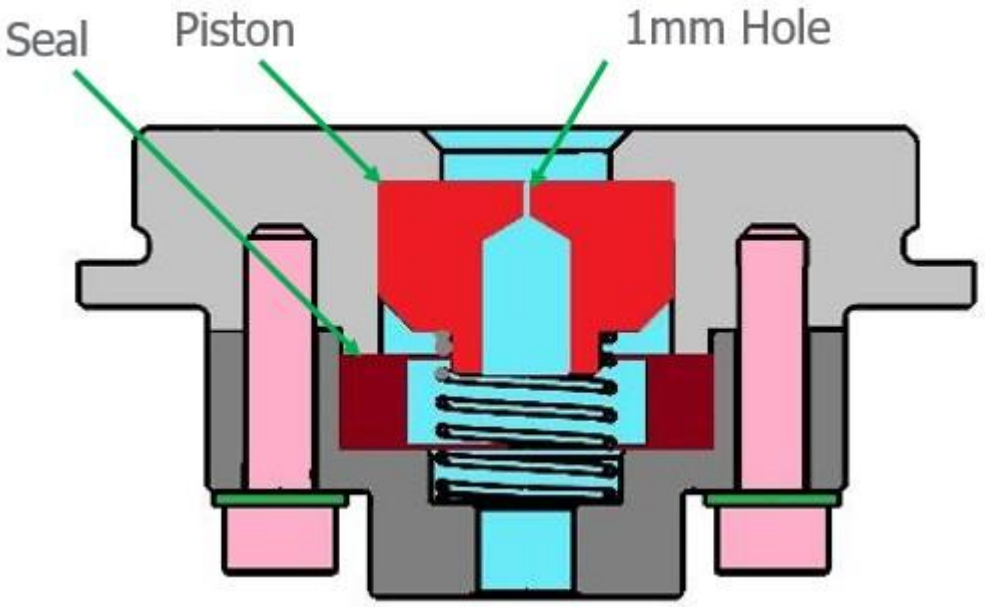
1. In case, blockage is noticed at 1 mm hole remove drain valve and clean by means of external air and assemble as per below figure.
2. All parts to be checked for any damages. If, any damages noticed in parts, it should be replaced with new parts.
3. If, no damages noticed. Clean all parts by external air for dusts etc.
4. After cleaning of all parts, re-assembly of drain portion and fit in water separator assembly.



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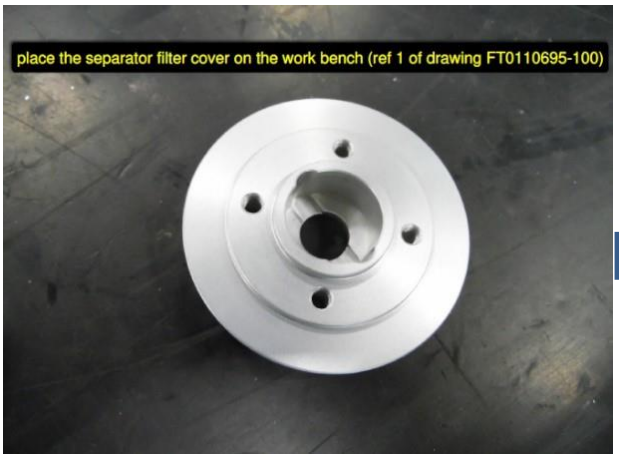

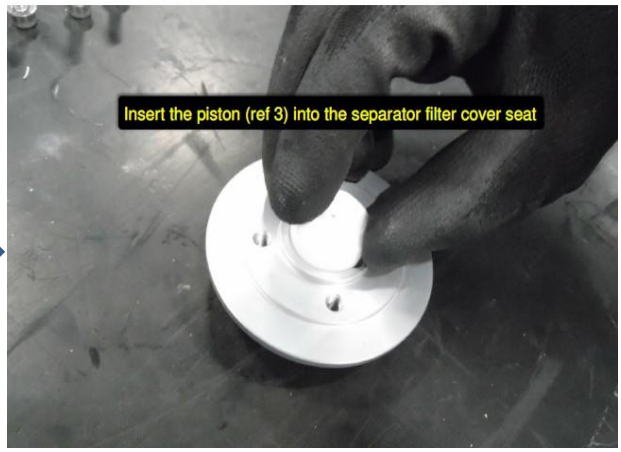

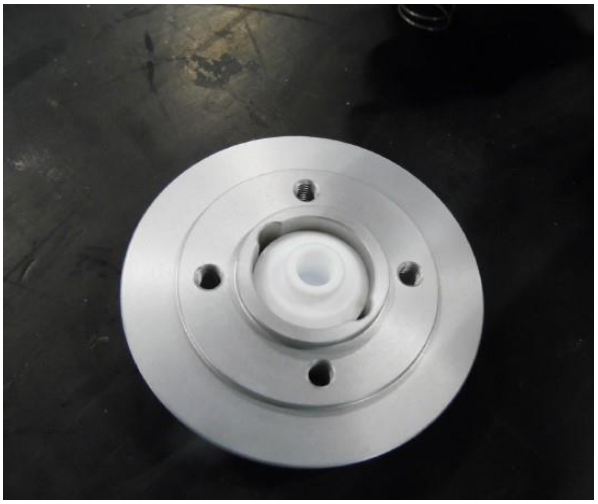

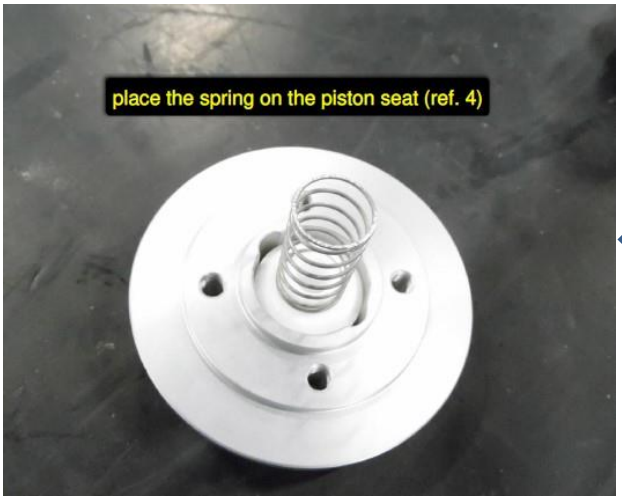

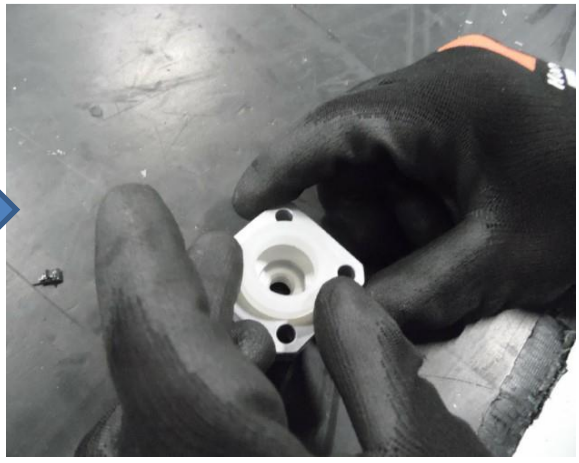

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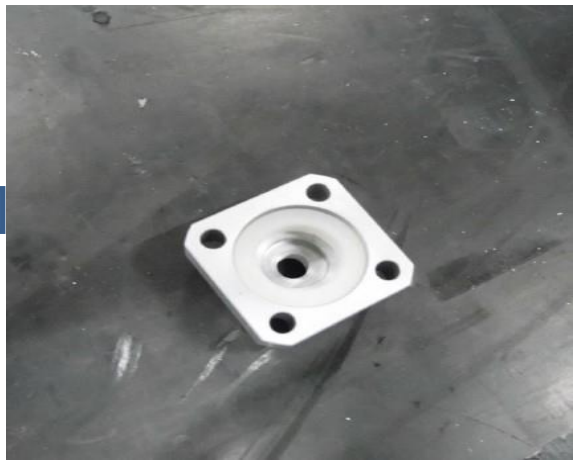

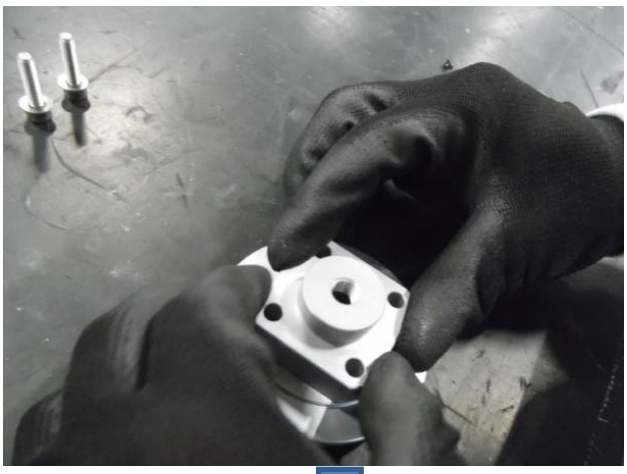

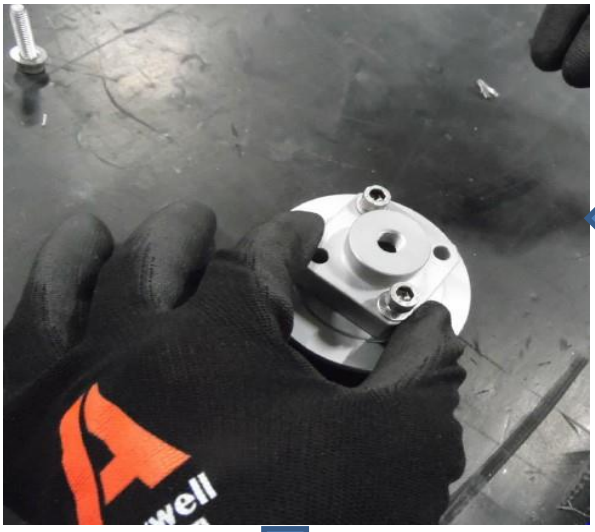

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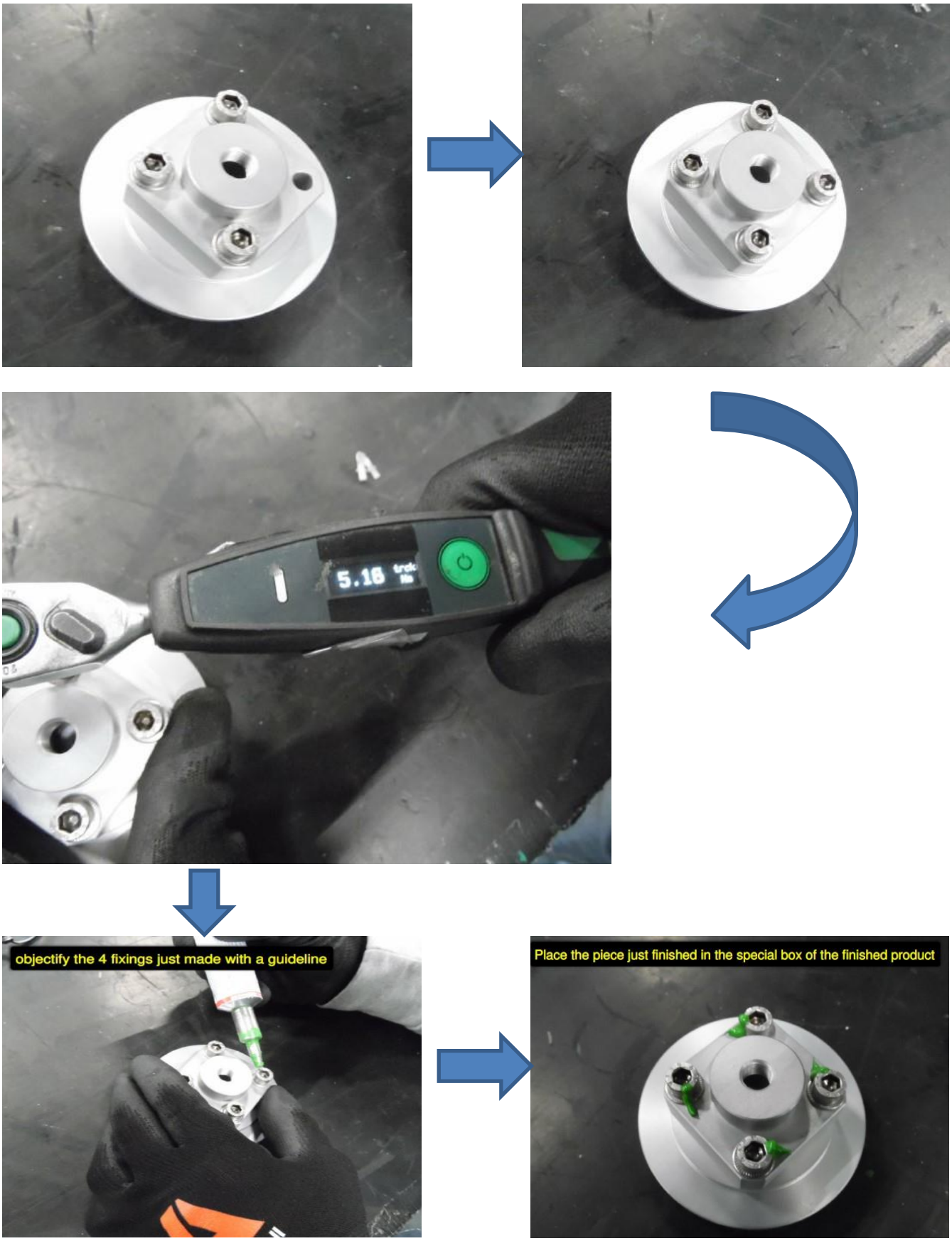

Figure 8: Assembly of Water Separator Drain Valve

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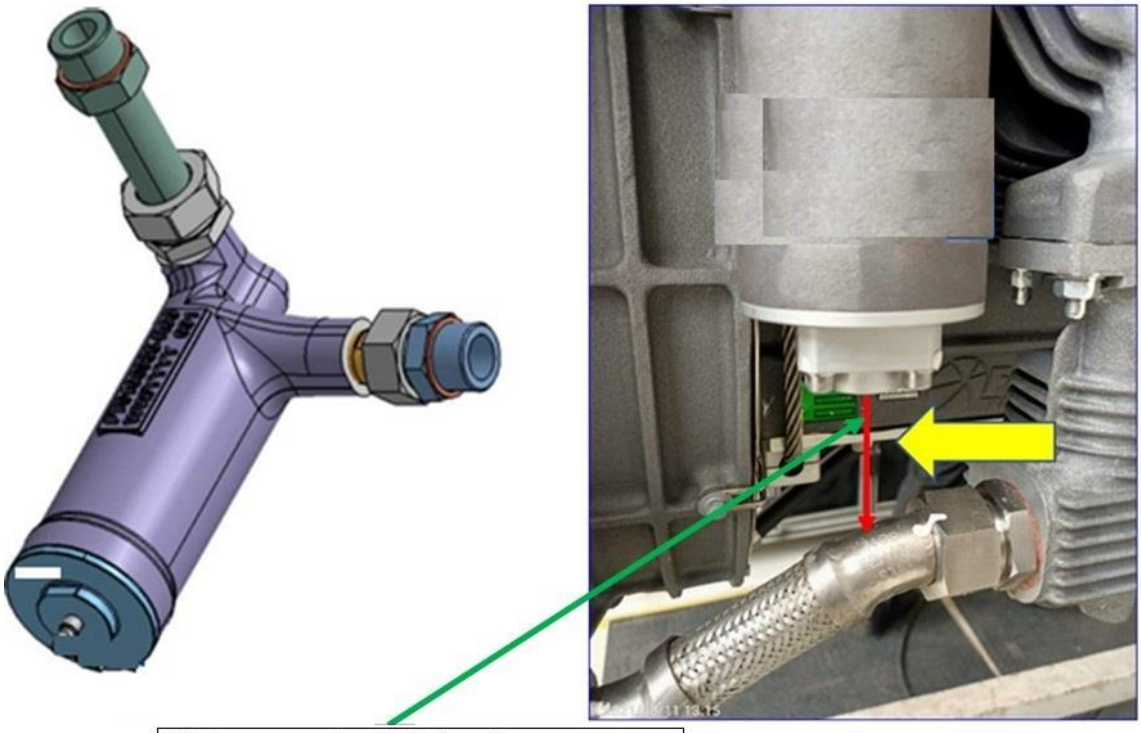
5.2.1.3 Re-verification water separator drain:

1. Start AGTU and check for water separator drain location and free flow (Water + Air) draining must be noticed.



Water separator drain location:
When AGTU is in working condition- water +air mixture is noticed

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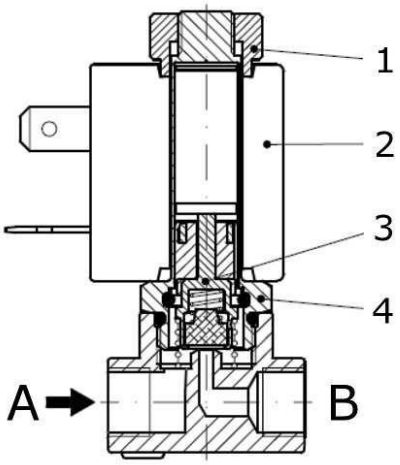
5.2.2 320 HOURS / 2 MONTHS: DRAIN VALVE FUNCTION CHECK/ CLEANING



REF.	DESCRIPTION
1	LOCKING NUT
2	SOLENOID
3	SPOOL VALVE ASSEMBLY
4	GUIDE-PIN SLEEVE ASSEMBLY
A	INLET PORT
B	OUTLET PORT

The device consists of a body on which is fitted the spool valve assembly (3) that is fixed by the guide-pin sleeve assembly (4). Over the body is mounted the solenoid (2) secured by the locking nut (1).

In normal position, with solenoid de-energized, the inlet port “A” is in communication with the outlet port “B”. When the solenoid is energized, the spool valve closes the orifice and block the airflow from the inlet port “A” towards the outlet port “B”.

Routine Maintenance

CAUTION! Make sure that all the described man works can be done without risks.

1. Thoroughly clean the exterior of the device and check for signs of damages or wear.
2. Check the electrical connector is firmly plugged to the valve.
3. Energize the solenoid and verify that the airflow at the outlet port “B” is interrupted.
4. De-energize the solenoid and check that the airflow to the outlet port “B” is restored.
5. At the end of the test, make sure all the initial conditions are restored.

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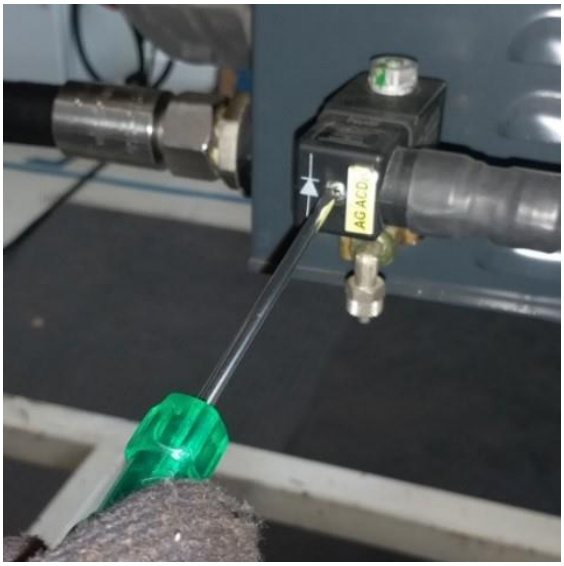
5.2.2.1 Drain valve cleaning if it is not working:

1) Switch OFF high power (415 V AC) and low power (110VDC).
2) Remove the electrical connection of valve by screwdriver as follows.

NOTE: Drain valve mounting mentioned below is an illustrated example. Mounting is project dependent. However, construction and cleaning is common for all drain valves.



3) Remove the EP coil in valve as follows by using standard spanner M14.

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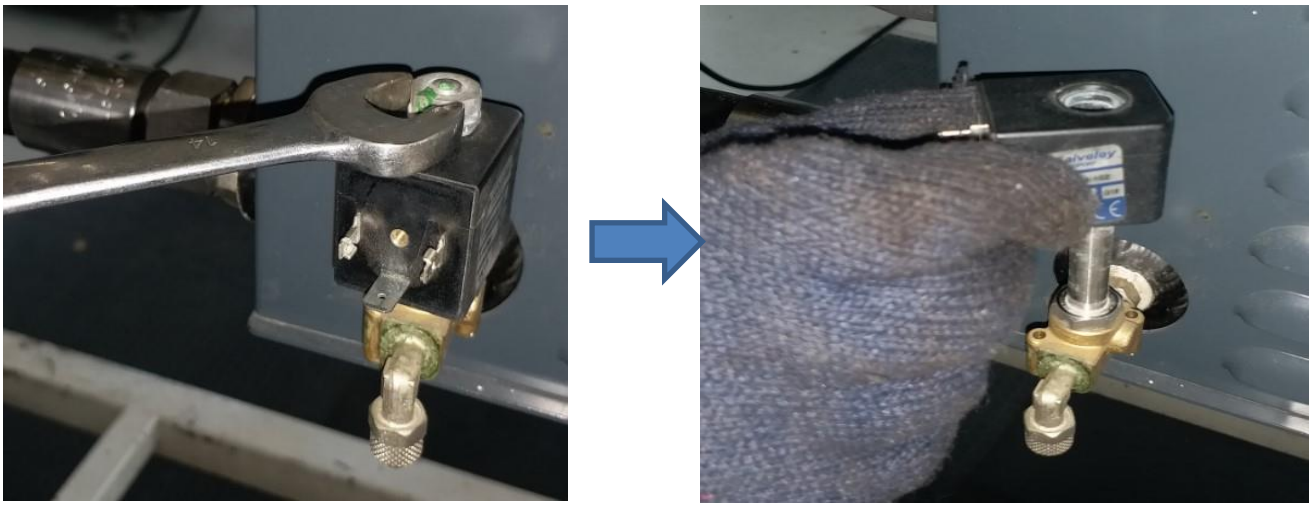
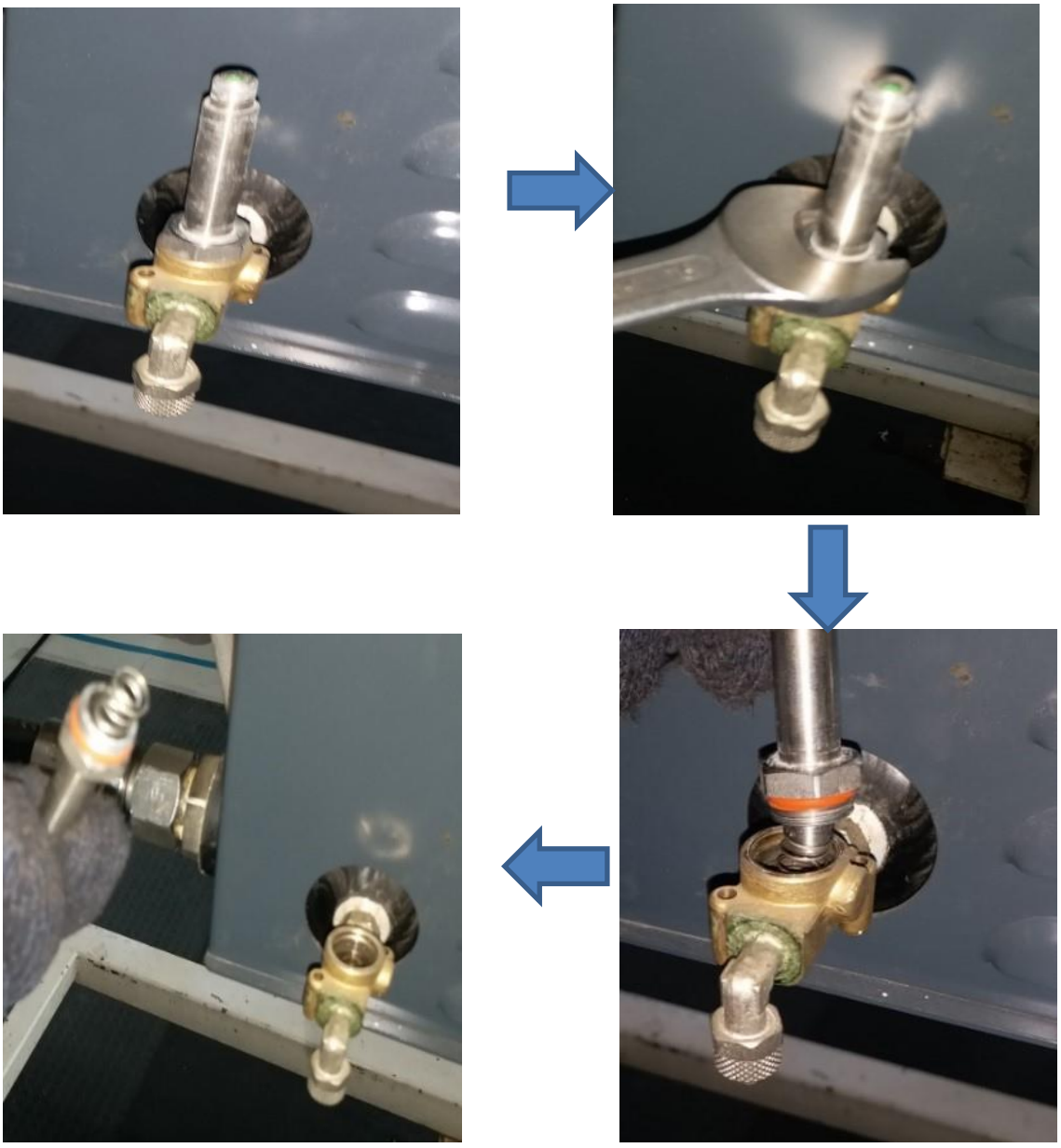


4) Removal of valve stem in body by using standard spanner M16.



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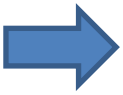
5) Cleaning of valve stem & spring by external air:

6) Cleaning magnetic stem by external air and cleaned white paper:



7) Assembling of magnetic stem in valve stem:

8) Assembling of magnetic stem + valve stem+ spring as follows:

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9) Verification of O-ring and assembly by using MOLYKOTE 33 MEDIUM grease:

10) Cleaning of valve inner portion by external air as follows:

11) Assembly of valve stem in body as follows by using spanner M14.

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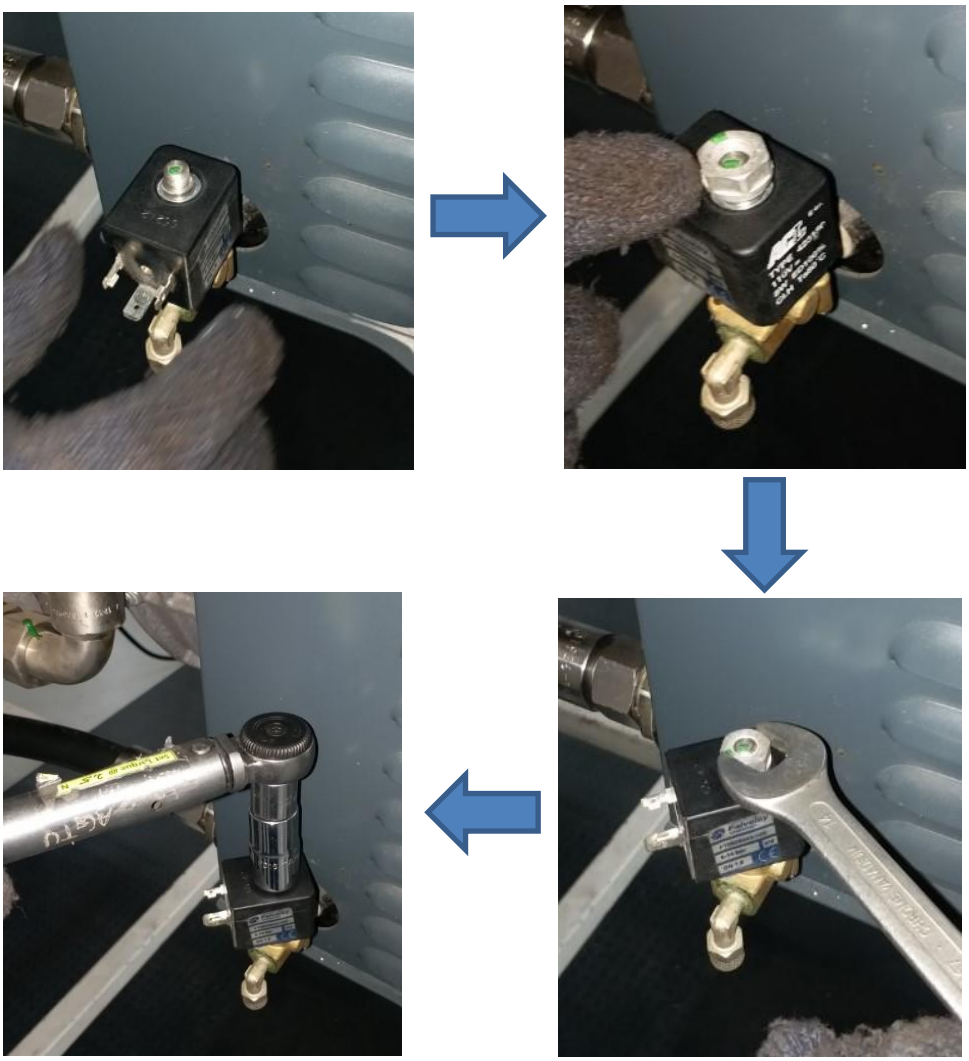
12) Assembly of EP Coil as follows by spanner M16 and tightening torque wrench 2.5 Nm.



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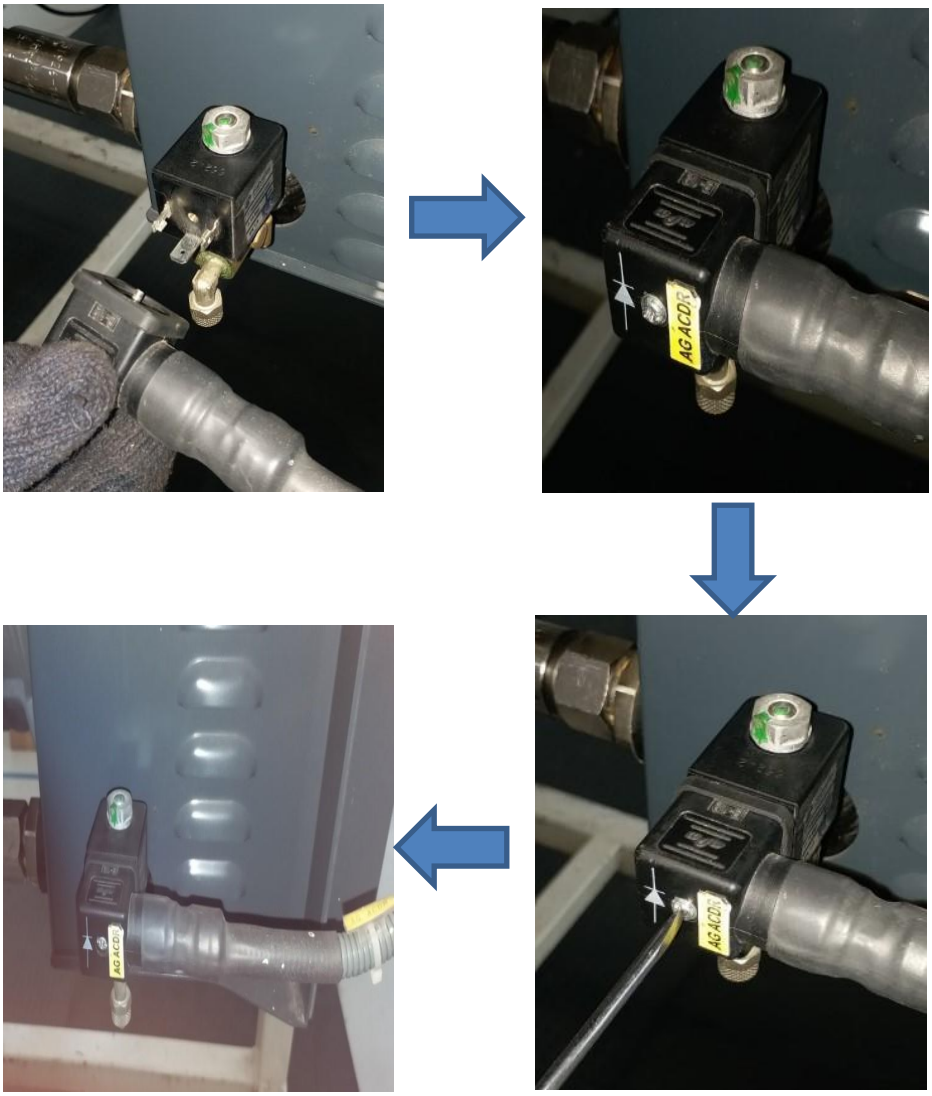
13) Assembly of electrical connections as follows:



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5.2.3 1000 HOURS - AGTU INSPECTION AND CLEANING

Warning! Disconnect the power supply before disassembling!

Warning! Check that the temperature of contact surfaces is not dangerous, before starting the operation.

Caution! Pressurised system! Discharge the pressure before any operation.

The noise absorbing material special characteristics and take care during washing operations to avoid water jet directing to the noise panels.

1. Activate the compressor (compressor start with power supply on and low pressure in reservoirs) and check for abnormal noises in the system.
2. Disconnect the power supply.

Caution! Rotating parts! Disconnect the power supply before accessing to the machine.

3. Remove the dust from the complete unit with an aspirating device. As an alternative, use a flow of compressed air to clean the different components. Take care to wear the appropriate individual protection devices suitable for the operation.
4. Inspect the general assembly and check that there are no signs of damage or leakages, sludge, dust. Also check that there are no loose parts.
5. Check the frame assembly for presence of damages or corrosion. If necessary, repair, restore the painting or replace.
6. Check the status of fasteners, welds, central aluminium casting support.
7. Check the following elements. Parts must be correctly fixed, integer and must not show signs of damage or wear.
8. Make a general inspection of the unit, paying particular attention to the following components:
    a. **Frame:** check there are no signs of corrosion, cracking or fatigue. If necessary, repair. Check that all the devices are firmly secured. Tighten if necessary.

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b. **Damping suspensions:** the rubber-dampened suspensions that hold the compressor to the frame must not show any signs of damage. Fixing bolts must be tightened. Tighten if necessary.

c. **Cabling connections:** the electric connections must not show signs of damage (wear, rubbing) and must not be pinched. Replace if necessary.

d. **Flexible hose:** the flexible hoses must show no signs of damage (deformations, dents, flaws, corrosion, leaks, wear) or rubbing and must not be bent or pinched. Replace if necessary.

e. **Cooling fans:** all blades must be in place and intact. In case of damage, replace.

f. **General assembly**: check that there are no signs of damage or leakages, sludge, dust, damage, corrosion. Also check that there are no loose parts. Check the status of fasteners, welds, aluminium casting parts.

g. **After-coolers cleaning**: clean carefully the combined cooler surfaces using an industrial aspirator. Check that are correctly fixed, integer and that there are no signs of damage or wear.

h. **Electrical motor:** clean carefully the electrical motor verifying the absence of dust, scale, and residue; check the free passage of ventilation air and clean carefully the air ducts.

i. **Axial fan:** Connect the power supply and pneumatic connections, activate the compressor, and check the functioning of axial fan, free from abnormal noises and vibrations.

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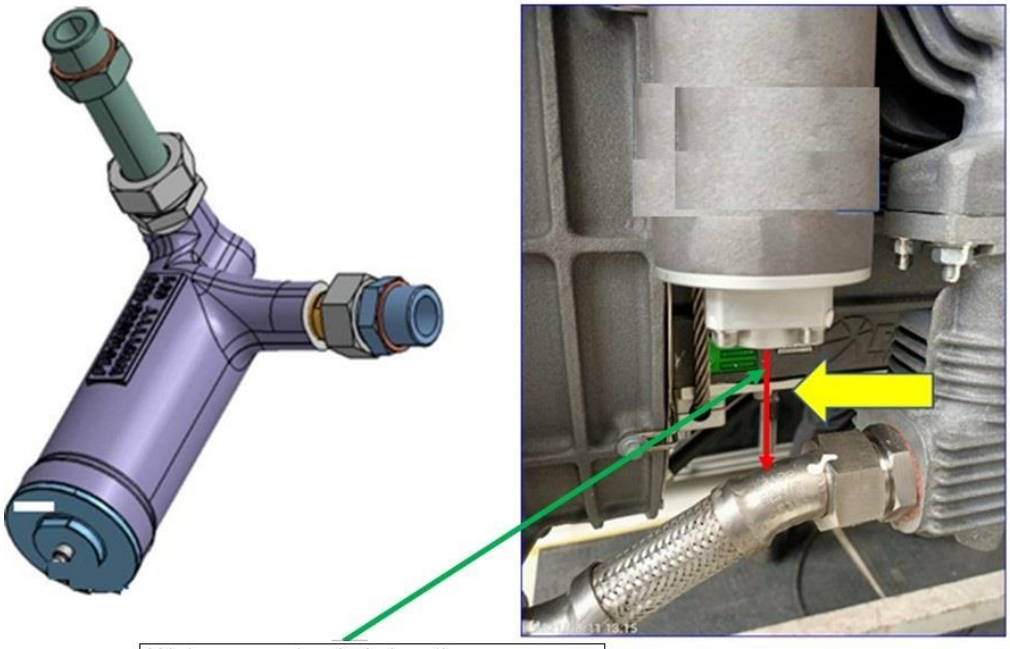
5.2.4 1000 HOURS/ 6 MONTHS – WATER SEPARATOR DRAIN CLEANING AND FUNCTION CHECKING

5.2.4.1 Water separator drain cleaning

Stop AGTU and remove the Drain portions as per below sketch.



Water separator drain location:
When AGTU is in working condition- water +air mixture is noticed

1. All parts to be checked for any damages. If, any damages noticed in parts, it should be replaced with new parts.
2. If, no damages noticed. Clean all parts by external air for dusts etc.
3. After cleaning of all parts, re-assembly of drain portion and fit in water separator assembly.

More details for cleaning and assembly of Water separator drain refer section 5.2.1.

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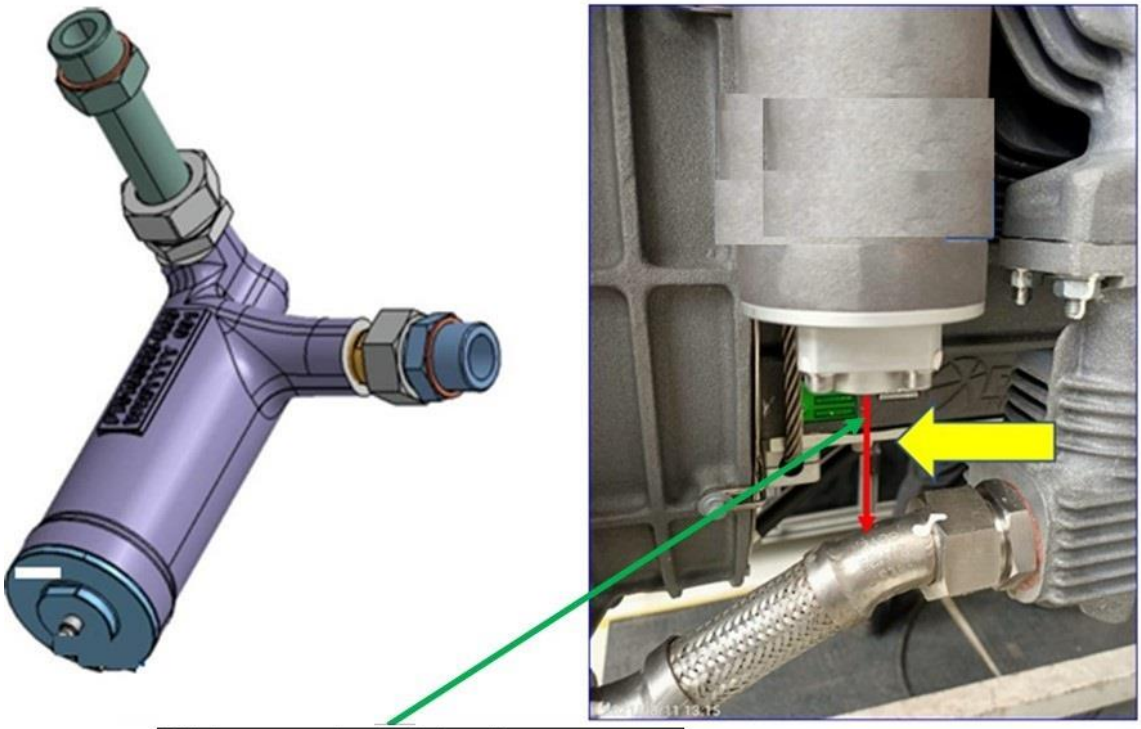
5.2.4.2 Re-verification water separator drain:

1. Start AGTU and check for water separator drain location and free flow (Water + Air) draining must be noticed.



Water separator drain location:
When AGTU is in working condition- water +air mixture is noticed

More details for cleaning and assembly of Water separator drain refer section 5.2.1.

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5.3 REMOVAL AND INSTALLATION PROCEDURE OF AGTU

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply.
- Prevention of vehicle movement.
- Performing undercar procedures.
- Eye and breathing protection.
- Heavy components.
- Lifting equipment, straps, harnesses.

Caution! Moving parts, Disconnect main power supply.

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Caution! Take care to prevent ingress of dirt or debris in the system.

Caution! Heavy weight! Use adequate lifting tools.

5.3.1 REMOVAL PROCEDURE

Refer to Figure 9

1. Disconnect the electrical connection (XC1), electrical connection (XC2), electrical motor connection and pneumatic connection.
2. Disconnect earthing connections by unscrewing fasteners (Not FT scope of supply) using appropriate tool.
3. Support the AGTU (1), using a lifting tool/appropriate device. Make use of four lifting points and resting points.
4. Unscrew and remove the following parts that attach the AGTU (1) to the car body:
    - Four hex hd bolts M16 (2) using 24mm open end spanner
    - Four plain washers (3)
    - Four contact washers (4)
    - Four nuts M16 (5) using 24mm socket wrench
5. Remove the AGTU (1) by using hydraulic trolley with special fixture or wooden blocks below the compressor and motor.

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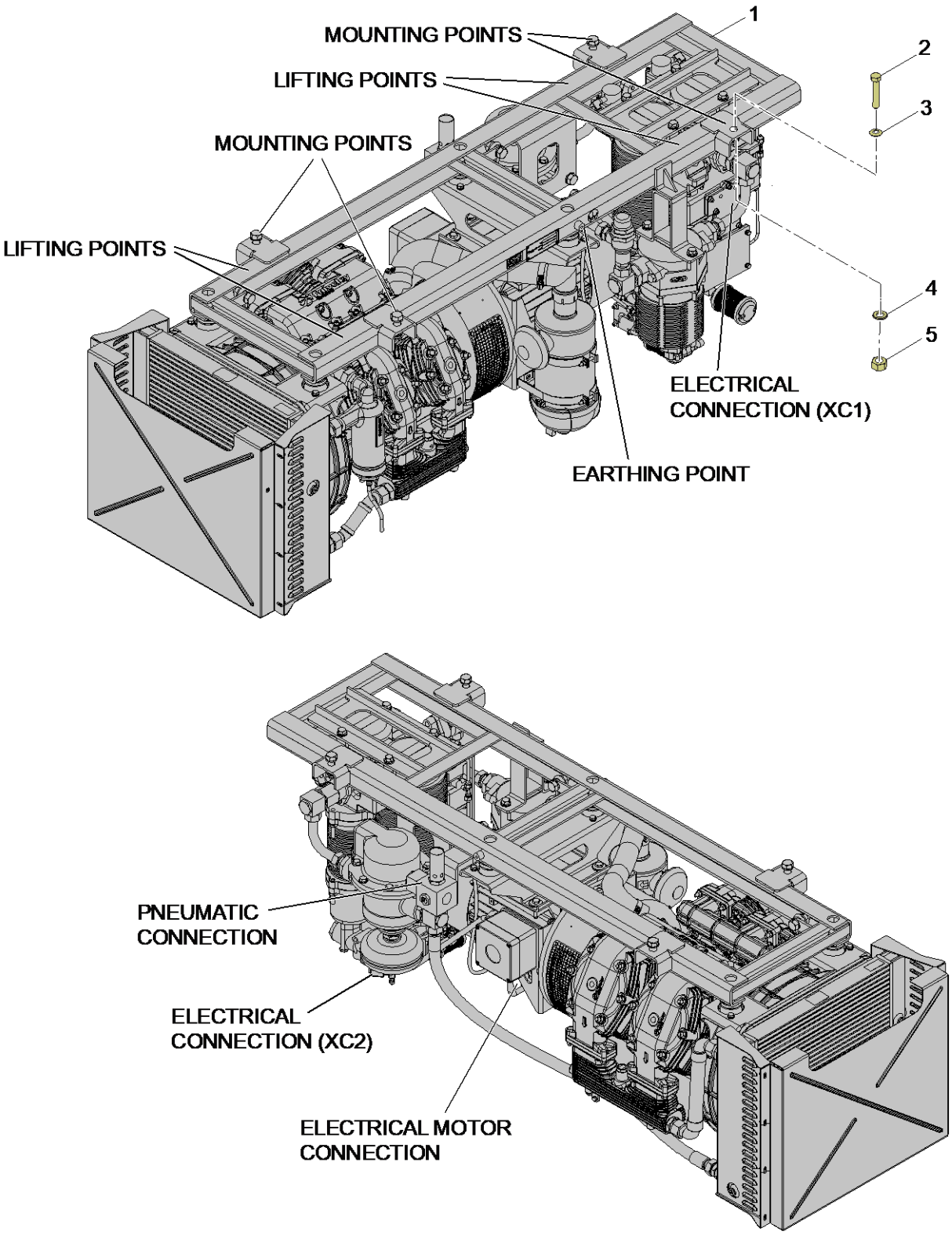

Figure 9: Air Generation and Treatment Unit, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	AIR GENERATION AND TREATMENT UNIT	FT0053718-100	1
2	HEX HD BOLT M16	905024700	4
3	PLAIN WASHER	FT0040205-001	4
4	CONTACT WASHER M16	FT0040297-007	4
5	NUT M16	FT0040528-000	4

5.3.2 INSTALLATION PROCEDURE

Refer to Figure 9

1. Support AGTU (1) using a lifting tool or other appropriate device. Make use of four lifting points and resting points.
2. Install the following parts that attach the AGTU (1) to the car body:
   - Four hex hd bolts M16 (2) using 24mm open end spanner
   - Four plain washers (3)
   - Four contact washers (4)
   - Four nuts M16 (5) using 24mm socket wrench
3. Torque tighten the four hex hd bolts M16 (2) to 120 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

4. Connect earthing connections by installing fasteners (Not FT scope of supply) using appropriate tool.
5. Before assembly of pipe connection perform cleaning of piping on the vehicle.
6. Connect the pneumatic connections.
7. Connect the electrical connection (XC1), electrical connection (XC2), electrical motor connection and pneumatic connection.
8. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check.
9. Check that all service conditions are restored.

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5.4 REMOVAL AND INSTALLATION PROCEDURE OF AIR DRYER

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Caution! Heavy weight! Use adequate lifting tools.

Refer to Figure 10

5.4.1 REMOVAL PROCEDURE

1. Support air dryer (1) using a lifting tool or other appropriate device.
2. Disconnect and remove the electrical connections from 19-way free connector of the air dryer (1).
3. Unscrew and remove the test point 1/4" thread (5) from the special adaptor (6) using 17mm open end spanner.
4. Unscrew and remove the special adaptor (6) along with the high presser bonjo ft 3/4"BSP from the air dryer (1) by using 50mm open end spanner.
5. Unscrew and remove the pneumatic connection (stud adaptor) along with the high presser bonjo ft 3/4"BSP from the air dryer (1) using 50mm open end spanner.
6. Unscrew and remove the following parts that attach the air dryer (1) to the frame:
   - Four hex hd screws M12 (2) using 18mm open end spanner.
   - Four contact washers (3)
   - Four plain washers (4).

Caution! Slightly move the air dryer in order to avoid damage to pipe. Pay attention to the heavy weight.

7. Slide and remove the air dryer (1) from the frame. Make sure to use lifting tool.

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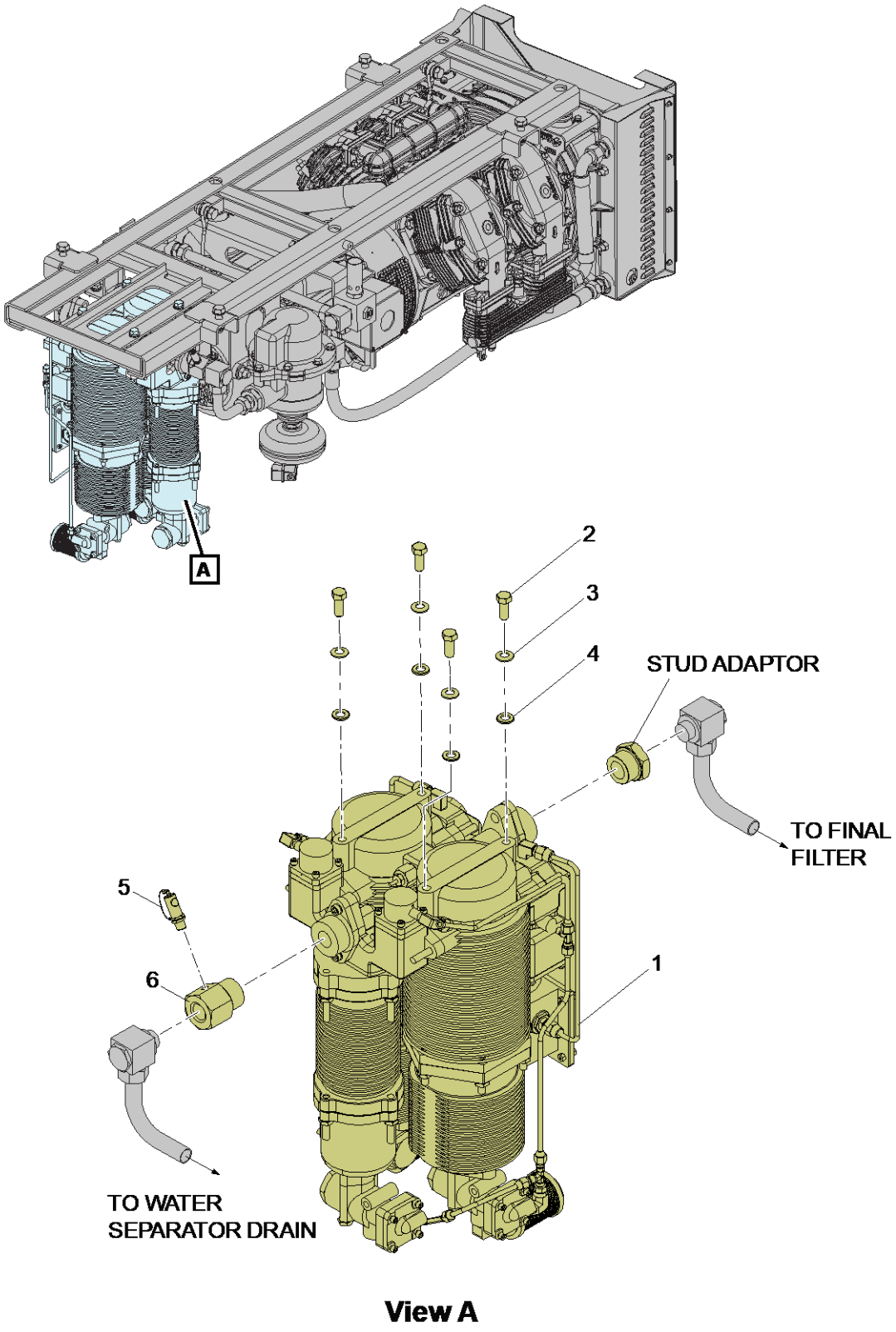

Figure 10: Air Dryer, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	AIR DRYER	FT0053022-100	1
2	HEX HD SCREW M12	920012200	4
3	CONTACT WASHER M12	FT0040297-006	4
4	PLAIN WASHER M12	908012000	4
5	TEST POINT 1/4” THREAD	FT0027358-000	1
6	SPECIAL ADAPTOR	FT0051960-000	1

5.4.2 INSTALLATION PROCEDURE

Refer to Figure 10

1. Support air dryer (1) using a lifting tool or other appropriate device.
2. Apply Loctite 242 to the threads of four hex hd screws M12 (2).
3. Install and secure the air dryer (1) onto the frame with the following parts:
   - Four hex hd screws M12 (2) using 18mm open end spanner.
   - Four contact washers (3)
   - Four plain washers (4).
4. Torque tighten the four hex hd screw M12 (2) to 90 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

5. Install and secure the pneumatic connection (stud adaptor) along with the high presser bonjo ft 3/4" BSP to air dryer (1) using 50mm open end spanner.
6. Install and secure the special adaptor (6) to the air dryer (1) by using 50mm open end spanner.
7. Install and secure the test point 1/4" thread (5) using 17mm open end spanner onto the special adaptor (6).
8. Install and secure the electric connections to the air dryer (1).
9. Pressurise the system, perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.5 REMOVAL AND INSTALLATION PROCEDURE OF MINIMUM PRESSURE VALVE

5.5.1 REMOVAL PROCEDURE

Refer to Figure 11

1. Unscrew and loosen the pneumatic connection (adapter) using 36mm open end spanner holding the minimum pressure valve (1) using adjustable wrench.
2. Unscrew and loosen the pneumatic connection (fitting) using 30mm open end spanner holding the minimum pressure valve (1) using adjustable wrench.
3. Remove the minimum pressure valve (1) from the system.

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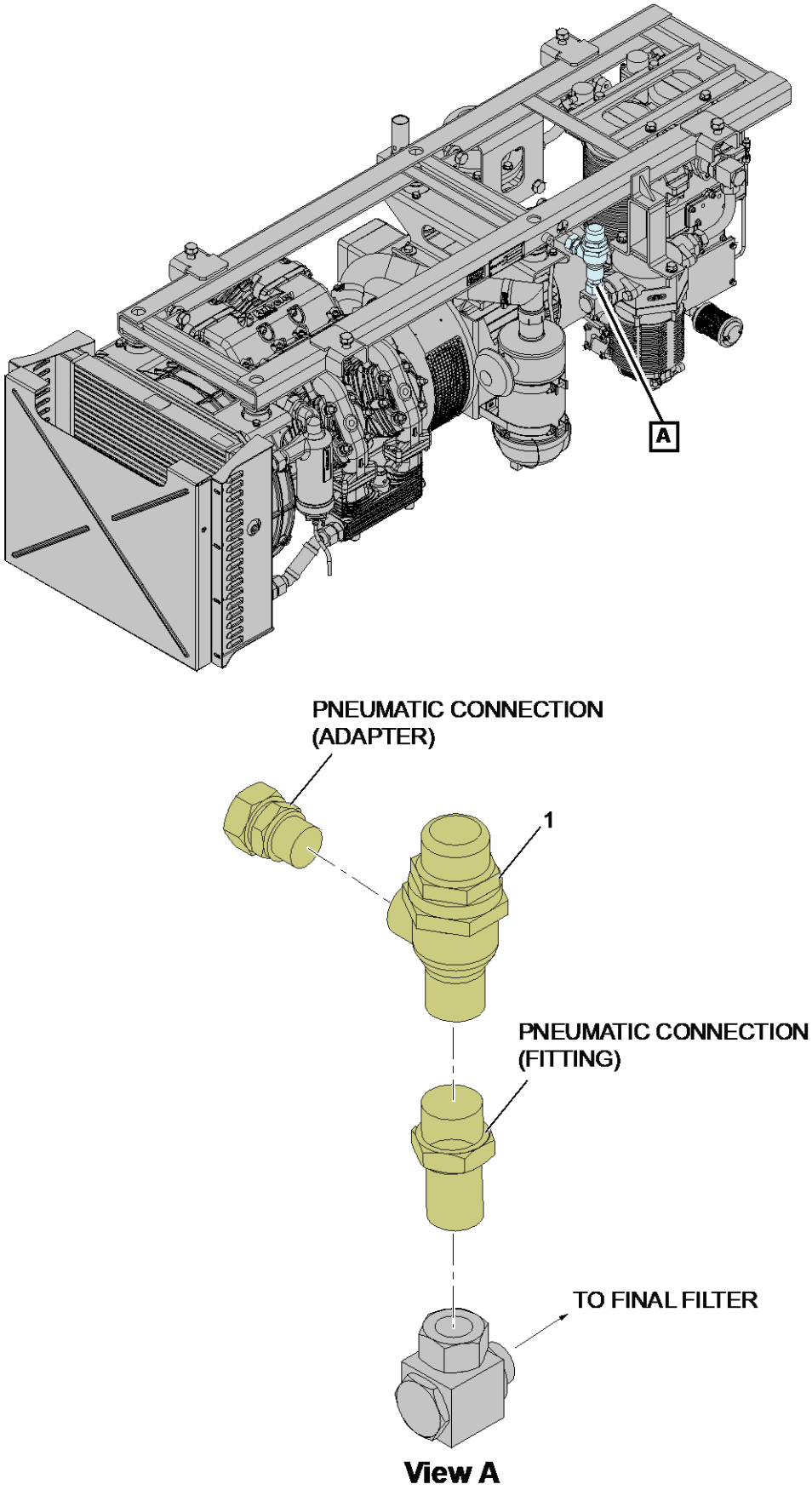

Figure 11: Minimum Pressure Valve, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	MINIMUM PRESSURE VALVE	2/517329	1

5.5.2 INSTALLATION PROCEDURE

Refer to Figure 11

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 577 on the pneumatic fittings.
5. Install and secure the minimum pressure valve (1) to its original position.
6. Tighten the minimum pressure valve (1) using adjustable wrench by holding the pneumatic connection (fitting) using 30mm open end spanner.
7. Tighten the pneumatic connection (adapter) to the minimum pressure valve (1) using 36mm open end spanner by holding the minimum pressure valve (1) using adjustable wrench.
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
9. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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5.6 REMOVAL AND INSTALLATION PROCEDURE OF WATER SEPARATOR WITH AUTO DRAIN VALVE

5.6.1 REMOVAL PROCEDURE

Refer to Figure 12

1. Disconnect the pneumatic connections from the water separator (1).
2. Disconnect the din socket with diode (8) from the water separator (1).
3. Unscrew and remove the stud adaptor (7) along with high presser bonjo ft 3/4" BSP (6) from one side of the water separator (1) using 50mm open end spanner.
4. Unscrew and remove the stud adaptor (7) along with pneumatic connection (adapter) from another side of the water separator (1) using 50mm open end spanner.
5. Unscrew and remove the following parts that secures the water separator (1) to the mounting bracket.
   - Two hex head screws M16 (2) using 24mm open end spanner.
   - Two contact washers M16 (3).
   - Two plain washers (4).
   - Two hex nuts M16 (5) using 24mm socket wrench.
6. Remove the water separator (1) from the bracket.

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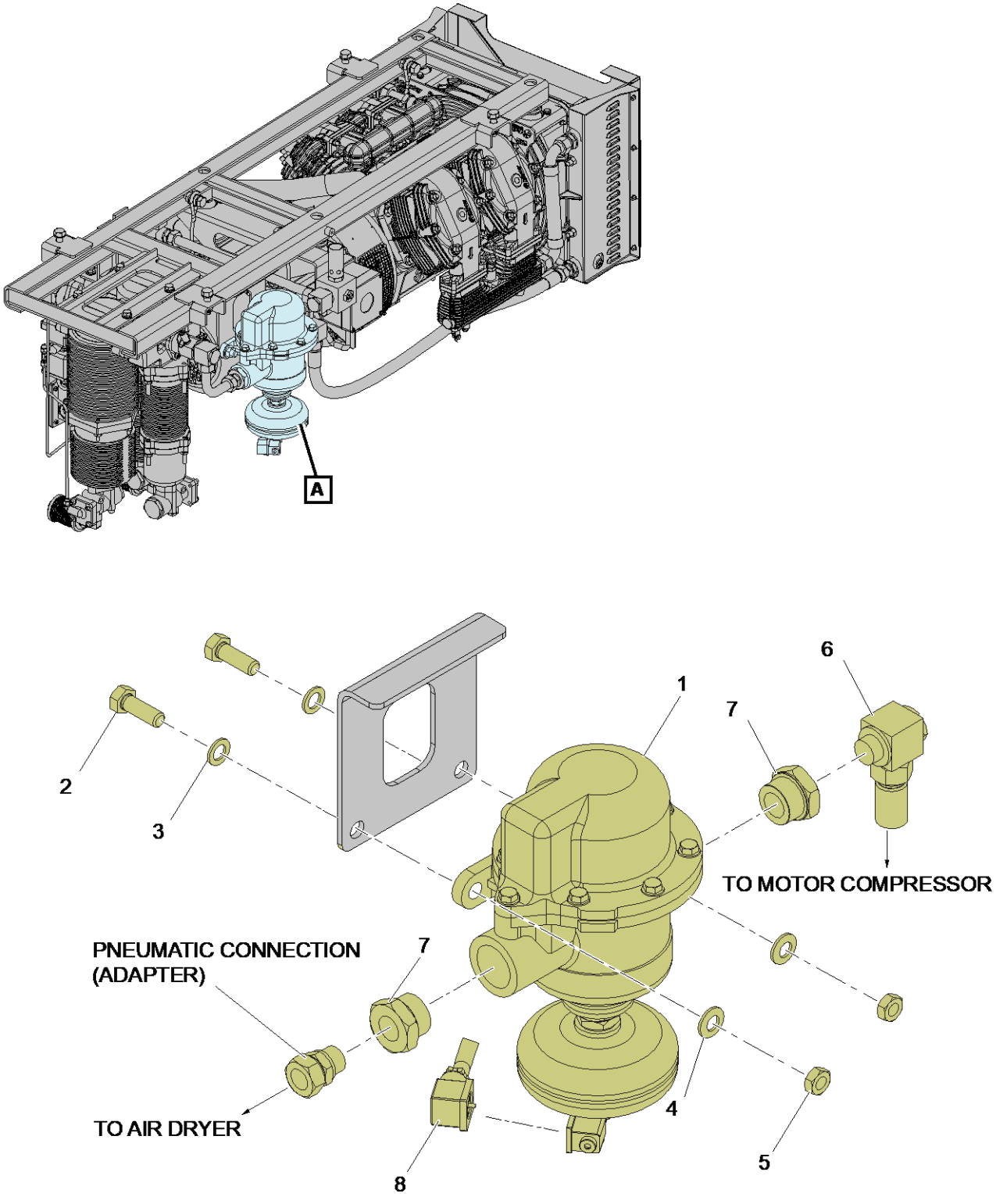

Figure 12: Water Separator with Auto Drain Valve, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	WATER SEPARATOR	FT0053017-100	1
2	HEX HD SCREW M16	920018700	2
3	CONTACT WASHER M16	FT0040297-007	2
4	PLAIN WASHER	FT0040205-001	2
5	HEX NUT M16	906017500	2
6	HIGH PRESSER BONJO FT 3/4" BSP	936078800	1
7	STUD ADAPTOR 1 - 1/4" - 3/4" BSP	936076200	2
8	DIN SOCKET WITH DIODE	FT0050910-000	1

5.6.2 INSTALLATION PROCEDURE

Refer to Figure 12

1. Apply Loctite 242 to the threads of the two hex hd screws M16 (2).
2. Install the following parts to secure the water separator (1) to the bracket:
   - Two hex head screws M16 (2) using 24mm open end spanner.
   - Two contact washers M16 (3).
   - Two plain washers (4).
   - Two hex nuts (5) using 24mm socket wrench.
3. Torque tighten the two hex hd screws M16 (2) to 120 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

4. Apply Loctite 577 on the pneumatic fittings.
5. Before assembly of pipe connection perform cleaning of piping on the vehicle.
6. Pneumatic ports connection should be BSPP fittings.
7. Do not use tuflon tape on the threaded ports.
8. Connect the stud adaptor (7) along with pneumatic connection (adapter) to one side of the water separator (1) using 50mm open end spanner.
9. Connect the stud adaptor (7) along with high presser bonjo ft 3/4" BSP (6) to another side of the water separator (1) using 50mm open end spanner.
10. Connect the pneumatic connections to the water separator (1).
11. Connect the din socket with diode (8) to the water separator (1).
12. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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5.7 REMOVAL AND INSTALLATION PROCEDURE OF DRAIN VALVE

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

5.7.1 REMOVAL PROCEDURE

Refer to Figure 13

1. Disconnect electrical connection from the drain valve (1).
2. Unscrew and remove the hex nipple (2) along with drain valve (1) from the water separator using adjustable wrench.
3. Unscrew and remove the hex nipple (2) from the drain valve (1) using adjustable wrench.

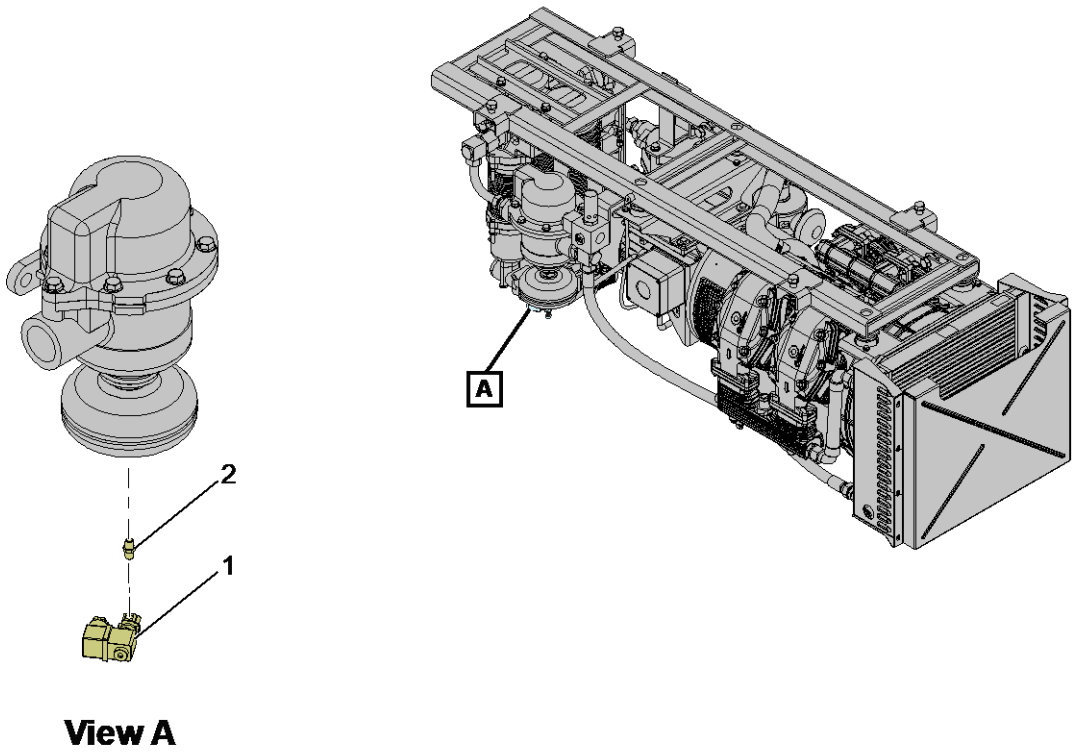

Figure 13: Drain Valve, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	DRAIN VALVE	FT0025443-102	1
2	HEX NIPPLE 1/8" BSPT	FT0052010-001	1

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5.7.2 INSTALLATION PROCEDURE

Refer to Figure 13

1. Apply Loctite 577 on the pneumatic fittings.
2. Install the hex nipple (2) to the drain valve (1) using adjustable wrench.
3. Install and secure the drain valve (1) along with hex nipple (2) adjustable wrench.
4. Connect the electrical connection to the drain valve (1).
5. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.8 REMOVAL AND INSTALLATION PROCEDURE OF AIR FILTER KIT

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

5.8.1 REMOVAL PROCEDURE

Refer to Figure 14

1. Support air filter kit (1) using a lifting tool.
2. Unscrew and remove the jupiter warm drive clamp (6) that secures intake elbow (2) to the air filter kit (1) using screwdriver.
3. Remove intake elbow (2) from the air filter kit (1).
4. Unscrew and remove the following parts that secures the air filter kit (1) to the mounting bracket:
   - Four hex hd bolts M8 (3) using 13mm open end spanner.
   - Eight plain washers M8 (4).
   - Four hex nuts (5) using 13mm socket wrench.
5. Remove the air filter kit (1) from the bracket.

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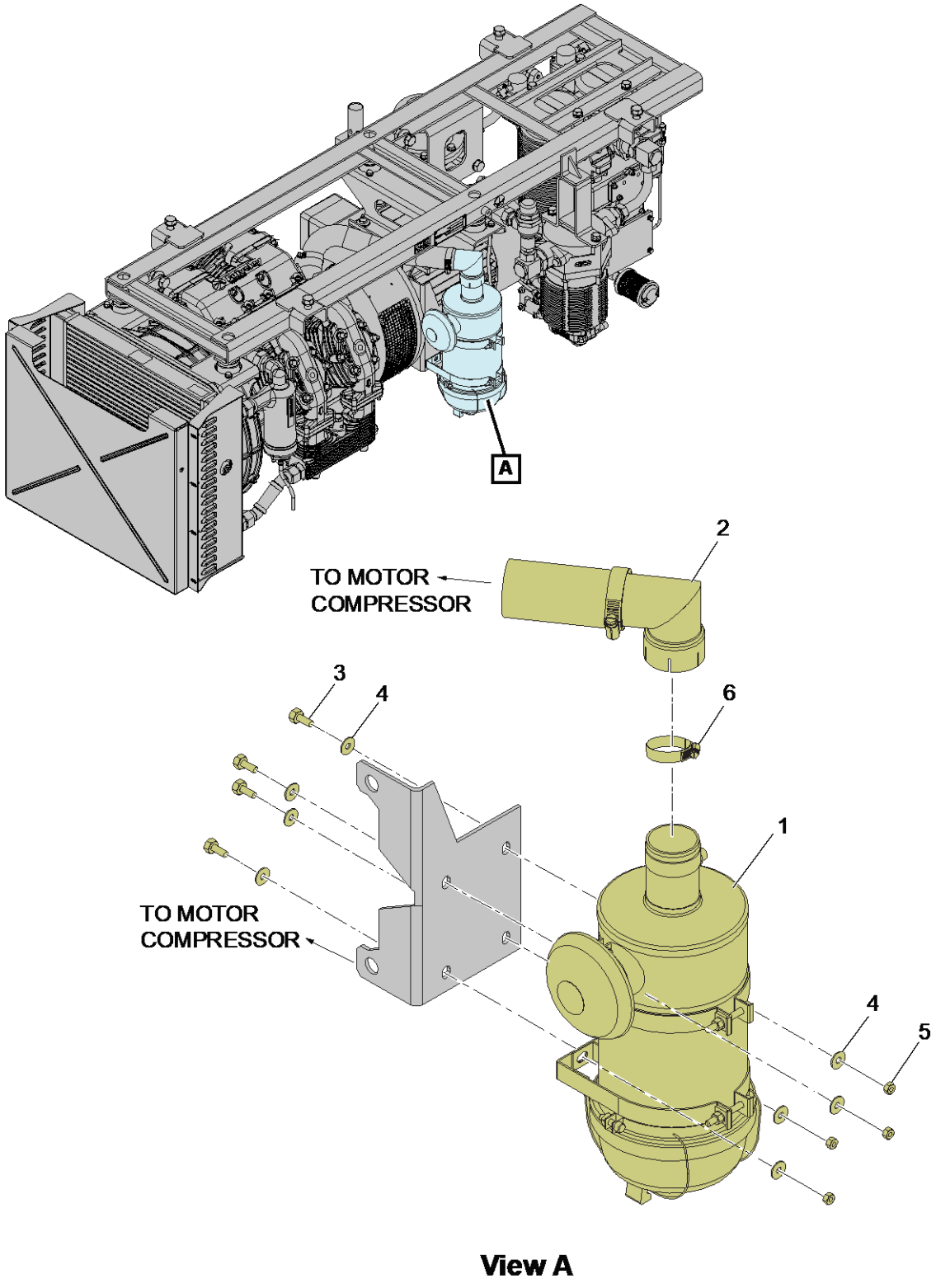

Figure 14: Air Filter Kit, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	AIR FILTER KIT	1/320658	1
2	INTAKE ELBOW	FT0026695-000	1
3	HEX HD BOLT M8	FT0030006-012	4
4	PLAIN WASHER M8	908016800	8
5	HEX NUT M8	FT0030002-003	4
6	JUPITER WARM DRIVE CLAMP	2/512521	1

5.8.2 INSTALLATION PROCEDURE

Refer to Figure 14

1. Support air filter kit (1) using a lifting tool.
2. Apply Loctite 242 to the threads of the four hex hd bolts M8 (3).
3. Install the following parts that secures the air filter kit (1) to the mounting bracket:
   - Four hex hd bolts M8 (3) using 13mm open end spanner.
   - Eight plain washers M8 (4).
   - Four hex nuts (5) using 13mm socket wrench.
4. Torque tighten the four hex head bolts M8 (3) to 24 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

5. Before assembly of pipe connection perform cleaning of piping on the vehicle.
6. Pneumatic ports connection should be BSPP fittings.
7. Do not use tuflon tape on the threaded ports.
8. Apply Loctite 577 on the pneumatic fittings.
9. Install the intake elbow (2) to the air filter kit (1) and secure it with the jupiter warm drive clamp (6) using screwdriver.
10. Pneumatic connection shall be locked using the driving torque indicated by the fitting manufacturer.
11. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.9 REMOVAL AND INSTALLATION PROCEDURE OF FINAL FILTER

5.9.1 REMOVAL PROCEDURE

Refer to Figure 15

1. Unscrew and loosen the pneumatic connection (adaptor) from both sides of the final filter (1) using 50mm open end spanner.
2. Unscrew and remove the following parts that secures the final filter (1) to the mounting bracket:
   - Two hex hd screw M12 (2) using 18mm open end spanner.
   - Two plain washers (4).
   - Two contact washers (3).
3. Remove the final filter (1) from the bracket.

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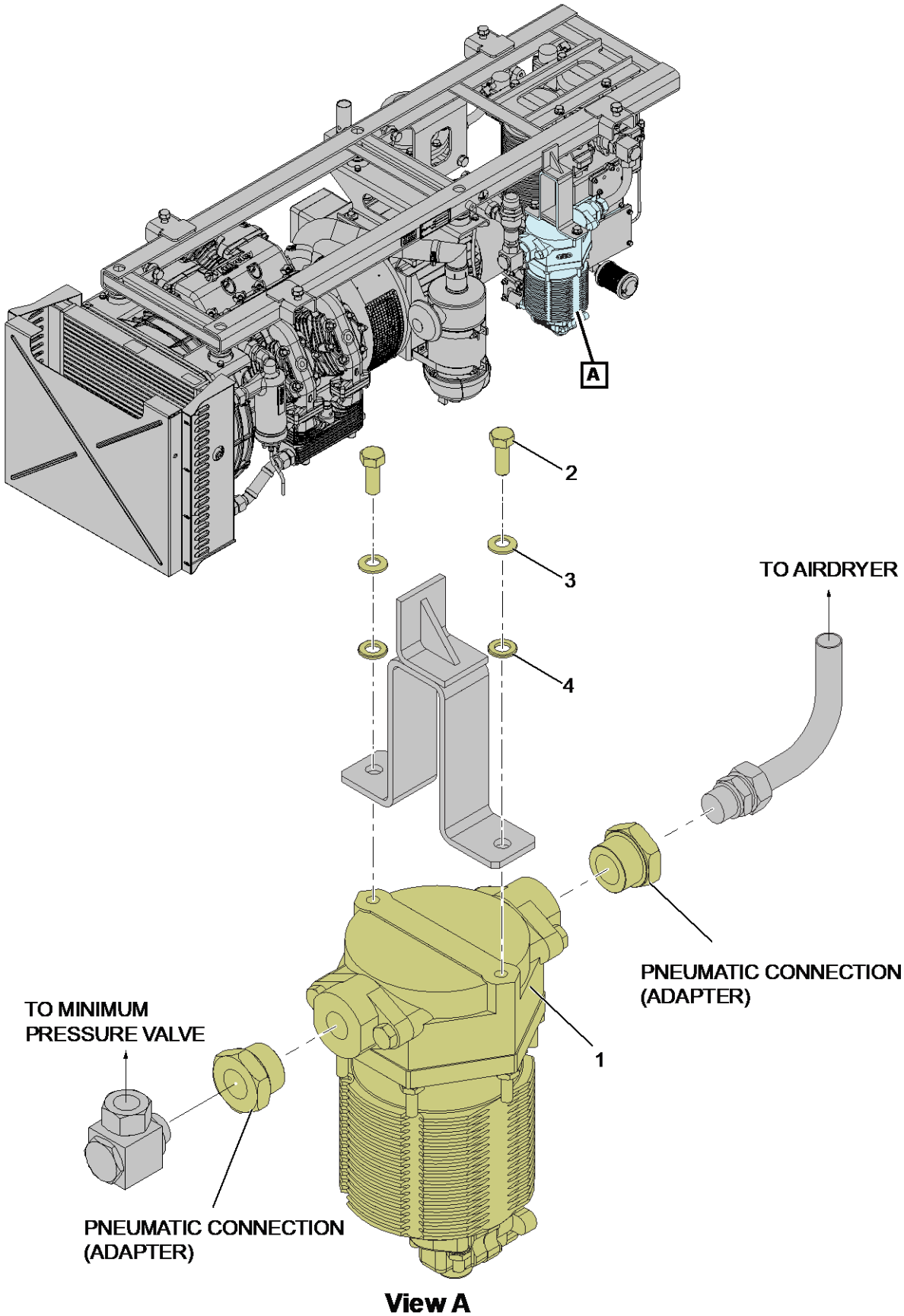

Figure 15: Final Filter, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	FINAL FILTER 1-1/4"BSP	FT0051762-100	1
2	HEX HD SCREW M12	920012200	2
3	CONTACT WASHER M12	FT0040297-006	2
4	PLAIN WASHER M12	908012000	2

5.9.2 INSTALLATION PROCEDURE

Refer to Figure 15

1. Apply Loctite 242 to the threads of the two hex hd screws M12 (2).
2. Install the following parts that secures the final filter (1) to the bracket:
   - Two hex hd screws M12 (2) using 18mm open end spanner.
   - Two plain washers M12 (4).
   - Two contact washers M12 (3).
3. Torque tighten the two hex hd screws M12 (2) to 90 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

4. Before assembly of pipe connection perform cleaning of piping on the vehicle.
5. Pneumatic ports connection should be BSPP fittings.
6. Do not use tuflon tape on the threaded ports.
7. Apply Loctite 577 on the pneumatic fittings.
8. Install the pneumatic connection (adaptor) to both sides of the final filter (1) using 50mm open end spanner.
9. Pneumatic connection shall be locked using the driving torque indicated by the fitting manufacturer.
10. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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5.10 REMOVAL AND INSTALLATION PROCEDURE OF SAFETY VALVE

5.10.1 REMOVAL PROCEDURE

Refer to Figure 16

1. Unscrew and remove the safety valve (1) from the block using a 35mm open end spanner.

NOTE: During dismantling, if the safety valve is found jammed or hard to remove, it is recommended to clean the projected threads by using the Molykote supergliss or WD-40 to clean the deposited muddy particles. Despite this precaution, if the metal end of the stud gets loosened, then clean the metal end of the stud and assemble with Loctite 270.

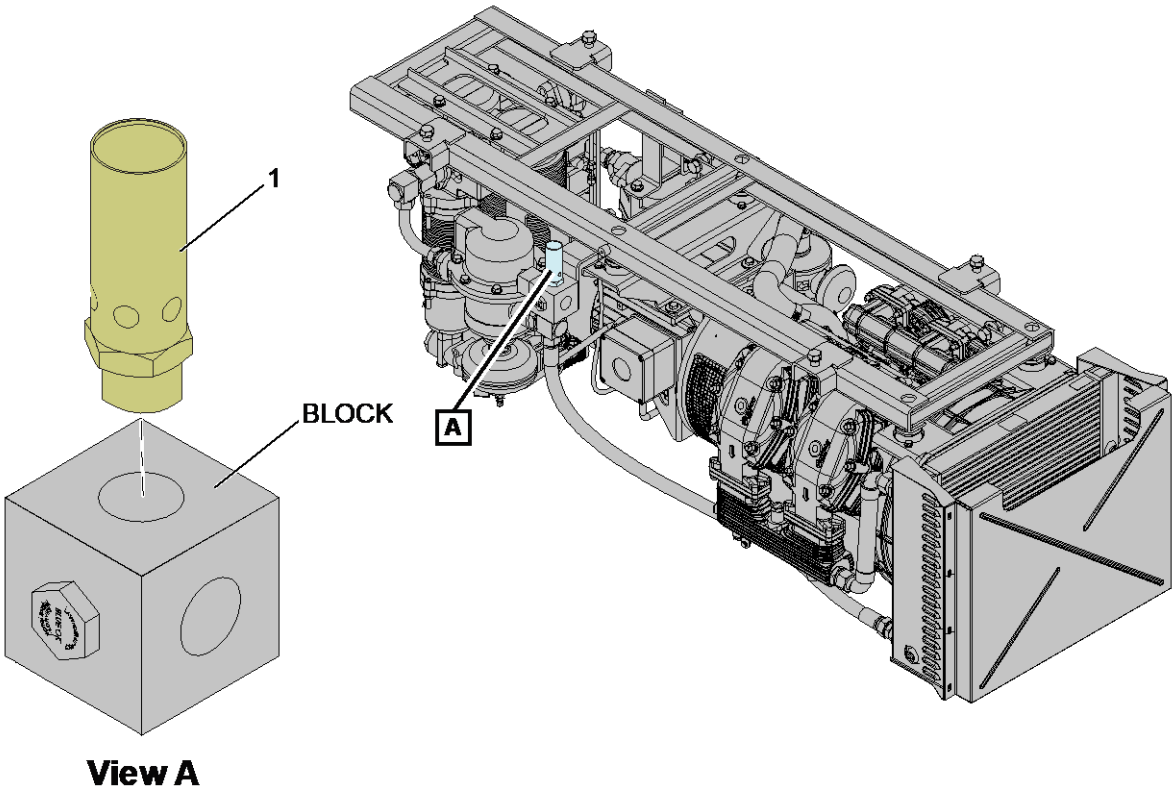

Figure 16: Safety Valve, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	SAFETY VALVE FOR 11 BAR	FT0052383-100	1

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5.10.2 INSTALLATION PROCEDURE

Refer to Figure 16

1. Clean the seat carefully; make sure no foreign object or dirt enters into the pipe.

NOTE: In case a new valve is fitted, ensure the proper setting (verify the setting marked on the body).

2. Install and secure the safety valve (1) on to the block using a 35mm open end spanner.

NOTE: Safety Valves must not be painted or coated with any substance, which could possibly obstruct or restrict free and full discharge through the valve. Any condition that could lead to blockage of discharge piping or discharge ports on safety valves must be avoided.

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5.11 REMOVAL AND INSTALLATION PROCEDURE OF AIR INTAKE HOSE

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

5.11.1 REMOVAL PROCEDURE

Refer to Figure 17

1. Unscrew and remove the jupiter warm drive clamps (2) using screwdriver to disconnect one end of air intake hose (1) from the motor compressor and another end from the intake elbow (3).
2. Remove and discard the air intake hose (1).

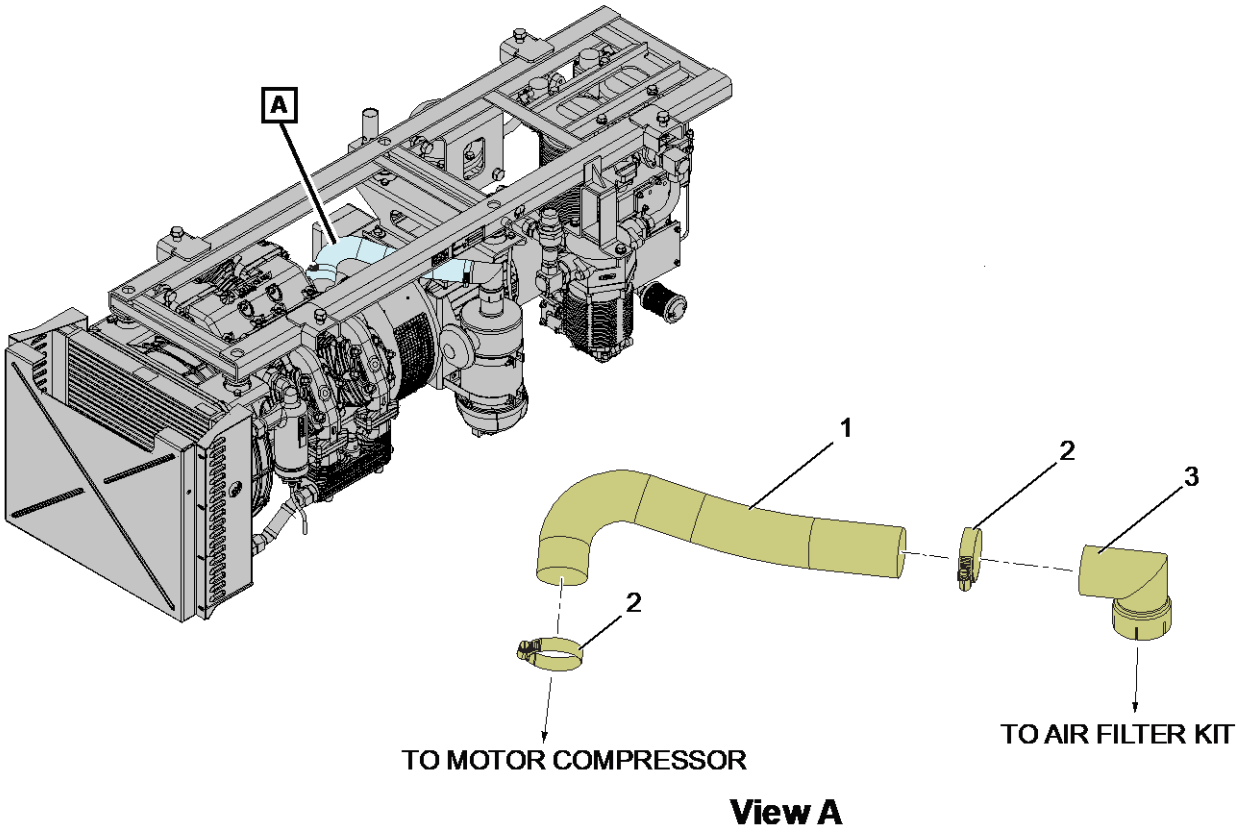

Figure 17: Air Intake Hose, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	AIR INTAKE HOSE	FT0105239-001	1
2	JUPITER WARM DRIVE CLAMP	2/512521	2
3	INTAKE ELBOW	FT0026695-000	1

5.11.2 INSTALLATION PROCEDURE

Refer to Figure 17

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Install the two jupiter warm drive clamps (2) to the new air intake hose (1) and connect the one end of the air intake hose (1) to the motor compressor and another end to the intake elbow (3).
5. Tighten the screws of jupiter warm drive clamps (2) using screwdriver.
6. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.12 REMOVAL AND INSTALLATION PROCEDURE OF HOSE FROM WATER SEPARATOR TO COMPRESSOR

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

5.12.1 REMOVAL PROCEDURE

Refer to Figure 18

1. Unscrew and remove the hose (1) from the pneumatic connection (banjo fitting) using 32mm open end spanner.
2. Unscrew and remove the following parts that secures the hose (1) along with flexible cable clamp (8) to the L-clamp (7).
   - Hex head screw M6 (3) using 10mm open end spanner while holding the hex nut M6 (6) using 10mm socket wrench.
   - Plain washer (4)
   - Contact washer M6 (5)
3. Unscrew and remove the hose (1) from the fitting (2) using 32mm open end spanner holding the fitting (2) using 36mm open end spanner.

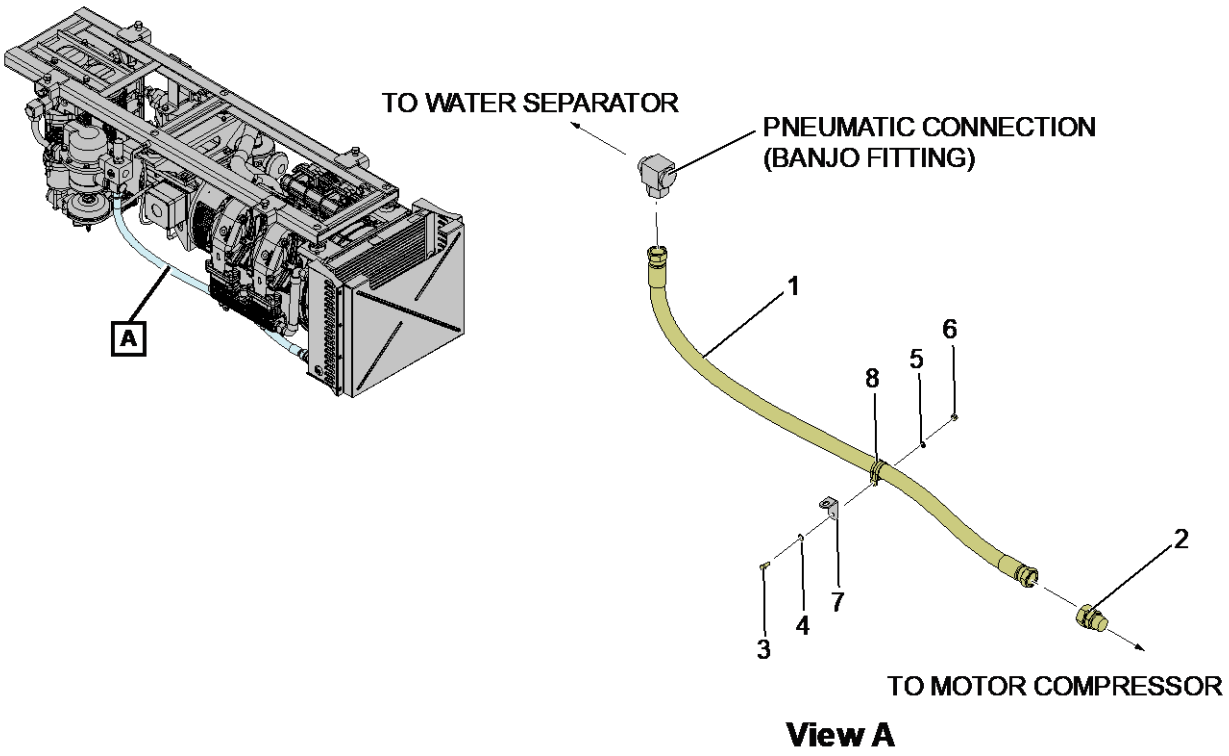

Figure 18: Hose 3/4", Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	HOSE 3/4”	FT0052297-000	1
2	ST. MALE STUD FITTING 3/4"BSP	936078700	1
3	HEX HEAD SCREW M6	920012300	1
4	PLAIN WASHER	908008000	1
5	CONTACT WASHER M6	FT0040297-003	1
6	HEX NUT M6	906011000	1
7	L-CLAMP	FT0052264-000	1
8	CABLE CLAMP FLEXIBLE	FT0052358-000	1

5.12.2 INSTALLATION PROCEDURE

Refer to Figure 18

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Install and secure one end of the hose (1) to the pneumatic connection (banjo fitting) using 32mm open end spanner.
5. Install the following parts that secures the hose (1) along with flexible cable clamp (8) to the L-clamp (7).
   - Hex head screw M6 (3) using 10mm open end spanner while holding the hex nut (6) using 10mm socket wrench.
   - Plain washer (4)
   - Contact washer M6 (5)
6. Torque tighten the hex head screw M6 (3) to 5.2 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

7. Connect and secure the other end of hose (1) to the motor compressor fitting (2) using 32mm open end spanner holding the fitting (2) using 36mm open end spanner.
8. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
9. Pressurize the system and check for leakages as per the system level procedure performed during car builder’s general system check.

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5.13 REMOVAL AND INSTALLATION PROCEDURE OF COOLER PANEL

5.13.1 REMOVAL PROCEDURE

Refer to Figure 15

1. Unscrew and remove the following parts that secures the cooler panel center (1) to the cooler panel side (1):
   - Eight hex hd screws M6 (2) using 10mm socket wrench.
   - Eight contact washers M6 (3).
2. Remove the cooler panel center (1) from the cooler panel side (1).
3. Unscrew and remove the following parts that secures the two cooler panel side (1) to the motor compressor:
   - Four hex hd nuts M12 (4) using 18mm socket wrench.
   - Four contact washers (5).
4. Remove the two cooler panel side (1) from the motor compressor.

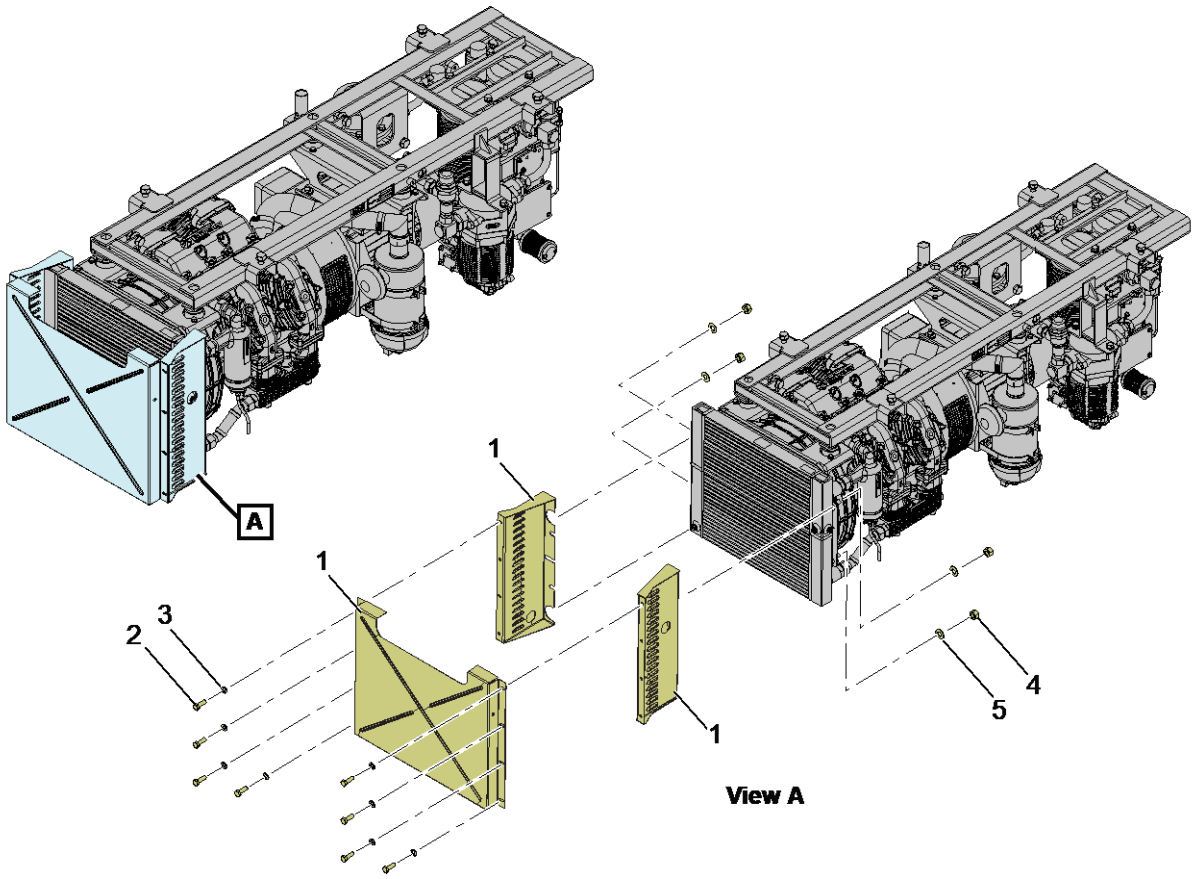

Figure 19: Cooler Panel, Removal/Installation

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ITEM NO.	DESCRIPTION	P/N	QTY
1	COOLER PANEL	FT0052194-005	1
2	HEX HD SCREW M6	920013200	8
3	CONTACT WASHER M6	FT0040297-003	8
4	HEX HD NUT M12	FT0030002-005	4
5	CONTACT WASHER	FT0040297-006	4

5.13.2 INSTALLATION PROCEDURE

Refer to Figure 19

1. Apply Loctite 242 to the threads of the four hex hd nuts M12 (4).
2. Install and secure the following parts to install the two cooler panel side (1) to the motor compressor:
   - Four hex hd nut M12 (4) using 18mm socket wrench
   - Four contact washers (5)
3. Torque tighten the four hex hd nut M12 (4) to 90 Nm. Apply torque mark using Stylmark paint on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

4. Apply Loctite 242 to the threads of the eight hex hd screws M6 (2).
5. Install and secure the following parts to install the cooler panel center (1) to the cooler panel side (1):
   - Eight hex hd screws M6 (2) using 10mm socket wrench
   - Eight contact washers M6 (3)
6. Torque tighten the eight hex hd screws M6 (2) to 5.2 Nm. Apply torque mark using Stylmark paint on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

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5.14 REMOVAL AND INSTALLATION PROCEDURE OF MOTOR COMPRESSOR BURAN 10

5.14.1 REMOVAL PROCEDURE

Refer to Figure 20 and Figure 21.

1. Disconnect the electrical connection from the motor compressor buran 10 (1).
2. Disconnect the pneumatic connection (air intake hose) from the motor compressor buran 10 (1), refer section 5.11.
3. Disconnect the pneumatic connection (water separator hose) from the motor compressor buran 10 (1), refer section 5.12.
4. Remove the air filter kit from the motor compressor buran 10 (1), refer section 5.8.
5. Remove the cooler panel from the motor compressor buran 10 (1), refer section 5.13.
6. Unscrew and remove the following parts to remove one safety sling (2) from the frame:
   - Two hex head screws M16 (3) using 24mm socket wrench holding the two hex nuts M16 (6) using 24mm open end spanner.
   - Two plain washers (4).
   - Two contact washers M16 (5).
7. Unscrew and remove the two hex soc. hd cap screws M6 (7) to remove the mounting block (8) from the motor compressor buran 10 (1) using 5mm allen key.
8. Unscrew and remove the hex soc hd cap screw M12 (9) that secures mounting block (10) to the motor compressor buran 10 (1) using 10mm allen key.
9. Remove the mounting block (10) from the motor compressor buran 10 (1).
10. Unscrew and remove the following parts to remove another safety sling (2) from the frame:
    - Two hex head screws M16 (3) using 24mm socket wrench holding the two hex nuts M16 (6) using 24mm open end spanner.
    - Two plain washers (4).
    - Two contact washers M16 (5).
11. Unscrew and remove the four hex soc hd cap screws M6 (11) that secures the mounting block (12) and mounting block (13) to the motor compressor buran 10 (1) using 5mm allen key.
12. Remove the safety sling (2) along with mounting block (12) and mounting block (13) from the motor compressor buran 10 (1).
13. Connect the appropriate lifting tool to the lifting points of the motor compressor buran 10 (1).
14. Unscrew and remove the following parts that secures the motor compressor buran 10 (1) along with elastic support to the frame:
    - Four hex hd bolts M12 (16) using 18mm open end spanner.
    - Four plain washers M12 (17)
    - Four contact washers M12 (18)
    - Four hex nuts M12 (19) using 18mm socket wrench.
15. Remove the motor compressor buran 10 (1) from the frame.
16. Unscrew and remove the fitting (14) along with tube (15) using 15mm open end spanner.
17. Disconnect the appropriate lifting tool from the lifting points of the motor compressor buran 10 (1).
18. Unscrew and remove the hour counter box cover along with four screws using screwdriver.
19. Unscrew and remove the four hex soc hd cap screws M6 (21) that attach the hour counter box (20) to the bracket using 5mm allen key.
20. Remove the hour counter box (20) from the motor compressor bracket.

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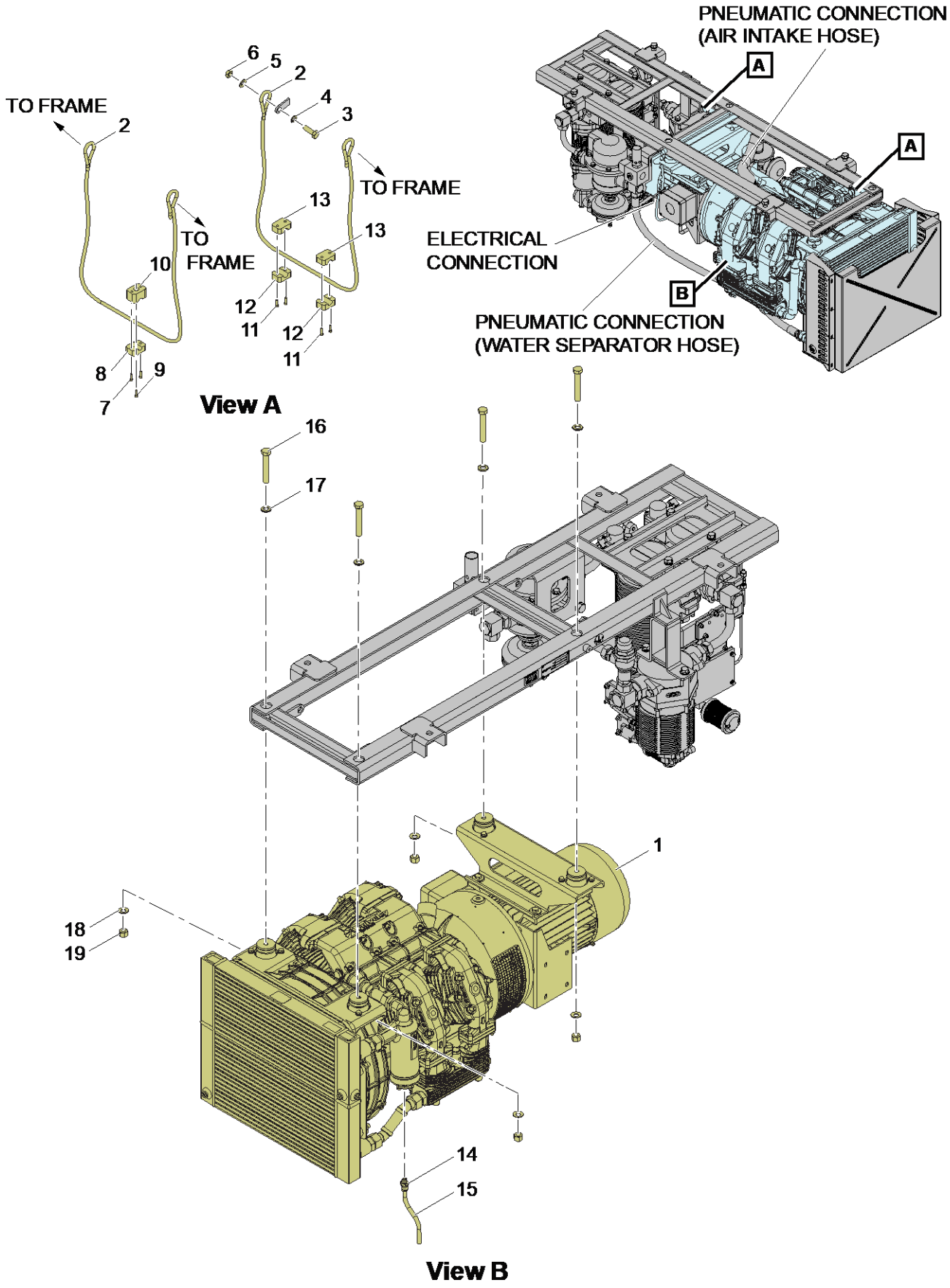

Figure 20: Motor Compressor Buran 10, Removal/Installation

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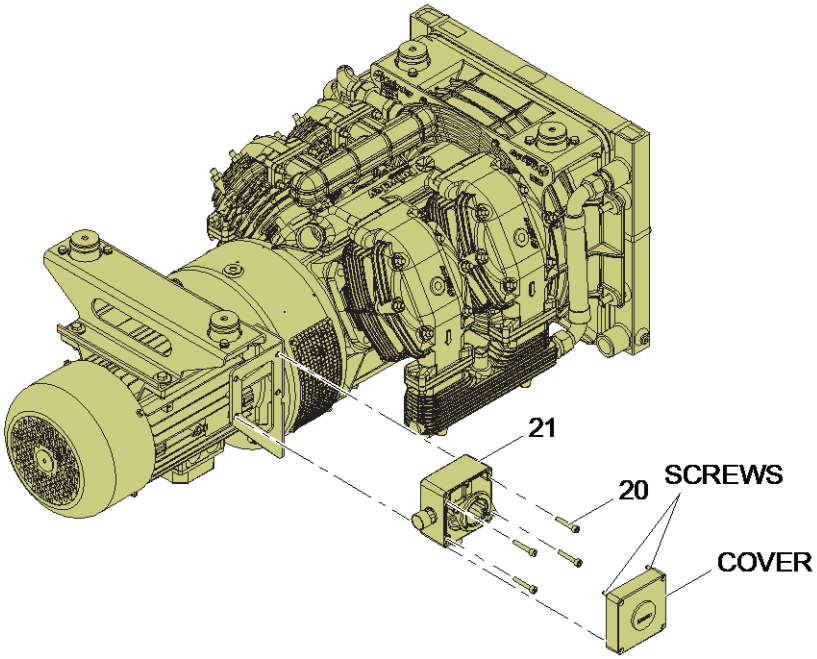

Figure 21: Motor Compressor Buran 10, Removal/Installation

ITEM NO.	DESCRIPTION	P/N	QTY
1	MOTOR COMPRESSOR BURAN 10	FT0055009-100	1
2	SAFETY SLING	FT0051956-003	2
3	HEX HD SCREW M16	920018700	4
4	PLAIN WASHER	FT0030004-011	4
5	CONTACT WASHER M16	FT0040297-007	4
6	HEX NUT M16	906017500	4
7	HEX SOC HD CAP SCREW M6	901020000	2
8	MOUNTING BLOCK	FT0051953-004	1
9	HEX SOC HD CP SCREW M12	FT0053318-000	1
10	MOUNTING BLOCK	FT0051953-003	1
11	HEX SOC HD CAP SCREW M6	901036400	4
12	MOUNTING BLOCK	FT0051953-001	2
13	MOUNTING BLOCK	FT0051953-000	2
14	FITTING	FT0040003-011	1
15	TUBE	FT0027349-001	1

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16	HEX HD BOLT M12	905027100	4
17	PLAIN WASHER M12	908012000	4
18	CONTACT WASHER M12	FT0040297-006	4
19	HEX NUT M12	906015800	4
20	HEX SOC HD CAP SCREW M6	901029600	4
21	HOUR COUNTER ELECTRIC BOX	FT0055486-100	1

5.14.2 INSTALLATION PROCEDURE

Refer to Figure 20 and Figure 21

1. Install the hour counter box (21) to the motor compressor bracket and secure it with the four hex soc hd cap screw M6 (20) using 5mm allen key.
2. Torque tighten the four hex soc hd cap screw M6 (20) to 5.2 Nm. Apply torque mark using Stylmark paint on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

3. Install the cover to the hour counter box (21) and secure it with the screws using screwdriver.
4. Connect the appropriate lifting tool to the lifting points on the motor compressor buran 10 (1).
5. Position the motor compressor buran 10 (1) on the frame.
6. Apply Loctite 242 on to the threads of the four hex hd bolts M12 (16).
7. Secure the motor compressor buran 10 (1) to the frame with the following parts:
   - Four hex hd bolts M12 (16) using 18mm open end spanner.
   - Four plain washers M12 (17).
   - Four contact washers M12 (18).
   - Four hex nuts M12 (19) using 18mm socket wrench.
8. Torque tighten the four hex hd bolts M12 (16) to 90 Nm. Apply torque mark using Stylmark paint on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

9. Install and secure the fitting (14) along with tube (15) to the motor compressor buran 10 (1) using 15mm open end spanner.
10. Apply Loctite 242 on to the threads of the two hex head screws M16 (3).
11. Install the following parts that secures the safety sling (2) to the frame:
    - Two hex head screws M16 (3) using 24mm socket wrench holding the two hex nuts M16 (6) using 24mm open end spanner.
    - Two plain washers (4).
    - Two contact washers M16 (5).
12. Torque tighten the two hex head screws M16 (3) to 120 Nm. Apply torque mark using Stylmark paint on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

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13. Install the mounting block (12) and mounting block (13) to the motor compressor buran 10 (1) and secure it with the four hex soc. hd cap screws M6 (11) using 5mm allen key.
14. Apply Loctite 242 on to the threads of the two hex head screws M16 (3).
15. Install the following parts that secures another safety sling (6) to the frame:
    - Two hex head screws M16 (3) using 24mm socket wrench holding the two hex nuts M16 (6) using 24mm open end spanner.
    - Two plain washers (4).
    - Two contact washers M16 (5).
16. Torque tighten the two hex head screws M16 (3) to 120 Nm. Apply torque mark using Stylmark paint on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

17. Install the mounting block (10) to the motor compressor buran 10 (1) and secure it with the hex soc. hd cap screw M12 (9) using 10mm allen key.
18. Install the mounting block (8) to the mounting block (10) and secure it with the two hex soc. hd cap screws M6 (7) using 5mm allen key.
19. Disconnect the appropriate lifting tool from the lifting points of the motor compressor buran 10 (1).
20. Install the air filter kit to the motor compressor buran 10 (1), refer section 5.8.
21. Connect the pneumatic connection (water separator hose) to the motor compressor buran 10 (1), refer section 5.12.
22. Connect the pneumatic connection (air intake hose) to the motor compressor buran 10 (1), refer section 5.11.
23. Install the cooler panel to the motor compressor buran 10 (1), refer section 5.13.
24. Connect the electrical connection to the motor compressor buran 10 (1).
25. Pressurize the system and check for leakages.
26. Check that all service conditions are restored.

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/// 6. Spare Part List

- Routine maintenance - The spare parts required for routine maintenance are reported in the single main subcomponent User Manuals: see User Manuals list in the table preventive maintenance (First level).

- Installation: Not required

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with NEW ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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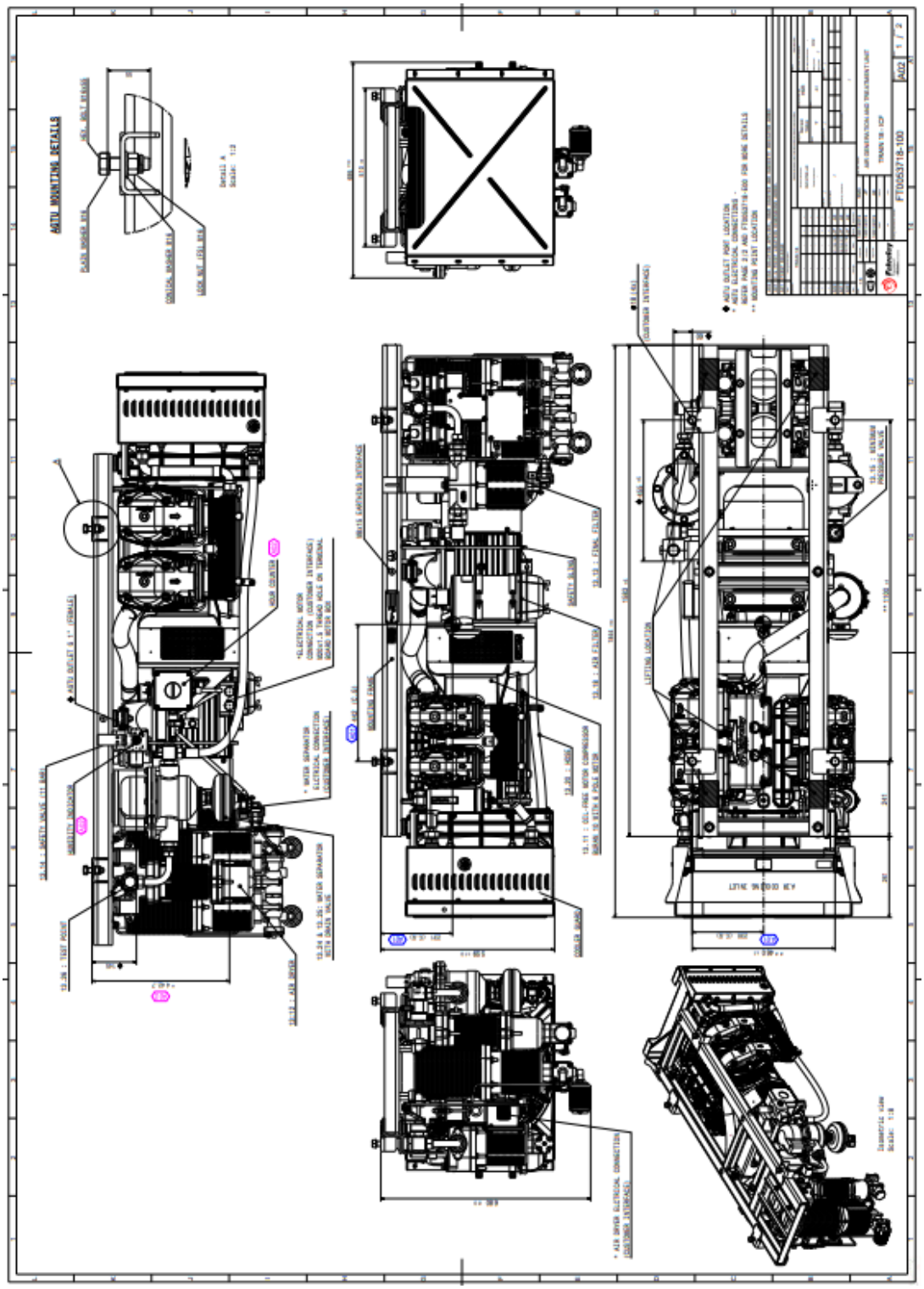
/// 8. OUTLINE DRAWING



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13.21_AUTOMATIC DRAIN VALVE

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User Manual

Auto drain valve

P/N 010 0012 00

Ø	28/11/2008	First Issue	A. BLANCHEZHAN	A. ELAYAPPAN	G. CUSCELLO
Revisione *Issue*	**Data** *Date*	**Descrizione** *Description*	**Compilato** *Compiled*	**Verificato** *Checked*	**Approvato** *Approved*

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REVISIONI / *REVISIONS*					
∅	28/11/2008	First Issue	A.ELANCHEZHIAN	A.ELAYAPPAN	ELISA RUSCELLO
Revisione ***Issue***	**Data** ***Date***	**Descrizione** ***Description***	**Compilato** ***Compiled***	**Verificato** ***Checked***	**Approvato** ***Approved***

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SUMMARY

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9. SPARE PARTS 8
10. SPECIAL TOOLS 8

Symbols

Warning/Caution. The rule must be strictly observed.

Information, recommendation.

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1. Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- The device must be maintained when and as prescribed.
- Authorised personnel must carry out installation and maintenance.
- Only original spare parts can be used.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

Important! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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2. Description of equipment

The Auto drain valve is designed for use in main reservoir or principle air circuits. Its maximum recommended pressure is 12 bar (175 p.s.i.) and for it to drain automatically at a pressure of 6.9 bar (100 p.s.i.) the minimum operating pressure applied must be 1.4 ± 0.14 bar (20 ± 2 p.s.i.). The pressure applied to operate the valve is often taken from the brake cylinder supply thus ensuring that the drain valve is actuated whenever the brake cylinder pressure exceeds the operating pressure.

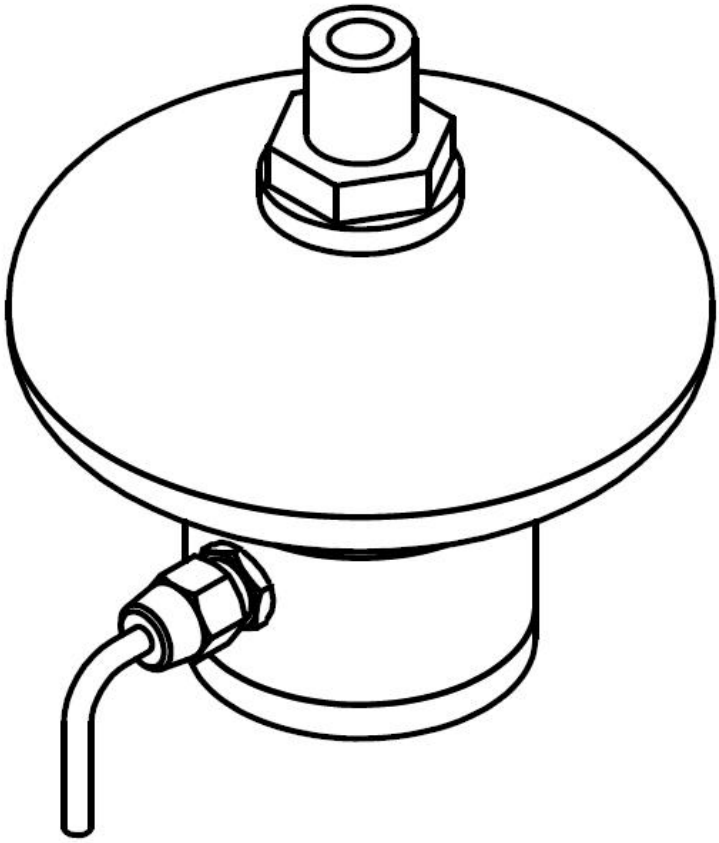

Figure 1:External view

3. Main features and data

- Nominal diameter of drain outlet.....1/4 ”
- Mass:.....4 kg

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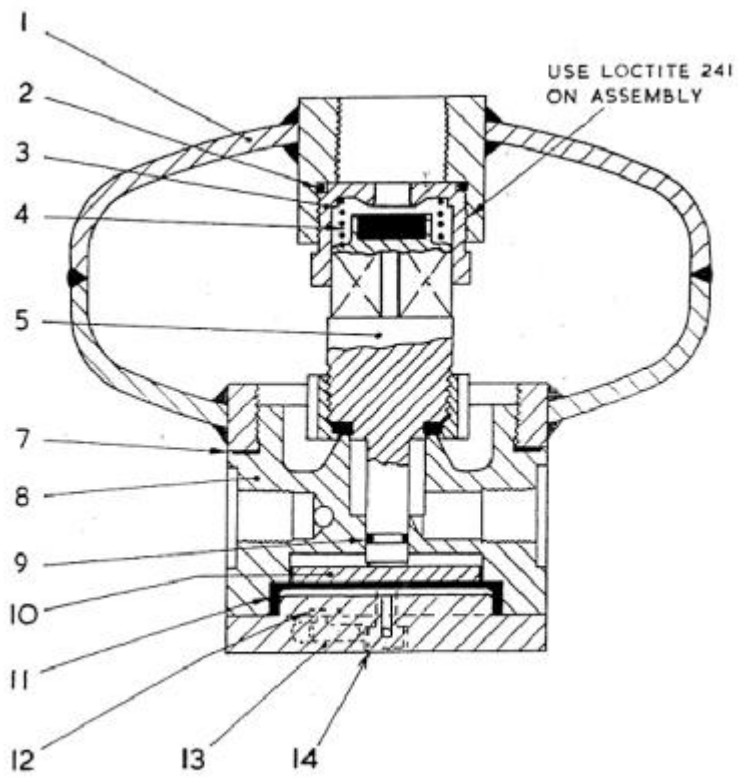
4. Description of Function/Operation

Refer to Figure 2.



1	Reservoir
2	O-ring
3	Valve seat
4	Spring
5	Valve spindle assembly
7	Joint
8	Valve body
9	O-ring
10	Pressure plate
11	Diaphragm
12	O-ring
13	Cover
14	Socket head cap screw

Figure 2: functional scheme

The valve comprises a prefabricated reservoir (1) into which the valve seat (3), the spring (4) and valve spindle (5) are fitted. The latter is held in position by the valve body which is screwed into the base of the reservoir. The pressure plate is held in position by diaphragm (11) which is in turn locked in position by the cover (13).

When the operating air line is at atmosphere pressure, there is no pressure on the underside of the diaphragm (11), consequently the valve spindle (5) is moved to its lowest position by the spring (4), allowing the lower valve head formed on the spindle to seat itself on the seating formed in the valve body (8), thus isolating the inside of the reservoir form the drain connection.

In this position the upper valve head is parted from the seating formed in the top valve seat (3) so allowing condensate to pass freely into the reservoir where it is accumulated.

When air pressure is applied from the operating air line to the underside of diaphragm (11), the diaphragm, pressure plate (10) and the valve spindle (5) are raised until the upper valve head is pressed against the top vale seat (3) thus isolating the reservoir. At the same time the lower valve head is lifted from its seating so that the accumulated condensate within the reservoir can pass freely to atmosphere, being assisted by the expansion of the compressed air which is trapped in the top part of the reservoir.

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5. Maintenance prescriptions

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not applicable.
2. Second Level Maintenance: overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhauled regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 2 years.

6. Routine maintenance

This device doesn't require any light maintenance.

7. Removal procedure

Caution! Pressurised system! Discharge the pressure before removal.

Refer to Figure 3.

1. Remove all the piping connections(3).
2. Unscrew the Hexogonal Nipple (2) using 32mm Spanner.
3. Remove the Hexogonal Nipple from Auto drain valve.
4. Remove the Auto Drain valve (1) and send it for overhauling.

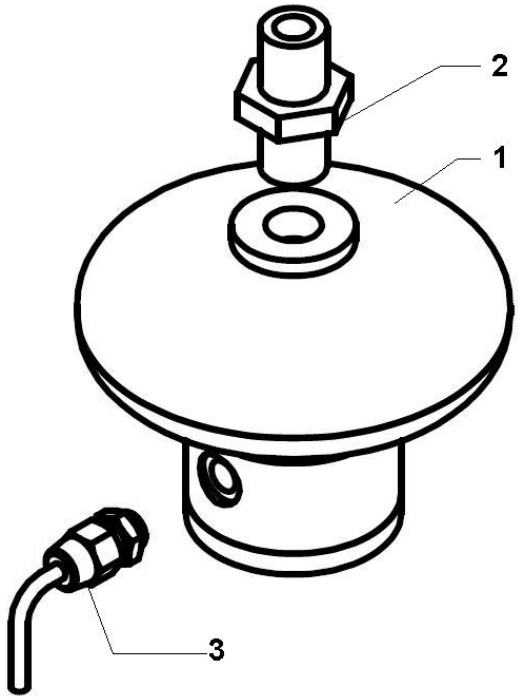

Figure 3: installation/removal procedure

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8. Installation Procedure

Refer to Figure 3.

1. Use Locktite 542 as sealant screw the Hexogonal Nipple (2) using 32mm Spanner.
2. Connect all the piping connections(3).
3. Check that all the service conditions are restored and that there are no leahages.

9. Spare parts

- **Routine Maintenance** – Not applicable.
- **Installation –** Spare parts not required.

10. Special Tools

No special tools required for servicing and installation.

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13.23_ISOLATING COCK & MICRO SWITCH

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/// FT0050822-102-E00MUM

1/2" ISOLATING COCK WITH DRAIN & MICRO SWITCH
FT0050822-102, FT0054573-100, FT0054573-101
3/4" ISOLATING COCK WITH DRAIN & MICRO SWITCH
FT0050822-100, FT0054574-101

Maintenance/Use manual

ECO: DRC XXX
Compiled: VP
Checked: . KMS
Approved: .BSH

Date: 19/01/2022 - Revision: C00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	01/03/2016	NEW RELEASE	.	SRC	.MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
C00	19/01/2022	New P/Ns added: FT0054573-100, FT0054573-101 and FT0054574-101	DRC XXX	VP	. KMS	. BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Isolating Cock with Drain & Micro Switch is used to open/close a pneumatic circuit. Micro switch is used to convey the cock condition to the operator. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

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- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

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- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE “PED”)

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 0. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from - 10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Isolating Cock with Drain & Micro Switch must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Isolating Cock with Drain & Micro Switch and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Isolating Cock with Drain & Micro Switch for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Full Name
BSPP	British Standard Parallel Pipe
mm	millimeter
MS	Micro Switch
P/N	Part number
QTY	Quantity

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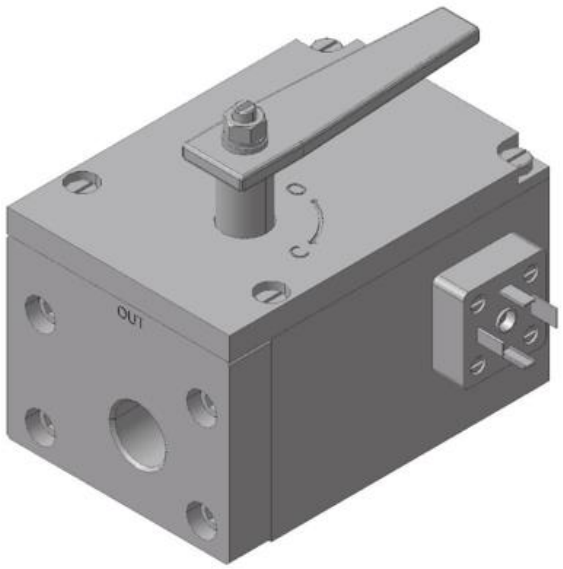
/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

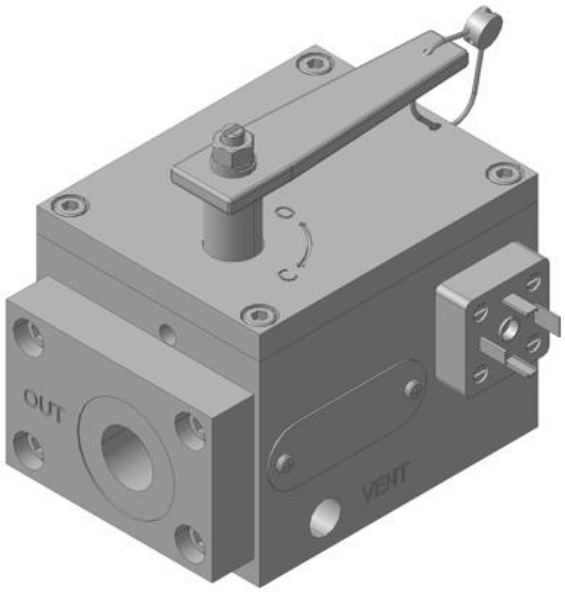
2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Isolating Cock with Drain & MS is used to open/close a pneumatic circuit. Micro switch is used to convey the cock condition to the operator. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position.



FT0050822-101 and
FT0050822-102



FT0054573-100
FT0054573-101 and
FT0054574-101

Figure 1a - Isolating Cock with Drain & MS, Isometric View

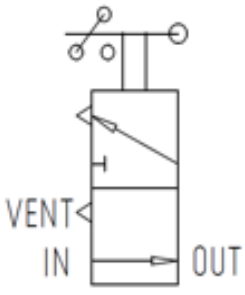


Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Parameters	FT0050822-102	FT0054573-100	FT0054573-101
Port size	1/2” BSPP		
Bore size	15mm		
Max operating pressure	10 bar		
Working pressure range	0-10 bar		
Handle Colour	BLACK	BLACK	RED

Parameters	FT0050822-100	FT0054574-101
Port size	3/4” BSPP	
Bore size	19mm	
Max operating pressure	10 bar	
Working pressure range	0-10 bar	
Handle Colour	BLACK	RED

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/// 3.OPERATIONS

The device consists of a main body is having the inlet and delivery port. Micro switch is mounted on the main body. The handle is connected to a spindle, which in-turn operates the spherical ball and micro switch as well.

3.1 OPEN CONDITION

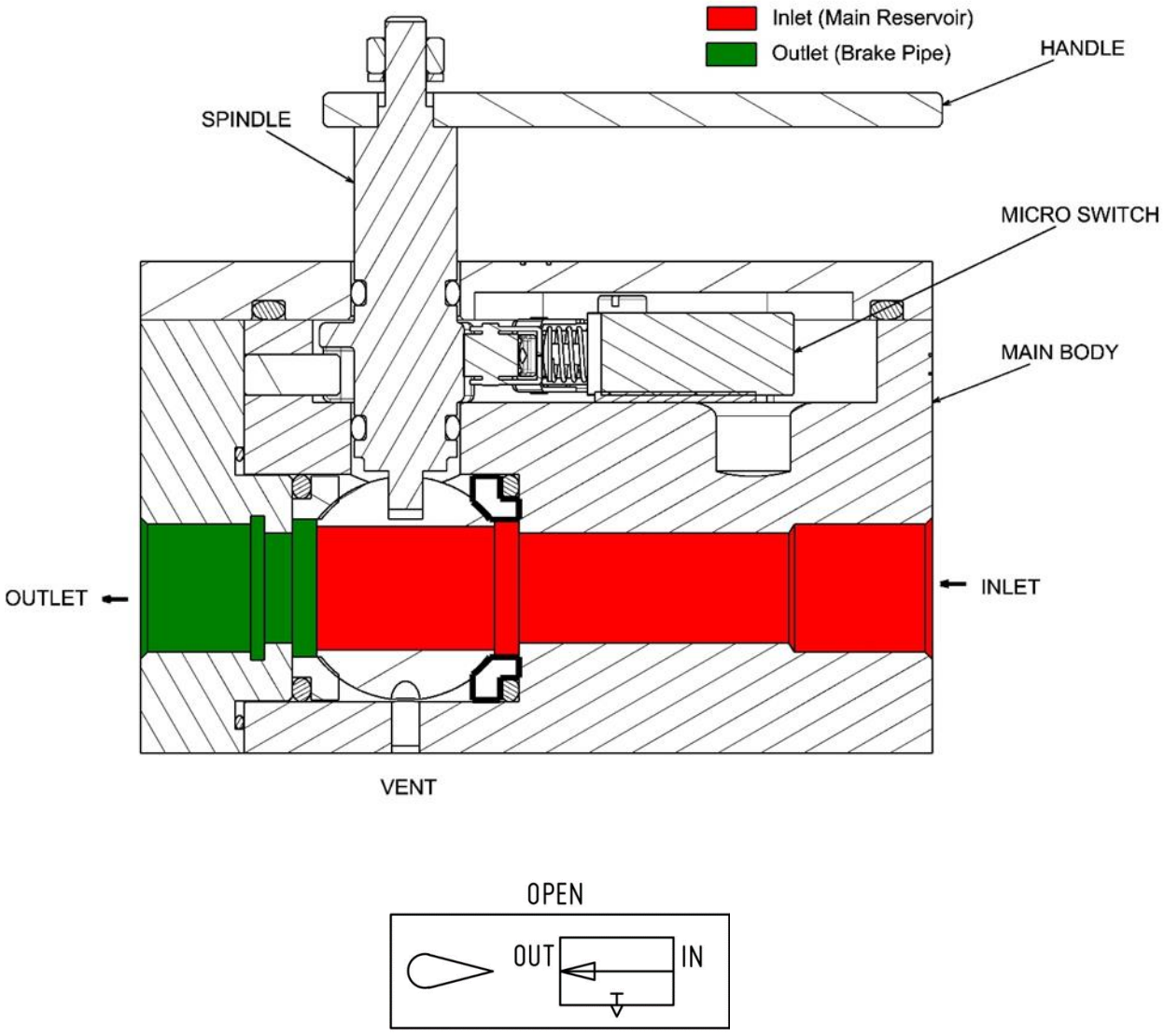

Figure 2a - Isolating Cock with Drain & MS, Open Condition

Refer to Figure 2a

In working condition handle is in open position. The inlet port is connected to the outlet port through vented ball and the microswitch is deactivated.

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3.2 CLOSED CONDITION

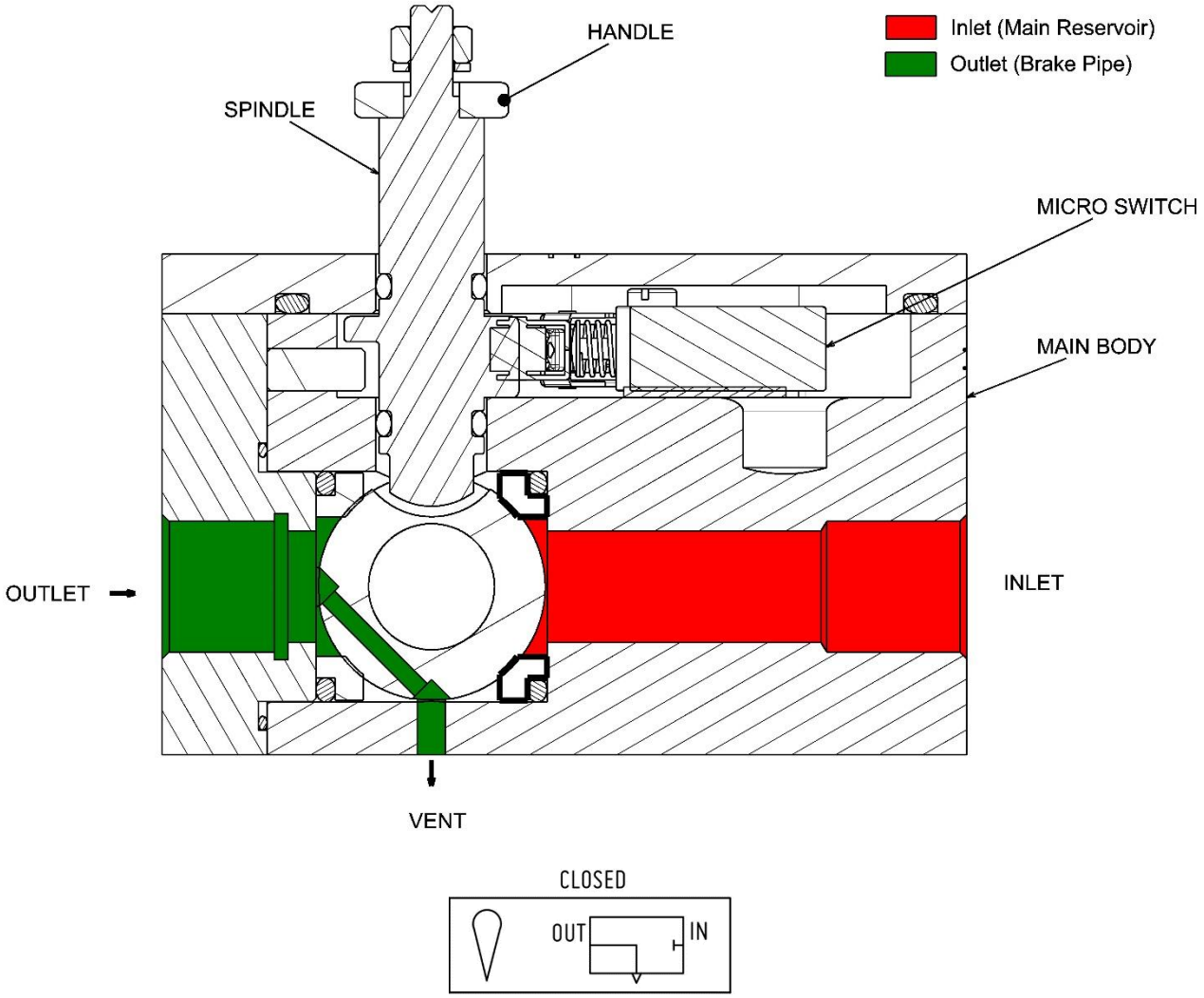

Figure 2b - Isolating Cock with Drain & MS, Closed Condition

Refer to Figure 2b

In closed condition, the handle has to be rotated to the closed position. When handle is rotated it rotates the ball plug via spindle. The inlet and outlet are isolated from each other. The outlet pressure is vented to atmosphere through vented port. The micro switch is activated.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
Screw driver	Tighten/loosen the screws
Standard tools	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

This device doesn't require any special tools.

4.3 LIST OF CONSUMABLES

Name	Application
Loctite 242/243	Thread locking

/// 5.MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be maintained regularly as required by the operator's rules; the mission profile and the environmental conditions (refer Section 5.2.1).
   Typical functional test periodicity: 1 year
2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/Handle turns free and that the micro switch gives the right indication. The test must be done with the system pressurised.
3. At the end of the test, make sure all the initial conditions are restored.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. Close the Isolating cock that has to be removed to drain the outlet pressure, and the inlet side cock of the two-port Relay Valve to be closed before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 3

1. Remove the electrical connections by using screw driver and remove the pipe fittings using appropriate tool from the Isolating Cock inlet and delivery ports.
2. Remove the Isolating Cock (1) from the customer interface, which is under car builder scope by unscrewing two M8 screws (2) using appropriate tool and the two washers (3).

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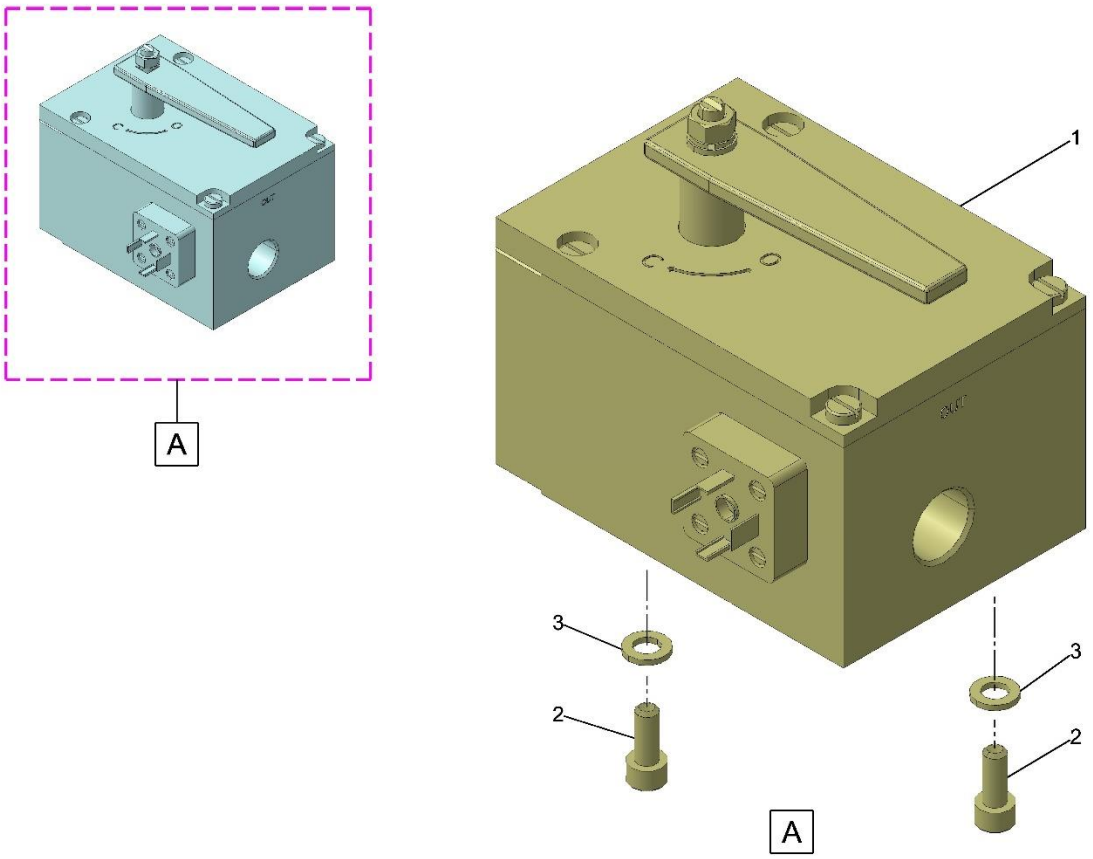

Figure 3 - Isolating Cock with Drain & MS, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0050822-102	1
1	3/4" ISOLATING COCK WITH DRAIN & MS	FT0050822-100	1
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0054573-100	1
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0054573-101	1
1	3/4" ISOLATING COCK WITH DRAIN & MS	FT0054574-101	1

NOTE: Item 2 and 3 are not under the scope of WABTEC.

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242/243 on the threads of the two screws (2).
5. Install the Isolating Cock (1) to the customer interface, which is under car builder scope.
6. Secure the Isolating Cock (1) using the two M8 screws (2) and two washers (3). Recommended torque value for the two M8 screws (2) is 14 Nm. Apply Stylmark on the two M8 screws (2).

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

7. Connect the Isolating Cock (1) to the pipe fitting. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
8. Connect the electrical connection using a screw driver.
9. Pressurize the system and perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6.SPARE PART LIST

- Routine Maintenance - Not applicable.
- Installation -the spare parts not required.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, stainless steel, rubber, brass, etc. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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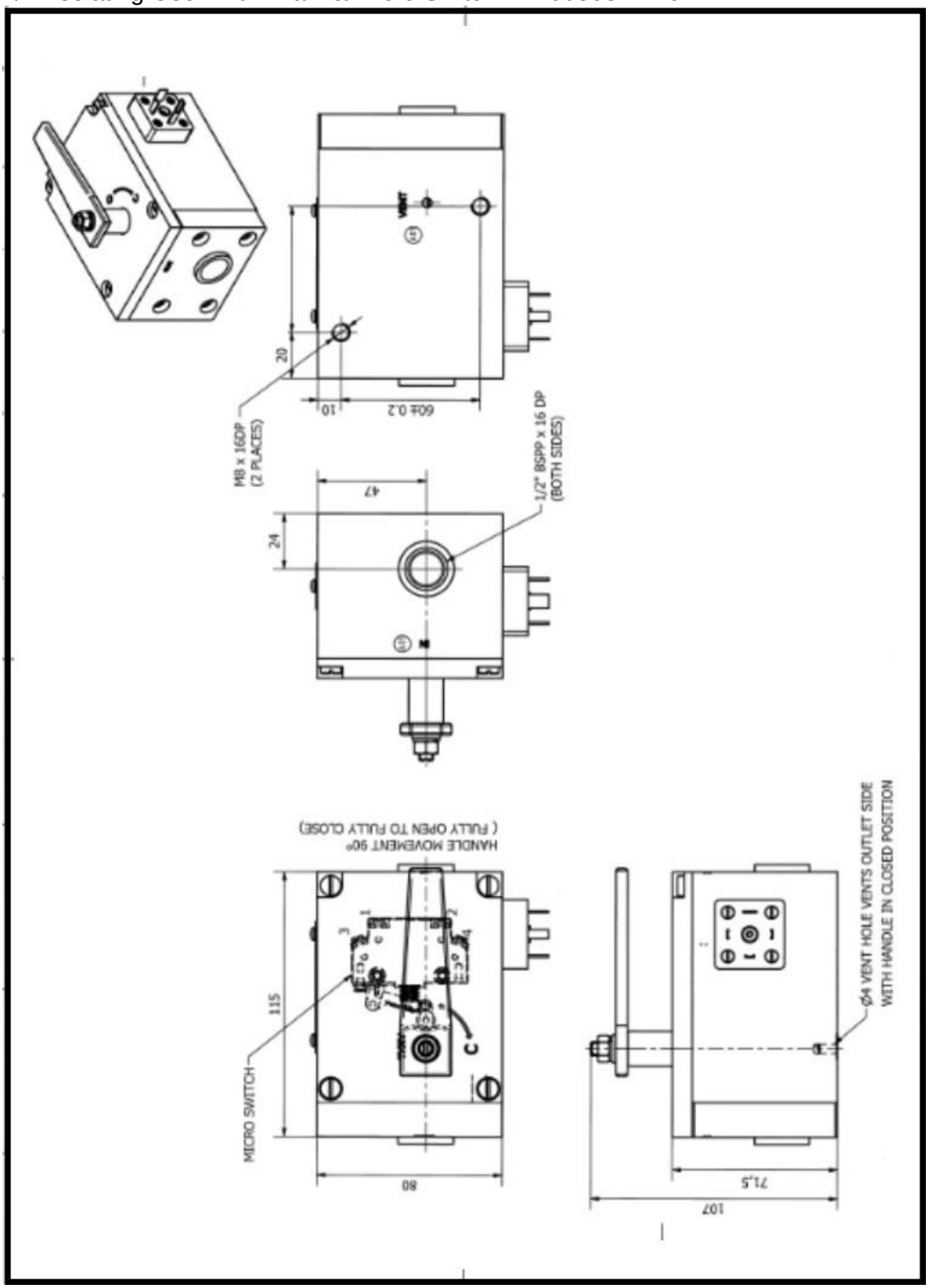
/// 8.OUTLINE DRAWING

1/2" Isolating Cock with Drain & Micro Switch - FT0050822-102



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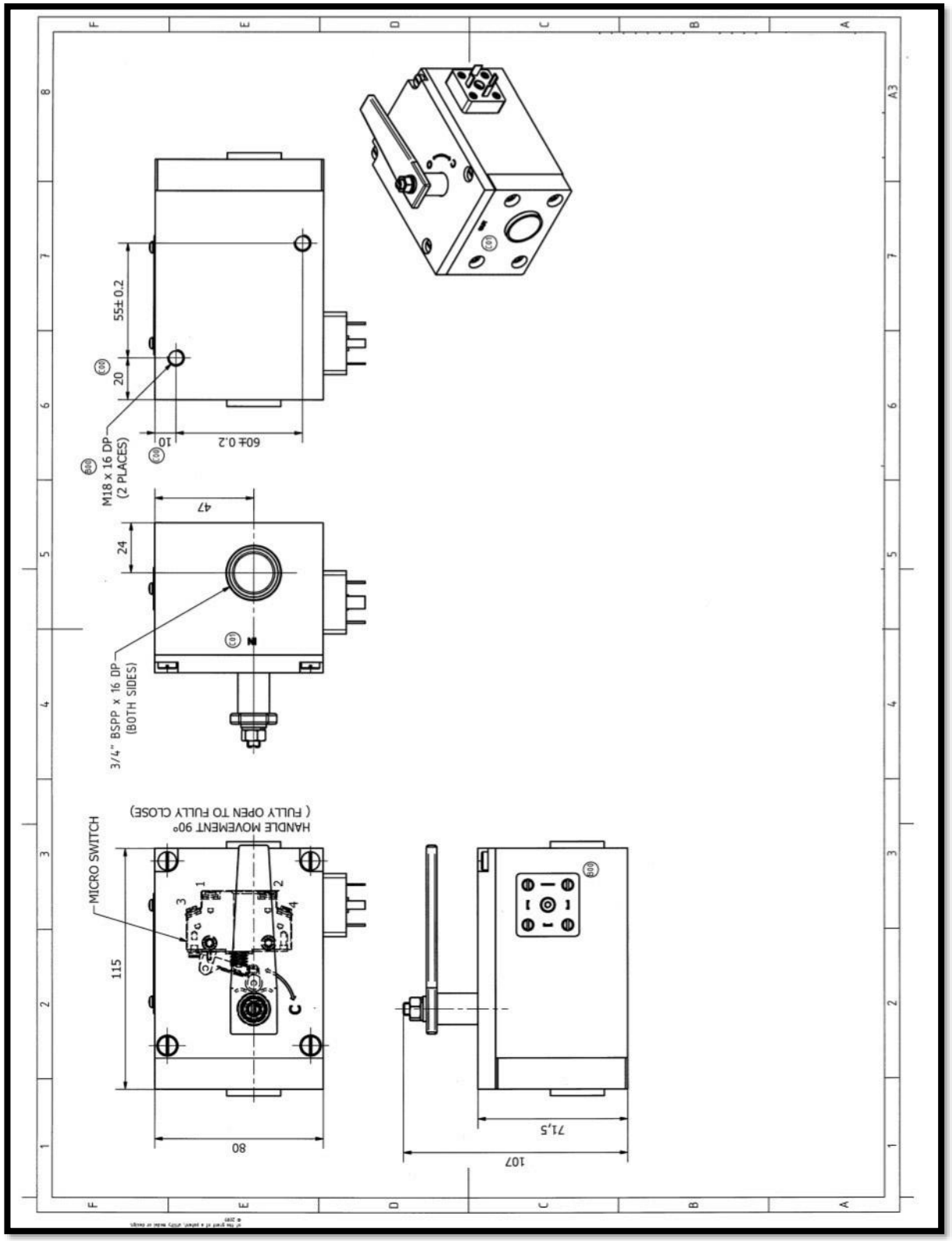
3/4" Isolating Cock with Drain & Micro Switch - FT0050822-100



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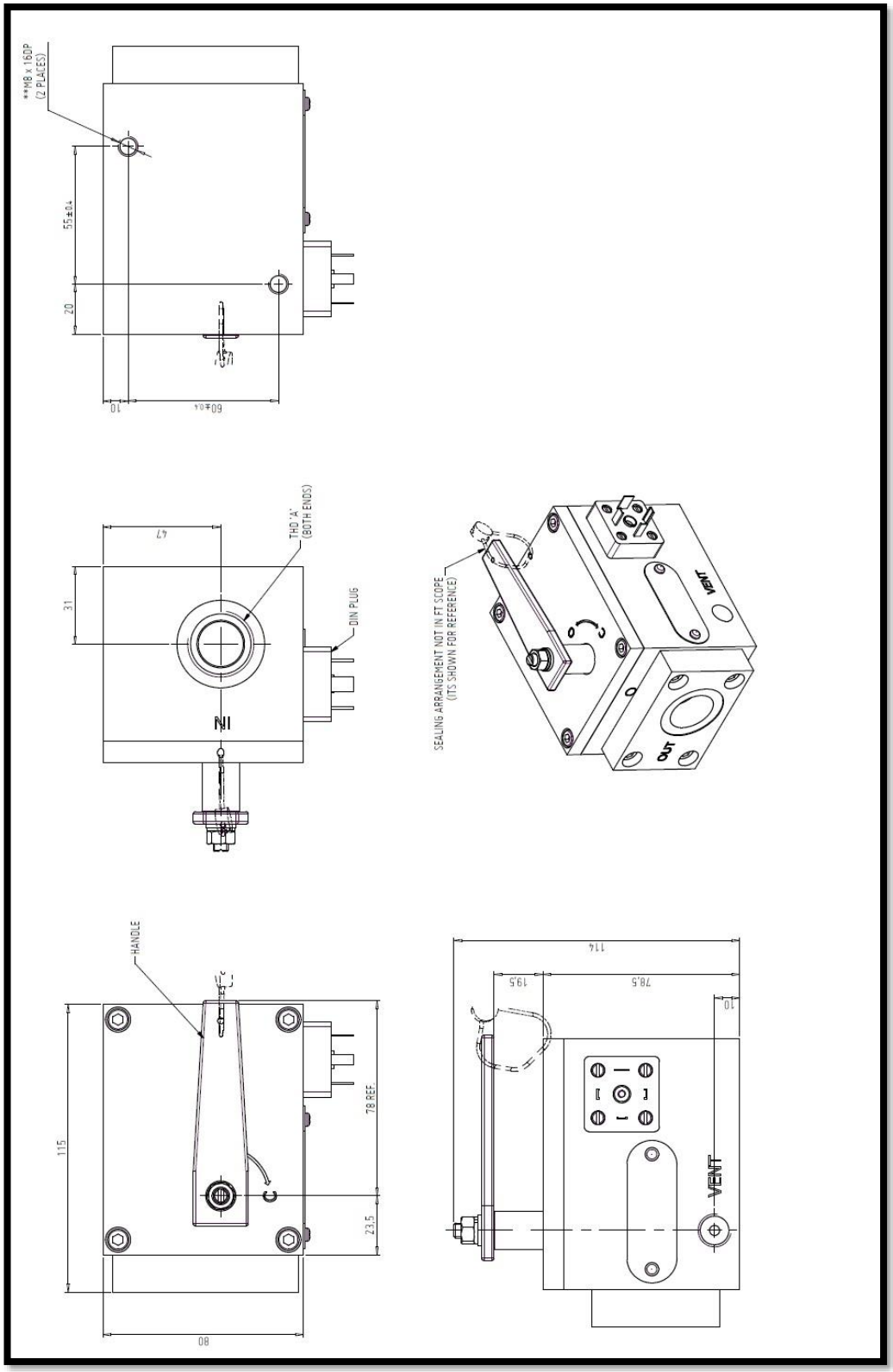

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13.30_MAGNET VALVE WITH PIPE BRACKET

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/// 013003100-E00MUM

MAGNET VALVE WITH BRACKET (NC)
013003100

Maintenance/Use manual

ECO: DRC 1675
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 23/09/2021 - Revision: B01

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	30/11/2015	NEW RELEASE	.	SRC	.MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
B01	23/09/2021	Section 2.2: Added coil resistance parameter	DRC 1675	VP	. KMS	. BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

Magnet Valve is an EP valve that is designed to direct or cut-off the flow of air under pressure between two ports.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

- The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer’s prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease;
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Magnet Valve with Bracket must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Magnet Valve with Bracket and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Magnet Valve with Bracket P/N 013003100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
Assy	Assembly
DC	Direct Current
EP	Electro Pneumatic
HD	Head
HEX	Hexagonal
NC	Normally Closed
Nm	Newton metre
P/N	Part Number
QTY	Quantity
SOC	Socket
V	Voltage

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The magnet valve type NC is a normally-closed EP valve in de-energised condition. When the EP coil is energised, the input port is connected to the output port. The EP valve is mounted on a bracket for pipe connections.

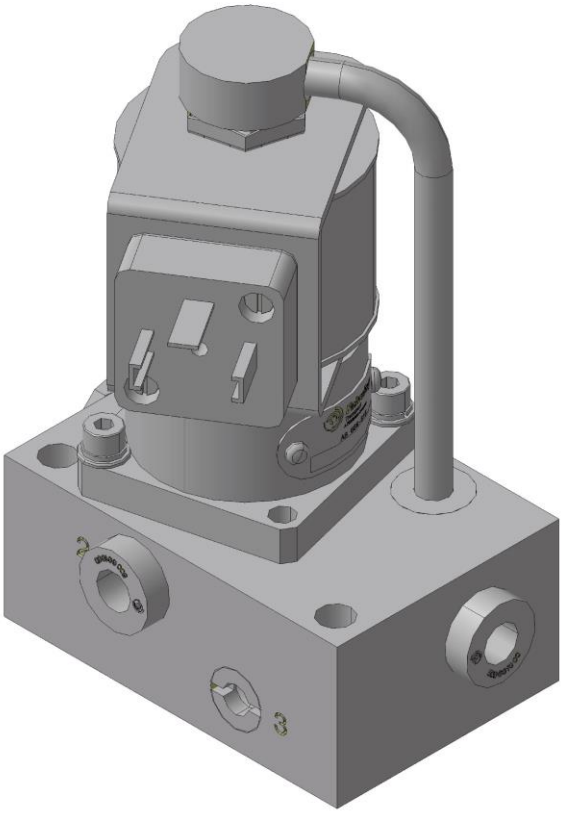

Figure 1a - Magnet Valve with Bracket, Isometric View

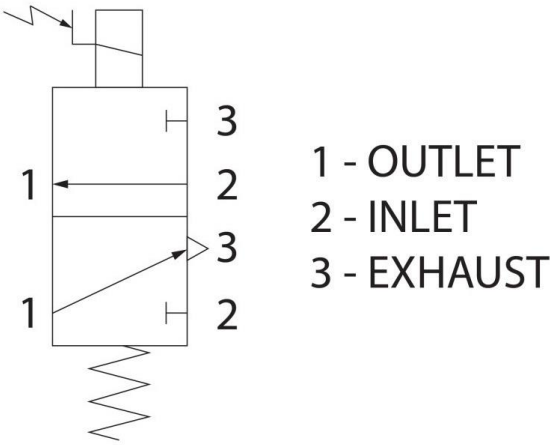

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

- Port size .....1/4” BSP
- Max operating pressure.....10 bar
- Working pressure range .....0-10 bar
- Power supply.....110Vdc
- Mass.....0.70 kg
- Coil resistance.....1115 Ω ±5% at 20°C

/// 3.OPERATIONS

3.1 NORMAL CONDITION

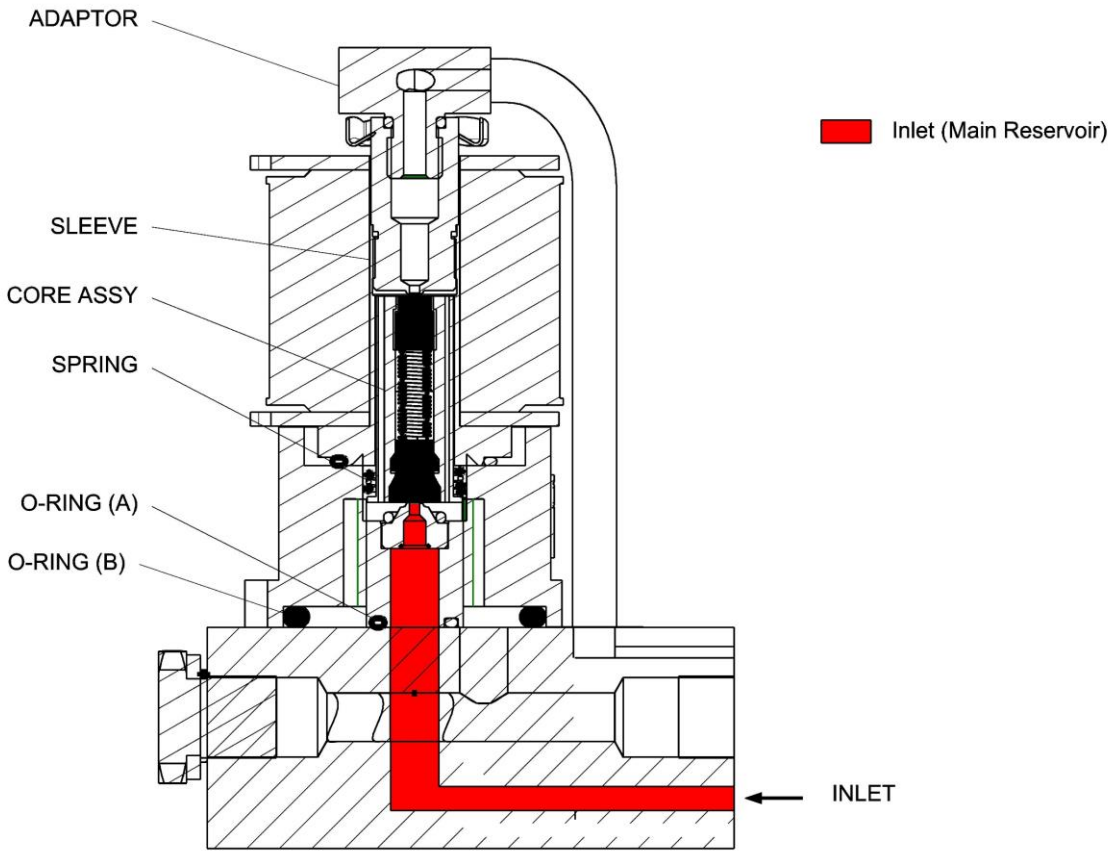

Figure 2a - Magnet Valve Assembly, Normal Condition

Refer to Figure 2a

The centre port (middle port) sealed by O-ring (A) is the inlet port. The side port sealed by O-ring (B) is the outlet port. The top port in the adaptor is the exhaust port. Normally (in de-energised condition) the inlet port is sealed by the core assy seat which is held by the spring, there by the outlet port is connected to the exhaust port.

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3.2 ENERGISED CONDITION

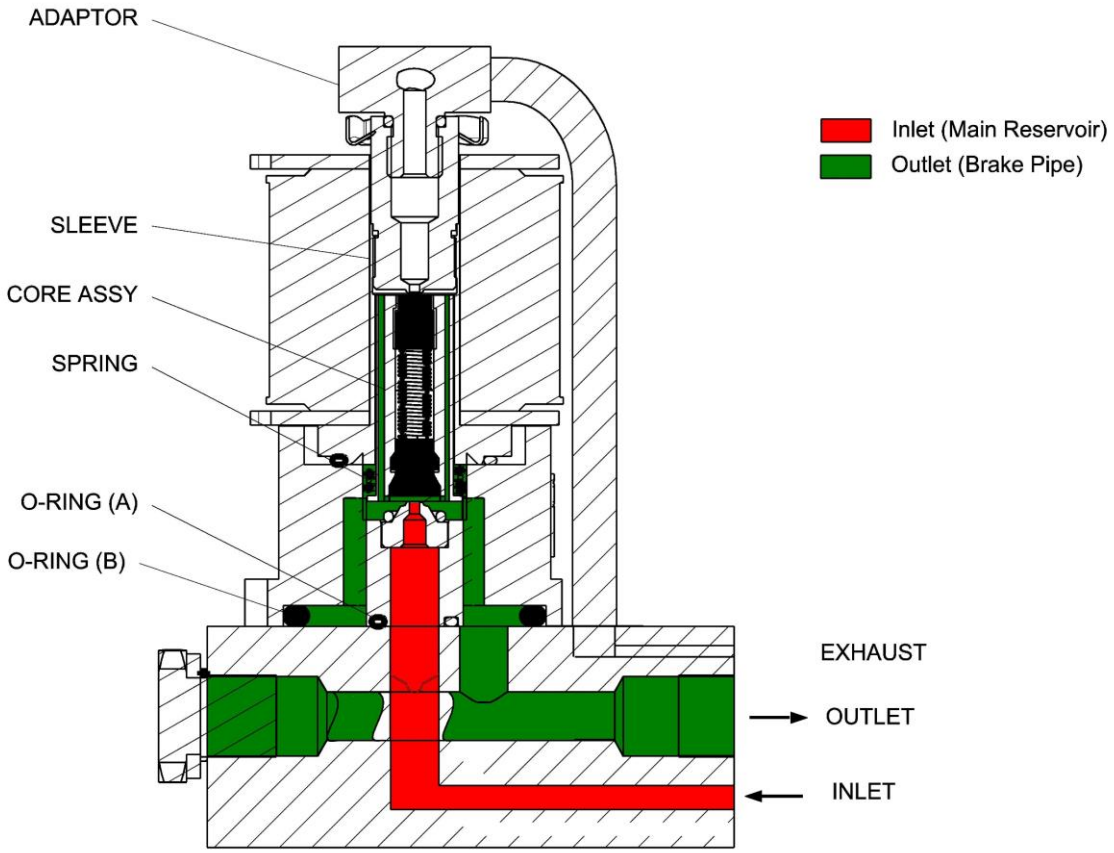

Figure 2b - Magnet Valve Assembly, Energised Condition

Refer to Figure 2b

When the EP valve coil is energised, the core assy moves upwards and contacts the valve seat of the sleeve to seal the exhaust port thereby connecting the inlet port to the outlet port.

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3.3 EXHAUST CONDITION

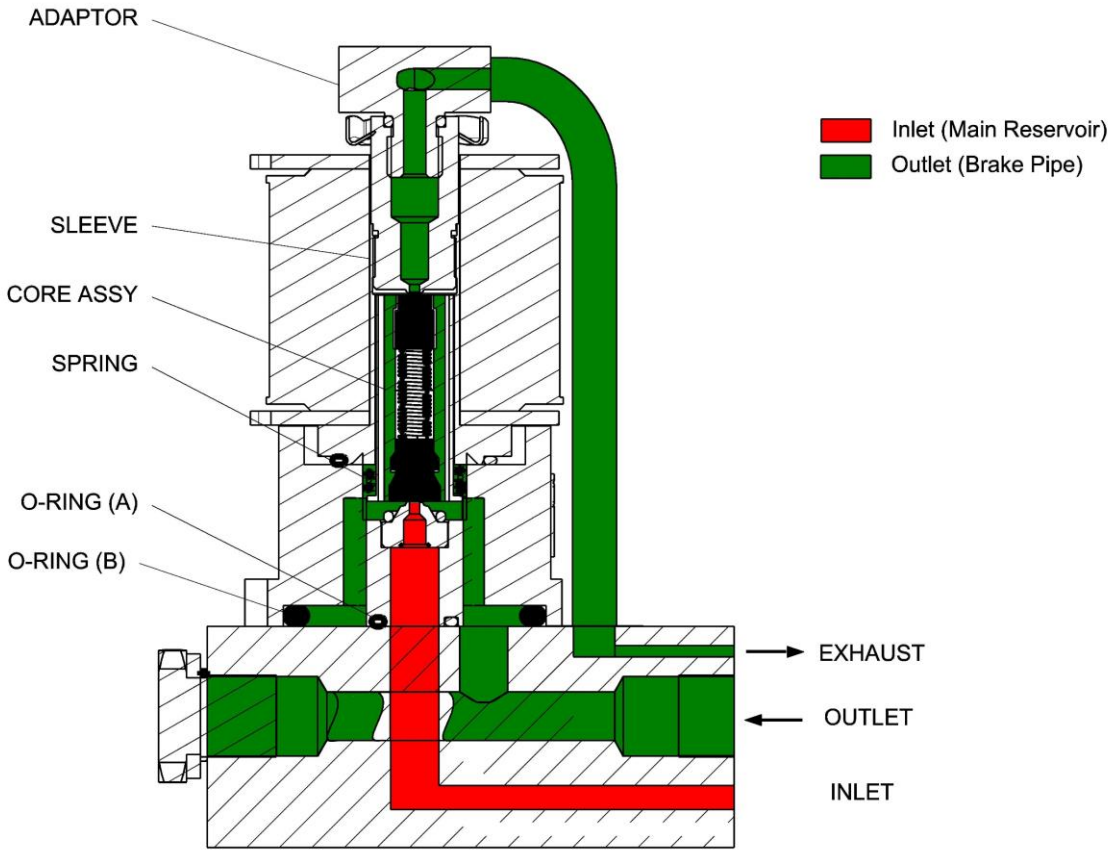

Figure 2c - Magnet Valve Assembly, Exhaust Condition

Refer to Figure 2c

In exhaust condition the core assy move downwards and the seal the seat. The inlet pressure and delivery pressure is cut off and delivery pressure connected to exhaust.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
3mm allen key	Tighten/Loosen the fasteners
Screw driver	To remove DIN plug

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote grease M33/M55	Lubricant for parts
Loctite 242/243	Thread locking
Stylmark	Torque marker

/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine Maintenance): Not required.
2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

Refer to Figure 3

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal. The main reservoir pressure has to be drained to remove the Magnet Valve with Bracket.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

1. Unplug the electrical connector using screw driver.
2. Remove the following parts which secure the solenoid valve assembly (1) to the manifold assembly (5):
    - Two M4 screws (2) using 3mm allen key;
    - Two spring washers (3);
    - Two plain washers (4).
3. Lift the solenoid valve assembly (1) from the manifold assembly (5).
4. Remove and **DISCARD** the O-rings (6) and (7) from the mounting surface of the solenoid valve assembly (1). Set the solenoid valve assembly (1) aside in a protected area.

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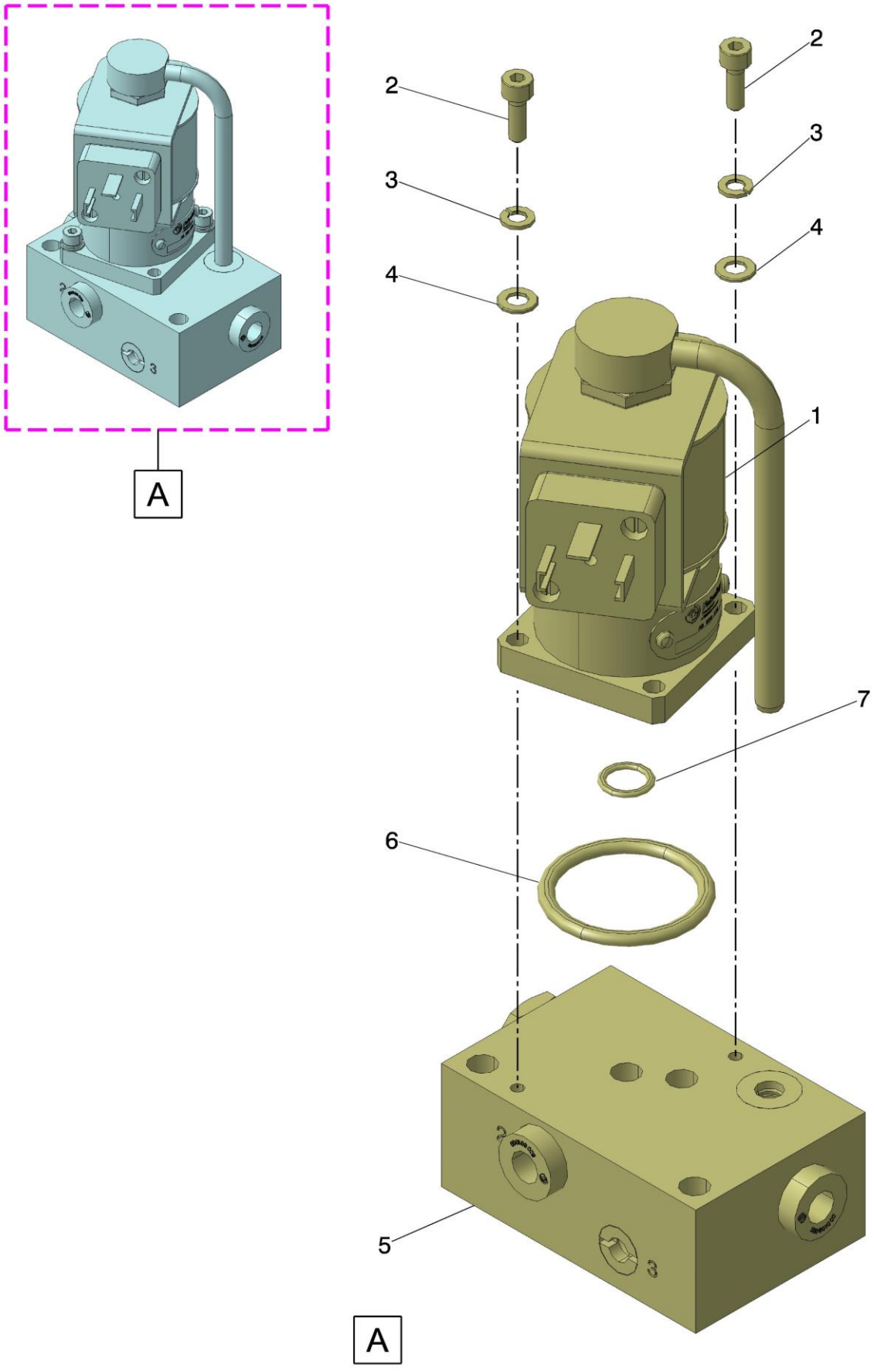

Figure 3 - Removal/Installation of the Magnet Valve with Bracket Assembly

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	SOLENOID VALVE ASSY	013003500	1
2	HEX SOC HD CAP SCREW M4X12	901039900	2
3	SPRING WASHER DIA 4	909020500	2
4	PLAIN WASHER DIA 4	908018700	2
5	MANIFOLD ASSEMBLY	AB686-W3	1
6	O-RING	013711000A	1
7	O-RING	013710000A	1

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Smear the **NEW** O-ring (6) and (7) with Molykote M33 grease.
2. Install the O-rings (6) and (7) into the groove of the solenoid valve assembly (1).
3. Position the solenoid valve assembly (1) to the manifold assembly (5).
4. Apply Loctite 242 on the threads of the two M4 screws (2).
5. Secure the solenoid valve assembly (1) with the parts that follow:
    - Two M4 screws (2);
    - Two spring washers (3);
    - Two plain washers (4).
6. Tighten the two screws (2) with 3mm allen key.
7. Torque the two screws (2) to 2.1 Nm.
8. Apply torque mark on the screw head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

9. Plug the electrical connector using screw driver.
10. Pressurise the system, switch on the electrical power and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6.SPARE PART LIST

- Routine Maintenance – Not applicable.

Refer to Figure 3

- Installation: The spare parts required for installation are:

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
6	O-RING	013711000A	1
7	O-RING	013710000A	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the laws in force in the country where the component is used.

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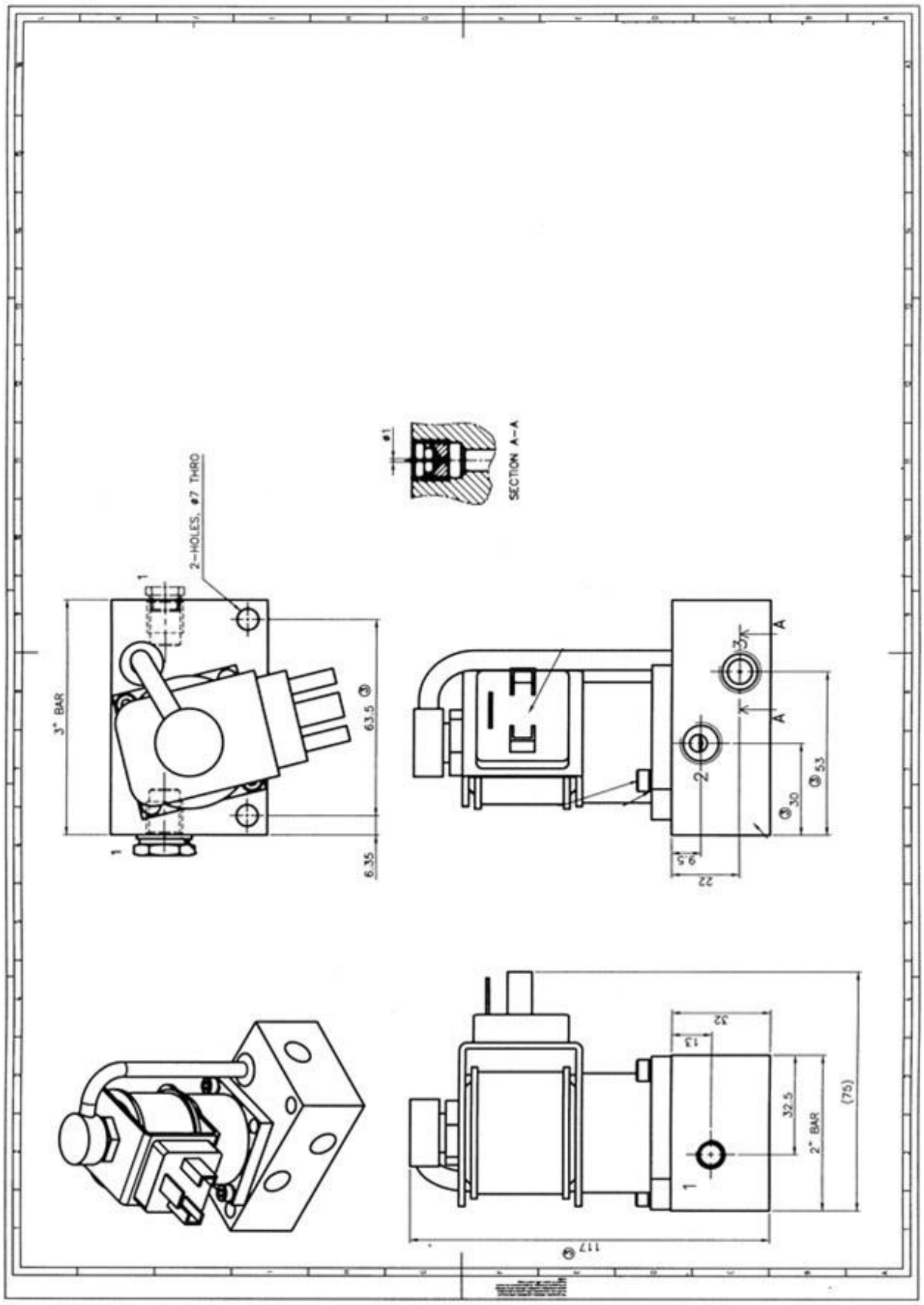
/// 8.OUTLINE DRAWING

Magnet Valve with Bracket - 013003100



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14.06_WHEEL MOUNTED DISC Ø750

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/// MM1-29003-01-EN-00

Trainset18
Wheel mounted brake disc in NCM cast iron

29003

Maintenance/Use manual

ECO/**ECO**: **-**
Compiled: **F.** Scarpa (TEORESI)
Checked: **mcremona**
Approved: **alessandro**.peraboni

Date: 15/07/2019 - Revision: 00
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
00	15/07/2019	First emission	-	F. Scarpa (TEORESI)	mcremona	alessandro .peraboni
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Faiveley Transport
A Wabtec Company

/// 1. Scope and application

The scope of this document is to provide the description of the Poli wheel mounted brake disc, the procedures for the disc installation and replacement and the necessary in-service inspections.
It applies to all the Poli Wheel Mounted Discs in Cast Iron – One-piece friction ring version.
Specific disc version instructions shall be defined in the dedicated project maintenance manuals.

/// 2. Safety precautions

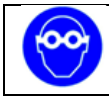
2.1 Safety at work

The following operations described in the chapters of this Manual may be the cause of accidents at the workplace if they are performed without taking appropriate precautions; therefore, the operator concerned must, first of all, follow the workplace safety and accident prevention standards in force at the workplace.

In particular, operation steps described in the chapters of this manual shall be carried out only by people who are suitably qualified for the development of the operations themselves; they shall also know the content of the whole of this manual and they must have attained training courses concerning safety and prevention of accidents at work.

The operator and/or other persons present during the following activities described in the Chapters of this Manual must always work in an environment suitable for carrying out the operations required, must always use the recommended personal protective equipment in order to avoid causing risk or damage to the operator and other persons present in the workplace.

Every time that, in this manual, the operator finds in the description of the operation steps to carry out the symbol shown below, he is required to pay great attention to the instructions written close to the symbol itself and to the content of § 3 of this manual.

	DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and /or and/or to damage to the unit or the environment.
	NOTE: Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.
	USE THE GLOVES! The operator must use protective gloves when carrying out the operation highlighted: failure to comply with this warning may cause injury to people
	**USE THE GLASSES!** The operator must use the safety goggles while carrying out the highlighted operation: failure to comply with this warning may cause injury to people.

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	USE THE MASK! The operator must use the protection mask during the execution of the highlighted operation: failure to comply with this warning may cause injury to people.

	USE THE HELMET! The operator must use the helmet when performing the highlighted operation: failure to comply with this warning may cause injury to people.

	USE THE HOIST! The operator must use the hoist during the execution of the highlighted operation: failure to comply with this warning may cause injury to people

	USE THE ELEVATOR TABLE! The operator must use the lift table (or similar equipment) during the execution of the highlighted operation: failure to comply with this warning may cause injury to people.

The instructions and warnings given in this Chapter and in the rest of the Manual do not replace the standards regarding safety at the workplace, but are in addition to these and are meant to stimulate compliance.

***IMPORTANT*: THE INSTRUCTIONS AND WARNINGS DO NOT ELIMINATE THE DANGER**

	WARNING ! The brake disc supplier is not responsible for damages to people or things due to the missing of observance of the instructions relevant to safety and prevention of accidents a work - contained in this manual - during inspection and maintenance operation steps of the brake disc itself.

2.1 Environmental safety

	WARNING ! It is important to follow the indications given below in order to prevent environmental pollution and accidents to personnel during operations.

While handling consumables (oil, solvents, greases, etc.) follow the producer's instructions and work in ventilated places; avoid contact with the skin and adopt appropriate precautionary measures (gloves, glasses, mask).

While handling oils, solvents and other potentially contaminating substances, adopt all the necessary precautions to avoid dispersal in the environment.
If these substances are spilt on the floor, remove the spills immediately to avoid uncontrolled dispersal in the environment and take appropriate measures to prevent slipping.

Strictly abide by the regulatory standards in force concerning disposal of potentially contaminating substances (oils, solvents).

Packaging products such as cardboard, wood, iron, etc, must be disposed off by separate recycling without dumping in the surrounding environment.
In any case, the regulatory standards in force must be followed.

In any case, the regulatory standards in force must be followed.

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/// 3. Description of equipment

The wheel mounted brake disc, (Figure 1) consist of two friction rings and fixation kit. The friction rings (2) are fixed to the wheel by the main pins (3) and the screws (4) with the nuts (7). The tightness of the screws is guaranteed by the spacers (5,6, see Figure 1).

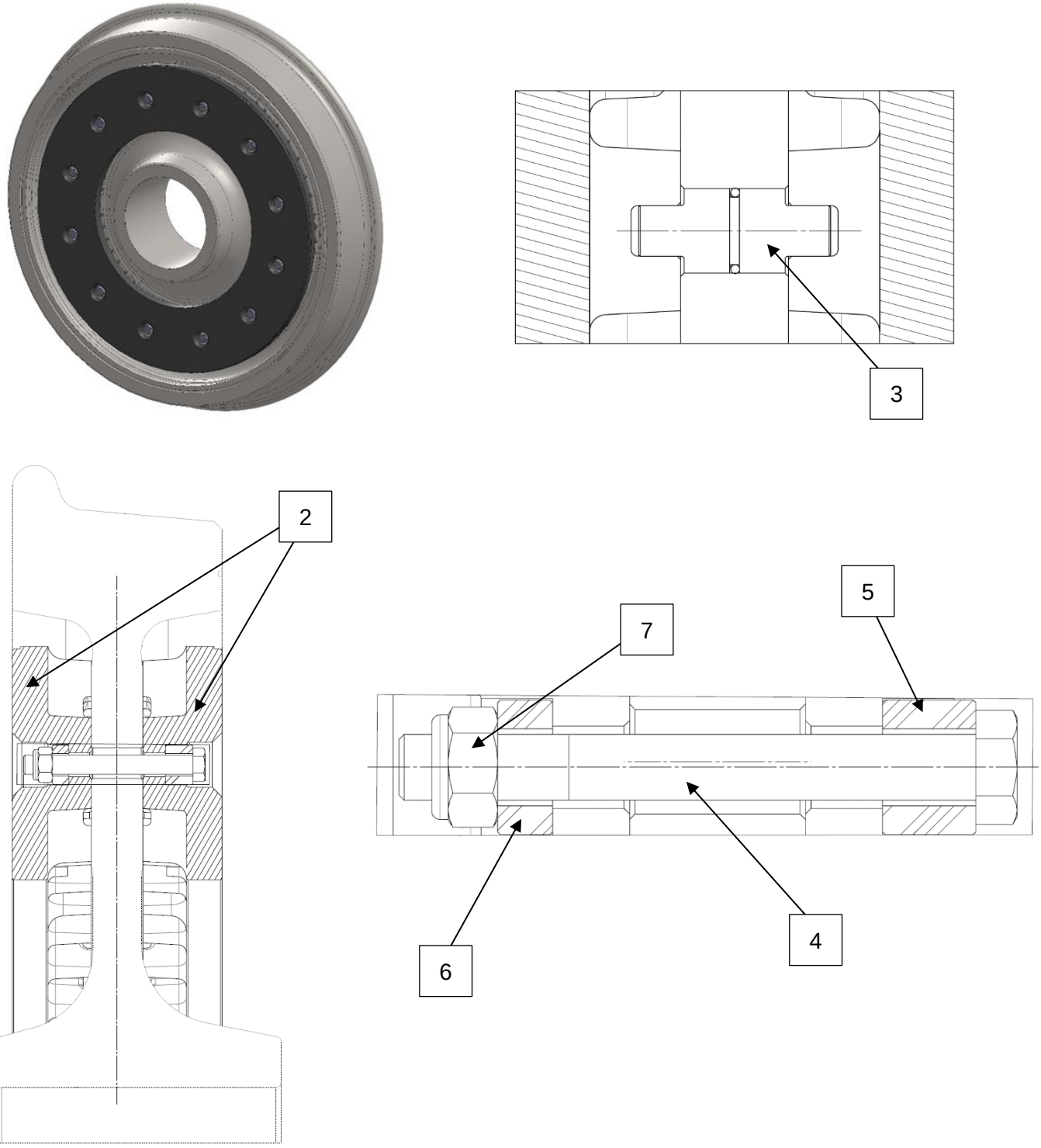

Figure 1

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The two friction rings are both marked at the imbalance position with the serial number (0000), max imbalance value in gm (000GM), drawing number (POLI-00000), month and year of manufacture (MM/AA) (see Figure 2).

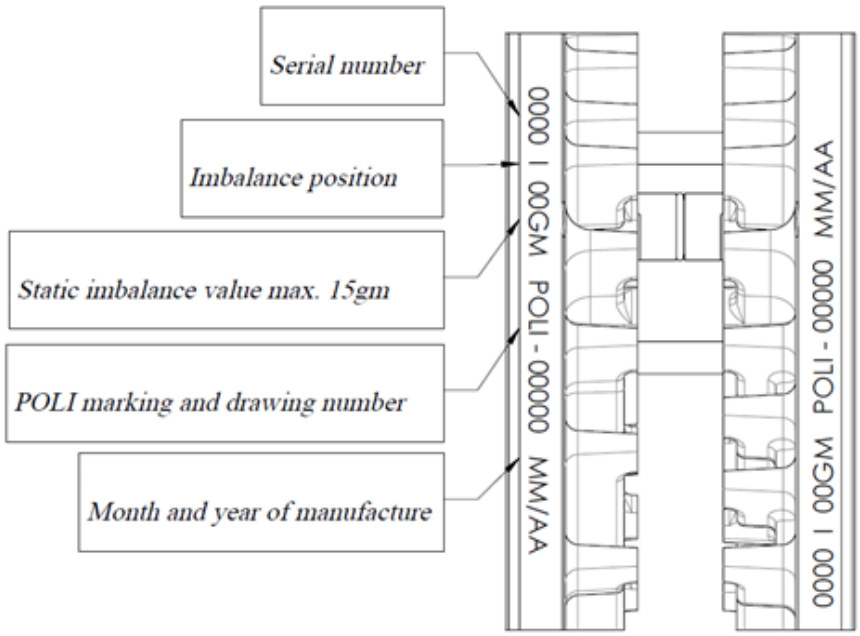

Figure 2

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/// 4. Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance)**: visual inspections and wear measurements as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions.
2. **Second Level Maintenance**: replacement as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions.

/// 5. Tools

This section comprehends the list of all the tool necessary to carry on maintenance on the wheel mounted disc.

Special tool:

- Workbench POLI16939

Generic tool for installation/removal:

- Hammer 0.8 Kg
- Hammer 2 Kg
- Hexagon socket Ch 24
- Torque wrench 60÷160
- Drive reversible ratchet
- Chisels
- Impact wrench
- Molykote GN-Plus
- Hoist with bands (bands must be chosen accordingly to the weight of wheel-disc assembly)

Generic tool for routine maintenance:

- Caliper
- Gauge (disc wear evaluation)

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/// 6. Installation Procedure

General references for safety							
Reference drawings and documents.	- Wheel mounted brake disc 29003-IR						
Tools	**SPECIAL TOOLS** • Workbench POLI16939				**COMMERCIAL TOOLS/CONSUMABLES** • Hammer 0.8 Kg • Hammer 2 Kg • Hexagon socket Ch 24 • Torque wrench 60÷160 • Drive reversible ratchet • Chisels • Impact wrench • Molykote GN-Plus • Hoist with bands		

	WARNING! Maintenance must be performed with the vehicle immobilized.

	WARNING! If the air inlet pipe of the spring parking brake breaks, it would release the spring immediately and consequently apply the parking brake.

	WARNING! Any damage to the brake unit will result in it not working correctly. If the unit is damaged, send it to the supplier for the necessary maintenance or replacement.

	CAUTION! Work on the brake system may make the brakes completely ineffective and consequently cause the movement of the vehicle.

- Put up clear visible signs to warn that maintenance work is in progress (for example with signs on the control panel, electrical panel and on board the vehicle) to prevent other persons from carrying out operations that could place the personnel in danger.
- Before starting any operation, take the utmost care to ensure that the work being done on one part of the system does not jeopardise the safety of workers who are working on other parts.

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6.1 Controls before installation

The new brake disc or the spare friction rings must be controlled before the installation on the wheel.
It is recommended to control main dimensions (external diameter, thickness and fitting hole) in order to check if the disc that is going to be installed is compliant to the drawing or code that has been ordered.
The braking surface of either a complete brake disc or a spare friction ring made of cast iron might show hollows compliant to the following limits:

- Maximum number of hollows for each brake disc: 5
- Maximum diameter of hollows: 10 mm
- Minimum distance between the edges of the hollows: 5 mm
- Maximum depth of hollows: 3 mm

If the number of hollows on the braking surface of the brake disc is equal to or less than three, it is allowed that the maximum depth of each hollow is 5 mm.

	NOTE: Hollows are not defects of the friction rings and do not affect the integrity of material. Hollows will be reducing their dimensions during the normal wear of friction surface till to disappearing.

	NOTE: The brake discs Poli can be provided with a grease surface protection film Rustilo DW370. Before use, is mandatory to clean the disc. Clean it with petroleum solvents, alkaline process cleaner or mechanical action. The removal can be done even after long periods.

6.2 Installation

	WARNING ! It is important for maintenance personnel to follow the instructions below to prevent personal injury.

	WARNING ! The activity has to be done in appropriate conditions and in a dedicated place. A proper lifting device is needed to move correctly the disc and prevent injuries.

	NOTE: For better performance of the wheel-disc assembly, mount the disc so that its imbalance point is opposite to that of the wheel.

	NOTE: Screw and pin once used must be always replaced, they must never be reused.

To ensure correct installation of the Brake Disc on the wheel, the operators must proceed in accordance with the instructions provided herein and the European state of the art, regarding Brake Discs of similar engineering and performance. The procedure described below, must be adopted bearing in mind that positions of components refer to POLI wheel mounted disc drawing.

1. Check that the interface surfaces of the wheel (red part of Figure 3) where the discs have to be applied, are free from paint or rust. Remove any paint or rust using a scraper.
2. Threat the wheel surface before friction rings installation with Molycote G-N Plus (red part of Figure 3).

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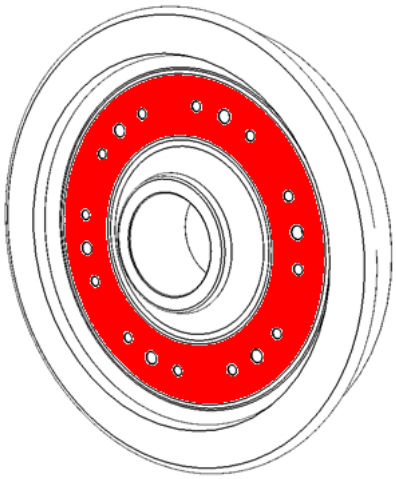

Figure 3

3. Using hoist and band (able to support the weight of the whole assembly wheel and disc), place the wheel, with the vertical axis and flange (internal side of wheel) facing upward, on the workbench POLI16939 (Figure 4).

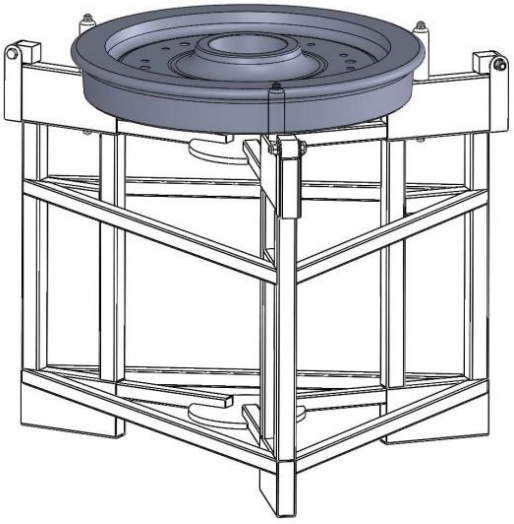

Figure 4

4. Use a Go/No-go gauge to check that all the wheel holes are within the tolerance stated in the Poli wheel interface drawing, especially the holes ∅ 25 mm H8.
5. Lubricate the holes ∅ 25 mm in the wheel with grease Molykote GN-Plus and, using a copper hammer, insert main pins (3) into the hole seats, so that they project by the same amount on both sides of the wheel; they must mate with just a little friction due to the O-Ring (8) mounted on the pins (3, see Figure 5).

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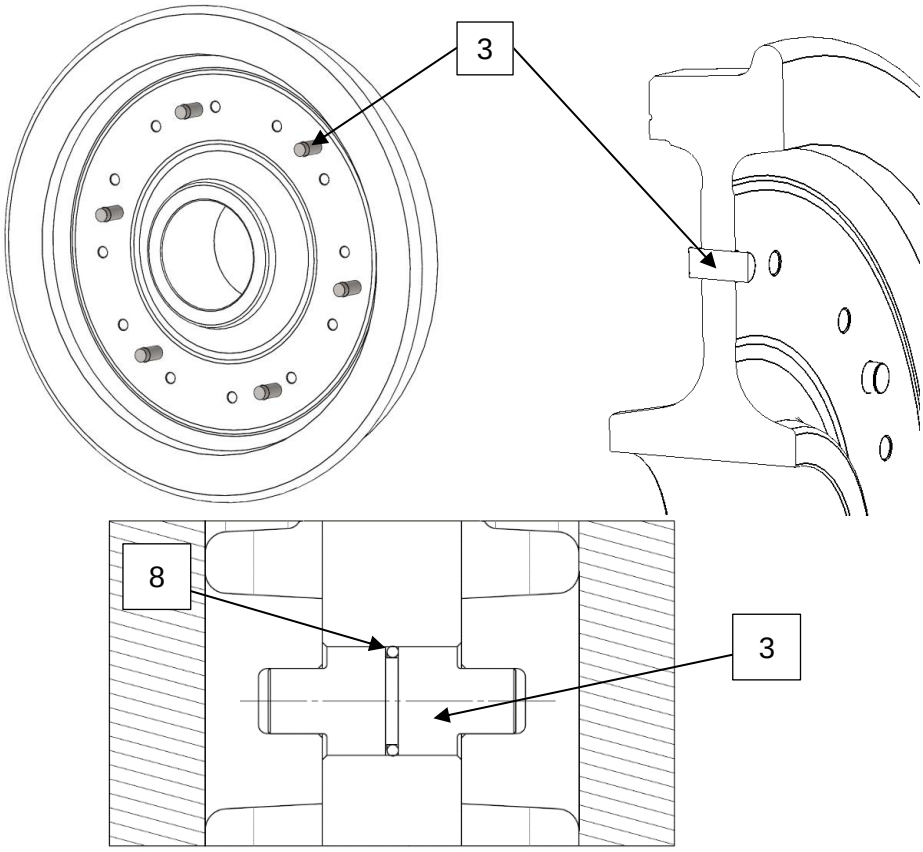

Figure 5

6. Fit the friction ring (2) on the wheel.
7. Fix the internal friction ring (2) to the wheel by using at least 3 temporary bolts M12x130 (min. length) in the holes equally spaced (120°, see Figure 6).

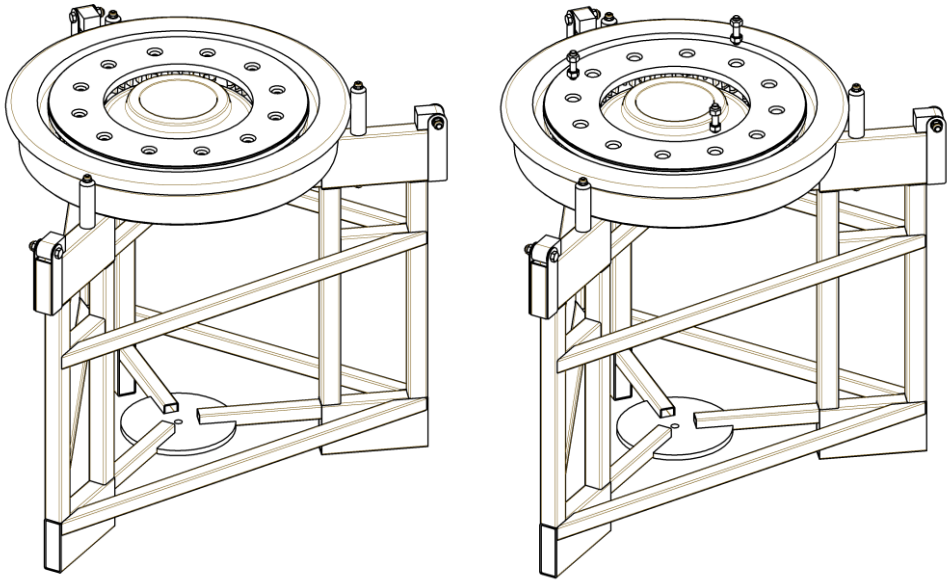

Figure 6

8. Using hoist and band (able to support the weight of the whole assembly wheel and disc), turn the assembly upside down, supporting it from the assembled friction ring surface. Don't make the supports touch the friction ring on the holes, to have access for screws assembly (see Figure 7).
9. Put three spacers on the bench, under the wheel, to support the internal ring.

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10. Remove the temporary bolts M12x130.

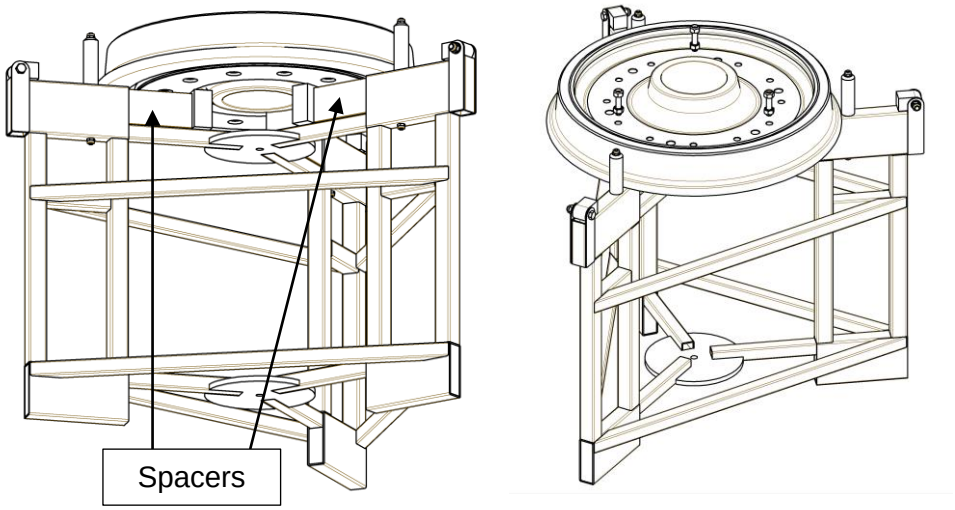

Figure 7

11. Lubricate the bolts thread and the screw thread using grease Molycote GN-Plus.
12. Install the fixings as shown in the assembly drawing, paying attention to insert the spacers (5 and 6) in the correct way (see Figure 8).

⚠	**WARNING! Wrong position of spacers (5 and 6) could compromise the integrity of the disc-wheel assembly.**

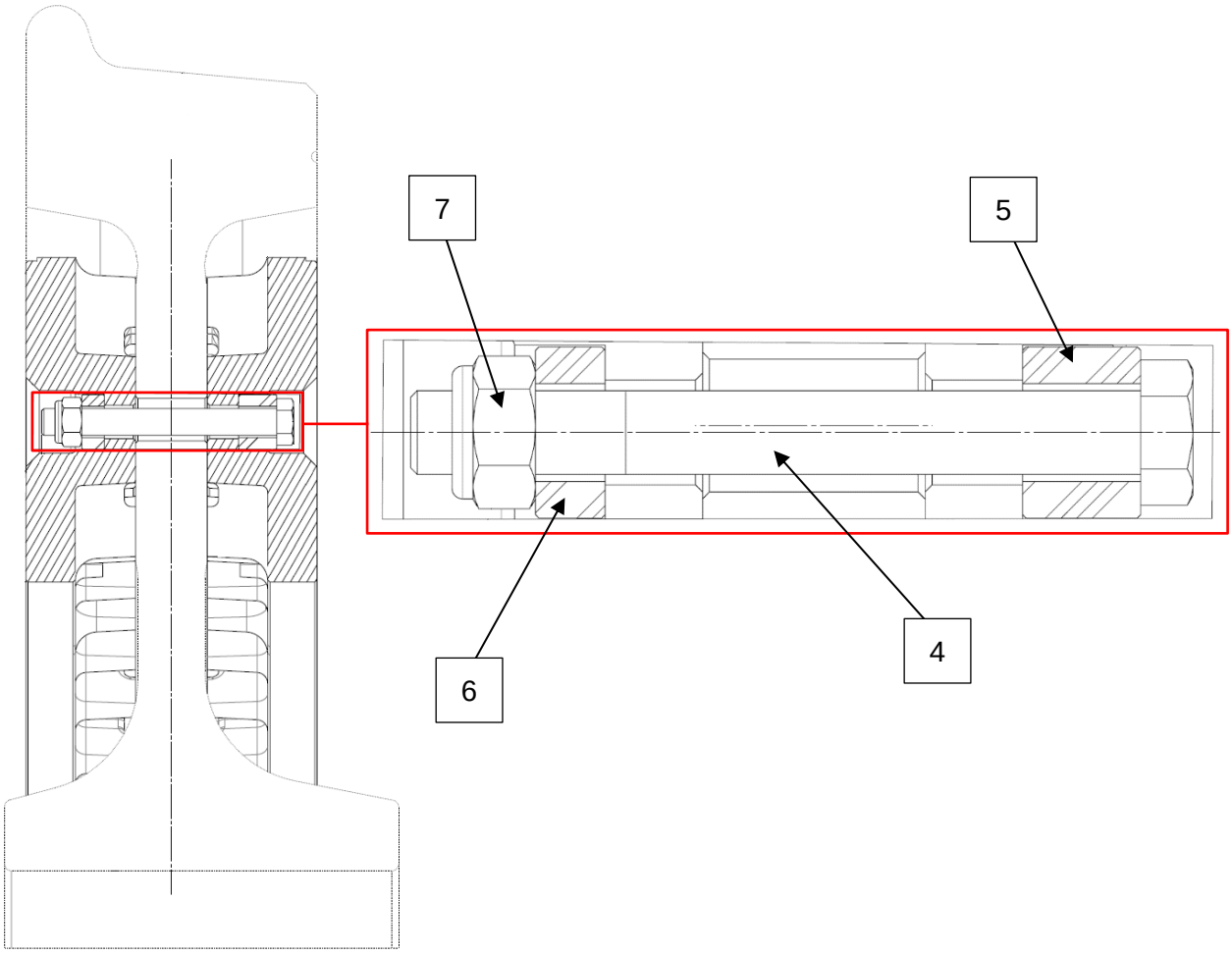

Figure 8

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13. Pre-tighten the screws (4) at 40 Nm (N.B. do not use a pneumatic impact wrench for this operation).
14. Check that the two friction rings (2) are correctly assembled referring to the wheel sides.
15. Tighten the screws (4) at 80 Nm, following the order from 1 to 12 (see Figure 9).

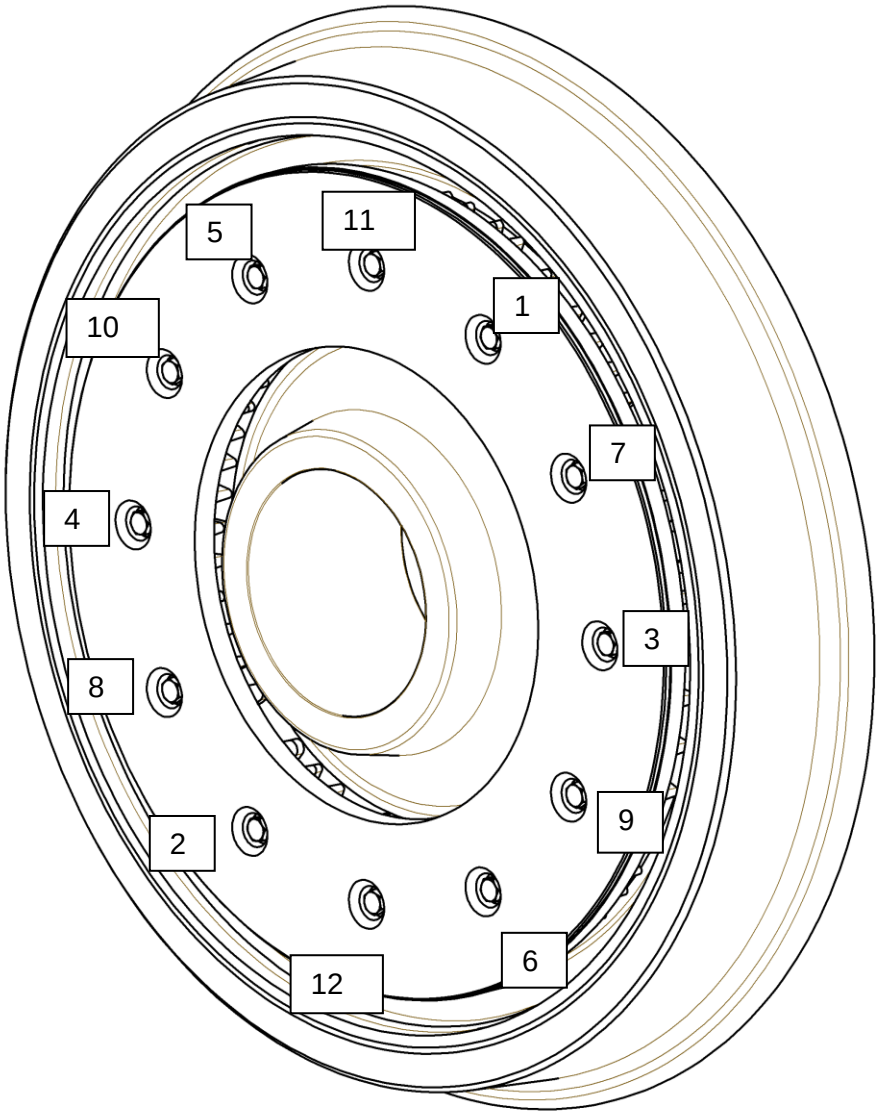

Figure 9

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/// 7. Removal procedure

General references for safety							
Reference drawings and documents	- Wheel mounted brake disc 29003-IR						
Tools	**SPECIAL TOOLS** • Workbench POLI16939						
	COMMERCIAL TOOLS/CONSUMABLES • Hammer 0.8 Kg • Hammer 2 Kg • Hexagon socket Ch 24 • Torque wrench 60÷160 • Drive reversible ratchet • Chisels • Impact wrench • Molykote GN-Plus • Hoist with bands						

	WARNING! Maintenance must be performed with the vehicle immobilized.

	WARNING! Sharp edges

	WARNING! Check that the temperature of contact surfaces is not dangerous, before starting the operation.

	WARNING! If the air inlet pipe of the spring parking brake breaks, it would release the spring immediately and consequently apply the parking brake.

	WARNING! Any damage to the brake unit will result in it not working correctly. If unit is damaged, send it to the supplier for the necessary maintenance or replacement.

	WARNING ! It is important for maintenance personnel to follow the instructions below to prevent personal injury.

	WARNING ! The activity has to be done in appropriate conditions and in a dedicated place. A proper lifting device is needed to move correctly the disc and prevent injuries.

	CAUTION! Work on the brake system may make the brakes completely ineffective and consequently cause the movement of the vehicle.

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To ensure correct installation of the Brake Disc on the wheel, the operators must proceed in accordance with the instructions provided herein and the European state of the art, regarding Brake Discs of similar engineering and performance. The procedure described below, must be adopted bearing in mind that positions of components refer to POLI wheel mounted disc drawing.

	NOTE: Before removing the wheel mounted disc, take note of the position of its imbalance point respect to that of the wheel for correct assembly of the new disc.

1. Place the wheel, with the vertical axis and flange (inside of wheel) facing upward, on the workbench POLI16939, with the locator pins fitted and secured in place using the M12 bolts provided (see Figure 10).

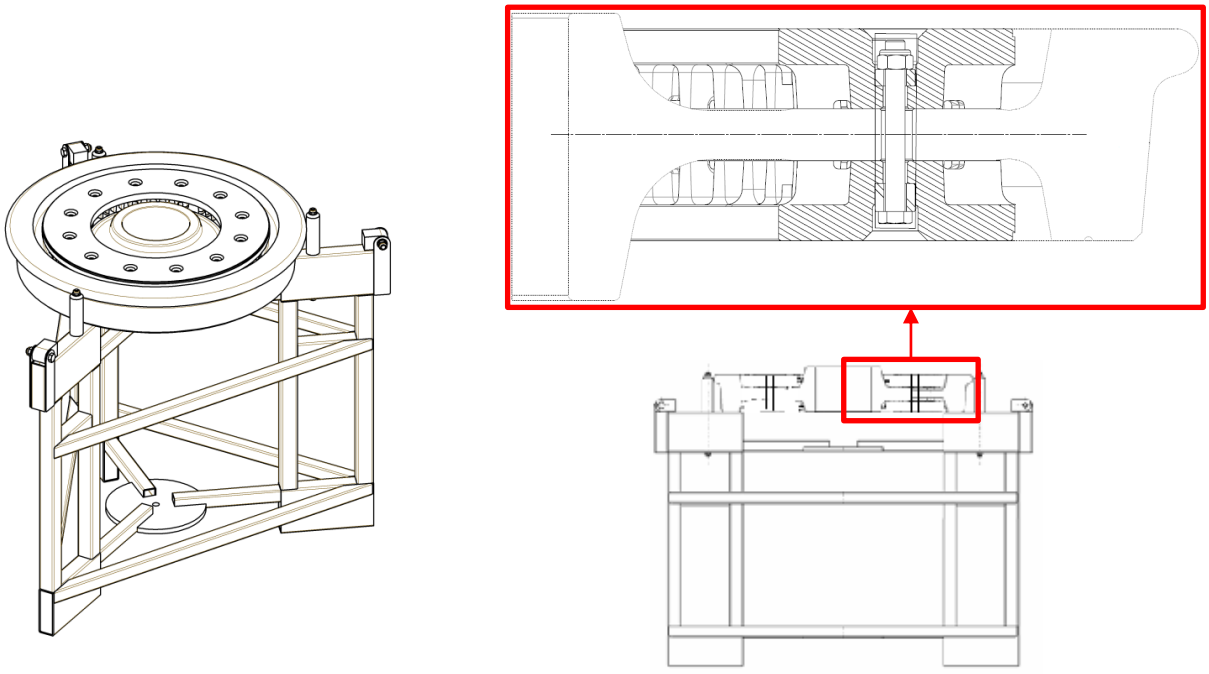

Figure 10

2. Put three spacers on the bench, under the wheel, to support the internal ring (see Figure 11).

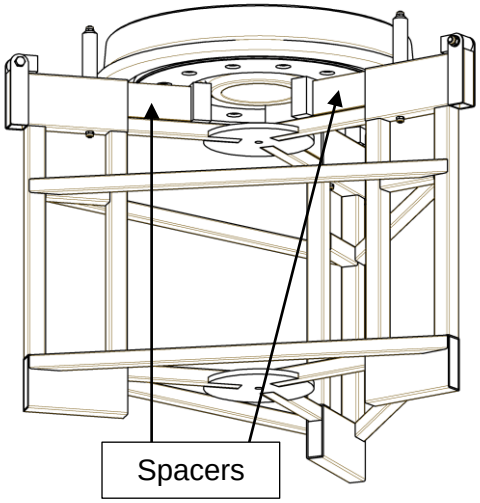

Figure 11

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3. Clean the hex nut (7) to guarantee that the key comes to the end.
4. Apply some liquid lubricant on all the nuts-thread (7) to facilitate the unscrewing operation (see Figure 12).

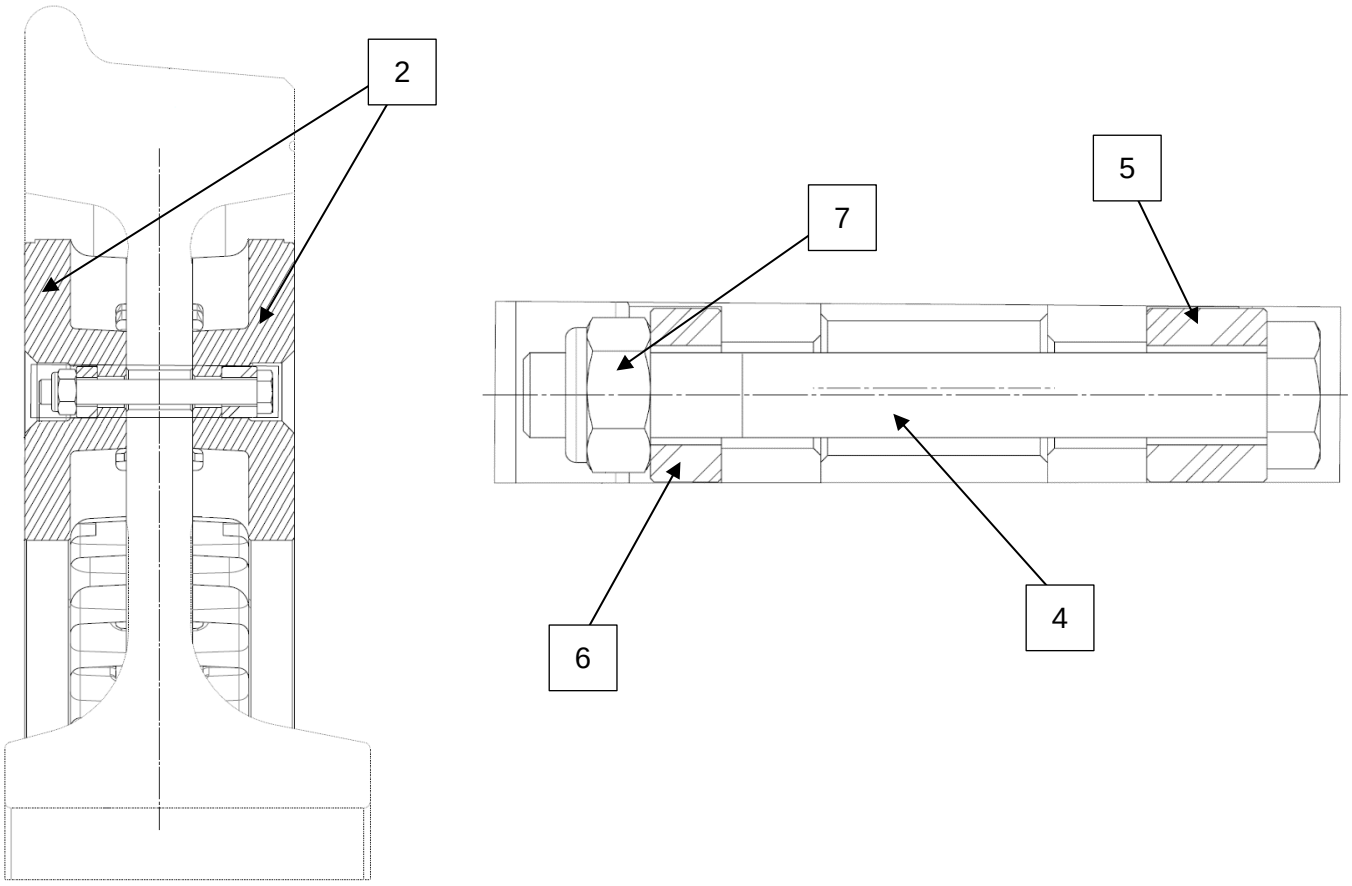

Figure 12

5. Remove the nuts (7) and the screws (4) using the hex key ch.12 male anticlockwise following the order from 1 to 12 indicated as in the Figure 13.

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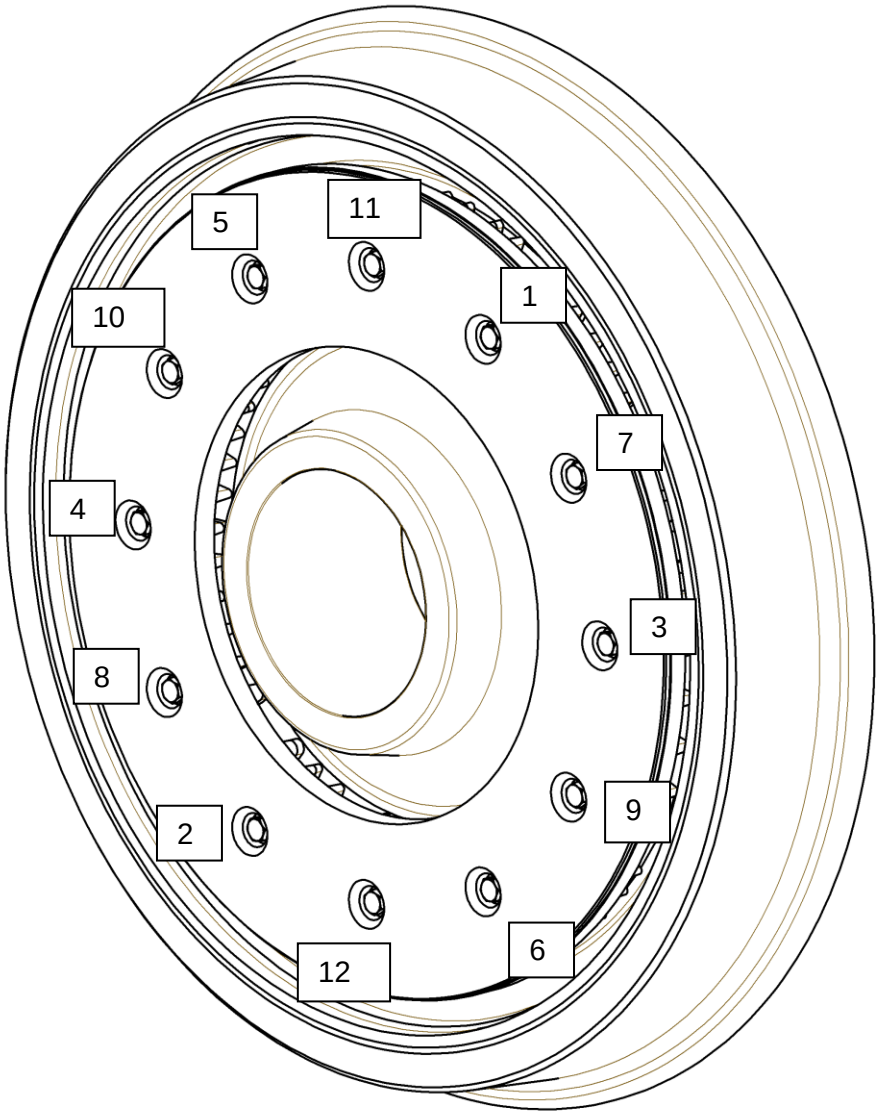

Figure 13

6. Remove all spacers (5,6). After this operation, with two levers, is possible to remove one friction ring (2).
7. Fix the lower friction ring (2) to the wheel by using at least 3 temporary bolt M12x130 (min. length) in the holes equally spaced (120°, see Figure 14).

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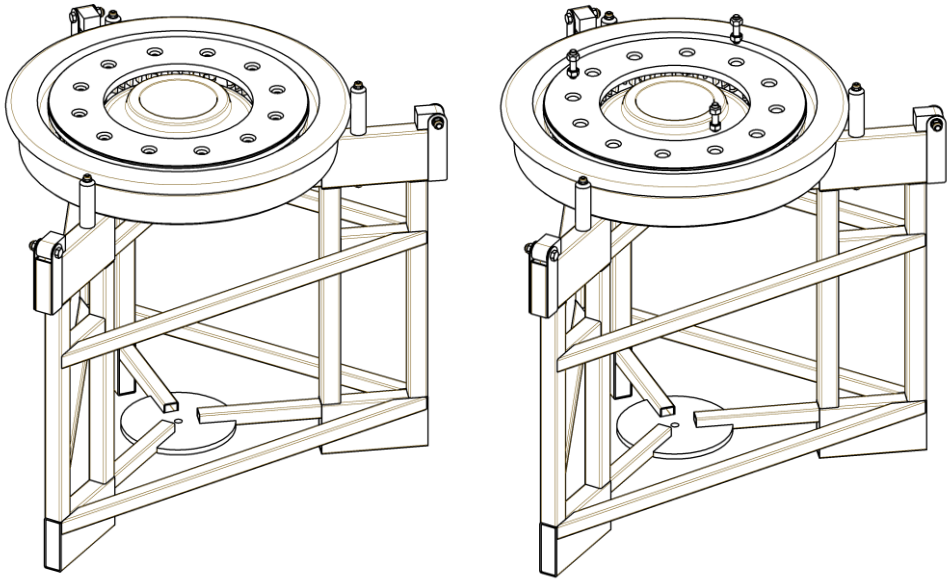

Figure 14

8. Using hoist and band (able to support the weight of the whole assembly wheel and disc), turn the assembly upside down, supporting it from the assembled friction ring surface. Don't make the supports touch the friction ring on the holes, in order to have access for screws assembly.
9. Remove the 3 temporary bolts M12x130.
10. Remove the last piece of friction ring (2)
11. Now is possible to remove all pins (3, see Figure 15).

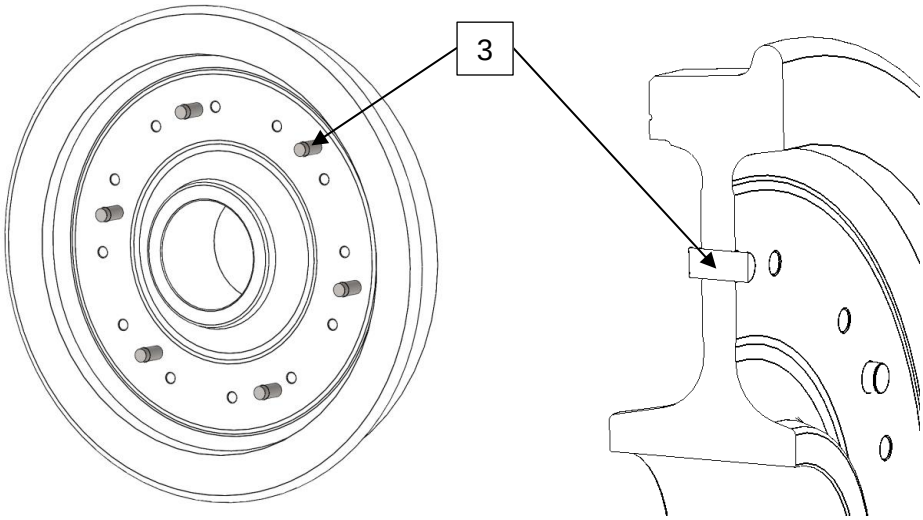

Figure 15

	NOTE: Screw and pin once used must be always replaced, they must never be reused.

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/// 8. Routine maintenance

General references for safety						
Reference drawings and documents	- Wheel mounted brake disc 29003-IR					
Tools	**SPECIAL TOOLS** • N/A		**COMMERCIAL TOOLS/CONSUMABLES** • Caliper • Gauge (disc wear evaluation)			

	WARNING! Maintenance must be performed with the vehicle immobilized.

	WARNING! Sharp edges

	WARNING! Check that the temperature of contact surfaces is not dangerous, before starting the operation.

1. Check visually all bolted connections. In case some nuts are found loosen or some bolts are missing, it is necessary to recover the wheelset for further investigations.
2. Check friction ring and measure friction ring wear; if are present cracks, scores, hollow wear or excessive wear, follow below instruction to verify if corrective actions are needed.

8.1 Thermal cracks

Thermal effects caused by braking effort can bring to formation of cracks on brake disc friction surfaces. In case of defective working by the brake equipment or incorrect handling which may cause particularly high temperature peaks on the disc (like, for instance, overpressure on the brake pads, vehicle dragged with its brake applied, burning of pads) or thermal shocks (above all, the extinguishing of burning by water sprays), the formation of thermal cracks can be increased in a significant way and could require some special attention (through cracks).

During the visual inspection, the operator must be able to evaluate if the brake disk presents cracks that may be considered abnormal and must investigate the cause of such anomalies. As previously explained, the formation of thermal cracks and their propagation occurs only in abnormal operating conditions, which would be encountered during maintenance and then analyzed and eliminated. If cracks length is close to the limit, them must be monitored to check that cause of formation have been eliminated and to avoid propagation beyond acceptance limit during operation. The general criteria for crack allowance applicable to POLI brake disc are provided below.

	NOTE. In case the brake disc surface is affected by cracks that cannot be recognized in the following criteria or the crack length/depth is increasing within following controls, don't hesitate to contact WABTEC/Poli for technical support.

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Refer to Figure 16:

8.1.1 Cracks type A

The cracks type A are defined as “hair cracks” or “crazing”.
They are normally created by the interaction between an aggressive pad material and the cast iron.
Usually they disappear with the normal wear of the brake disc that refurbish the surface.

8.1.2 Cracks type B – C – D

a) cracks that start and finish in the central zone of the friction surface.
b) cracks that start from the outer or the inner diameter.

8.1.3 Cracks type E

Pass through cracks from the inner to the outer diameter or that reach the fins (passing through the complete thickness of the friction ring).

Crack	Length	Evaluation
Type A	Any	Acceptable
Type B	a<80 mm b<60 mm	Acceptable
Type C	80 mm<a<100 mm 60 mm<b<80 mm	Acceptable in a limited condition. Keep them checked during the next maintenance
Type D	a>100 mm b>80 mm	Not acceptable, the discs must be replaced.
Type E	Any	Not acceptable, the discs must be replaced.

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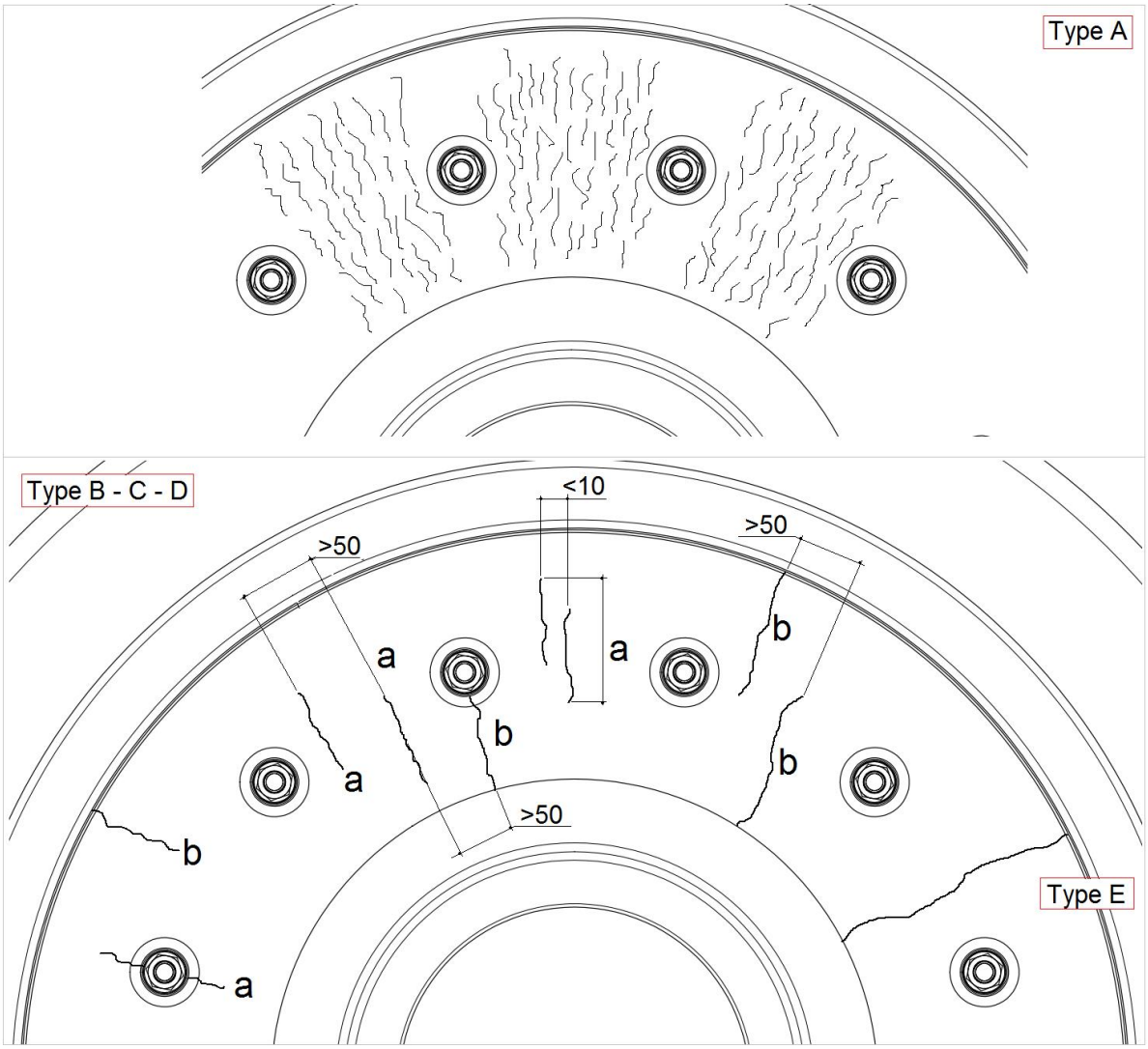

Figure 16

8.2 Scores

They may occur in the event of infiltration of any foreign matters between the disc working surfaces and the friction pads or consequent to brake application with entirely worn out pads (then with the pad holders rubbing onto the disc surfaces directly). The surface refurbishing shall be done in case the scores are present in a circular area with radial extension ≥ 50 mm (De-Di≥100) with maximum depth of 2 mm referred to the fiction surface and if the roughness is ≥ 6.3Ra. In the case of the lighter scratches, when you remove the cause, the correct geometry of the friction surface would be restored during the normal use of the brake.

8.3 Concave wear

The wear of the friction rings can determine in time the appearance of concavity in the braking surfaces. This phenomenon is physiological and can be more or less accentuated. If the max. measured depth of the concavity (indicated by **X** in Figure 18) is >2 mm, it is advisable to lathe-shape the braking surfaces, restoring flatness and roughness as specified in the disc assembly drawing.

This wear can be caused by many reasons, such as an unparallel pad clamping on the disc surfaces due to salt-caused pad holder gripping, that causes different pressures on the same disc areas.

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It is mandatory to restore the flatness of both sides of the brake disc through lathe-shaping when the concavities have reached a 2 mm depth (indicated by **X** in the Figure 18).

Before lathe-shaping is important to evaluate if, after the process, there is enough wear material to reach the next overhaul stop

During any lathe-shaping, material must be machined on both surfaces in a symmetrical way. The braking surface turning is made directly on the assembled wheel set, which is placed on the lathe without having to remove the disc, as shown in Figure 17.

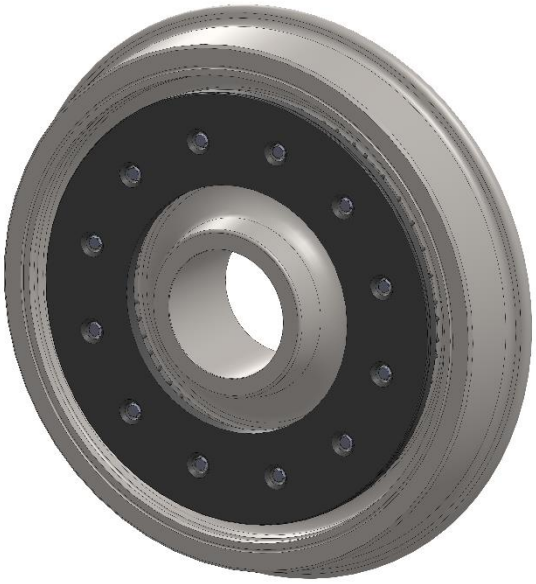

Figure 17

Friction ring shall be replaced when its wear reaches special marks displayed on the outer cylindrical surface, indicated by **Z** dimension in Figure 18.

For every rail application it is necessary to evaluate the available wear of the brake disc because, even if the disc have not yet reached the wear limit, it is possible that it cannot be used until the next overhaul stop.

During the periodical inspections made on the vehicle, it is necessary to evaluate the residual thickness of the disc $\mathbf{S_R}$ using an appropriate measuring device in the point where the concavity is maximum and the thickness is minimum, checking that the wear is the same for both the disc sides.

Subtracting the measured value $\mathbf{S_R}$ from the value of the brand-new disc, it is defined the worn thickness [mm] $\mathbf{S_U}$**.** The value of the specific wear for the application $\mathbf{U_S}$ [mm/km] is defined by the ratio between $\mathbf{S_U}$ and $\mathbf{I_{M1}}$ where $\mathbf{I_{M1}}$ is the maintenance interval in km run by the vehicle from the installation of the brand-new disc. The brake disc can be used until the next overhaul stop $\mathbf{I_{M2}}$ if it is verified the relation:

$$S_R - S_L \geq U_S * I_{M2}$$

Where S_L [mm] is the thickness of the brake disc in the complete wear condition.
If the relation is not verified it is not useful to perform the refurbishment of the surface because anyway the residual thickness of the brake disc will not be enough to reach the next overhaul stop.

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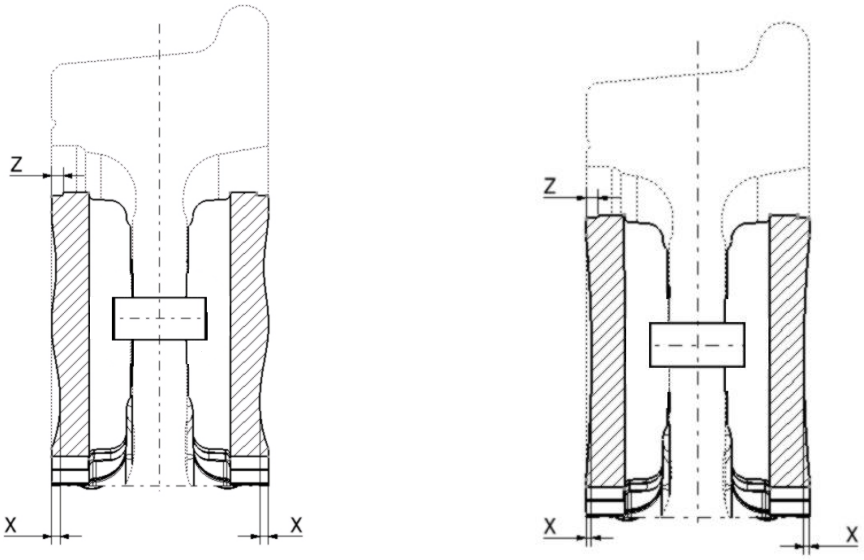

Figure 18

8.4 Corrective measures

During the scheduled maintenance intervals, the workshop will assess the condition of the brake disc.

1. If the disc reached the limit of the wear as shown it the Figure 18, the disc must be replaced.
2. If the brake disc had reached wear that does not guarantee a further distance, the disc must be replaced.

During the replace of the wheel, the maintenance workshop will assess the brake disc.

3. If the brake disc had reached wear that does not guarantee a further distance, then you must replace it together with the wheel.
4. If the brake disc wear thickness is enough to guarantee further distance, the brake disc existing deemed suitable and is necessary to order a new fixation kit only.

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/// 9. Spare parts

- **Routine Maintenance** – Spare parts not required.
- **Installation** - Spare parts required for installation are listed in the following table:

REF.	DESCRIPTION	P/N	QUANTITY
2	Friction Ring	29005	2
-	Fixation kit	SOKL-29003-01	1
-	Molycote G-N Plus	-	Q.s.

Table 1: spare parts' codes

/// 10. Disposal

The device is mainly composed by the following materials: cast iron, steel.

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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14.07_14.08_BRAKE CALIPER SERVICE BRAKE

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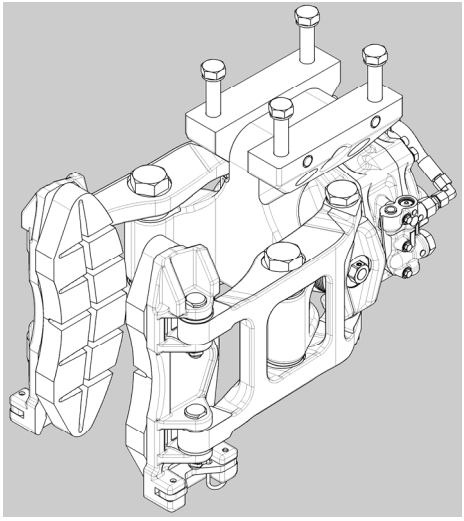
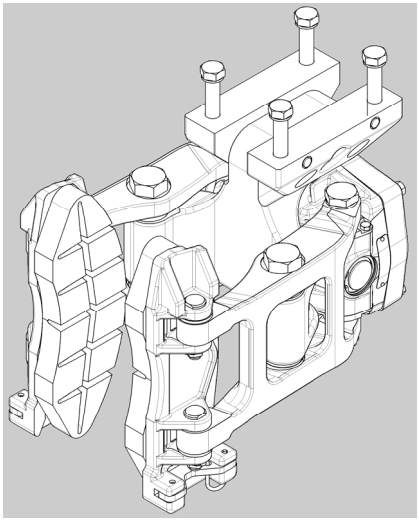
Brake caliper

Versions according to drawing no.
136281F41_ and 136281F51_

Report No. V/H 16/091
October 25, 2017





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Brake caliper

Versions according to drawing No. 136281F41_
136281F51_

Technical manual
for the maintenance staff

Manufacturer and sales

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Faiveley Transport Witten GmbH reserve the right to modify the product described here in accordance with technical progress at any time and without prior notice, unless it is subject to a contrary contractual ruling.

Modification Record

Modification	of	incorporated on	by
First issue 06/16		2016/06/27	Schulz/ FT
Status 06/16 in status 10/17 Figures modified: Cover, 3.1, 3.2, 3.3, 7.1, 7.7, 8.1, 9.1, 9.6, 10.1a, 10.2. Modification of air connection (Service brake). Tightening torques added (Page 8-3). Threaded bolts (Pos. 5) with high screw head. Layout revision: all pages.		2017/10/25	Schulz/ FT

REVISIONS					
Index	**Date**	**Description**	**Compiled**	**Checked**	**Approved**
06/16	27.06.2016	First release	N. Schulz	T. Gallbeck	O. Kühl
10/17	25.10.2017	refer modification record	N. Schulz	T. Gallbeck	O. Kühl

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Information on this manual

This manual is intended for the technical introduction to maintenance and repair work. It contains all the information required to carry out the work properly and comprises a technical description and, for ordering spare parts, spare parts catalogue.

The manual is divided into several chapters for the sake of better clarity. In this way the required information can be found very quickly.

References in the text concerning figure and item numbers in the text are placed in brackets: e.g. (9.1/3) means: Fig. 9.1, item 3.

The overhaul of the brake cylinders is not described in this manual.

In requirement order separately an overhaul manual (see chapter 6.1).

The following graphic symbols have been used to make particular situations clearer:

NOTE **Notice indicates a property damage message and important information in the text!**

CAUTION **Caution indicates a hazardous situation which, if not avoided, may result in minor or moderate injury!**

WARNING	**Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury!**

1 Safety and operating safety regulations

WARNING

(1) The wheel-mounted disc brake is constructed in accordance with the state of the art and with generally acknowledged safety regulations. **Even so**, its use can **expose the user or third parties to danger to life and limb**, and cause damage to the machine itself or to other property**.**

(2) The **wheel-mounted disc brake** must be in **perfect mechanical condition** and may be **used** only for its design purpose, in accordance with the operating manual and with full awareness of safety requirements. Any malfunctions compromising safety must be immediately rectified either by the user or by yourselves!

(3) **The wheel-mounted disc brake is intended solely for the braking of rail vehicles**. Its use for any other or for any more extensive purpose is not in accordance with its design, and the manufacturer will accept no responsibility for any resulting damage. The risk is borne entirely by the user.

Use for the intended purpose comprises the observance of the contents of this manual.

(4) Keep the manual in a place of which the user must be informed.

(5) In addition to the provisions of the operating manual, all general legal and other binding regulations for the prevention of accidents and the protection of the environment must be observed and applied!

(6) **Personnel** entrusted with work on the wheel-mounted disc brake **must read** the maintenance instructions, in particular the chapter on **safety requirements**, **before beginning work**. This is especially true for personnel working on the brake only sporadically.

(7) **Protective clothing** (e.g. gloves) must be worn if necessary or if required by regulation!

(8) **No alterations**, additions to or modifications of **the wheel-mounted disc brake may be made.**

(9) Spare parts must conform to the technical requirements specified by the manufacturer. This can be ensured only by using original-Faiveley Transport spare parts.

(10) It is essential that the **intervals** for recurring checks and servicing prescribed or stated in the maintenance instructions be **adhered to without fail!**

(11) Use only specified lubricants.

(12) Refrain from all working practices that could be prejudicial to safety.

(13) **Observe the setting, maintenance and inspection work and deadlines** including information on the replacement of parts/parts of the **equipment!** This work must be performed by skilled personnel only.

(14) Always **firmly tighten screw connections loosened** during maintenance and repair work; **adhere to the tightening torques** specified**.**

(15) Ensure safe and environmentally acceptable disposal of consumables and auxiliary materials and replaced parts!

(16) When handling oils, greases and other chemical substances observe the safety regulations applying to the product!

References to special dangers

(17) For repair/overhaul of the brake cylinders it is necessary to need a special assembly device.

Spring actuators are assembled with high prestress.

(18) **For maintenance work** on the caliper **depressurise the compressed-air pipes**.

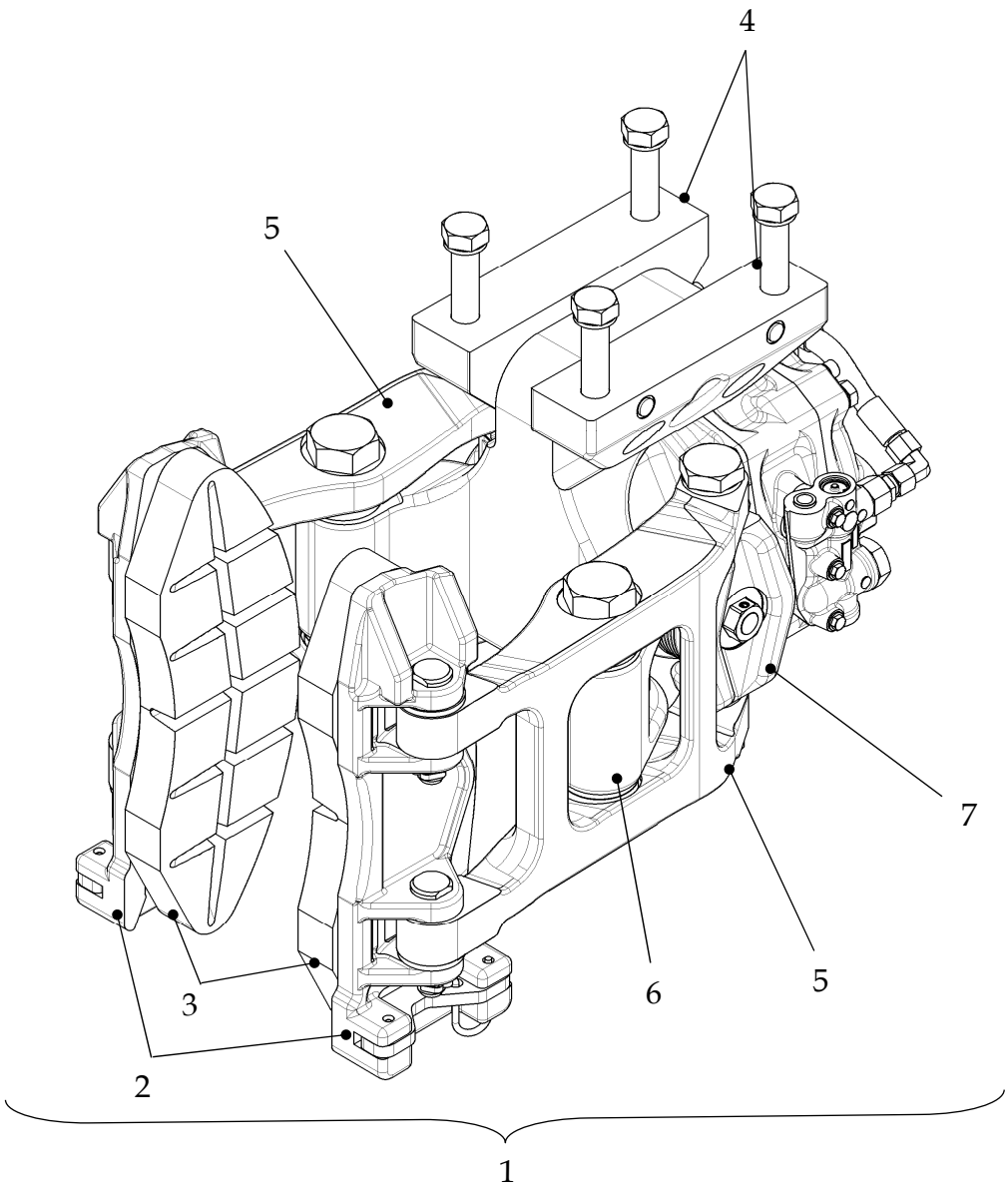
(19) **Install and connect the compressed-air pipes** and their connections **in a workmanlike manner**. The quality of the connections must meet the requirements.

2 Warranty

For every Faiveley Transport product supplied Faiveley Transport provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

This warranty does not apply to such damage as is caused by normal wear, improper treatment, negligent treatment, fitting of non-original spare parts, insufficient care and/or non-observance of this technical manual.

The brake caliper must be used only by appropriately trained persons. Otherwise any warranty in accordance with the delivery terms shall become null and void.



1 - Brake caliper, compl.
2 - Pad holder; 2x
3 - Brake pad; 2 x 400 cm²
4 - Adapter; 2x
5 - Brake lever; 2x
6 - Brake bridge piece
7 - FT-brake cylinder

Fig. 3.1

3 Description

3.1 Application

The brake caliper with built-in brake cylinder in conjunction with a set of wheel-mounted brake discs makes up a wheel-mounted disc brake for rail vehicles.

This compressed-air brake (electro- pneumatic brake) serves as a supplementary and safety brake in addition to the regenerative brake. The brake calipers with spring- loaded brake cylinders can also be used as a parking brake.

Fig. 3.1 General view of brake caliper

3.2 Place of installation

The wheel-mounted brake discs are fitted to the wheels of the vehicle.

Any rail wheel is assigned to a wheel brake disc set.

The brake calipers are mounted on the bogie frame in the wheels area.

3.3 Versions

The brake calipers of the bogies are used with the following designs:

- Brake caliper, cpl. according to drawing 136281F41_
  with FT-spring loaded brake cylinder CCC PB 8"/8"
- Brake caliper, cpl. according to drawing 136281F51_
  with FT-brake cylinder CCC SB 8".

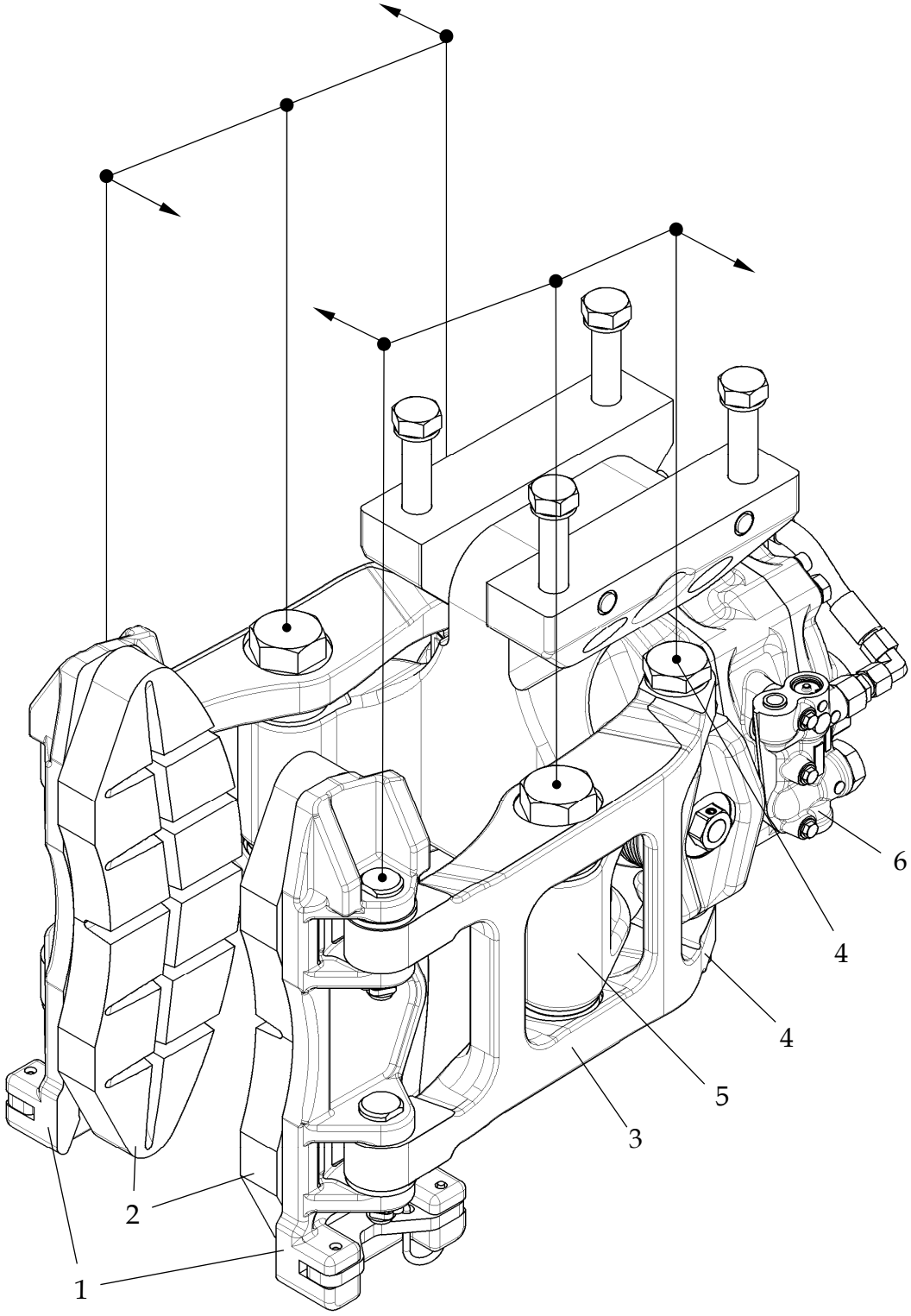


Fig. 3.2

3.4 Function

During the braking process the brake cylinder (3.2/6) - which is operated by compressed-air - extends. The fastening points (3.2/4) of the brake levers (3.2/3) follow this motion.

Since the pivot points of the brake levers are located on the brake bridge piece (3.2/5) that is designed as a fixed point, the ends of the lever that are connected to the pad holders (3.2/1) move toward the brake disc. The caliper closes, the brake pads (3.2/2) apply to the brake disc.

By means of increased pressure in the brake cylinder, the braking force is building up according to the cylinder pressure - the braking effect begins.

When releasing, the described procedures occur in the opposite order, whereas the brake regulator that is integrated into the cylinder opens the brake to the predetermined brake pad clearance.

The brake cylinder with spring actuator may be released by a release-cable.

Fig. 3.2 Function of the brake caliper

Functioning of the brake caliper as a whole can only be ensured, if the indicated wear dimensions of the following components are not exceeded.

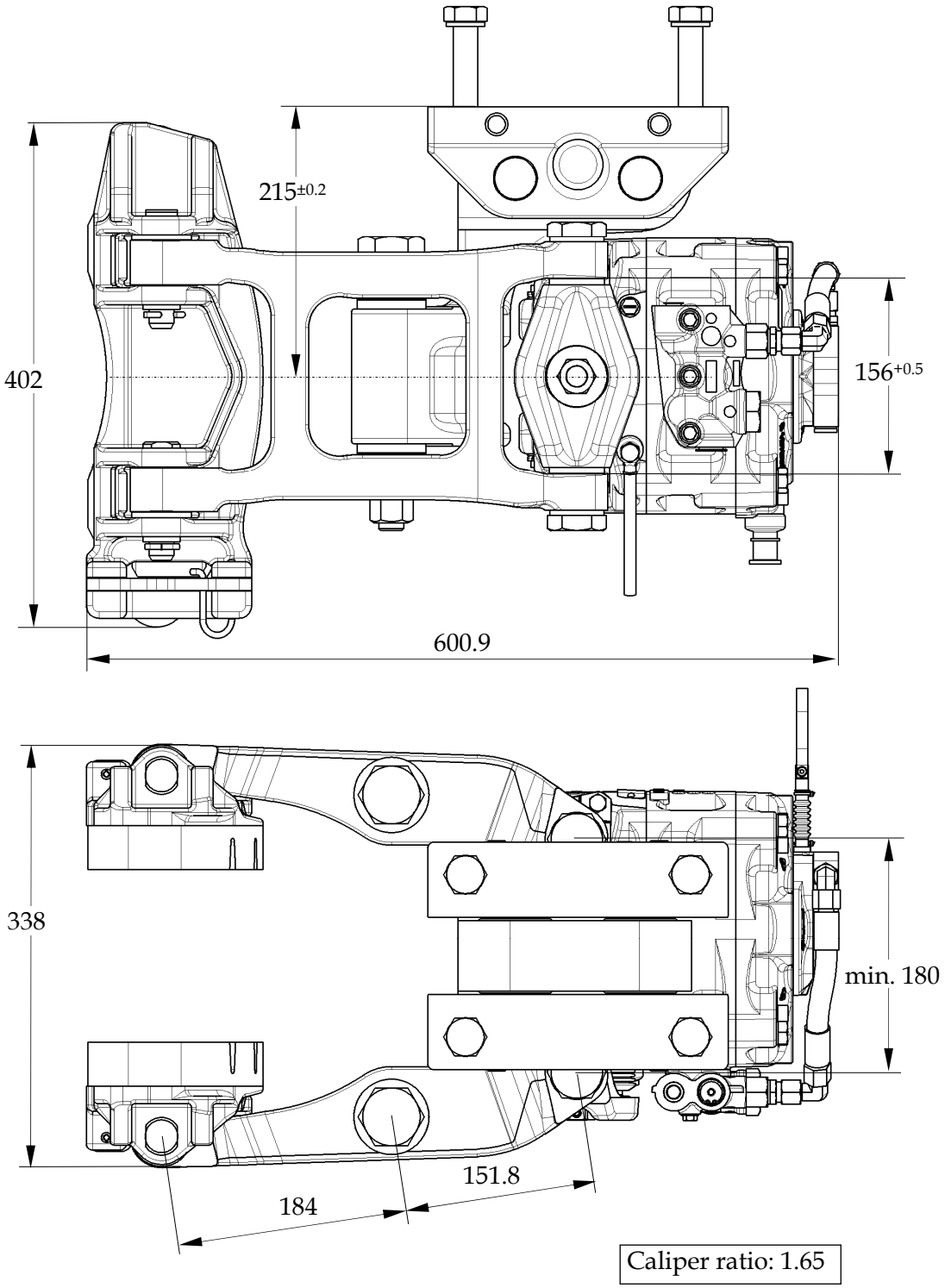


Fig. 3.3 (Dimensions in mm)

3.5 Technical data

3.5.1 Weight

- Brake caliper (with brake cylinder SB, with brake pads) ..... ca. 96.6 kg
- Brake caliper (with brake cylinder PB, with brake pads) ..... ca. 104.6 kg
- Brake caliper (without brake cylinder, without brake pads) ..... ca. 59.8 kg
- FT- Brake cylinder CCC SB 8" ..... ca. 18.0 kg
- FT- Brake cylinder CCC PB 8"/8" (with parking brake) ..... ca. 25.6 kg

3.5.2 Compressed air data

Data for the traction operation

- Max. permitted pressure in service (service brake) ..... 4.5 bar
- Max. permitted pressure in service (parking brake) ..... 8.0 bar
- Minimum release pressure (parking brake) ..... 4.5 bar
- Service brake air connection ..... G 1/2“
- Spring actuator air connection ..... G 1/4“

Data for the cylinder test stand

- Maximum admitted test pressure (service brake) ..... 6 bar
- Maximum admitted test pressure (parking brake) ..... 10 bar

3.5.3 Dimensions

Fig. 3.3 Brake caliper dimensions

4 Operation and service

WARNING!	**Operation of the brake systems must be carried out only by authorised skilled personnel.** **Faulty operation may expose the user to danger to life and limb and/or cause serious material damage.**

The dynamic braking process is initiated from the driver's cabin, alike the operation of the spring loaded brake.

The brake caliper is activated by the air pressure in the brake cylinder controlled by the brake controls.

On the driver's display it's possible to control the operating conditions.

The spring loaded brake ensures, when the train is parked, that the train is protected from rolling away.

In blocked state it is not allowed to move on the train.
Start the train moving only when the parking brake is fully released.

The spring loaded brake cylinders have a mechanical emergency release device. The brake cylinder with spring loaded may be manual released via release cable.

5 Transport/ Storage

5.1 Transport

The brake caliper is normally supplied as a unit ready for mounting.

Use an appropriate load suspension device (fork lift truck/crane) for transporting the pallet. Use fabric belts for lifting the brake caliper in order to avoid damage. Place the straps in such a way that no components are damaged.

Comply with the corresponding safety regulations during transport.

5.2 Storage

If the brake caliper is to be stored before mounting for a long time, the following points should be observed:

- Deposit the brake caliper on a wooden pallet and cover,
- do not pile up.
- Only dry and ventilated rooms should be used for intermediate storage.

The brake caliper must never be exposed unprotected to atmospheric influences or high humidity (condensation).

A correctly stored Brake caliper does not need any special inspection before mounting.

Merely check smooth running before mounting.

At longer storage (more than 1 year) check the brake cylinders about tightness and grease condition (order special instructions).

6 Tools and consumables

6.1 Tools/ Equipment

No tools are needed for operation of the wheel-mounted disc brake fitted. For disassembly and assembly of the brake caliper the following aids are required:

- Standard workshop equipment.
- Dynamometric key up to 500 Nm.
- Wrenches (WS 46, WS 41, WS 30, WS 27, WS 25).
- Hydraulic press with applicable stamps for pressing in and pressing out.

For repair/overhaul of the brake cylinders it is necessary to need a special assembly device.

WARNING	**Injury danger at not specialized disassembly of the brake cylinders with spring loaded!** **Spring loadeds are assembled with high prestress.** **Dismantle the brake cylinders only in a test bench!**

6.2 Consumables and auxiliary materials

Designation	Application
Molykote- Paste P40, Fa. Dow Corning.	Lubrication of all bearings and joints.
Penetrating oil, rust removing (e.g. Molykote Supergliss, Spray).	Loosening of screw connections/joints.
Test means for the magnetic powder test or Test means for the dye-penetration test.	Carrying out of a crack test with magnetic powder (DIN EN ISO 9934 Part 1-3). Carrying out of a crack test in accordance with the dye-penetrant test (DIN EN ISO 3452 Part 1-4).
Chemical cleanser Recommendation: Rivolta M.T.X. 100 (environmentally acceptable special cleanser).	Cleaning of fouled components.
Tectyl 846 K19.	Corrosion protection.
Delothen degreasing spray.	Degreasing of damaged parts.
Paint.	Touching up of cleaned damaged parts: Refer paint specifications in chapter 11.1.

7 Inspection/ Maintenance

7.1 Maintenance levels

The maintenance levels are to be set down in writing.
Document the execution of the maintenance work in writing.

Pay attention to the following maintenance intervals:

Function check	(FC)	daily
Visual check	(VC)	every 2 weeks
Service check A	(SA)	every 4 month
Service check B	(SB)	every year
Main workshop		
Overhaul	(OH)	every 8 years

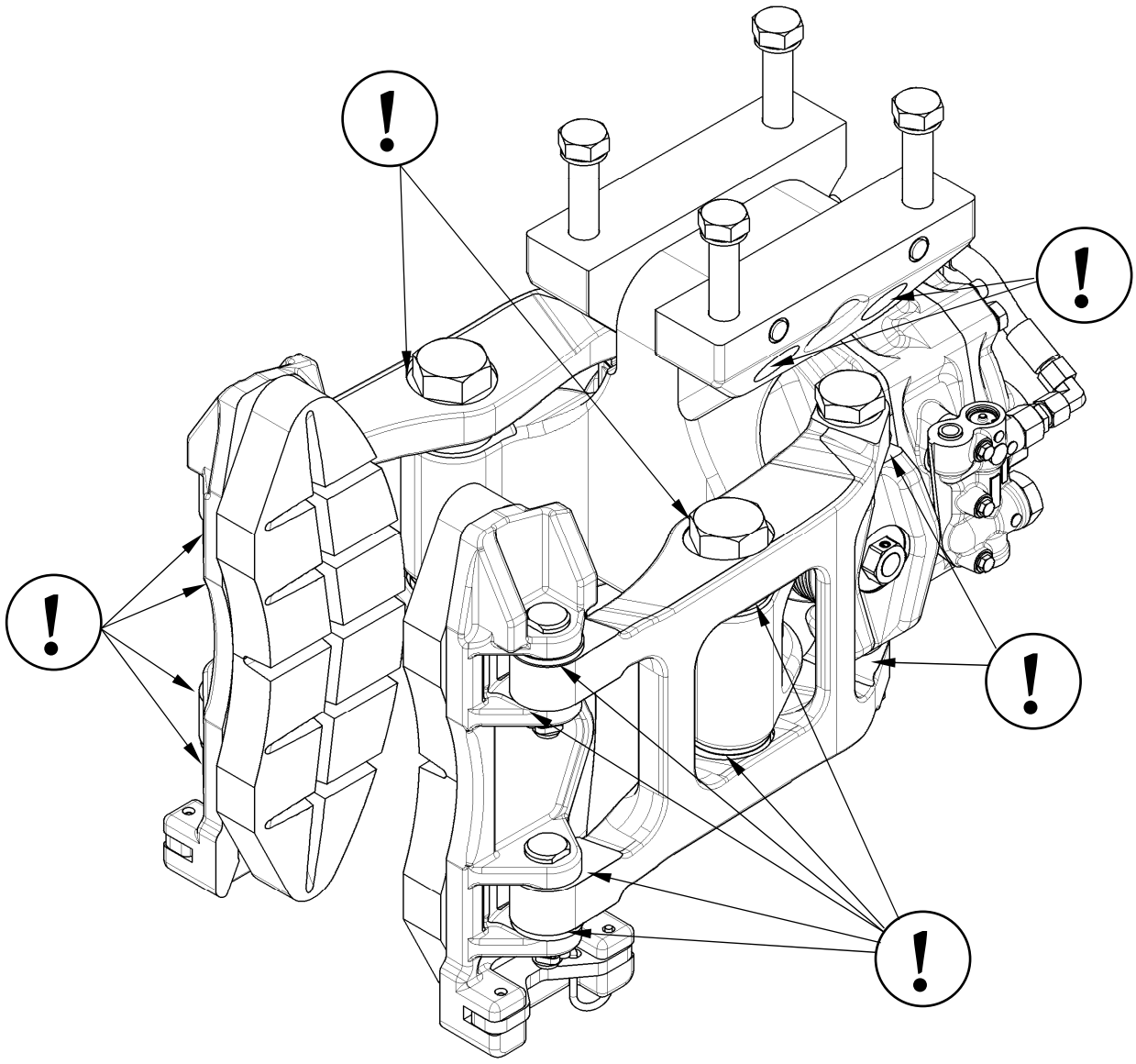
The maintenance levels are structured cumulatively, i.e. each higher inspection level contains all the work involved in the one below it.

WARNING	**Before the work described below is carried out, it must be ensured that the safety measures described in chapter 1 are observed.**

WARNING	**Injury danger at not specialized disassembly of the brake cylinders with spring loaded!** **Spring loaded brake cylinders are assembled with high prestress.** **Dismantle the brake cylinders only in a test bench unit!**

7.2 Maintenance plan

Maintenance work	FC	VC	SA	SB	Overhaul (OH)
Functional check with brake disc (braking test before daily starting up).	●	●	●	●	
Visual check for at sight seen external damage and existance of pads; see chapter 7.3.1.		●	●	●	
Check condition of the brake pads; see chapter 7.3.2.			●	●	
Replace brake pads when permissible residual thickness reached; see chapter 7.3.3.			●	●	
Function check of the brake cylinder. (Can be carried out in connection with the brake pad replacement).			●	●	
Check clearance of the brake pads in the pad holders; see chapter 7.3.2.			●	●	
Check clearance between brake pads and brake disc; see chapter 7.3.4.			●	●	
Check firm fit of the fastenings on the bogie.				●	
Check the tightness of shank screws and condition of the detent edged rings; see note of page 7-5.				●	
Check free operation of brake caliper.				●	
Check tightness of the air hoses and the connections.				●	
Visual inspection of the brake cylinders. Check the estate of the crimp bellows. Clean the exhaust ports (Drainages).				●	



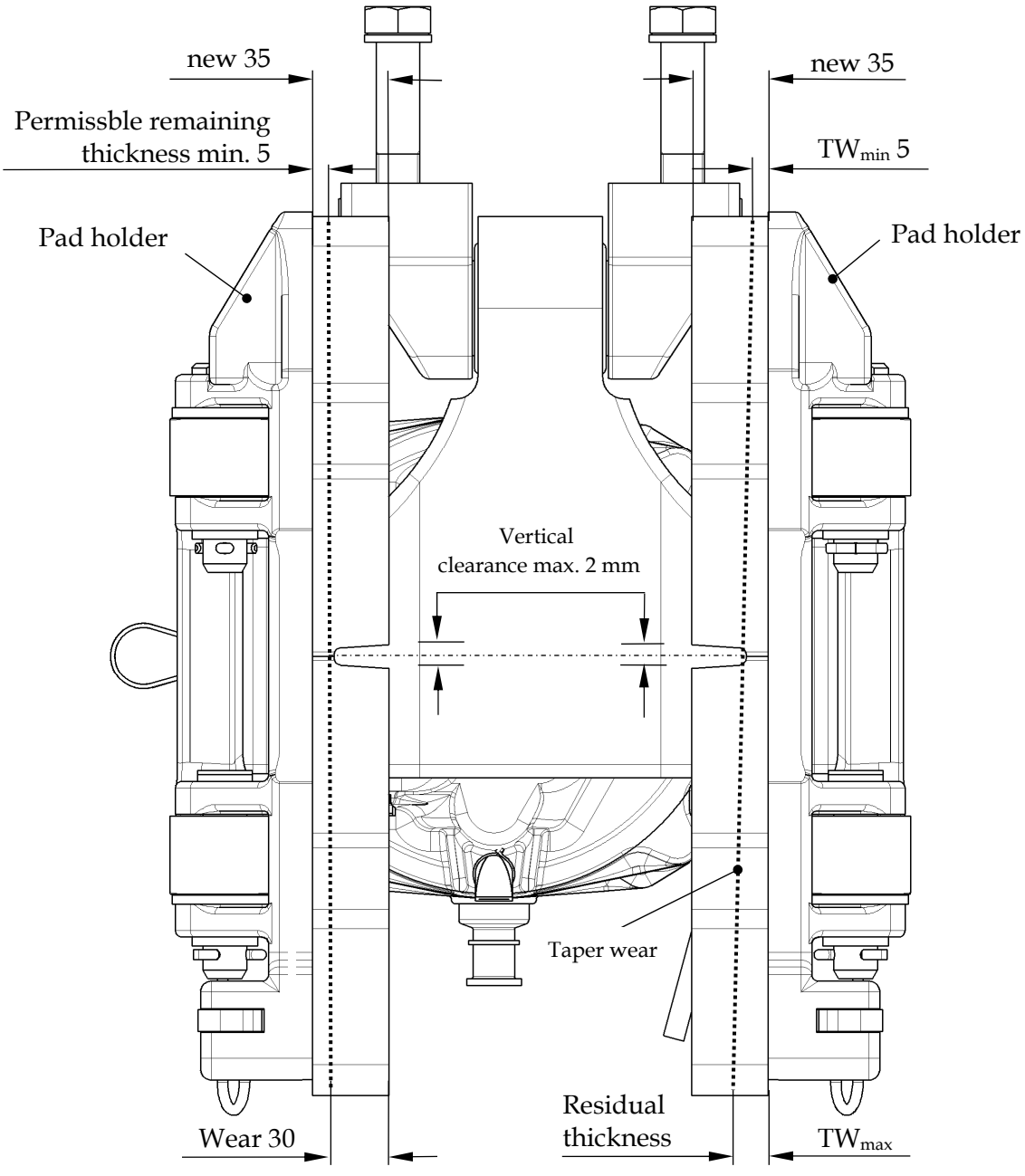
= Grease with Molykote paste P40

Fig. 7.1

Inspection	FC	VC	SA	SB	OH
Examine accurately the estate of the brake caliper. Measure spot check the abrasion of the bolts and bushes; see chapter 9.2 and 9.4.					●
Dismount brake caliper and dismantle; see chapter 8 and chapter 9.2.					●
Clean the piece parts (see chapter 9.3). Check the abrasion, cracking, corrosion and other defectives of the main components. Silentblocs (rubber mount) of the brake bridge piece replace in accordance with figure 9.12. Measuring wear of the bolts and bushes (samples), see Section 9.4. If necessary press out the metal bushes and replace these by new bushes (see chapter 9.4). If necessary replace all bolts and shank screws. Use only new securing elements.					●
Grease all bearings and joints in accordance with Fig. 7.1. *Fig. 7.1 Lubricating points*					●
For overhaul of the brake cylinders remove the caliper acc. to section 8.2 and dismantle the caliper acc. to section 9.2. Send the brake cylinder back to Faiveley Transport Witten.					●
Assemble the brake caliper. Mount it in the bogie, see chapter 8.3 and 9.6. Install new brake pads.					●

Have any defects found during an inspection eliminated immediately! In case of uncertainty of resulting effects Faiveley Transport Witten has to be informed.

Check the tightness of shank screws (M27x2; WS 41) and condition of the detent edged rings annually.
If the tightening torque is less than 200 Nm (M_A < 200 Nm), unscrew the shank screw and replace the detend edged ring.
For overhaul (OH) also replace all the detent edged rings.



Taper wear (TW)
$TW_{max} - TW_{min} \leq 5$ mm
(vertical)

(Dimensions in mm)

Fig. 7.2

7.3 Description of the maintenance work

7.3.1 Carrying out visual check

Check the brake caliper in place for damage. Look out for visible signs of external damage and existance of pads. Check the brake calipers at regular intervals for cracks. Carry out a crack investigation to verify the safety implications of any cracks found (cf. point 6.2).

7.3.2 Check brake pads

(1) Check for Wear

New brake pads have a thickness of 35 mm. The permissible residual thickness of worn pads is 5 mm. In the case of taper wear, the side with the greatest wear is decisive. Thereby the values are allowed according Figure 7.2.

Fig. 7.2 Brake pad test dimensions

(2) Check on condition

The brake pads must not have inadmissible damages.
For the assessment of the organic brake pads refer section 11.2.

Due to aging replace the brake pads after 4 years from production date (compare far side of the brake pads). Else a risk of reduced brake performance cannot be excluded.

(3) Checking of the longitudinal clearance between brake pads

With the brake released the pads must not be able to move more than 2 mm in vertical direction within the pad holder.
If the possible movement exceeds this amount then the pads are to be removed and the dovetail guide to be checked.

Renew the pads if there is any damage to the back of the pad.
During removal and installation all parts should move quite freely.

Change the pad holder if there is any damage to the pad holder and/or the snap lock.

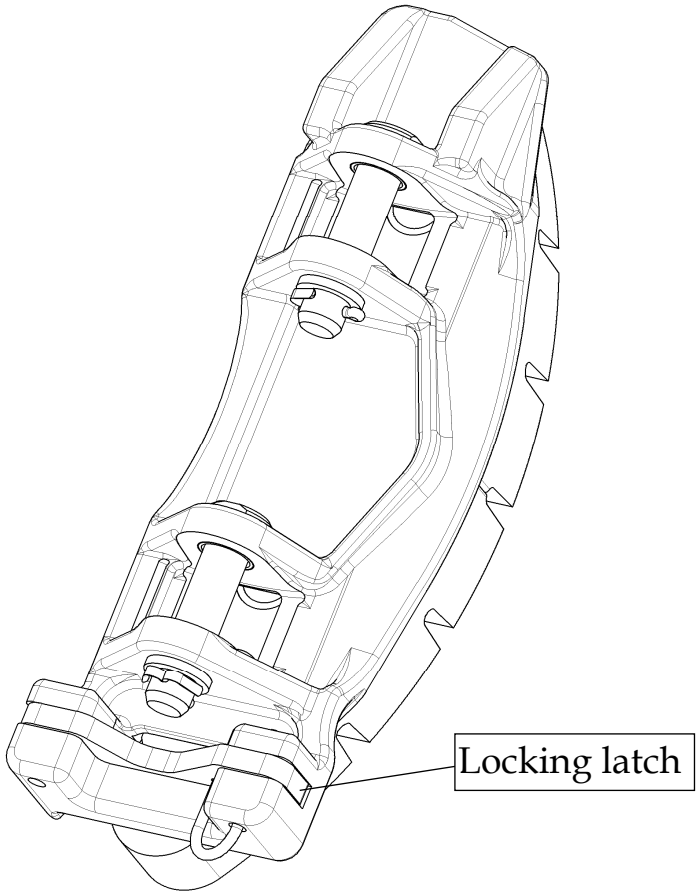


Fig. 7.3

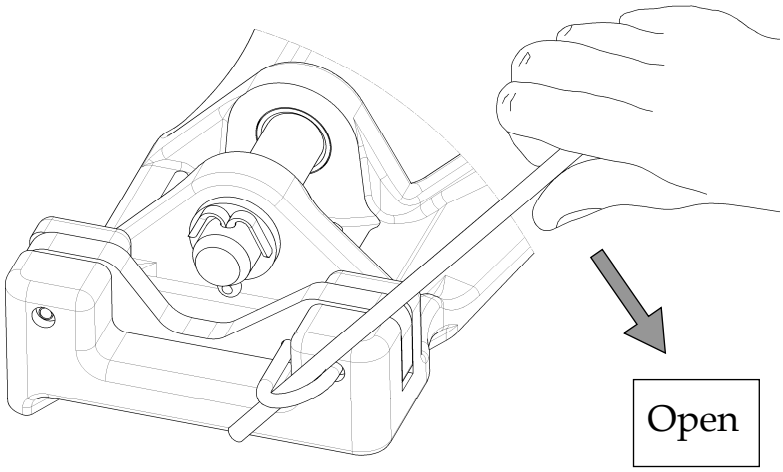


Fig. 7.4

7.3.3 Brake pad change

(1) Preparatory work

- Park the vehicle above a pit with the service and parking brake **released** and ensure that it cannot roll away. Use chocks.

WARNING	**Unauthorised actuation of the brake must be ruled out;** **DANGER OF ACCIDENT!**

- Cut off compressed-air (service brake) supply.

For brake cylinders with parking brake:

- actuate the parking brake.
- Release the parking brake manually by pulling the release cable.

Fig. 7.3 Brake pad mounted

(2) Pad change

Before inserting the new pad bring the adjuster in the brake cylinder to its shortest length (maximum gap between shoes and discs).
For this purpose, turn the reset device (refer Fig 7.7) in a clockwise direction with a torque wrench (width across flats 27). The required torque is about 35 Nm and may not exeed 100 Nm. Turn the spindle in up to the stop and then turn in the opposite direction by 4 clicks to relieve any stresses in the mechanism.

Use only a hand tool for the resetting, not any impact wrench!

WARNING	**Failure to follow these recommendations may result in a nonfunctioning slack adjuster with a consequential reduction in braking effort, as the brake pads wear.** **For opening the caliper, use reset device only.** **When changing the brake pads be careful not to place your hand or fingers between the brake disc and the pad/ pad holder. Danger of crushing.**

- Place a round steel (or screwdriver) in the locking latch and open this.

Pads may fall out.

Fig. 7.4 Pad holder opened

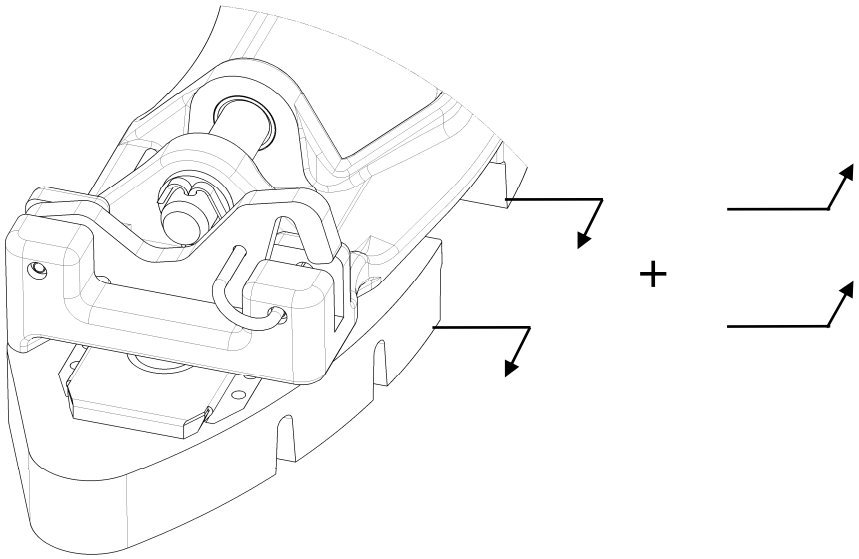


Fig. 7.5

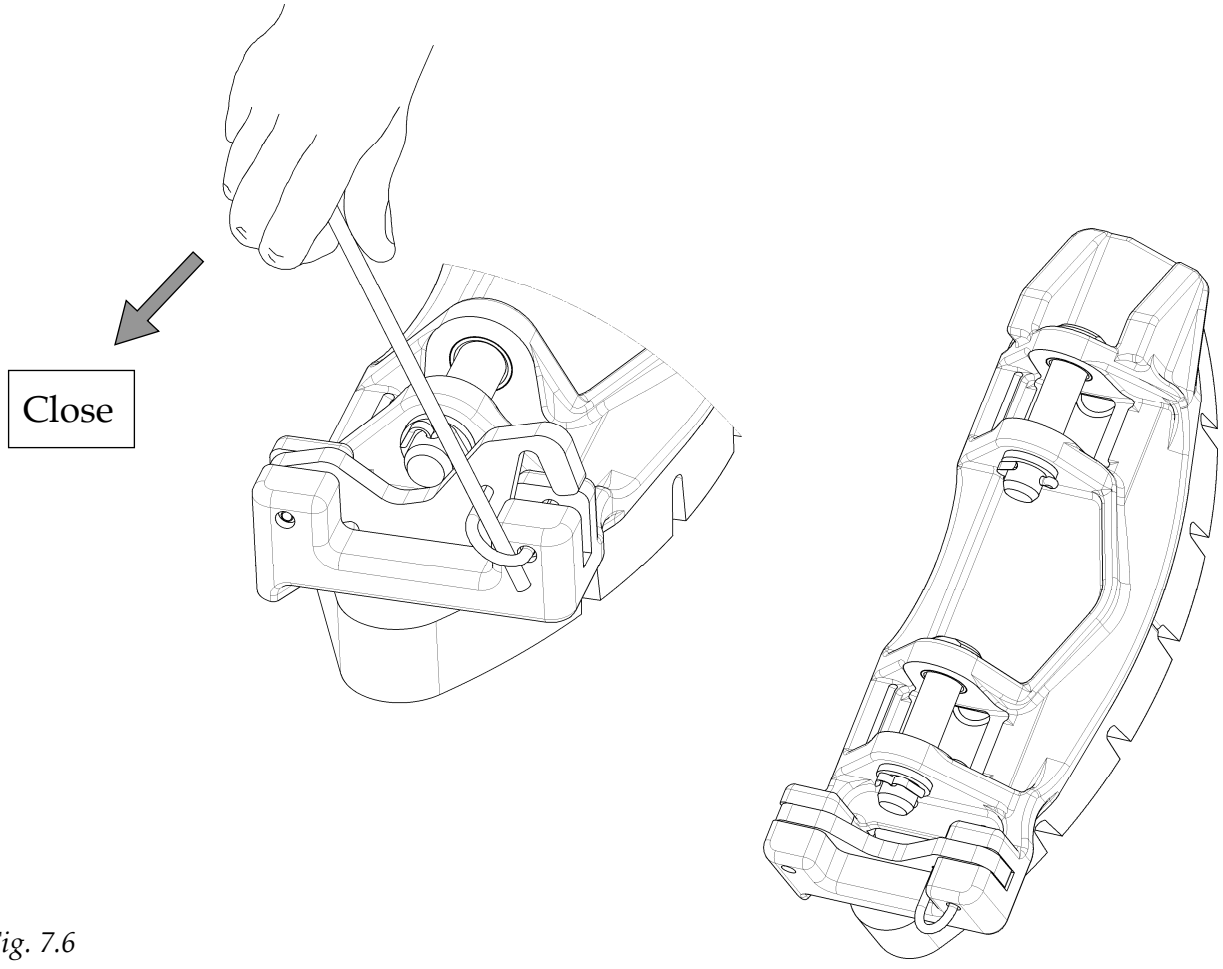


Fig. 7.6

- Remove pads to be replaced from the dovetail guide inside the pad holder.

Fig. 7.5 Brake pad replacement

- Push the new brake pads, a right-hand and a left-hand half each, into the dovetail guide up to the limit stop. Take care to ensure that the pads are mounted in accordance with the disc shape.

It's only allowed to mount the provided brake pads.

- Close the locking latch according Figure 7.6.
  Take care that the locking latch perfectly engages on **both** sides.
- Open compressed-air feeding pipe.
- Set and release the brake several times.
- Check the clearance between brake pad and brake disc.

Fig. 7.6 Pad holder closed

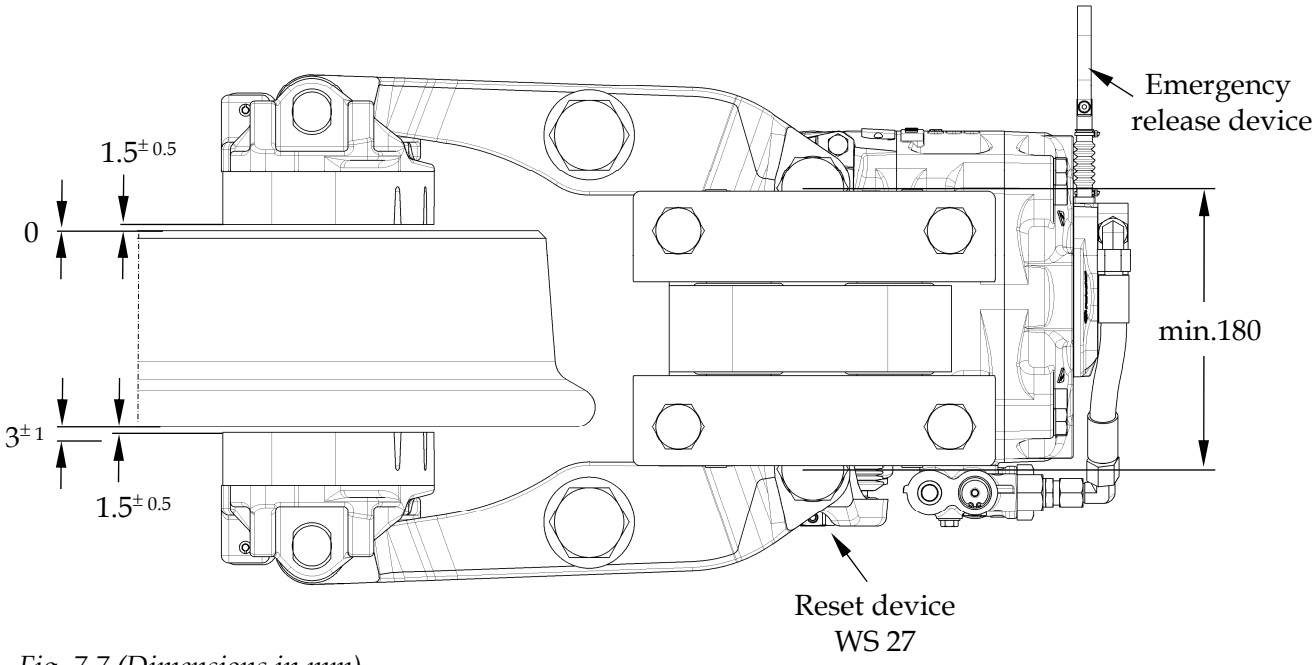


Fig. 7.7 (Dimensions in mm)

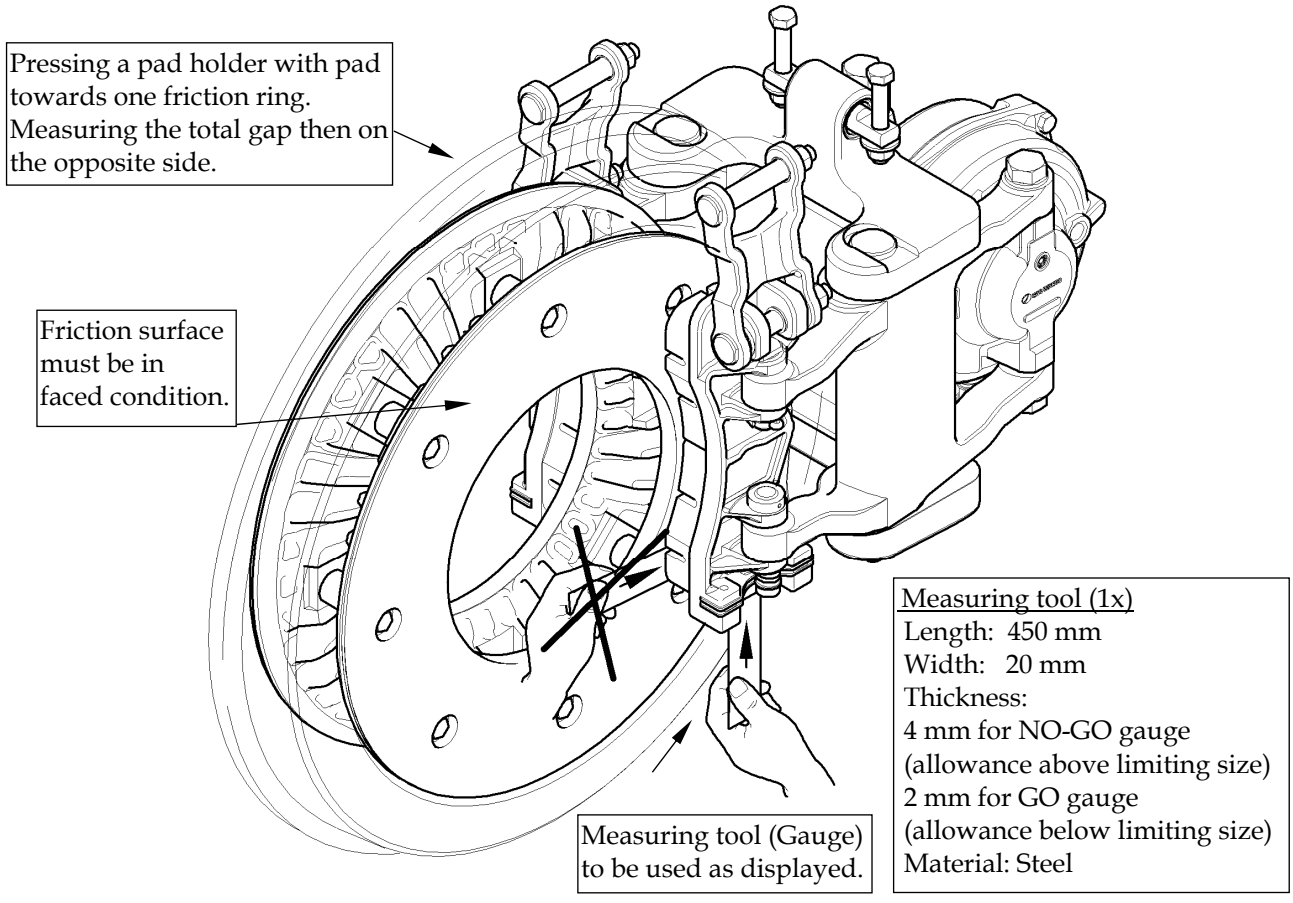


Fig. 7.8 (Illustration similar)

7.3.4 Checking brake pads/ brake disc clearance

This technical instruction should be refered only for checking the gap between brake pads and disc. For all other purposes please refer to the relevant maintenance manuals of brake caliper and actuator.

The two brake pads of the brake caliper must have an identical clearance of 1.5±0.5 mm each to the brake disc.

To verify the actual gap the pads must be set in correct position.

This can be done by applying and releasing the emergency brake 3 – 5 times.

It is recommended that the pads/disc clearance is basically not checked after a manual parking brake release.
In case of a manual parking brakes release has been carried out, the parking brakes are required to be reset by applying and releasing the parking brakes 3 – 5 times pneumatically.

To check the total clearance, push the actuator away from your body and pull the brake lever / Pad holder towards your body. This results in a total gap of 3±1 mm on one side of the disc. Refer fig. 7.8 for details.

The gap is checked by means of a GO and NO-GO gauge.

The gauge (thickness 2 mm) representing the minimal gap and must be insertable by hand force, over total pad length.
The gauge (thickness 4 mm) representing the maximal gap and must not be insertable over total pad length by hand force.

Fig. 7.7 Fitting situation of the brake caliper
Fig. 7.8 Method for checking the clearance between brake pads and disc

7.4 Troubleshooting

7.4.1 General Information

This chapter contains information to be used for troubleshooting for those faults that may occur during operation of the brake caliper.

Before starting with troubleshooting and the elimination of faults, a thorough visual inspection of the brake caliper must be performed to determine if the trouble is caused by obvious defects such as loose screw connections and damaged sub-assemblies.

7.4.2 Troubleshooting chart

The following troubleshooting chart lists the most probable malfunctions. Additional fault combinations are possible.

Malfunction	Possible cause	Remedy
Brake not functioning.	Brake cylinder is not supplied with compressed air. Valve shut off.	Check hoses and connections, replace if necessary. Open valve.
	Brake cylinder defective.	Replace brake cylinder.
	No brake requirement signal or brake control unit defective.	Check brake control.
Required clearance between brake pads and brake disc not achievable.	Brake cylinder not in initial position.	Adjust brake cylinder; (see chapter 7.3.3 point (2)), afterwards actuate brake.
	Caliper actuator in brake cylinder defective.	Replace brake cylinder.
The slack adjuster cannot be reset completely.	Brake caliper is jammed.	Disassemble brake cylinder; possibly rework brake caliper in order to ensure ease of movement.
	Brake cylinder defective.	Replace brake cylinder.
Uneven wear of the friction rings of a brake disc set.	Jamming brake caliper or defective brake cylinder.	Check brake caliper, if necessary repair it.
Above-average crack frequency, hot spots.		Check functional efficiency of the brake cylinder, if necessary replace it.
	Moving with tightened spring actuator brake.	Release all brakes. Check brake clearance when the brake is released.
	Wrong pad type.	Fit type of pad as specified by the brake supplier.
		Information to Faiveley.

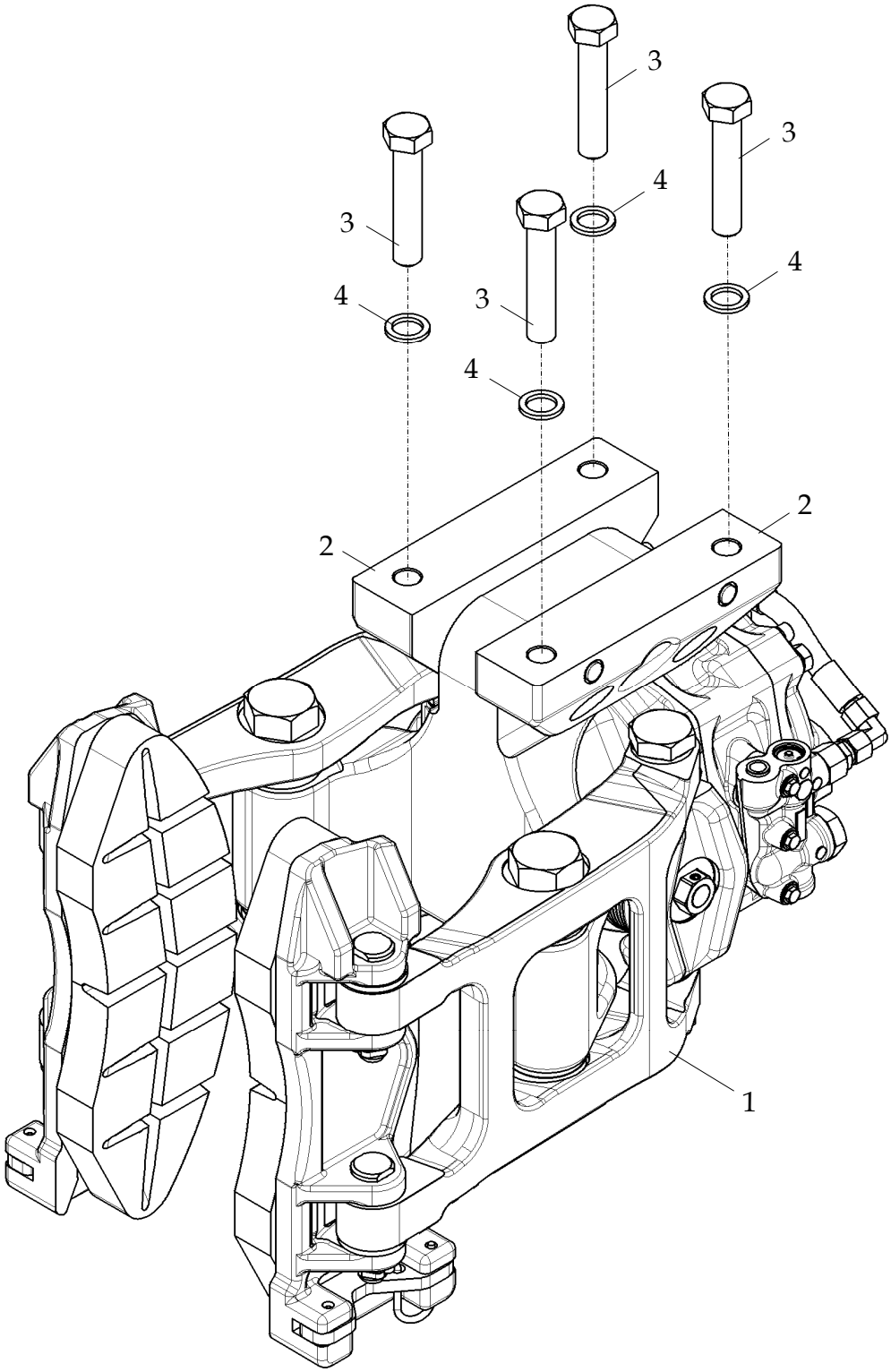


Fig. 8.1

8 Removal and installation

8.1 Notes

The brake caliper is only to be removed for carrying out an overhaul (Level 3).

WARNING	**Work is only to be carried out on the brake if the safety requirements (chapter 1) are observed.**

Suitable load carrying equipment (crane or fork lift truck) must be available for removal or installation of the brake caliper. When lifting use a fabric belt to avoid damaging the brake.

8.2 Removal

(1) Position the vehicle over a pit with the service brake and parking brake **released** and secure the vehicle against rolling away.

(2) Depressurise the pressurized air pipes on the brake cylinder and dismantle. Dismantle the emergency release cable of the parking brake cylinder.

(3) Actuate the reset device on the brake cylinder – the brake calipers open (use spanners with width across flats 27).

(4) Remove brake pads; refer section 7.3.3.

Fig. 8.1 Removal/ installation of the brake caliper

WARNING	**The brake caliper weighs approximately 105 kg.** **Provide a suitable support for the unit!**

(5) Unscrew the four hexagon bolts (8.1/3) from the two adapters (8.1/2), remove washers (8.1/4) and pull out the hexagon bolts.

(6) The brake caliper is now removed from the bogie.

8.3 Installation

For overhaul (OH) replace all hexagon bolts and washers.

(1) Installation takes place in a logical reverse order.
Hold the brake caliper (8.1/1) in its fitting position with lifting gear (crane, pallet truck).

(2) Observe the following tightening torque when assembled to bogie:

Threaded connections

- Adapters (Brake bridge piece) / bogie
- Hexagon bolts (8.1/3), M20 (WS 30) M_A = 320 Nm
  (according to car-builder information)
- Air connection service brake G1/2" M_A = 35 Nm ± 10%
- Air connection parking brake G1/4" M_A = 20 Nm ± 10%

(3) After assembly of the adapters, the unpainted areas (adapter bores Ø 35 and silentbloc pin) have to be sprayed with conservation.

(4) Screw pressurized air pipes onto brake cylinder.
Fit the emergency release cable for the parking brake.
(no extend of supply from Faiveley Transport).

Note the installed position of the brake cylinder.
The vent plugs (draining tip) should point downwards.

(5) Bring the brake cylinder into the basic position.

(6) Mount brake pads. Open pneumatic supply.

(7) Carry out the functional test: actuate brake several times.
It must continuously make contact and release without jamming.
The movement must not take place one-sided.

(8) Check the clearance between brake pads and brake disc.

9 Repair and overhaul work

9.1 General information

Fastening elements that cannot be reused such as split pins and detent edged rings should be replaced by new ones.

Lock nuts may be reutilized. Thereby regard, the clamping forces decreases after repeated screwing on and unscrewing.

For overhaul (OH) also replace all the nuts.

Damaged bolts should also be replaced.

During partial repairs to the brake caliper only dismantle as far as required for the work.

Always remove the old grease from all plain bearings and bare parts and apply new grease in accordance with section 6.2.

Do not grease screw-type connections.

WARNING	**Before the work on the brake is started it must be ensured that the safety and works safety provisions are observed and adhered to in accordance with chapter 1.**

For the Overhaul (OH) check and measure all wearing parts e.g. brake lever, brake bridge piece, pad holder (see Fig. 9.5 to 9.10).

Replace the part, if the specified limit value to the next revision is reached or exceeded.

For the Overhaul (OH) measuring wear of the bolts and bushes (samples), see Section 9.4.
If necessary press out the metal bushes and replace these by new bushes.

If necessary replace all bolts and hexagon head bolts with tapped.

Replace the silentblocs.

WARNING	**Injury danger at not specialized disassembly of the brake cylinders with spring loaded!** **Spring loaded brake cylinders are assembled with high prestress.** **Dismantle the brake cylinders only in a test bench unit!**

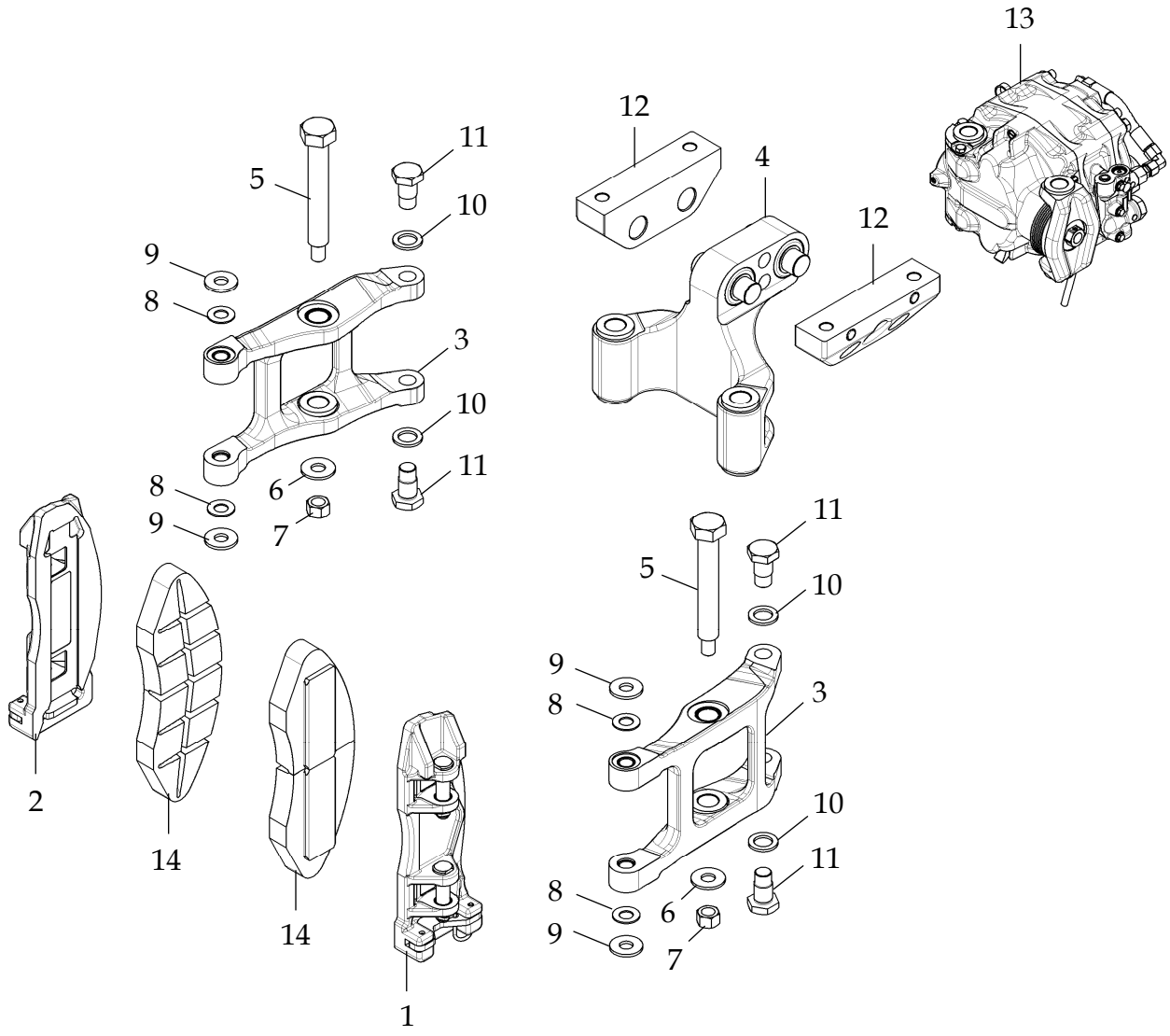


Fig. 9.1

9.2 Disassembly

Special tools:

Hydraulic press with applicable stamps (Pressing out drifts).
Sleeves for pressing in and pressing out the silentblocs.

(1) Place the brake caliper to an applicable base.

(2) Pull off the adapters (9.1/12) from the brake bridge piece (9.1/4).

(3) Unscrew the four hexagon head bolts with tapped (9.1/11), remove the detend edged rings (9.1/10).

(4) Remove brake cylinder (9.1/13) from the two brake levers (9.1/3).

(5) Unscrew two lock nuts (9.1/7) and remove washers (9.1/6). Pull out the threaded bolts (9.1/5). Brake bridge piece (9.1/4) and brake levers (9.1/3) are separated.

(6) Pull off and remove the split pins (9.2/7) on each pad holder (9.2/1 and 2) and remove the washer (9.2/6). Pull out the bolts (9.2/5).

(7) Remove pad holder (9.2/1 and 2) from the brake levers.

(8) Remove distance washer (9.1/9) and spring washers (9.1/8).

Fig. 9.1 Brake caliper disassembled

Fig. 9.2 Pad holder removed

(9) If necessary, press out the bushes from the brake levers, brake bridge piece and pad holders.

If necessary, press out the silentblocs from the brake bridge piece.

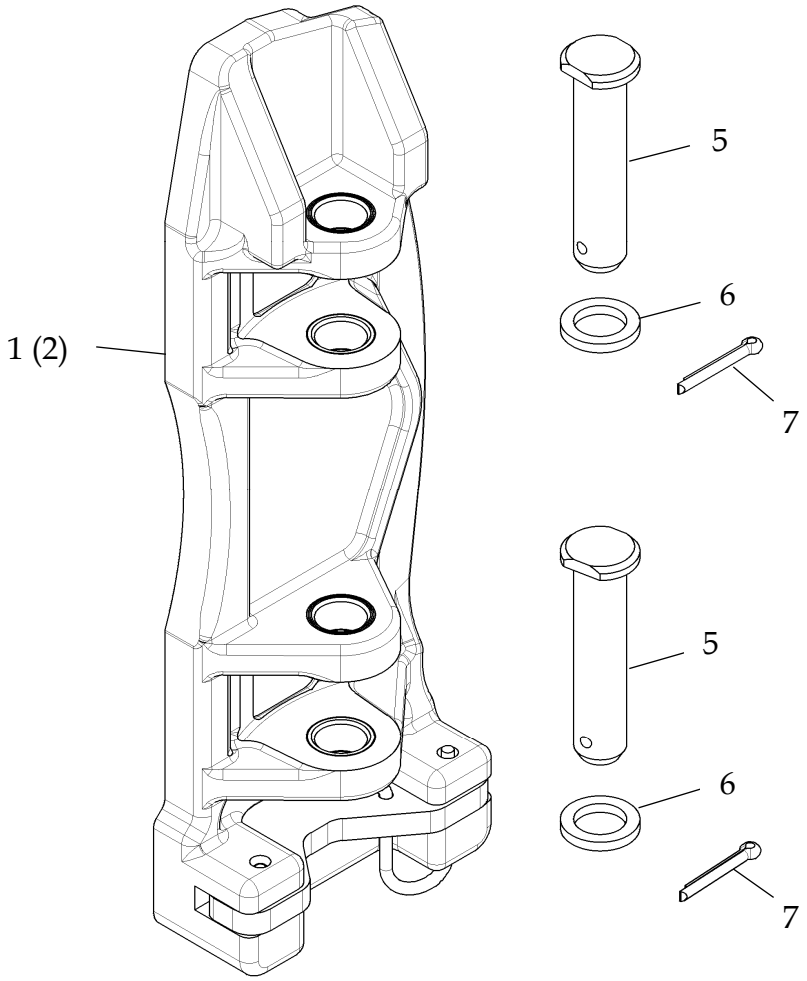


Fig. 9.2

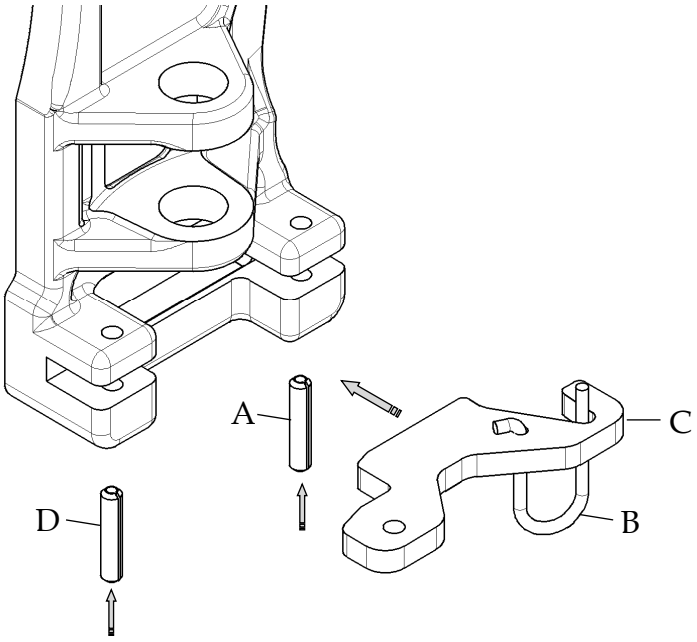


Fig. 9.3

9.2.1 Changing locking latch in the pad holder

The brake pads are removed, the pad holders are disassembled.

Disassembly (see Fig. 9.3)

- Force dowel pin (D) out of the pad holder with a drift (∅ 7 to 7,5 mm).
- Swing out locking latch (C) around the pivot point (A).
- Force dowel pin (A) out of the pad holder with a drift.
- Remove the locking latch with spring (B) from the pad holder.

Installation

- Force dowel pin (A) in the pad holder with a drift (∅ 7 to 7,5 mm).
- Place the new locking latch at point (A) and mount the spring (B).
- Swing in locking latch (C) around the pivot point (A).
- Force dowel pin (D) in the pad holder with a drift.
- The locking latch must be supported by the pad holder (closed position).

Fig. 9.3 Changing locking latch

When doing this make sure that the slot of the dowel pin points upwards in the pad holder.

Fig. 9.4 Mounting of the dowel pins

Fig. 9.5 Dowel pin secure

- Drive in the dowel pins until they have sunk in the same depth at both ends. Finally, secure the dowel pins with a punch impact.

Functional check

- Check the locking latch by opening and closing in the same way as when replacing the pad.

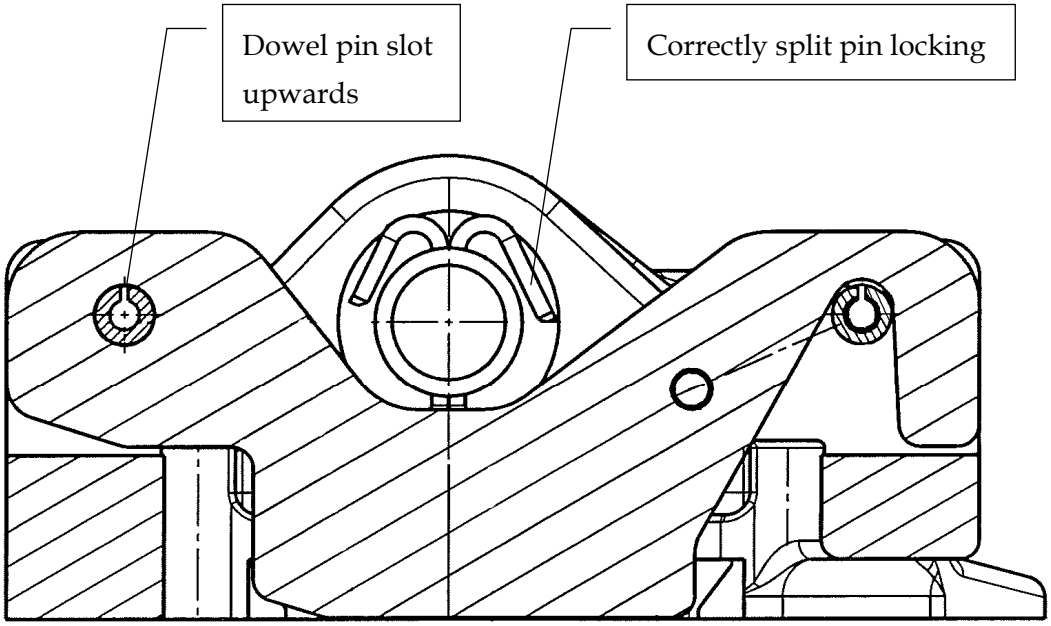

Dowel pin slot upwards
Correctly split pin locking

Fig. 9.4

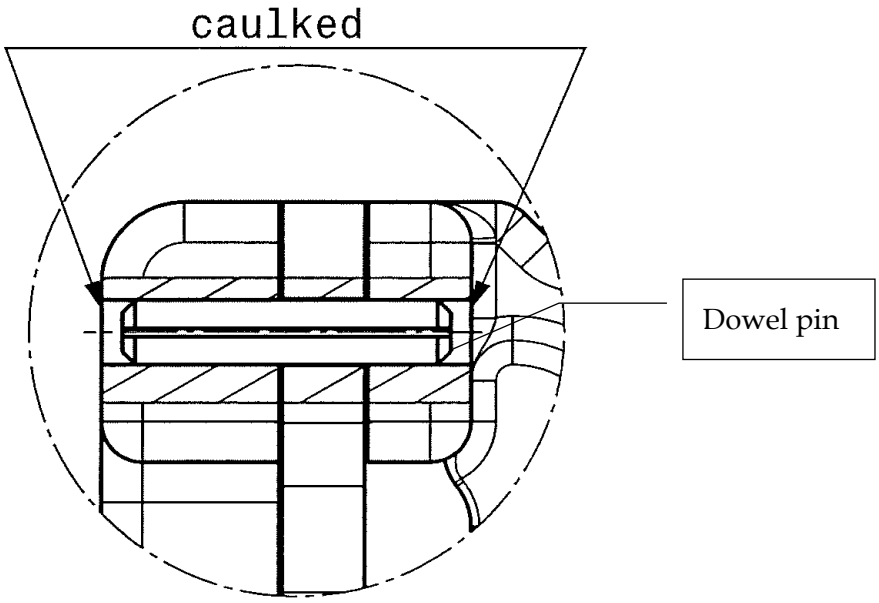

caulked
Dowel pin

Fig. 9.5

9.3 Cleaning

9.3.1 Cleaning the brake caliper

Thoroughly clean dismounted parts to be re-used. Remove coarse dirt with a soft wire brush, as an aid using. As required, chemical cleaning agents for a cleaning bath (see chapter 6.2).

9.3.2 Cleaning of drainings

Tools and auxiliary recources

- Flat screwdriver
- Soapy water

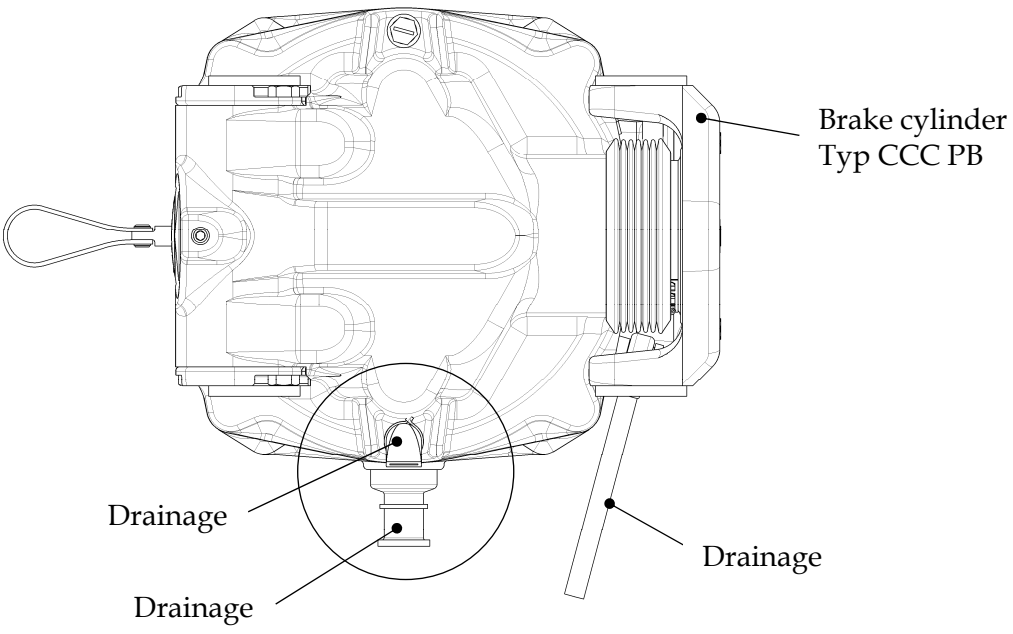
Preventive maintenance

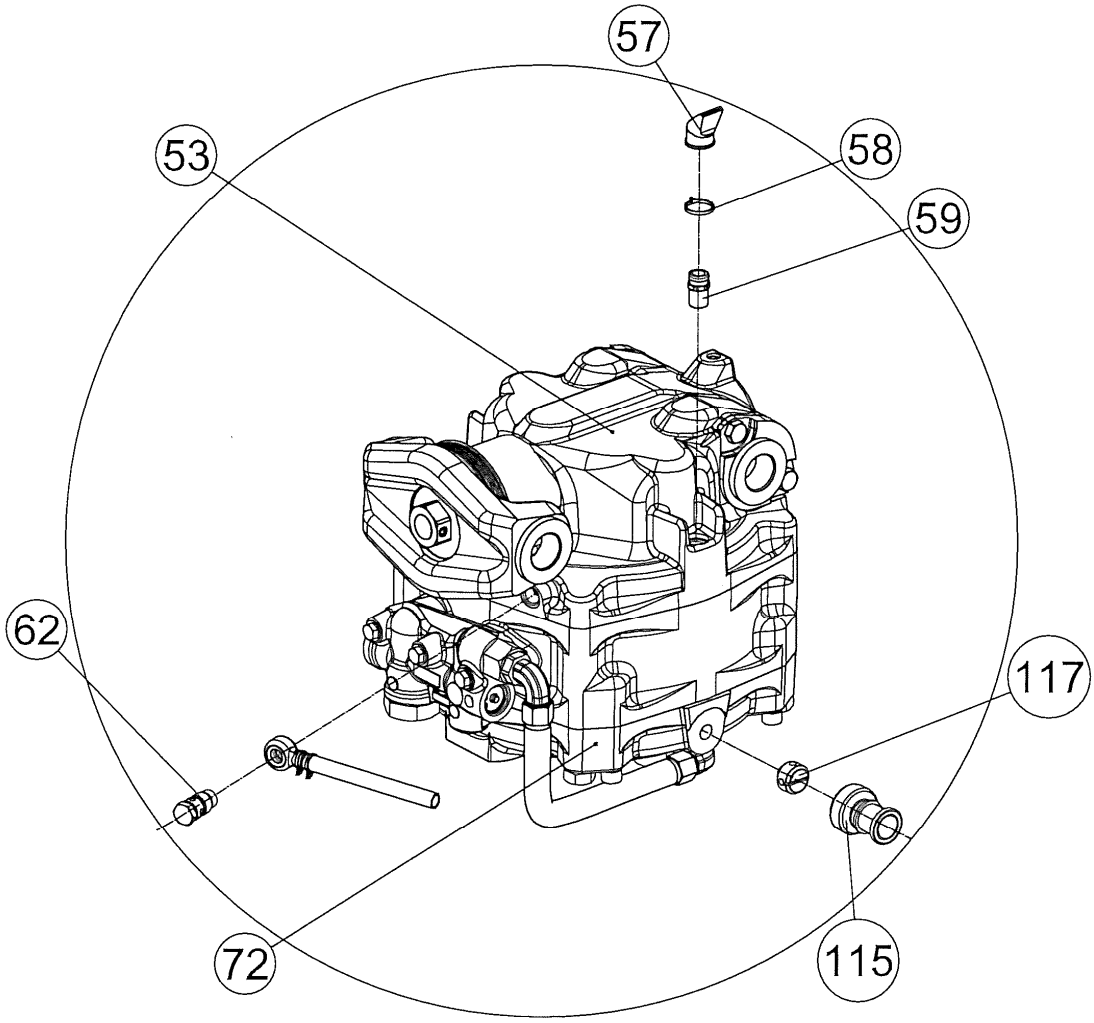
Cleaning interval: annually.

Clean with soapy water the housing body of cylinder, the complete drain (62), the swhistle drain (57), the drain tube (59), the draining tip (117) and the draining tip bellows (115). Then blow the parts with dry compressed air. Reassemble parts in the housing body of cylinder and tighten a torque of $3^{\pm 0.5}$ Nm the complete drain (62) and the draining tip (117). Mount the drain tube (59) with a tightening torque of $6.5^{\pm 0.5}$ Nm.

When cleaning be careful not to put water in the cylinder.

Fig. 9.6 Cleaning of drainage





Removal of drains

- By means of a flat screw driver unscrew and remove from main housing (53) the complete drain (62).
- Cut and remove the clamp (58), remove the drain swhistle (57), then to unscrew the drain tube (59).
- By means of a flat screw driver unscrew and remove from PB- cover (72) the draining tip (117) and the draining tip bellows (115).

(Illustration similar)

Fig. 9.6

9.4 Tests

9.4.1 Brake caliper

Clean carefully the brake caliper in the disassembled state. After that check for external damage and cracks. If dismounting of the brake caliper has been easy, further dimensional inspections will not be necessary. However, should the brake caliper be jammed or rusted in, the dimensions of every component must be checked by all means. For this purpose dismantle the brake caliper.

To assess the re-usability, as a rule a check on the bush- and bolt-diameter according to the corresponding figures suffices.

9.4.2 Brake lever, brake bridge piece and pad holder

Fig. 9.7 to 9.12 Test dimensions

Procedure as described in chapter 9.4.1.

The components can be re-used, if dimensions are within the drawing tolerance. Abrasion on supporting faces and joints is admissible up to 0.5 mm. This wear is allowed in the declaration of the limit dimensions (Figures 9.7 to 9.12).

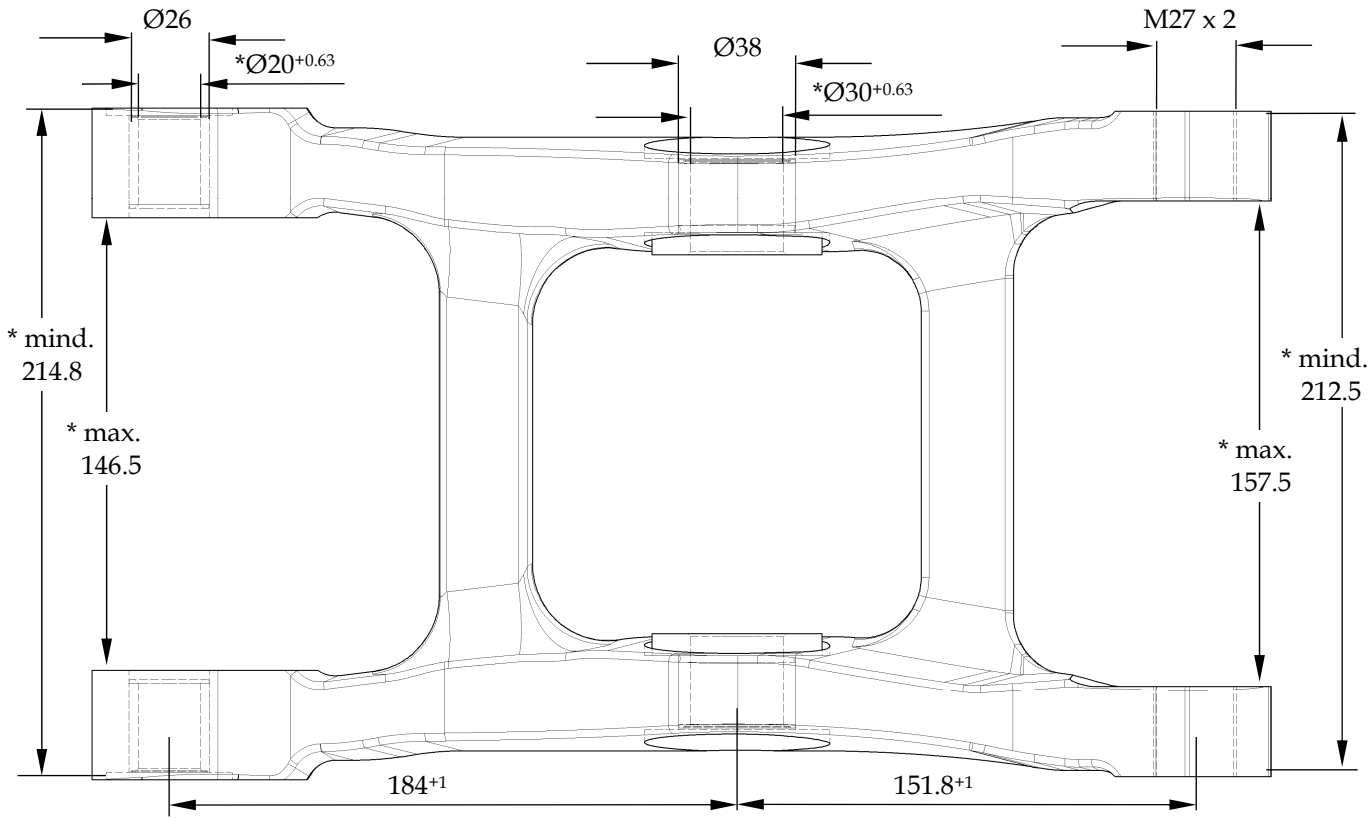
Pad Holder

The back plates of the brake pads may be not jam in the dovetail guide (removal and installation without any problems).

At reaching the limit dimensions replace the bushes.

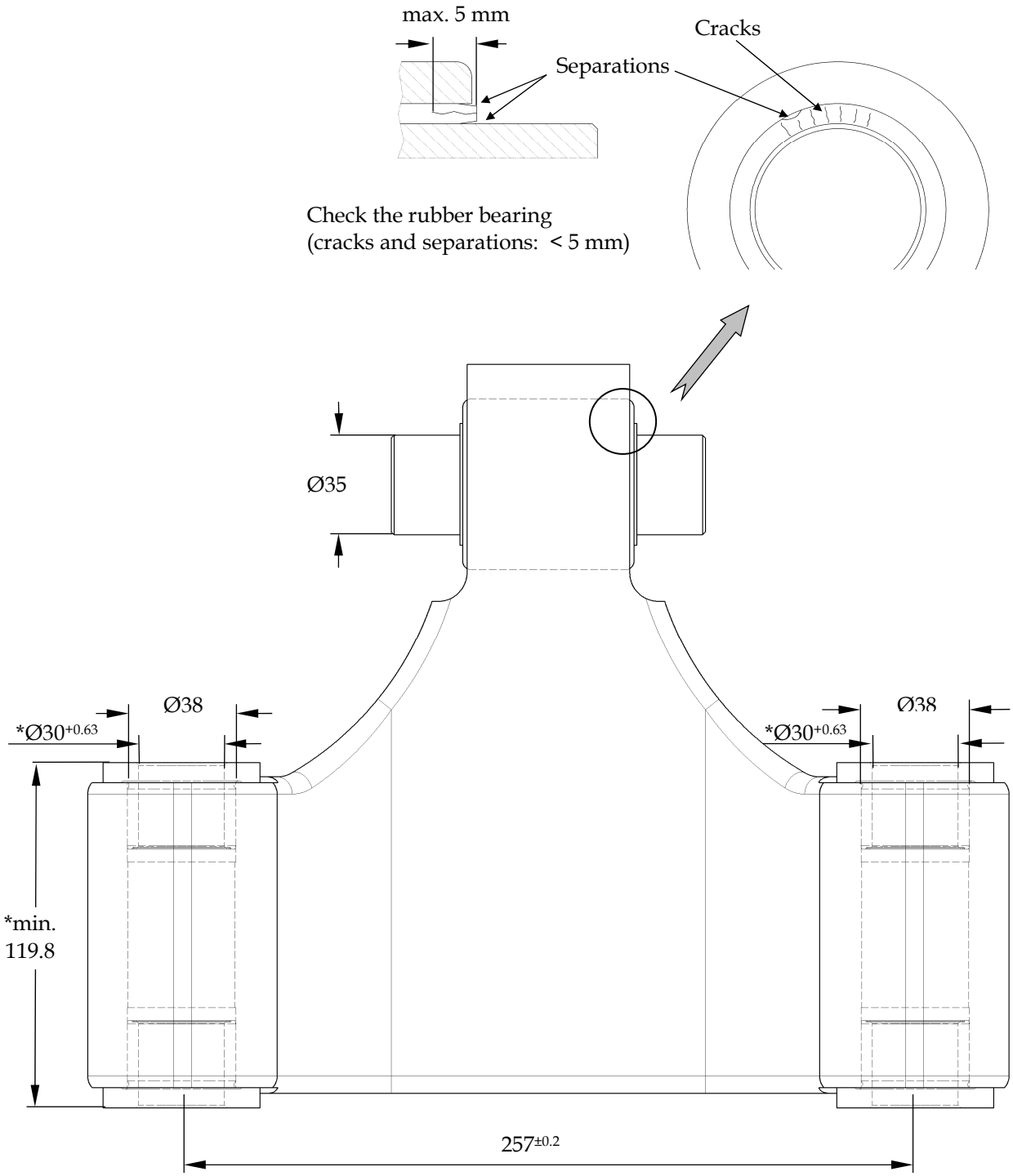
The pad holder must be replaced in the following case:

- Damage,
- Deformations of the dovetail guide,
- Defects of the locking latch (see chapter 9.2.1).



* Test dimension; deviation is limit dimension

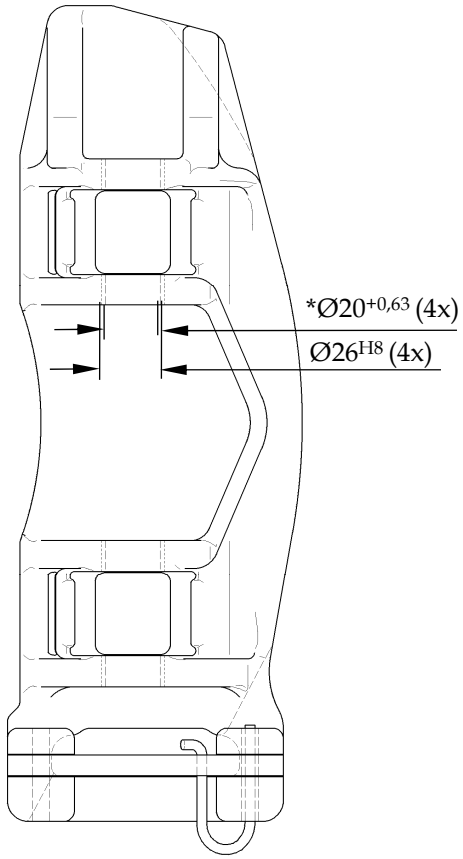
Fig. 9.7 Test dimensions of the brake lever (Dimensions in mm)



* Test dimension; deviation is limit dimension

Fig. 9.8 Test dimensions of the brake bridge piece (Dimensions in mm)

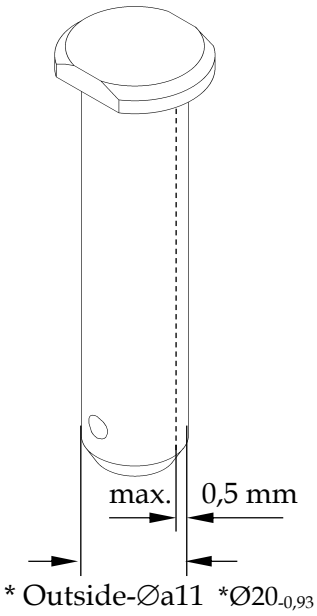
(all dimensions in mm)



* Test dimension; deviation is limit dimension

Fig. 9.9 Test dimensions of the brake pad holder

(Fig. 10.3 Pos. 5)



* Test dimension; deviation is limit dimension

Fig. 9.10

(Fig. 10.3 Pos. 4)

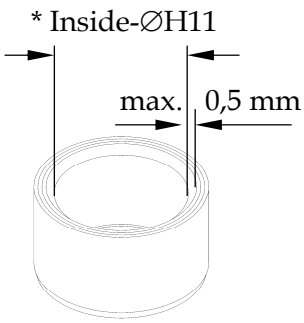


Fig. 9.11

(Fig. 10.2 Pos. 5)

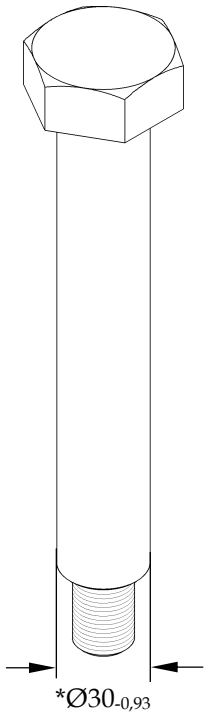
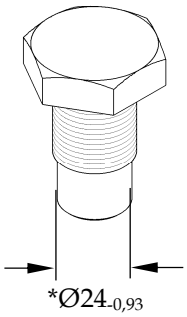


Fig. 9.12

(Fig. 10.2 Pos. 11)



9.4.3 Bolts and bushes

Replace bolts if the external wear measured at the most unfavourable point is more than 0.5 mm in diameter.

Replace the bolts (10.3/5), if the limit dimension is exceeded (see Fig. 9.10).

Replace steel bushes if the internal wear measured at the most unfavourable point is more than 0.5 mm in diameter.

Fig. 9.10 Test dimension of the bolt

Fig. 9.11 Test dimension of the bushes

9.4.4 Threaded bolt and Hexagon head bolt with tapped

Replace the threaded bolts and hexagon head bolts with tapped, if the limit dimensions are exceeded.

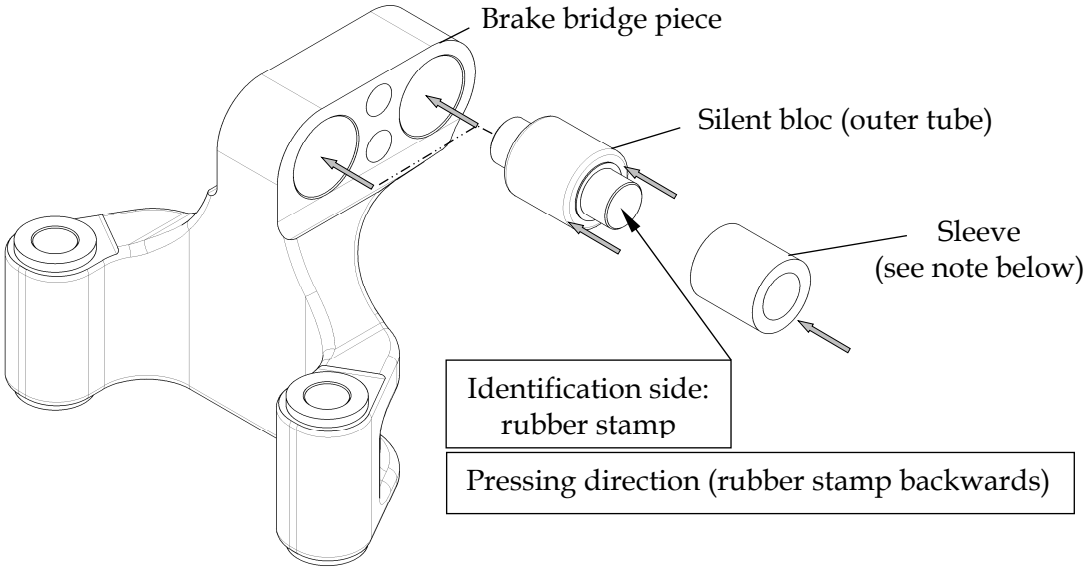
Fig. 9.12 Test dimension of the threaded bolt and hexagon head bolt with tapped

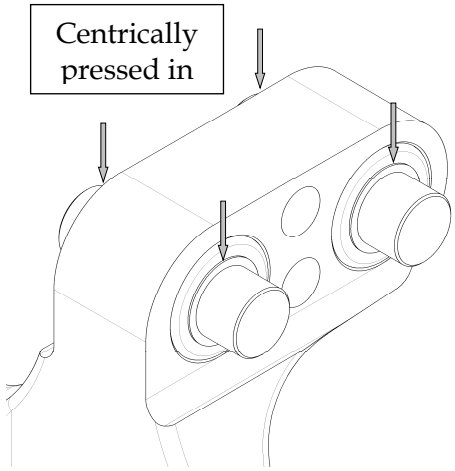
9.5 Corrosion Proofing

The main components of the brake caliper are spray painted.
Defective areas have to be touched up.

For that purpose derust, clean, degrease and paint the appropriate area (see chapter 6.2 and 11.1).
If necessary, cover up bearing bushes and metallically bright areas.

Where required apply primer and then apply a top coat of covering paint.





Pressing the silentblocs as shown into the brake bridge piece. Regard the pressing direction
Spread the outer tube of the silentbloc with lubricant.
Align the pressing sleeve centrical on the outer tube.
At the stop of the pressing sleeve to the brake bridge piece: Finish the pressing action.
Regard the central pressing of the silentblocs.

Regard for the pressing in and out of the silentblocs, that there is no axial thrust on the core.
The transfer of force is <u>only</u> to perform on the front side of the outer tube.
For disregard the silentbloc may be damaged.

<u>Note</u> For pressing in: apply pressing in sleeve. For pressing out: apply pressing out sleeve.

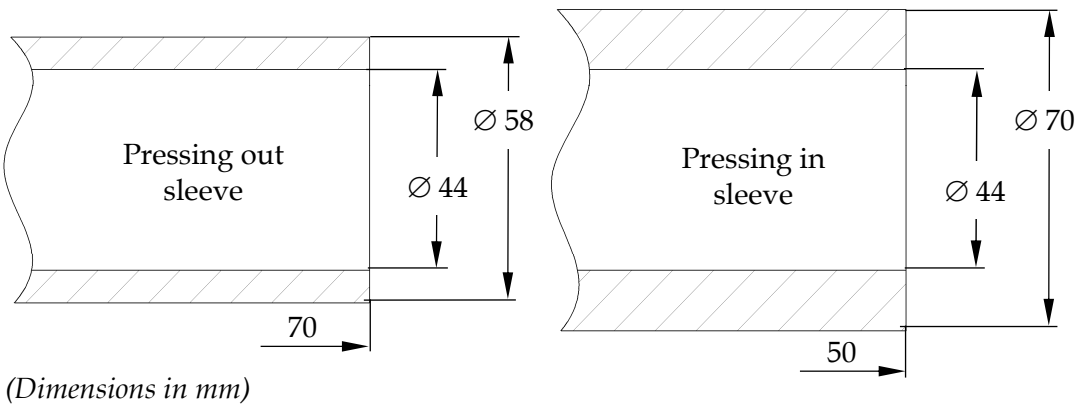


Fig. 9.13 (Dimensions in mm)

9.6 Assembly

After the individual components have been checked, repaired or replaced, the brake caliper can be assembled in logical reverse order (see figure 9.1).

Grease wearing parts (bolts, metal bushes) and paint-free contact surfaces with lubricant according to chapter 6.2.

The threads of screws, nuts and bolts remain free from oil and grease.

Fastening parts which cannot be re-used such as split pins, dowel pins and detent edged rings should be replaced by new ones.

Lock nuts may be reutilized. Thereby regard, the clamping forces decreases after repeated screwing on and unscrewing.

For Overhaul (OH) also replace all the nuts.

For Overhaul (OH) replace basically the silentblocs in the brake bridge pieces (see Fig. 9.13).

When fitting the silentblocs in the brake bridge piece make sure that no axial pressure is applied to the inner part when pressing in.
The force should be introduced via the end face of the outer tube.

Fig. 9.13 Pressing in the silentblocs

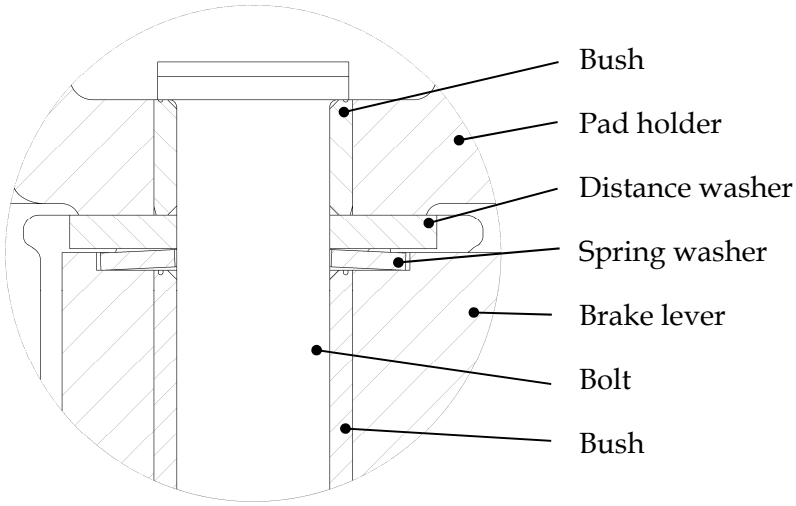


Fig. 9.14

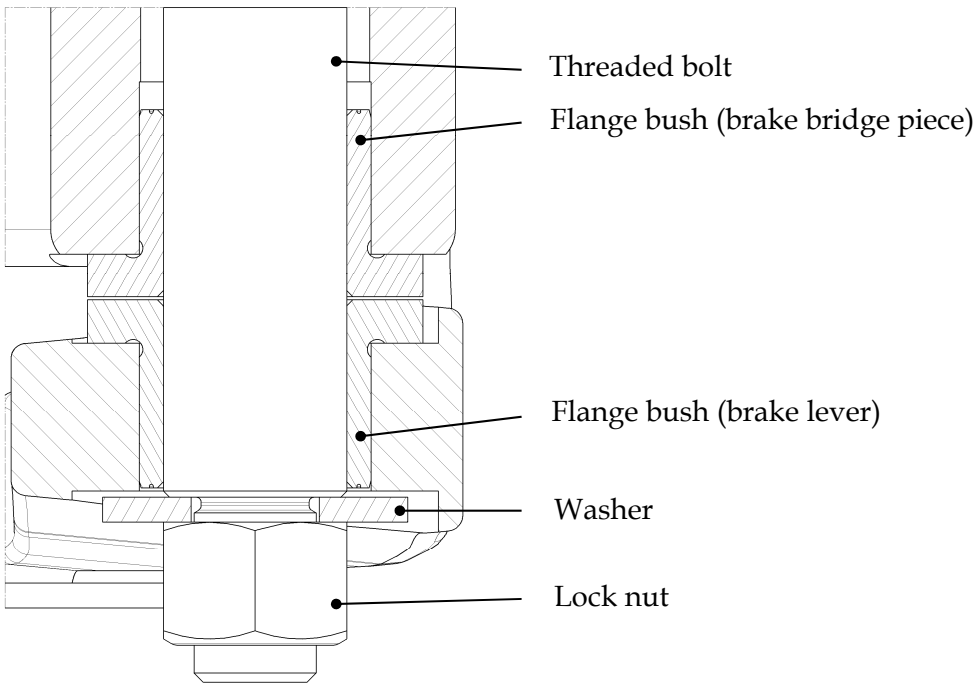


Fig. 9.15

Special tools:

Torque wrench up to 500 Nm.

Assembly sequence:

(1) Mount the pad holder (9.1/1 and 2) on the both brake levers (9.1/3).

Pay attention to the position of the spring washers during assembly.
Grease spring washers before fitting (see chapter 6.2).
Allocate spring washers and distance washers according figure 9.13.

Fig. 9.14 Connection Pad holder/ Brake lever

Insert the split pin into the pad holder bolt in such a way that the bolt can turn through at least 180°.

Fig. 9.15 Connection Brake bridge piece/ Brake lever

(2) Mount the brake bridge piece (9.1/4) to the brake levers, thereby arrange the washers to the threaded bolt (9.1/8) according figure 9.14.

(3) Hang up the brake cylinder (9.1/13) and mount to the brake levers. Observe the position of the air connections. Exhaust ports (draining tips) must point downwards.

After mounting the four hexagon head bolts with tapped (9.1/11), spray the not painted area of the brake lever with preservative (e.g. Tectyl 846, see section 6.2).

(4) Tighten screw connections with the following torques:

- Hexagon head bolt with tapped (9.1/11) on the brake cylinder — M_A = 500 Nm
- Lock nuts (9.1/7) above the brake bridge piece — M_A = 200 Nm

(5) Mount the brake caliper in the bogie:

- Screw fastening brake bridge piece/ bogie. Hexagon bolts (8.1/3), M20 (WS 30) (according to car-builder information). — M_A = 320 Nm

(6) Adjust the brake cylinder in the basic setting.

(7) Fit brake pads (9.1/14).

(8) Connect the pressurized air pipes. Fit the emergency release cable for the spring- loaded cylinder - open the air supply.

(9) Carry out functional check.

- actuate brakes,
- check clearance.

10 Spare part catalogue

For the order for spare parts state the order number, the designation and the quantity of the part without fail.

The particular individual parts are to be found in the appropriate exploded drawings. The order numbers and the designations relevant to the individual parts can be seen from the associated spare parts lists.

Use only original spare parts for repairs and overhaul work**.**

Orders for spare parts are to be addressed to:

Faiveley Transport Witten GmbH

Phone +49 (0)2302 2775-0 • Fax +49 (0)2302 2775-99334

Brauckstraße 26, D-58454 Witten (Germany)

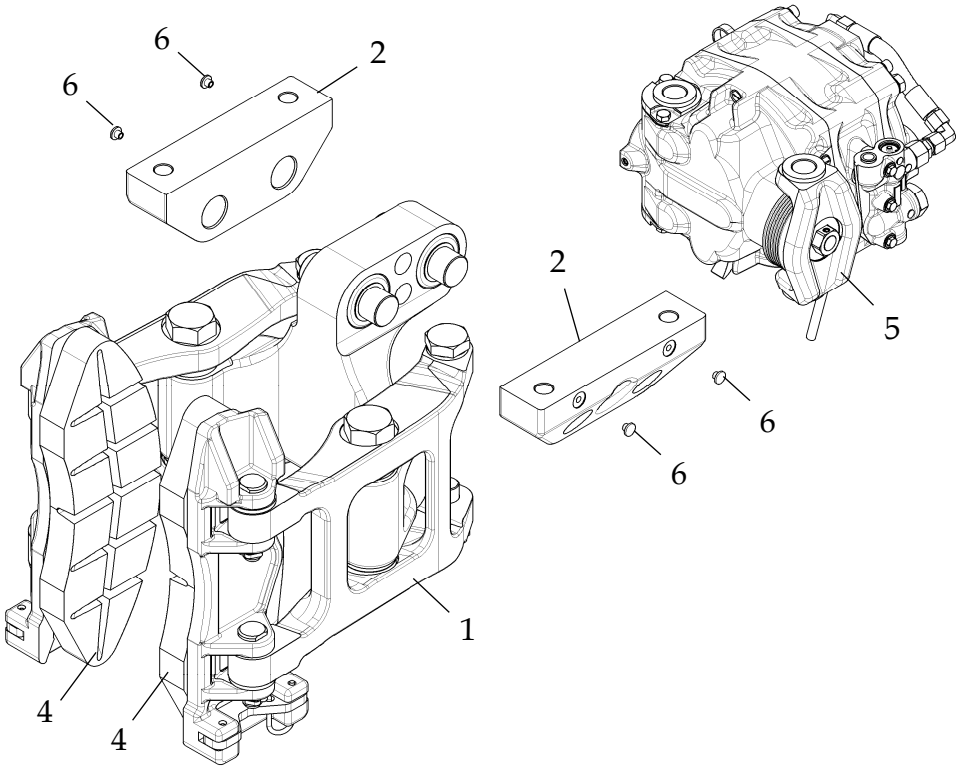


Fig. 10.1a

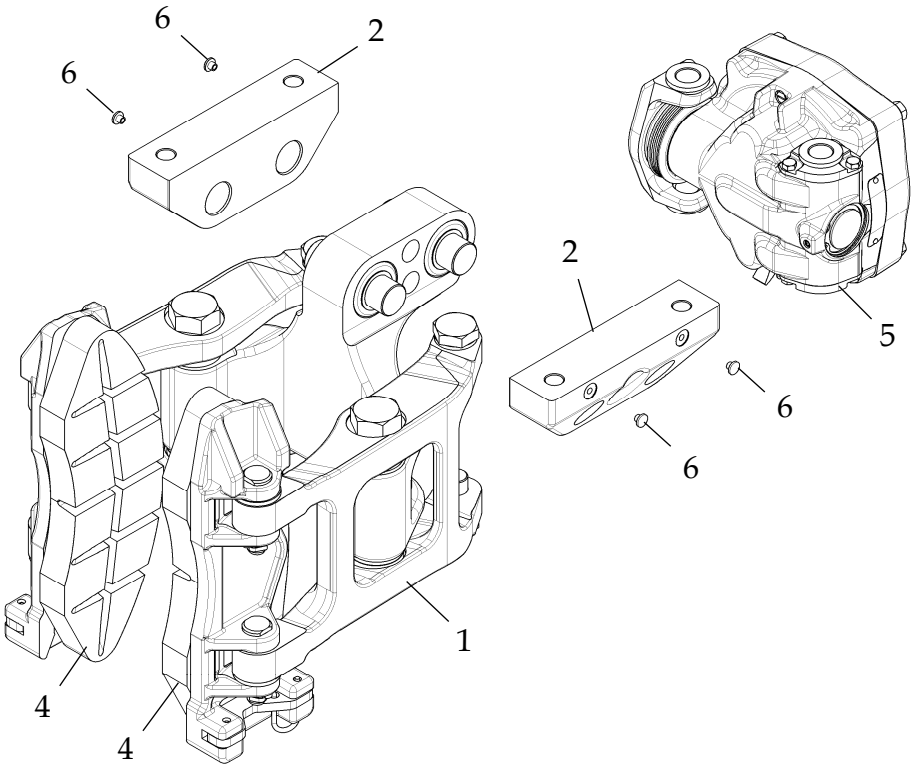


Fig. 10.1b Spare parts for brake caliper, assembly

10.1 Spare parts for brake caliper, assembly

Versions according to drawing no. 136281F41_ and 136281F51_

(see Fig. 10.1a)

Item No.	Order No.	Designation	Quantity	Waste Category
-	D136281-400	Brake caliper, assembly	1	-
1	D136280-200	Brake caliper, complete	1	-
2	D136311-500	Adapter	2	R4
4	D122101-701	Brake pad 400 cm^2 x 35, Set	2	-
5	FT0013521-100	FT-Brake cylinder CCC PB 8"/8"	1	-
6	D003149-101	Verschlussstopfen GPN300, F2	4	-

(see Fig. 10.1b)

Item No.	Order No.	Designation	Quantity	Waste Category
-	D136281-500	Brake caliper, assembly	1	-
1	D136280-200	Brake caliper, complete	1	-
2	D136311-500	Adapter	2	R4
4	D122101-701	Brake pad 400 cm^2 x 35, Set	2	-
5	FT0010959-136	FT-Brake cylinder CCC SB 8"	1	-
6	D003149-101	Verschlussstopfen GPN300, F2	4	-

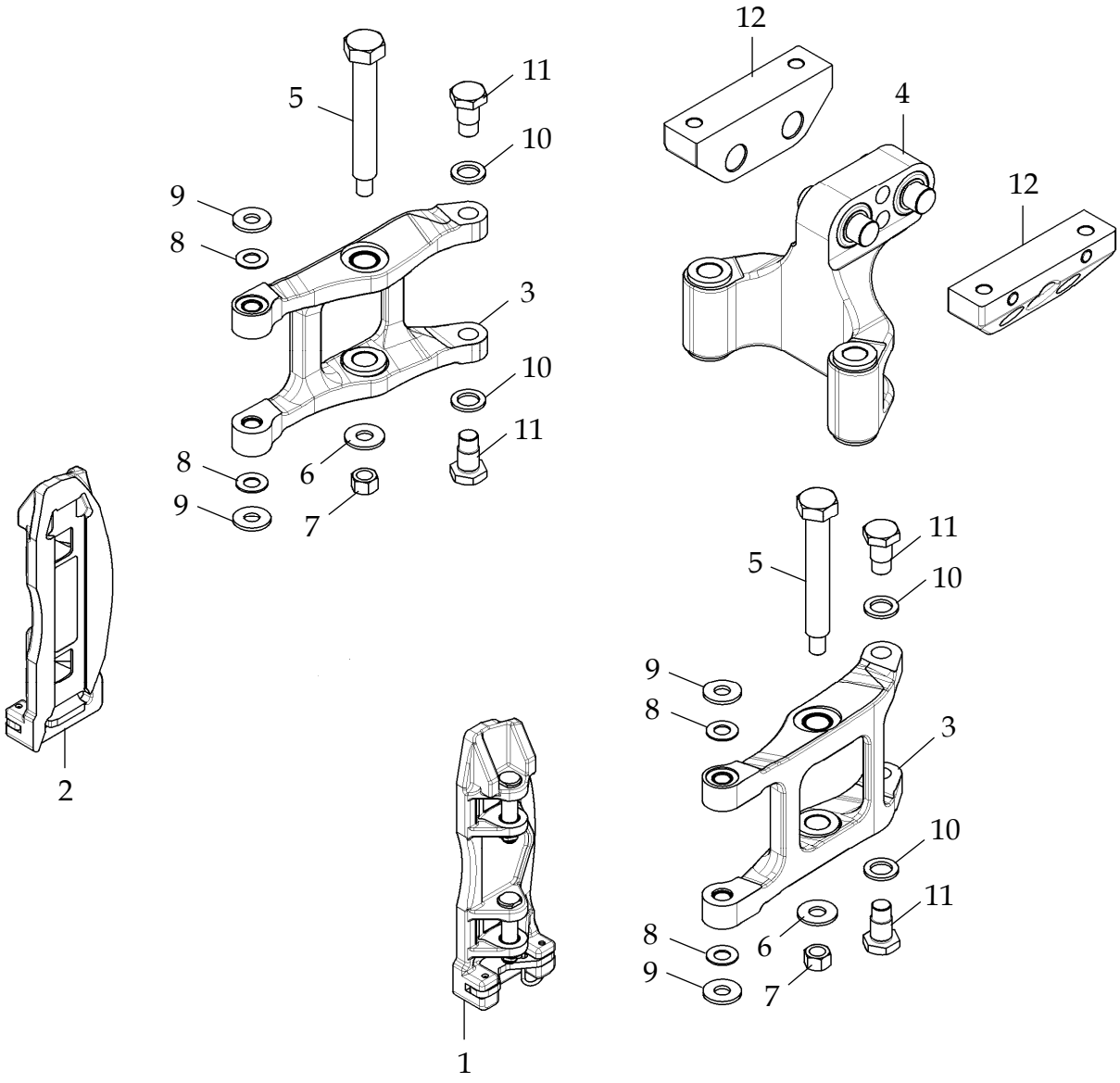


Fig. 10.2 Spare parts for brake caliper, compl.

10.2 Spare parts for brake caliper, compl.

Version according to drawing No. 136280F21_

Item No.	Order No.	Designation	Quantity	Waste Category
-	D136280-200	Brake caliper, compl.	1	-
1	D136278-100	Pad holder BF400, right-hand, ready for mounting	1	-
2	D136279-100	Pad holder BF400, left-hand, ready for mounting	1	-
3	D136344-100	Brake lever, compl.	2	-
4	D136346-100	Brake bridge piece, compl.	1	-
5	D136085-100	Threaded bolt D30A11	2	R4
6	D136086-100	Washer	2	R4
7	D002232-103	Lock nut M20x1,5	2	R4
8	D000632-101	Spring washer A40 GR2	4	R4
9	D136087-100	Distance washer	4	R4
10	D001882-101	Detent edged ring BN208012/6	4	R4
11	D136088-100	Hexagon head bolt with tapped M27x2	4	R4
		Lubricant: Molykote P40, Fa. Dow-Corning		R9

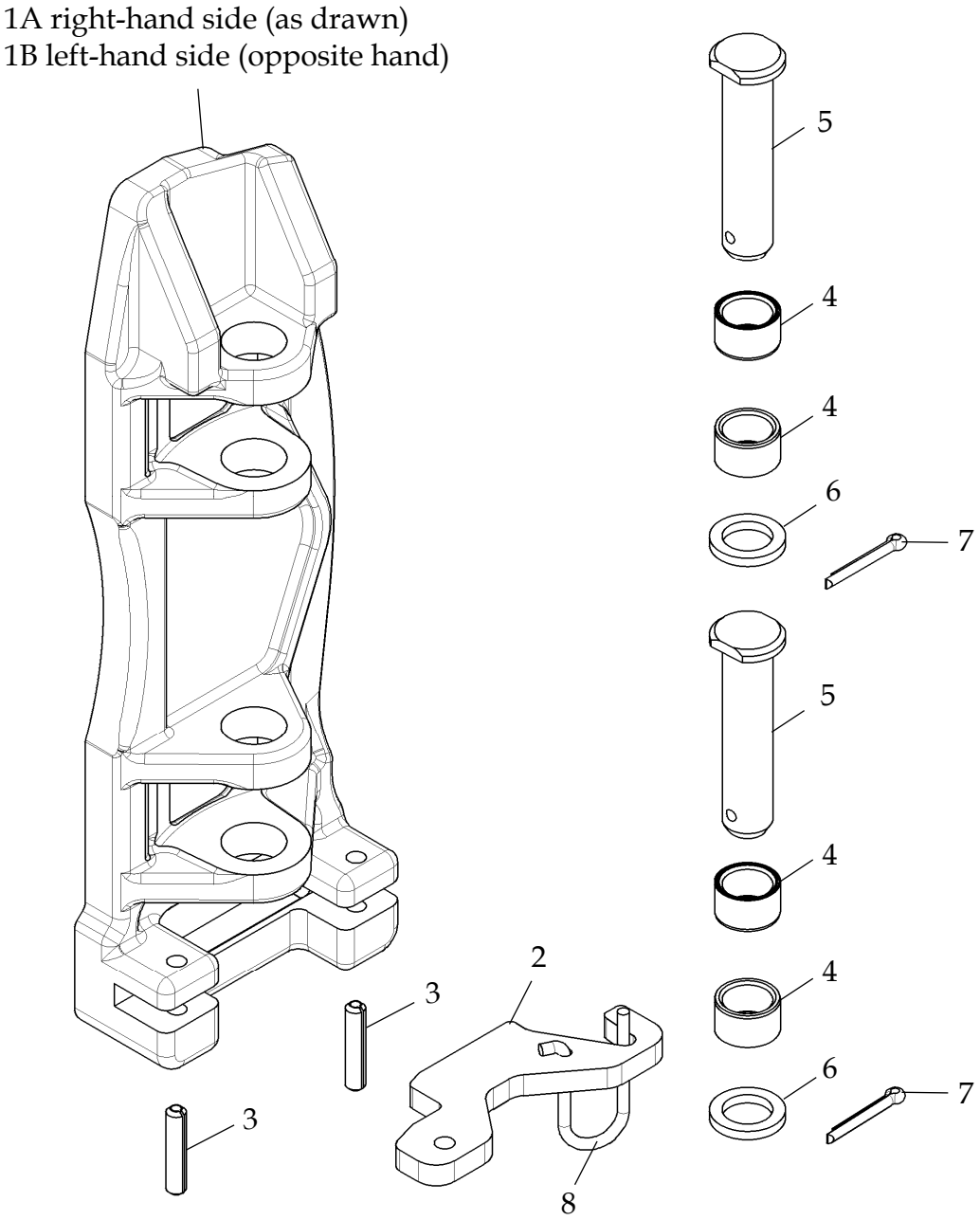


Fig. 10.3 Spare parts for pad holder BF400, ready for mounting

10.3 Spare parts for pad holder BF400, ready for mounting

(acc. to drwg. no. 136278F13_ = right; drwg. no. 136279F13_ = left)

Item No.	Order No.	Designation	Quantity	Waste Category
-	D136278-100	Pad holder BF400, right-hand, ready for mounting	1	-
-	D136279-100	Pad holder BF400, left-hand, ready for mounting	1	-
1A	D136744-100	Pad holder BF400, right-hand	1	R4
1B	D136745-100	Pad holder BF400, left-hand	1	R4
2	D136276-200	Locking latch	1	R4
3	D001278-101	Heavy-type dowel pin SG 8x40 (Connex)	2	R4
4	D120119-100	Bush C20/26x15	4	R4
5	D136089-100	Bolt D20a11x90x79	2	R4
6	D000299-106	Washer 20	2	R4
7	D000555-101	Split pin 5x32	2	R4
8	D136277-100	Spring	1	R4

10.4 Spare parts for brake lever, compl.

Version according to drawing no. 136344F11_

Item No.	Order No.	Designation	Quantity	Waste Category
-	D136344-100	Brake lever, compl.	1	-
2	D132041-100	Bush C20/26x30	2	R4
3	D136381-100	Flange bush 30/38x23.5	2	R4

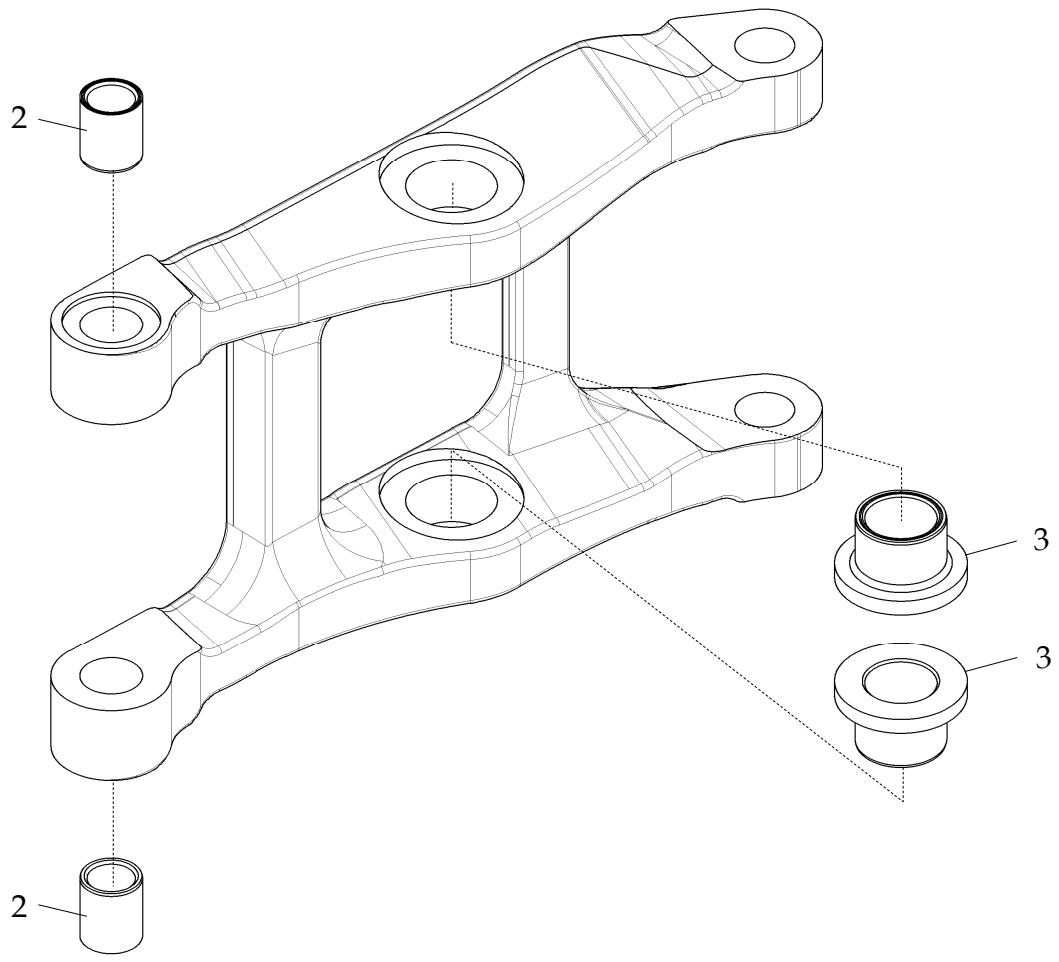


Fig. 10.4 Spare parts for brake lever, compl.

10.5 Spare parts for brake bridge piece, compl.

Version according to drawing No. 136346F10_

Item No.	Order No.	Designation	Quantity	Waste Category
-	D136346-100	Brake bridge piece, compl.	1	-
2	D128854-200	Silentbloc	2	R4
3	D120187-100	Flange bush C30/38x23.5	4	R4

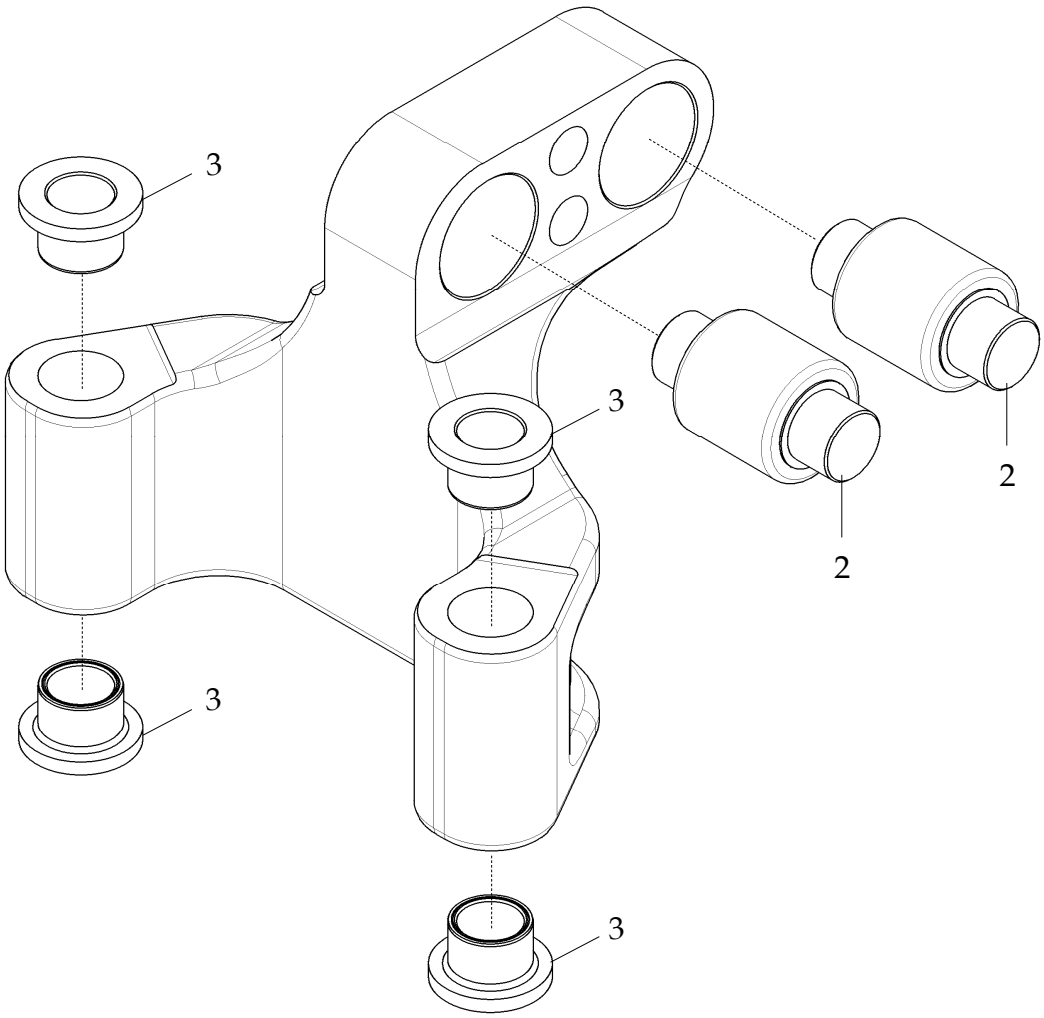


Fig. 10.5 Spare parts for brake bridge piece, compl.

11 Annex

11.1 Paint specification

For the brake caliper, the following separate document applies:

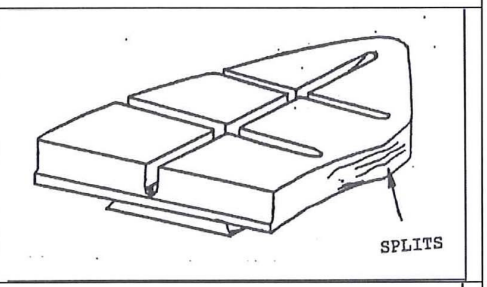
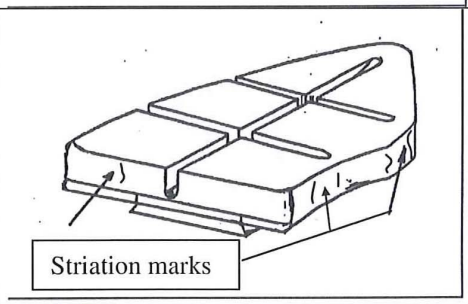
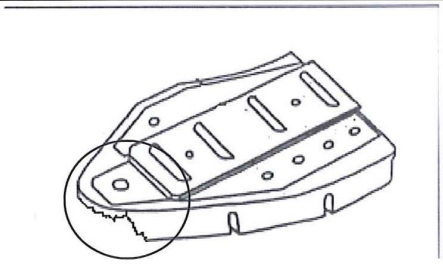
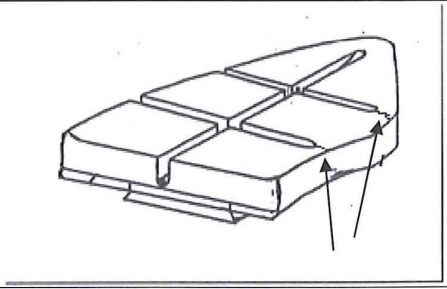
FTD136481-400-E00TSI.

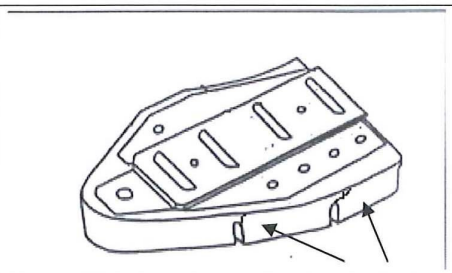
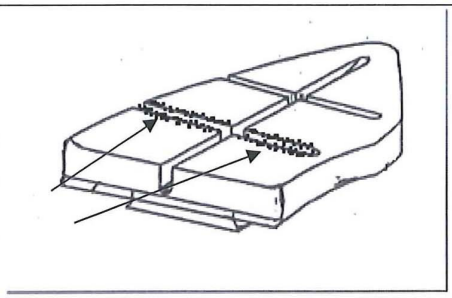
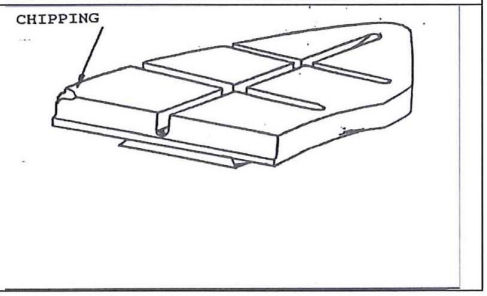
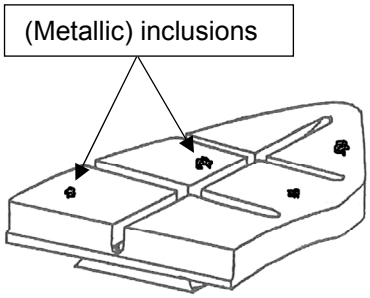
For the brake cylinder, the following color instruction applies:

A84931/ A84932.

11.2 Appraisal document for organic brake pads

Crack appraisal for organic brake pads

No.	CHARACTERISTIC	DESCRIPTION	VISUAL
1.	**CRACKS IN SIDE WALLS OF PAD**	Allowed up to a crack length of 25 mm Safety relevant: No Pad change: No	
2.	**STRIATION MARKS**	Allowed Safety relevant: No Pad change: No	
3.	**MISSING PARTS. PAD MATERIAL BREAKING OFF.**	Not allowed Safety relevant: No Pad change: Yes	
4.	**CRACKS ON PAD SURFACE AT END OF GROOVE**	Allowed Safety relevant: No Pad change: No	

5.	**CRACKS AT BASE OF GROOVES**	Allowed. If the split opens up to > 2mm it is recommended the pads are replaced. Safety relevant: No Pad change: No	
6.	**EDGE PITTING IN GROOVE AREA ON PAD SURFACE**	Allowed Safety relevant: No Pad change: No	
7.	**CHIPPING**	Allowed Safety relevant: No Pad change: No	
8.	**INCLUSIONS**	Allowed Safety relevant: No Pad change: No, but for avoiding grooving the user can decide to change the brake pads. If possible the inclusions can also be removed.	

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01.03_MAGNET VALVE

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/// FT0050768-102-E00MUM

MAGNET VALVE ASSEMBLY
FT0050768-102
EP MAGNET VALVE
FT0050768-103

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.SKK Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0050768-102-E00MUM.docx	C00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	30/12/2015	NEW RELEASE		SRC	MK	.VC
B00	30/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1675	VP	.KMS	.BSH
C00	07/02/2023	Document updated with new template and added new P/N: FT0050768-103	DRC1751 /4	DC	.SKK	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Magnet valve is an EP valve that is designed to direct or cut-off the flow of air under pressure between two ports.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Magnet Valve Assy must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Magnet Valve and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Magnet Valve Assy P/N FT0050768-102 and FT0050768-103 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
DC	Direct Current
EP	Electro Pneumatic
HD	Head
HEX	Hexagonal
NC	Normally Closed
Nm	Newton metre
P/N	Part number
QTY	Quantity
SOC	Socket
V	Voltage

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

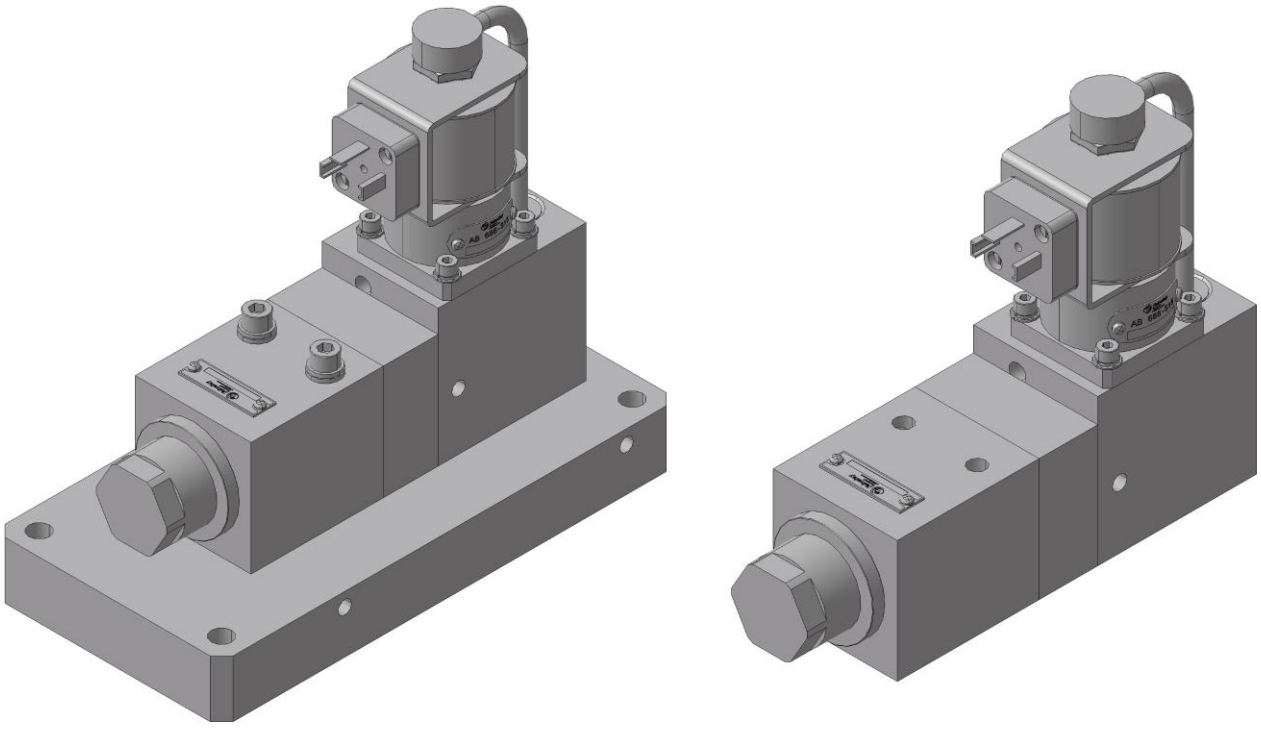
2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The EP magnet valve type NC is a normally-closed valve, which connects the Inlet to delivery when it is energised. The valve has a pneumatic portion piloted by an EP valve.

The Magnet Valve is a 110 volt, single solenoid type, EP valve designed to direct or cut-off the flow of air under pressure between two ports. Air flow through the valve portion is controlled by the energization or de-energization of the magnet valve coil. The Magnet Valve is NC and the magnet valve coil de-energized.

This Magnet Valve Assy P/N FT0050768-102, consists of a Pilot Valve Portion, P/N FT0050768-103, and a Pipe Bracket Portion, P/N. FT0050924-100. The Pilot Valve Portion is mounted on the Pipe Bracket Portion in such a way that it can be removed for servicing or maintenance without disturbing the piping or wiring of the equipment arrangement.



FT0050768-102

FT0050768-103

Figure 1: Magnet Valve, Isometric View

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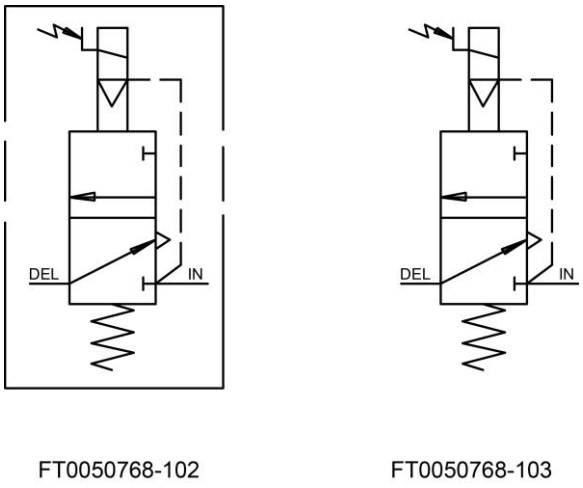

Figure 2: CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

- Port size……...……...…...3/8” BSP
- Max operating pressure.....……...10 bar
- Working pressure range……...…....0 - 10 bar
- Mass.....1.9 Kg. Approx.
- Power supply..... 110 V DC
- Coil resistance…….1115 Ω ±5% at 20°C

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/// 3. OPERATIONS

3.1 NORMAL CONDITION

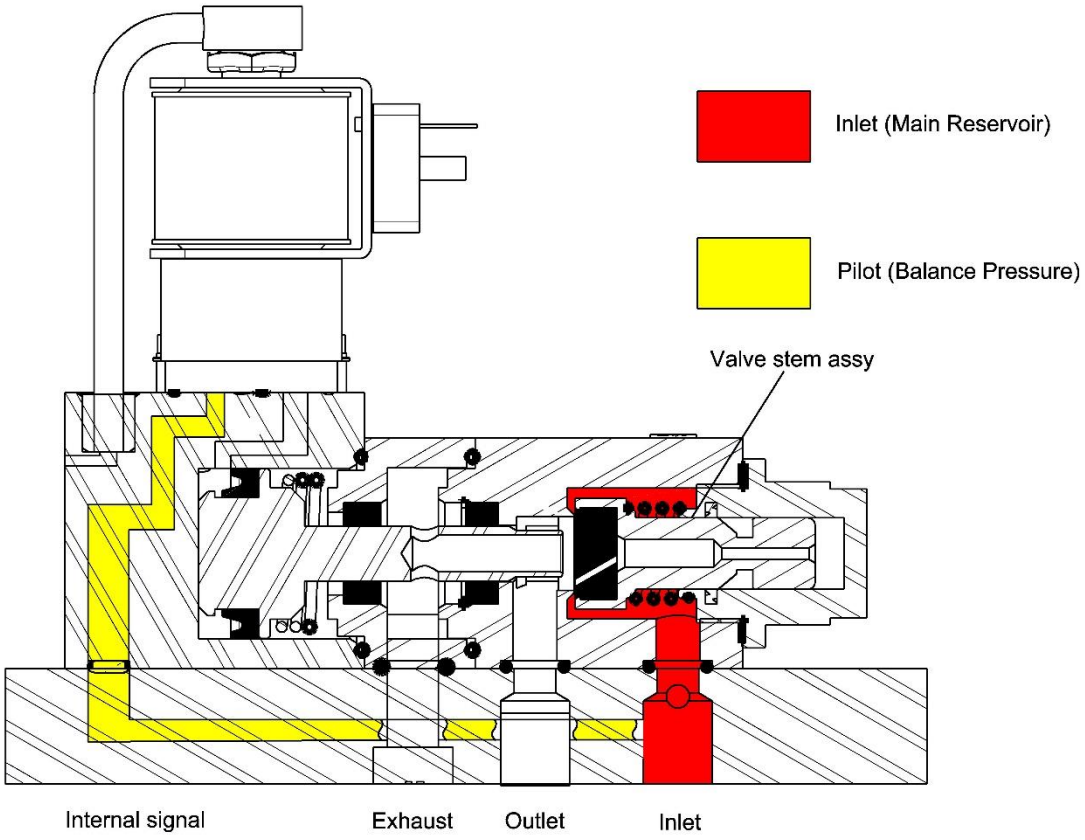

Figure 3: Magnet Valve, Normal Condition

Refer to Figure 3

The valve operates with a Solenoid coil of 110 V DC. The valve is connected to the pipe bracket which has the pneumatic port interface and mounting holes for mounting on to the vehicle. In normal conditions (i.e. de- energised) the valve stem assy remains closed. The outlet is connected to the exhaust.

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3.2 WORKING CONDITION

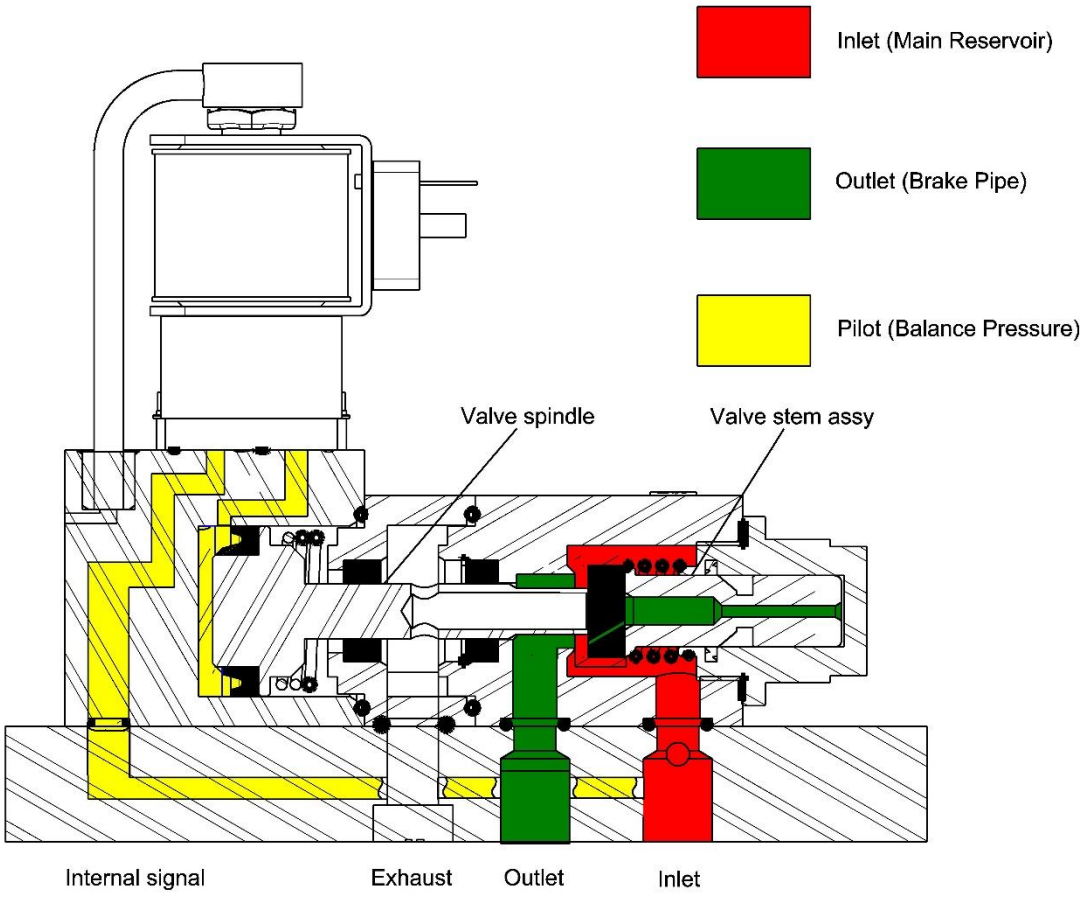

Figure 4: Magnet Valve, Working Condition

Refer to Figure 4

During working conditions, the magnet valve solenoid coil is energised; the valve spindle is moved to open the main valve stem assy to connect the inlet port to outlet.

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3.3 EXHAUST CONDITION

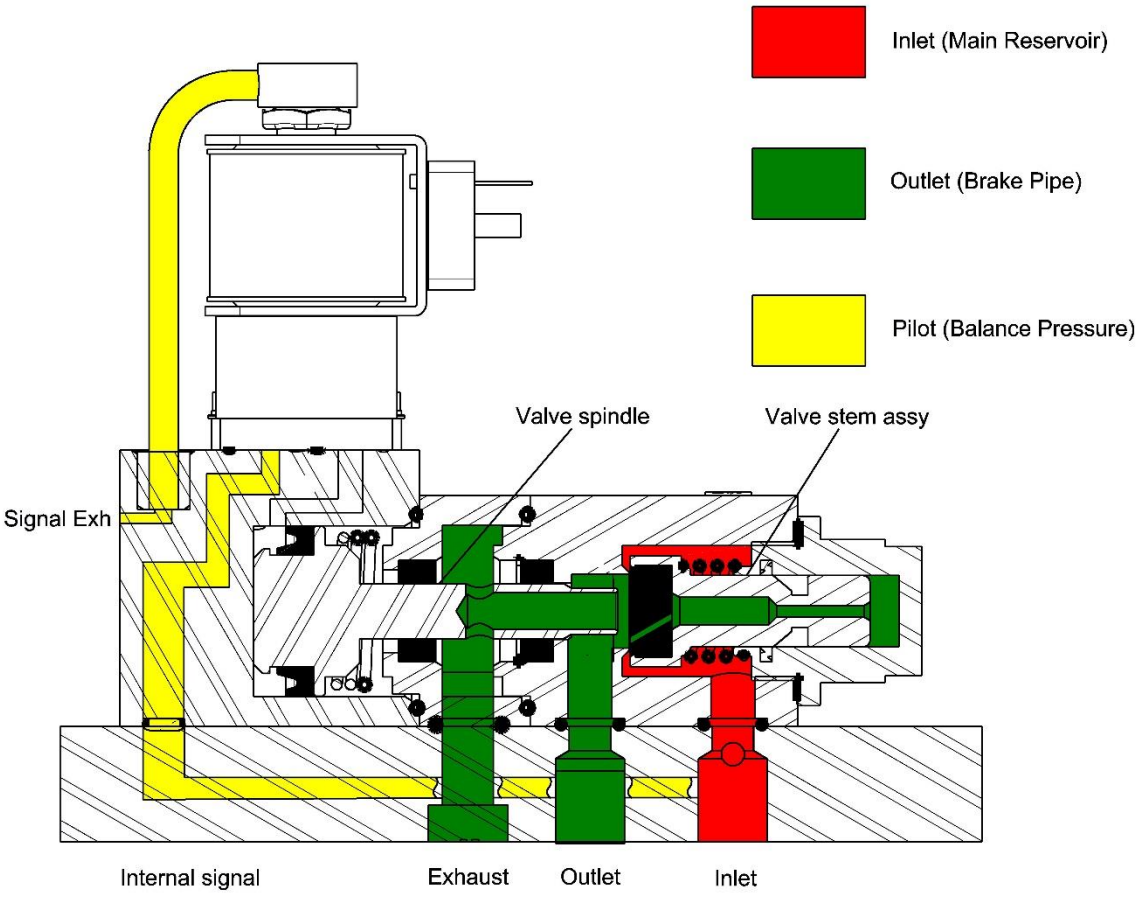

Figure 5: Magnet Valve, Exhaust Condition

Refer to Figure 5

When the valve is again de-energised the normal conditions are restored (i.e. delivered air will be connected to exhaust). The valve spindle and valve stem assy move back to their initial condition.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
5 mm allen key	Tighten/loosen the fasteners
Torque wrench 3-14 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33 or M55	Lubricant for parts
Loctite 242 or 243	Thread locking
Lint free cloth	Lint free cloth
Stylmark	Torque marker

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): As scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be checked regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Replacement of filter applicable only for FT0050768-102. (Refer to section 5.2.1).
   Typical periodicity: 1 year.

2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 REPLACEMENT OF FILTER (Applicable only for FT0050768-102)

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 6

1. Unplug the electrical connector and drain the system pressure.
2. Remove the filter (3) and sieve (2) from the pipe bracket (1).
3. **DISCARD** the filter (3) and replace with the **NEW** filter (3).
4. Clean the sieve (2) for any impurities so that it is clog free.
5. Install the sieve (2) and the filter (3) to the pipe bracket (1).
6. Plug the electrical connector and restore to its initial condition.

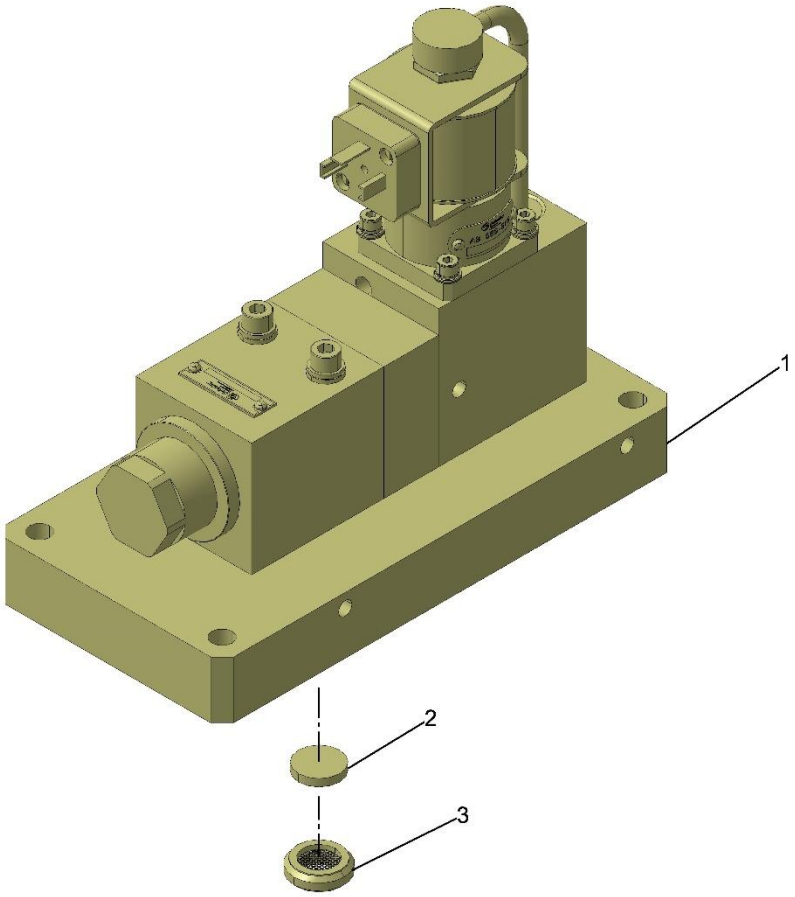

Figure 6: Magnet Valve, Filter Replacement

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PIPE BRACKET	FT0050924-100	1
2	SIEVE	001606000	1
3	FILTER	531602000	1

5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 7

1. Unplug the electrical connector and drain the system pressure.
2. Remove the following parts which secures the pilot valve (1) to the pipe bracket (2)
   - Two cap screws (5) using 5 mm allen key
   - Cap screw (6) using 5 mm allen key
   - Three spring washers (3)
   - Three plain washers (4).
3. Lift the pilot valve (1) from the pipe bracket (2).
4. Remove the four O-rings (9) from the mounting surface of the pilot valve (1).
5. Check the condition of four O-rings (9). In case of damage replace with two **NEW** O-rings (9)
6. Set the pilot valve (1) aside in a protected area.
7. Remove the filter (7) and sieve (8) from the pipe bracket (2).
8. Clean the filter (7) and sieve (8) for any impurities so that it is clog free

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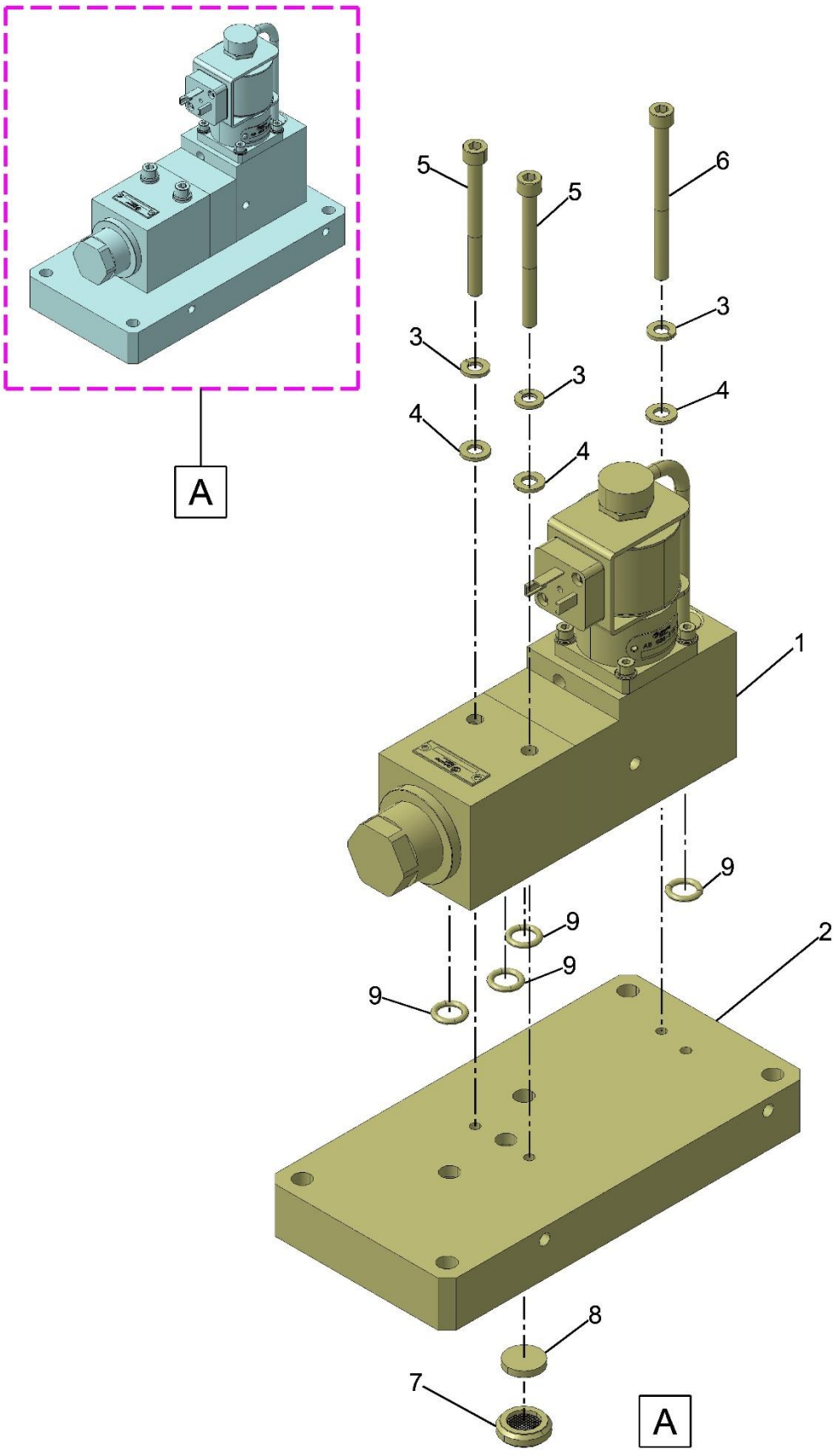

Figure 7: Magnet Valve, Removal/Installation

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PILOT VALVE ASSY	FT0050768-103	1
2	PIPE BRACKET	FT0050924-100	1
3	SPRING WASHER DIA 6	909020700	3
4	PLAIN WASHER DIA 6	908018900	3
5	HEX SOC HD CAP SCREW M6X65	901042100	2
6	HEX SOC HD CAP SCREW M6X75	901042200	1
7	FILTER	531602000	1
8	SIEVE	001606000	1
9	O-RING	003703000A	4

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 7

1. Apply a thin coating of Molykote M33 grease to the four O-rings (9) and to the groove of pilot valve.
2. Install the four O-rings (9) into the groove of pilot valve (1). Remove any excess lubricant by wiping with clean, dry lint-free cloth.
3. Install the sieve (8) and the filter (7) to the pipe bracket (2).
4. Mount the pilot valve (1) onto the pipe bracket (2). Make sure it is seated properly.
5. Apply Loctite 242 on threads of the three cap screws (5) & (6)
6. Secure the pilot valve (1) in place by installing the following parts
   - Three plain washers (4)
   - Three spring washers (3)
   - Two cap screw (5)
   - Cap screw (6)
7. Tighten the three cap screws (5) and (6) using 5 mm allen key.
8. Equally torque tighten the three cap screws (5) and (6) to 5.2 Nm. Apply torque mark using stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

9. Plug the electrical connector.
10. Pressurize the system, switch on the electrical power and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance - the spare parts required for routine maintenance is listed in the below table:

Refer to Figure 6

ROUTINE MAINTENANCE SPARE PARTS LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
3	FILTER	531602000	1

- Installation: Spare parts required for installation are listed in the below table:

Refer to Figure 7

ROUTINE MAINTENANCE SPARE PARTS LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
9	O-RING	003703000A	4

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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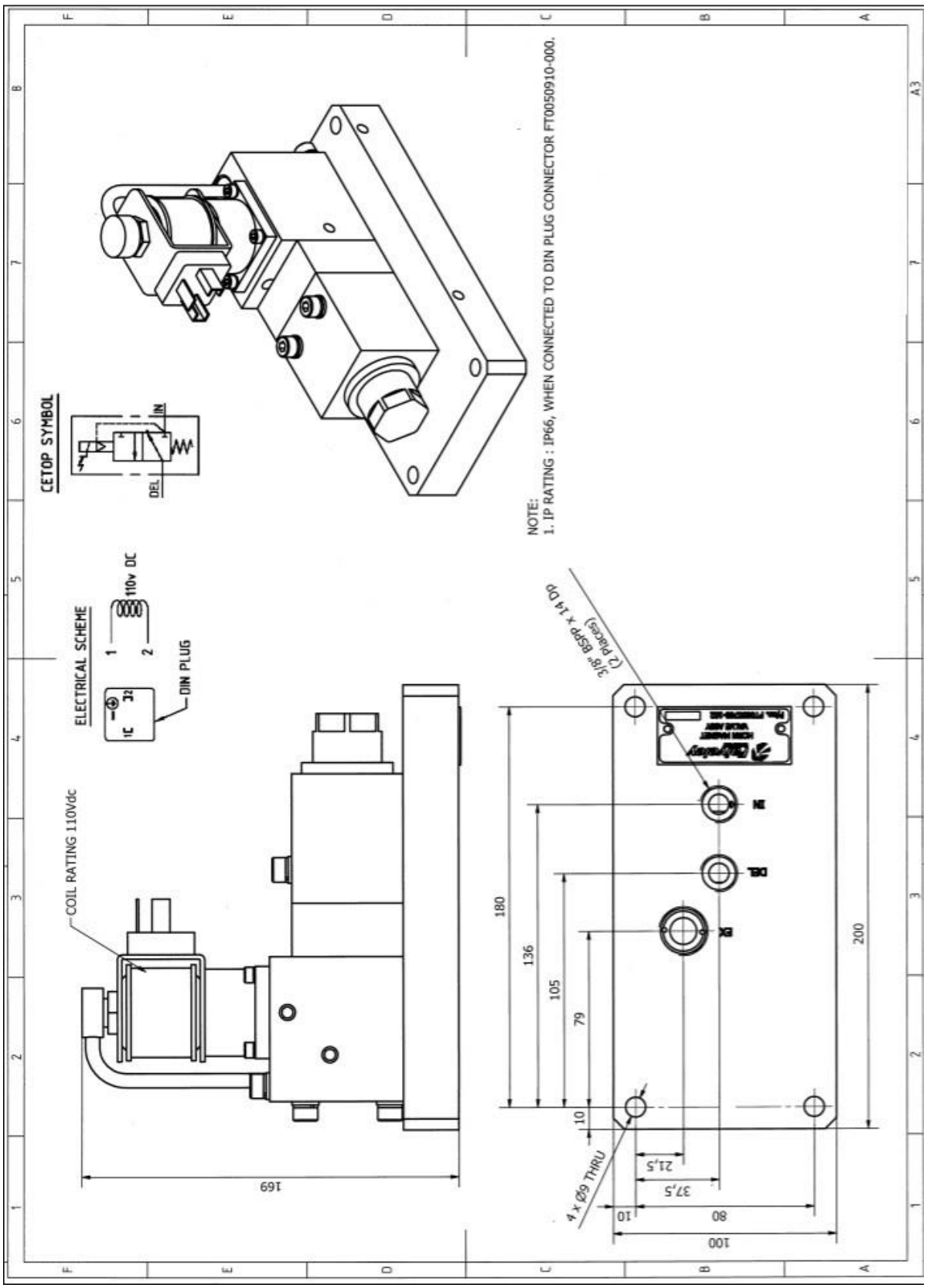
/// 8. OUTLINE DRAWING

Magnet Valve Assy - FT0050768-102



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01.24_BRAKE VALVE ISOLATOR

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/// FT0053756-100-E00MUM

BRAKE VALVE ISOLATOR
FT0053756-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.SKK Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
FT0053756-100-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	07/02/2023	NEW RELEASE	DRC1751 /4	DC	SKK	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Brake Valve Isolator establishes communication of brake pipe to the relay valve for charging and venting the brake pipe in the active cab and prevents such communication in the in-active cab.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Brake Valve Isolator must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Brake Valve Isolator and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Brake Valve Isolator P/N FT0053756-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
BP	Back Pressure
DC	Direct Current
HD	Head
HEX	Hexagonal
MR	Main Reservoir
Nm	Newton metre
P/N	Part Number
QTY	Quantity
SOC	Socket
V	Voltage

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The Brake Valve Isolator establishes communication of brake pipe to the relay valve for charging and venting the brake pipe in the active cab and prevents such communication in the in-active cab. The automatic actuation is controlled by means of a solenoid valve triggered by the cab switch.

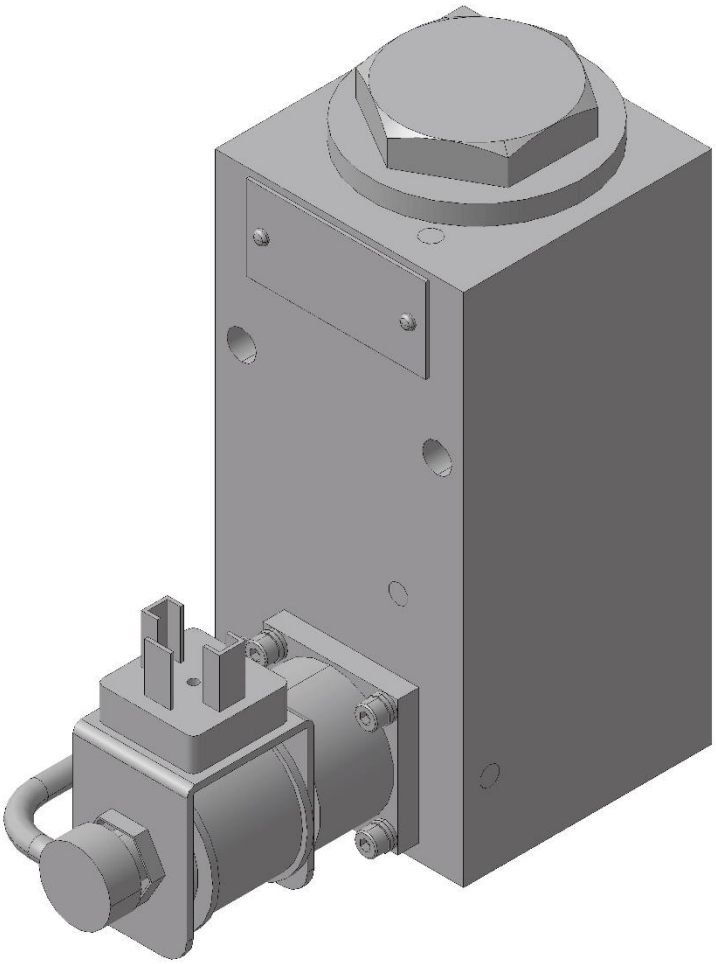

Figure 1: Brake Valve Isolator, Isometric View

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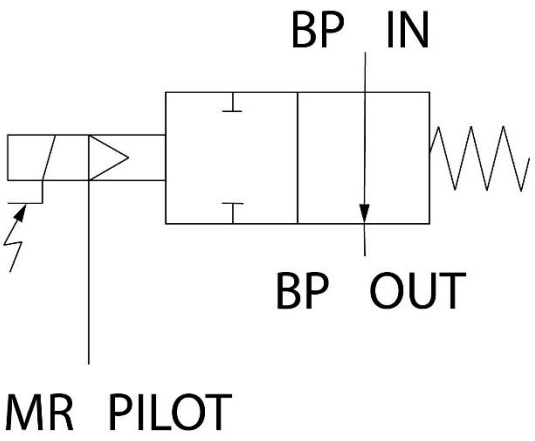

Figure 2: CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

- Max operating pressure……...…...10 bar
- Working pressure range……...…...0 - 10 bar
- Mass.....2.6 Kg. Approx.
- Power supply..... 110 Vdc
- Coil resistance……1115 Ω ±5% at 20°C

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/// 3. OPERATIONS

This device is a normally open valve.

The body of the Brake Valve Isolator is formed from aluminium alloy, which gives a lightweight yet robust construction. The front portion of the valve comprises the electro-pneumatic solenoid valve, the main portion of the valve houses the pneumatic valves comprising the differential piston assy and operating valve stem assy.

3.1 CONNECTED CONDITION

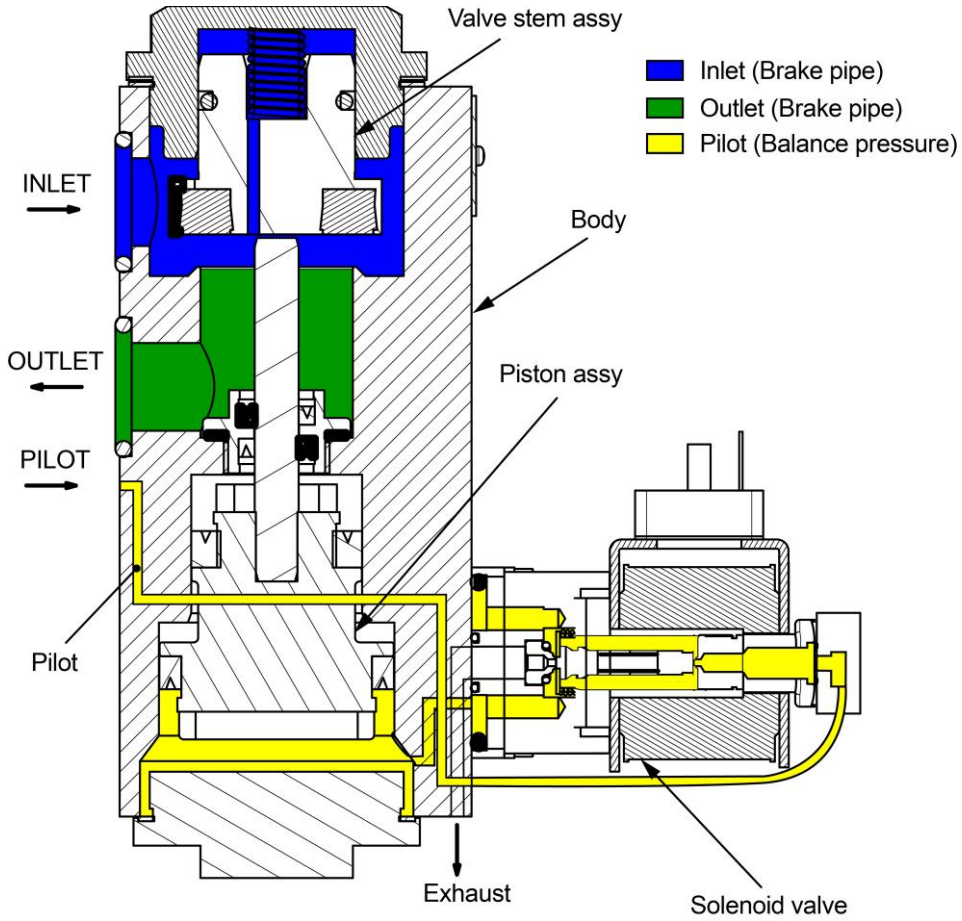

Figure 3: Brake Valve Isolator, Connected Condition

Refer to Figure 3

MR pressure enters into the pilot port of the valve and passes through the solenoid valve, which is normally open and occupies chamber below piston assy. Due to the large area in the chamber below the piston assy, it moves up along with the stem and lifts the valve stem assy connecting the inlet port to the outlet port (BP connection is established).

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3.2 ISOLATED CONDITION

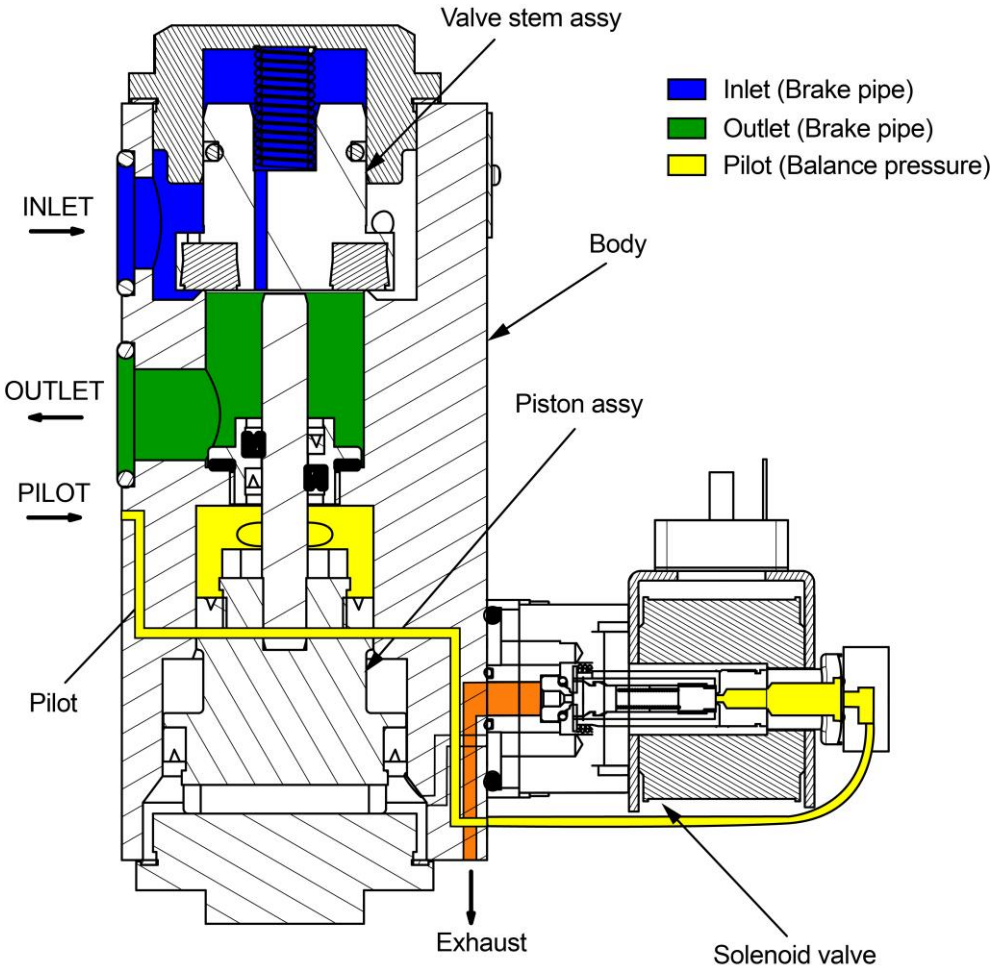

Figure 4: Brake Valve Isolator, Isolated Condition

Refer to Figure 4

To isolate the BP in operation, the solenoid valve is energised to exhaust the MR pilot pressure from the chamber below the piston assy. Due to the MR pressure available at the top chamber of the piston assy, it moves down, thereby the valve stem assy gets seated on its valve seat disconnecting the connection from inlet to the outlet port (BP connection is shut.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
6mm allen key	Tighten/loosen the fasteners
Torque wrench 3-14 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242 or 243	Thread locking
Molykote M33 or M55	Lubricant for parts
Stylmark	Torque marker

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required

2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 5

1. Disconnect the electrical connections from the solenoid valve assy.
2. Remove the two hex socket head cap screws (4), two lock washers (5) and two washers (6) using 6mm allen key to release brake valve isolator (1) from manifold.
3. Remove and **DISCARD** the two O-rings (2) and the O-ring (3) from the groove portion of brake valve isolator (1).

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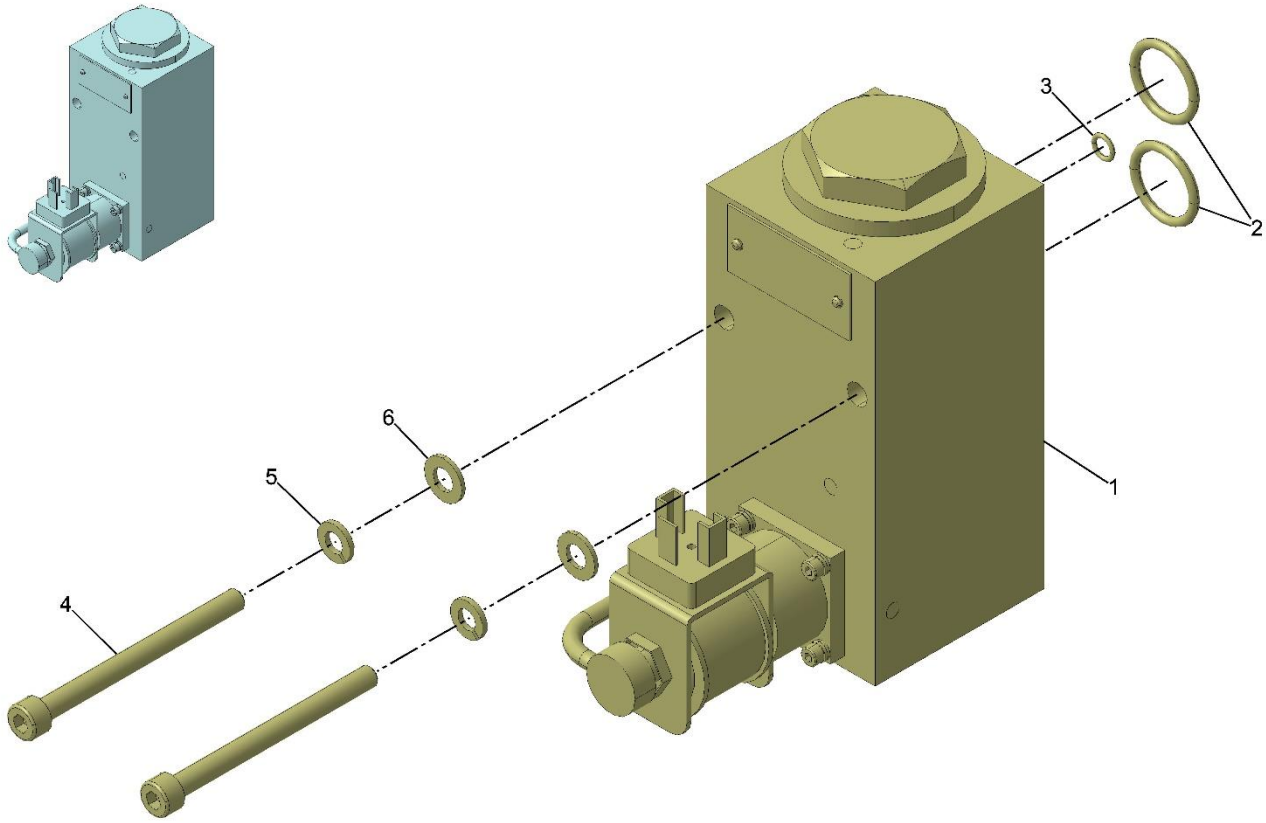

Figure 5: Brake Valve Isolator, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	BRAKE VALVE ISOLATOR	FT0053756-100	1
2	O RING	006720000A	2
3	O RING	010703000A	1

NOTE: Item 4, 5 and 6 are not under the scope of WABTEC.

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 5

1. Smear Molykote M33 grease to the two **NEW** O-rings (2) and O-ring (3) and to the groove portion of brake valve isolator (1).
2. Install the two **NEW** O-rings (2) and the **NEW** O-rings (3) on the groove portion of brake valve isolator (1).
3. Install the brake valve isolator (1) on the manifold, which is under car builder scope.
4. Apply the Loctite 242 to the threads of the two hex socket head cap screws (4).
5. Secure brake valve isolator (1) with the two hex socket head cap screws (4), two lock washers (5) and the washers (6) using 6mm allen key.
6. Torque tighten the two hex socket head cap screws (4) to 14 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

7. Pressurise the system, switch on the electrical power, and check for leakages as per the system level procedure performed during car builder's general system check

/// 6. Spare Part List

- Routine Maintenance - Not required.
- Installation: Spare parts required for installation are listed in the below table:

Refer to Figure 5

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
2	O RING	006720000A	2
3	O RING	010703000A	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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05.05_ DUPLEX CHECK VALVE

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/// FT0054993-100-E00MUM

DUPLEX CHECK VALVE
FT0054993-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0054993-100-E00MUM.docx	A00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Duplex Check Valve is used to prevent any air flow between the two air spring suspension bellows until it exceeds the set differential pressure.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Duplex Check Valve Assy must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Duplex Check Valve and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Duplex Check Valve Assy P/N FT0054993-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
BSPP	British Standard Parallel Pipe
HEX	Hexagonal
NC	Normally Closed
Nm	Newton metre
P/N	Part number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The Duplex Check Valve is used to prevent any air flow between the two air spring suspension bellows until it exceeds the set differential pressure.

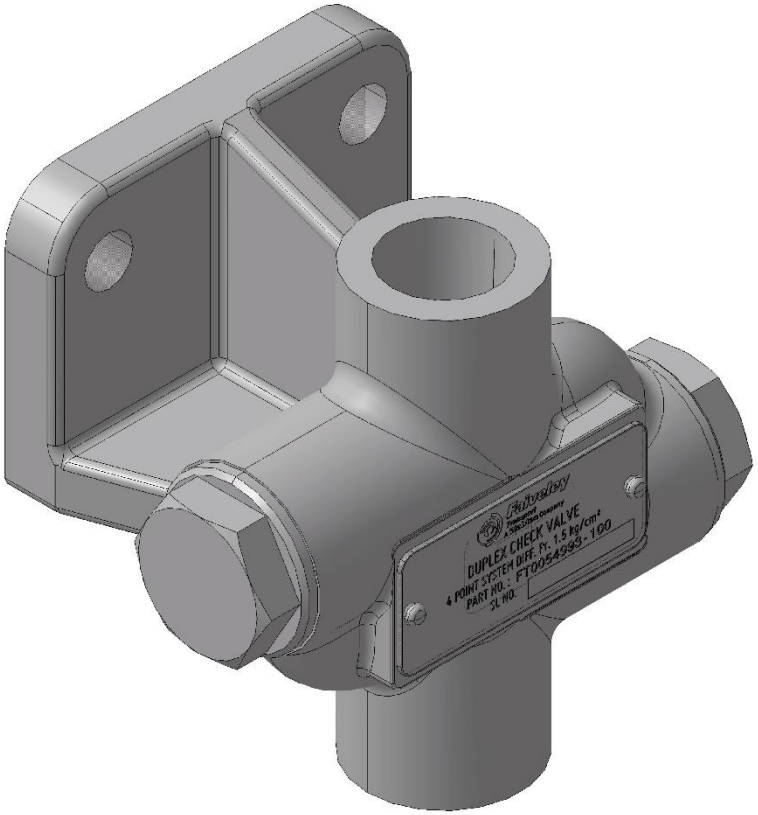

Figure 1: Duplex Check Valve, Isometric View

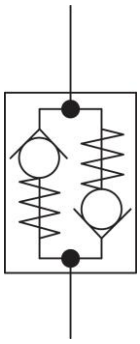

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

- Port size: .....G ½”
- Bore size: .....12 mm
- Max operating pressure: .....10 bar
- Working pressure range: .....0 - 10 bar
- Weight: .....0.7 kg Approx.
- Differential setting.....0.5 ± 0.1 bar

/// 3. OPERATIONS

3.1 NORMAL CONDITION

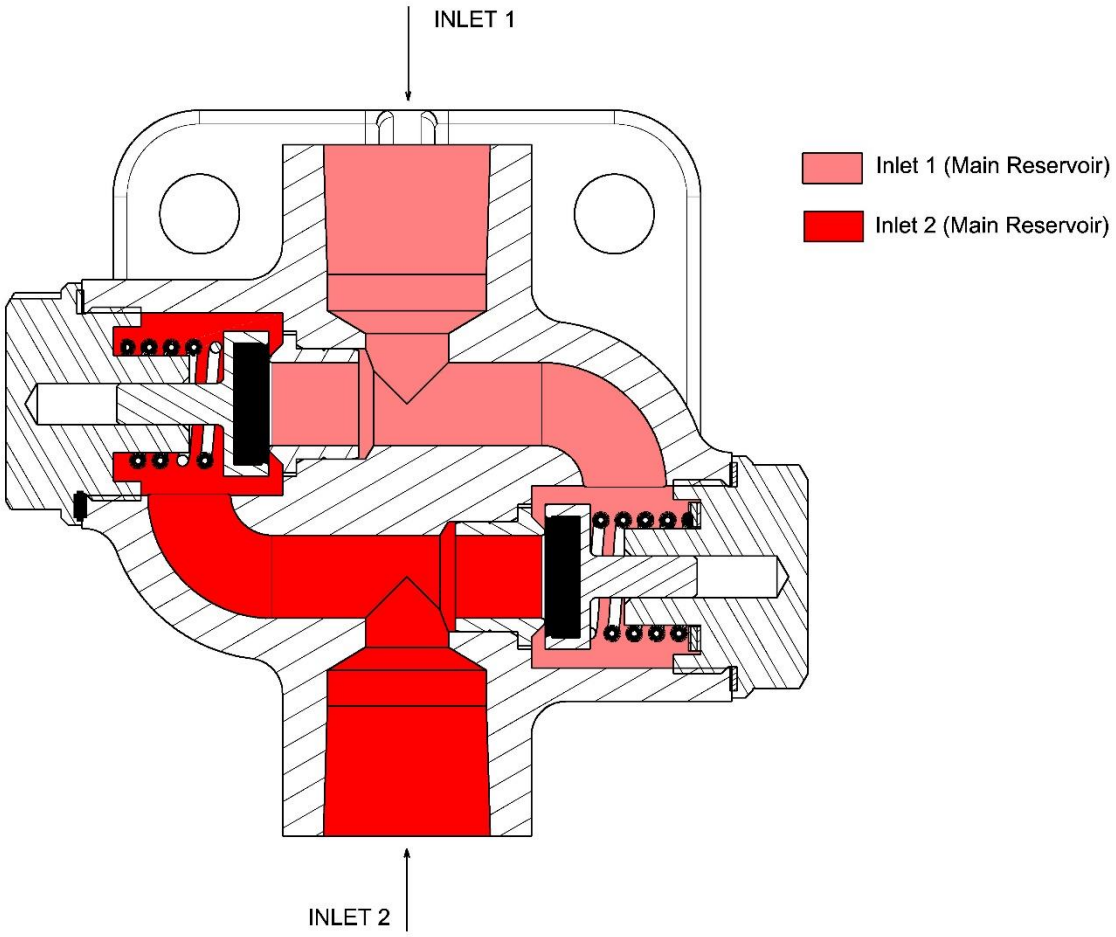

Figure 3: Duplex Check Valve, Normal Condition

Refer to Figure 3

When the air pressure at one input port exceeds the air pressure at the other input port by less than the differential limit, the springs keep both the check valves closed. This allows the two air suspension bags to have a pressure differential up to this pre-set value.

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3.2 WORKING CONDITION

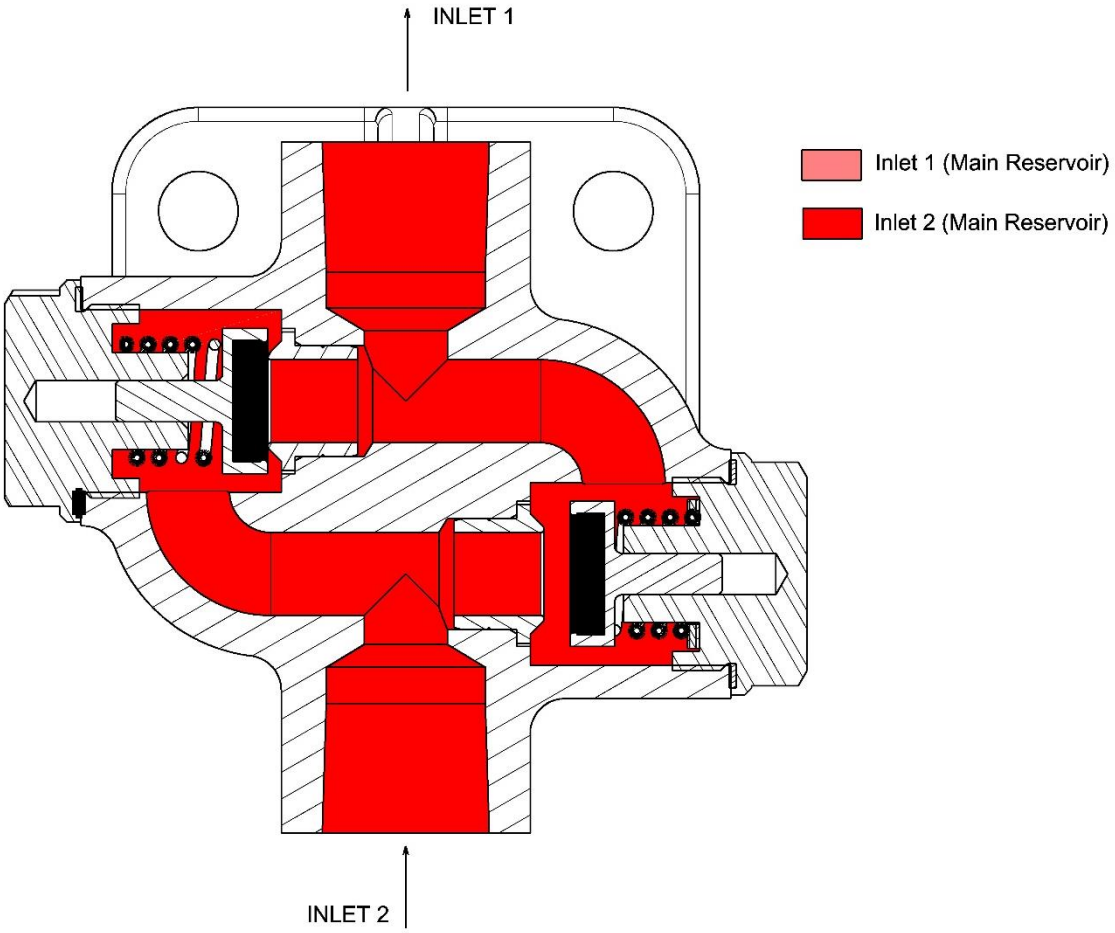

Figure 4: Duplex Check Valve, Working Condition (Sheet 1 of 2)

Refer to Figure 4

When the air pressure at one input port (inlet 2) exceeds the air pressure at the other input port (inlet 1) by more than the differential limit, the higher pressure overcomes the spring and opens the valve, allowing the air to flow from higher to the lower pressure. This flow continues until the differential pressure is reached.

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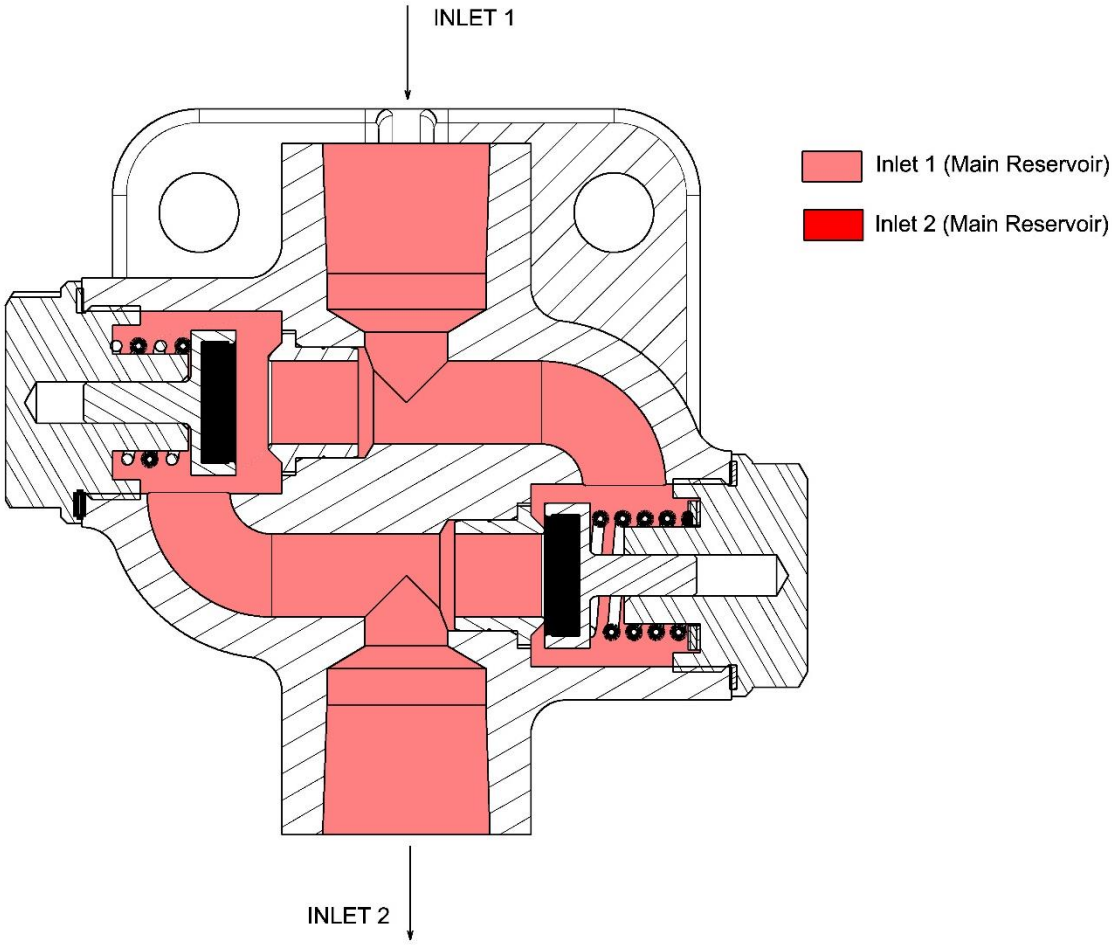

Figure 4: Duplex Check Valve, Working Condition (Sheet 2 of 2)

Refer to Figure 4

When the air pressure at one input port (inlet 1) exceeds the air pressure at the other input port (inlet 2) by more than the differential limit, the higher pressure overcomes the spring and opens the valve, allowing the air to flow from higher to the lower pressure. This flow continues until the differential pressure is reached.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
Standard tools	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242 or 243	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.

2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan.** If no system maintenance plan is provided; the device must be overhauled regularly as required by the Operator's rules; the mission profile and the environmental conditions.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

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5.3 REMOVAL PROCEDURE OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal. The Suspension pressure has to be isolated to remove the Duplex Check Valve.

Refer to Figure 5

1. Remove the pipe fittings.
2. Remove the two screws (2), two washers (3), four plain washers (4) and two hex nuts (5) using appropriate tool and remove the Duplex Check Valve (1) from the system

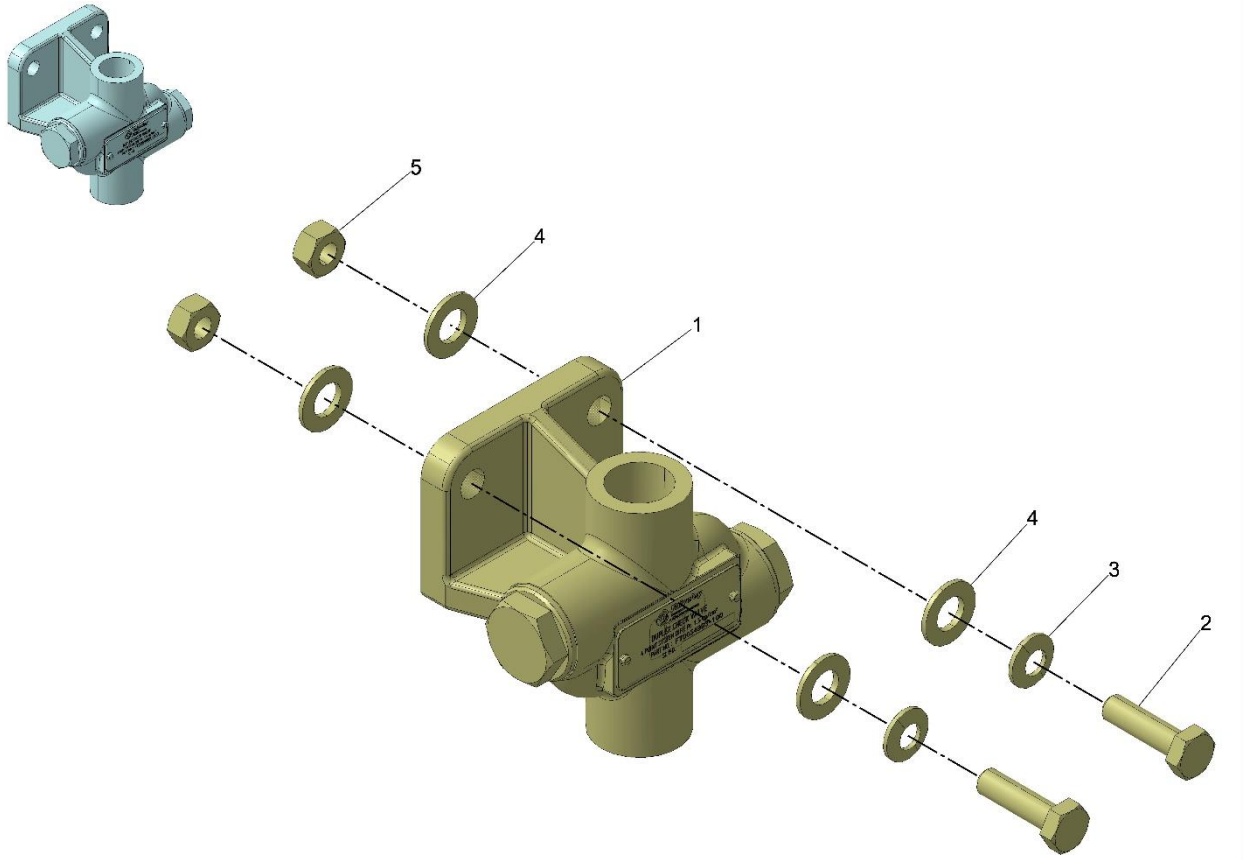

Figure 5: Removal / Installation Duplex Check Valve

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	DUPLEX CHECK VALVE	FT0054993-100	1

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NOTE: Item 2, 3, 4 and 5 are not under the scope of WABTEC

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 5

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242 on the threads of the two screws (2).
5. Install the Duplex Check Valve (1) with customer interface, which is under car builder scope. Use suitable two screws (2) two washers (3), four plain washers (4) and two hex nuts (5) with applicable clamping torque for mounting.
6. Connect the pipe fittings on both the ports. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
7. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6. Spare Part List

- Routine Maintenance - Not required.
- Installation: Spare parts not required.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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05.06_ISOLATING COCK WITH DRAIN AND MICRO SWITCH

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/// FT0050822-102-E00MUM

1/2" ISOLATING COCK WITH DRAIN & MICRO SWITCH FT0050822-102, FT0054573-100, FT0054573-101, FT0050822-103 3/4" ISOLATING COCK WITH DRAIN & MICRO SWITCH FT0050822-100, FT0054574-101

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0050822-102-E00MUM.docx	D00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	01/03/2016	NEW RELEASE	.	SRC	MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template	DRC1659	VP	.KMS	.BSH
C00	19/01/2022	New P/Ns added: FT0054573-100, FT0054573-101 and FT0054574-101	DRC1922	VP	.KMS	.BSH
D00	07/02/2023	Document updated with new template and added New P/N: FT0050822-103	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Isolating Cock with Drain & Micro Switch is used to open/close a pneumatic circuit. Micro switch is used to convey the cock condition to the operator. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

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1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

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1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

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- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Isolating Cock with Drain & Micro Switch must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Isolating Cock with Drain & Micro Switch and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Isolating Cock with Drain & Micro Switch for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
BSPP	British Standard Parallel Pipe
mm	millimeter
MS	Micro Switch
P/N	Part number
QTY	Quantity

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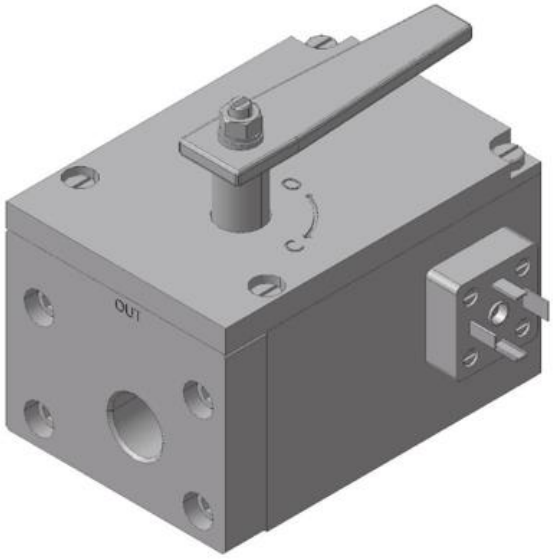
/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The Isolating Cock with Drain & MS is used to open/close a pneumatic circuit. Micro switch is used to convey the cock condition to the operator. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position.



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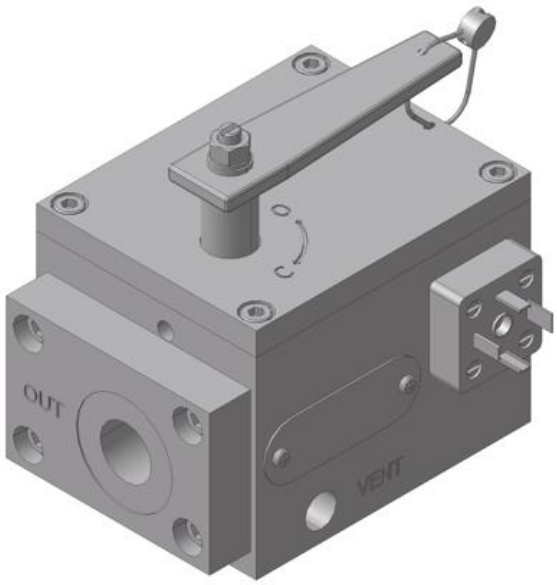
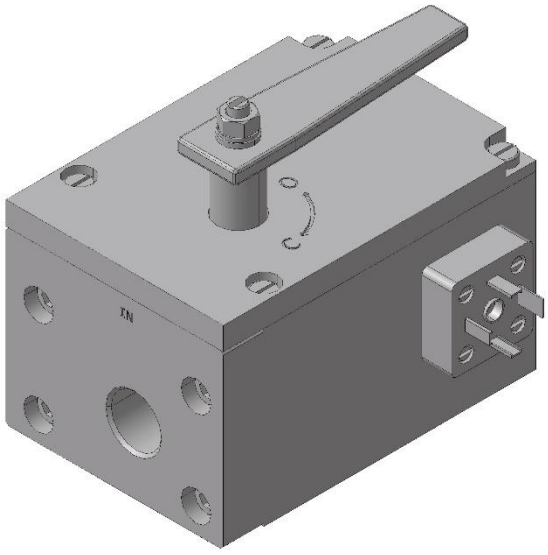


FT0054573-100
FT0054573-101 and
FT0054574-101



FT0050822-103

Figure 1: Isolating Cock with Drain & MS, Isometric View

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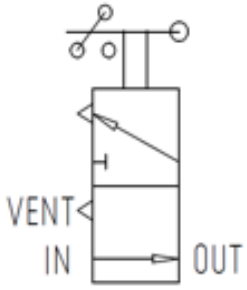

Figure 2: CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

Parameters	FT0050822-102	FT0054573-100	FT0054573-101	FT0050822-103
Port size	1/2” BSPP			
Bore size	15mm			
Max operating pressure	10 bar			
Working pressure range	0-10 bar			
Handle Colour	BLACK	BLACK	RED	BLACK

Parameters	FT0050822-100	FT0054574-101
Port size	3/4” BSPP	
Bore size	19mm	
Max operating pressure	10 bar	
Working pressure range	0-10 bar	
Handle Colour	BLACK	RED

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/// 3. OPERATIONS

The device consists of a main body is having the inlet and delivery port. Micro switch is mounted on the main body. The handle is connected to a spindle, which in-turn operates the spherical ball and micro switch as well.

3.1 OPEN CONDITION

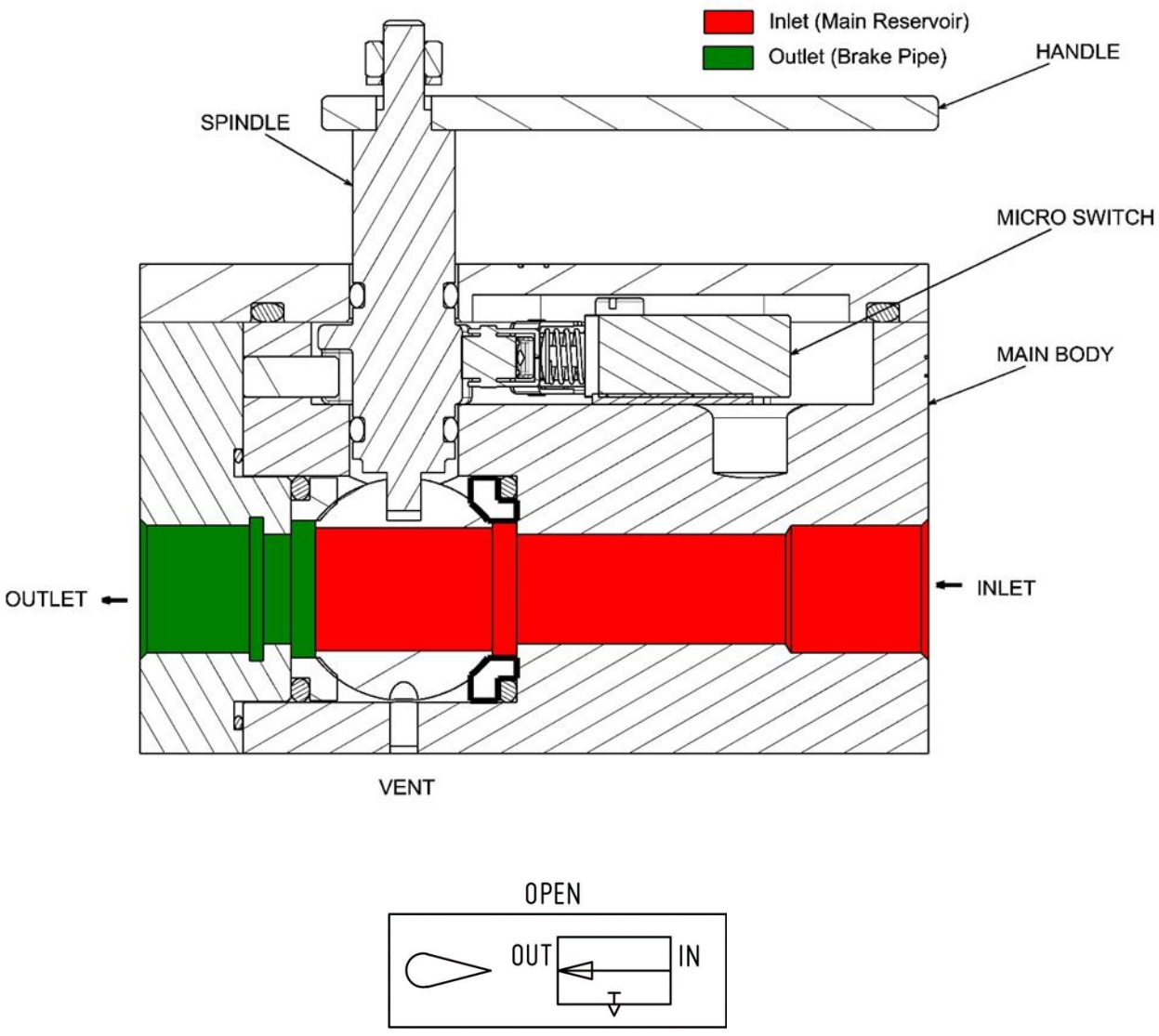

Figure 3: Isolating Cock with Drain & MS, Open Condition

Refer to Figure 3

In working condition handle is in open position. The inlet port is connected to the outlet port through vented ball and the microswitch is deactivated.

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3.2 CLOSED CONDITION

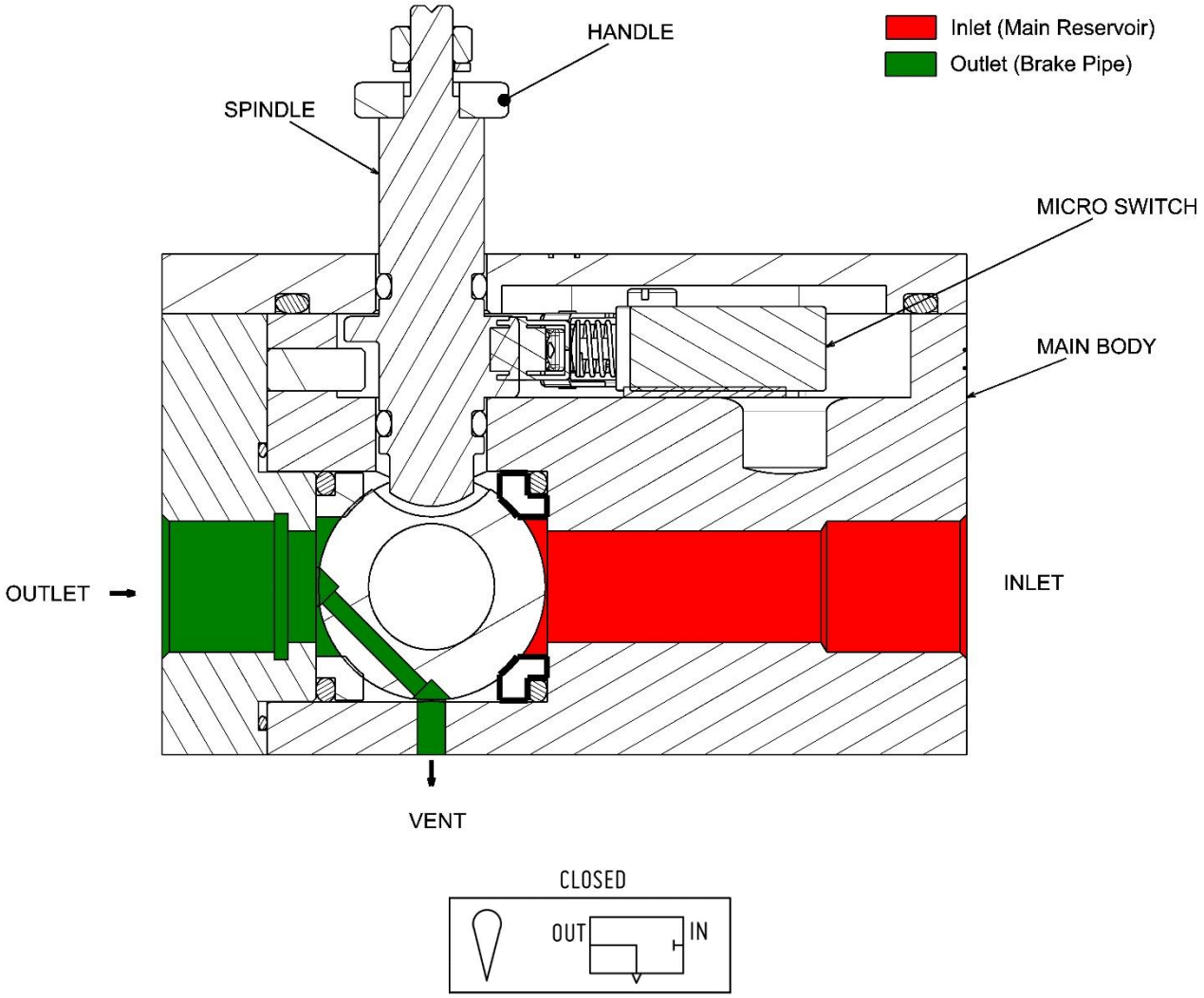

Figure 4: Isolating Cock with Drain & MS, Closed Condition

Refer to Figure 4

In closed condition, the handle has to be rotated to the closed position. When handle is rotated it rotates the ball plug via spindle. The inlet and outlet are isolated from each other. The outlet pressure is vented to atmosphere through vented port. The micro switch is activated.

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3.3 OPEN CONDITION

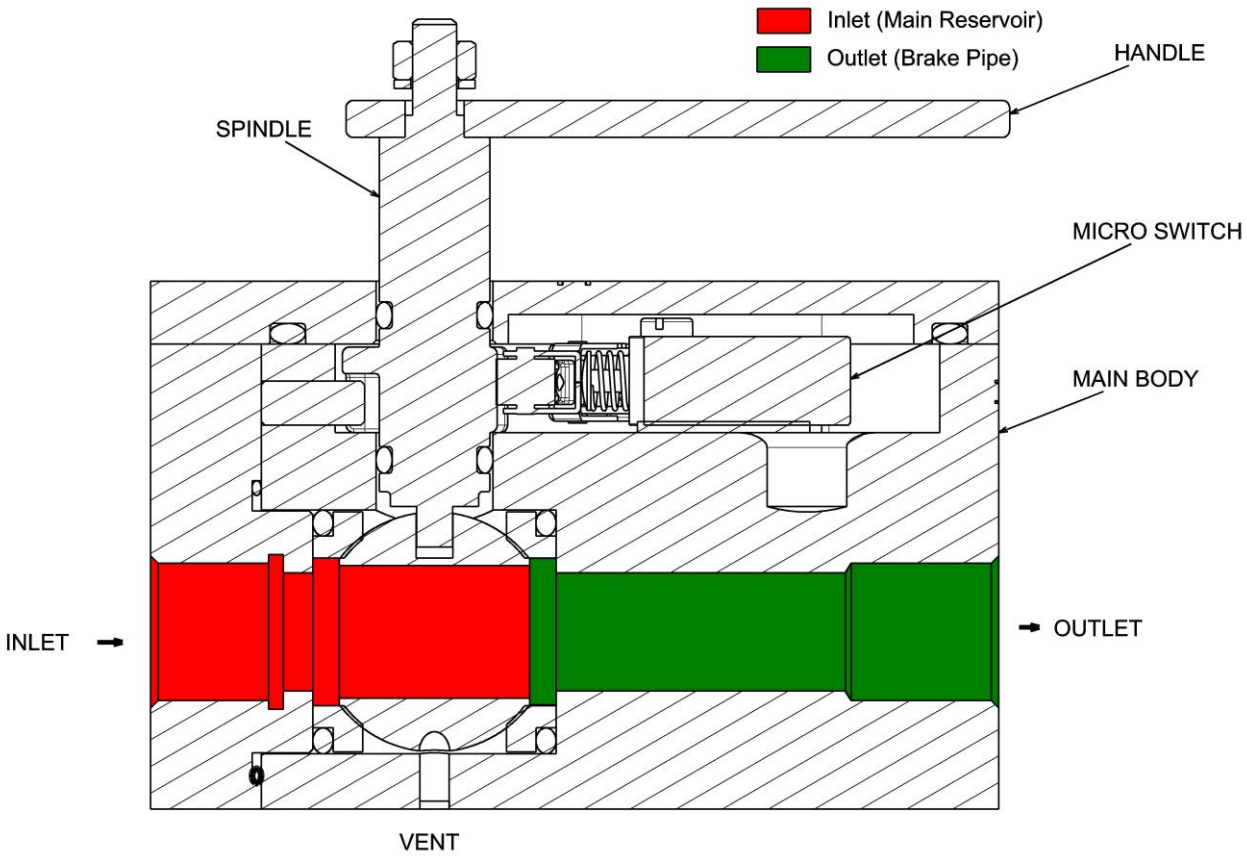

Figure 5: Isolating Cock with Drain & MS, Open Condition

Refer to Figure 5

In working condition handle is in open position. The inlet port is connected to the outlet port through vented ball and the microswitch is deactivated.

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3.4 CLOSED CONDITION

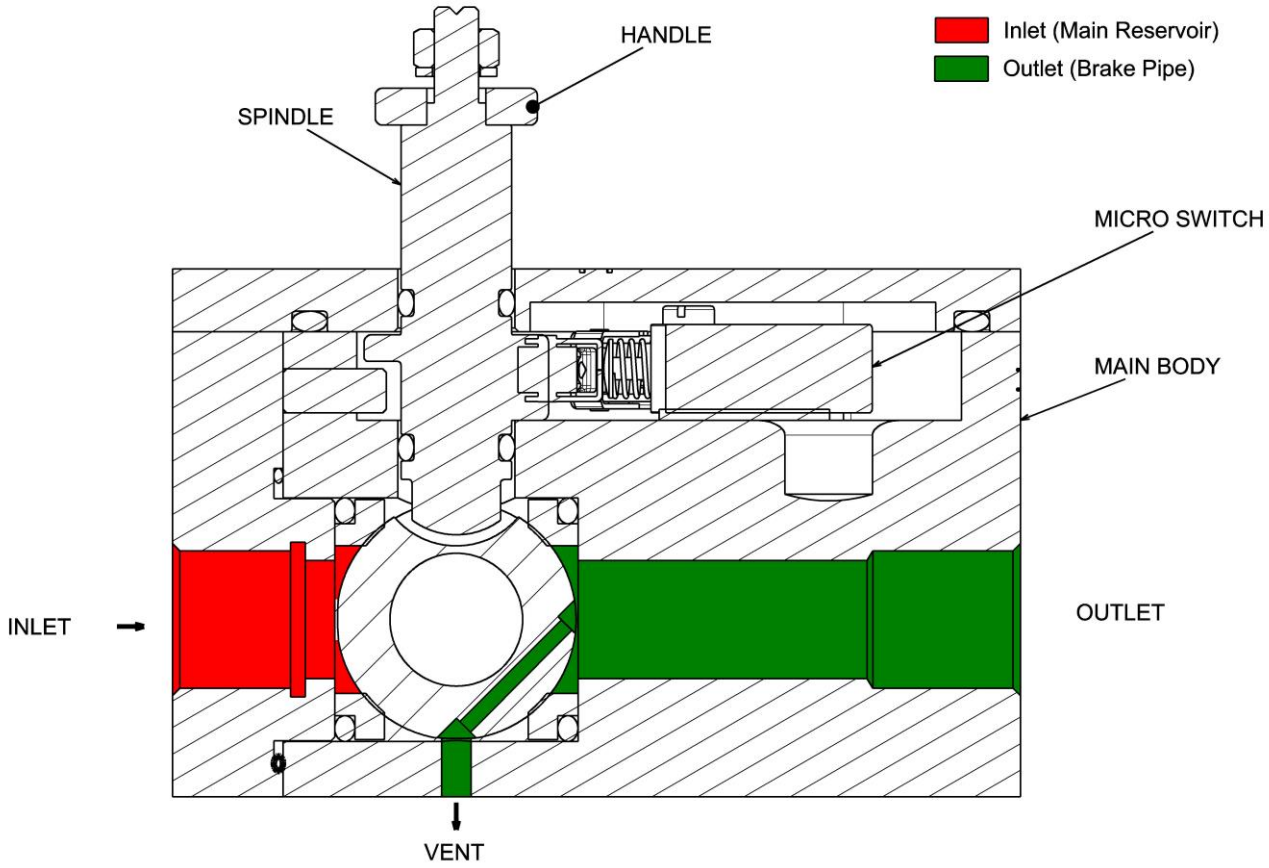

Figure 6: Isolating Cock with Drain & MS, Closed Condition

Refer to Figure 6

In closed condition, the handle has to be rotated to the closed position. When handle is rotated it rotates the ball plug via spindle. The inlet and outlet are isolated from each other. The outlet pressure is vented to atmosphere through vented port. The micro switch is activated.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
Screw driver	Tighten/loosen the screws
Standard tools	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

This device doesn't require any special tools.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242/243	Thread locking

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be maintained regularly as required by the operator's rules; the mission profile and the environmental conditions (Refer Section 5.2.1).
   Typical check periodicity: 1 year.

2. Second Level Maintenance: overhaul as scheduled in the system maintenance plan. If no **system maintenance plan** is provided; the device must be overhauled regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/Handle turns free and that the micro switch gives the right indication. The test must be done with the system pressurised.
3. At the end of the test, make sure all the initial conditions are restored

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5.3 REMOVAL PROCEDURE OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. Close the Isolating cock that has to be removed to drain the outlet pressure, and the inlet side cock of the two-port Relay Valve to be closed before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 7

1. Remove the electrical connections by using screw driver and remove the pipe fittings using appropriate tool from the Isolating Cock inlet and delivery ports.
2. Remove the Isolating Cock (1) from the customer interface, which is under car builder scope by unscrewing two M8 screws (2) using appropriate tool and the two washers (3).

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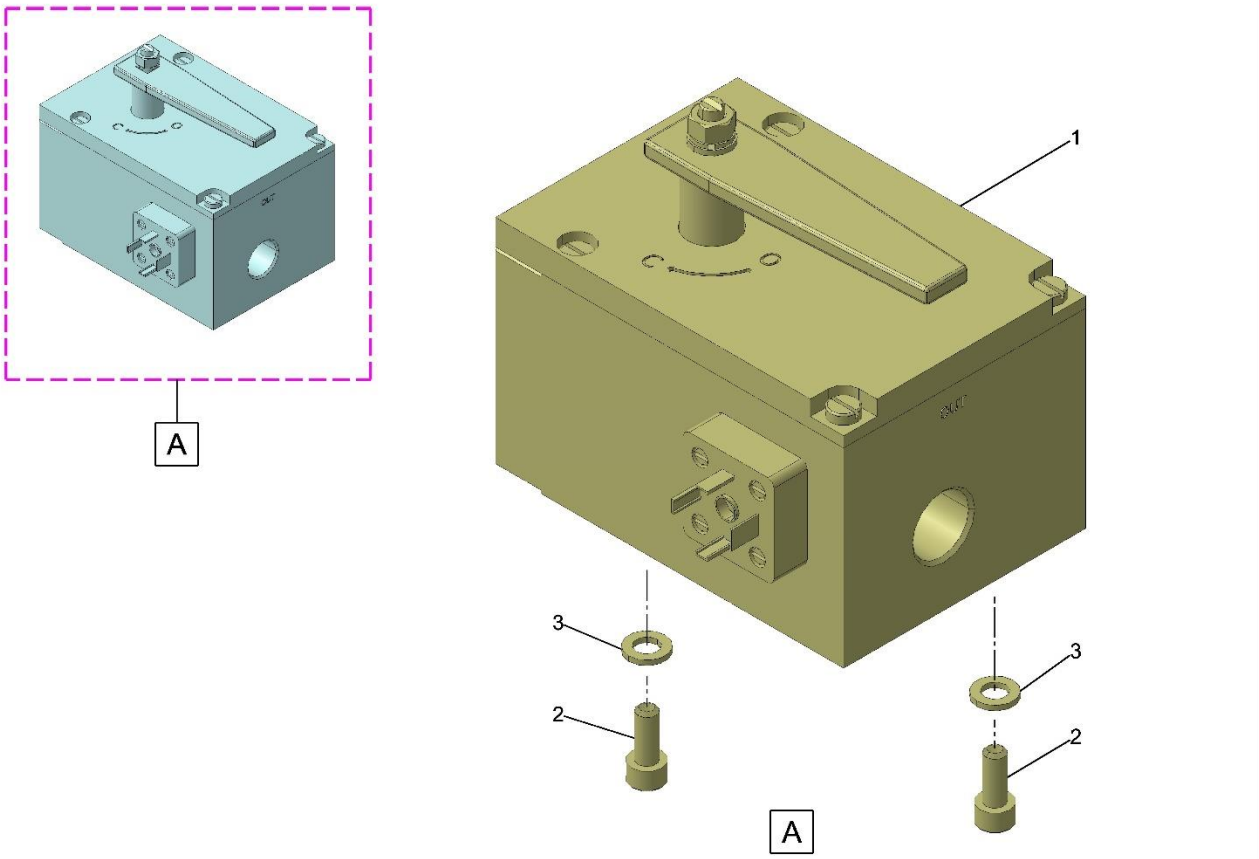

Figure 7: Isolating Cock with Drain & MS, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0050822-102	1
1	3/4" ISOLATING COCK WITH DRAIN & MS	FT0050822-100	1
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0054573-100	1
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0054573-101	1
1	3/4" ISOLATING COCK WITH DRAIN & MS	FT0054574-101	1
1	1/2" ISOLATING COCK WITH DRAIN & MS	FT0050822-103	1

NOTE: Item 2 and 3 are not under the scope of WABTEC.

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 7

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242/243 on the threads of the two screws (2).
5. Install the Isolating Cock (1) to the customer interface, which is under car builder scope.
6. Secure the Isolating Cock (1) using the two M8 screws (2) and two washers (3). Recommended torque value for the two M8 screws (2) is 14 Nm. Apply Stylmark on the two M8 screws (2).

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

7. Connect the Isolating Cock (1) to the pipe fitting. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
8. Connect the electrical connection using a screw driver.
9. Pressurize the system and perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder's general system check

/// 6. Spare Part List

- Routine Maintenance - Not applicable
- Installation: Spare parts not required

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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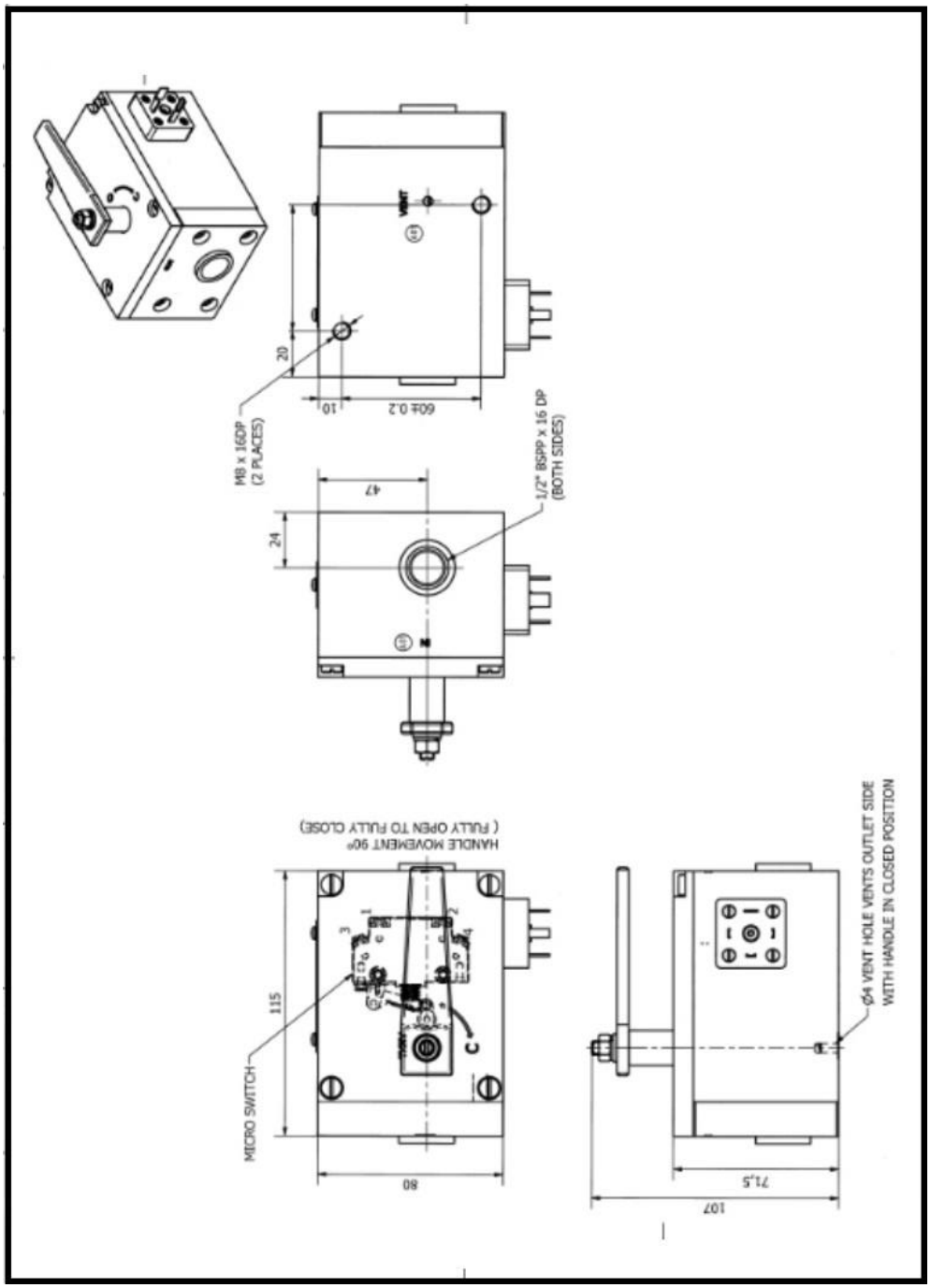
/// 8. OUTLINE DRAWING

1/2" Isolating Cock with Drain & Micro Switch - FT0050822-102



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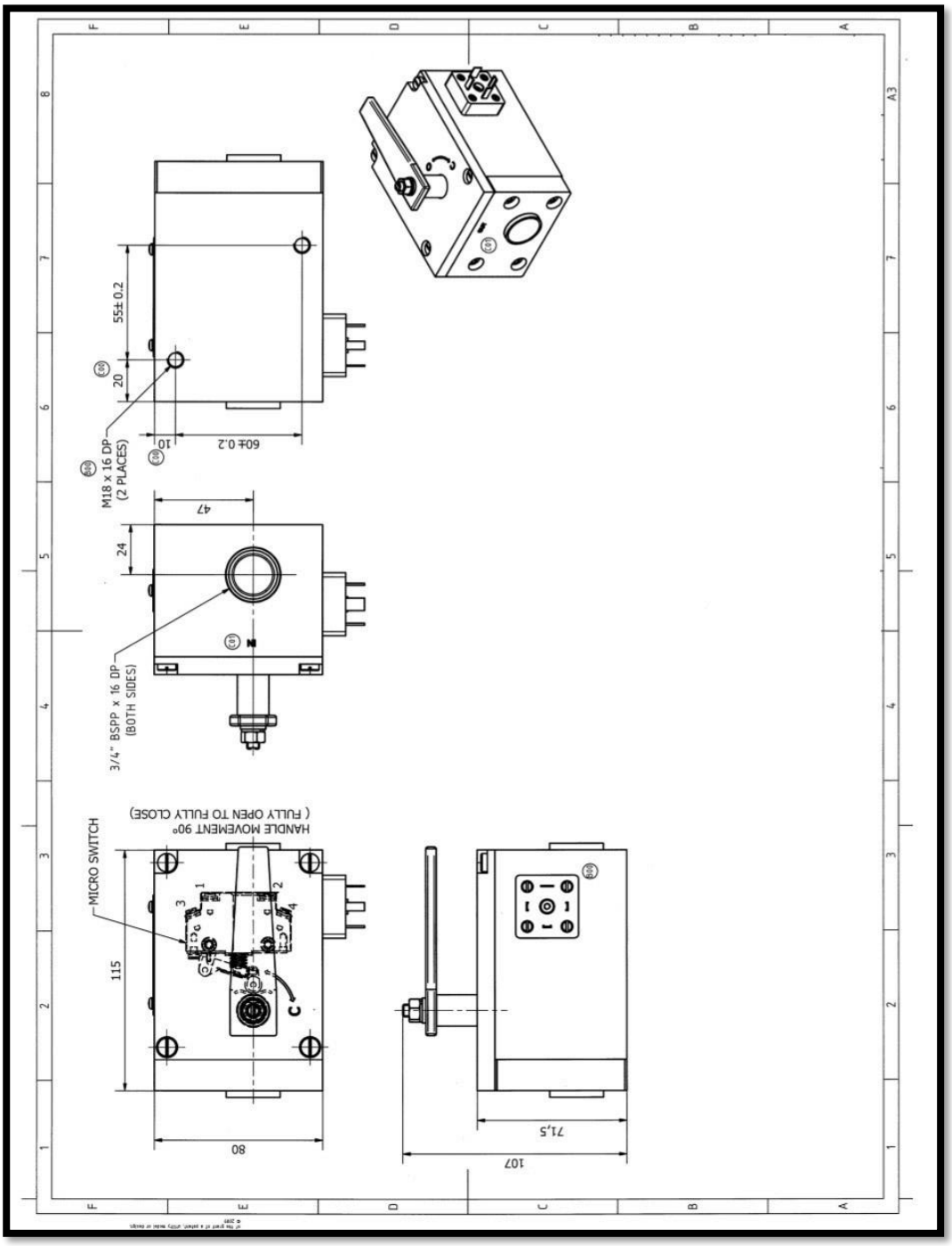
3/4" Isolating Cock with Drain & Micro Switch - FT0050822-100



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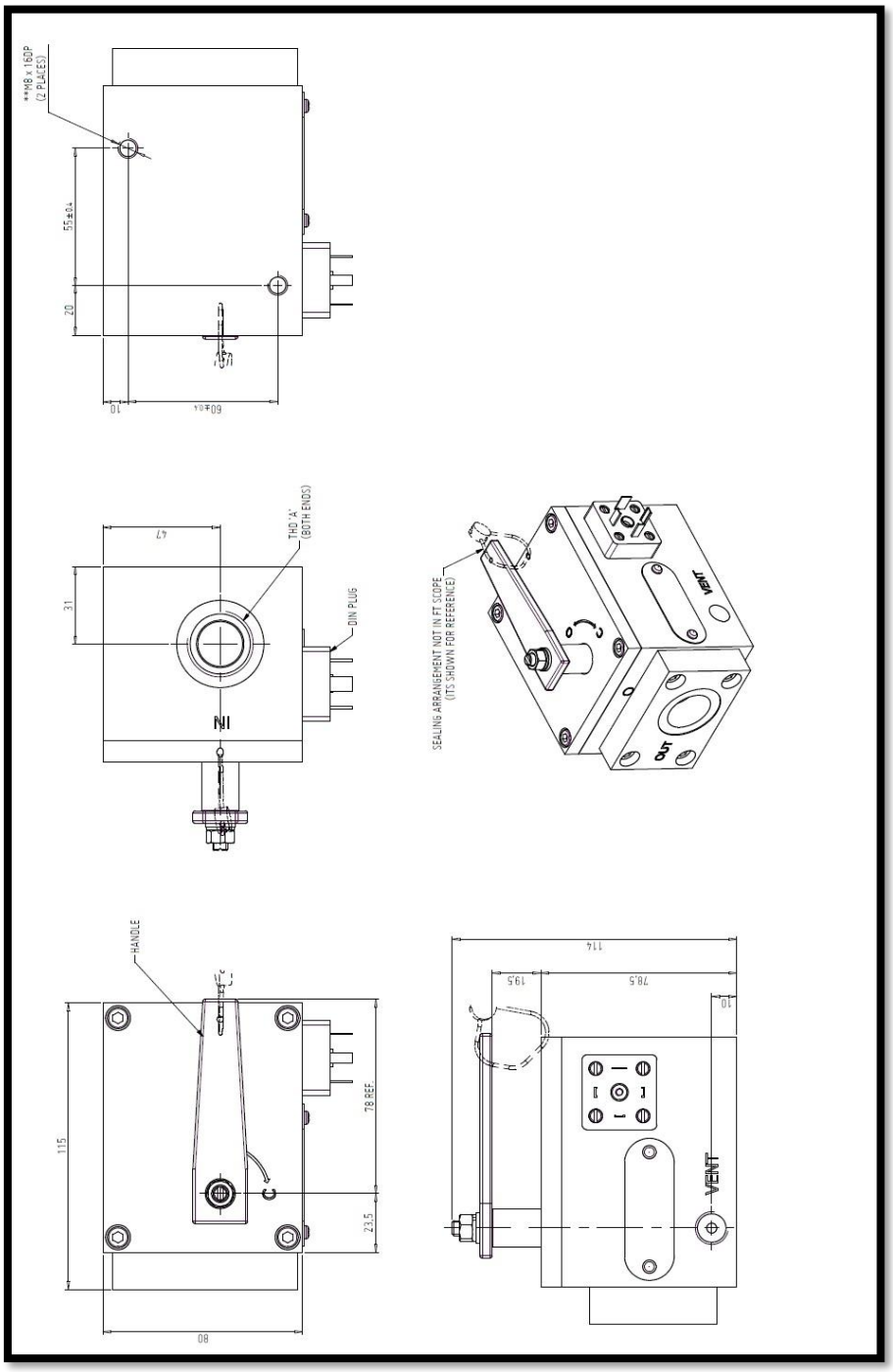

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06.05_PRESSURE SWITCH

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/// FT0051877-100-E00MUM

PRESSURE SWITCH SET
FT0051877-100
FT0051877-101
FT0051877-102
FT0051877-105
FT0051877-103

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
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FT0051877-100-E00MUM.docx	C00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/03/2016	NEW RELEASE	.	SRC	MMR	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
C00	07/02/2023	Document updated with new template and new P/N: FT0051877-103	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The pressure switch is a device that transforms a pneumatic signal into an electrical signal by opening or closing two electrical circuits, when the pressure is lower or higher than the given thresholds.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -25°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for test details.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +47°C with relative humidity <60% and original packaging for a period not exceeding 36 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from 0°C to + 50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Pressure Switch must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Pressure Switch and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Pressure Switch for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
HD	Head
mm	Millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The pressure switch is a device that transforms a pneumatic signal into an electrical signal by opening or closing two electrical circuits, when the pressure is lower or higher than the given thresholds.

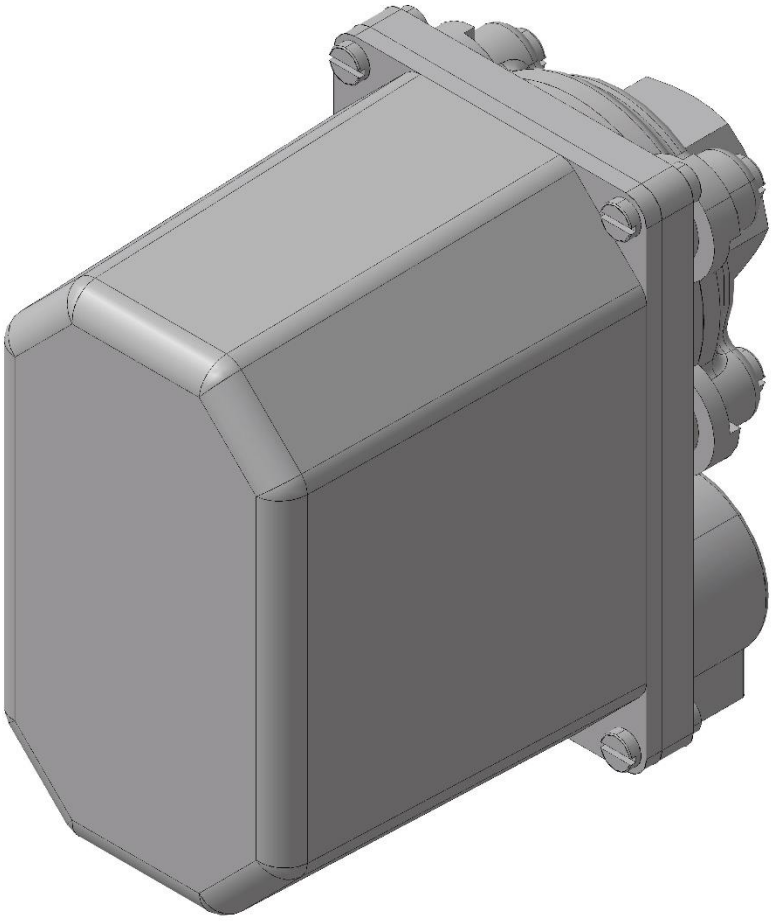

Figure 1: Pressure Switch, Isometric View

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Pressure Switch Assembly No.	Pressure switch P/N	Project	Characteristics	Pressure Setting (bar) nominal values		
				Type	Falling Pr.	Rising Pr.
FT0051877-200	FT0051877-100	KMRL LMRCL	pressure switch	MCS4-SOND910-G	0.4	0.6
FT0051877-201	FT0051877-101	KMRL LMRCL	pressure switch	MCS11G	1.5	2
FT0051877-211		MML3				
FT0051877-202	FT0051877-102	KMRL LMRCL	pressure switch	MCS11-SOND910-G	3.5	5.0
FT0051877-212		MML3				
FT0051877-210	FT0051877-105	MML3	pressure switch	MCS4-SOND910-G	0.4	1.9
FT0051877-213	FT0051877-103	ICF Trainset (Train 18)	Pressure switch	MCS11-SOND910-G	5.2	6.0

Table 1**:** Technical Data

Max working pressure ……15 bar
Max working pressure range……0-15 bar
Mass……0.4 kg Approx.

Tolerances at ambient temperature:
Up to 5 bar……±0.20 bar
From 5 bar to 6.5 bar……±0.15 bar
From 6.5 bar to 11 bar……±0.20 bar

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/// 3. OPERATIONS

3.1 NORMAL CONDITION

Refer to Figure 3

Pressure switch senses the pressure from the source and depending on the pressure settings it opens and closes the electrical circuits. The Plastic knob and the Hex. screw are used for setting the falling and rising set points respectively.

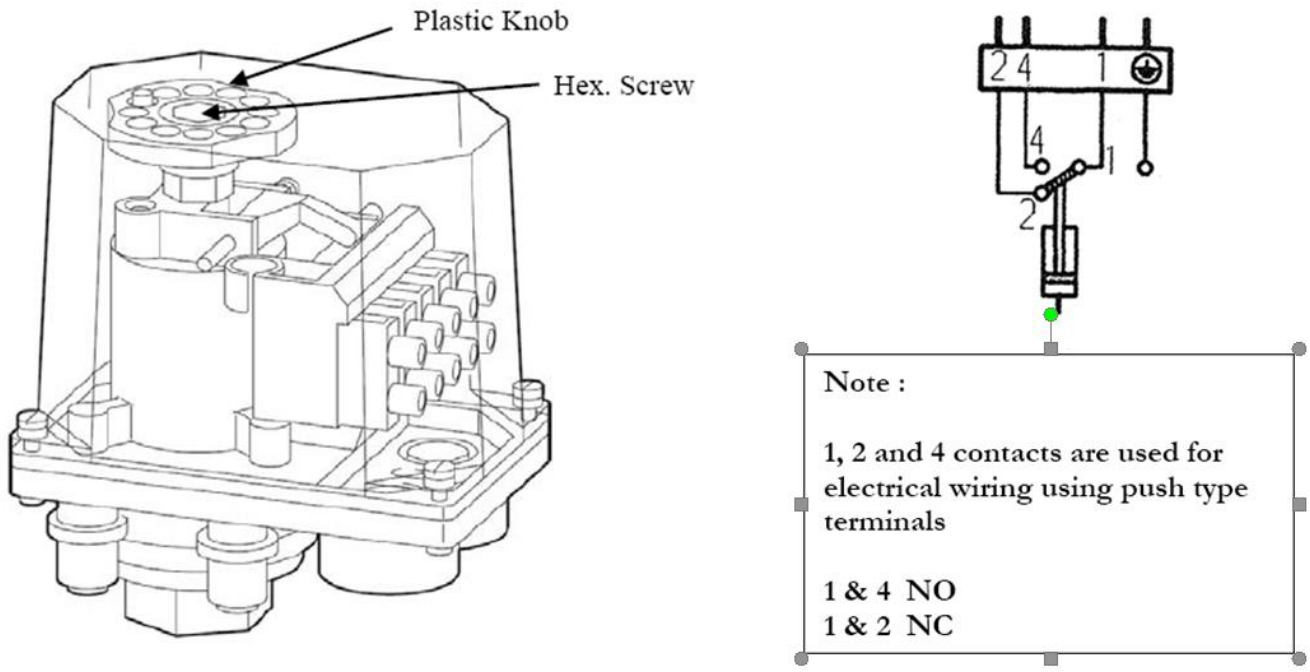

Figure 3: Pressure Switch, Operating Condition

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
Socket spanner	Tighten/loosen the adaptor
4mm allen key	Tighten/loosen the fasteners
Torque wrench (3 to 14 Nm)	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

Name	Application
Fixture	To mount the Pressure switch

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Lubricant for parts
Loctite 242/243	Thread locking
Stylmark	Torque marker

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): check calibration on bench as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer to section 5.2.1.
   Typical check periodicity: 1 year.

2. Second Level Maintenance: Not Applicable. If the pressure switch is found faulty, to be replaced.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 CALIBRATION CHECK

Caution! Pressurised system! Discharge the pressure before removal. The main reservoir pressure must be drained to remove the component.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 4, Figure 5 and Figure 6

1. Remove the pressure switch from the brake panel (refer section 5.3, steps 1 to 3) and fit it onto the test bench shown here below.

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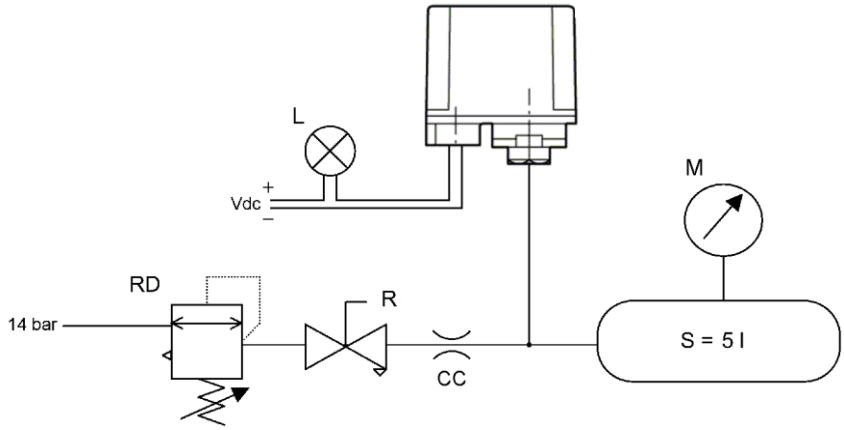

CC	Calibrated choke
L	Lamp
M	Pressure gauge
R	Cut-out cock ¼”
RD	Pressure regulator
S	Reservoir 5 litres.

Figure 4: Test Bench Scheme

2. Connect the pressure switch to a pressure line. Ensure clean dry air supply before commencing the setting.
3. Open the enveloped cover by unscrewing the four cheese head screws with a flat screw driver.
4. Make the Electrical connections at NO or NC terminals and connect a lamp or hooter to give signal when the switch makes contact.
5. First note down the falling and rising pressure to be set.

Setting Rising Pressure:

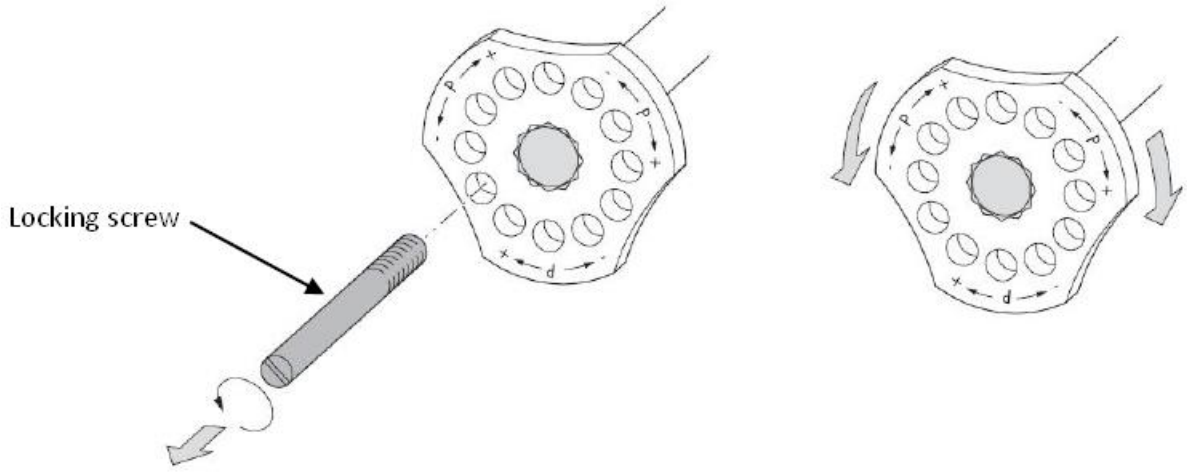

Figure 5: Setting Raising Pressure

6. Open the inlet cock slowly. Check the pressure in gauge when the pressure switch makes contact. Check if the rising pr. setting is achieved. If not remove the locking screw adjust the plastic wheel along with the Hex screw to get the required pressure by opening and closing the inlet and drain cock as required

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Setting Falling Pressure:

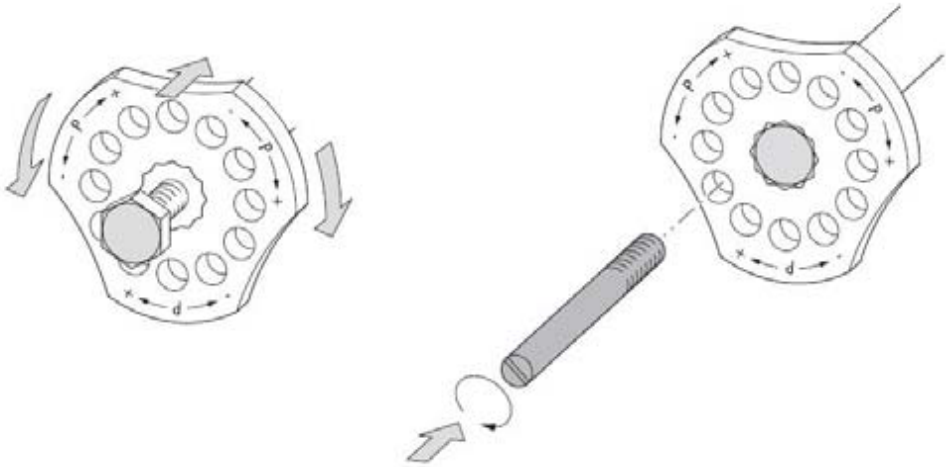

Figure 6: Setting Falling Pressure

7. Ensure the pressure is above the rising set point and close the inlet cut out cock.
8. Through cut out cock drain the pressure and note down the pressure in a gauge when the switch makes contact. Close the cut out cock.
9. Check if the falling pressure setting is achieved. If not gently push the plastic knob inside and adjust the plastic knob alone to get the required falling pressure.
10. After setting the both falling and rising pressures individually, check once again both the pressures and ensure no change in the settings.
11. After necessary settings are obtained, tighten the locking screw in position using a screw driver.
12. Drain the pressure in the test setup system and remove the Pressure switch and mark the set values.

5.3 REMOVAL PROCEDURES OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the air pressure in the system before removal, referring to the pneumatic schemes.

Caution! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

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MML3 & ICF Trainset (Train 18) Project Application
(Applicable for FT0051877-210, -211, -212, 213 refer Table 1)

Refer to Figure 7

1. Open the brake panel front cover to access the Pressure switch.
2. Open the cover (1.2) by unscrewing the four cheese head screws (1.1) with a flat screw driver. Loosen the screws in the terminal block and pull out the electrical wires.
3. Unscrew both the M6 screw (2) using 4 mm allen key and remove the pressure switch assy along with the mounting plate (6) from the brake panel.
4. Remove and **DISCARD** the O-ring (3).
5. Hold the pressure switch assy in the fixture
6. Unscrew the adaptor (4) using socket spanner and remove the mounting plate (6) from the body (1.3).
7. Remove and **DISCARD** the grommet (7) from the body (1.3).
8. Remove and **DISCARD** the dowty seal (5) from the body (1.3).

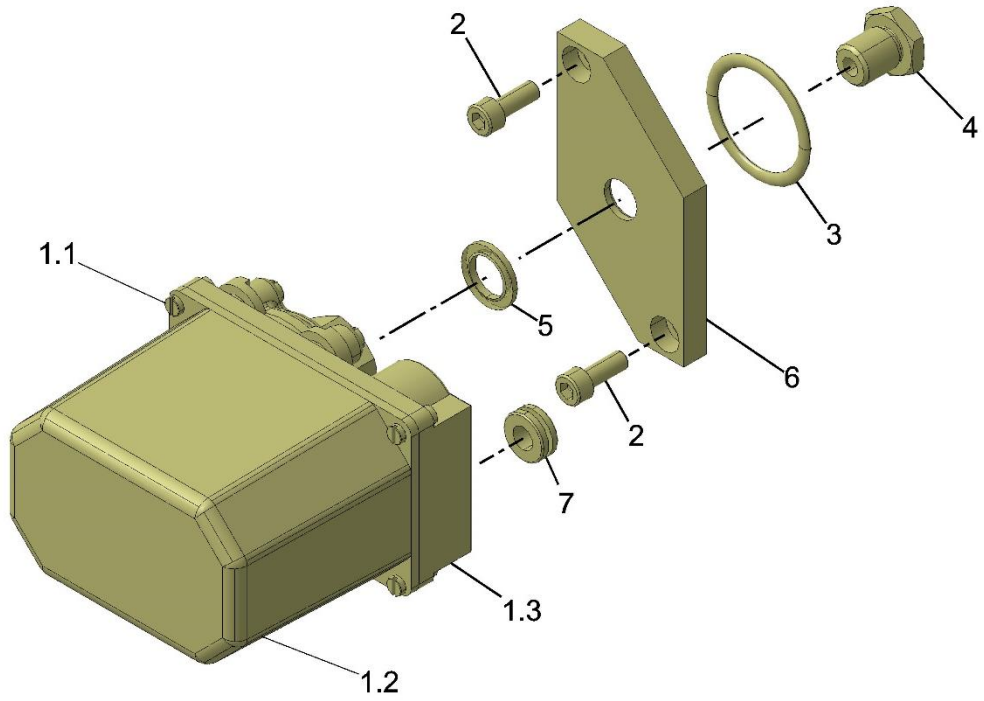

Figure 7: Pressure Switch, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PRESSURE SWITCH	Refer Table 1	1
2	SOC HD CAP SCREW M6	901020000	2
3	O RING	011701500	1
4	ADAPTOR	FT0052875-000	1
5	DOWTY SEAL	0018-19	1
6	MOUNTIG PLATE	FT0052871-000	1
7	GROMMET	034703000	1

NOTE: Item 1.1 thru 1.3 are sub parts of pressure switch (Item 1).

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KMRL & LMRCL Project Application
(Applicable for FT0051877-200, -201, -202, refer Table 1)

Refer to Figure 8

1. Open the brake panel front cover to access the Pressure switch.
2. Open the cover (2.2) by unscrewing the four cheese head screws (2.1) with a flat screw driver. Loosen the screws in the terminal block and pull out the electrical wires.
3. Unscrew both the M6 screw (7) using 4 mm allen key and remove the pressure switch assy along with the mounting plate (1) from the brake panel.
4. Remove and **DISCARD** the O-ring (6).
5. Hold the pressure switch assy in the fixture.
6. Unscrew the adaptor (4) using socket spanner and remove the mounting plate (1) from the body (2.3).
7. Remove and **DISCARD** the grommet (8) from the body (2.3).
8. Remove and **DISCARD** both the dowty seal (3) from the body (2.3).

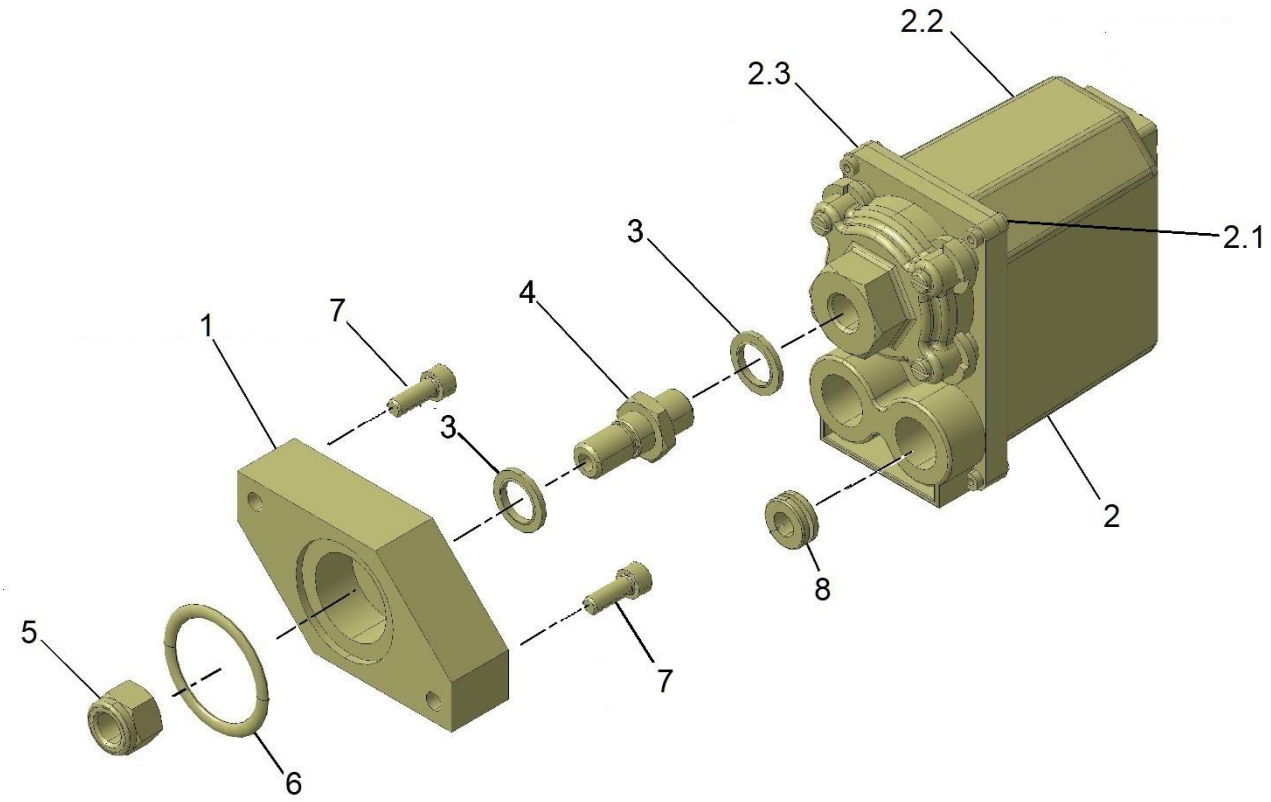

Figure 8: Pressure Switch, Removal/Installation

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	MOUNTIG PLATE	FT0051159-000	1
2	PRESSURE SWITCH	Refer Table 1	1
3	DOWTY SEAL	0018-19	1
4	ADAPTOR	FT0051160-000	1
5	PREVALING TORQUE TYPE NUT	907007200	1
6	O RING	011701500	1
7	SOC HD CAP SCREW M6	FT0051943-007	2
8	GROMMET	034703000	1

NOTE: Item 2.1 thru 2.3 are sub parts of pressure switch (Item 2).

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

MML3 & ICF Trainset (Train 18) Project Application
(Applicable for FT0051877-210, -211, -212, 213 refer Table 1)

Refer to Figure 7

1. Place the **NEW** dowty seal (5) on the body (1.3).
2. Install the **NEW** grommet (7) on to the body (1.3).
3. Apply Loctite 242 on the threads of the adaptor (4).
4. Secure the mounting plate (6) on the pressure switch assy with the adaptor (4) using the socket spanner.
5. Clean carefully the O-ring seating zone on the mating part.
6. Smear Molykote M33 grease on the **NEW** O-ring (3) and install the lubricated O-ring (3) onto the mounting plate (6).
7. Apply Loctite 242 on the threads of the two M6 screws (2).
8. Secure the whole pressure switch assy back on to the brake panel with the two M6 screws (2) using 4mm allen key. Apply a torque of 8.6 Nm.
9. Apply torque mark using Stylmark on the two M6 screws (2).

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

10. Connect electrical wires back to the pressure switch and tighten the screws.
11. Apply Loctite 242 on the threads of the four cheese head screws (1.1).
12. Secure the cover (1.2) to the pressure switch with the four cheese head screws (1.1) using flat screw driver.
13. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check. Verify the correct electrical functionality by checking the operation of the on-board equipment
14. Close and secure the brake panel front cover.

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KMRL & LMRCL Project Application
(Applicable for FT0051877-200, -201, -202, refer Table 1)

Refer to Figure 8

1. Place the **NEW** one off dowty seal (3) on the body (2.3).
2. Install the **NEW** grommet (8) on to the body (2.3).
3. Apply Loctite 242 on the threads of the adaptor (4).
4. Place another **NEW** dowty seal (3) on the adaptor (4).
5. Secure the adaptor (4) on to the pressure switch assy using the socket spanner.
6. Secure mounting plate (1) on the pressure switch assy into the adaptor (4) with nut (5) using the socket spanner.
7. Clean carefully the O-ring seating zone on the mating part.
8. Smear Molykote M33 grease on the **NEW** O-ring (6) and install the lubricated O-ring (6) onto the mounting plate (1).
9. Apply Loctite 242 on the threads of the two M6 screws (7).
10. Secure the whole pressure switch assy back on to the brake panel with the two M6 screws (7) using 4mm allen key. Apply a torque of 8.6 Nm.
11. Apply torque mark using Stylmark on the two M6 screws (7).

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

12. Connect electrical wires back to the pressure switch and tighten the screws.
13. Apply Loctite 242 on the threads of the four cheese head screws (2.1).
14. Secure the cover (2.2) to the pressure switch with the four cheese head screws (2.1) using flat screw driver.
15. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check. Verify the correct electrical functionality by checking the operation of the on-board equipment
16. Close and secure the brake panel front cover

/// 6. Spare Part List

- Routine Maintenance - Not required.

- Installation: The spare parts required for installation are:

MML3 & ICF Trainset (Train 18) Project Application
(Applicable for FT0051877-210, -211, -212, 213 refer Table 1)

Refer to Figure 7

INSTALLATION SPARE PART LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
3	O RING	011701500	1
5	DOWTY SEAL	0018-19	1
7	GROMMET	034703000	1

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KMRL & LMRCL Project Application
(Applicable for FT0051877-200, -201, -202, refer Table 1)

Refer to Figure 8

INSTALLATION SPARE PART LIST			
ITEM NO.	**DESCRIPTION**	**PART NUMBER**	**QTY**
3	DOWTY SEAL	0018-19	2
6	O RING	011701500	1
8	GROMMET	034703000	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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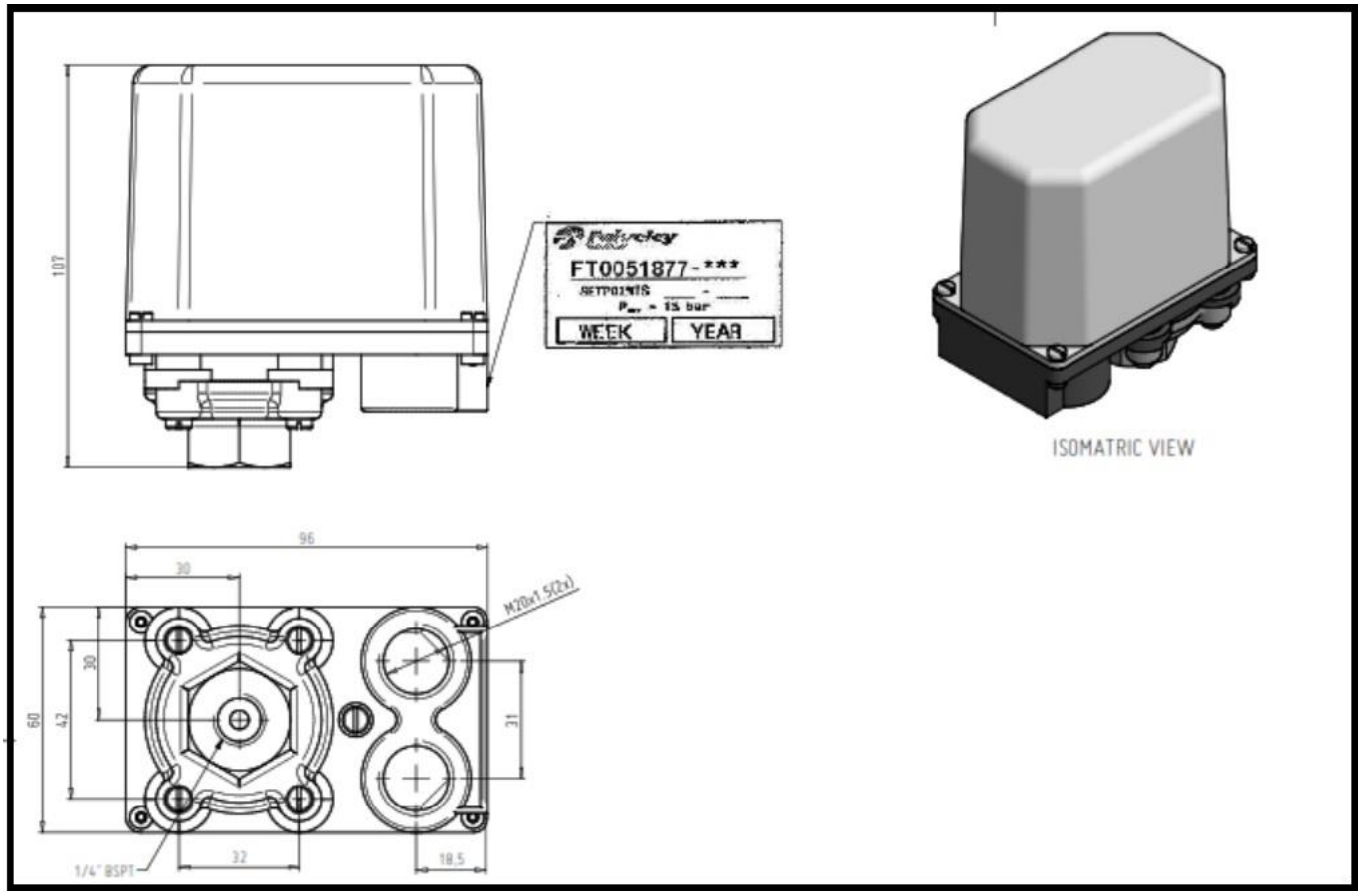
/// 8. OUTLINE DRAWING

Pressure Switch - FT0051877-100



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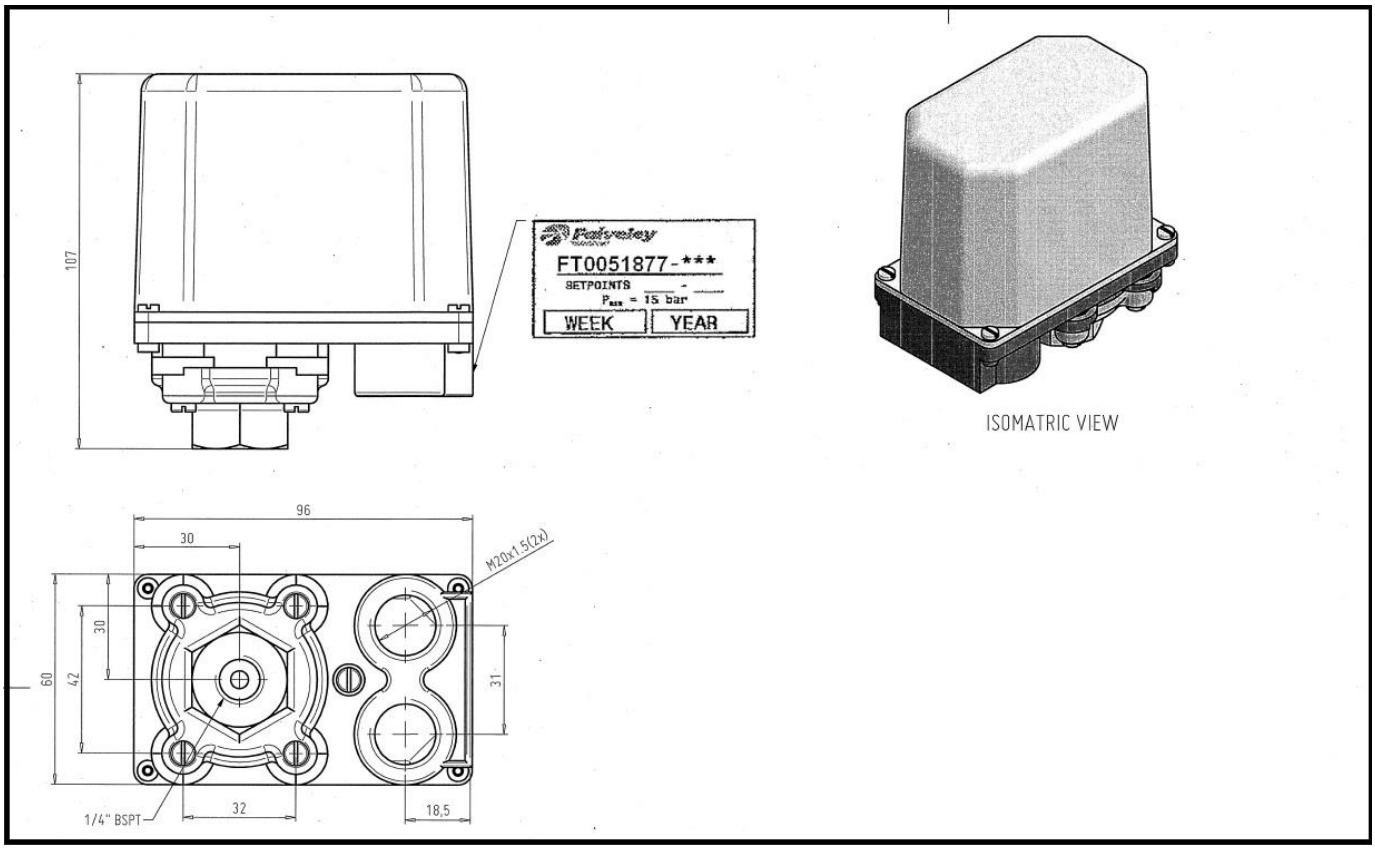
Pressure Switch - FT0051877-101 & FT0051877-102



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06.06_BISTABLE MAGNET VALVE 110 Vdc

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/// 013006500-E00MUM

BISTABLE MAGNET VALVE 110 Vdc
013006500

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.NRS Systems Engineer, Engineering		07/02/2023
Approved:	.BSH Manager, Engineering		07/02/2023
Expert:	 Name / Title, Group		
Customer acceptance:	 Position, Railroad Name		
	Name, Title, Group	Signature	Date

Filename:	Revision:	Status:
013006500-E00MUM.docx	E00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	28/11/2008	FIRST ISSUE	-	AE	MK	.ER
B00	15/10/2009	Updated Chapter 3 with IP protection: Ref. ECR090444	-	AE	.MK	.ER
C00	15/02/2011	Modified the chapter 4, Ref ECR 11HSR004	-	AE	.KMS	.VC
D00	18/03/2011	Modified the chapter 4, Ref ECR 11HSR004	-	AE	.KMS	.VC
E00	07/02/2023	Document updated with new template	DRC1751 /4	DC	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

Bistable stable magnet valve is a double solenoid operated spool valve actuated by the pilot pressure from
each of the solenoids given one at a time alternately. The valve is used to electrically apply and release the pneumatic parking brakes in the vehicle. When electrical supply fails, the valve can be manually operated to apply and release the parking brakes by two handles fixed on either side.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.
- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.
- Prior to accessing the electric parts, make sure the power is duly switched off.
- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.
- For operations under the vehicle, personnel must wear protective helmet.
- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.
- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.
- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.
- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).
- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.
- While testing the components, never exceed the maximum operating pressure limits.

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- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

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1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +47°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

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For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Bistable magnet valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Bistable magnet valve and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Bistable magnet valve P/N 013006500 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
Assy	Assembly
HD	Head
HEX	Hexagonal
mm	Millimetre
Nm	Newton Metre
P/N	Part Number
QTY	Quantity
Vdc	DC Voltage

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

Bistable stable magnet valve is a double solenoid operated spool valve actuated by the pilot pressure from each of the solenoids given one at a time alternately. The valve is used to electrically apply and release the pneumatic parking brakes in the vehicle. When electrical supply fails, the valve can be manually operated to apply and release the parking brakes by two handles fixed on either side.

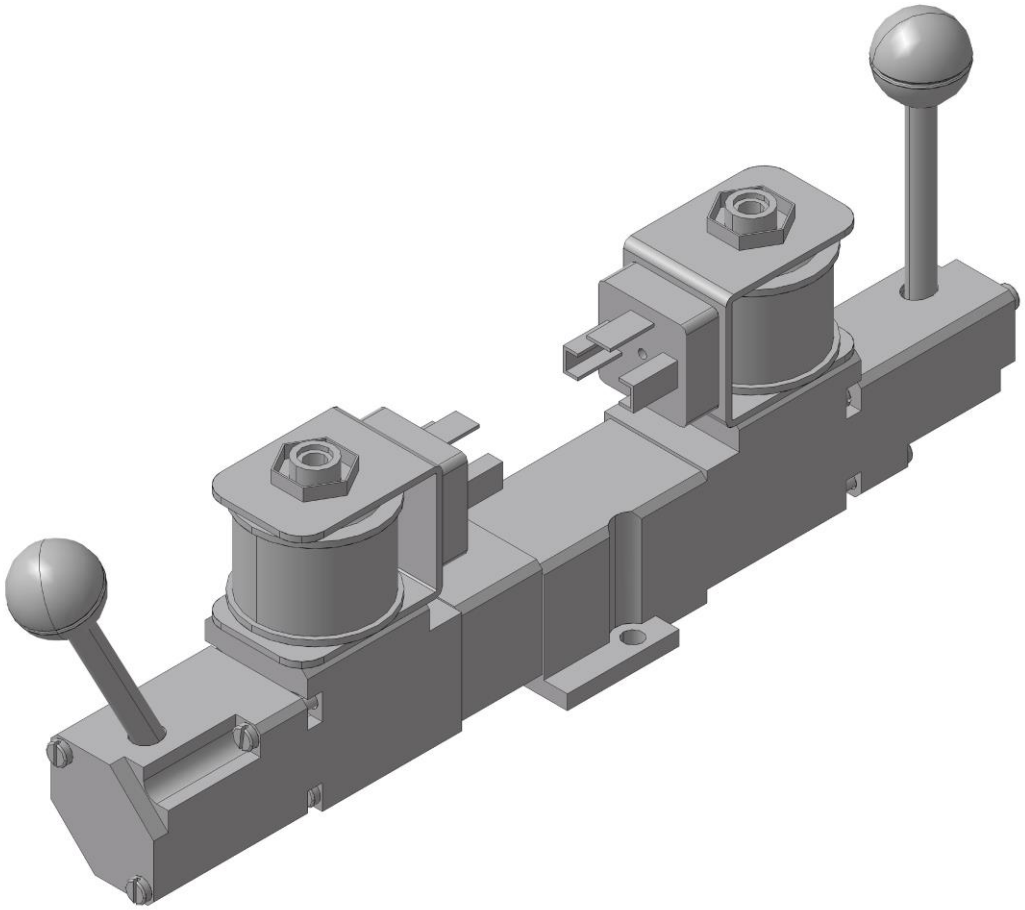

Figure 1: Bistable Magnet Valve, Isometric View

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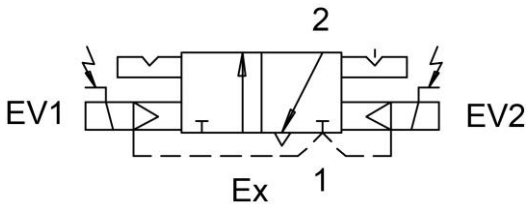

1	Inlet
2	Outlet
Ex	Exhaust
EV1	Pilot 1
EV2	Pilot 2

Figure 2: CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

- Nominal diameter ..... 10 mm
- Max service pressure ..... 10 bar
- Voltage ..... 110 Vdc
- IP protection IP65

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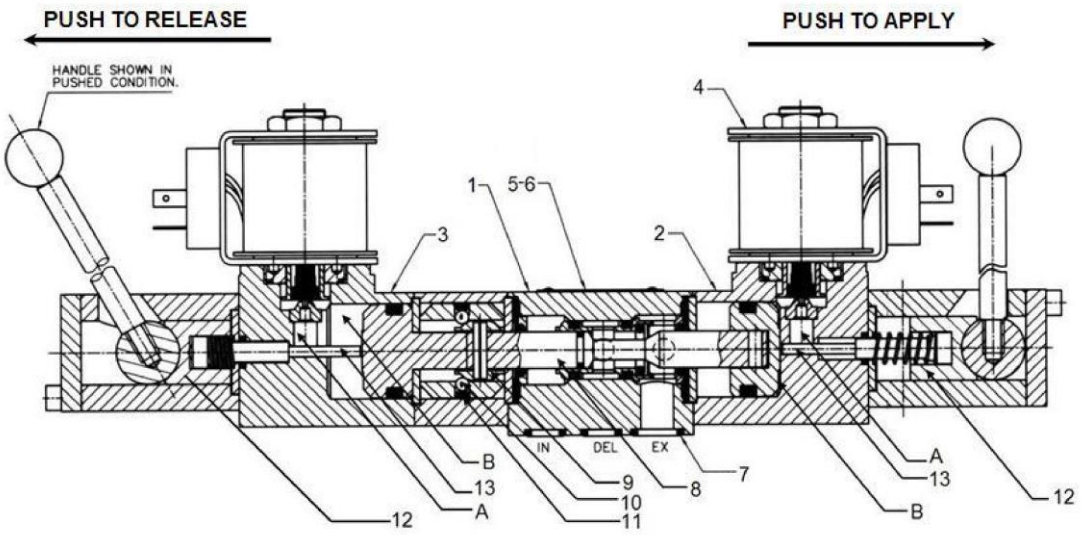
/// 3. OPERATIONS



Abbreviation	Meaning
1	Body
2	Solenoid operator S/A
3	Solenoid operator S/A with detent
4	Coil and plug assy
5	Name plate
6	Drive screw
7	O-ring
8	Spool valve
9	Detent sleeve
10	Detent balls
11	Rubber ring
12	Sleeve
13	Pusher pin

Figure 3: Bistable Magnet Valve, Operation

Refer to Figure 3

1. Main reservoir pressure at a pre regulated level is connected to the inlet port. At that time, if the right solenoid is energized, the solenoid core is activated and is lifted off its seat admitting the MR pressure in the chamber “A" to chamber “B". Under the influence of MR pressure, the spool valve moves out towards the left solenoid. The spool is made in such a way that the recess in the middle, sealed by O-rings on both sides, slips out of the sealing surface connecting the inlet to the delivery port, at the same time sealing of the exhaust port from delivery.

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2. When the spool moves as above, a detent sleeve also moves with the spool pushing through the detent balls kept in contact by a rubber ring. The force of spool movement overcomes the resistance offered by the rubber ring on the detent balls which “squeezes out” and allows the detent sleeve to pass through. Once the spool moves to the left side, it stays put “Stably” in that position, even if the MR pressure in chamber “B‟ is removed for any reason. This is due to the resistance offered by the detent balls, having been “Pressed in” by the rubber ring.

3. When the right solenoid is de-energized, the pilot pressure in its chamber “B‟ is exhausted to atmosphere, but the detented spool valve continues to stay in its position. At this stage, if left solenoid is energized, the same phenomenon repeats, moving the spool to the right side overcoming the resistance of the detent balls. In the right position the recess in the spool is aligned to seal the inlet passage and connect the delivery to the exhaust port.

4. Even in this position, if the left solenoid is de-energized, the spool continues to stay in its position and cannot slide back due to the resistance offered by the detent balls, which can be overcome only by the force due to the pilot pressure in any of the chambers “B‟. In other words, the spool is held “stable” in either of the end positions even if there is no power supply and hence the name Bi-stable.

5. In the absence of power, the spool can be moved from one position to the other by pulling the handle on any side which causes a sleeve connected to a pusher pin to act on the spool valve piston faces.

6. The valve is compact and has all the ports on one face for panel mounting.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
5mm allen key	Tighten/loosen the fasteners
Torque wrench 3-14 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242/243	Thread locking

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): not required.

2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

5.3 REMOVAL PROCEDURE OF EQUIPMENT

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Important! For the disposal of parts replaced during removal procedure (e.g. seals, etc.), follow the rules in force at the End-user premises and the law in force in the Country where the component is used.

Refer to Figure 4

1. Unplug and disconnect the two electrical connectors on magnet valves (1).
2. Unscrew and remove the following parts that attach the magnet valves (1) to the panel:
   - Two hex socket head cap screws (2) using 5mm allen key.
   - Two washers (3)s
3. Remove and **DISCARD** the three O-rings (4) from the magnet valves (1).

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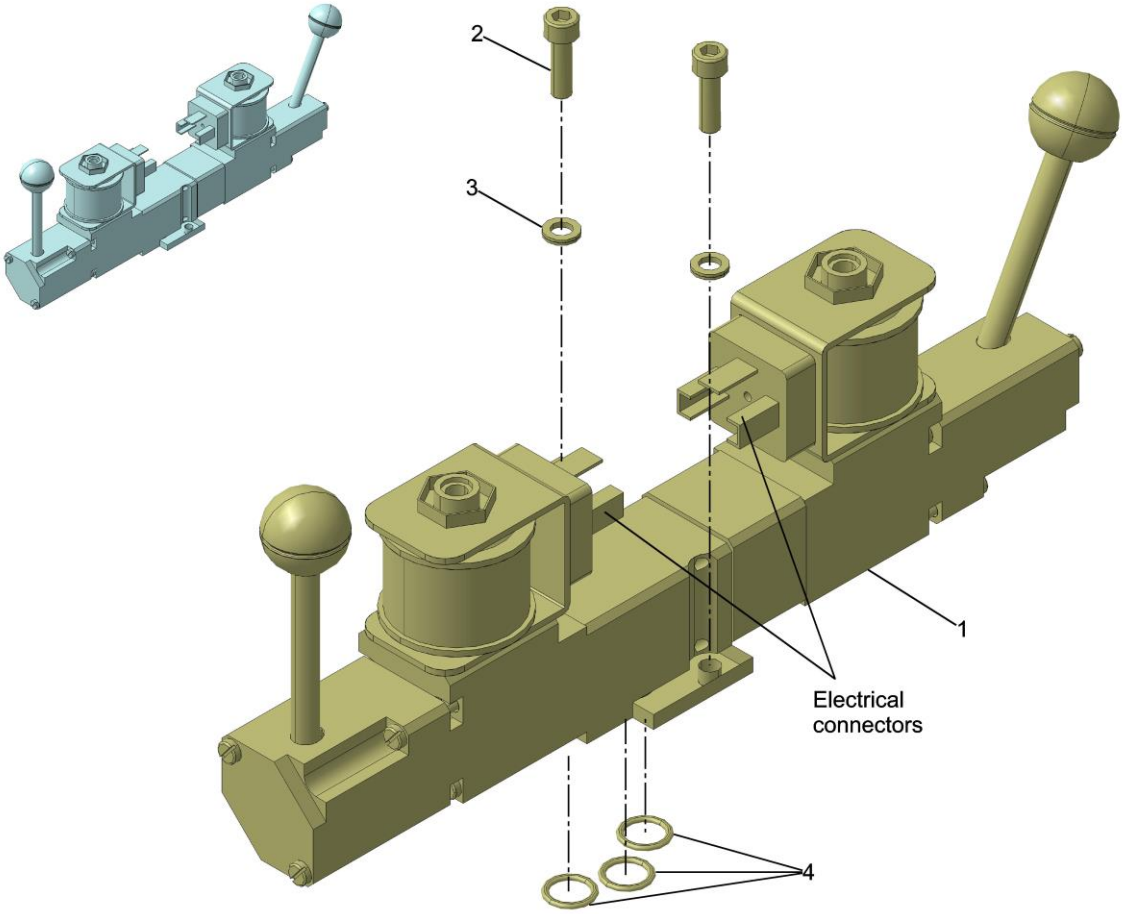

Figure 4: Bistable Magnet Valve, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	BISTABLE MAGNET VALVE	013006500	1
2	HEX SOCKET HD CAP SCREW M6	901035000	2
3	NORD LOCK WASHER	FT0051677-000	2
4	O-RINGS	001710500A	3

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 4

1. Smear Molykote M33 grease to the three **NEW** O-rings (4) and to the groove portion of magnet valves (1).
2. Install the three **NEW** O-rings (4) to the groove portion of magnet valves (1).
3. Install the magnet valves (1) along with three O-rings (4) to the panel. Make sure it is seated properly.
4. Apply Loctite 242 on threads of the two hex socket head cap screws (2).
5. Install the following parts that secures the magnet valves (1) to the panel:
   - Two hex socket head cap screws (2) using 5mm allen key.
   - Two washers (3)
6. Torque tighten the two hex socket head cap screws (2) to 5.2 Nm. Apply torque mark using Stylmark on it.
7. Plug and connect the two electrical connectors to the magnet valves (1).
8. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6. Spare Part List

- Routine Maintenance - Spare parts not required.
- Installation: The spare parts required for installation are listed in the below table:

Refer to Figure 4

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
4	O-RINGS	001710500A	3

Note:
For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with NEW ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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01.22_P1K RELAY VALVE

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Tome : *Volume :* Dossier Techn. : *Technical file. :*	BUREAU D'ETUDE *DESIGN DEPT.*	APPLICATION (série de matériels ou appareils) *APPLICATION* *(series of equipment or units)*	N° des DESSINS D'ENSEMBLES *ASSEMBLY DRAWING Numbers*
	FREIN ***BRAKE***	**DIVERS** ***MISCELLANEOUS***	

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NOTICE EXPLICATIVE ET D'ENTRETIEN
EXPLANATORY AND MAINTENANCE MANUAL

RELAIS TYPE P1K et P1KB

RELAY TYPE P1K AND P1KB

781 121 .. 08	**10 9007 609**
N° de dessin d'ensemble constructeur *Manufacturer's assembly drawing N°*	N° de dessin d'ensemble SNCF *Customer assembly drawing number*

Faiveley TRANSPORT ©	Date / *Date*	09/10/90	**Référence client SNCF**		N° 1
	Nom / *Name*	VP			

(E) 3255	A	M	N	O	P	Q	**10-9006 272**							23 Nbre
	R	S	T00	U00										

Indice *Index*	Date *Date*	N° de diffusion *Distribution n°*	NATURE DE LA MODIFICATION *MODIFICATION NATURE*
-	09.10.1990		Création / *first issue.* Mise à jour suivant dessin B E n° 781 121 .. 08 indice T/16, F04/711 du 12/04. *Update according to design depart drawing N° 781 121 .. 08 index T/16, F04/711 of 12/04.* Mise à jour suivant dessin B E n° 781 121 06 08 indice C/01, F04/0248 du 04/04. *Update according to design depart drawing N° 781 121 06 08 index C/01, F04/0248 of 04/04.* **07/10/05 –** Mise à jour sans modification du plan d'ensemble. *Update without modification of assembly drawing* **Sommaire / Contents:** § 4.3, remplacer « General servicing » par « General overhaul » *Replace « General servicing » by « General overhaul »* **Texte / *Text*:** § 4.3, remplacer « General servicing » par « General overhaul » *Replace « General servicing » by « General overhaul »* § 4.3.1, modifier le texte / *Modify the text* § 4.3.2, ajouter le rebut des joints toriques / *Add the scrap of O.rings* § 4.3.4, remplacer "See assembly drawing" par "See attached drawings" *Replace "See assembly drawing" by "See attached drawings"* § 6, modifier le texte. / *Modify the text.* **Sommaire / *Contents*** § Plans joints, aux plans 781 418 et 781 146, ajouter "ou / or » *§ Attached drawings, at drawings 781 418 and 781 146, add "ou / or »* Supprimer le plan 784 152 00 08 PU. Delete the drawing 784 152 00 08 PU. Le plan 781 144 00 08 PU devient 781 144 00 08,, modifier l'indice « A/00 » qui devient « E/04 » *Drawing 781 144 00 08 PU becomes 781 144 00 08,, modify the index « A/00 » which becomes « E/04 »* Ajouter le plan 781 497 00 08 PU / *Add the drawing 781 497 00 08 PU..* Plan 782 585 .. 08 PU, modifier l'indice « A/00 » qui devient «B/00» *Drawing 782 585 .. 08 PU, modify the index « A/00 » which becomes « B/00 »* Le plan 782 359 .. 08 PU devient 782 359 .. 08, modifier l'indice «B/01» qui devient «E/01» *The drawing 782 359 .. 08 PU becomes 782 359 .. 08, modify the index «B/01» which becomes «E/01»* Ajouter le plan 782 358 00 08PU. / *Add the drawing 782 358 00 08PU.*
Q	06/06/06	/	**06/06/06 :** Mise à jour suivant dessin B E n° 781 121 .. 08 indice V/16, F06/176 du 05/06. *Update according to design depart drawing N° 781 121 .. 08 index V/16, F06/176 of 05/06.* Mise à jour suivant dessin B E n° 781 121 06 08 indice C/01, F04/0248 du 04/04. *Update according to design depart drawing N° 781 121 06 08 index C/01, F04/0248 of 04/04.*

Indice *Index*	Date *Date*	N° de diffusion *Distribution n°*	NATURE DE LA MODIFICATION *MODIFICATION NATURE*
R	11/07/06	/	**11/07/06:** Mise à jour suivant dessin B E n° 781 121 .. 08 indice W/16, F06/288 du 06/06. *Update according to design depart drawing N° 781 121 .. 08 index W/16, F06/288 of 06/06.* Supprimer le plan 781 121 06 08 car il est intégré dans le 781 121 .. 08. *Delete the drawing 781 121 06 08 because he is into the 781 121 .. 08.* **24/02/09:** Mise à jour suivant **les remarques du client suite aux bordereaux SNCF n° 1163, 2700** et suivant le plan N° 781 121 .. 08 indice X/16, F09/164 du 03/09. Pour les modifications dans le texte voir les documents réponses des bordereaux 1163 et 2700. *Update according to **the remarks of the customer following the claim sheets n° 1163, 2700** and following the drawing n° 781 121 .. 08 index X/16, F09/164 of 03/09.* *for the modification in the text, see the documents answer of claim sheets n° 1163 and 2700.* Ajouter dans le § 4.3 révision générale, la phrase « au premier des deux termes échu ». *Add in the § 4.3. General overhaul, the sentence "at the first of two terms expired".* Ajouter le § 5. Ancienne et nouvelle disposition. / *Add the § 5. Obsolete and new version.* **02/01/15**: Mise à jour suivant le plan d'ensemble N° 781 121 .. 08 indice X/17, F12/0108 du 01/12. / *Update according to the assembly drawing n° 781 121 .. 08 index X/17, F12/0108 of 01/12.* Remplacement de la phrase "Entretien préventif" par "Entretien courant" dans le texte. / *Replacement of the phrase "Preventive maintenance" by "Servicing" in the text.* Ajout de vues pour les § démontage et remontage. / *Add illustrations of § disassembly and reassembly.* **05/11/19**: Mise à jour suivant le plan d'ensemble N° 781 121 .. 08 indice Z00. / *Update according to the assembly drawing n° 781 121 .. 08 index Z00.* Modifier le texte et les captures afin de supprimer les repères 23, 26, 29, 45 et ajouter le repère 51. *Modify the text and the views in order to delete items 23, 26, 29, 45 and add the item 51.* Ajouter dans le § Révision Générale, la phrase "Faire un contrôle fonctionnel … comme prévu dans le plan de maintenance". / *From § General overhaul" add the sentence "Make a functional check …. As scheduled in the projet maintenance plan".*
T00	02/01/15	/	
U00	**05/11/19**	/	
Rédacteur ***Writer***		**CH**	**Ce document a été validé et diffusé électroniquement** ***This document was approved and dispatched electronically***

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Plan d'ensemble / *Assembly drawing* n° 781 121 .. 08 / SNCF N° 10-9007 609 indice / *index* Z00 (3 feuilles / *3 sheets*),

Plan / *Drawing* n° 781 161 01 08 PU indice / *index* A00 (rep / *item* .1),

Plan / *Drawing* n° 725 748 xx 08 PU indice / *index* E01 (rep / *item*.3),

Plan / *Drawing* n° 653 838 00 08 PU indice / *index* D00 (rep / *item*.5),

Plan / *Drawing* n° 184 703 00 08 PU indice / *index* C00 (rep / *item*.8),

Plan / *Drawing* n° 180 373 00 08 PU indice / *Index* F00 (rep / *item*.11),

Plan du piston équipé / *Drawing of fitted piston* n° 781 148 .. 08 indice / *index* L00 (rep / *item*.15 ou / or 41),

Plan / *Drawing* n° 781 146 .. 08 PU indice / *Index* B01 (rep / *item*.15/2, 15/4 ou / or 41/2, 41/4),

Plan / *Drawing* n° 784 152 00 08 PU indice / *Index* B01 (rep / *item*.15/3 ou / or 41/3),

Plan du couvercle équipé / *Drawing of fitted cover* n° 781 144 00 08 indice / *Index* F00 (rep / *item*.27),

Plan / *Drawing* n° 781 497 00 08 PU indice / *Index C01* (rep / *item*.27/2),

Plan du couvercle équipé / *Drawing of fitted cover* n° 782 051 .. 08 indice / *index* F00 (rep / *item*.32),

Plan / *Drawing* n° 782 050 00 08 PU indice / *Index* A00 (rep / *item*.32/2),

Plan / *Drawing* n° 782 585 .. 08 PU indice / *Index* B00 (rep / *item*.35),

Plan du couvercle équipé / *Drawing of fitted cover* n° 782 359 01 08 indice / *index* G00 (rep / *item*.36),

Plan / *Drawing* n° 782 358 00 08 PU indice / *index* A00 (rep / *item*.36/2),

Plan / *Drawing* n° 728 725 01 08 PU indice / *index* A00 (rep / *item*.47),

Plan / *Drawing* n° 727 353 00 08 PU indice / *index* B00 (rep / *item*.48).

1. GENERALITES / *GENERAL*

Le relais P1K ou P1KB est destiné à l'alimentation en air comprimé à grand débit d'un "Circuit d'utilisation". Cette pression suit la variation d'une pression dite "Pression pilote" issue d'un appareil pilote à faible débit.

The relay P1K or P1KB is used to supply an "output circuit" with high output compressed air. This pressure follows the variation of a pressure known as the "pilot pressure" from a low flow control unit.

Le rapport entre la pression pilote et la pression d'utilisation est de 1 / *The ratio between the pilot pressure and the service pressure is 1.*

L'appareil peut être fixé sur : / *It can be secured onto :*

- un support simple (voir notice descriptive **n° 3159** - 5 MCF 12.1..),
- *a simple support (see descriptive instructions **n° E3159**),*
- un support simple avec une électrovalve de commande (voir notice descriptive **n° 3157** - 5 MCF 12.1.67),
- *a simple support with a control magnet valve (see descriptive instructions **n° 3157**),*
- un groupe de freinage type GF4, / *a GF4 type braking unit,*
- un bloc type W2, / *a W2 type unit,*
- tous les panneaux fraisés-collés prévus à cet effet. / *any milled-glued panel provided for this purpose.*

Sa fixation sur goujons est assurée par deux trous **Ø 11 mm** ou quatre trous **Ø 9 mm**, selon les variantes.

It is secured on studs through two holes 11 mm or four holes 9 mm, according to variants.

La masse de la variante 01 est de / *The mass of variant 01 is :* **2,06 Kg ± 5 %**.

La masse des variantes 02, 98 est de / *The mass of variants 02, 98 is :* **2,22 Kg ± 5 %**.

La masse des variantes 03, 04, 07, 08, 99 est de / *The mass of variants 03, 04, 07, 08, 99 is :* **2,17 Kg ± 5 %**.

La masse de la variante 05 est de / *The mass of variant 05 is :* **2,18 Kg ± 5 %**.

NOTA : Le plan n° 781 121 06 08 est spécifique au projet X-40. Pour l'avenir suivre le plan n° 781 121 .. 08 / SNCF N° 10-9007 609 variante 03.

***NOTE**: The drawing n° 781 121 06 08 is specific for X-40 project. For new project follow the drawing n° 781 121 .. 08 variant 03.*

Les repères cités dans cette notice sont ceux du plan n° 781 121 .. 08 / SNCF N° 10-9007 609.

The items mentioned on this pamphlet are those of drawing n° 781 121 .. 08.

2. DESCRIPTION / *DESCRIPTION* (VOIR LE PLAN / SEE THE DRAWING N° 781 121 .. 08 / SNCF N° 10-9007 609)

Le relais P1K ou P1KB est principalement composé de : / *The relay P1K or P1KB is chiefly composed of :*

- un piston équipé **(15)** ou **(41)** à tige creuse muni d'un diaphragme **(21)** (le piston équipé **(41)** est muni d'une tuyère **(42)**),
- *a piston assembly **(15)** or **(41)** with a hollow rod, equipped with a diaphragm **(21)** (the piston assembly **(41)** is equipped with a choke **(42)**),*

NOTA : le piston équipé **(15)** ou **(41)** comprenant le serre membrane et la tige sont assemblés avec de la « **LOCTITE 601 SUPER RAPIDE** ».

***NOTE**: The complete piston **(15)** or **(41)** comprising the membrane clamp and the rod are assembled with "**LOCTITE ref. 601**".*

- une tige de clapet **(3)**, munie de deux joints toriques **(2)** faisant fonction de clapets d'admission et d'échappement,
- *a valve rod **(3)** with O-rings **(2)**, used as inlet valves and exhaust valves ,*
- un corps **(1)** ou **(35)** et un couvercle équipé **(27)** ou **(32)** ou **(36)** constituant les différentes chambres 1, 3, 9, 8 et l'orifice 5 :
- *a body **(1)** or **(35)** and a cover assembly **(27)** or **(32)** or **(36)**, making up the chambers 1, 3, 9 ,8 and the aperture 5 :*
  - 1 – Alimentation */ supply*,
  - 3 – Utilisation / *output,*
  - 9 – Réaction / *reaction,*
  - 8 – Pilote / *pilot,*
  - 5 – Echappement / *exhaust,*

Les chambres 3 et 9 sont reliées entre elles par un gicleur solex **(14)** ou **(33)** ou **(50)** ou **(51)**, selon les variantes.

*The chambers 3 and 9 are linked via a choke SOLEX **(14)** or **(33)** or **(50)** or **(51)** according to variants.*

L'étanchéité d'interface est réalisée par les joints toriques **(39)**, **(18)** ou **(37)**.

*The interface is made tight by means of O-rings **(39)**, **(18)** or **(37)**.*

3. FONCTIONNEMENT */ OPERATION* (VOIR LE PLAN / *SEE THE DRAWING* N° 781 121 .. 08 / SNCF N° 10-9007 609)

La chambre d'alimentation 1 est alimentée par l'air du réservoir principal ou du réservoir auxiliaire.

The supply chamber 1 is filled with air from the main reservoir or the auxiliary reservoir.

3.1. Pression pilote nulle / *Zero pilot pressure*

Tant que la pression pilote est nulle dans la chambre pilote 8 (à l'atmosphère), le piston équipé **(15)** ou **(41)**, sollicité par la pesanteur se trouve dans la position basse.

*As long as the pressure is zero in the chamber 8 (atmospheric pressure), the assembly piston **(15)** or **(41)**, through the effect of gravity, is in the lower position.*

La tige de clapet **(3)**, est suspendue sur le siège d'admission. Le clapet est donc fermé et sa fermeture, confirmée par l'effort du petit ressort **(11)** ou **(48)**, interdit toute alimentation de la chambre d'utilisation 3.

*The valve rod **(3)** is suspended on the inlet seat . This valve is therefore closed, which is confirmed by the effort of the little spring **(11)** or **(48)**. Accordingly it is impossible to supply the output chamber 3.*

La tige creuse du piston équipé **(15)** ou **(41)**, dont l'extrémité constitue le siège du clapet d'échappement, étant éloignée de ce clapet, celui-ci est ouvert. La chambre d'utilisation 3 est mise à l'atmosphère par la grande section de la tige creuse.

*The piston's hollow rod assembly **(15)** or **(41)** , the end of which is the exhaust valve seat , is withdrawn from this valve, which is therefore open. The output chamber 3 is brought to atmospheric pressure via the large section of the hollow rod.*

3.2. Pression pilote croissante / *Increasing pilot pressure*

Dès que l'air comprimé, venant de l'appareil pilote, arrive dans la chambre pilote 8, l'effort de cette pression sur la section déplace le piston équipé **(15)** ou **(41)** à tige creuse vers le haut, son siège vient fermer le clapet d'échappement, puis soulève la tige de clapet **(3)** qui ouvre le clapet d'admission. / *As soon as the compressed air from the control unit arrives in the pilot chamber (8), the effort of this pressure on the section moves the hollow-rod piston assembly **(15)** or **(41)** upwards, and its seat closes the exhaust valve , then raises the valve rod **(3)**, which opens the inlet valve .*

L'air de la chambre d'alimentation 1 pénètre par le clapet dans la chambre d'utilisation 3 et, de là, dans le circuit d'utilisation. L'air de la chambre d'utilisation 3 pénètre également dans la chambre de réaction 9, par le gicleur solex **(14)**, **(33)**, **(50) ou (51)**, et sollicite le piston équipé **(15)** ou **(41)** vers le bas. / *The air from the supply chamber 1 enters the output chamber 3 via the valve and, from there, enters the output circuit. The air in the output chamber 3 also enters the reaction chamber 9, via the choke SOLEX **(14)** or **(33)** or **(50)** or **(51)** and pushes the assembly piston **(15)** or **(41)** downwards.*

3.3. Pression d'utilisation égale à la pression pilote / *Output pressure equal to pilot pressure*

Lorsque la pression dans la chambre de réaction 9 est égale à celle régnant dans la chambre pilote 8, le piston descend et le clapet d'admission se ferme sans que celui d'échappement ne s'ouvre. / *When the pressure in the reaction chamber 9 is the same as that in the pilot chamber 8, the piston descends and the inlet valve closes without the exhaust valve opening.*

Si, pour une raison quelconque, la pression diminue dans la chambre d'utilisation 3, (fuite sur le circuit d'utilisation), la pression pilote devient prépondérante, elle soulève le piston et la chambre d'utilisation 3 est ré-alimentée jusqu'à rétablissement de l'équilibre. / *If, for any reason, the pressure drops in the output chamber 3 (leak in the output circuit), the pilot pressure becomes preponderant. It raises the piston and the output chamber 3 is refilled until a balance is attained.*

3.4. Grand débit / *High flow*

Lorsque la chambre de réaction 9 est mise en communication avec la conduite d'utilisation, en aval des appareils créant des pertes de charge et si cette conduite d'utilisation a un grand volume à remplir, il se produit un écoulement d'air à partir de la chambre d'utilisation 3, par le gicleur solex **(14)** ou **(33)** ou **(50)** ou **(51)**, et la chambre de réaction 9.

*When the reaction chamber 9 is brought into communication with the output pipe, downstream from the units which create losses of charge and if this output pipe has a large volume to fill, air flows from the chamber 3 via the choke SOLEX **(14)** or **(33)** or **(50)** or **(51)** and the chamber 9.*

La pression dans la chambre de réaction 9 devient inférieure à celle de la chambre pilote 8 et le piston équipé **(15)** ou **(41)**, sollicité par cette différence de pression, monte et ouvre en grand le clapet d'admission. Tant que la pression de réaction, au droit du raccordement avec la conduite d'utilisation n'aura pas atteint la valeur de la pression pilote, le relais P1K ou P1KB restera dans la position « grand débit ».

*The pressure in the chamber 9 becomes lower than that of the chamber 8 and the piston assembly **(15)** or **(41)**, under the effect of this difference in pressure, rises and fully opens the inlet valve . Until the reaction pressure, at right angles with the connection with the output pipe, reaches the value of the pilot pressure, the relay P1K or P1KB stays in the "high flow" position.*

3.5. Pression pilote décroissante / *Decreasing pilot pressure*

Lorsque la pression diminue dans la chambre pilote 8, la pression dans la chambre de réaction 9 devient prépondérante et le piston se déplace vers le bas. Le clapet d'admission reste fermé, le clapet d'échappement s'ouvre et l'air de la chambre d'utilisation 3, donc celui du circuit d'utilisation, s'échappe par la tige creuse jusqu'à ce qu'un nouvel équilibre s'établisse.

When the pressure drops in the pilot chamber 8, the pressure in the reaction chamber 9 becomes preponderant and the piston moves downwards. The inlet valve remains closed, the exhaust valve opens and the air in the output chamber 3, and therefore in the output circuit), escapes via the hollow rod, until a balance is once again attained.

4. ENTRETIEN */ MAINTENANCE* (VOIR LE PLAN / *SEE THE DRAWING* N° 781 121 .. 08 / SNCF 10-9007 609)

4.1. Précautions environnementales */ Environmental precautions*

Les pièces en élastomère, les chiffons et papiers gras étant des déchets de catégorie DIS (déchets industriels souillés) doivent être triées conformément à la réglementation sur le tri des déchets du pays concerné et jetées dans la poubelle appropriée.

The elastomer parts, fatty rags and papers being waste of category SIW (Soiled Industrial Waste) must be sorted in accordance with the regulation on the sorting of waste of the country concerned and be thrown in the suitable dustbin.

Les pièces métalliques pouvant être valorisées par recyclage ou récupération seront rebutées dans la benne appropriée.

The metal parts being able to be developed by recycling or recovery will be rejected in the suitable bucket.

4.2. Entretien courant / *Servicing*

Le relais P1K ou P1KB ne nécessite aucun entretien courant ni de graissage périodique. Néanmoins si lors d'une intervention ponctuelle, le relais P1K ou P1KB est démontée, procéder au nettoyage et à l'examen des élastomères :

The P1K or P1KB relay does not require any servicing or periodic lubrication. Nevertheless, during a punctual intervention, if the P1K or P1KB relay is disassembled, it should be cleaned and the elastomer parts should be inspected:

Les joints toriques seront extraits au moyen d'une spatule en bakélite / ***The O-rings will be extracted using a spatula Bakelite.***

- essuyer les pièces en élastomère avec un chiffon sec non pelucheux au besoin imbibé d'essence minérale, / *Wipe the elastomer parts with a dry, lint-free cloth if necessary soaked in mineral oil,*
- examiner que le diaphragme **(21)** ait conservé sa souplesse et ne présente pas de craquelure. Auquel cas le rebuter, / *Check that the flat diaphragm **(21)** has conserved its suppleness and doesn't present any cracking. **If such were the case, scrap it,***
- examiner que les joints toriques dynamiques ou statiques **(2)**, **(7)**, **(12)**, **(13)**, **(16)**, **(18)**, **(19)**, **(20)**, **(37)**, **(38)** et **(39)** ne présentent pas d'usure anormale ou d'arrachement de matière ou de méplat. Auquel cas les rebuter,
- *Check that the dynamic or static O-rings **(2)**, **(7)**, **(12)**, **(13)**, **(16)**, **(18)**, **(19)**, **(20)**, **(37)**, **(38)** and **(39)** do not show signs of excessive flats or indents. If such were the case, scrap then,*
- Examiner que l'obturateur **(9)** ne présente pas de craquelure, **Auquel cas le rebuter,** / *Check that the blanking plate **(9)** is not cracked. **If such were the case, scrap it**,*
- Examiner que la portée du siége du clapet **(4)** et du piston équipé **(15)**, ne présente pas d'empreinte trop prononcée ou de rayure. **Auquel cas le rebuter.**
- *Check that the scope of the seat of valve **(4)** and of assembly piston **(15)**, does not show signs of excessive indents or scratch. **If such were the case, scrap it.***

4.3. Révision générale / *General overhaul*

Faire un contrôle fonctionnel et une révision générale comme prévu dans le plan de maintenance du projet. S'il n'y a pas de plan de maintenance pour le projet, respecter les périodicités ci-dessous. / ***Make a functional check and a general overhaul** as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below***.**

Lors des révisions générales que nous conseillons tous **les cinq ans** ou **800 000 km**, **au premier des deux termes échu**, le relais P1K ou P1KB sera déposée pour démontage, nettoyage, examen et remplacement des pièces d'usure.

*During the general overhaul, which is recommended at interval of **five years** or **800 000 km**, **at the first of two terms expired**, the PIK relay must be removed for disassembly, cleaning, verification, and replacement of worn parts.*

L'exploitant peut adapter cette périodicité selon les conditions d'utilisation, sa politique de maintenance et son expérience propre, sous sa responsabilité. / *The owner can adapt this periodicity according to conditions of use, its maintenance policy and its own experiment, under its responsibility*.

4.3.1. Dépose / *Removal*

Prendre la précaution d'isoler le panneau **(P)** avant d'intervenir sur le relais P1K ou P1KB.

*Take care to isolate the panel **(P)** before intervening on the P1K or P1KB relay.*

Avant la dépose du relais P1K ou P1KB, s'assurer de : / *Before the removal of P1K or P1KB relay, ensure itself of:*

- l'absence de pression résiduelle dans les conduites pneumatiques ou au sein du panneau, / *the absence of residual pressure in the pneumatic pipes or within the panel.*
- la propreté de l'environnement (essuyer le panneau avec un chiffon imbibé d'un solvant) du relais P1K ou P1KB avant la dépose, / *the environment cleanness (wipe the panel with a rag soaked with a solvent) of P1K or P1KB relay before removal,*

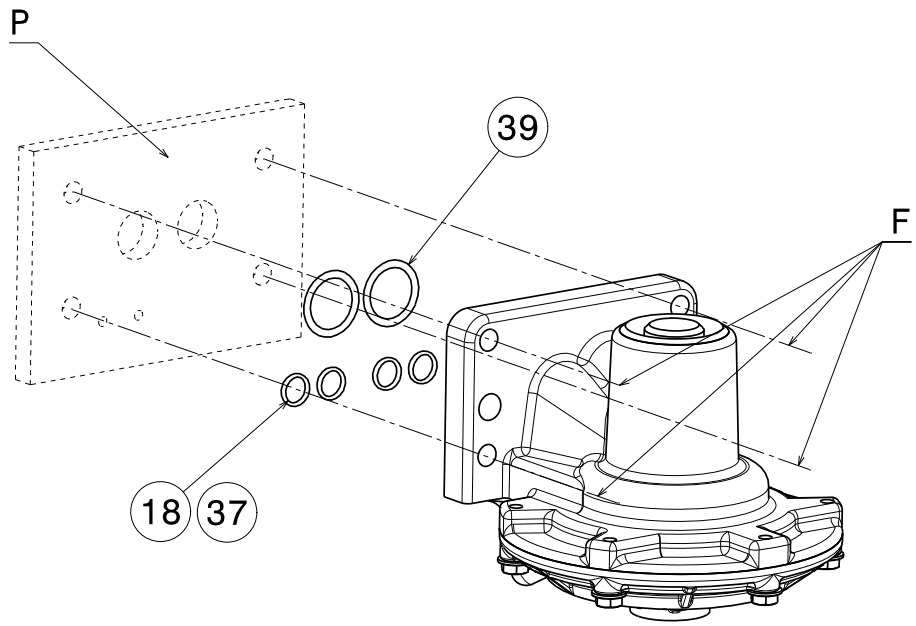
Desserrer et ôter les écrous de fixation **(F)**, ôter et rebuter les rondelles, déposer le relais P1K ou P1KB.

*Loosen and remove the fastening nuts **(F)**, remove and scrap the washers, deposit the P1K or P1KB relay.*

Rebuter les joints toriques **(18)** ou **(37)** et **(39)** d'interface. / *Reject the interface O-rings **(18)** or **(37)** and **(39)**.*

Prendre la précaution d'obturer les orifices du panneau afin d'éviter sa pollution interne.

Take the precaution to seal the panel apertures in order to avoid its internal pollution.

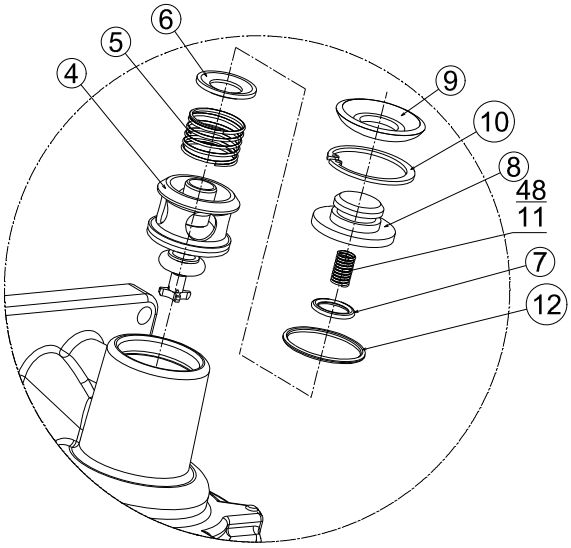


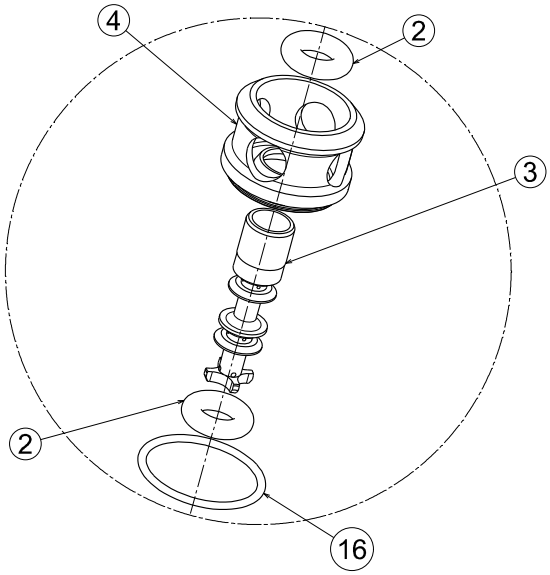
4.3.2. Démontage / *Disassembly*

Oter et rebuter l'obturateur **(9)** et le circlips **(10)**. / *Remove and scrap the blanking plate **(9)**, and the circlip **(10)**.*

Enlever le bouchon **(8)**, le ressort **(11)** ou **(48)**, rebuter les joints toriques **(7)** et **(12)**, la coupelle **(6)**, le ressort **(5)** et le siège **(4)** équipé.

*Remove the plug **(8)**, the spring **(11)** or **(48)**, scrap the O-rings **(7)** and **(12)**, the follower cup **(6)**, the spring **(5)** and the valve seat **(4)** equipped.*

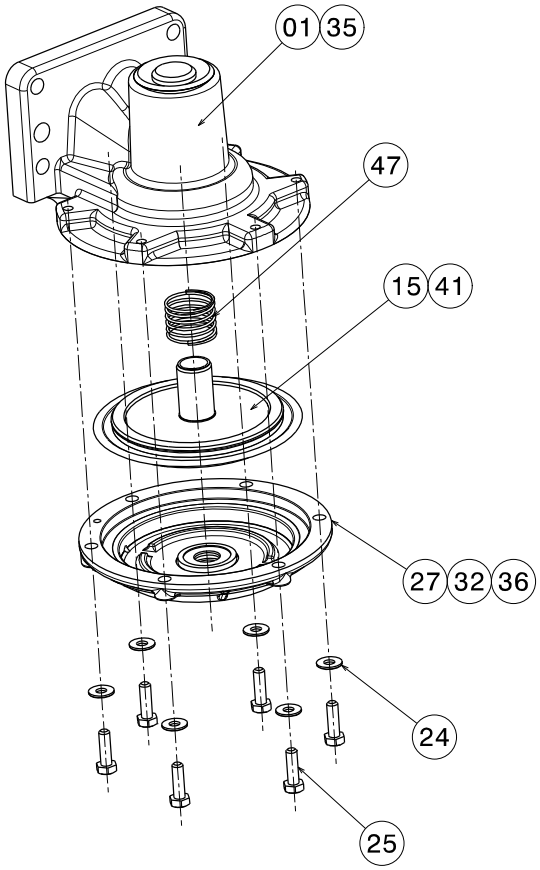




Extraire et rebuter le joint torique **(16)**. / *Extract and scrap the O-ring **(16)**.*

Extraire et rebuter les joints toriques **(2)**. / *Extract and scrap the O-rings **(2)**.*

Séparer délicatement la tige de clapet **(3)** du siège de clapet **(4)**. / *Separate the valve rod **(3)** from the valve seat **(4)**.*



Dévisser et enlever les vis **(25)** et rebuter les rondelles **(24)**. / *Unscrew the screws **(25)** and scrap the washers **(24)**.*

Déposer le couvercle équipé **(27)** ou **(32)** ou **(36)**. / *Remove the cover assembly **(27)** or **(32)** or **(36)**.*

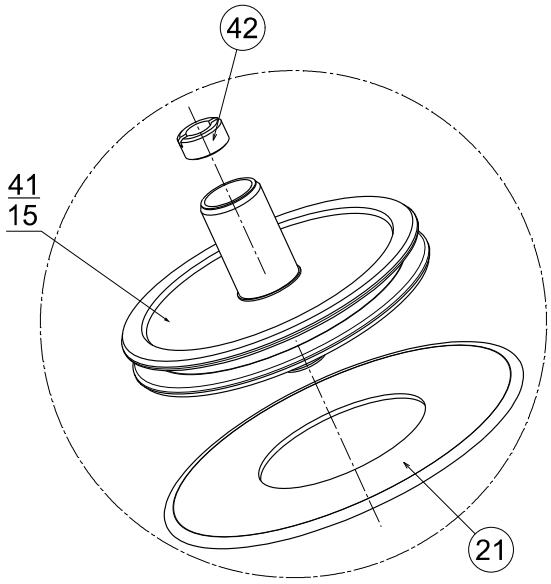
Retirer le piston équipé **(15)** ou **(41)** puis déposer pour la variante 07 le ressort **(47)**.

*Remove the piston assembly **(15)** or **(41)** then remove for the variant 07 the spring **(47)**.*

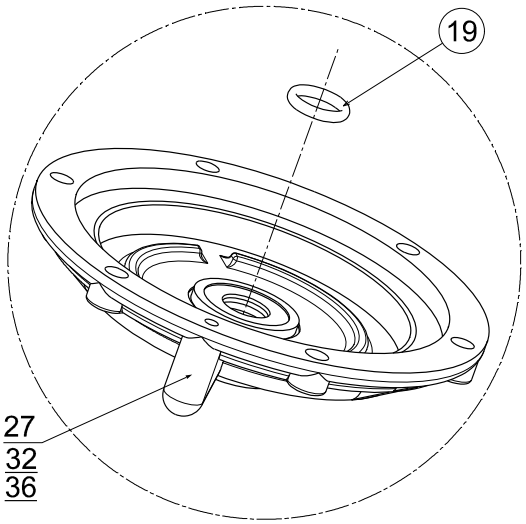
NOTA : ne pas séparer les deux pièces. / ***NOTE**: don't separate the two parts.*

Extraire et rebuter du piston équipé **(15)** ou **(41)**, le diaphragme **(21)** puis pour la variante 04 dévisser et enlever la tuyère **(42)**.

*From the assembly piston **(15)** or **(41)**, extract and scrap the diaphragm **(21)**, then for the variant 04 unscrew the choke **(42)**.*

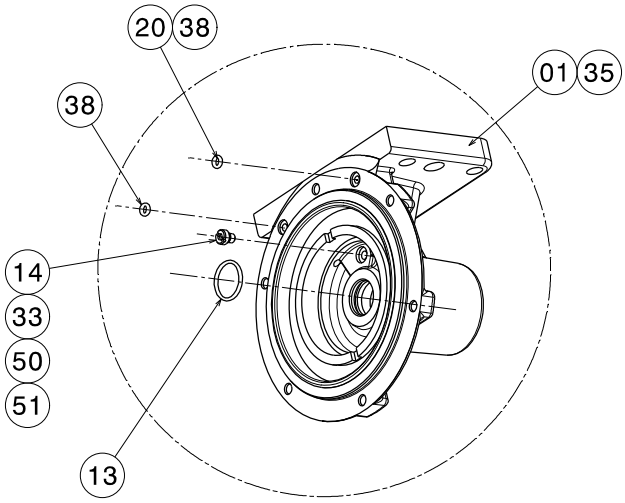


Faiveley TRANSPORT ©	Date / *Date*	09/10/90	**Référence client SNCF**		N° 13
	Nom / *Name*	VP			
***(E)* 3255**	**A** **M** **N** **O** **P** **Q**		**10-9006 272**		23
	R **S** **T00** **U00**				Nbre



Enlever du couvercle équipé **(27)** ou **(32)** ou **(36)** le joint torique **(19)**. Rebuter le joint torique.

*From cover assembly **(27)** or **(32)** or **(36)** remove the O-ring **(19)**. Scrap it*



Oter et rebuter du corps **(1)** ou **(35)** les joints toriques **(13)**, **(20)** ou **(38)**.

*From body **(1)** or **(35)** remove and scrap the O-rings **(13)**, **(20)** or **(38)**.*

Enlever sauf pour la variante 07 le gicleur **(14)** ou **(33)** ou **(50)** ou **(51)**.

*Remove except for the variant 07 the choke SOLEX **(14)** or **(33)** or **(50)** or **(51)**.*

4.3.3. Nettoyage / *Cleaning*

Utiliser les protections réglementaires aux normes en vigueur pour les produits dangereux.

When using dangerous products, observe the local workshop regulations in force.

Nettoyer les pièces métalliques à l'aide d'un solvant de nettoyage agréé, puis les souffler à l'air comprimé sec. / *Clean all metal parts with an approved cleaning solvant, blow them with a dry compressed air.*

4.3.4. Examen / *Check*

Examiner et contrôler les pièces de **type BB ou BC** (voir les plans joints).

*Inspect and check the parts **type BB, BC (See attached drawings)**.*

Examiner que les pièces à frottement métal-métal ne présentent pas de trace de grippage. **Auquel cas les rebuter**. / *To examine that the parts with friction metal-metal do not present a trace of corrosion, **If such were the case, scrap them**.*

Les faces d'appui des ressorts ne doivent pas présenter de trace de corrosion, examiner l'aspect géométrique des ressorts, ceux-ci ne doivent pas être déformés. **Auquel cas les rebuter**. / *Spring resting surfaces must be devoid of any corrosion; check spring geometrical aspect as the springs must comport no deformation. **If such were the case, scrap them**.*

Le circlips ne doit pas présenter de trace de corrosion, examiner l'aspect géométrique, celui-ci ne doit pas être déformé**. Auquel cas le rebuter**.

Examiner que le gicleur solex **(14)** ou **(33)** ou **(50)** ou **(51)** ne soit pas obstrué. **Auquel cas le rebuter**. / *Check that the Solex choke **(14)** or **(33)** or **(50)** or **(51)** do not have closing. **If such were the case, replace it**.*

4.3.5. Graissage / *Lubrication*

Avant le remontage, procéder au graissage comme défini dans la consigne de montage « **CM n° 3056** / **SNCF 10-9050 637**».

*Before reassembly, carry out lubrication as defined in Assembly Instruction **CM n°E 3056**.*

4.3.6. Remontage / *Re-assembly*

Lors des révisions générales, nous conseillons le remplacement systématique de tous les élastomères, pièces de **type AA ou AC** voir le plan « **n° 781 121 .. 08** / **SNCF n° 10-9007 609**».

*During general overhauls, it is recommended to systematically replace all elastomer parts, parts **type AA, AC**, see assembly drawing **N° 781 121 .. 08**.*

A la révision générale, il est impératif de remplacer la tige de clapet. / *During general overhaul, it is imperative to replace the valve rod and valve seat.*

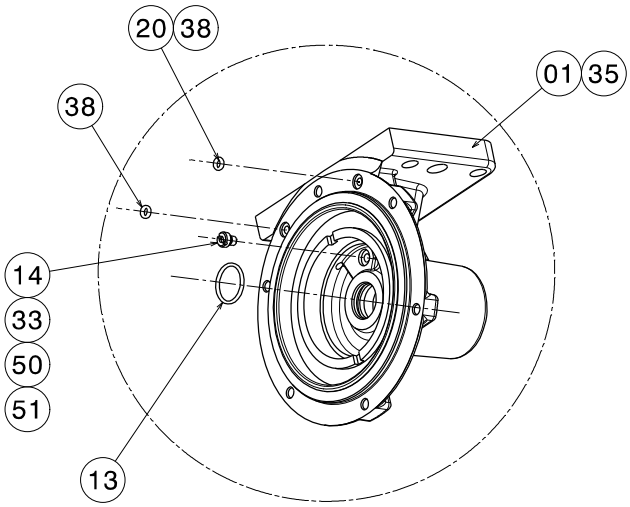
NOTA : La tige de clapet n° 653 835 00 08 / SNCF n° 10-9008 029 est remplacée par la tige de clapet n° 725 748 00 08 / SNCF n° 10-9009 081.Le siège de clapet n° 184 816 00 08 / SNCF n° 10-521 150 est remplacé par le siège de clapet n° 184 816 10 08 / SNCF n° 10-9008 461.

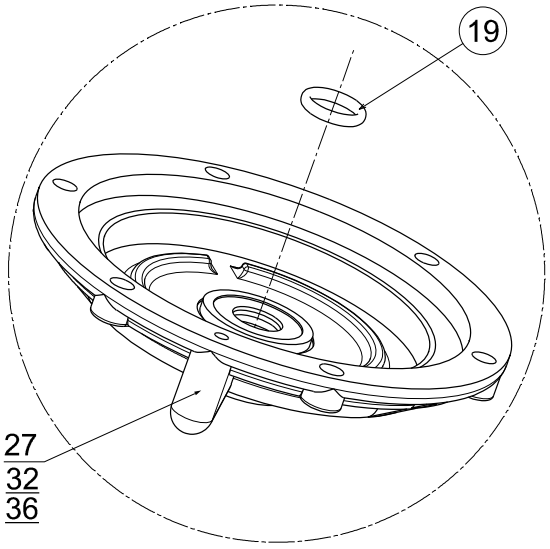
***NOTE** : the valve rod ref. 653 835 00 08 is replaced by the valve rod ref. 725 748 00 08. the valve seat ref.184 816 00 08 is replaced by the valve seat 184 816 10 08.*

Monter sauf pour la variante 07 le gicleur solex **(14)** ou **(33)** ou **(50)** ou **(51)** dans le corps **(1)** ou **(35)**.

*Fit except for the variant 07 the choke SOLEX **(14)** or **(33)** or **(50)** or **(51)** in the body **(1)** or **(35)**.*

Monter les joints toriques **(13)**, **(20)** ou **(38)** et dans le corps **(1)** ou **(35)**. / *Fit the O-rings **(13)**, **(20)** or **(38)** in the body **(1)** or **(35)**.*

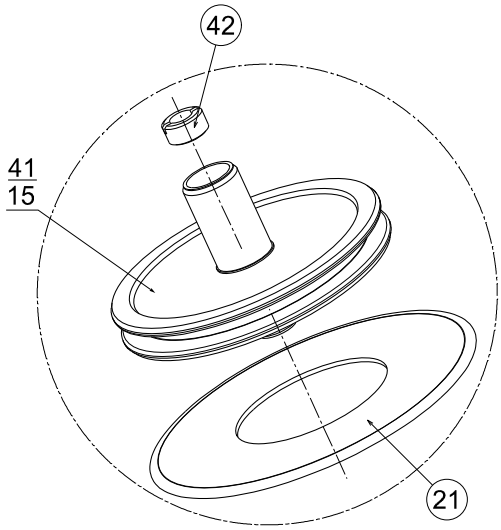




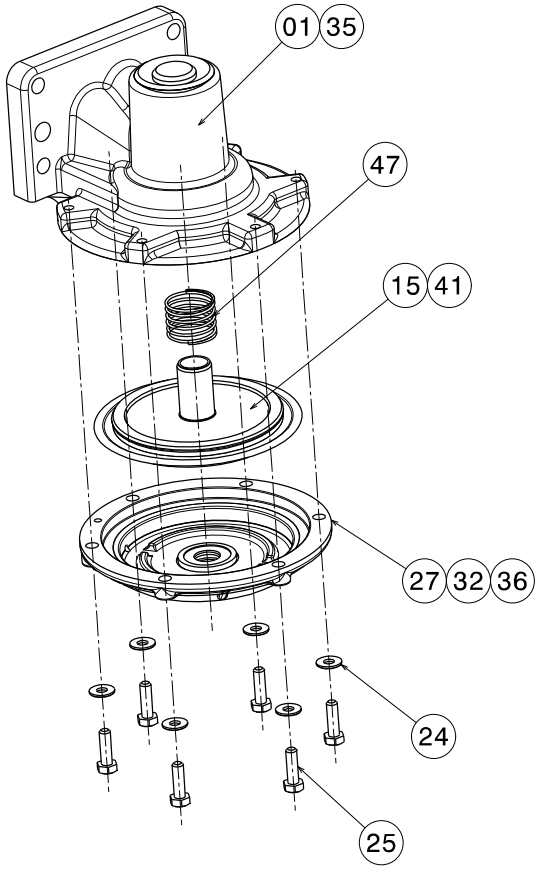
Monter le joint torique **(19)** dans la gorge de la bague épaulée du couvercle **(27)** ou **(32)** ou **(36)**.

*Fit the O-ring **(19)** in the groove of shouldered ring gorge of cover **(27)** or **(32)** or **(36)**.*

Pour la variante 04, appliquer de la « **LOCTITE 243 FREIN FILET NORMAL**» sur le filetage de la tuyère **(42)** avant de monter celle-ci dans le piston équipé **(41)**. / *For the variant 04, Apply "**LOCTITE ref. 243**" on the thread of choke **(42)** before mounting in the piston assembly **(41)**.*



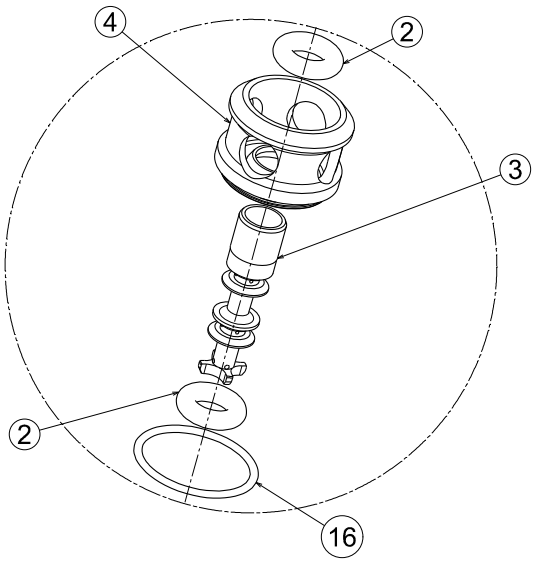
Monter le diaphragme **(21)** sur le piston équipé **(15)** ou **(41)**, puis l'ensemble dans l'alésage du corps **(1)** ou **(35)**. / *Fit the diaphragm **(21)** on the piston assembly **(15)** or **(41)**, then this unit in the body **(1)** or **(35)**.*



Pour la variante 07 mettre en place le ressort **(47)**. / *For the variant 07, place the spring **(47)**.*

Assembler le couvercle équipé **(27)** ou **(32)** ou **(36)** sur le corps **(1)** ou **(35)** et fixer cet ensemble avec les vis **(25)** et les rondelles **(24)**. / *Fit the cover assembly **(27)** or **(32)** or **(36)** on the body **(1)** or **(35)** and fix this unit with the screws **(25)** and washers **(24)**.*

NOTA: lors de l'assemblage du couvercle équipé **(27)** ou **(32)** ou **(36)** sur le corps **(1)** ou **(35)**, positionner l'orifice d'alimentation de la chambre pilote du couvercle équipé en face du joint torique **(20)** ou **(38)**, voir la vue de face sur le plan d'ensemble **n° 781 121 .. 08** / **SNCF N° 10-9007 609**.
***NOTE**: When assembling the cover fitted **(27)** or **(32)** or **(36)** on the body **(1)** or **(35)**, position the orifice chamber feed pilot of cover fitted opposite the O- ring **(20)** or **(38)**, see the front view on the assembly drawing **N° 781 121 .. 08**.*

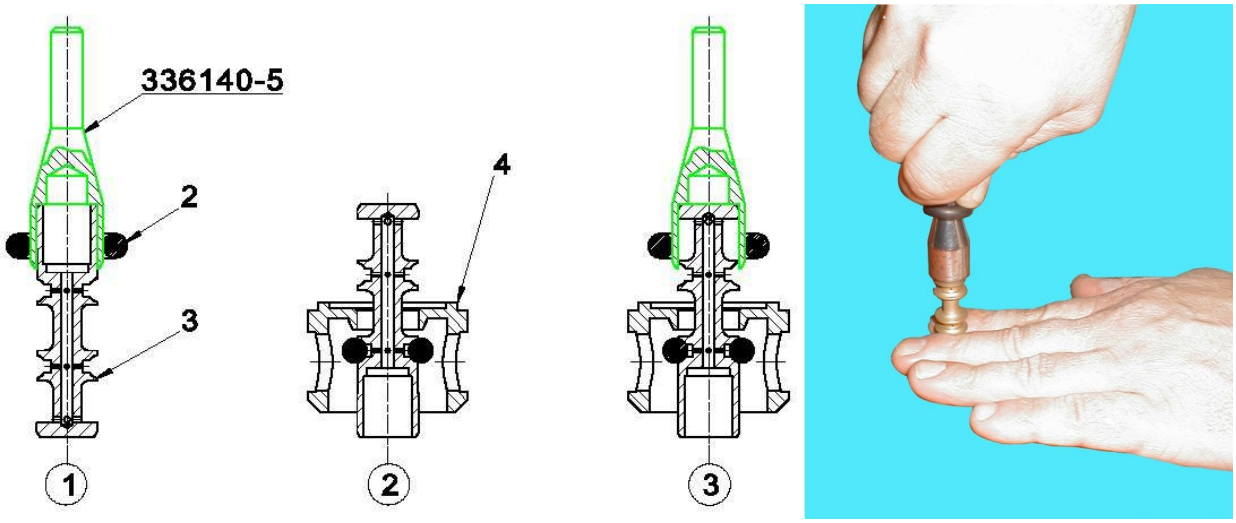


Monter le joint torique **(16)** dans le corps **(1)** ou **(35)**. / *Fit the O-ring **(16)** into the body **(1)** or **(35)**.*

Remontage de l'ensemble tige de clapet **(3)**, siège de clapet **(4)** avec joints toriques **(2)**. / *Re-assemby of the valve rod **(3)**, the valve seat **(4)** assembly with the O-rings **(2)**.*

Pour cette opération il est nécessaire d'utiliser l'outillage « **n° 336 140-5** ». / *For operation it is necessary to use the tool "**n° 336 140-5**".*

Monter le premier joint torique **(2)** avec l'outillage spécial (voir le dessin ci-dessous et l'image). / *Fit the first O-ring **(2)** witch the special tool (see the drawing below).*



Ne pas graisser les joints toriques **(2)**. / *Do not lubricate the O-rings **(2)**.*

Retourner cet ensemble et mettre en place le siège de clapet **(4)**. / *Return the assembly and put in place the valve seat **(4)**.*

Faire attention à la position du siège de clapet **(4)**. / *To make caution at the position valve seat **(4)**.*

Monter le second joint torique **(2)** avec l'outillage spécial (voir le dessin ci-dessous et l'image). / *Fit the second O-ring **(2)** with the special tool (see the drawing below).*

NOTA : l'image du siège repère 4, n'est pas contractuelle. / ***NOTE**: the picture of the item 4, is not contractual.*

Mettre en place dans le corps **(1)** ou **(35)**, l'ensemble siège de clapet / tige de clapet / joint toriques.

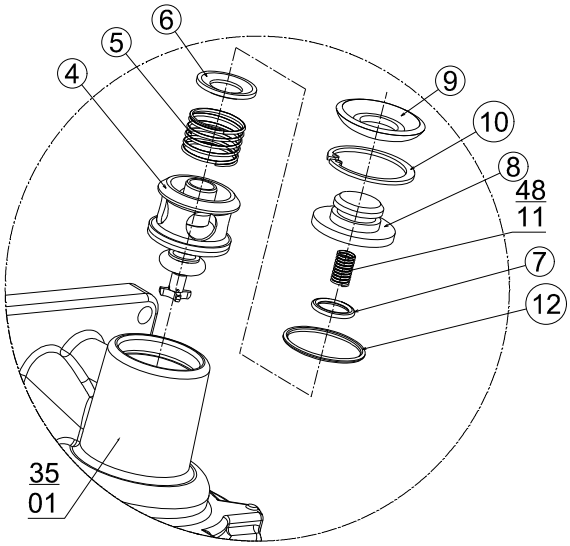
*Put in place into the body **(1)** or **(35)** the valve seat / valve rod / O-rings assembly.*

Monter le ressort **(5)**, la coupelle **(6)**, les joints toriques **(7)** et **(12)**. / *Fit the spring **(5)**, the follower cup **(6)**, the O-rings **(7)** and **(12)**.*

Monter le ressort **(11)** ou **(48)** dans la tige de clapet **(3)**. / *Fit the spring **(11)** or **(48)** in the valve rod **(3)**.*

Monter le bouchon **(8)** et le fixer avec le circlips **(10)**. / *Fit the plug **(8)** and fix it with the circlip **(10)**.*

Monter l'obturateur **(9)** sur le bouchon **(8)**. / *Fit the blanking plate **(9)** in the plug **(8)**.*



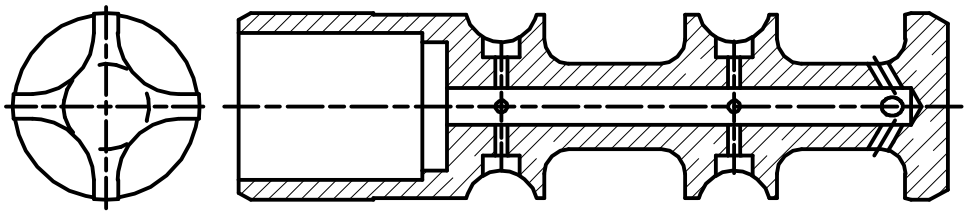
Respecter les valeurs de couple de serrage définies dans la consigne de montage « **CM n° 3079** / **SNCF 10-9006 441** ».

*Comply with the tightening torque values defined in Assembly Instruction **CM n° E 3079**.*

5. ANCIENNE ET NOUVELLE DISPOSITION (SIEGE DE CLAPET ET TIGE DE CLAPET) / *OBSOLETE AND NEW VERSION (VALVE SEAT AND VALVE ROAD)*

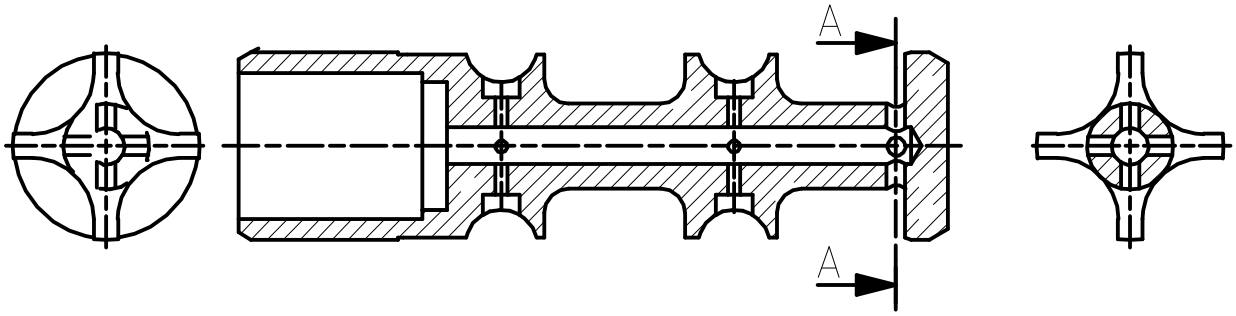
TIGE DE CLAPET

VALVE ROAD



Ancienne disposition / Obsolete version

Dessin d'ensemble / Assembly drawing N° 653 835 00 08 / SNCF N° 10-9008 029



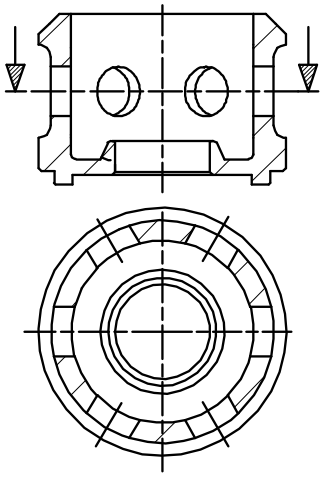
Nouvelle disposition / New version

Dessin d'ensemble / Assembly drawing N° 725 748 00 08 / SNCF N° 10-9009 081

Ancienne et nouvelle disposition
Obsolete and new vesion

SIEGE DE CLAPET

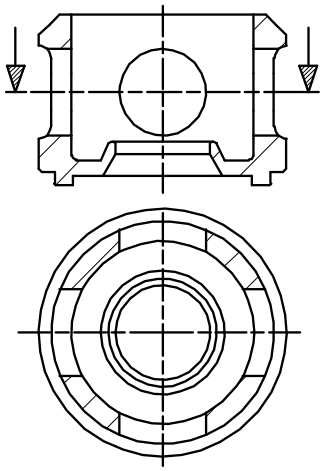
VALVE SEAT



Ancienne disposition / Obsolete version

Dessin d'ensemble / Assembly drawing

N° 184 816 .. 08 / SNCF N° 10-521 150



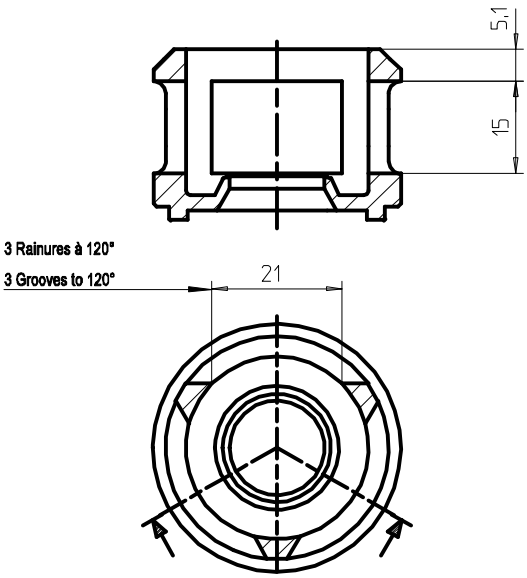
Nouvelle disposition / New version

Dessin d'ensemble / Assembly drawing

N° 184 816 10 08 / SNCF N° 10-9008 461

Version admise : pour retouche de la pièce 184 816 .. 08 / SNCF N° 10-521 150

Allowed version : For re-machining of the part 184 816 .. 08



Faiveley TRANSPORT ©	Date / *Date*			09/10/90			**Référence client SNCF**							N° 21
	Nom / *Name*			VP										
***(E)* 3255**	A	M	N	O	P	Q	**10-9006 272**							23 Nbre
	R	S	T00	U00										

6. ESSAIS / *TESTS*

Après révision générale, le relais P1K ou P1KB devra satisfaire aux essais d'étanchéité et de fonctionnement définis dans la spécification de réception «**SR n° 3288** / **SNCF 10-9006 323**».

*After general overhaul, the P1K or P1KB relay must comply with the tightness and operating tests defined in routines test specification **SR N° E 3288**.*

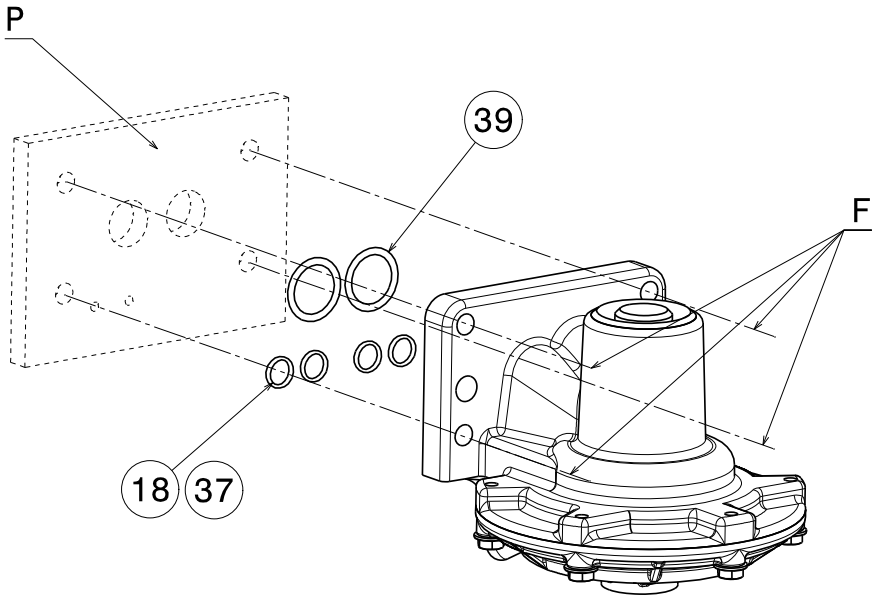
7. INSTALLATION / *INSTALLATION*

Oter la protection mise en place sur les orifices découverts lors de la dépose.

Remove the protection put in place on the uncovered apertures during removal.

Installer le relais P1K ou P1KB muni de ses quatre joints toriques **(18)** ou **(37)** et ses deux joints toriques **(39)** sur le panneau **(P)**, mettre en place les rondelles et écrous de fixation **(F)** et serrer.

Install the P1K or P1KB relay provided with its four O-rings **(18)** or **(37)** *and its two O-rings **(39)** on the panel **(P),** put in place the washers and fastening nuts **(F)** and tighten.*



Procéder à un essai d'étanchéité après installation sur le panneau.

Carry out to a tightness test after installation on the panel.

8. PIECES DE RECHANGE / *SPARE PARTS*

Lors des révisions générales, suivant les conditions d'exploitation remplacer les éléments préconisés dans la nomenclature du plan pièces « **AA ou AC, BB ou BC ou CC** ».

*During general overhauls, according to operating conditions, replace or check the parts recommended in the parts list of the drawing, parts "**AA or AC, BB or BC or CC**".*

AA ou AC : composants à remplacer systématiquement en révision.

***AA or AC**: parts to be replaced systematically during servicing.*

BB ou BC : composants à remplacement non systématique à contrôler en révision et à ne remplacer que si les limites d'usures sont dépassées.

***BB or BC**: non-systematic replacement parts, to be inspected during servicing and to be replaced only if wear limits are exceeded.*

CC : autres pièces et sous-ensembles non soumis à usure.

***CC**: other parts and sub-assemblies not subjected to wear.*

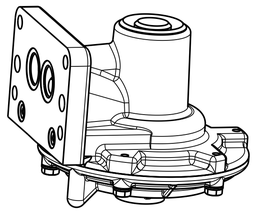
9. COUPLES DE SERRAGE / *TIGHTENING TORQUE VALUES*

Respecter les valeurs de couple de serrage définies dans la consigne de montage « **CM n° 3079 / SNCF 10-9006 441** ».

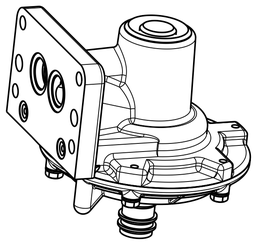
*Comply with the tightening torque values defined in Assembly Instruction **CM N° E 3079**.*

PLANS JOINTS / *JOINED DRAWINGS*

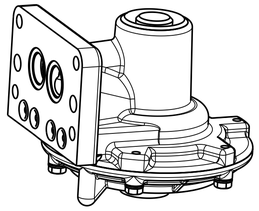
Relais P1K



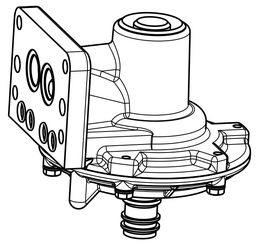
Relais P1K canalisé
Channeled P1K relay

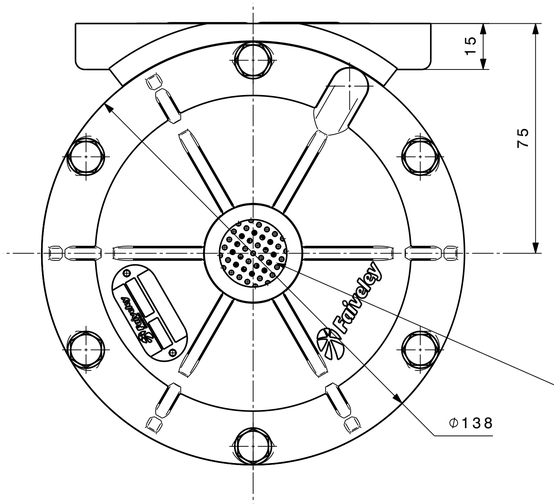


Relais P1KB



Relais P1KB canalisé
Channeled P1KB relay





Variantes canalisées
Channeled variants
102 - 198

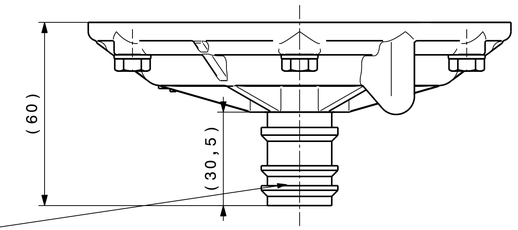
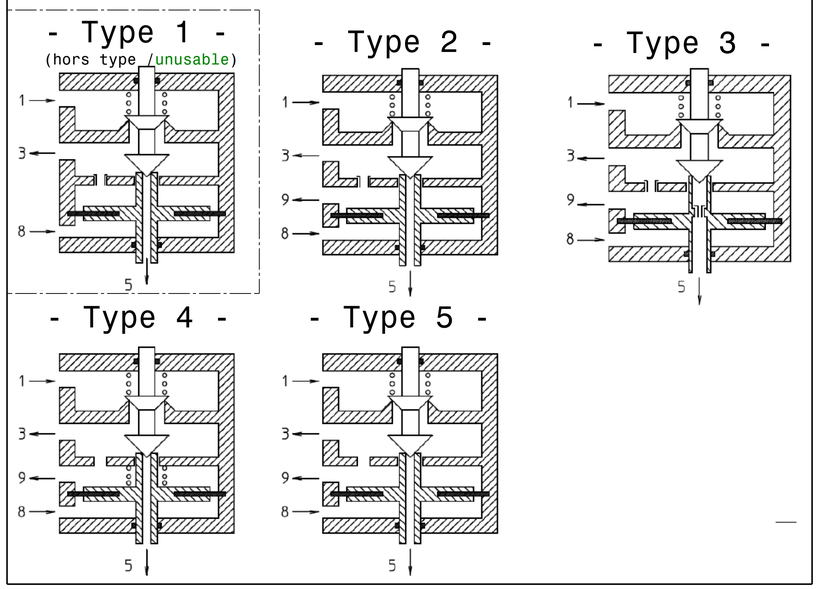


Schéma pneumatique/*Pneumatic scheme*

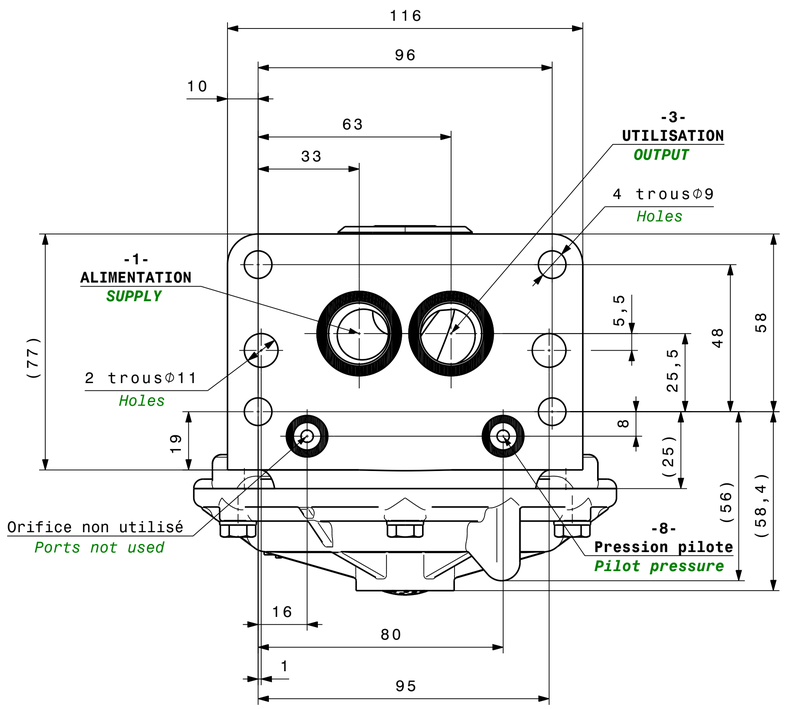


Port *Port*		
	Désignation *Description*	**Diamètre** *Diameter*
-1-	Alimentation *Supply*	**Ø20**
-3-	Utilisation *Output*	**Ø20**
-8-	Pilote *Pilot*	**Ø8**
-9-	Grand débit *High flow*	**Ø8**

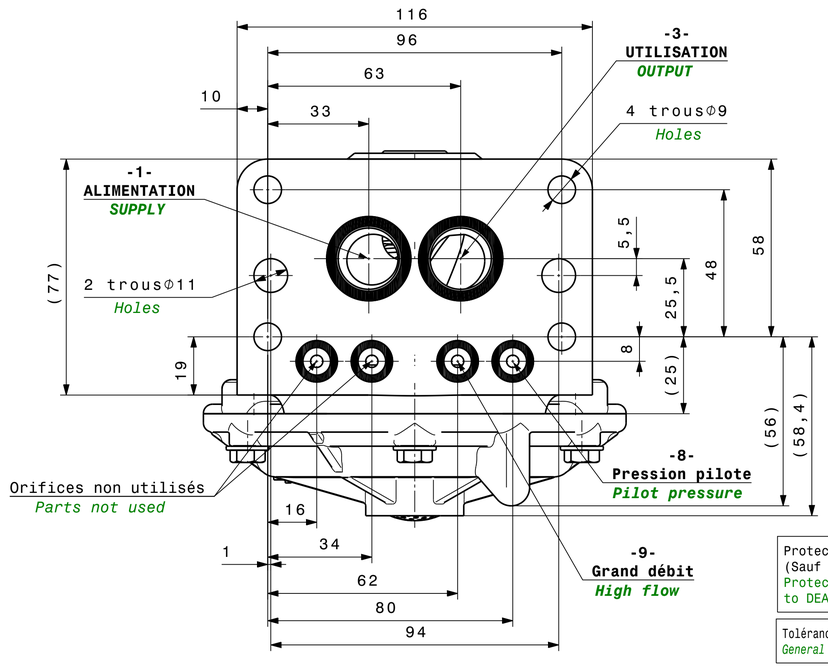
**Paramètres / *Parameters **

0	1	2
Code	Type de schéma *Type of scheme*	Echappement canalisé *Channeled exhaust*
781 121 01 08	1	Non / *No*
781 121 02 08	1	Oui / *Yes*
781 121 03 08	2	Non / *No*
781 121 04 08	3	Non / *No*
781 121 05 08	2	Non / *No*
781 121 06 08	2	Non / *No*
781 121 07 08	4	Non / *No*
781 121 08 08	5	Non / *No*
781 121 09 08	2	Non / *No*
781 121 98 08	2	Oui / *Yes*
781 121 99 08	2	Non / *No*
FT0126058-100	2	Non / *No*

Relais P1K
-Hors type-
-Unusable-



Relais P1KB
-Standard-



Protection de la visserie suivant DEA0053
(Sauf indication particulière)
Protection of bolts and screws according to DEA0053 (Except particular indication)

Tolérances générales suivant NF F 00-037
General tolerances according to NF F 00-037

Nota:
Pression maximale en service: 10bar
Maximum pressure: 10bar
Température de fonctionnement: -40°C / +70°C
Operating temperature: -40°C / +70°C

	N° FAIVELEY TRANSPORT	N° SNCF
SR *Routine*	3288	10-9006 323
Notice *Pamphlet*	3255	10-9006 272
Couple de serrage *Tightening torque*	CM3079	10-9006 441
Graissage *Lubrification*	CM3056	10-9050 637
Documentation de marquage *Marking documentation*	FT0012869-000-F02DIS	/

Rev.	Change Description
Z00	MàJ plan; Création nouveau code avec orifice Ø2,25mm; suppr. Rep.26, 29 et 30; Rep.25 qté 5->6; Rep.24 qté 7->6
Y00	Rep.7:7048121508 devient 7048120408.
X17	Voir fiche de modification

Application: DIVERS

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Rev.	Change	Date	Name	Approved
Z00	EC019AMS0400	02/08/19	SPN	SLE
Y00	EC017AMS1033	26/04/18	NC2	SLE
X17	F12/0108	01/2012	SP	JB
X16	F09/0164	03/2009	AD	MR
W16	F06/0288	06/2006	GUO	EO
V16	F06/0716	05/2006	RT	EO
U16	F2005/529	11/2005	OW	MB
T16	F2004/711	12/2004	TV	MB

General tolerances: - | Thread tolerances: -
Weight kg: Voir/see BOM | Responsible site: AMIENS | Status: RELEASED
BOM: Y | Size: A1 | Document Classification: MTB006
Safety class: CF2 | Fire and smoke class: Exigence 0
Wear piece: YES
Based on: / | Replacement: / | Replaced: /
Customer name: SNCF FREIN | Customer number indexes:
Approved by Customer | Customer reference number: 10-9007 609

Scale			
1:1	Prepared	01 / 2012	SPR
	Checked	08/2019	JBU
	Approved	08/2019	SLE
	Date		
	Iran		mm

Main title, subtitle
RELAIS P1K et P1KB
P1K and P1KB RELAY

Faiveley Transport a Wabtec Company

Drawing identification number: 781121xx08 | Revision: Z00 | Sheet 1 / Sheets 3

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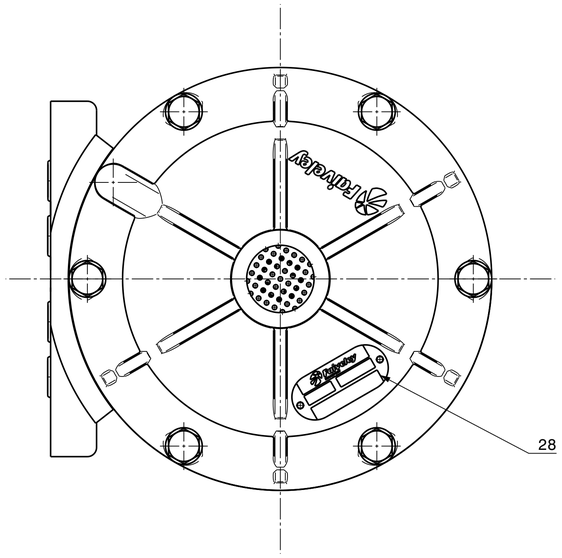
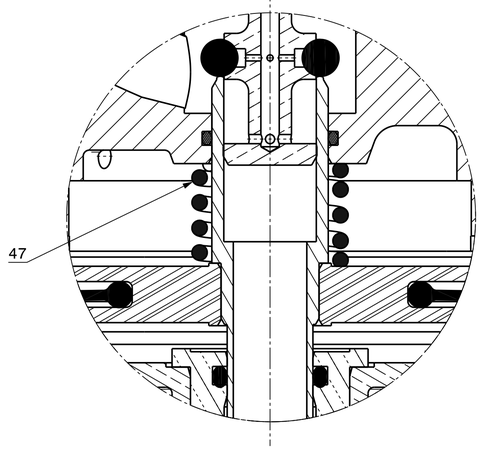
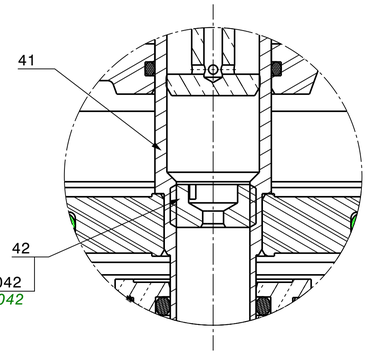


- D -
(Variante 07 / *Variant 07*)

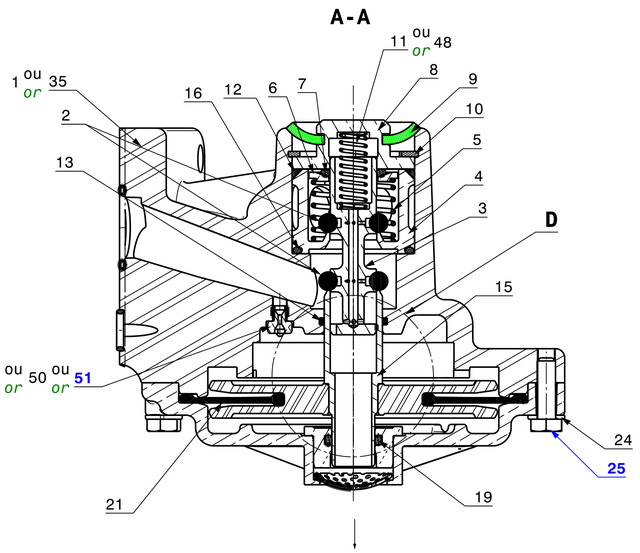


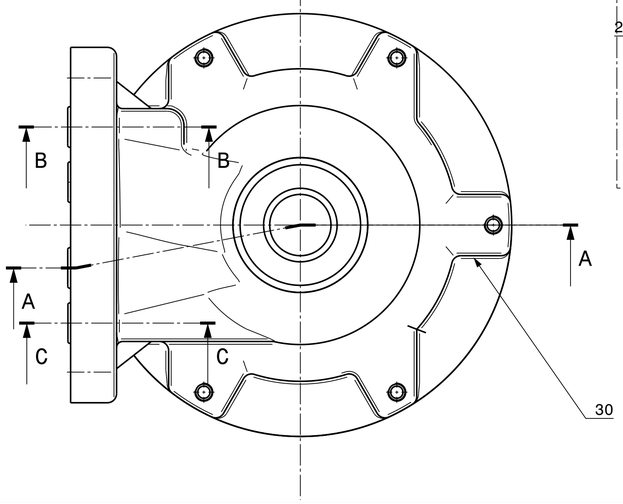
- D -
(Variante 04 / *Variant 04*)



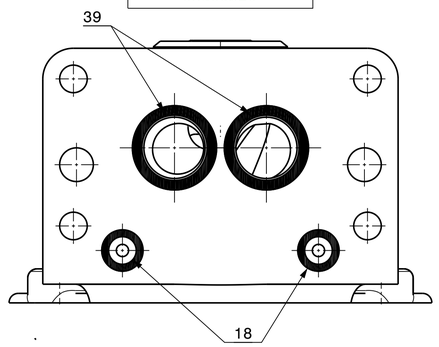
Montage à la colle A285 042
Assembling with the glue A285 042

A-A

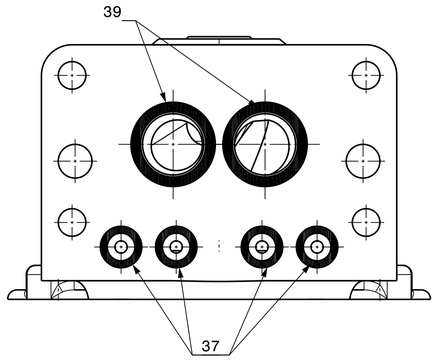




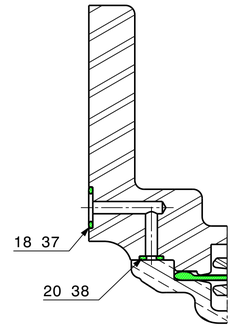
Interface P1K
-Hors type-
-Unusable-



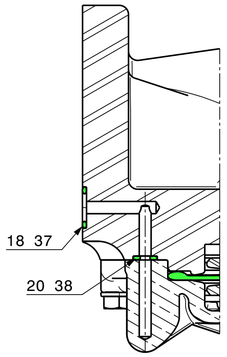
Interface P1KB
-standard-



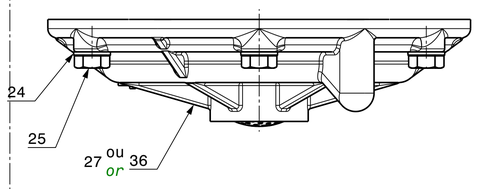
Coupe B-B
B-B



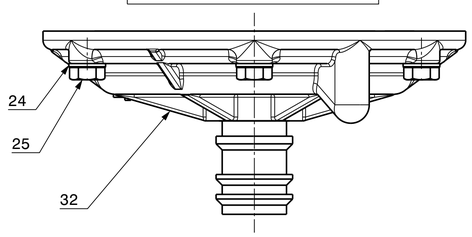
Coupe C-C
C-C



Couvercle simple
Simple cover



Couvercle canalisé
Channeled cover



Rev.	Change Description
Z00	MàJ plan; Création nouveau code avec orifice Ø2,25mm; suppr. Rep.26, 29 et 30; Rep.25 qté 5->6; Rep.24 qté 7->6
Y00	Rep.7:7048121508 devient 7048120408.
X17	Voir fiche de modification

Application	DIVERS			
Z00	EC019AM80400	02/08/19	SPN	SLE
Y00	EC017AM81033	26/04/18	NC2	SLE
X17	F12/0108	01/2012	SP	JB
X16	F09/0164	03/2009	AD	MR
W16	F06/0288	06/2006	GUO	EO
V16	F06/0716	05/2006	RT	EO
U16	F2005/529	11/2005	OW	MB
T16	F2004/711	12/2004	TV	MB
Rev.	Change	Date	Name	Approved

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

General tolerances: -
Thread tolerances: -
Weight kg: Voir/see BOM
Responsible site: AMIENS
BOM: Y
Size: A1
Status: RELEASED
Document Classification: MTB006
Fire and smoke class: Exigence 0
Safety class: CF2
Wear piece: YES
Based on: /
Replacement: /
Replaced: /
Customer name: SNCF FREIN
Approved by Customer
Customer reference indexes:
Customer reference number: 10-9007 609

Scale	1:1	Prepared	01 / 2012	SPR
		Checked	08/2019	JBU
		Approved	08/2019	SLE
		Date		Name
		In km		mm

Main title, subtitle
RELAIS P1K et P1KB
P1K and P1KB RELAY

Faiveley Transport a Wabtec Company

Drawing identification number: 781121xx08
Revision: Z00
Sheet 2 / Sheets 3

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FT0126059-000	51	1	Gicleur Ø2,25 Nozzle Ø2.25	782725XX08	CC
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
02à13-15-16-19-21-24-25-28-39			Pièces détaillées ci-dessous *Items detailed below*		
FT0126058-100	-		**Relais P1KB** ***P1KB relay***	Masse: 2,17kg ±5% *Weight*	

2à10-12-13-15-16-19-21-24-25-28-35à39-48	Pièces détaillées ci-dessous *Items detailed below*	
7811219908 **199**	**Relais P1KB** ***P1KB relay***	Masse: 2,17kg ±5% *Weight*

7273530008	48	1	Ressort Spring	7273530008	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
2à10-12-13-15-16-19-21-24-25-28-32-33-35-37à39			Pièces détaillées ci-dessous *Items detailed below*		
7811219808	**198**		**Relais P1KB** ***P1KB relay***	Masse: 2,22kg ±5% *Weight*	

7035041508	50	1	Gicleur Ø0,80 Nozzle Ø0,80	782725XX08 10-874 008 rep.22	CC
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
2à13-15-16-19-21-24-25-28-35à39			Pièces détaillées ci-dessous *Items detailed below*		
7811210908	**109**		**Relais P1KB** ***P1KB relay***	Masse: 2,17kg ±5% *Weight*	

2à13-15-16-19-21-24-25-28-35à39	Pièces détaillées ci-dessous *Items detailed below*
7811210808 **108**	**Relais P1KB** ***P1KB relay***

Masse: 2,17kg ±5%
Weight

7287250108	47	1	Ressort Spring	7287250108	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
2à13-15-16-19-21-24-25-28-35à39			Pièces détaillées ci-dessous *Items detailed below*		
7811210708	**107**		**Relais P1KB** ***P1KB relay***	Masse: 2,17kg ±5% *Weight*	

N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
2à16-19-21-24-25-28-35à39			Pièces détaillées ci-dessous *Items detailed below*		
7811210508	**105**		**Relais P1KB** ***P1KB relay***	Masse: 2,18kg ±5% *Weight*	

1918392208	42	1	Tuyère M14 M14 nozzle	191839XX08 10-516 783 rep.18	CC
7811480308	41	1	Piston équipé Fitted piston	781148XX08 10-9008 106	BC
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
2à13-16-19-21-24-25-28-33-35à39			Pièces détaillées ci-dessous *Items detailed below*		
7811210408	**104**		**Relais P1KB** ***P1KB relay***	Masse: 2,17kg ±5% *Weight*	

7048030408	38	2	Joint torique 4,20x1,90 svt FT0012869-000E01MTS O-Ring 4.20x1.90 acc. to FT0012869-000-E01MTS	TF712D1	AA
7050220408	37	4	Joint torique Ø9.50x2.00 svt FT0012869-000-E01MTS O-Ring Ø9.50x2.00 acc. to FT0012869-000-E01MTS	TF712D1	AA
7823590108	36	1	Couvercle équipé Fitted cover	7823590108 10-9008 110	BB
7825850008	35	1	Corps Body	782585XX08 10-9008 109	BC
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
02à13-15-16-19-21-24-25-28-33-39			Pièces détaillées ci-dessous *Items detailed below*		
7811210608 **7811210308**	**106** **103**		**Relais P1KB** ***P1KB relay***	Masse: 2,17kg ±5% *Weight*	

7035201508	33	1	Gicleur Ø1,5 Choke Ø1,5 Nozzle Ø1,5	782725XX08 10-874 008 rep. 6	CC
7820510108	32	1	Couvercle Equipe Equiped Cover	782051XX08 10-9008 108	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
01à13-15à25-28-39			Pièces détaillées ci-dessous *Items detailed below*		
7811210208	**102**		**Relais P1K canalisé** ***Channeled P1K relay***	Masse: 2,22kg ±5% *Weight*	

7811440008	27	1	Couvercle équipé Fitted cover	781144XX08 10-9008 107	BC
7048030408	20	1	Joint torique 4,20x1,90 svt FT0012869-000-E01MTS O-Ring 4,20x1,90 acc. to FT0012869-000-E01MTS	TF712D1	AA
7050220408	18	2	Joint torique Ø9.50x2.00 svt FT0012869-000-E01MTS O-Ring Ø9.50x2.00 acc. to FT0012869-000-E01MTS	TF712D1	AA
7035131508	14	1	Gicleur Ø1 Nozzle Ø1	782725xx08 10-874 008 rep.1	CC
1803730008	11	1	Ressort Spring	1803730008 10-518 251	BB
7811610108	1	1	Corps Body	7811610108 10-9008 104	BC
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
01à10-12-13-15à16-19-21-24à25-28-39			Pièces détaillées ci-dessous *Items detailed below*		
7811210108	**101**		**Relais P1K - remplacé par variante 03** ***P1K relay - replaced par variant 03***	Masse: 2,18kg ±5% *Weight*	

Lors de la révision changer systématiquement l'ensemble siège de clapet 184 816 XX 08 / 10-521 150 et tige de clapet 653 835 00 08 / 10-9008 029 (anciennes versions). Pour plus d'informations se reporter sur la notice 3255 10-9006 272.

During the revision change systematically the unit valve seat 184 816 XX 08 / 10-521 150 and valve rod 653 835 00 08 / 10-9008 029 (obsoletes versions). For more information refer on the pamphlet 3255 10-9006 272.

7012460408	39	2	Joint torique Ø22,23xØ2,62 svt FT0012869-000-E01MTS O ring Ø22,23xØ2,62 acc. to FT0012869-000-E01MTS	TF712D1	AA
1591230008	28	1	Plaque de firme Firm plate	1591230008 10-3041 165 rep 1	CC
7120740008	25	6	Vis à tête hexagonale ISO 4017-M6x20 H screw ISO 4017 - M6×20	NF EN ISO 4017	CC
7119300008	24	6	Rondelle CS 6x12x1,2 NF E 25-511 Washer CS 6x12x1,2 NF E 25-511	NF E 25-511	AA
1847060008	21	1	Membrane Diaphragm	10-519 154	AC
7048111508	19	1	Joint torique Ø 13.6x2.7 svt FT0012869-000-E01MTS O-ring Ø 13.6x2.7 acc. to FT0012869-000-E01MTS	TF510D1	AA
7050730408	16	1	Joint torique Ø31,50x2,50 svt FT0012869-000E01MTS O-ring Ø31,50x2,50 acc. to FT0012869-000E01MTS	TF712D1	AA
7811480108	15	1	Piston équipé Fitted piston	781148XX08 10-9008 106	CC
7052411508	13	1	Joint torique 19,00x1,80 svt FT0012869-000-E01MTS O-ring 19,00x1,80 acc. to FT0012869-000-E01MTS	TF510D1	AA
7050760408	12	1	Joint torique 35,00 x 2,50 svt FT0012869-E01MTS O.ring 35,00 x 2,50 acc. to FT0012869-E01MTS	TF712D1	AA
7013300008	10	1	Anneau élastique intérieur ø40x1.75 Elastic ring ø40x1.75	NF E 22 165	AA
1898060008	9	1	Obturateur BLANKING PLATE	1898060008 10-520 702	AA
1847030008	8	1	Bouchon Plug	1847030008 10-519 156	BB
7048120408	7	1	Joint torique Ø15,10x2,70 svt FT0012869-000-E01MTS O-ring Ø15,10x2,70 acc FT0012869-000-E01MTS	TF712D1	AA
6538390008	6	1	Coupelle Cup	10-518 250	CC
6538380008	5	1	Ressort Spring	6538380008 10-518 249	BB
1848161008	4	1	Siège de clapet Valve seat	1848161008 10-9008 461	CC
7257480008	3	1	Tige de clapet Valve rod	7257480008 10-9009 081	BB
7051500408	2	2	Joint torique Ø9,50 x 6,00 svt FT0012869-000-E01MTS O-ring Ø9,50 x 6,00 acc. to FT0012869-000-E01MTS	TF712D1	AA
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
7811210008	**100**		**Relais P1K ou P1KB - Tronc commun -** ***P1K and P1KB relay - Common part -***		

Z00	MàJ plan; Création nouveau code avec orifice Ø2,25mm; suppr. Rep.26, 29 et 30; Rep.25 qté 5->6; Rep.24 qté 7->6	(08)
Y00	Rep.7:7048121508 devient 7048120408.	
X17	Voir fiche de modification	

Rev.	Change Description
Application	DIVERS
Z00	EC019AMS0400 02/08/19 SPN SLE
Y00	EC017AMS1033 26/04/18 NC2 SLE
X17	F12/0108 01/2012 SP JB
X16	F09/0164 03/2009 AD MR
W16	F06/0288 06/2006 GUO EO
V16	F06/0716 05/2006 RT EO
U16	F2005/529 11/2005 OW MB
T16	F2004/711 12/2004 TV MB

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

General tolerances	Weight kg	Responsible site	Status: RELEASED
Thread tolerances -	Voir/see BOM	AMIENS	Document Classification: MTB006
	BOM: Y	Size: A1	Fire and smoke class: Euglence 0
			Safety class: CF2
			Minor piece: YES

Based on: /
Replacement: /
Replaced: /
Customer name: SNCF FREIN
Approved by Customer
Customer reference number: 10-9007 609

Rev.	Change	Date	Name	Approved
Scale: 1:1	Prepared	01 / 2012	SPR	Main site, subsite
	Checked	08/2019	JBU	RELAIS P1K et P1KB
	Approved	08/2019	SLE	P1K and P1KB RELAY
	Date		Name	
	In/en		mm	

Faiveley Transport a Wabtec Company

Drawing identification number: 781121xx08 | Revision: Z00 | Sheet: 3 / 3 | Sheets: 3

A1

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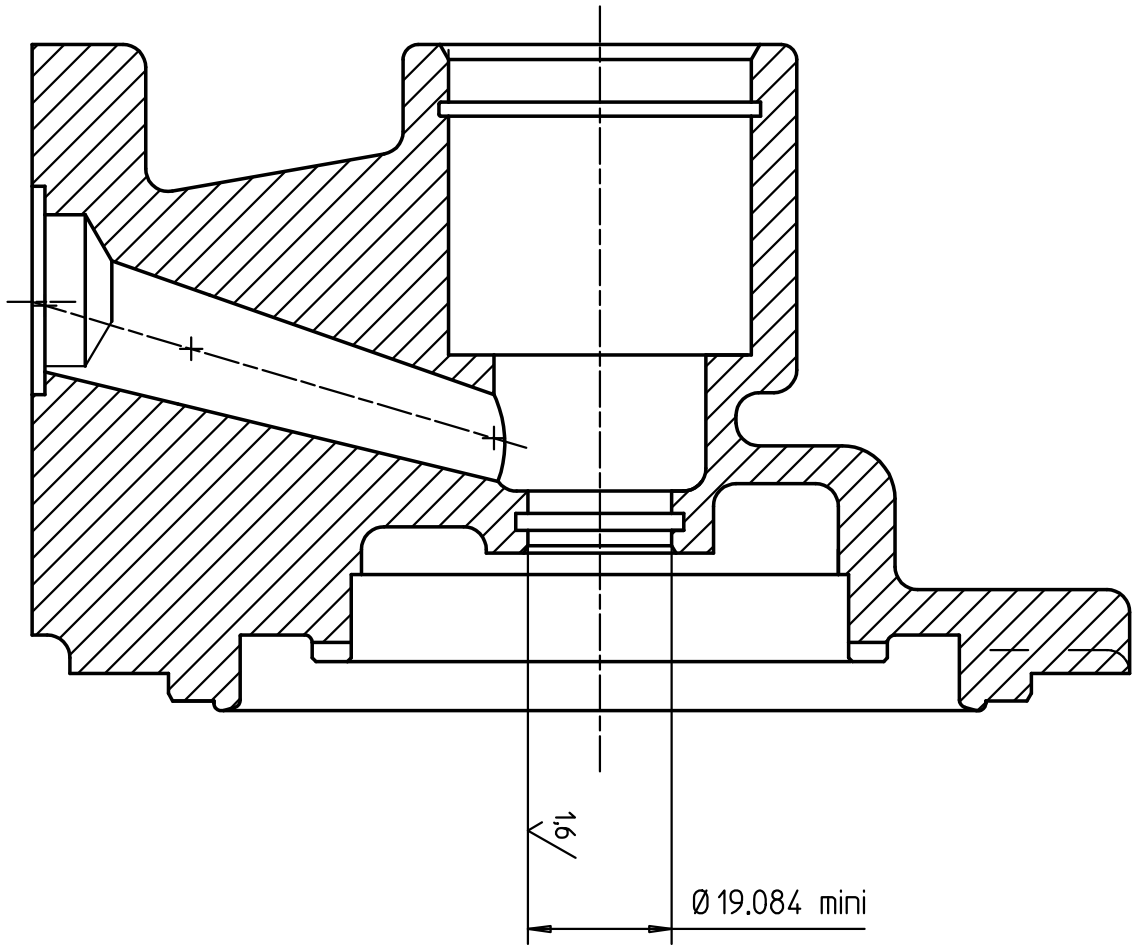
Issue Indice	*Design change n°* N° de modification	*Date*	*Design change* Nature de la modification	*A* *Added* Ajouté	*D* *deleted* Supprimé	*W* *Was* Etait	*Altered by* Modifié par	*Approuved by* Approuvé par
A00	F01/0685	11/02	Première diffusion				S.Gé	M.Brûlé



Replaced by ·	*Replacement for* ·		
Based on ·	*Application* 781 121 .. 08	*Weight* · *Kg*	

SNCF

10-9008 104 PU

Scale : 1/1

	Date	*Name*
Prepared		
Checked		
Approved		

CORPS
BODY

SAB WABCO
Products ©
CARDO RAIL Group

781 161 01 08 PU

Issue A00

Sheet 1/1

Ensemble - A4

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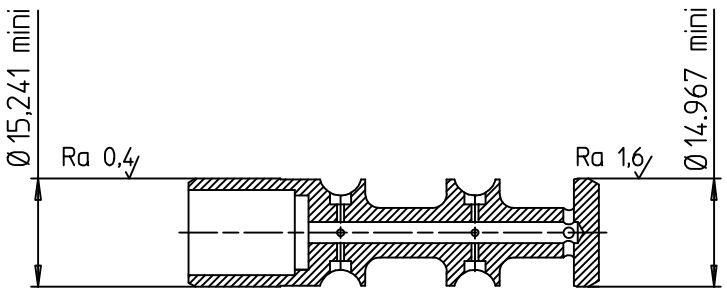
Issue Indice	*Design change n°* N° de modification	*Date*	*Design change* Nature de la modification — *A* Added Ajouté *D* deleted Supprimé *W* Was Etait	*Altered by* Modifié par	*Approuved by* Approuvé par
A00	F02/0685	11/02	Première diffusion	S.Gé	M.Brûlé
B01	F03/0181	03/03	Mise à jour	S.Gé	M.Brulé
C01	F03/0293	04/03	Modification application (1)	S.Gé	M.Brulé
D01	F03/0460	07/03	Adaptation du plan aux pièces d'usures	F.JANISZEWSKI	M.Brulé
E01	F03/0131	18/03/05	Cartouche application : Relais au lieu de 781121**08 (01)	R.Traullé	M.Brûlé



Replaced by | *Replacement for*
Based on | *Application* E Relais | *Weight* 0.031 *Kg*

SNCF
Frein

10-9009 081 PU

Scale : 1/1

	Date	Name
Prepared		
Checked		
Approved	18/03/05	

TIGE DE CLAPET
VALVE ROD

Faiveley TRANSPORT

725 748 00 08 PU

Issue E01 | *Sheet* 1/1

Ensemble - A4

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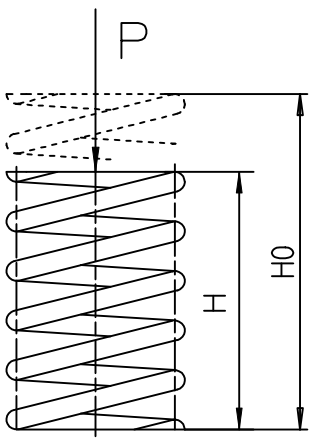
Issue Indice	*Design change n°* N° de modification	*Date*	*Design change* Nature de la modification (*A* Added Ajouté, *D* deleted Supprimé, *W* Was Etait)	*Altered by* Modifié par	*Approuved by* Approuvé par
A00	F02/0685	11/02	Première diffusion	S.Gé	M.Brûlé
B00	F03/0181	03/03	Ajout n°SNCF	S.Gé	M.Brulé
C00	F03/0450	07/03	Ajout du poids (01)	F. Janiszewski	M. Brûlé
D00	F04/0652	11/04	Mise à jour effort en H2 (01)	S.Panier	M.Brulé



HAUTEUR (H) APPLIQUEE	EFFORT NOMINAL (P)	EFFORT MINI TOLERE (P)
APPLIED DIMENSION (H)	*NOMINAL FORCE (P)*	*MINIMUM ALLOWED FORCE (P)*
20 mm	3 N	2.7 N
15 mm	5,1 N	4.59 N [D]

Replaced by ·
Based on ·
Replacement for ·
Application DIVERS
Weight 0,006 *Kg* [C]

SNCF
Frein

10-518 249 PU

Scale : */*

	Date	*Name*
Prepared		
Checked		
Approved		

RESSORT
SPRING

SAB WABCO

653 838 00 08 PU

Issue D00 *Sheet* 1/1

Ensemble - A4

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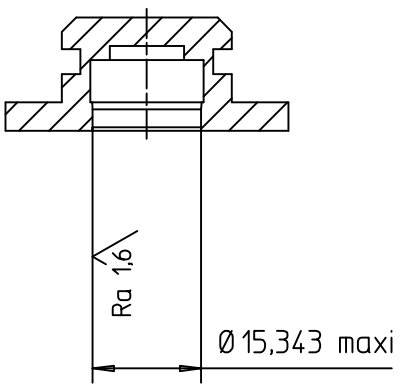
Issue / Indice	Design change n° / N° de modification	Date	Design change / Nature de la modification (A Added / Ajouté, D deleted / Supprimé, W Was / Etait)	Altered by / Modifié par	Approuved by / Approuvé par
A00	F01/0685	11/02	Première diffusion	S.Gé	M.Brûlé
B00	F03/0181	03/03	Mise à jour	S.Gé	M.Brulé
C00	F03/0293	04/03	Modification application (1)	S.Gé	M.Brulé



Replaced by ·
Based on ·
Replacement for ·
Application C DIVERS
Weight 0.064 Kg

SNCF
Frein

10 519 156 PU

Scale : 1/1

	Date	Name
Prepared		
Checked		
Approved		

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BOUCHON
PLUG

184 703 00 08 PU

Issue C00 | Sheet 1/1

Ensemble - A4

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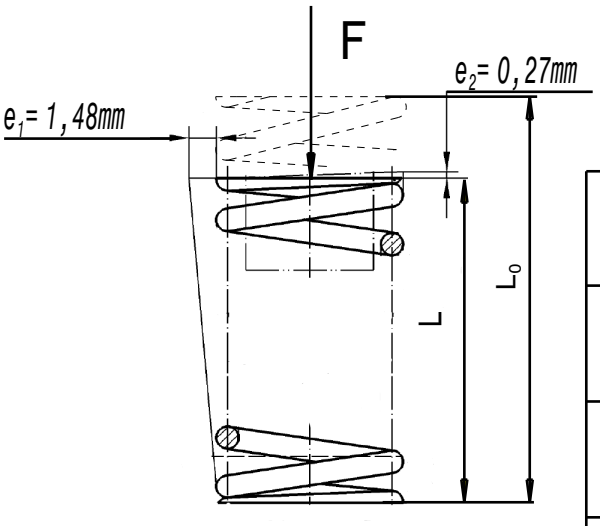

Hauteur Appliquée (L)	Effort Nominal (F)	Effort mini toléré* (Fmin)
Applied Dimension (L)	*Nominal Force (F)*	*Minimum Allowed Force* (Fmin)*
19,00 mm	*23,0 N*	*20,4 N*
16,00 mm	*29,5 N*	*26,8 N*

*Effort prenant en compte une relaxation théorique (selon logiciel IST) de 1% pour une compression à L=16,00mm d'une durée de 10 000h à 20°C.
La perte d'effort est reportée à l'identique en N sur la première hauteur.
*Theorical relaxation included (based on IST) Prediction of 1% for an operating position of L=16,00mm during 10 000h at 20°C.
The force loss is applied with the same value in Newton on the 1st dimension.*

Rev.	Change Description
F00	Refonte 3D et 2D avec nouvel outil de calcul ressorts.
E00	Ajout N° SNCF (01)
D00	Mise à jour des efforts minis (01)

Tol.dim.	Deviation	Tol.dim.	Deviation

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: RELEASED

Surface: √ (√ √ √)

Hardening	Hardness	Depth	Finish
/	/	/	/

Treatment	Raw part number	Model number
/	/	/

Application: DIVERS

Rev.	Change	Date	Name	Approved
.	.	.	.	.
.	.	.	.	.
F00	EC019AMS0005	05/03/19	NC2	SLE
E00	F05/0131	18/03/05	RTr	M.Br
D00	F04/0652	11/2004	SPa	M.Br
C00	F03/0460	07/2003	FJa	M.Br
B00	F03/0181	03/2003	SGé	M.Br
A00	F02/0685	11/2002	SGé	M.Br

Material specifications:
EN 10270-1, EN 10270-2, EN 10270-3
EN 12166, EN 10089

Spring calculation:
EN 13906-1, EN 13906-2, EN 13906-3

Spring tolerances:
EN 15800, DIN 2096

Weight (kg): 0,002±5% | BOM: N | Responsible site: AMIENS | Size: A4

Material: Acier non allié (SH) acc. to EN 10270-1

Document Classification: MTB007

Fire and smoke class: /
Safety class: CF1
Wear piece: /

Based on: /

Replacement: /

Replaced: /

Customer name: SNCF Frein

Approved by Customer:

Customer revision indexes:

Customer reference number: 10-518 251 PU

Scale				
1:1	Prepared	11/2002	S.Gé	
	Checked	03/2019	DBS	
	Approved	03/2019	SLE	
		Date	Name	
		en	mm	

Main title, subtitle: Ressort - Spring -

Faiveley Transport
A Wabtec Company

Drawing identification number: 1803730008PU

Revision: F00

Sheet: 1 / Sheets: 1

A4

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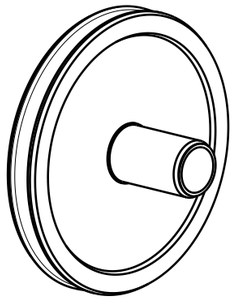
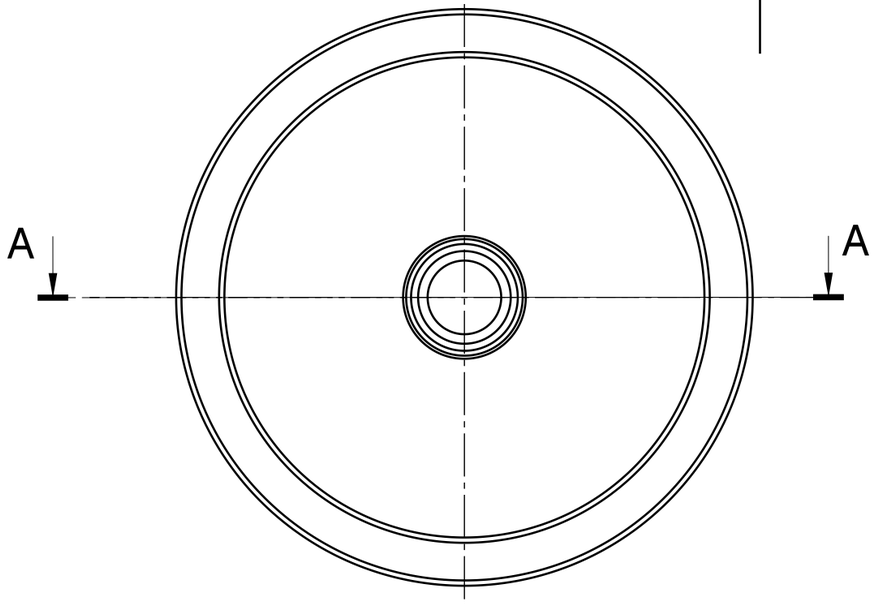
Isometric view
1:2

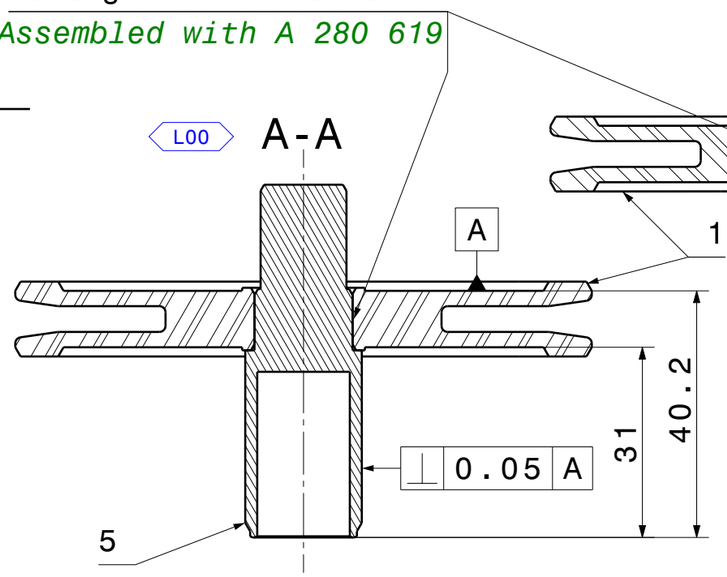




LOO	Var.	Masse/*Weight* (Kg±5%)
	01	0.16
	02	0.16
	03	0.16
	04	0.18

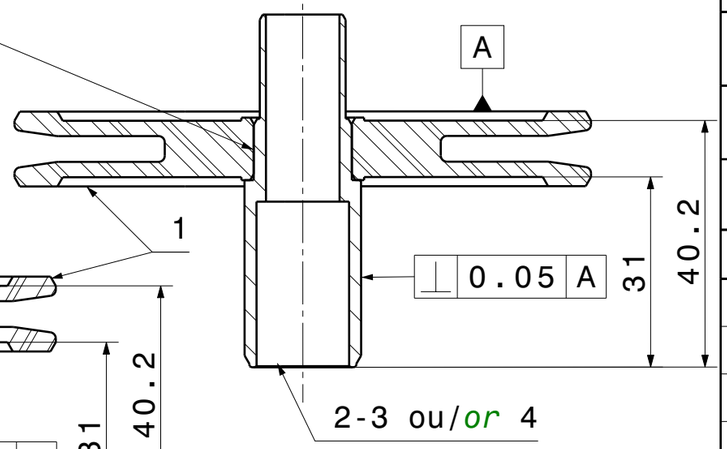
Montage avec A 280 619
Assembled with A 280 619

LOO A-A



Var. 04

A-A



2-3 ou/*or* 4

Var. 01, 02 ou/*or* 03

	N° FAIVELEY	Rep. *Ref.*	Qté *Qty*	Designation des pièces *Designation of parts*	Spécifications *Specifications*	*ABC Class*
LOO	781 146 02 08	5	1	Tige *Rod*	.	BC
LOO	782 587 00 08	1	1	Serre membrane *Clamp membrane*	.	CC
LOO	781 148 04 08	104	.	Piston équipé comprenant : *Equipped piston including :*		.
	781 148 03 08	103	.	Piston équipé comprenant : *Equipped piston including :*	.	.
	.	.	.	. .	.	.
	784 152 00 08	3	1	Tige *Rod*	.	BC
	782 587 00 08	1	1	Serre membrane *Clamp membrane*	.	CC
	781 148 02 08	102	.	Piston équipé comprenant : *Equipped piston including :*	.	.
	.	.	.	. .	.	.
	781 146 00 08	2	1	Tige *Rod*	.	BC
	782 587 00 08	1	1	Serre membrane *Clamp membrane*	.	CC
	781 148 01 08	101	.	Piston équipé comprenant : *Equipped piston including :*		.
	781 146 01 08	4	1	Tige *Rod*	.	BC

Les plans des pièces classées AC, BC ou CC ne sont pas diffusables afin de protéger le savoir faire de Faiveley transport
Drawings of parts AC, BC or CC cannot be released in order to protect Faiveley transport's knowhow

Tol.dim.	Deviation	Tol.dim.	Deviation

Application 781121XX08 784053XX08

L00	1	EC018AMS0113	02/18	JBN	SLE
K00	02	F10/0359	08/10	SP	MR
J01	1	F09/164	03/09	AD	MR
I01	1	F07/259	06/07	MM	EO
H01	1	F06/640	12/06	SH	EO
G01	1	F03/450	07/03	FJ	MB
F01	1	F02/685	11/02	SG	MB
E01	1	F95/377	01/96	.	

Rev.	Qty.	Change	Date	Name	Approved

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM — Status RELEASED

Surface

Hardening	Hardness	Depth	Finish
-	-	-	-

Treatment	Raw part number	Model number
-	-	-

General tolerances
General tolerances : ISO 2768-mH
Tapping tolerances
-

Weight kg see table | Size A3 | Responsible site AMS | Res. dept. RI | -

Material

Document Classification
Fire and smoke class 0
Classification -
Wear piece -

Based on - | Replacement - | Replaced -

Customer name: SNCF Frein
Approved by Customer

Customer revision indexes

Customer reference number: 10-9008 106

Scale			
1:1	Prepared	08/10	S.Panier
	Checked	02/2018	VF
	Approved	02/2018	SLE
	Date		Name
	en/fr		mm

Main title, subtitle
PISTON EQUIPE
-
EQUIPPED PISTON
-

Drawing identification number: 781 148 XX 08
Revision: L00 | Sheet: 1 / 1 | Sheets

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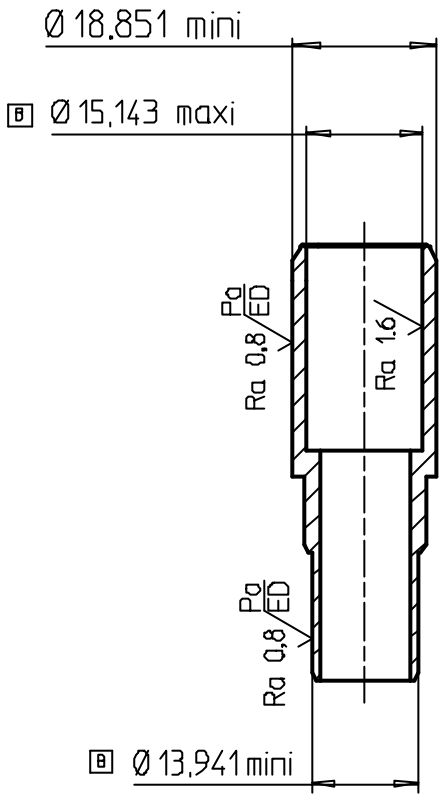
Issue Indice	Design change n° N° de modification	Date	Design change Nature de la modification	A Added Ajouté	D deleted Supprimé	W Was Etait	Altered by Modifié par	Approuved by Approuvé par
A00	F01/0685	11/02	Première diffusion				S.Gé	M.Brûlé
B01	F04/0190	03/04	Ø 15.343 devient Ø15,143 - Ø13,88 devient Ø13.94				DG	M. Brulé



Replaced by	Replacement for	
Based on	Application 781 121 . 08	Weight 0,04 Kg

Scale . 1/1

	Date	Name
Prepared		
Checked		
Approved		

TIGE
ROD

SAB WABCO

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781 146 .. 08 PU

Issue B01 | Sheet 1/1

Ensemble - A4

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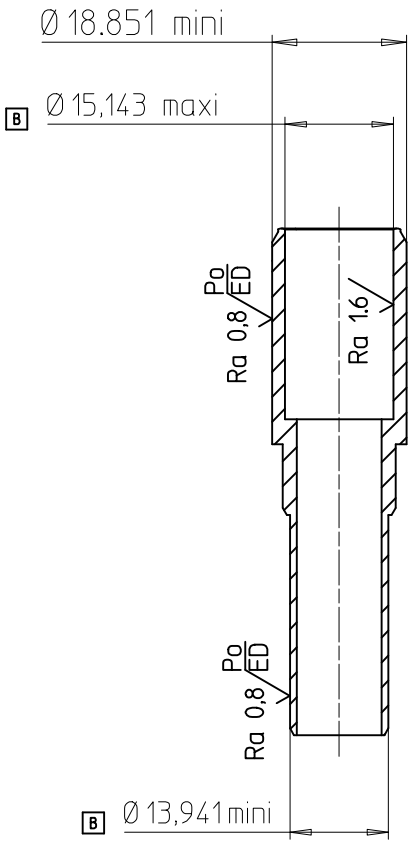
Issue / Indice	Design change n° / N° de modification	Date	Design change / Nature de la modification (A Added / Ajouté, D deleted / Supprimé, W Was / Etait)	Altered by / Modifié par	Approuved by / Approuvé par
A00	F01/0685	11/02	Première diffusion	S.Gé	M.Brûlé
B01	F04/0190	03/04	Ø 15.343 devient Ø15.143 - Ø13.88 devient Ø13.94	DG	M. Brulé



Replaced by	Replacement for
Based on	Application 782 875 00 08 — Weight 0,04 Kg

Scale : 1/1

	Date	Name
Prepared		
Checked		
Approved		

TIGE CREUSE
ROD

SAB WABCO ©

784 152 00 08 PU

Issue B01 — Sheet 1/1

Ensemble - A4

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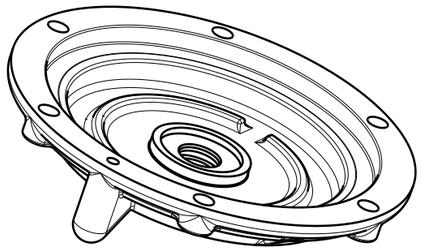
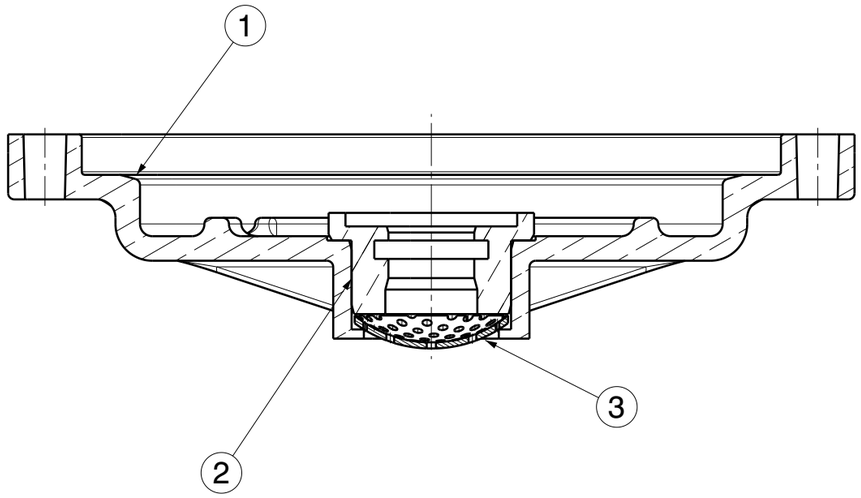


A-A



Montage jusqu'en butée
Push fully home
+
Collage au A280619 pour étanchéité entre Rep. 1 et 2
Glued to A280619 for airtightness between Item 1 and 2

Nota : variante 00 représentée
Note : variant 00 represented

Nota : cotes d'usure, voir plan 781 497 00 08 PU
Note : wear dimensions, see drawing 781 497 00 08 PU

N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
7823591008	1	1	Couvercle Cover	-	-
Ref. 2, 3			Pièces détaillées ci-dessous *Items detailed below*	-	-
7811440108	**101**		Couvercle équipé *Fitted cover*	-	BB

F00

N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
FT0013194-000	3	1	Protecteur d'échappement Exhaust protector	-	-
7814970008	2	1	BAGUE EPAULE BEARING BUSH	-	-
7823590008	1	1	Couvercle Cover	-	-
7811440008	**100**		**Couvercle équipé** ***Fitted cover***	-	BB

Rev.	Change	Date	Name	Approved
F00	Changement réf. - Rep.3 - Protecteur d'échappement passe en inox			
E04	Création variante 01 (00)			
D04	Mise à jour représentation de la bague (00)			
C04	F04/004	01/2004	AC	MB
B04	F02/685	11/2002	SGé	MB
A04	F96/382	10/1996	SGé	MB
A00	/	10/1989	AM	-

Application /

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

General tolerances -

Thread tolerances -

Weight kg 0,724

Responsible site AMIENS

BOM Y

Size A3

Status XXXXX

Document Classification MTB006

Fire and smoke class Yes

Safety class CF2

Wear piece /

Based on /

Replacement /

Replaced /

Customer name /

Customer revision indexes

Approved by Customer

Customer reference number /

Scale 1:1	Prepared	10/1989	AM
	Checked	11/2014	SP
	Approved	11/2014	SL
	Date		Name
	en		mm

Main title, subtitle

COUVERCLE EQUIPE
FITTED COVER

Drawing identification number 781 144 XX 08

Revision F00

Sheet 1 / Sheets 1

A3

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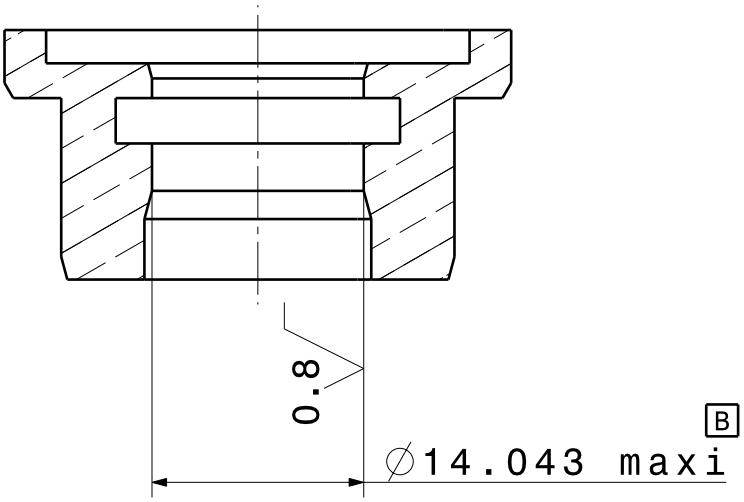
Issue Indice	Design change n° N° de modification	Date	Design change Nature de la modification (A Added Ajouté, D deleted Supprimé, W Was Etait)	Altered by Modifié par	Approuved by Approuvé par
A00	F04/0004	03/04	Première diffusion	A.Charvot	M.Brûlé
B01	F04/0248	03/04	Modification pour amélioration guidage et étanchéité (12)	DG/RT	M.Brûlé
C01	F04/663	26/11/04	Mise à jour représentation (00)	K.Laden	M.Brûlé



Replaced by **	Replacement for **		
Based on **	Application 781 144 xx 08	Weight 0,051kg	

**

**

Scale : 2/1

	Date	Name
Prepared	.	.
Checked	.	.
Approved	25/01/2005	

BAGUE EPAULEE
BEARING BUSH

Faiveley TRANSPORT

781 497 00 08 PU

Issue C01 | Sheet 1/1

Catia V5 - Usure - A4

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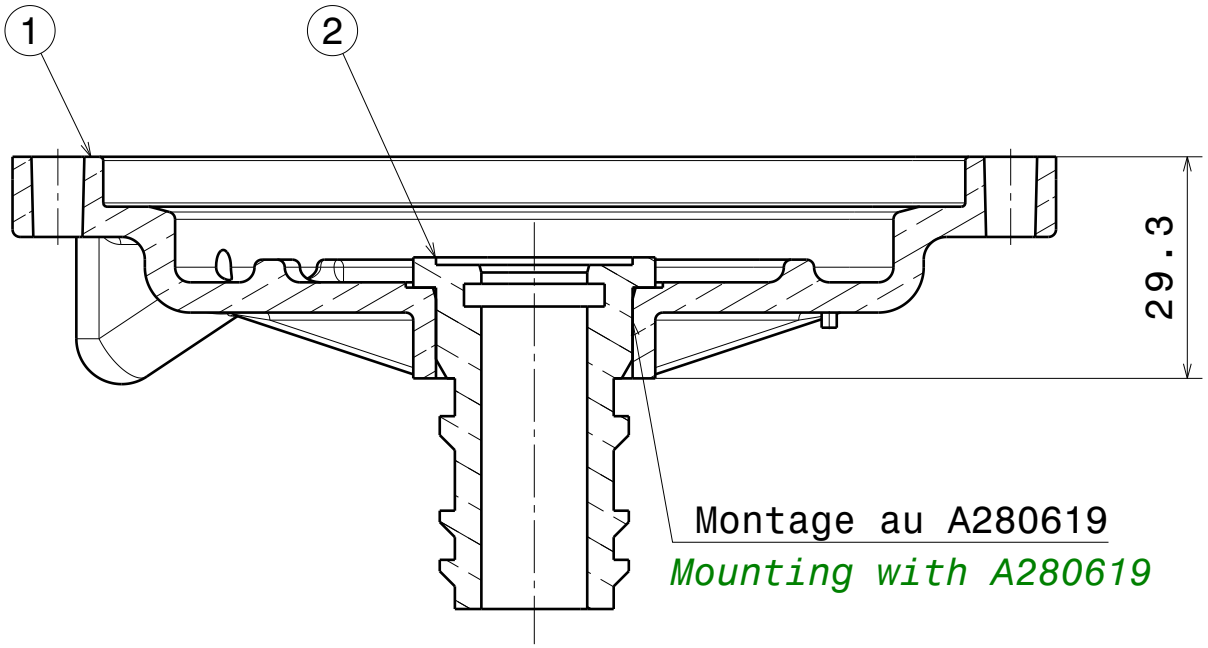

Montage au A280619

Mounting with A280619

Cotes d'usure:
voir plan 782 050 00 08 PU

Wear dimensions,
see drawing 782 050 00 08 PU

N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
782 051 01 08	101		Couvercle équipé		BC
782 050 00 08	2	1	Bague épaulée Ring	782 050 00 08	BB
F00 782 359 20 08	1	1	Couvercle Cover	782 359 XX 08	CC

Rev.	Change Description
F00	Changement de la Var. 00 par la Var. 20
E01	Suppression PU et ajout n° SNCF (01)
D01	Mise à jour de représentation de la bague (00)

Rev.	Change	Date	Name	Approved
F00	EC015AMS0588	01/09/15	NC2	SL
E01	F04/0455	07/04	A.Ch	M.Br
D01	F04/0248	04/04	R.Tr	M.Br
C01	F03/0450	07/03	F.Ja	M.Br
B01	F02/0685	11/02	S.Gé	M.Br
A01	F96/382	10/96		
A00		02/91	Merlo	

Application: 781121XX08

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: RELEASED

General tolerances

Thread tolerances: -

Weight kg: 0,7±5%

Responsible site: AMIENS

Document Classification: MTB006

Fire and smoke class: /

Safety class: CF2

Wear piece: No

BOM: Y

Size: A4

Based on: /

Replacement: /

Replaced: /

Customer name: SNCF Frein

Customer revision indexes

Approved by Customer

Customer reference number: 10-9008 108 F00

Scale 1:1	Prepared	02/1991	Merlo
	Checked	03/2017	SPa
	Approved	03/2017	SL
	Date		Name
	en		mm

Main title, subtitle

Couvercle équipé

Equipped cover

Faiveley TRANSPORT

Drawing identification number: 782051XX08

Revision: F00

Sheet 1 / Sheets 1

A4

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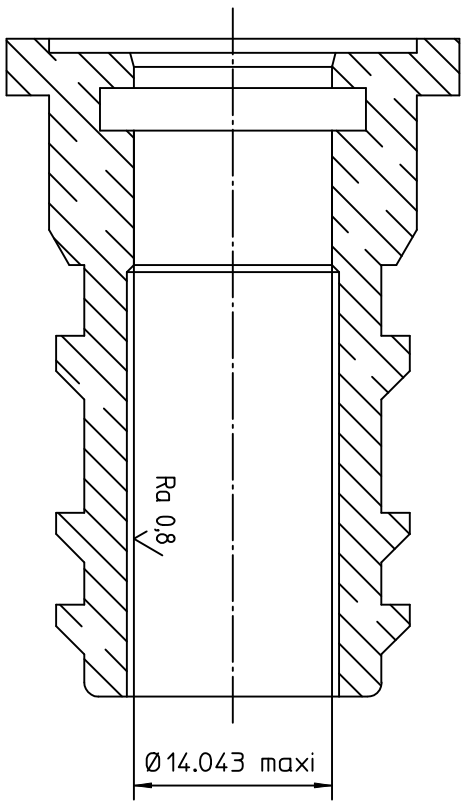
Issue / Indice	Design change n° / N° de modification	Date	Design change / Nature de la modification	A Added / Ajouté	D deleted / Supprimé	W Was / Etait	Altered by / Modifié par	Approuved by / Approuvé par
A00	F04/0455	07/04	Première diffusion				A. Charvot	M. Brûlé



Replaced by	Replacement for	
Based on	Application 781 121 .. 08	Weight 0,07 Kg

Scale : 1/1

	Date	Name
Prepared		
Checked		
Approved		

BAGUE EPAULEE
BERAING BUSH

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782 050 00 08 PU

Issue A00 | Sheet 1/1

Ensemble - A4

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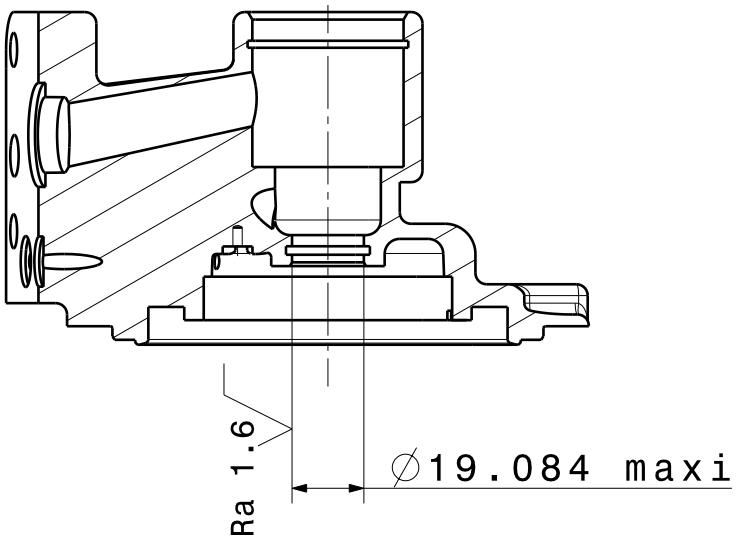
Issue Indice	Design change n° N° de modification	Date	Design change Nature de la modification	A Added Ajouté	D deleted Supprimé	W Was Etait	Altered by Modifié par	Approuved by Approuvé par
B00	F05/9976	02/05	Première diffusion				K.LADEN	M.BRULE



Replaced by **	Replacement for **	
Based on 365 107 01 08	Application Divers	Weight 0,971kg

SNCF
FREIN

10-9008 109 PU

Scale : 1/2

	Date	Name
Prepared	.	.
Checked	.	.
Approved	14/02/05	

CORPS
BODY

Faiveley TRANSPORT

782 585 xx 08 PU

Issue B00 | Sheet 1/1

Catia V5 - Usure - A4

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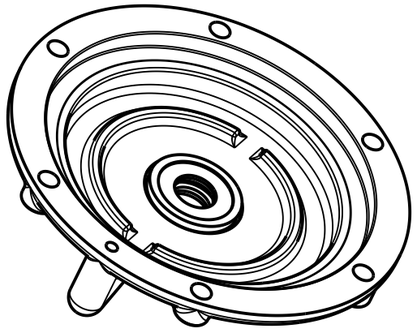
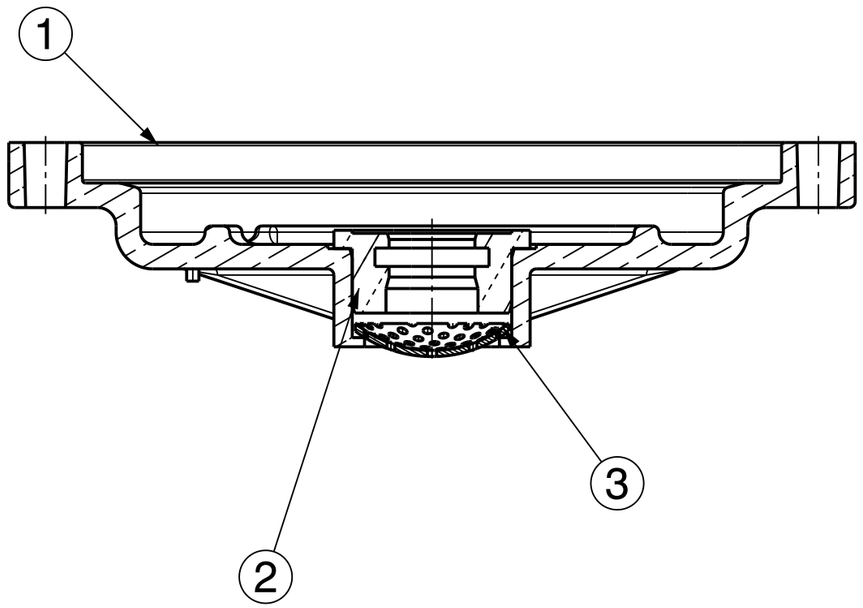


A-A



Montage jusqu'en butée

Push fully home

+

Collage au A280619 pour étanchéité entre Rep.1 et 2

Glued to A280619 for airtightness betweeen Item 1 and 2

Nota : cotes d'usure, voir plan 782 358 00 08 PU

Note : wear dimensions, see drawing 782 358 00 08 PU

N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
FT0013194-000	3	1	Protecteur d'échappement Exhaust protector	FT0013194-000	-
7823580008	2	1	BAGUE EPAULE BEARING BUSH	7823580008	-
7823590008	1	1	Couvercle Cover	782359XX08	-
7823590108	**101**		**Couvercle équipé** ***Fitted cover***	-	BC

Rev.	Change Description
G00	Update of drawing + changing code of item 3
F01	-
E01	-

Rev.	Change	Date	Name	Approved
G00	EC019AMS0511	24/09/19	SPN	SLE
F01	F07/388	09/2007	MM	EO
E01	F04/455	07/2004	A.Ch	MB
A00	-	07/1991	A.Ad	-

Application: Relay

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: RELEASED

General tolerances: -

Thread tolerances: -

Weight kg: 0,72 ±5%

Responsible site: AMIENS

Document Classification: MTB006

Fire and smoke class

Safety class: CF2

Wear piece: Yes

BOM: Y

Size: A3

Based on: /

Replacement: /

Replaced: /

Customer name: SNCF FREIN

Customer revision indexes

Approved by Customer

Customer reference number: 10-9008 110

Scale			
1:1	Prepared	07/1991	A.Ad
	Checked	09/2019	JCR
	Approved	09/2019	SLE
	Date		Name
	fr/en		mm

Faiveley Transport
A Wabtec Company

Main title, subtitle

Couvercle équipé

Fitted cover

Drawing identification number: 7823590108

Revision: G00

Sheet: 1 / Sheets: 1

A3

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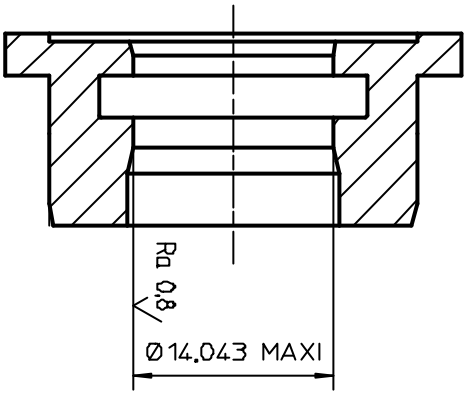
A00	F04/0455	07/04	Première diffusion				A. Charvat	M.BRULE



Replaced by	Replacement for	-	
Based on	Application	782 359 01 08	Weight 0,05Kg
.	.		

Scale • 2/1

	Date	Name
Prepared	.	.
Checked		
Approved		

BAGUE EPAULEE
BEARING BUSH

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782 358 00 08 PU

Issue A00 | Sheet 1/1

Ensemble - A4

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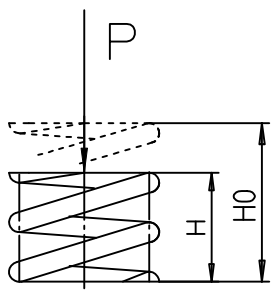
A00	F2004/01	01/05	Première diffusion				T.Vandenkerckhove	M.Brûlé



HAUTEUR (H) APPLIQUEE	EFFORT NOMINAL (P)	EFFORT MINI TOLERE (P)
APPLIED DIMENSION (H)	*NOMINAL FORCE (P)*	*MINIMUM ALLOWED FORCE (P)*
16,8 mm	86N	79.1 N

Replaced by ·	Replacement for ·		
Based on ·	Application	P1K	Weight 0,001Kg

Scale : */*		Date	Name
	Prepared		
	Checked		
SAB WABCO	Approved	01/05	

RESSORT
SPRING

728 725 01 08 PU

Issue A00 | Sheet 1/1

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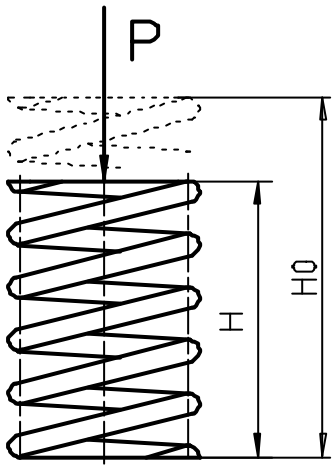
Issue Indice	Design change n° N° de modification	Date	Design change Nature de la modification	A Added Ajouté	D deleted Supprimé	W Was Etait	Altered by Modifié par	Approuved by Approuvé par
A00	F02/0685	11/02	Première diffusion				S.Gé	M.Brûlé
B00	F04/0380	06/04	Ajout du poids (01)				A. Charvot	M. Brûlé



HAUTEUR (H) APPLIQUEE	EFFORT NOMINAL (P)	EFFORT MINI TOLERE (P)
APPLIED DIMENSION (H)	NOMINAL FORCE (P)	MINIMUM ALLOWED FORCE (P)
24.5 mm	20 N	18 N

Replaced by	Replacement for	
Based on	Application 781 121 .. 08	Weight 0,003 Kg B

Scale : -		Date	Name
	Prepared		
	Checked		
	Approved		

SAB WABCO

RESSORT
SPRING

727 353 00 08 PU

Issue B00 | Sheet 1/1

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Ensemble - A4

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Date/Data: 28/07/15 - Issue/Revisione: A00
Maintenance/Use manual
Manuale di Uso e Manutenzione
ECO/ECO: .

FT0044798-100-E00MUM

Coalescing Filter, panel mounted

FT0044798-100

Compiled/Compilato: Teoresi - C.T.
Checked/Verificato: M BOBES
Approved/Approvato: A PERABONI

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REVISIONS / Revisioni						
Issue Revisione	Date Data	Description Descrizione	ECO ECO	Compiled Compilato	Checked Verificato	Approved Approvato
A00	28/07/15	First Issue	.	Teoresi - C.T.	M BOBES	A PERABONI
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Summary

1 SAFETY PRECAUTIONS 4
2 DESCRIPTION OF EQUIPMENT 7
3 MAIN FEATURES AND DATA 7
4 DESCRIPTION OF THE FUNCTION/OPERATION 8
5 MAINTENANCE PRESCRIPTIONS 9
6 ROUTINE MAINTENANCE 10
7 REMOVAL PROCEDURE 11
8 INSTALLATION PROCEDURE 13
9 SPARE PARTS 13
10 SPECIAL TOOLS 13
11 DISPOSAL 14
12 DATA SHEETS AND MATERIAL SAFETY DATA 14

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1 Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools .
- Place the Warning Cartel " Maintenance on going" during the maintenance activities.
- The device must be maintained when and as prescribed. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorised personnel must carry out installation and maintenance.
- For maintenance activities Faiveley recommends to use only original parts supplied by Faiveley. This to be understood for all components and, in particular, for those containing rubbers and degradable materials. Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.

  The above considerations are valid in order to assure the results of laboratory tests and Faiveley approval, taking into account both the design aspects, the production processes and materials' supply and selection.

  Faiveley will not be responsible for any loss of performance of the products, as well as for any damage and / or defects resulting from the use of these components, if it is not unequivocally demonstrated the exclusive use of Faiveley original spare parts.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Before accessing to electric parts, make sure the power is duly switched off.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

NOTE. For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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NOTE. Faiveley Transport reserves the right to modify its equipment or the content of this manual at any time without giving any communication.

1.1 Storage conditions

- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust, temperature shocks and direct source of heat such as boilers, radiators and direct sunlight. The ambient temperature and humidity values must be the ones reported in the brake system maintenance manual. If the brake system maintenance manual is not foreseen, the ambient temperature must be within -25°C and +25°C and the relative humidity must be within 10% and 65%.
- If the storage is below 15°C care should be exercised during the handling of stored products as they may have stiffened and become susceptible to distortion if not handled carefully. The temperature of product taken from such low-temperature storage should be raised to approximately 30°C throughout their mass, before the products are put into service.
- Rubber parts, if out of their original packaging, must be kept in black bags, to avoid ingress of light. If out of their original packaging, equipment must be protected against bad weather and light (UV).
- Rubber parts should be protected from light sources, in particular direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury lamps or high-voltage electrical equipment giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap.
- Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.
- Take care that the packaging are protected from rodents.
- Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:
    - pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
    - prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than:
        - **6 months:** safety valves;
        - **18 months:** brake manipulator, distributor, emergency valves, magnet valves for brake control, emergency push-button valve;
        - **36 months:** all other equipment.
- No component can be used after the date of expiration. It must be disposed of according to the applicable regulations.

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- All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.
- All the protective plugs must be removed only at the time of installation.
- Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.
- Parts must be picked off the shelf in order of time of manufacture.

1.2 Warning messages

Messages and warning symbols in this document are as follows:

DANGER:
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING:
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION:
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and /or and/or to damage to the unit or the environment.

Note:
Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.

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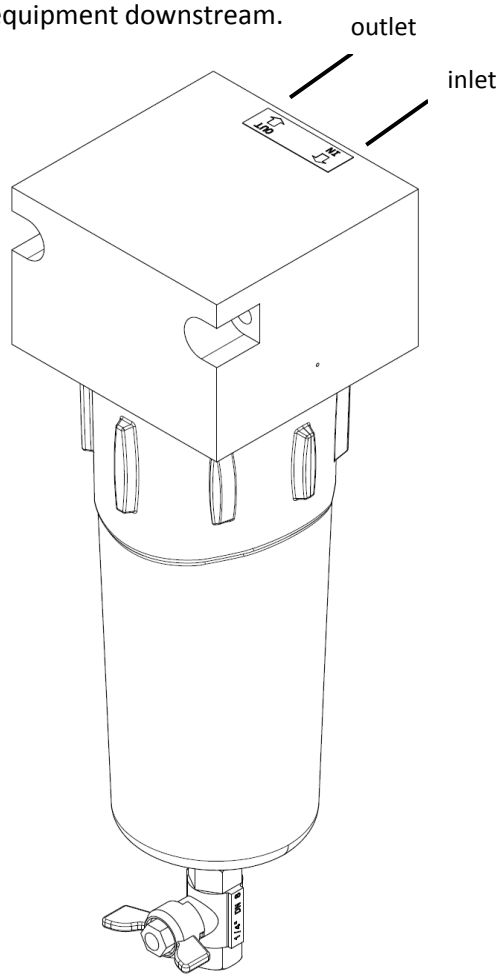
2 Description of equipment

The panel mounted filter is used to collect and trap the impurities conveyed by the airflow in order to protect the equipment downstream.



1 Supply

2 Outlet

Ex Exhaust

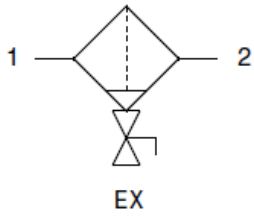


Figure 1:External view and ISO symbol

3 Main features and data

- Max operating pressure: ..... 12 bar
- Mass: ..... 1.9 kg
- Material cast bell:..... EN AC-Al Si9Cu3 (fe)
- Head material: ..... EN-AW Alsi1MgMn – T6
- Surface treatment: ..... anodic oxidation according to YTS-1025 / painted black RAL 9005 according to YTS-1201
- Working temperature:..... -40 ÷ 80 °C
- Filtering capacity (solids removal): ... 0.01 µ
- Filtering capacity (residual oil):..... 0.01 ppm
- Purity class of compressed air: ..... ISO 8573-1 [1-NA-1]
- Load loss with satured cartridge: ..... 0,2 bar
- Dimension: ..... 120x118x391 mm

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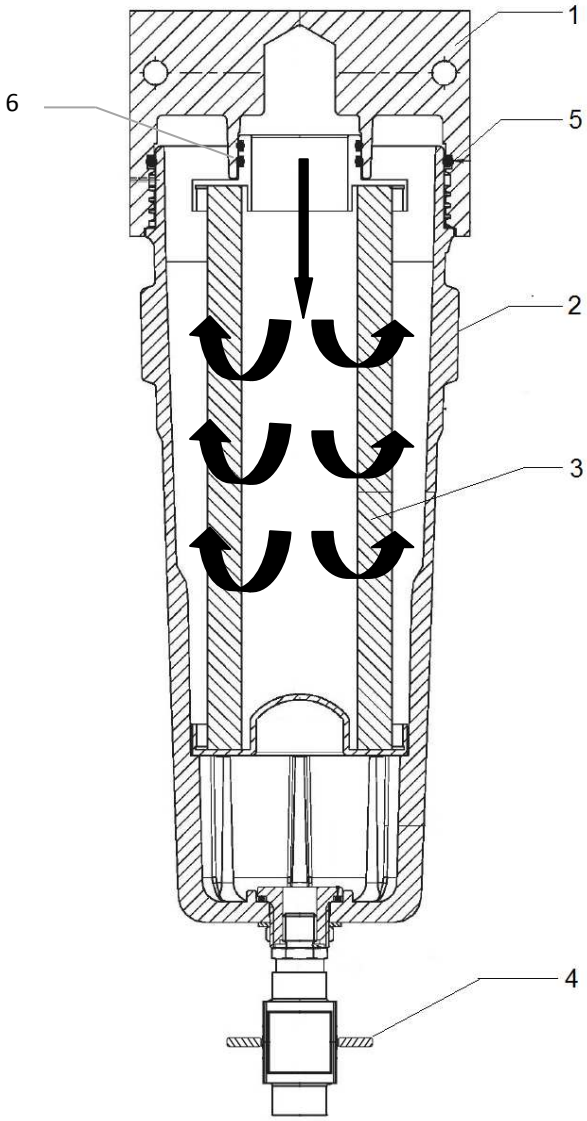
4 Description of the Function/Operation

Refer to Figure 2:



1 Filter head
2 Filter body
3 Filter cartridge
4 Drain cock 1/4"
5 O-ring
6 O-rings

Figure 2: functional scheme

The filter consists in a body (2) screwed in a head (1). A cartridge (3) is fitted to the head (1) and an O-ring (5) is provided between the head (1) and the body (2).

The body (2) is fitted with a draining device, namely a drain cock (4).

As shown in the figure above, airflow enters in the filter head (1), passes through the cartridge (3) from inside to outside and exits from the filter head (1). The impurities are collected in the cartridge (2).

Cartridge is provided with two O-rings (6).

All the impurities can be periodically discharged through a drain cock (4) placed at the bottom of the body (2).

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5 Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance):**

   Typical draining periodicity: every 3 months.

   Filter cartridge replacement: every year (see paragraph 6).

   At the same time check filter structural integrity and if compromised, replace the whole filter assembly.

2. **Second Level Maintenance**: not required.

NOTE. FTI provides an overhauling service for its own units. FTI performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality. The FTI Service Centers have the experience and technical equipment needed for performing professional overhauls.

CAUTION! Equipment either stored on-the-shelf or mounted on inoperative vehicles must be replaced after 1 years from the date of manufacture or of last overhaul, since rubber parts age out even in optimum storage conditions. Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than 36 months.

NOTE! Replacement periodicity must include both the years of functioning and the years of storage on-the- shelf or mounting on inoperative vehicles.

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6 Routine maintenance

WARNING! Pressurized system! Discharge the pressure before removal.

CAUTION! Filtering elements may contain oil. They must be disposed of according to the law.

CAUTION! Ensure that a minimum clearance of 100 mm is foreseen under the cock, in order to make all the operations possible.

CAUTION. Take care to avoid ingress of dirt or debris into the system.

CAUTION. The drain cock must be removed only if it must be replaced.

Refer to Figure 2.

1. Before dismantling the filter, purge the filter by opening the drain cock (4).
2. Unscrew the canister (2) and remove the cartridge (3).

NOTE! If the body is not easily to remove by hand, use the strap wrench if necessary.

3. Clean carefully the canister (2) and the head (1) by means of a dry and lint free cloth.
4. Replace the cartridge (3) with a new one.
5. Lubricate the two O-rings (ref. a in Figure 3 below) of the new cartridge, the one in the head (ref. b in Figure 3 below), the threads of the head (ref. d in Figure 3 below) and the hole in which the cartridge has to be inserted (ref. c in Figure 3 below) with grease Uniflor NYE 8512S (indicated datasheet at the end of document).

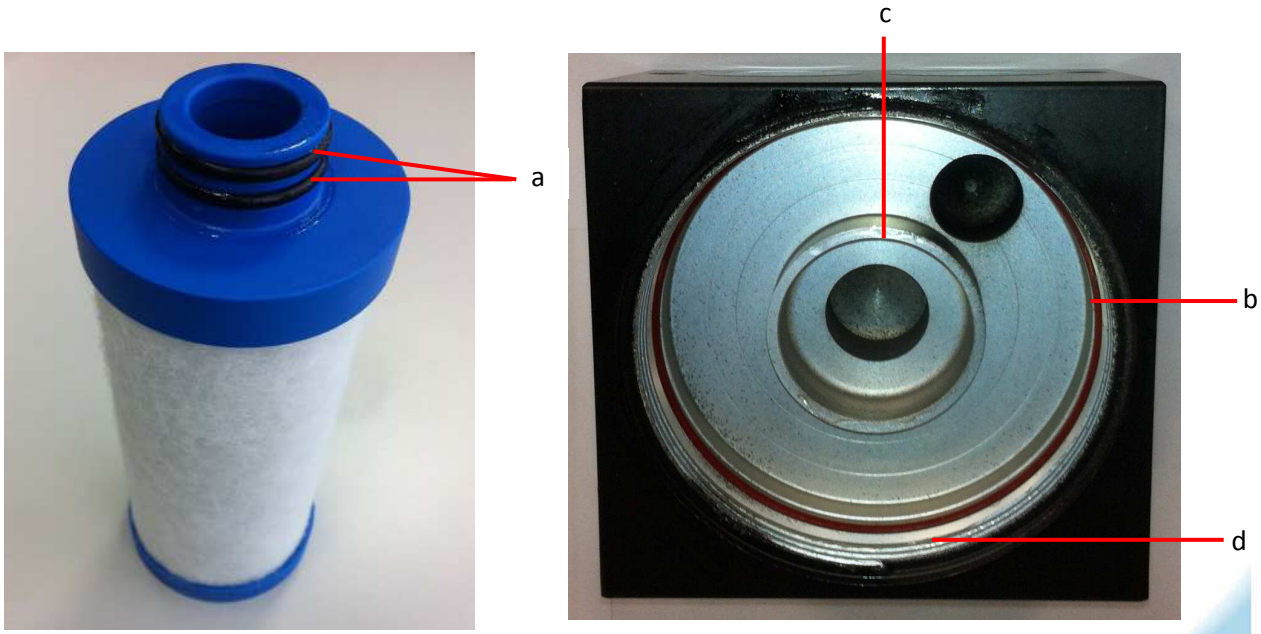

Figure 3: Details of the cartridge and filter's head for the lubrication

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6. Then screw the canister (ref. 2 of Figure 2) by hands till the correct position between the head and the canister, is reached. The canister stops turning when it reaches its mechanical stop.
7. Pressurize the system and check for leakages by using a water soap solution.

7 Removal procedure

WARNING! Isolate the filter (inlet and outlet) and reduce the pressure to zero with gradual opening of the drain cock and leave it in open position.

NOTE! During maintenance operations beware to keep the maximum cleanliness, avoiding contamination of the pneumatic circuit from any possible debris.

NOTE! Fittings are application dependent.

Refer to Figure 4:

1. Unscrew the two screws (3) and remove the filter assembly (1).

CAUTION! Take care to prevent ingress of dirt or debris in the system.

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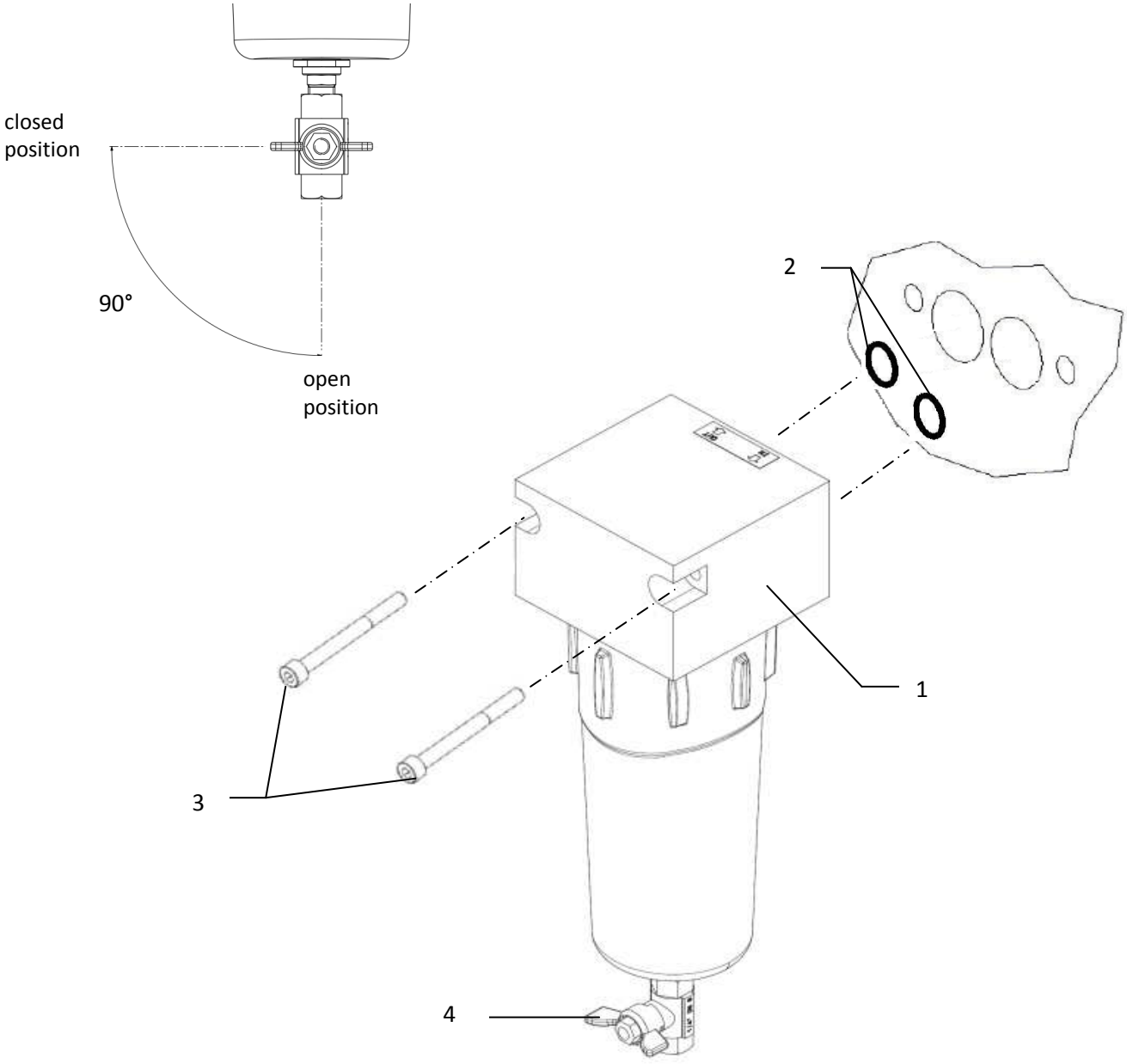

Figure 4: installation/removal procedure

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8 Installation Procedure

CAUTION! Take care to prevent ingress of dirt or debris in the system.

NOTE! Fittings are application dependent.

Refer to Figure 4:

1. In case the component has the interface O-rings already installed in place, analyse them and:
   - if they have signs of damage or wear, replace them with new ones according to the codes reported in paragraph 9 and lubricate them with a light amount of grease type Uniflor 8512S;
   - if they are intact and in proper condition, slightly lubricate them with grease type Uniflor 8512S and proceed with point 3.
2. In case the component doesn't have the interface O-rings already installed in the place in which they are foreseen, slightly lubricate the new O-rings, according to P/Ns indicated in paragraph 9, with grease type Uniflor 8512S and put them in place.
3. Remove the two plugs or other protection type of inlet and outlet supplies.
4. Install the filter (1) onto the host panel and secure it by means of the two screws (3) with relevant washers.
5. Pressurise the system and check for leakages by using leakages by using a leak finder (for example bubble soap).

9 Spare parts

- **Routine Maintenance** – With reference to the exploded view of par. 6 , the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
3	Filter element	FT0040586-000	1

Table 1: spare parts' codes

- **Installation** - With reference to the exploded view of Figure 4, paragraph 7, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
2	O-ring-ISO 3601-1-122A-28,25x2,62-N Compound VMQ 70Sh.	FT0023874-006	2
-	Uniflor 8512S	3000.00.550	as needed

Table 2: spare parts' codes

10 Special Tools

No special tools required for servicing and installation.

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11 Disposal

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

The device is mainly composed by the following materials: aluminium alloy, brass, stainless steel, rubber, plastic.

12 Data sheets and material safety data

See document 3000.00.550_All6 for the safety data sheet for the product **Uniflor 8512S** .

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04.32_N-JMR DISTRIBUTOR (SET 4.5 bar)

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/// 9171 / SNCF 10-9052 149

Générique / Generic

Notice de niveau 4 / Level 4 manual
Distributeur à ressort type NJMR
Spring distributor valve type NJMR
728 835 xx x8

Division:	Document Type:	Distribution:
.	Maintenance/Use manual	
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	.

	Name, Title, Group	Signature	Date
Compiled:	Himdi Morjane Design Engineer, Engineering		12/10/2021
Checked:	camille.halloo Systems Engineer, Engineering		23/11/2021
Approved:	candice.crochu Manager, Engineering		23/11/2021
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
9171.docx	J00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	18/01/2010	Création / First issue Suivant dessin BE n° 728 835 xx x8 indice E/00, F09/0556 du 10/09. / *According to design depart drawing n° 728 835 xx x8 index E/00, F09/0556 of 10/09.*	.	Camille Halloo	.	.
B00	25/05/2012	Mise à jour / Update Suivant dessin BE n° 728 835 xx 08 indice H/00, F12/0075 du 01/12. / *According to design depart drawing n° 728 835 xx 08 index H/00, F12/0075 of 01/12.*	.	Himdi Morjane	.	.
C00	02/01/2015	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8 indice O01, F2015/18 du 20/01/15. / *According to the assembly drawing n° 728 835 xx x8 index O01, F2015/18 of 20/01/15.* Remplacement de la phrase "Entretien préventif" par "Entretien courant" dans le texte. / *Replacement of the phrase "Preventive maintenance" by "Servicing" in the text.*	.	Himdi Morjane	.	.
D00	21/09/2015	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8 indice P00, F2015/91 du 22/04/15. / *According to the assembly drawing n° 728 835 xx x8 index P00, F2015/91 of 22/04/15.* Ajout du type 4 dans le texte. / *Add of type 4 in the text.*	.	Himdi Morjane	.	.
E00	17/03/2016	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8 indice R00, ECO15AMS0765 du 03/02/16. / *According to the assembly drawing n° 728 835 xx x8 index R00, ECO15AMS0765 of 03/02/16.* Modification du § 3 fonctionnement. / *Modification of § 3 operation.* Mise à jour des plans joints / *Update of joined drawings.* Plan / *Drawing* 728 836 .. 08 indice / *index* C/00 devient / *becomes* D/00. Plan / *Drawing* 728 845 .. 08 PU indice / *index* A/00.	.	Camille Halloo	.	.
F00	12/10/2017	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8 indice U00, ECO17AMS0736 du 19/09/17. / *According to the assembly drawing n° 728 835 xx x8 index U00, ECO17AMS0736 of 19/09/17.*	.	Himdi Morjane	.	.
G00	17/10/2018	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8 indice W00, ECO18AMS0405 du 03/08/18. / *According to the assembly drawing n° 728 835 xx x8 index W00, ECO18AMS0405 of 30/08/18.* Mise à jour des plans joints / *Update of joined drawings.*	.	Camille Halloo	.	.

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H00	06/11/2019	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8 indice AB00. / *According to the assembly drawing n° 728 835 xx x8 index AB00.* Mise à jour des plans joints / *Update of joined drawings.* Ajouter dans le § Révision Générale, la phrase “Faire un contrôle fonctionnel … comme prévu dans le plan de maintenance”. / *From § General overhaul” add the sentence “Make a functional check …. As scheduled in the projet maintenance plan”.*	.	Camille Halloo	.	.
I00	01/12/2020	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8, indice AC00. / *According to the assembly drawing n° 728 835 xx x8, index AC00.*	.	Himdi Morjane	camille. halloo	candice. crochu
J00	12/10/2021	Mise à jour / Update Suivant le plan d'ensemble n° 728 835 xx x8, indice AE00 du 08/2021. / *According to the assembly drawing n° 728 835 xx x8, index AE00 of 08/2021.* Nouvelle présentation groupe. / *New group presentation.* Ajout du chapitre « 1. Mesures de sécurité » / *Adding of chapter « 1. Safety instructions ».* Changement repère (E) par (16) et suppression du guide ressort (16). / *Replace item (E) with (16) and delete the spring guide (16).* Ajout de nouvelles variantes FT0120345-101 et FT0120345-102. / *Adding of new variants FT0120345-101 and FT0120345-102.* Ajout des vues 3d pour la nouvelle génération. / *Adding 3d views for new generation.*	.	Himdi Morjane	camille. halloo	candice. crochu
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PLANS JOINTS / *JOINED DRAWINGS*:

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Plan du kit de maintenance NJMR / *Drawing of NJMR maintenance kit* n° 730 439 00 08 indice / *index* D00,

Plan d'ensemble du support */ Assembly drawing of bracket* n° 730 173 01 08 indice */ Index* B00.

Plan d'ensemble du corps équipé */ Assembly drawing of equipped body* n° 728 836 .. 08 indice */ Index* G00, (rep. */ Item* 1),

Plan */ Drawing* n° 728 587 00 08 PU, indice */ Index* A00 (rep. */ Item* 3),

Plan */ Drawing* n° 786 435 00 08 PU, indice */ Index* A00 (rep. */ Item* 4),

Plan */ Drawing* n° 185 562 00 08 PU, indice */ Index* B00 (rep. */ Item* 7),

Plan */ Drawing* n° 728 942 00 08 PU, indice */ Index* A00 (rep. */ Item* 9),

Plan */ Drawing* n° 728 838 00 08 PU, indice */ Index* A00 (rep. */ Item* 12) (Non disponible / *Not available*),

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Plan */ Drawing* n° FT0120718-U00, indice */ Index* A00 (rep. */ Item* 16),

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Plan */ Drawing* n° 191 968 00 08 PU, indice */ Index* C00 (rep. */ Item* 36),

Plan */ Drawing* n° 728 594 .. 08 PU, indice */ Index* A/00 (rep. */ Item* A) (Non disponible / *Not available*),

Plan */ Drawing* n° 728 599 .. 08 PU, indice */ Index* A/00 (rep. */ Item* B) (Non disponible / *Not available*),

Plan d'ensemble de la bride équipée / *Assembly drawing of fitted hanger* n° 728 855 xx 08 indice / *index* B00 (rep / *item* .50).

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/// 1. MESURES DE SECURITE / *SAFETY INSTRUCTIONS*

1.1 Préface / *Foreword*

Ces règles font partie intégrantes de ce manuel d'entretien et ont pour but de fournir les notions nécessaires au personnel impliqué dans des opérations d'entretien, afin d'éviter les accidents, les blessures ou dommages pour l'environnement. / *The rules are integrating parts of this maintenance manual and are intended to provide the basic knowledge needed by staff involved in maintenance operations to avoid injuries, damage and environmental pollution.*

L'appareil ne peut être utilisé, entretenu et réparé que par un personnel dûment formé à cet effet. Dans le cas contraire, la garantie prévue en vertu des conditions de livraison sera frappée de nullité. / *The device only be used, serviced and repaired by appropriately trained personnel. Otherwise, any warranty with respect to the terms of delivery will be forfeited*.

Ce manuel doit être facilement accessible à tout le personnel impliqué pour consultation immédiate. Avant d'entreprendre toute action, le personnel doit prendre connaissance du contenu de ce manuel. / *This manual must be easily accessible to all involved personnel for immediate consultation. Personnel must be informed of the content of this manual before undertaking any actions*.

Il est obligatoire que le personnel soit informé des conditions légales au sujet de la sécurité et de la santé au travail et de la prévention des accidents. Le personnel doit avoir la connaissance de base nécessaire dans le domaine des opérations (de : mécanique, système pneumatique, transport etc.).

It is compulsory that staff is aware of the legal conditions that relate to health and safety at work and accident prevention. Personnel must have the basic knowledge necessary in the operations' domain (mechanics, pneumatic system, transport, etc.).

Faiveley transport décline toute responsabilité en cas d'accidents, dommages ou pollution environnementale provoqués par la mauvaise application des prescriptions, ou par la mauvaise utilisation des produits ou des outils. / ***Faiveley Transport*** *cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools*.

Ces prescriptions de sécurité viennent en complément aux règles de sécurité applicables sur le site d'intervention. / *The safety requirement comes in addition to safety rules on the site of intervention*.

Outre ce manuel, il est également impératif de respecter et d'appliquer les réglementations générales légales et les autres réglementations relatives à la prévention des accidents et à la protection de l'environnement / *In addition to this manual, you must observe and apply the binding general statutory and other regulations on accident prevention and environmental protection.*

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1.2 Opération préliminaire / *Preliminary operation*

En général, la propreté doit être garantie pour éviter la contamination par la poussière, la saleté ou d'autres agents externes.

In general, cleanliness must be guaranteed to avoid contamination by dust, dirt or other external agents.

Récipient sous pression
Pressurised vessel

Avant intervention sur les pièces pneumatiques, assurez-vous que les appareils sous pression soient mis à l'atmosphère. Lors du démontage des éléments, faites attention aux possibles pressions résiduelles.

Before any intervention on the pneumatic parts, make sure that pressure devices are vented to atmosphere. During elements removal, pay attention to any potential residual pressure.

Pièce Sous Tension
HIGH VOLTAGE

Avant toute intervention, s'assurer de la mise hors tension des équipements.

Before any intervention, make sure that the power is cut off.

1.3 Sécurité du personnel / *Personal safety*

Le lieu de travail doit être correctement dimensionné et préparé afin d'enlever tous les obstacles possibles. / *The workplace must have the right size and be correctly prepared to remove all possible obstacles*.

Pour le déplacement des pièces lourdes, le personnel doit utiliser les outils de levage appropriés (cric, poussoir, treuil, etc...) et porter des chaussures et gants de protection appropriés.

While heavy parts are being moved, personnel must use the appropriate lifting tools (jacks, piston, pulley, etc.) and wear the appropriate protective shoes and gloves.

Avant de démonter toutes pièces, lire soigneusement la documentation technique afin de prendre connaissance des risques possibles, comme la pression ou les ressorts sous pression. Dans ce cas, les lunettes de protection doivent être portées. ATTENTION ! L'étiquette d'avertissement est peut être absente.

Before removing any parts, read the technical documentation carefully to get acquainted on the potential risks, such as pressure or compressed springs. In this case, protective glasses must be worn. CAUTION! The warning label may be missing.

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Risque générique
Generic risk

Concernent les produits chimiques émanant des lubrifiants, de graisse, des diluants, solvants, etc. suivre soigneusement les prescriptions du fabricant. Dans tous les cas, éviter de respirer les vapeurs et éviter le contact avec la peau et les yeux. Porter des gants de protection, des lunettes et un masque à filtres approprié.

For chemical products that emanate from lubricants, grease, thinners, solvents, etc., follow carefully the manufacturer's recommendations. In any case, avoid to breath the vapours and avoid contact with skin and eyes. Wear protective gloves, glasses and a filter mask.

Pour les matières consommables comme l'huile et la graisse, se référer à la fiche de sécurité du fournisseur. / *For consumables substances like oil and grease, refer to the supplier safety datasheet*.

Lors de l'utilisation des substances inflammables (lubrifiants, diluants, etc.), adopter toutes les précautions possibles pour éviter le risque d'incendie. Ne pas fumer. Ne pas employer de sources de chaleur ou de flammes. Ne pas provoquer d'étincelles. Maintenir la salle aérée. Stocker les produits selon la prescription du fabricant.

When using flammable substances (lubricants, thinners, etc.) take all possible precautions to avoid the risk of fire. Do not smoke. Do not use sources of heat or flames. Do not cause any sparks. Keep the room ventilated. Store products according to the manufacturers' indications.

Lors du nettoyage ou du séchage des pièces, ne pas utiliser une source d'air à haute pression supérieure à 6 bars. / *Do not use a high pressure air source upper at 6 bar when cleaning or drying parts*.

Lors du nettoyage des filtres ou des ailettes de refroidisseur, utiliser un aspirateur adapté. / *Use an adapted vacuum cleaner when cleaning cooler filters or cooling fins*.

Pour toutes les opérations, utilisez les outils appropriés. Les outils doivent être maintenus dans des conditions optimales. Les outils qui sont usés ou endommagés représentent un risque. / *For any operation, use appropriate tools. The tools must be maintained in optimum conditions. The tools which are worn out or damaged represent a risk*.

Lors du test des composants, ne jamais dépasser les limites de pression de fonctionnement maximales. / *When testing components, never exceed the maximum operating pressure limits*.

Si un liquide (lubrifiant, liquide réfrigérant, solvants) s'est renversé sur le plancher, nettoyer aussitôt la zone concernée et prendre les précautions pour éviter de glisser. / *If liquids (lubricant, cooling fluid, solvents) are spilt over the floor, clean the area straight away and take precautions to avoid slipping*.

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1.4 Sécurité fonctionnelle / *Functional safety*

La sécurité du produit ne peut être garantie que si des pièces de rechange d'origine **Faiveley** sont employées. Tous autres matériels peuvent compromettre la fonctionnalité et la sécurité. / *Product safety can only be guaranteed if genuine **Faiveley** spare parts are used. Any other materials can compromise functionality and safety*.

Suite à toute opération de maintenance, s'assurer que les composants et le système complet ont retrouvé une parfaite fonctionnalité. / *After any maintenance operation, make sure that components and the complete system have been restored to their perfect functionality*.

Après chaque prise de pression, remettre immédiatement les bouchons métalliques de protection sur les prises test. / *After each pressure measurement, immediately reinstall the metal protection caps on test points.*

1.5 Sécurité environnementale / *Environnemental safety*

Risque générique
Generic risk

Pendant la manipulation des lubrifiants, des diluants, solvants et d'autres substances qui peuvent être nocives pour l'environnement, prendre toutes les précautions pour éviter le renversement. Toutes les conditions applicables des lois doivent être respectées lorsque l'on se débarrasse de substances qui peuvent polluer l'environnement (lubrifiants, batteries, liquide réfrigérant, etc.).

When handling lubricants, thinners, solvents and other substances that may be harmful for the environment, take all precautions to avoid reversal. All applicable laws must be respected when disposing of substances that may pollute the environment (lubricants, batteries, cooling fluid, etc.)

1.6 Prescriptions spécifiques des équipements sous pressions / *Specific requirements for under pressure equipments*

Utilisation des équipements : tous les équipements du produit doivent exclusivement effectuer les fonctions pour lesquelles elles sont conçues. Par conséquent, toute autre utilisation, en dehors de celle du système sur lequel ils sont installés, est expressément interdite. / *Equipement use: all equipment must exclusively carry out the functions which they have been designed for. Consequently, any other use, outside the system on which they are installed, is expressly prohibited*.

Conditions dégradées : le système peut fonctionner seulement s'il est parfaitement efficace. Les défauts de fonctionnement ou les erreurs possibles doivent être considérés comme des conditions exceptionnelles et, en tant que tels, doivent être supprimés dès que possible. / *Degraded conditions: the system can operate only if it is perfectly efficient. Possible malfunctions or errors are to be considered as exceptional conditions and, as such, must be eliminated as soon as possible*.

Durée de fonctionnement : le système est conçu pour une durée de vie de **30 ans**, à échéance de laquelle, il doit être rendu inopérant en débranchant toutes les alimentations en énergie (alim. élect., mécanique, pneumatique), en déchargeant toutes les capacités résiduelles afin de mettre à zéro la pression et en démontant tous les composants. En particulier, les réservoirs doivent être rendus inutilisables, les tuyaux doivent être démontés et les raccords jetés ainsi que les dispositifs de sécurité (par exemple soupapes de sûreté) doivent être rendus inutilisables.

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*Operating life: the system is designed for a life of **30 years** on condition that the maintenance plan is respected, at the end of which it must be made as non-operational by disconnecting all power supplies (electrical, mechanical, pneumatic elements), by discharging all residual capacities to bring the pressure to 0 pressure and by dismantling all the components. In particular, the reservoirs must be made unusable, the pipes must be dismantled and discarded, flexibles and safety devices (for example safety valves) must be made unusable*.

Maintenance : les opérations de maintenance nécessaires sont expliquées dans ce manuel. Elles doivent être effectuées comme décrite dans ce document. En cas de doute arrêter l'opération de maintenance et consulter le fabricant pour clarifications. / *Maintenance: the necessary maintenance operations are explained in this manual. They must be carried out as described in this document. In case of doubt, stop the maintenance and consult the manufacturer for clarification*.

Remplacement des pièces : au cas où une pièce devrait être remplacée, une pièce neuve de **FAIVELEY** doit être installée selon les prescriptions spécifiques et en évitant toute sorte de contrainte externe pouvant par conséquent l'endommager (par exemple effort, torsion, etc.).

*Replacement of parts: if a part needs to be replaced, a new **FAIVELEY** part must be installed according to the specific recommendations and avoiding all types of external stress that may consequently cause damage (for example stress, torsion, etc.)*.

Modifications et réparations statiques : toutes les modifications sur les réservoirs pressurisés sont absolument interdites. Il est possible de les dépanner seulement si ils sont déposés et suivant les prescriptions spécifiques des documents permettant la dépose des appareils sous pressions : il est absolument nécessaire avant d'enlever toutes les pièces de s'assurer que toutes les capacités ont été déchargées, puis enlever les pièces avec soin. L'utilisation de dispositifs de protection personnels (lunettes, gants) est cependant recommandée. Attention ! Même si un système est inopérant depuis longtemps, il risque de conserver des pressions résiduelles dangereuses.

Static modifications and repairs: all modifications on pressurised reservoir are strictly prohibited. They may be repaired only if they are removed and if the specific recommendations in the documents that enable pressurised appliances to be dismantled are respected; before removing any parts it is vital that you ensure that all the capacities have been discharged, then carefully remove the parts. The use of personal safety equipment (goggles, gloves) is still recommended. Caution! Even if a system has been out of operation for a long time, there is a risk that it has retained a certain level of hazardous residual pressure.

Les risques résiduels suivants n'ont pas été considérés durant la conception, donc il est de la responsabilité de l'utilisateur de respecter les textes de lois applicables. / *The following residual risks were not considered during design. Therefore, it is the user's responsibility to respect the texts in the applicable laws*.

Le feu externe : les risques inhérent à un feu externe n'ont pas été pris en compte, / *External fire: the external fire risks have not been considered*,

Les contraintes externes : le produit est conçu pour du matériel roulant ferroviaire, dans les conditions environnementales indiquées dans les spécifications applicables. Aucune autre condition n'a été prise en compte, / *External stress: the product has been designed for rolling stock material and for environmental conditions indicated in the applicable specifications. No other conditions have not been taken into account*,

Les abus: aucun abus prévisible n'a été identifié et n'a donc été considéré. / *Misuse: no foreseeable misuse abuse has been identified and therefore has not been considered*.

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1.7 Symboles / *Symbols*

Dans ce document, les risques sont identifiés en utilisant les notes d'avertissement spécifiques et les symboles suivants : / *In this document, the risks are identified using specific warning notes and the following symbols*:

High voltage

Pièce Sous tension

Rotating parts

Pièce en rotation

Pressurised vessel

Récipient sous pression

Flammable materials

Matériaux inflammables

Handle with care

Manipuler avec précaution

Risk of crushing

Risque d'écrasement

Generic risk

Risque générique

Hot surface

Surface chaude

Nota / *Note* : Une note signale une information importante dans le texte ! / *A note indicates important information in the text !*

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1.8 Stockage des appareils / *Storage of the devices*

1.8.1 Conditions de stockage sur véhicule / *Environnement of storage on vehicle*

Les équipements montés sur le véhicule ne nécessitent pas de protection particulière. / *Equipments fitted on the vehicles don't need any particular protection*.

Ils peuvent supporter des températures de **– 25°C à + 70°C** lors du stockage sur véhicule. Ces conditions de stockage sont acceptables si la durée n'excède pas **6 mois** (Exemple : 1 année de stockage en extérieur sur véhicule est acceptable lorsque l'exposition de **- 25°C à 0°C en hiver** dure **3 mois** maximum et de **+25°C à +70°C en été** dure également **3 mois** maximum).

*They can meet temperature: from **- 25°C to + 70°C** during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed **6 months** (Example : 1 outside storage year on vehicle is acceptable if the temperature is, **in winter from -25°C to 0°C** during **3 months** maximum and also, **in summer** from **+25°C to +70°C** during **3 months** maximum).*

1.8.2 Stockage en magasin / *Storage in workshop*

Les équipements doivent être stockés dans leur emballage d'origine dans une pièce aérée et ne doivent pas être exposés à l'humidité, la poussière. / *The components must be stored with their original packaging in a ventilated room and not exposed to humidity and dust*.

La température de stockage doit être comprise entre 0°C et +35°C avec un taux d'humidité maximal de 80% et avec une variation de température de 15°C en 24h maximum. / *The storage temperature must be within 0°C and +35°C, RH 80% maximum and with variation in temperature of 15°C in 24h maximum*.

Protection des équipements : / *Protection of equipment*:

Si les équipements sont stockés en dehors de leur emballage d'origine, ils doivent être à l'abri des intempéries et de la lumière (rayons UV). / *If out of their original packaging, equipment must be protected against bad weather and light (UV)*.

Toutes les entrées, sorties doivent être protégées (scotch) contre la poussière. / *All outlet / inlet parts must be protected (scotch) against dust*.

Les évents de mise à l'atmosphère des équipements doivent être dirigés vers le bas, il est important de respecter le sens de positionnement de l'équipement (Étiquettes haut / bas). / *Blowholes of equipments must be directed downward, respect the position according to the sticker "up/down"*.

1.8.3 Conditions particulières / *Specific conditions*

Dans le cas d'un stockage sur véhicule inopérant, effectuer tous les 3 mois: / *In the case of equipment mounted on inoperative vehicle, perform every 3 months:*

- un desserrage du frein de parking. Puis réaliser au moins 10 actions de freinage / défreinage du frein de service afin de mettre en mouvement les pièces mécaniques, / *release of parking brake. Then carry out at least 10 brake / release actions of service brake in order to move the mechanical parts*,

- vérifier visuellement que les garnitures de frein soient en contacts avec les disques lors des phases de freinages. A la fin de la vérification, appliquer le frein de parking. / *visually check that brake pads are in contact with the disc during phases of braking. At the end of the checking, apply the parking brake*.

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Etant donné que les pièces élastomères vieillissent même dans les conditions optimales de stockage, la règle suivante doit être suivie pour les équipements stockés en magasin ou sur un véhicule inopérant.

Since rubber parts age out even if optimum storage conditions, the following rule must be followed for equipment stored on the shelf or mounted on inoperative vehicles.

Les équipements pneumatiques doivent être renvoyés chez **FAIVELEY TRANSPORT** pour révision au bout de **2 ans** à compter de la date de fabrication ou de la dernière révision. / *Pneumatic equipments must be sent back to **FAIVELEY TRANSPORT** after **2 years** from the date of manufacture or last overhaul, in order to be checked and reconditionned.*

Lors d'un retour chez **FAIVELEY TRANSPORT** d'un produit, utiliser un emballage adapté permettant de ne pas endommager celui-ci pendant le transport. / *When returning to **FAIVELEY TRANSPORT** of a product, use a suitable packaging to avoid damaging it during transport*.

1.9 Température de fonctionnement des appareils / *Operating temperature of devices*

Les équipements fonctionnent de manière optimale dans la plage de température **– 25°C à + 45°C** (classe T3 de la norme NF EN 50125-1).

*Equipments are operating in full satisfactory way in the temperature range from - **25°C to + 45°C** (class T3 of the EN 50125-1 standard.*

Pour les températures de **+45°C à +70°C**, les fonctions restent pleinement assurées, mais les caractéristiques et les performances peuvent être légèrement dégradées (ex: taux de fuite plus important).

*For temperature range from **+45 °C to +70°C**, the function are fully performed, but characteristics and performances may slightly derivate (ex: leakage rate).*

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/// 2. GENERALITES / *GENERAL*

Le distributeur à ressort type NJMR est un distributeur modérable au serrage et au desserrage. La pression délivrée au cylindre de frein fictif **(CFF)** est fonction de la dépression dans la conduite générale **(CG)** et du réglage des ressorts **(16)** et **(28)**. Il assure un débit important du fait de ses larges sections de passage et présente une bonne sensibilité du fait de l'équilibrage complet de son clapet.

*The spring distributor valve type NJMR is a distributor graduable both at brake application at brake release. The pressure delivered to the dummy brake cylinder **(DBC)** is a function of depression in the brake pipe **(BC)** and adjusting the springs **(16)** and **(28)**. It provides a high delivery, due to its large way through, and possesses a high sensitivity since its valve members are fully balanced.*

Le distributeur à ressort type NJMR a été développé pour les véhicules type automoteur fonctionnant avec un freinage électropneumatique. Il est équipé d'une bride d'interface **n° 728 855 01 08** pour la variante **728 835 .. 18**. Il permet de remplacer les anciens distributeurs JMR type 75 mais en supprimant la fonction vide chargé autovariable.

*The spring distributor valve type NJMR has been developed for vehicles type rail motor vehicle operating with an electropneumatic braking. It is equipped with a flange interface n° **728 855 01 08** for the variant **728 835 .. 18**.There used to replace old distributor JMR type 75 but by removing the self-variable empty loaded device function.*

Le distributeur à ressort type NJMR n'ai pas homologué par l'UIC car les variations de pression dans la conduite générale **(CG)** ne sont pas comparées à une pression de référence issue d'un réservoir de commande **(RC)** mais à un effort généré par un ressort. Cette non homologation permet une plus grande liberté dans le réglage des temps de serrage et de desserrage.

The spring distributor valve type NJMR have not approved by the UIC because changes in pressure in the brake pipe (BP) are not compared to a reference pressure after a control reservoir (CR) but with an effort generated by a spring. This non-approval allows greater freedom in the timing of brake application at brake release.

Le distributeur à ressort type NJMR est flasquable sur un panneau du type collé ou sur un support **n° 730 173 01 08** afin de l'intégrer sur un châssis, sa fixation est réalisée au moyen de deux goujons M8.

*The spring distributor valve type NJMR is flangeable and on an adhesive type panel or on the bracket **n° 730 173 01 08** in order to integrated it on the frame, its fixing is achieved by means of two studs M8.*

La pression maximale en service du distributeur est de **10 bars**. / *The maximum pressure in service of the distributor valve is **10 bar***.

La masse des types 0, 3 et 6 est de / *The weight of types 0, 3 and 6 is :* **2.70 kg ± 5%**.

La masse du type 1 est de / *The mass of type 1 is :* **3.10 kg ± 5%**.

La masse des types 2, 4, 5 est de / *The mass of types 2, 4, 5 is :* **2.60 kg ± 5%**.

La masse du type 7 est de / *The mass of type 7 is :* **2.90 kg ± 5%**.

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/// 3. DESCRIPTION / *DESCRIPTION* (Voir le plan / *SEE THE DRAWING* N° 728 835 XX X8)

Le distributeur à ressort type NJMR se compose essentiellement: / *The spring distributor valve type NJMR is essentially composed of:*

- d'un corps équipé **(1)** muni d'un siège **(1/2)** et de deux sièges **(1/3) (sauf type 4 et 7)** emmanchés et collés à celui-ci à l'aide de la colle Loctite **Blocpresse 675**, d'une plaque de firme **(42)** fixée par deux clous cannelés **(41)**. Le corps équipé **(1)** est équipé de deux prises de pression pour les distributeurs **type 0,5, 6** et **7**.

- *an equipped body **(1)** provided with a seat **(1/2)** and two seats **(1/3)** **(except type 4 and 7)** assembled and glued this one by means of glue Loctite **Blocpresse 675**, of manufacturer's plate **(42)** secured by two nails **(41)**. The equipped body **(1)** is equipped with two test points for the distributors **type 0,5, 6** and **7**.*

- **(sauf type 4 et 7)** de deux bouchons **(37)** vissés sur le dessus du corps équipé **(1)** sont étanchés chacun par un joint torique **(2)**, permettent de maintenir les deux clapets **(35)** sur les deux sièges **(1/3)** par l'intermédiaire des ressorts **(36)**,

- ***(except type 4 and 7)** two plugs **(37)** screwed on the top of equipped body **(1)** are each tightness by an O-ring **(2)**, allow to maintain two valves **(35)** on the both seats **(1/3)** via the springs **(36)**,*

- d'un bouchon **(3)** vissé sur le dessus du corps équipé **(1)** est étanché par un joint torique **(2)**, permet de maintenir le clapet **(8)** sur le siège **(1/2)** par l'intermédiaire du ressort **(4)**. Un ressort **(7)** en appui sur le siège **(1/2)** et équipé d'une coupelle **(6)** permet de plaquer le joint torique **(5)** sur le clapet **(8)** afin de l'étancher,

- *a plug **(3)** screwed on the top of equipped body **(1)** is sealed by an O-ring **(2)**, allows to maintain the valve **(8)** on the seat **(1/2)** via the spring **(4)**. A spring **(7)** resting on the seat **(1/2)** and equipped with a cupel **(6)** allows to press the O-ring **(5)** on the seat **(8)** in order to seal it,*

- d'une tige creuse **(9)** équipée de deux serres membranes **(15)** et **(A)** est maintenue et guidée dans le corps équipé **(1)** par le siège **(1/2)** et par l'entretoise **(12)**. Elle est guidée aussi par le guide **(10)**,

- *a hollow rod **(9)** equipped with two diaphragm clamps **(15)** and **(A)** are held in place and guided in the equipped body **(1)** by the seat **(1/2)** and the intermediate brace **(12)**. It is also guided by the guide **(10)**,*

- d'une serre membrane **(A)** équipée d'une membrane **(33)**, maintenu et guidé dans le corps équipé **(1)** par l'anneau **(B)** et l'entretoise **(12)**. L'étanchéité entre la serre membrane **(A)** et la tige creuse **(9)** est assurée par un joint torique **(34)**,

- *a diaphragm clamp **(A)** equipped with a diaphragm **(33)**, held in place and guided in the equipped body **(1)** by the ring **(B)** and the brace **(12)**. The tightness between the diaphragm clamp **(A)** and the hollow rod **(9)** is assured by an O-ring **(34)**,*

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– L'étanchéité entre l'entretoise **(12)** et le corps équipé **(1)** est assurée par les joints toriques **(31)** et **(32)**, et entre la tige creuse **(9)** par le joint torique **(29)**,

– *The interface between the brace **(12)** and the equipped body **(1)** is made tight by means of O-rings **(31)** and **(32)**, and between the hollow rod **(9)** by the O-ring **(29)**,*

– d'une serre membrane **(15)** équipée d'une membrane **(30)**, maintenu et guidé dans le corps inférieur **(26)** par l'anneau **(13)** et l'entretoise **(12)**, l'étanchéité sur la tige creuse **(9)** est assurée par un joint torique **(29)**,

– *A diaphragm clamp **(15)** equipped with a diaphragm **(30)**, held in place and guided in the lower body **(26)** by the ring **(13)** and the brace **(12)**, the tightness on the hollow rod **(9)** is assured by an O-ring **(29)**,*

– d'une vis **(25)** équipée d'un écrou **(20)** sur lequel le ressort **(16)** est en appui afin d'exercer un effort sur le serre membrane **(15)** via le guide **(10)**. Le guide **(15)** est arrêté en translation au moyen du circlips **(14)** logé dans la gorge du corps inférieur **(26)**. Le joint torique **(24)** assure l'étanchéité entre la vis **(25)** et le corps inférieur **(26)**,

– *a screw **(25)** equipped with a nut **(20)** on which the spring **(16)** bears to exert a force on the diaphragm clamp **(15)** via the guide **(10)**. The guide **(15)** was arrested in translation through the snap ring **(14)** lodged in the throat of the lower body **(26)**. The O-ring **(24)** provides sealing between the screw **(25)** and lower body **(26)**,*

– d'une vis de réglage **(22)**, équipée d'un guide **(21)**, d'un ressort **(28)**, d'une coupelle **(19)** et d'une bille **(17)** permet d'exercer un effort sur les serres membranes **(A)** et **(15)** via la tige creuse **(9)**. Le joint torique **(23)** assure l'étanchéité entre la vis de réglage **(22)** et la vis **(25)**,

– *a setting screw **(22)** equipped with a guide **(21)**, a spring **(28)**, a cupel **(19)** and a ball **(17)** bellows exert a force on the diaphragm clamps **(A)** and **(15)** via the hollow rod **(9)**. The O-ring **(23)** provides sealing between the setting screw **(22)** and the screw **(25)**,*

– d'un corps inférieur **(26)** équipé de lamages afin de guider la goupille **(18)** et d'assurer un mouvement de translation sur l'écrou **(20)** et le ressort **(16)** lors de la rotation de la vis de réglage **(22)**. Le corps inférieur **(26)** est maintenu sur le corps équipé **(1)** au moyen des quatre rondelles **(39)** et des quatre vis **(40)**.

– *a lower body **(26)** equipped with counterbores to guide the pin **(18)** and provide a translation movement on the nut **(20)** and spring **(16)** during rotation of the setting screw **(22)**. The lower body **(26)** is maintained on the equipped body **(1)** with four washers **(39)** and four screws **(40)**.*

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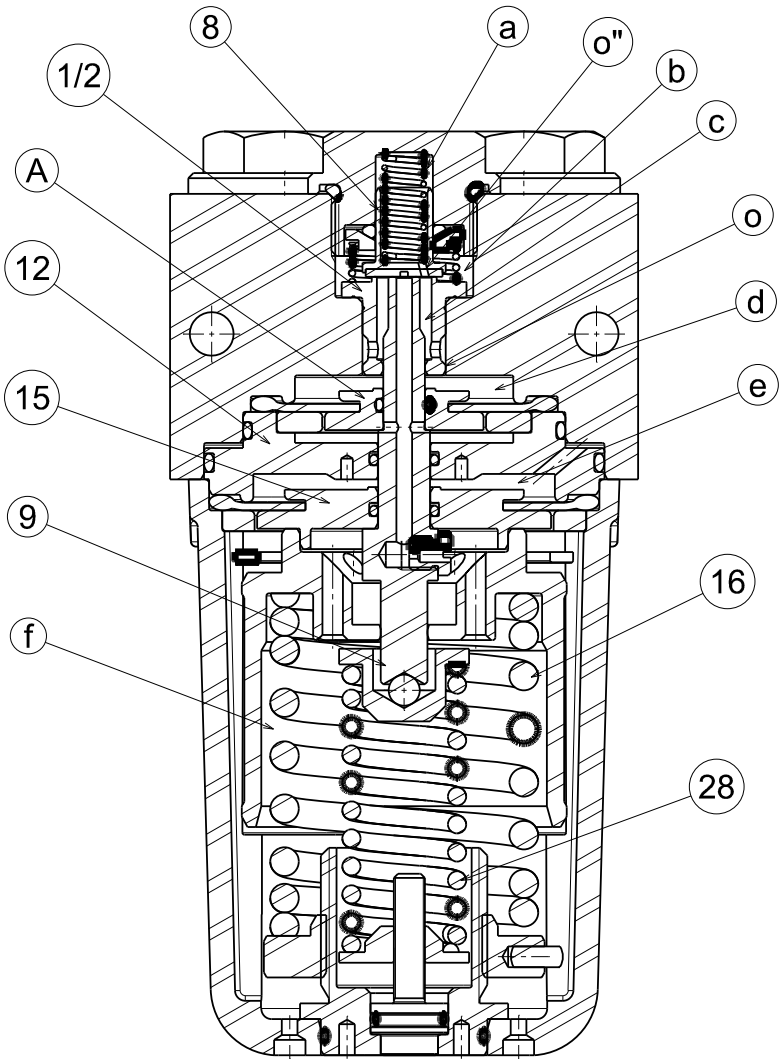
/// 4. FONCTIONNEMENT / *OPERATION* (voir le plan / *see the drawing* N° 728 835 XX X8)



a : Chambre d'équilibre / *Balance chamber.*

b : Chambre du réservoir auxiliaire / *Auxiliary reservoir chamber.*

c : Chambre du cylindre de frein fictif / *Dummy brake cylinder chamber.*

d : Chambre de contre réaction / *Reaction chamber.*

e : Chambre de la conduite générale /*Brake pipe chamber.*

f : Chambre à l'atmosphère / *Atmosphere chamber.*

o : Orifice de contre réaction / *Reaction Choke.*

o'' : Orifice d'équilibre / *Balance Choke.*

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4.1 Distributeur non alimenté / *Distributor not supplied*

Sans air comprimé dans la chambre **(e)** "conduite générale **(CG)**", le serre membrane **(15)** est en buté sur l'entretoise **(12)** sous l'effort du ressort RC **(16)**, le clapet **(8)** "Admission" est ouvert par le siège d'échappement de la tige creuse **(9)** sollicitée vers le haut par le ressort de limitation **(28)**.

*When the supply chamber **(e)** "brake pipe **(BP)**" is not under pressure, the diaphragm clamp **(15)** stumbled in on the brace **(12)** under the force of the spring CR **(16)**, the valve **(8)** "Admission" is held open by the exhaust seat of hollow rod **(9)**, which is itself held up by the limiting pressure spring **(28)**.*

Le serre membrane **(A)** est en position haute, sollicité par la tige creuse **(9)**. Sans air comprimé dans la chambre **(b)** « réservoir auxiliaire **(RA)** », la chambre **(c)** « cylindre de frein fictif **(CFF)** » ainsi que la chambre de contre réaction **(d)** ne sont pas alimentées, la pression est nulle.

*The diagram clamp **(A)** is raised, solicited by the hollow rod **(9)**. Without compressed air in chamber **(b)** "auxiliary reservoir **(AR)**", the chamber **(c)** "dummy brake cylinder **(DBC)**" and the reaction chamber **(d)** are not supplied , the pressure is zero.*

4.2 Armement du frein / *Brake arming* (sauf type 4 et 7 */ except type 4 and 7*)

L'air de la conduite générale **(CG)** ainsi que l'air dans la conduite principale **(CP)** passent directement vers la chambre **(b)** «réservoir auxiliaire **(RA)**» ou via les clapets de retenue **(35)**, s'ils sont présents dans l'appareil.

*The air from the brake pipe **(BP)** and that of the main pipe **(MP)** enter directly into chamber **(b)** "auxiliary reservoir **(AR)**" or via check valves **(35)**, if they are presents in the device.*

De cette chambre **(b)**, d'une part l'air passe par la conduite **(RA)** afin d'alimenter le réservoir auxiliaire **(RA)**, et d'autre part, par le clapet **(8)** ouvert dans la chambre **(c)** permettant d'alimenter le cylindre de frein fictif **(CFF)**, ce qui provoque généralement un serrage des cylindres de frein via un relais (non livré avec le distributeur). / *From this chamber **(b)**, first air through the pipe **(AR)** to supply the auxiliary reservoir **(AR)**, and secondly, by the valve **(8)** open in the chamber **(c)** for feeding the dummy brake cylinder **(DBC)**, which causes generaly an application of brake of brake cylinders via a relay valve (not supplied with the distributor).*

En même temps l'air de la conduite générale **(CG)** pénètre également dans la chambre **(e)**. / *At the same time the brake pipe **(BP)** also enters the chamber **(e)**.*

4.3 Position « Marche » /"*Running" position*

La pression dans la chambre **(c)** « cylindre de frein fictif **(CFF)** » pénètre par l'orifice **(o)** dans la chambre de contre réaction **(d)** et déplace la tige creuse **(9)** via le serre membrane **(A)** vers le bas. Le siège d'échappement de la tige creuse **(9)** n'est plus en contact avec le clapet **(8)**, mettant ainsi le circuit cylindre de frein fictif **(CFF)** à l'atmosphère « chambre **(f)** » via la tige creuse **(9)**.

*The pressure in the chamber **(c)** "dummy brake cylinder **(CFF)**" enters through the choke **(o)** in the reaction chamber **(d)** and moves the hollow rod **(9)** via the diagram clamp **(A)** to the bottom. The seat exhaust the hollow rod **(9)** is no longer in contact with the valve **(8)**, thereby*

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*putting the circuit dummy brake cylinder **(DBC)** in the atmosphere "chamber **(f)**" through the hollow rod **(9)**.*

Lorsque la pression de la conduite générale **(CG)** dans la chambre **(e)** atteint **5 bars** (ou 5.5 bars selon l'application) (pression de régime), cette pression équilibre l'effort du ressort RC **(16)** via le guide **(10)** et l'effort du ressort de limitation **(28)** par l'intermédiaire de la tige creuse **(9)**, de la bille **(17)** et de la coupelle **(19)**. La tige creuse **(9)** étant descendue, le clapet **(8)** en appui sur le siége de clapet **(1/2)** ferme l'admission de la chambre **(c)**.

*When the brake pipe **(BP)** pressure in chamber **(e)** reaches **5 bar** (or 5.5 bars according to application) (running pressure), it balances the load applied by RC spring **(16)** via the guide **(10)** and the load applied by limiting pressure spring **(28)** by intermediately of hollow rod **(9)**, of ball **(17)** and of cupel **(19)**. The hollow rod **(9)** is lowered, the valve **(8)** in support on the seat valve **(1/2)** closes the inlet of the chamber **(c)**.*

Donc lorsque la pression dans la conduite générale **(CG)** atteint **5 bars** (ou 5.5 bars selon l'application), les cylindres de frein sont généralement desserrés via un relais (non livré avec le distributeur).

*Therefore, when the brake pipe **(BP)** pressure reaches **5 bar** (or 5.5 bars according to application), the brake cylinders are generaly released via a relay valve (not supplied with the distributor).*

4.4 Serrage gradué / *Gradual brake application*

Lorsque l'on effectue une chute de pression d'au moins égale à la pression de départ de serrage soit **4,7 ± 0.1 bars** dans la conduite générale **(CG)**, donc dans la chambre **(e)**, l'effort du ressort RC **(16)** devient prépondérant à celui dans la chambre **(e)**. Le serre membrane **(15)** se déplace vers le haut, le ressort de limitation **(28)** via la coupelle **(19)** et la bille **(17)** pousse la tige creuse **(9)** vers le haut.

*When the brake pipe **(BP)** pressure drop of at least **4,7 ± 0.1 bar**, this pressure also drops in chamber **(e)**, the load of the RC spring **(16)** overcomes the pressure in chamber **(e)**. the diaphragm clamp **(15)** moves up, the limiting pressure **(28)** via the cupel **(19)** and the ball **(17)** pushes the hollow rod **(9)** up.*

Le siège d'échappement de la tige creuse **(9)** vient en en contact avec le clapet **(8)**, celui-ci se soulève, le clapet d'admission est ouvert. L'air du réservoir auxiliaire **(RA)** pénètre, dans la chambre **(b)**, dans la chambre **(c)** ainsi que dans le circuit cylindre de frein fictif **(CFF)**. Un freinage apparaît aux cylindres de frein.

*The seat exhaust the hollow rod **(9)** comes into contact with the valve **(8)**, it rises, the intake valve is open. The air auxiliary reservoir **(AR)** enters in the chamber **(b)**, in the chamber **(c)** and in the circuit dummy brake cylinder **(DBC)**. A brake is to brake cylinders.*

Par l'orifice **(o)** l'air pénètre également dans la chambre de contre réaction **(d)** et sollicite la tige creuse **(9)** vers le bas via le serre membrane **(A)**. lorsque les efforts s'exerçant sur le ressort de limitation **(28)** s'équilibrent, la clapet **(8)** d'admission se ferme sans ouvrir celui d'échappement. De cette manière la pression au cylindre de frein fictif est déterminée par la pression dans la conduite générale **(CG)**.

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*Via choke **(o)**, the air also enters into reaction chamber **(d)** and pushes the hollow rod **(9)** down via the diaphragm clamp **(A)**. when the loads applied on the limiting pressure **(28)** balance out, the inlet valve **(8)** closes without opening the outlet valve. In this manner, the pressure in the dummy brake cylinder is determined by the depression in brake pipe **(BP)**.*

En même temps la pression s'établit via l'orifice **(o'')** dans la chambre d'équilibre **(a)** et agit sur la section supérieure du clapet **(8)** afin de maintenir son équilibre. / *At the same time the pressure builds up in chamber balance **(a)** via the choke **(o'')** and acts on the upper section of the valve **(8)** to maintain its balance.*

Pendant le serrage, le réservoir auxiliaire **(RA)** continu à être alimenté par la chambre **(b)**. / *While the braking load is being applied, the auxiliary reservoir **(AR)** continues to be fed chamber **(b)**.*

4.5 Serrage maximal / *Full brake application*

Le serrage maximal est obtenu lorsque la dépression dans la conduite générale **(CG)** atteint **3,5 ± 0,1 bars**. En effet pour cette valeur de dépression, l'effort sur la tige creuse **(9)** exercé par le serre membrane **(A)** devient égale à l'effort du ressort de limitation **(28)**.

*To full brake application is obtained when the brake pipe **(BP)** depression reaches approximately **3,5 ± 0,1 bar**. Indeed, at this depression level, the load on the hollow rod **(9)** exercised by the diaphragm clamp **(A)** becomes equal to the load of the pressure limiting spring **(28)**.*

La pression dans le cylindre de frein fictif s'équilibre à la pression maximale. / *The pressure in the dummy drake cylinder equilibrates to the maximum pressure*.

Si la pression dans la conduite générale **(CG)** continue à baisser, par exemple lors d'un freinage d'urgence, où la pression tombe à zéro, le serre membrane **(15)** se décolle de la butée de la tige creuse **(9)**, coulisse sur celle-ci jusqu'à ce que ce dernier vienne en butée sur l'entretoise **(12)** solidaire du corps.

*If the pressure in the brake pipe **(BP)** continues to drop, as for example during emergency braking when the pressure drops to zero, the diaphragm clamp **(15)** separates from stop of hollow rod **(9)**, sliding on it until it comes into abutment on the brace **(12)** secured to the body.*

A partir de ce moment, c'est l'effort invariable du ressort de limitation **(28)** qui agit sur la tige creuse **(9)**. C'est donc ce ressort qui détermine la limite de la pression au cylindre de frein fictif.

*From then on, it is the unchanging load of the limiting spring **(28)** which bears on the hollow rod **(9)**. It is therefore this spring which determines the limit of the dummy brake cylinder pressure.*

La pression dans le cylindre de frein fictif s'équilibre à la pression maximale. / *The pressure in the dummy drake cylinder equilibrates to the maximum pressure*.

4.6 Desserrage gradué / *Gradual brake release*

Pour obtenir un desserrage il suffit d'augmenter la pression dans la conduite générale **(CG)**. Le desserrage commence lorsque la pression dans cette conduite monte au dessus de **3,5 bars** (pression serrage à fond). Il est gradué jusqu'au desserrage complet, qui survient à **4,85 bars**.

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*To release the brake, it is therefore necessary to increase the pressure in the brake pipe **(BP)**. The brake release starts when the brake pipe pressure rises above **3,5 bar** (pressure of max BC). The action is gradual up to full release which occurs at **4,85 bar**.*

La pression dans la chambre **(e)** « conduite générale **(CG)** » déplace la tige creuse **(9)** via le serre membrane **(15)** vers la bas. Le siège d'échappement de la tige creuse **(9)** n'est plus en contact avec le clapet **(8)**, mettant ainsi le circuit cylindre de frein fictif **(CFF)** à l'atmosphère « chambre **(f)** » via la tige creuse **(9)**. Pour une pression **(CG)** de **5 bars**, le guide **(10)** poussé par le serre membrane **(15)** vient en butée mécanique sur le corps inférieur **(26)**.

*The pressure in the chamber **(e)** "conduite générale **(BP)**" and moves the hollow rod **(9)** via the diagram clamp **(15)** to the bottom. The seat exhaust the hollow rod **(9)** is no longer in contact with the valve **(8)**, thereby putting the circuit dummy brake cylinder **(DBC)** in the atmosphere "chamber **(f)**" through the hollow rod **(9)**. For a **(BP)** pressure of **5 bar**, the guide **(10)** pushed by diagram clamp **(15)** comes in mechanical stop on the lower body **(26)**.*

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/// 5. ENTRETIEN / *MAINTENANCE* (Voir le plan / *See the drawing* N° 728 835 XX X8)

5.1 Précautions environnementales / *Environmental precautions*

Les pièces en élastomère, les chiffons et papiers gras étant des déchets de catégorie DIS (déchets industriels souillés) doivent être triées conformément à la réglementation sur le tri des déchets du pays concerné et jetées dans la poubelle appropriée.

The elastomer parts, fatty rags and papers being waste of category SIW (Soiled Industrial Waste) must be sorted in accordance with the regulation on the sorting of waste of the country concerned and be thrown in the suitable dustbin.

Les pièces métalliques pouvant être valorisées par recyclage ou récupération seront rebutées dans la benne appropriée. / *The metal parts being able to be developed by recycling or recovery will be rejected in the suitable bucket.*

5.2 Entretien courant / *Servicing*

Le distributeur à ressort type NJMR ne nécessite aucun entretien courant ni de graissage périodique. Néanmoins si lors d'une intervention ponctuelle, le distributeur à ressort type NJMR est démontée, procéder au nettoyage et à l'examen des élastomères:

The spring distributor valve type NJMR does not require any servicing or periodic lubrication. Nevertheless, during a punctual intervention, if the spring distributor valve type NJMR is disassembled, it should be cleaned and the elastomer parts should be inspected:

Les joints toriques seront extraits au moyen d'une spatule en bakélite. / *The O-rings will be extracted using a spatula Bakelite.*

- Essuyer les pièces en élastomère avec un chiffon sec non pelucheux au besoin imbibé d'essence minérale, / *Clean the elastomeric parts with a dry lint-free cloth, soaked in mineral solvent if necessary,*

- Examiner que les membranes **(30)** et **(33)** aient conservé leur souplesse et ne présentent pas de craquelure. **Auquel cas les rebuter**, / *Check that the diaphragms **(30)** and **(33)** have conserved its suppleness and do not present any cracking. **If such were the case, replace them**,*

- Examiner que les joints toriques dynamiques ou statiques **(2)**, **(5)**, **(23)**, **(24)**, **(29)**, **(31)**, **(32)**, **(34)** et **(38)** ne présentent pas d'usure anormale ou d'arrachement de matière ou de méplat. **Auquel cas les rebuter**, / *Check that the dynamic or static O-rings **(2)**, **(5)**, **(23)**, **(24)**, **(29)**, **(31)**, **(32)**, **(34)** and **(38)** do not show signs of excessive flats or indents. **If such were the case, scrap then**,*

- Examiner que le clapet **(8)** ne présente pas d'empreinte trop prononcée du siège **(1/2)** ou de la tige creuse **(9). Auquel cas le rebuter**. / *To examine that the valve **(8)** does not present a too marked print of the seat **(1/2)** or a hollow rod **(9)**. **If such were the case, replace it**.*

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Avant le remontage, procéder au graissage comme défini la consigne de montage « **CM n° 3056 / SNCF 10-9050 637** ». / *Before the re-assembly, perform the lubrication as defined in the « **CM n °E 3056** » assembly instruction.*

5.3 Révision générale / *General overhaul*

Faire un contrôle fonctionnel et une révision générale comme prévu dans le plan de maintenance du projet. S'il n'y a pas de plan de maintenance pour le projet, respecter les périodicités ci-dessous. / ***Make a functional check and a general overhaul*** *as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below***.**

Lors des révisions générales, que nous conseillons tous les **cinq ans ou 800 000 km, au premier des deux termes échu**, le distributeur à ressort type NJMR sera déposé pour démontage, nettoyage, examen et remplacement des pièces d'usure.

*During the general overhaul, which is recommended at intervals of **five years or 800 000 km, at the first of the two terms expired,** the spring distributor valve type NJMR should be removed for disassembly, cleaning, checking and replacement of wear parts.*

L'exploitant peut adapter cette périodicité selon son expérience propre et sous sa responsabilité./ *The owner can adapt this periodicity according to its own experiment and under its responsibility.*

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5.3.1 Dépose / *Removal*

Prendre la précaution d'isoler le panneau ou le support avant d'intervenir sur le distributeur à ressort type NJMR. / *Take care to isolate the panel or the bracket before intervening on the spring distributor valve type NJMR.*

Avant la dépose du distributeur à ressort type NJMR, s'assurer de : / *Before the removal of spring distributor valve type NJMR, ensure itself of:*

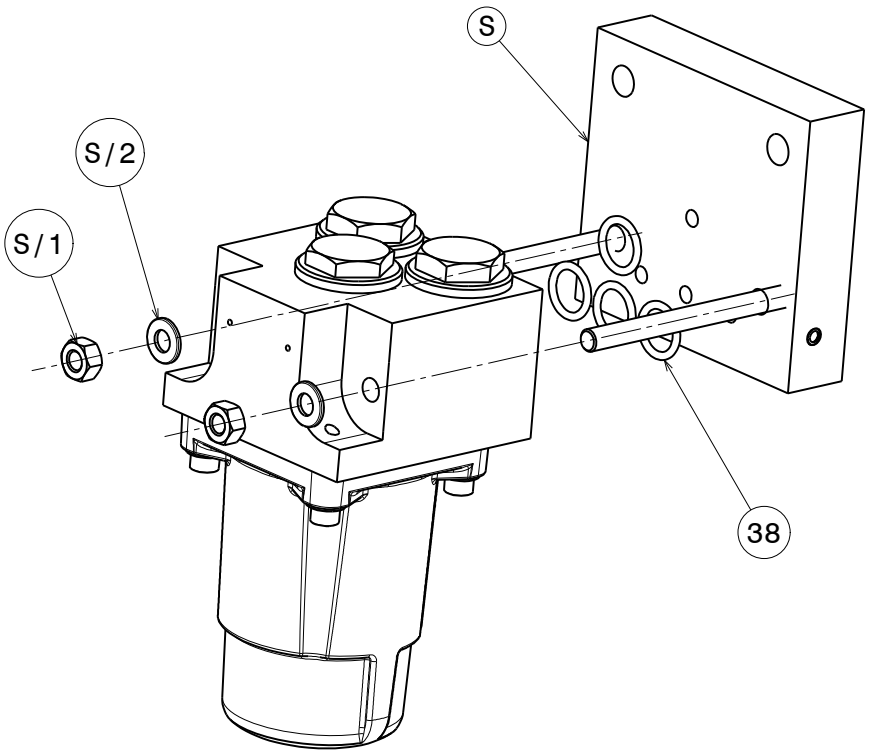
- l'absence de pression résiduelle dans les conduites pneumatiques ou au sein du panneau ou du support, / *the absence of residual pressure in the pneumatic pipes or within the panel or bracket,*

- la propreté de l'environnement (essuyer le panneau ou le support avec un chiffon imbibé d'un solvant de nettoyage agréé) du distributeur à ressort type NJMR avant la dépose, / *the environment cleanness (wipe the panel or the bracket with a rag soaked with an approved cleaning solvant) of spring distributor valve type NJMR before removal,*

5.3.1.1 Distributeurs / *Distributors* 728 835 .. 08, 728 835 .. 28, 728 835 .. 38, 728 835 .. 48, 728 835 .. 58, 728 835 .. 68, FT0120345-100, FT0120345-101 et / *and* FT0120345-102.

Desserrer et ôter les écrous **(S/1)** de fixation, ôter et rebuter les rondelles **(S/2)**, déposer du support **(S)** ou du panneau, le distributeur à ressort type NJMR. / *Loosen and remove the fastening nuts **(S/1)**, remove and scrap the washers **(S/2)**, from bracket **(S)** or panel remove the spring distributor valve type NJMR.*

Déposer et rebuter les quatre joints **(38)** d'interface du distributeur. / *Remove and scrap the four interface seal **(38)** of distributor.*



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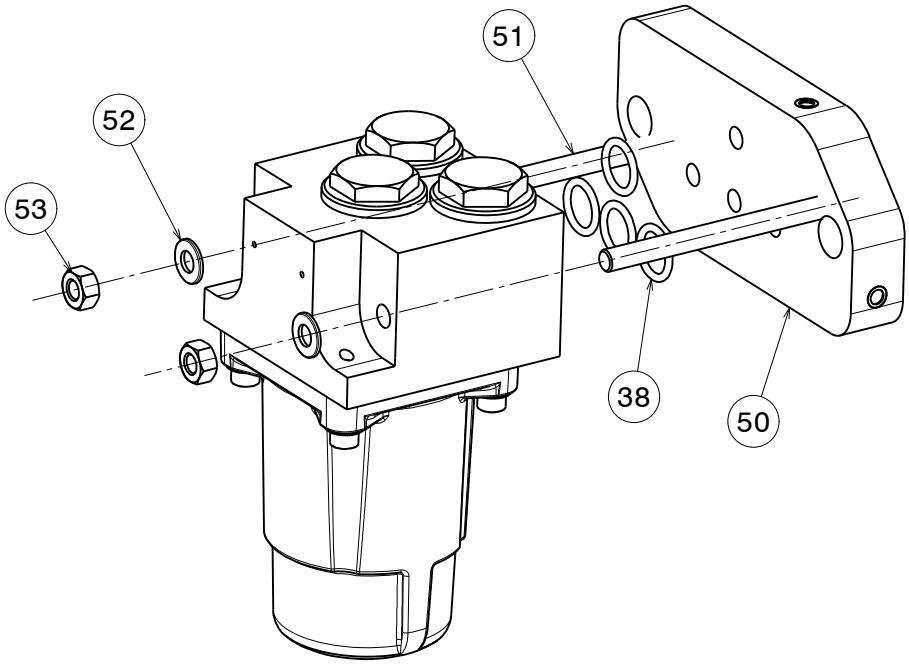
5.3.1.1 Distributeurs / *Distributors* 728 835 .. 18

Desserrer et ôter les écrous **(53)** de fixation, ôter et rebuter les rondelles **(52)**, déposer de la bride **(50)**, le distributeur à ressort type NJMR.

*Loosen and remove the fastening nuts **(53)**, remove and scrap the washers **(52)**, from flange **(50)** remove the spring distributor valve type NJMR.*

Déposer et rebuter les quatre joints **(38)** d'interface du distributeur. / *Remove and scrap the four interface seal **(38)** of distributor.*



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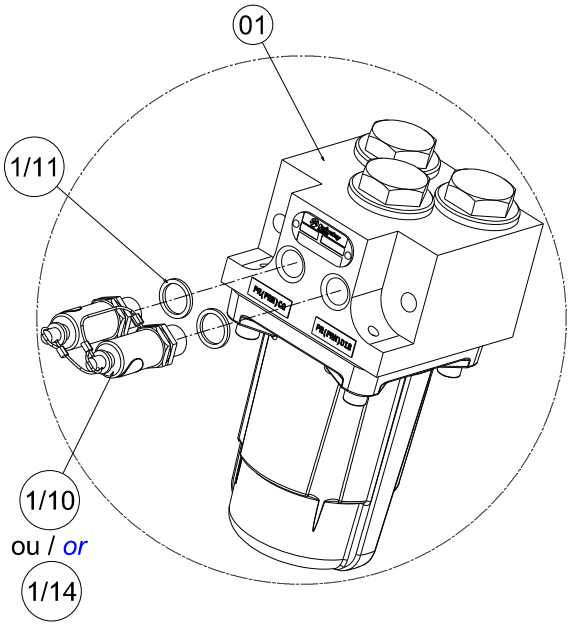
5.3.2 Démontage / *Disassembly*

5.3.2.1 Prises de pression / *Test points*



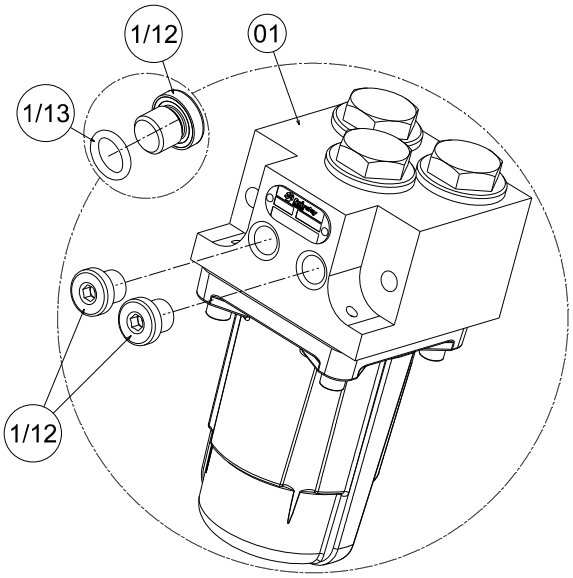
Pour les distributeurs **type 0, 5, 6** et **7**:

desserrer et déposer les deux prises de pression **(1/10)** ou **(1/14)** et rebuter les joints plats **(1/11)**.

*For distributors **type 0, 5, 6** and **7**:*

*Loosen and remove the two test points **(1/10)** or **(1/14)** and scrap flat seals **(1/11)**.*

Nota / *Note*: Il n'est pas nécessaire de déposer les prises de pression sauf en cas d'avarie de celles-ci. / *It is not necessary to remove the test points except in case of damage to them.*



Dans le cas des distributeurs **type 3** :

Desserrer et déposer les deux bouchons G1/4' **(1/12)**, puis ôter et rebuter les joints toriques **(1/13)**.

*For distributors **type 3**:*

*Loosen and remove the two plugs G1/4' **(1/12)**, then withdraw and scrap O-rings **(1/13)**.*

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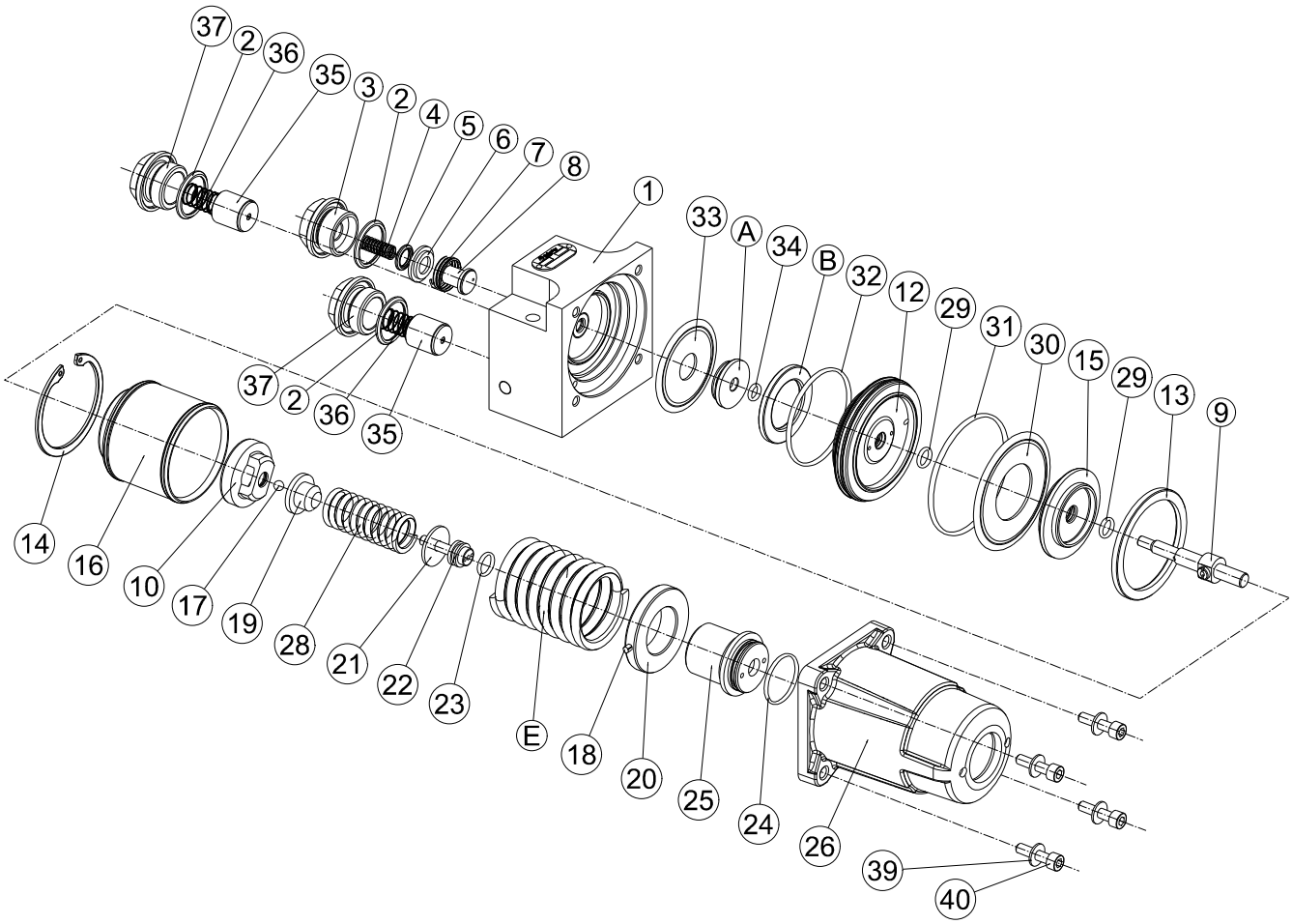
- **Première génération / *First generation***:



(sauf type 4) A l'aide d'une clé plate de 27 mm dévisser et déposer du corps équipé **(1)**, les deux bouchons **(37)**, rebuter les joints toriques **(2)** puis déposer les ressorts **(36)** et les clapets **(35)**.

***(except type 4)** Unscrew and remove by means of flat spanner of 27 mm two plugs **(37)**, scrap the O-rings **(2)** then remove the springs **(36)** and the valves **(35)** of equipped body **(1)**.*

En utilisant une clé 6 pans, dévisser et déposer du corps équipé **(1)**, les quatre vis **(40)**, déposer les rondelles **(39)** ainsi que le corps inférieur **(26)** équipé.

*Using a 6 pans spanner, unscrew and remove, four screws **(40)**, remove the washers **(39)** and the lower body **(26)** fitted of equipped body **(1)**.*

Extraire l'anneau **(13)** du corps inférieur **(26)**, / *From the lower body **(26)**, extract the ring **(13)**,*

Positionner le corps inférieur **(26)** sur une presse de façon à exercer un effort sur le guide **(16)**. Puis à l'aide d'une pince à circlips, extraire l'anneau élastique **(14)**. Relâcher doucement la presse et déposer, l'anneau élastique **(14)**, le guide **(16)**, le guide **(10)**, le ressort RC **(E)**, la coupelle **(19)** avec la bille **(17)** et le ressort de limitation **(28)**.

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*Position the lower body **(26)** on a press so as to exert a force on the guide **(16)**. Then by means of retaining ring pliers, extract the elastic ring **(14)**. Release slowly the press and remove, the elastic ring **(14)**, the guide **(16)**, the guide **(10)**, the CR spring **(E)**, the cupel **(19)** with the ball **(17)** and the limiting spring **(28)**,*

Exercer une pression sur la tête de vis **(25)** afin de la déposer du corps inférieur **(26)**, dévisser l'écrou **(20)** équipé de la goupille **(18)** et rebuter le joint torique **(24)**.

*Put pressure on the head of the screw **(25)** in order to remove it from the lower body **(26)**, unscrew and remove the nut **(20)** equiped with the pin **(18)** and scrap the O-ring **(24)**.*

Exercer une pression sur la tête de vis de réglage **(22)** afin de l'extraire de la vis **(25)**, dévisser le guide **(21)** et rebuter le joint torique **(23)**. / *Put pressure on the head of setting screw **(22)** in order to extract it of screw **(25)**, unscrew the guide **(21)** and scrape the O-ring **(23)**.*

Extraire l'ensemble (tige creuse **(9)** + serres membranes **(A)** et **(15)**) du corps équipé **(1)** en alimentant en air la chambre **(d)** via l'orifice pilote à l'aide d'une soufflette.

*From equipped body **(1)**, extract unit (hollow rod **(9)** + diaphragm clamps **(A)** and **(15)**) in supplying with air in the chamber **(d)** by means of air gun via the choke pilot.*

Déposer la tige creuse **(9)** afin de séparer, le premier serre membrane **(15)**, l'entretoise **(12)**, le second serre membrane **(A)** et l'anneau **(B)**. Puis extraire et rebuter les joints toriques **(29)**, **(31)**, **(32)** et **(34)** ainsi que les membranes **(30)** et **(33)**.

*Remove the hollow rod **(9)** in order to separate, the first diaphragm clamp **(15)**, the brace **(12)**, the second diaphragm clamp **(A)** and the ring **(B)**. Then extract and scrap the O-rings **(29)**, **(31)**, **(32)** and **(34)** so as the diaphragms **(30)** and **(33)**.*

A l'aide d'une clé plate de 27 mm dévisser et déposer du corps équipé **(1)**, le bouchon **(3)**, rebuter le joint torique **(2)** puis déposer le ressort **(4)**, le joint torique **(5)** et le rebuter, la coupelle **(6)**, le ressort **(7)** et le clapet **(8)**.

*Unscrew and remove by means of flat spanner of 27 mm the plug **(3)**, scrap the O-ring **(2)** then remove the spring **(4)**, the O-ring **(5)** and scrap it, the cupel **(6)**, the spring **(7)** and the valve **(8)** of equipped body **(1)**.*

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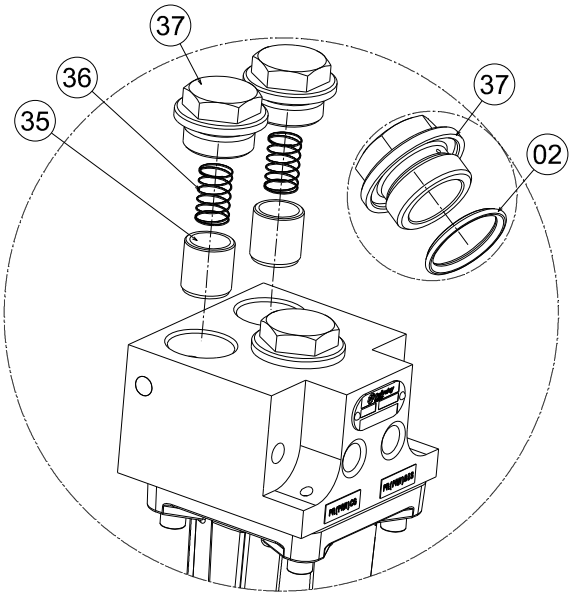
- **Deuxième génération / *Second generation***:

5.3.2.2 Clapets / *Valves*



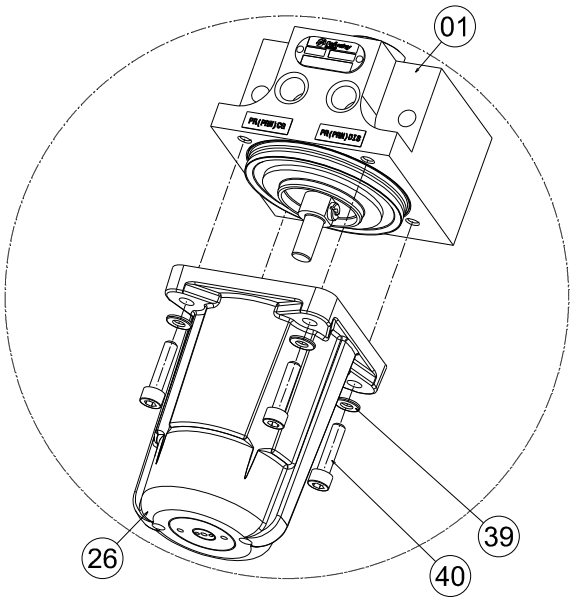
sauf type 4 et 7 :

Desserrer et déposer les deux bouchons **(37)**, retirer les ressorts **(36)** et les clapets **(35)**. Oter et rebuter les joints toriques **(02)**.

***except type 4 and 7**:*

*Loosen and remove the two plugs **(37)**, take out springs **(36)** and valves **(35)**. Withdraw and scrap O-rings **(02)**.*

5.3.2.3 Corps inférieur / *Lower body*



Dévisser et déposer les quatre vis **(40)**, rebuter les rondelles **(39)** et démonter le corps équipé **(1)** du corps inférieur **(26)**.

*Unscrew and remove the four screws **(40)**, discard washers **(39)** and dismantle the equipped body **(1)** from the lower body **(26)**.*

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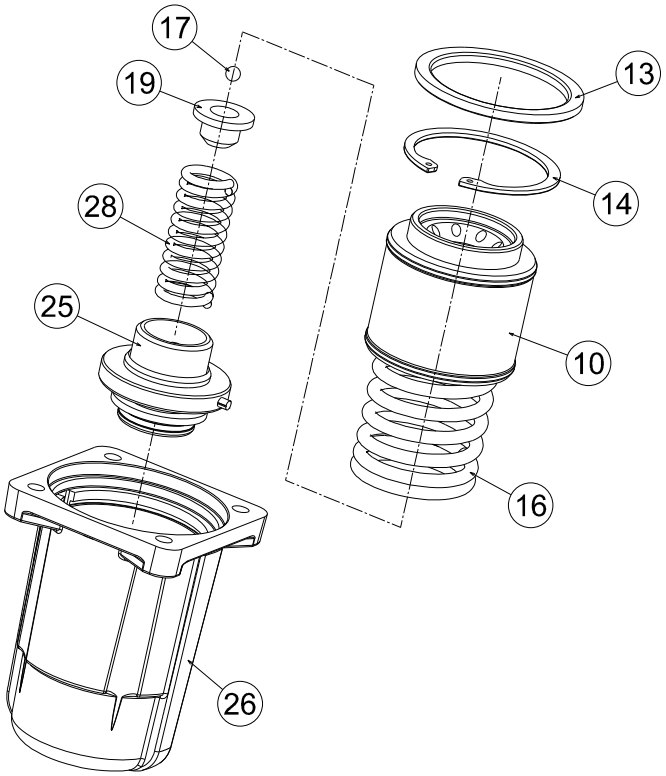

Extraire l'anneau **(13)** du corps inférieur **(26)**, / *From the lower body **(26)**, extract the ring **(13)**,*

Positionner le corps inférieur **(26)** sur une presse de façon à exercer un effort sur le guide **(10)**. Puis à l'aide d'une pince à circlips, extraire l'anneau élastique **(14)**. Relâcher doucement la presse et déposer, l'anneau élastique **(14)**, le guide **(10)**, le ressort RC **(16)**, la coupelle **(19)** avec la bille **(17)** et le ressort de limitation **(28)**.

*Position the lower body **(26)** on a press so as to exert a force on the guide **(10)**. Then by means of retaining ring pliers, extract the elastic ring **(14)**. Release slowly the press and remove, the elastic ring **(14)**, the guide **(10)**, the CR spring **(16)**, the cupel **(19)** with the ball **(17)** and the limiting spring **(28)**,*

Exercer une pression sur la tête de vis **(25)** afin de la déposer du corps inférieur **(26)**. / *Put pressure on the head of the screw **(25)** in order to remove it from the lower body **(26)**.*

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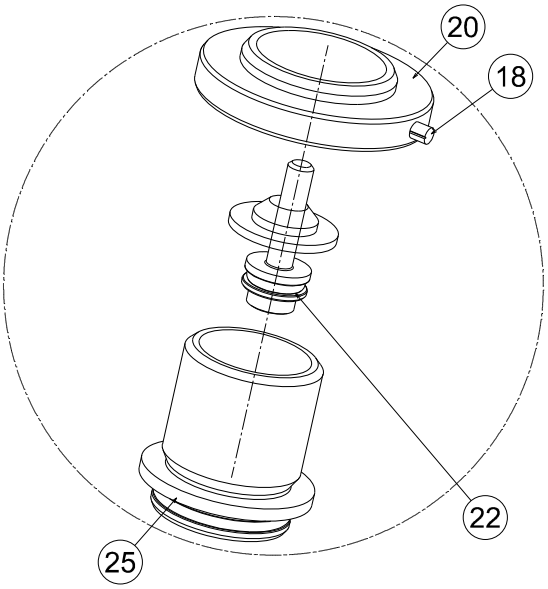
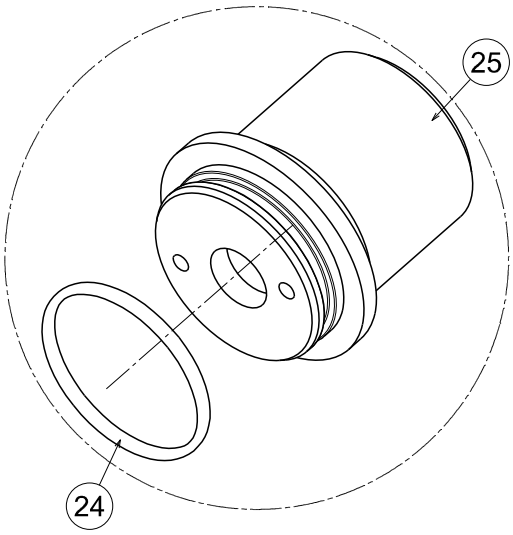
Dévisser l'écrou de réglage **(20)** équipé de la goupille **(18)** de la vis de réglage **(25)**,

*Unscrew and remove the adjusting nut **(20)** equiped with the pin **(18)** from the adjusting screw **(25)**,*

Exercer une pression sur la tête de vis de réglage **(22)** afin de l'extraire de la vis **(25)**.

*Put pressure on the head of setting screw **(22)** in order to extract it of screw **(25)**.*



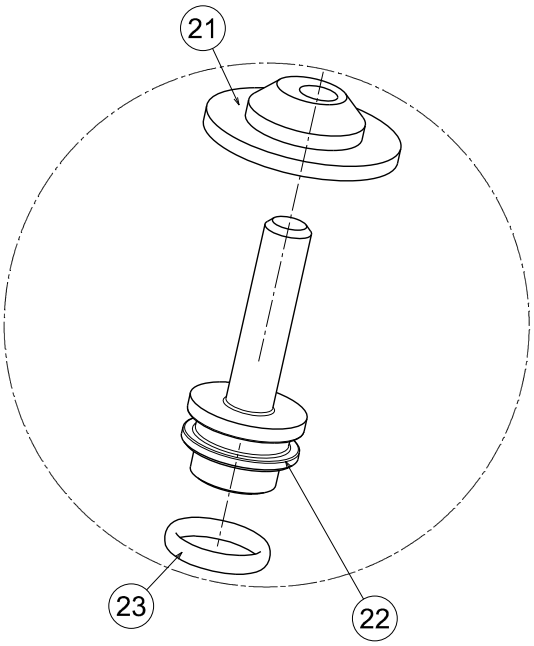


Extraire le joint torique **(24)** de la vis **(25)**.

*Extract the O-ring **(24)** from the screw **(25)**.*

Dévisser le guide **(21)** et rebuter le joint torique **(23)** de la vis de réglage **(22)**.

*Unscrew the guide **(21)** and scrap the O-ring **(23)** from the setting screw **(22)**.*



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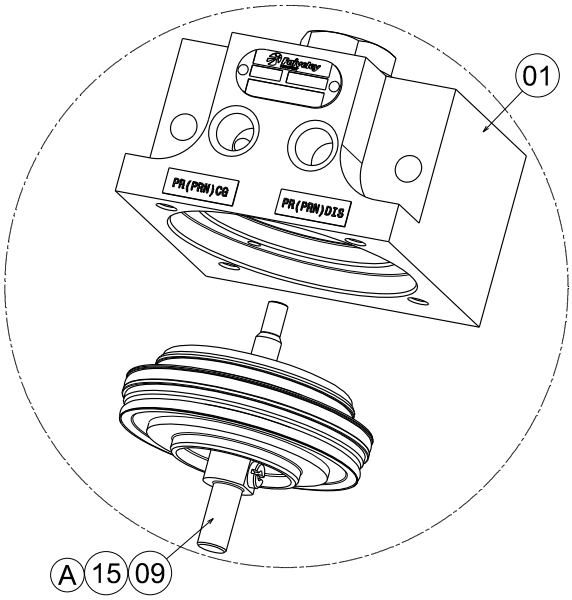
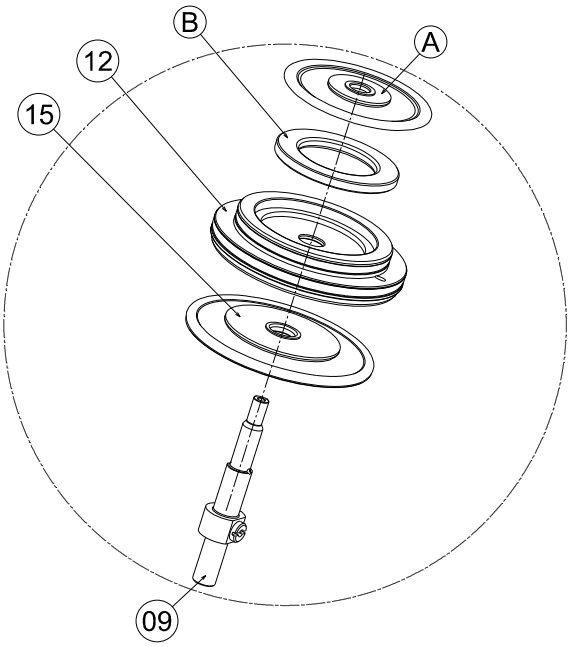
5.3.2.4 Corps équipé / *Equipped body*

Extraire l'ensemble (tige creuse **(9)** + serres membranes **(A)** et **(15)**) du corps équipé **(1)** en alimentant en air la chambre **(d)** via l'orifice pilote à l'aide d'une soufflette.

*From equipped body **(1)**, extract unit (hollow rod **(9)** + diaphragm clamps **(A)** and **(15)**) in supplying with air in the chamber **(d)** by means of air gun via the choke pilot.*





Déposer la tige creuse **(9)** afin de séparer, le premier serre membrane **(15)**, l'entretoise **(12)**, le second serre membrane **(A)** et l'anneau **(B)**.

*Remove the hollow rod **(9)** in order to separate, the first diaphragm clamp **(15)**, the brace **(12)**, the second diaphragm clamp **(A)** and the ring **(B)**.*

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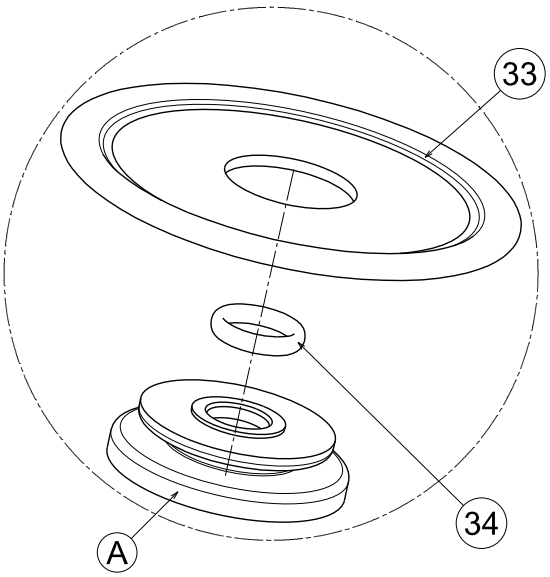
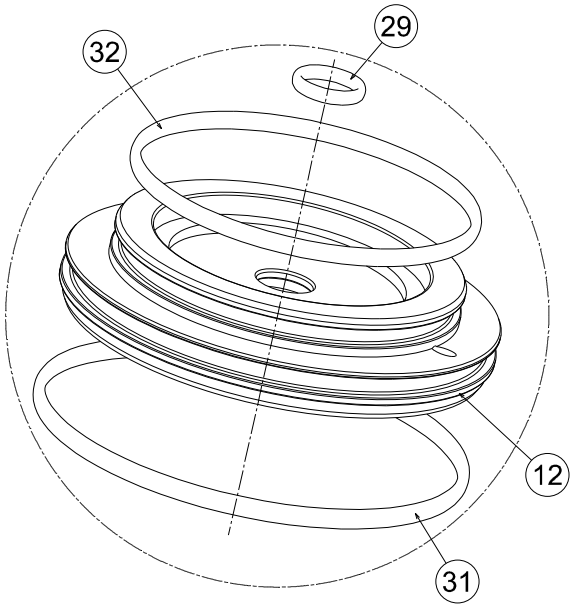


Extraire la membrane **(33)** et le joint torique **(34)** du serre membrane **(A)**.

*Extract the diaphragm **(33)** and the O-ring **(34)** from the diaphragm clamp **(A)**.*

Extraire les joints toriques **(29)**, **(31)** et **(32)** de l'entretoise **(12)**.

*Extract O-rings **(29)**, **(31)** and **(32)** from the brace **(12)**.*



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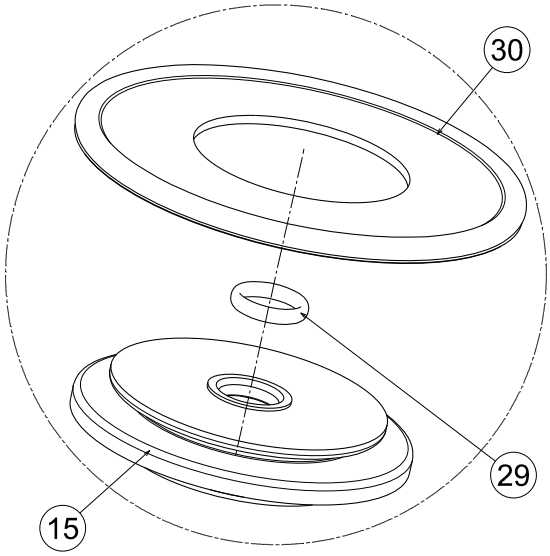
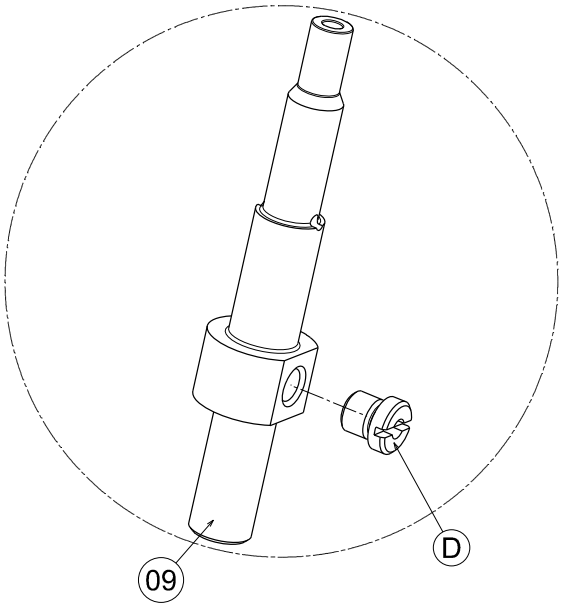


Extraire la membrane **(30)** et le joint torique **(29)** du serre membrane **(15)**.

*Extract the diaphragm **(30)** and the O-ring **(29)** from the diaphragm clamp **(15)**.*

Dévisser et déposer l'orifice de desserrage **(D)** de la tige creuse **(9)**.

*Unscrew and remove the release chocke **(D)** from the hollow rod **(9)**.*



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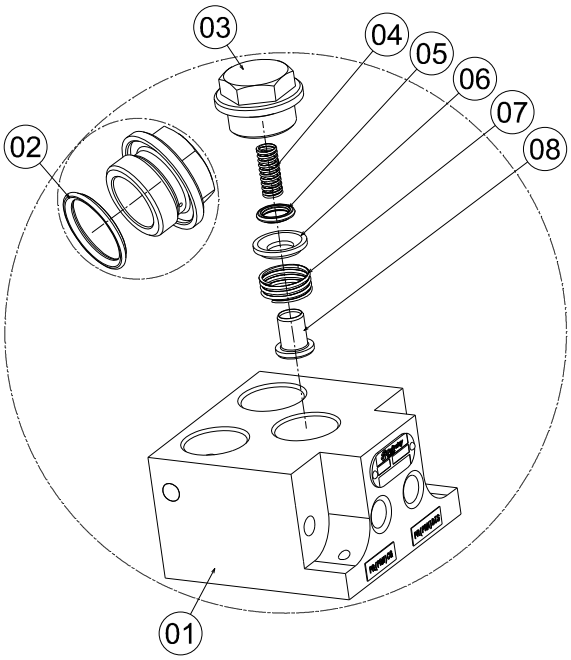
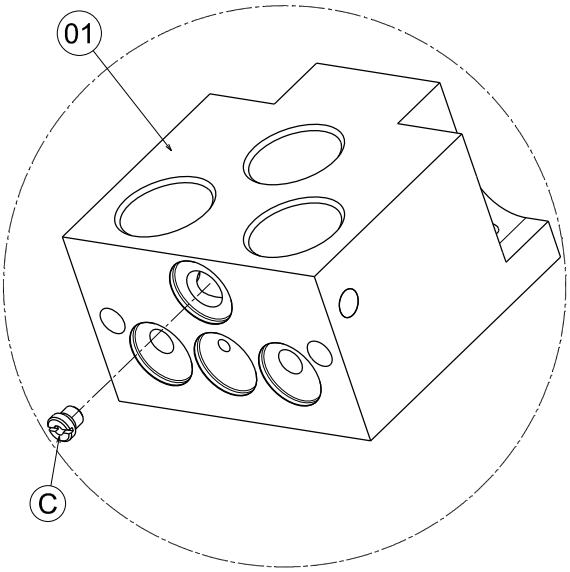


Desserrer et déposer le bouchon guide **(3)**, puis retirer le ressort **(4)**, le joint torique **(5)**, la coupelle **(6)**, le ressort **(7)** et le clapet adherisé **(8)**. Oter et rebuter le joint torique **(2)** du bouchon **(3)**.

*Loosen and remove the guide plug **(3)**, then take out the spring **(4)**, O-ring **(5)**, cupel **(6)**, spring **(7)** and rubber bonded valve **(8)**. Withdraw and scrap the O-ring **(2)** from the plug **(3)**.*

Dévisser et déposer l'orifice de serrage **(C)** du corps équipé **(1)**.

*Unscrew and remove the filling chocke **(C)** from equipped body **(1)**.*



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5.3.3 Nettoyage / *Cleaning*

Utiliser les protections réglementaires aux normes en vigueur pour les produits dangereux. / *When using dangerous products, observe the local workshop regulations in force.*

Nettoyer toutes les pièces métalliques à l'aide d'un solvant de nettoyage agréé et les souffler avec un jet d'air comprimé sec. / *Clean all metal parts with an approved cleaning solvent. Blow them with dry compressed air.*

5.3.4 Examen / *Check*

Examiner et contrôler les pièces de **type BB ou BC** (voir les plans joints).

*Inspect and check the parts **type BB, BC (See assembly drawing)**.*

Examiner que les pièces à frottement métal-métal ne présentent pas de trace de grippage. **Auquel cas les rebuter**. / *Check that the parts with friction metal-metal do not present a trace of corrosion, **If such were the case, scrap them**.*

Les faces d'appui des ressorts **(16)** et **(28)** ne doivent pas présenter de trace de corrosion, examiner l'aspect géométrique des ressorts, ceux-ci ne doivent pas être déformés. **Auquel cas les rebuter**.

*Springs **(16)** and **(28)** resting surfaces must be devoid of any corrosion; check spring geometrical aspect as the springs must comport no deformation. **If such were the case, scrap them**.*

Examiner que les orifices **(o)** et **(o'')** ne soient pas obstrués, **Auquel cas les nettoyer**. / *Check that the hole of the chokes **(o)** and **(o'')** are not blocked, **If such were the case, clean them**.*

Examiner que la portée des sièges **(1/2)** et **(1/3)** ne présente pas d'empreinte trop prononcée ou de rayure. **Auquel cas rebuter le corps équipé (1)**.

*Check that the scope of the seat **(1/2)** and **(1/3)** does not show signs of excessive indents or scratch. **If such were the case, scrap the equipped body (1)**.*

5.3.5 Graissage / *Lubrication*

Avant le remontage, procéder au graissage comme défini la consigne de montage « **CM n° 3056 / SNCF 10-9050 637** ». / *Before the re-assembly, perform the lubrication in accordance with the assembly instruction « **CM n° E 3056** ».*

5.3.6 Remontage / *Re-assembly*

Lors des révisions générales, nous conseillons le remplacement systématique de tous les élastomères, pièces de **type AA ou AC** voir le plan « **N° 728 835 xx x8** ».

*During general overhaul operations, it is recommended to systematically replace all elastomer parts, parts **type AA, AC**, see assembly drawing **N° 728 835 xx x8**.*

Respecter les valeurs de couple de serrage définies dans la consigne de montage « **CM n° 3079 / SNCF 10-9006 441** ». / *Comply with the tightening torque values defined in Assembly Instruction **CM n° E 3079**.*

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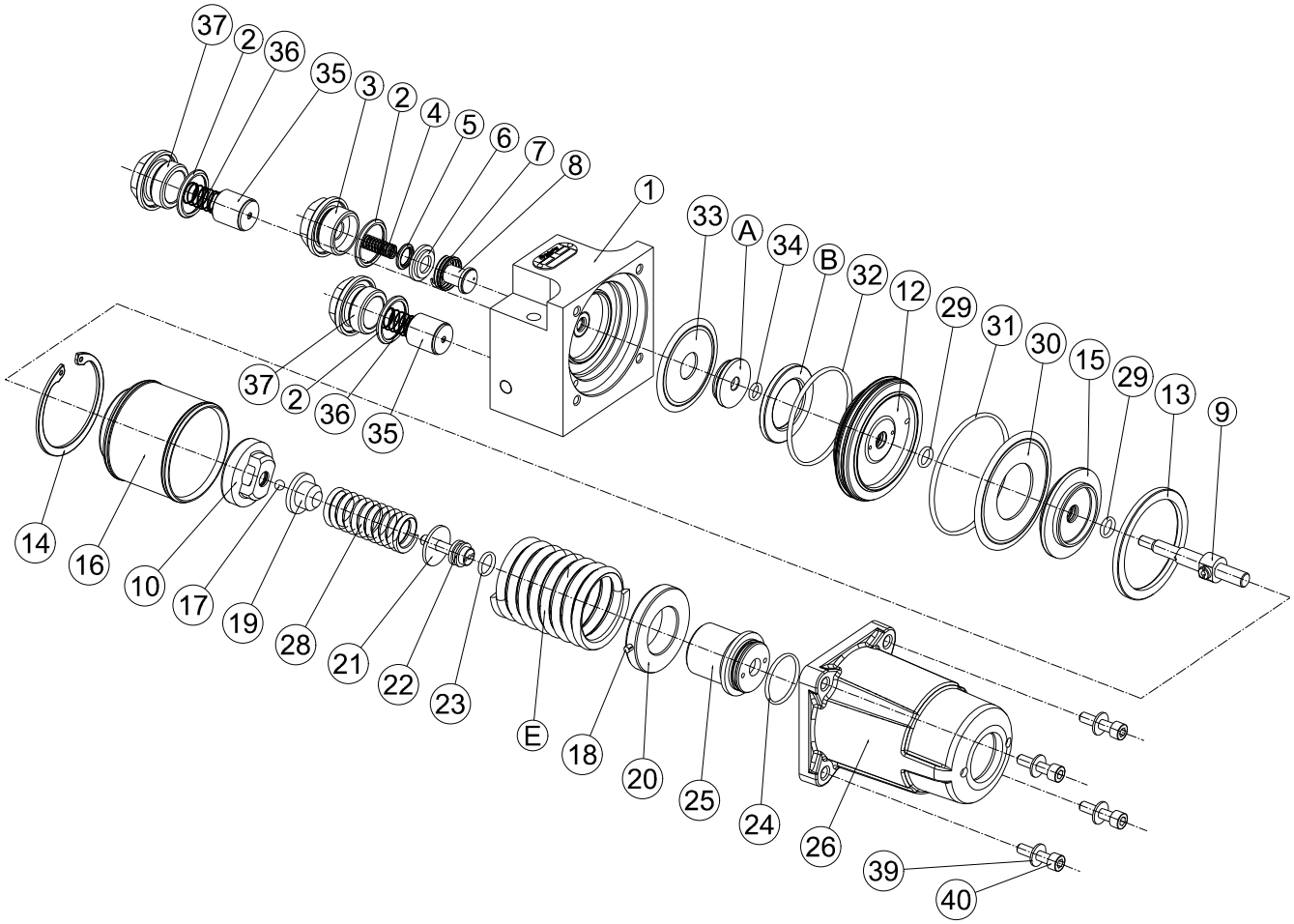
- **Première génération / *First generation*:**



Positionner sur le siége **(1/2)** à l'intérieur du corps équipé **(1)**, le clapet **(8)**, le ressort **(7)**, la coupelle **(6)**, le joint torique **(5)** neuf, le ressort de rappel **(4)** et maintenir l'ensemble en place en vissant le bouchon **(3)** équipé d'un joint torique **(2)** neuf au couple de **60 N.m**. / *Position on the seat **(1/2)** at inside of equipped body **(1)**, the valve **(8)**, the spring **(7)**, the cupel **(6)**, a new O-ring **(5)**, the spring **(4)** and maintain the assembly in place by screwing the plug **(3)** equipped with new O-ring **(2)** at the torque of **60 N.m**.*

Nota : Appliquer une fine couche de graisse **MOLYKOTE 55 O-RING** sur les joints toriques **(2)** et **(5)**, sur la coupelle **(6)** et sur les parties coulissantes du bouchon **(3)** et du clapet **(8)**. / ***Note**: Apply a thin layer of grease of **MOLYKOTE 55 O-RING** on the O-rings **(2)** and **(5)**, on the cupel **(6)** and on the sliding parts of plug **(3)** and valve **(8)**.*

Equiper les serres membrane **(15)** et **(A)**, l'entretoise **(12)** avec les joints toriques **(29)**, **(31)**, **(32)**, **(34)** et avec les membranes **(30)** et **(33)**. *Equipped the diaphragm clamps **(15)** and **(A)**, the brace **(12)** with the O-rings **(29)**, **(31)**, **(32)**, **(34)** and with the diaphragms **(30)** and **(33)**.*

Positionner à l'intérieur du corps équipé **(1)**, le serre membrane **(A)**, l'anneau **(B)**, l'entretoise **(12)**, le serre membrane **(15)** et l'anneau **(13)**. Puis introduire la tige creuse **(9)** à travers l'ensemble de ces pièces.

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*Positioned inside the equipped body **(1)**, the diaphragm clamp **(A)**, the ring **(B)**, the spacer **(12)**, the diaphragm clamp **(15)** and the ring **(13)**. Then insert the hollow rod **(9)** across all of these parts.*

Nota: Appliquer une fine couche de graisse **MOLYKOTE 55 O-RING** sur les joints toriques **(29)**, **(31)**, **(32)**, **(34)**, sur les membranes **(30)** et **(33)** dans les logements des pieces en contacts avec les membranes et sur la tige creuse **(9)**. / ***Note**: Apply a thin layer of grease of **MOLYKOTE 55 O-RING** on the O-rings **(29)**, **(31)**, **(32)**, **(34)**, on the diaphragms **(30)** and **(33)** in the housing parts in contact with the diaphragms and on the hollow rod **(9)**.*

Equiper la vis de réglage **(22)** avec le guide **(21)** et le joint torique **(23)** neuf. Puis introduire la vis de réglage **(22)** équipée dans la vis **(25)**. / *Equipped with the setting screw **(22)** with the guide **(21)** and new O-ring **(23)**. Then insert the screws **(22)** fitted into the screw **(25)**.*

Mettre en place un joint torique **(24)** neuf sur la vis **(25)** puis visser sur celle-ci l'écrou **(20)** équipé des de la goupille **(18)** et positionner l'ensemble dans le corps inférieur **(26)**. / *Put in place a new O-ring **(24)** on the screw **(25)** then screw it on the nut **(20)** with the pin **(18)** and positioned the assembly in the lower body **(26)**.*

Positionner à l'intérieur du corps inférieur **(26)** sur le guide **(21)**, le ressort de limitation **(28)**, la coupelle **(19)** et la bille **(17)** puis introduire sur l'écrou **(20)**, le ressort RC **(E)**, le guide **(10)** et le guide **(16)** et à l'aide d'une presse et des outillages spéciaux **n° 331 324 rep 1/2/3** mettre en place l'anneau élastique **(14)**.

*Position at inside of lower body **(26)** on the guide **(21)**, the limiting spring **(28)**, the cupel **(19)** and the ball **(17)** then introduce on the nut **(20)**, the RC spring **(E)**, the guide **(10)** and the guide **(16)** and by means of press and special tools **n° 331 324 item 1/2/3** put in place the elastic ring **(14)**.*

Nota: Appliquer une fine couche de graisse **LOCTITE GR 190** sur les joints toriques **(23)**, **(24)** et sur l'ensemble des pièces mise en place à l'intérieur du corps inférieur **(26)** ainsi que sur les faces internes de celui-ci. / ***Note**: Apply a thin layer of grease of **LOCTITE GR 190** on the O-rings **(23)**, **(24)**, and on the assembly of parts introduce inside of lower body **(26)** and on faces internal thereof.*

Mettre en place sur le corps inférieur **(26)** équipé, l'anneau **(13)** et le corps équipé **(1)** à l'aide de l'outillage spécial **n° 331 324 rep 4**. Puis maintenir l'ensemble en place en positionnant les rondelles **(39)**, les vis **(40)** et les serrer au couple de **6N.m**. / *Put in place on the lower body **(26)** equipped, the ring **(13)** and the equipped body **(1)** by means of special tool **n° 331 324 rep 4**. Then maintain the assembly in place in positioning the washers **(39)**, the screws **(40)** and tighten torque at **6 N.m**.*

(sauf type 4) Positionner sur les deux siéges **(1/3)** à l'intérieur du corps équipé **(1)**, les clapets **(35)**, les ressorts **(36)** et maintenir l'ensemble en place en vissant les bouchons **(37)** équipés d'un joint torique **(2)** neuf au couple de **60 N.m**. / ***(except type 4)** Position on the seats **(1/3)** at inside of equipped body **(1)**, the valves **(35)**, the springs **(36)** and maintain the assembly in place by screwing the plugs **(3)** equipped with new O-ring **(2)** at the torque of **60 N.m**.*

Nota: Appliquer une fine couche de graisse **MOLYKOTE 55 O-RING** sur les joints toriques **(2)** et sur les parties coulissantes des bouchons **(37)** et des clapets **(35)**. / ***Note**: Apply a thin layer of grease of **MOLYKOTE 55 O-RING** on the O-rings **(2)** and on the sliding parts of plugs **(37)** and valves **(37)**.*

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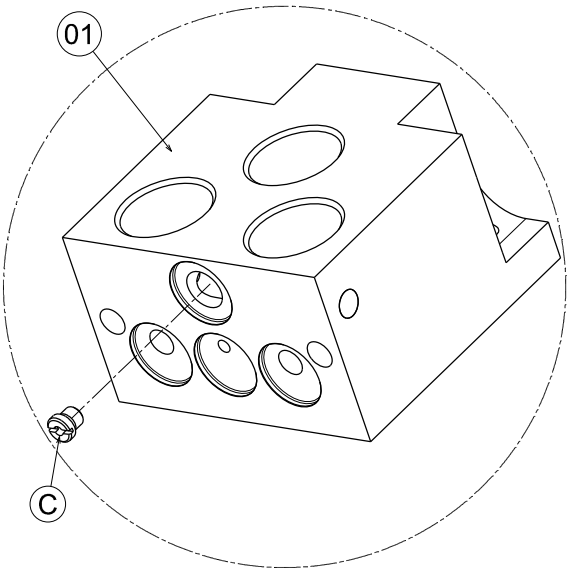
Wabtec CORPORATION

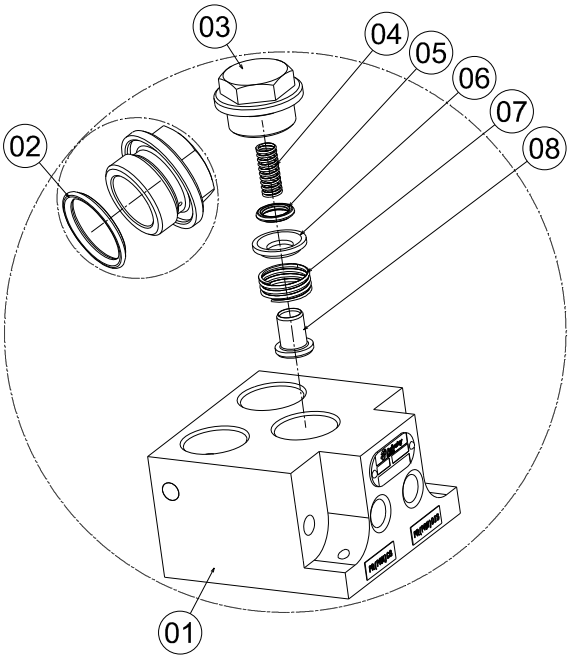
- **Deuxième génération / *Second generation***:

5.3.6.1 Corps équipé / *Equipped body*



Visser l'orifice de serrage **(C)** dans le corps équipé **(1)** et serrer au couple de **2,5 N.m ± 15%**.

*Screw the filling chocke **(C)** into the equipped body **(1)** and tighten at torque of **2.5 N.m ± 15%**.*



Positionner sur le siége **(1/2)** à l'intérieur du corps équipé **(1)**, le clapet **(8)**, le ressort **(7)**, la coupelle **(6)**, le joint torique **(5)** neuf, le ressort de rappel **(4)** et maintenir l'ensemble en place en vissant le bouchon **(3)** équipé d'un joint torique **(2)** neuf au couple de **60 N.m**.

*Position on the seat **(1/2)** at inside of equipped body **(1)**, the valve **(8)**, the spring **(7)**, the cupel **(6)**, a new O-ring **(5)**, the spring **(4)** and maintain the assembly in place by screwing the plug **(3)** equipped with new O-ring **(2)** at the torque of **60 N.m**.*

Nota : Appliquer une fine couche de graisse **MOLYKOTE 55 O-RING** sur les joints toriques **(2)** et **(5)**, sur la coupelle **(6)** et sur les parties coulissantes du bouchon **(3)** et du clapet **(8)**. /

***Note**: Apply a thin layer of grease of **MOLYKOTE 55 O-RING** on the O-rings **(2)** and **(5)**, on the cupel **(6)** and on the sliding parts of plug **(3)** and valve **(8)**.*

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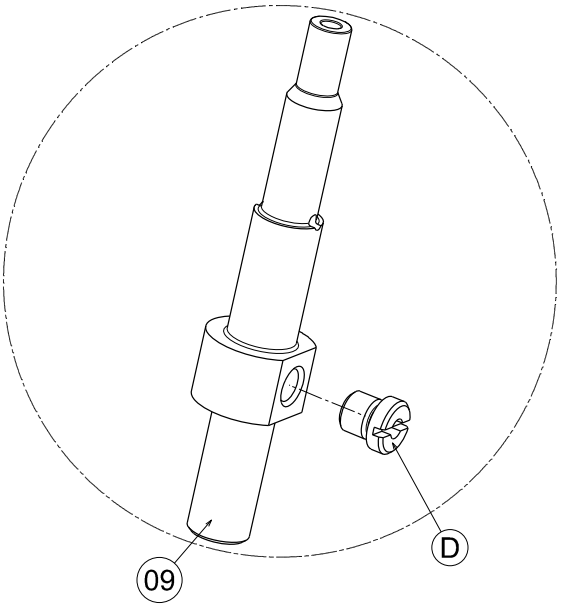
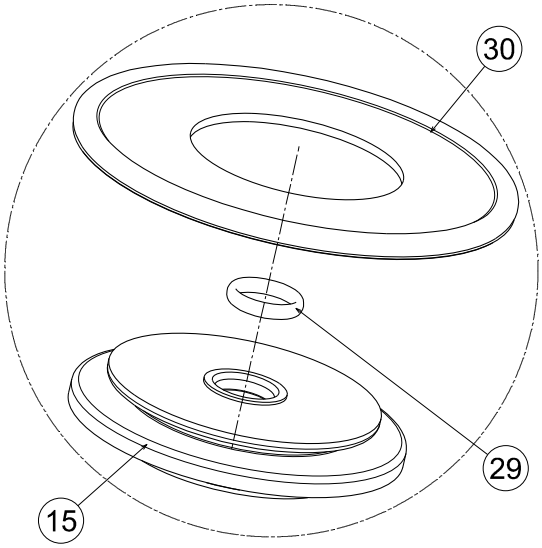
Visser l'orifice de desserrage **(D)** sur la tige creuse **(9)** et serrer au couple de **2,5 N.m ± 15%**.

*Screw the release chocke **(D)** on the hollow rod **(9)** and tighten at torque of **2.5 N.m ± 15%***



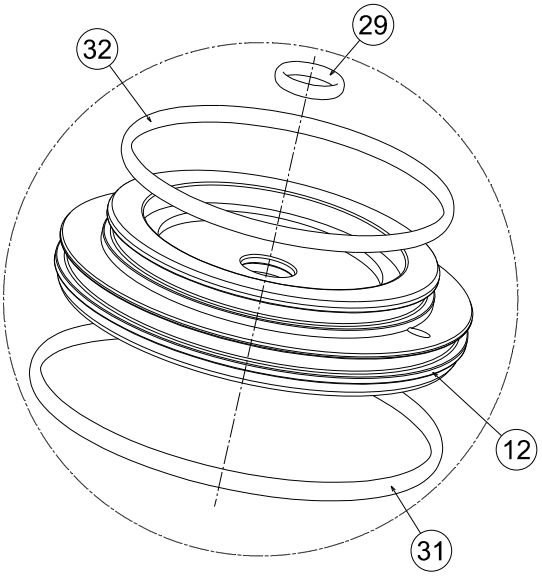


Equiper le serre membrane **(15)** avec la membrane **(30)** et le joint torique **(29)**.

*Fit the diaphragm clamp **(15)** with the diaphragm **(30)** and the O-ring **(29)**.*

Equiper l'entretoise **(12)** avec les joints toriques **(29)**, **(31)** et **(32)**.

*Fit the brace **(12)** with the O-rings **(29)**, **(31)** and **(32)**.*



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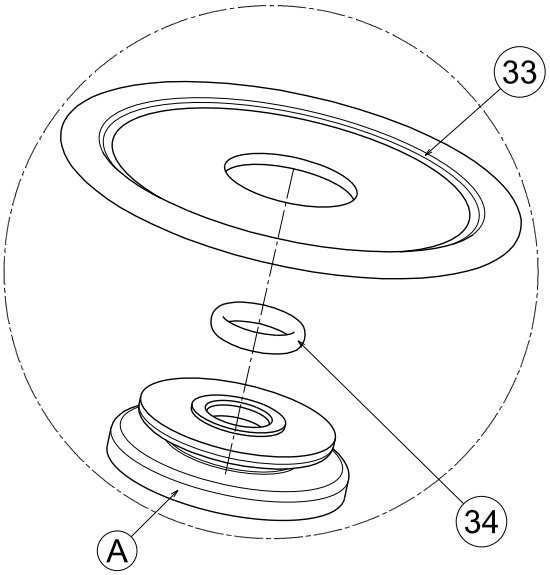
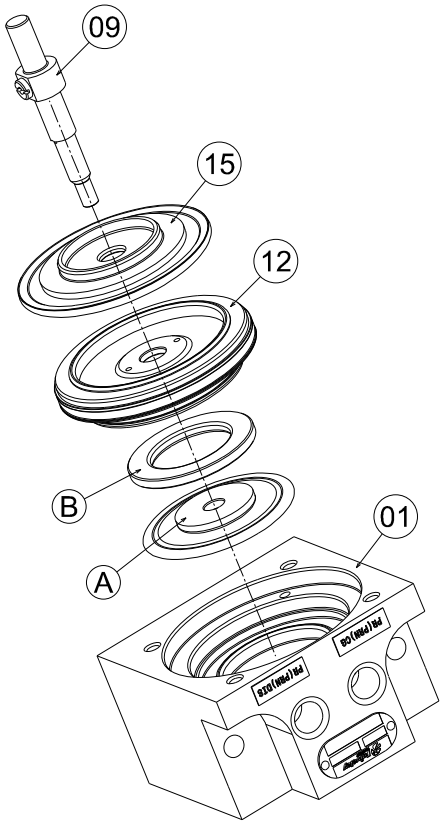


Equiper le serre membrane **(A)** avec la membrane **(33)** et le joint torique **(34)**.

*Fit the diaphragm clamp **(A)** with the diaphragm **(33)** and the O-ring **(34)**.*



Positionner à l'intérieur du corps équipé **(1)**, le serre membrane **(A)**, l'anneau **(B)**, l'entretoise **(12)**, le serre membrane **(15)** et l'anneau **(13)**. Puis introduire la tige creuse **(9)** à travers l'ensemble de ces pièces.

*Positioned inside the equipped body **(1)**, the diaphragm clamp **(A)**, the ring **(B)**, the spacer **(12)**, the diaphragm clamp **(15)** and the ring **(13)**. Then insert the hollow rod **(9)** through all these parts.*

Nota: Appliquer une fine couche de graisse **MOLYKOTE 55 O-RING** sur les joints toriques **(29)**, **(31)**, **(32)**, **(34)**, sur les membranes **(30)** et **(33)** dans les logements des pieces en contacts avec les membranes et sur la tige creuse **(9)**.

***Note**: Apply a thin layer of grease of **MOLYKOTE 55 O-RING** on the O-rings **(29)**, **(31)**, **(32)**, **(34)**, on the diaphragms **(30)** and **(33)** in the housing parts in contact with the diaphragms and on the hollow rod **(9)**.*

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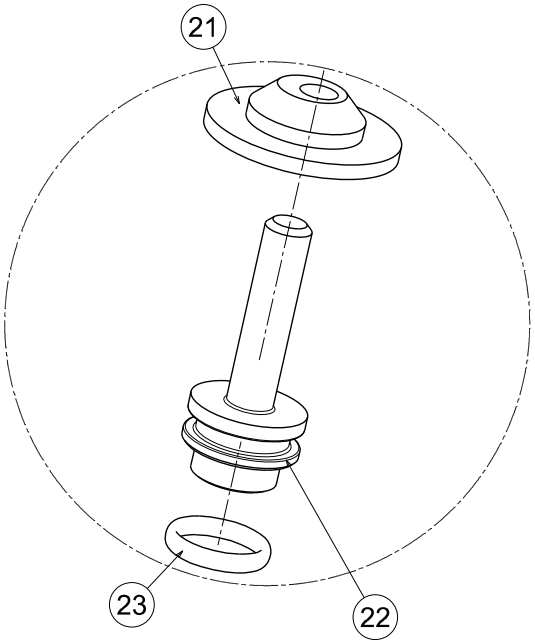
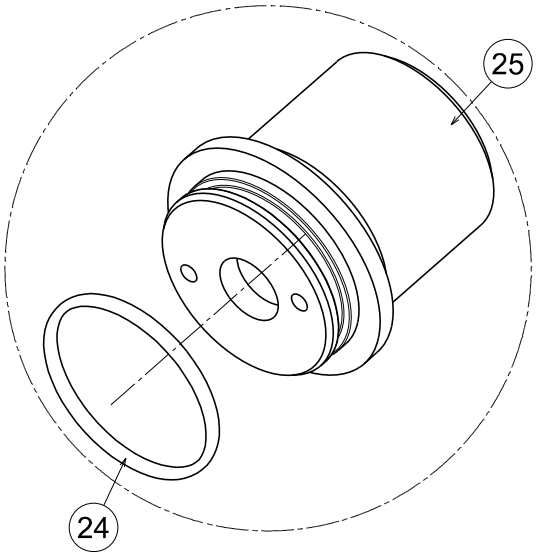
5.3.6.2 Corps inférieur / *Lower body*



Visser le guide **(21)** sur la vis de réglage **(22)** et monter un joint torique neuf **(23)**.

*Screw the guide **(21)** on the setting screw **(22)** and fit a new O-ring **(23)**.*

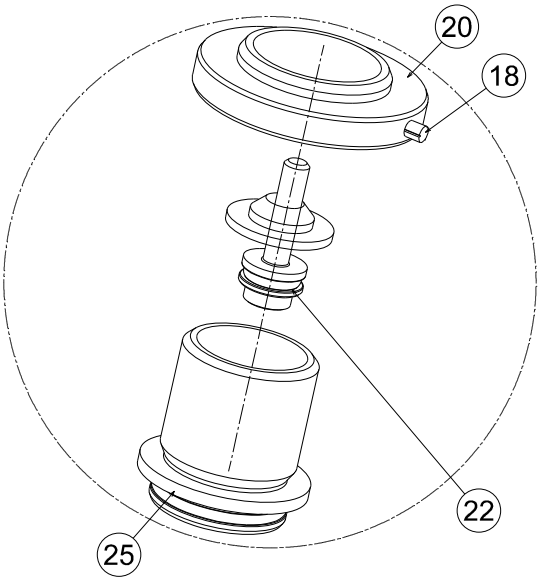


Monter un joint torique neuf **(24)** sur la vis **(25)**.

*Fit new O-ring **(24)** to the screw **(25)**.*

Introduire la vis de réglage **(22)** équipée dans la vis **(25)**. / *Insert the setting screw **(22)** fitted into the screw **(25)**.*

Visser l'écrou **(20)** équipé de la goupille **(18)** sur la vis **(25)**. / *Screw the nut **(20)** with the pin **(18)** on the screw **(25)**.*



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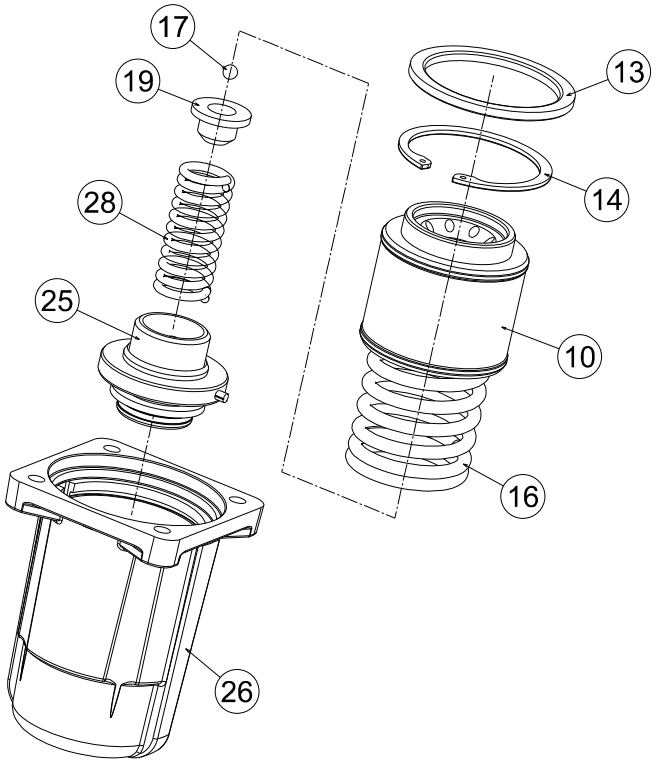

Installer au fond du corps inférieur **(26)**, la vis de réglage RC **(25)**, ensuite positionner sur le guide **(21)**, le ressort de limitation **(28)**, la coupelle **(19)** et la bille **(17)** puis introduire sur l'écrou **(20)**, le ressort RC **(16)**, le guide **(10)** et à l'aide d'une presse et des outillages spéciaux **n° 331 324 rep 1/2/3** mettre en place l'anneau élastique **(14)**. Mettre en place l'anneau **(13)**.

*Install the RC adjusting screw **(25)** at the bottom of the lower body **(26)**, next position on the guide **(21)**, the limiting spring **(28)**, the cupel **(19)** and the ball **(17)** then introduce on the nut **(20)**, the RC spring **(16)**, the guide **(10)** and by means of press and special tools **n° 331 324 item 1/2/3** put in place the elastic ring **(14)**. Put in place the ring **(13)**.*

Nota: Appliquer une fine couche de graisse **LOCTITE GR 190** sur les joints toriques **(23)**, **(24)** et sur l'ensemble des pièces mise en place à l'intérieur du corps inférieur **(26)** ainsi que sur les faces internes de celui-ci.

***Note**: Apply a thin layer of grease of **LOCTITE GR 190** on the O-rings **(23)**, **(24)**, and on the assembly of parts introduce inside of lower body **(26)** and on faces internal thereof.*

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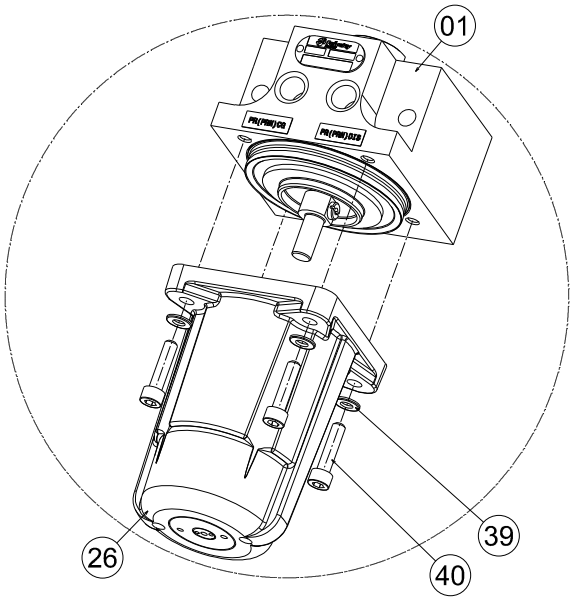


Mettre en place le corps équipé **(1)** sur le corps inférieur **(26)** équipé à l'aide de l'outillage spécial **n° 331 324 rep 4**. Puis maintenir l'ensemble en place en positionnant les rondelles **(39)**, les vis **(40)** et les serrer au couple de **6N.m**.

*Put in place the equipped body **(1)** on the lower body **(26)** equipped, by means of special tool **n° 331 324 rep 4**. Then maintain the assembly in place in positioning the washers **(39)**, the screws **(40)** and tighten torque at **6 N.m**.*

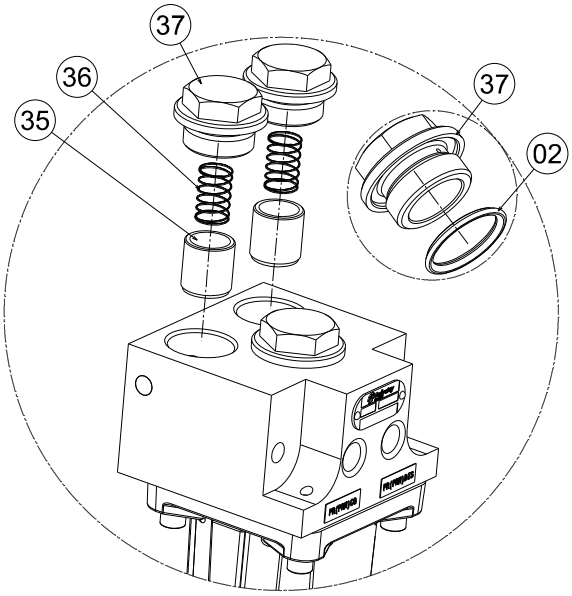
5.3.6.3 Clapets / *Valves*

(sauf types 4 et 7):

Positionner sur les deux siéges **(1/3)** à l'intérieur du corps équipé **(1)**, les clapets **(35)**, les ressorts **(36)** et maintenir l'ensemble en place en vissant les bouchons **(37)** équipés d'un joint torique **(2)** neuf au couple de **60 N.m**.

***(except types 4 and 7)**:*

*Position on the seats **(1/3)** at inside of equipped body **(1)**, the valves **(35)**, the springs **(36)** and maintain the assembly in place by screwing the plugs **(3)** equipped with new O-ring **(2)** at the torque of **60 N.m**.*



Nota: Appliquer une fine couche de graisse **MOLYKOTE 55 O-RING** sur les joints toriques **(2)** et sur les parties coulissantes des bouchons **(37)** et des clapets **(35)**.

***Note**: Apply a thin layer of grease of **MOLYKOTE 55 O-RING** on the O-rings **(2)** and on the sliding parts of plugs **(37)** and valves **(37)**.*

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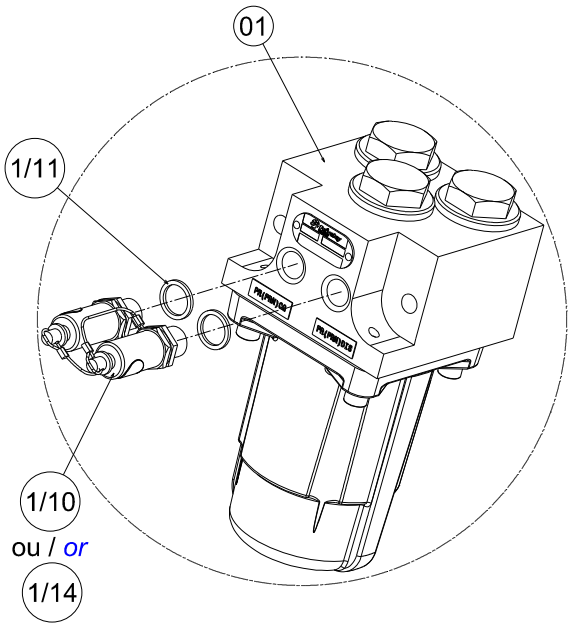
5.3.6.4 Prises de pression / *Test points*

Pour les distributeurs **type 0, 5, 6** et **7**:

Positionner sur le corps équipé **(1)**, les prises de pression **(1/10)** ou **(1/14)** équipées chacune d'un joint plat neuf **(1/11)** et serrer.

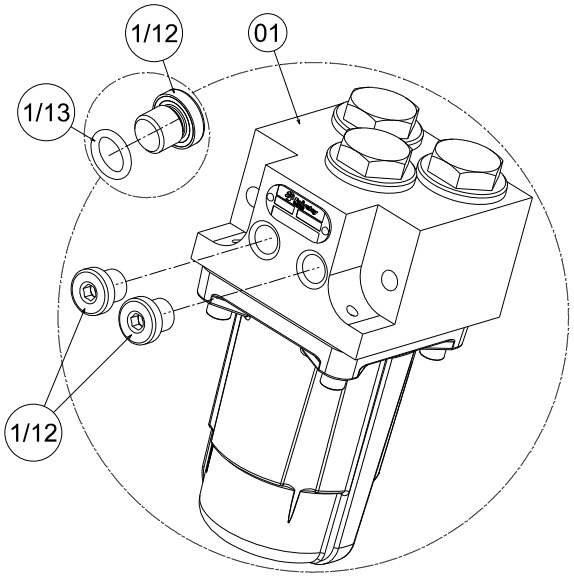
*For distributors **type 0, 5, 6** and **7**:*

*On the equipped body **(1)**, put in place the test points **(1/10)** or **(1/14)** each equipped with a new flat gasket **(1/11)** and tighten.*



Note / *Nota*:

- Pulvériser de la **Loctite activateur 7471** sur le filetage des prises de pression **(1/10)** ou **(1/14)** puis appliquer de la **Loctite Oléoétanche 542** uniformément. / *Spray the **Loctite type 7471** on the thread of the test points **(1/10)** or **(1/14)** then apply the **Loctite type 542** uniformly.*
- Appliquer un couple de serrage de **11 N.m** sur les prises de pression. / *Apply a torque of **11 N.m** on the test points.*



Dans le cas des distributeurs **type 3** :

Positionner sur le corps équipé **(1)**, les deux bouchons G1/4' **(1/12)**, équipés chacun d'un joint torique **(1/13)** et serrer.

*For distributors **type 3**:*

*On the equipped body **(1)**, set and tighten the two plugs G1/4' **(1/12)** each equipped with an O-ring **(1/13)**.*

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5.3.7 ESSAIS / *TESTS*

Après révision générale, le distributeur à ressort type NJMR devra satisfaire aux essais d'étanchéité et de fonctionnement définis dans la spécification de réception «**SR n° 3747 / SNCF 10-9051 675**».

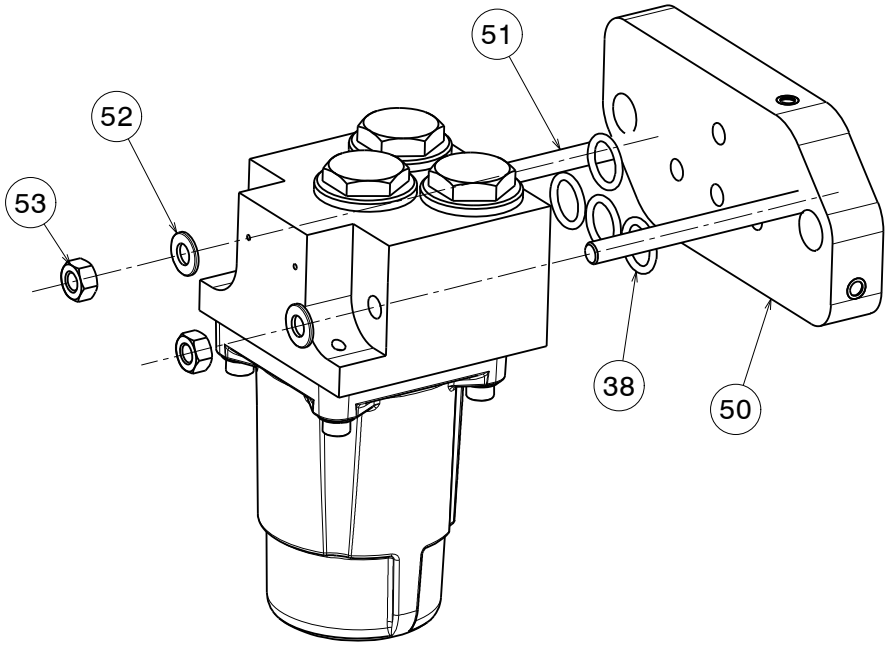
*After general overhaul, the spring distributor valve type NJMR must comply with the tightness and operating tests defined in routines test specification "**SR N° 3747**".*

5.3.8 INSTALLATION / *INSTALLATION*

5.3.8.1 Distributeurs / *Distributors* 728 835 .. 18

Mettre en place les quatre joints toriques **(38)** neufs sur le distributeur à ressort type NJMR. Puis le positionner sur la bride **(50)**, ainsi que les rondelles **(52)**, les écrous **(53)** et le fixer en serrant au couple les deux écrous **(53)**.

*To install the four new O rings **(38)** on the spring distributor valve type NJMR. Then position it on the flange **(50)**, and the washers **(52)**, the nuts **(53)** and to fasten it by tightening at torque the two nuts **(53)**.*



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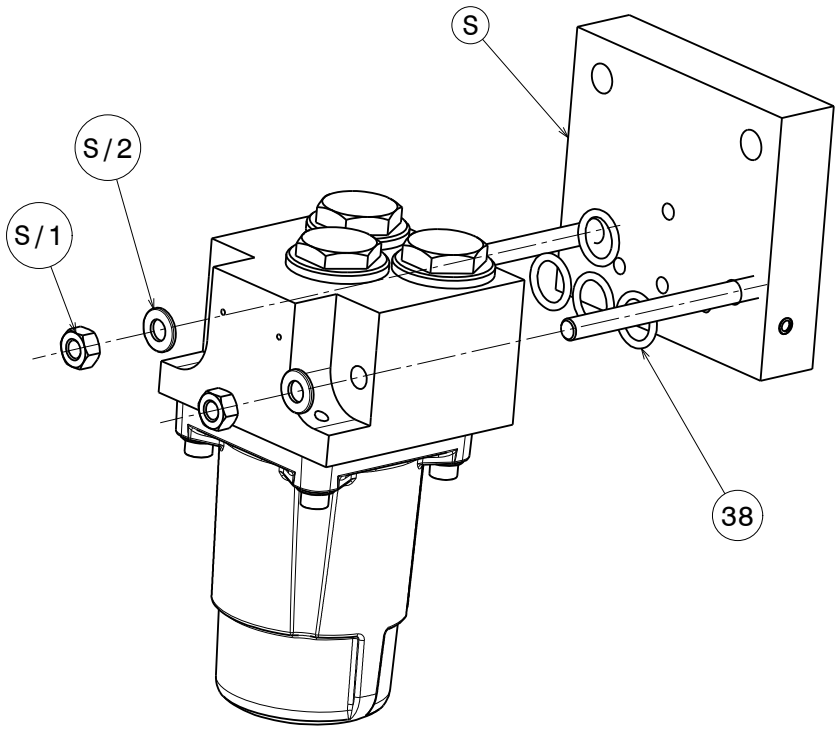
5.3.8.2 Distributeurs / *Distributors* 728 835 .. 08, 728 835 .. 28, 728 835 .. 38, 728 835 .. 48, 728 835 .. 58, 728 835 .. 68, FT0120345-100, FT0120345-101 et / *and* FT0120345-102.

Mettre en place les quatre joints toriques **(38)** neufs sur le distributeur à ressort type NJMR. Puis le positionner sur le support **(S)** ou le panneau, ainsi que les rondelles **(S/2)** et les écrous **(S/1).** Serrer les écrous **(S/1)** au couple en respectant la valeur définie par la société responsable de l'intégration du produit.

*Install the four new O rings **(38)** on the spring distributor valve type NJMR. Then position it on the bracket **(S)** or the panel, and the washers **(S/2)**, the nuts **(S/1)**. Tighten the nuts **(S/1)** at torque by respecting the value defined by the company responsible of the product integration.*



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/// 6. PIECES DE RECHANGE / *SPARE PARTS*

Lors des révisions générales, suivant les conditions d'exploitation, remplacer ou vérifier les éléments préconisés dans la nomenclature du plan pièces « **AA ou AC**, **BB ou BC** ou **CC** ».

*During the general overhaul, according to operating conditions, replace the elements recommended on parts list of drawing, parts : « **AA or AC, BB or BC and CC** ».*

AA ou AC : composants à remplacer systématiquement en révision.

***Parts AA or AC**: components to replace systematically in overhaul.*

BB ou BC : composants à remplacement non systématique à contrôler en révision et à ne remplacer que si les limites d'usure sont dépassées.

***Parts BB or BC**: components to replace non-systematically, to check in overhaul and to replace if the wear limits are exceeded.*

CC : autres pièces et sous-ensembles non soumis à usure.

***Parts CC**: other parts and sub-assemblies non-submissive to wearing.*

/// 7. COUPLES DE SERRAGE / *TIGHTENING TORQUES*

Respecter les valeurs de couple de serrage définies dans la consigne de montage « **CM n° 3079 / SNCF 10-9006 441** ». / *Perform the tightening torques, defined in the assembly instruction « **CM n° E 3079** ».*

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Wabtec CORPORATION

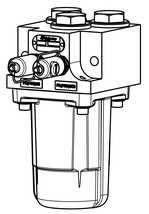
Paramètres / *Parameters* *

0	1	2	3	4	5	6	7	8	9	11	12	13	Réglage / *setting* * Rep/*item* A	Rep/*item* B	Rep/*item* C	Rep/*item* D
N° Faiveley	Type *Type*	Application *Application*	Pression de régime CG *BP Running pressure*	Pression CG départ serrage *BP pressure beginning of BC*	Pression CG serrage à fond *BP Pressure of max BC*	Pression RA *AR pressure*	Pression CFF serrage à fond *FBC pressure of max BC*	Volume CFF *FBC volume*	Volume RA *AR Volume*	Temps de serrage *Filling time*	Temps de desserage *Release time*	Kit étiquettes *Label kit* Rep/*item* F	728 594 .. 08	728 599 .. 08	Serrage *Filling*	Desserrage *Release*
													Variante / *variant*			
728 835 01 28	2	Prototype	5	4,7 (0/-0.1)	3,5 ± 0,1	4,3 ± 0,2	3,8 ± 0,1	2,5 l	30	-	-	-	04	04	-	-
728 835 02 28	2	Prototype	5	4,7 (0/-0.1)	3,5 ± 0,1	4,3 ± 0,2	3,8 ± 0,1	2,5 l	30	-	-	-	04	04	-	-
728 835 03 08	2	Wagon charbon Austria - OzECP	5	4,5 (0/-0.1)	3,5 ± 0,1	5,4 perm	4,2 ± 0,07	3,3 l	30	11 ± 1 s de/*from* 0 à/*to* 4,00 bar	11 ± 1 s de/*from* 4,2 à/*to* 0,4 bar	-	04	04	727473D110	727473D185
728 835 04 08	2	EMU Wellington - Matangui	5,5	5,2 (0/-0.1)	4 ± 0,1	-	4,5 ± 0,1	2,5 l	30	-	-	-	04	04	-	-
728 835 05 08	0	REGIOLIS	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,5 l	55	2 ± 0,5 s	7 ± 1 s	FT0012994-100	04	04	727473D200	727473D215
728 835 06 18	1	Autorail SNCF (Rennes)	5	4,625 ± 0,025	3,5 ± 0,1	4,3 ± 0,2	3,7 ± 0,1	7,5 l	25	≈ 3 s	6 ± 1 s	-	04	04	-	-
728 835 07 08	0	Régio 2N	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,5 l	36	2 ± 0,5 s	7 ± 1 s	FT0012994-100	04	04	727473D200	727473D215
728 835 08 28	2	Métro Chennai	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,5 l	55	2 (+0.5/-0.75)	6,5 ± 1 s	-	04	04	-	727473D220
728 835 09 08	0	Rhätische Bahn	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	1,5 l	100	2 ± 0,5 s	7 ± 1 s	-	04	04	727473D140	727473D145
728 835 10 08	0	Wagon RATP	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2 l	160	1,13 ± 0,625 s	4,9 ± 1,6 s	-	04	04	727473D200	727473D280
728 835 10 28	2	Wagon RATP	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2 l	160	1,13 ± 0,625 s	4,9 ± 1,6 s	-	04	04	727473D200	727473D280
728 835 11 08	0	Sans projet/ *without project*	5,5	5,2 (0/-0.1)	4 ± 0,1	7 perm	3,8 ± 0,1	2 l	78	2 0/-1 s	7 ± 1 s	-	04	04	727473D210	727473D170
728 835 12 08	0	Métro Milan EXPO *(Transport seulement/ Transportation only)*	5	4,7 (0/-0.1)	3,5 ± 0,1	7 perm	2,1 ± 0,1	2 l	78	2 0/-1 s	7 ± 1 s	-	07	03	727473D150	727473D135
728 835 13 28	2	Métro Kochi	5	4,7 (0/-0.1)	3,5 ± 0,1	5 perm	4,2 ± 0,1	1 l	70	2 (+0.5/-0.75)	6,5 ± 1 s	-	08	08	727473D160	727473D120
728 835 13 48	4	Métro Kochi	5	4,7 (0/-0.1)	3,5 ± 0,1	5 perm	4,2 ± 0,1	1 l	70	2 (+0.5/-0.75)	6,5 ± 1 s	-	08	08	727473D160	727473D125
728 835 14 58	5	Product Catalog	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,5 l	36	2 ± 0,5 s	7 ± 1 s	FT0012994-100	04	04	7803600308	727473D200
728 835 15 38	3	RRX	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	0,671	75	2 ± 0,5 s	7 ± 1 s	-	04	04	7803602908	727473D105
728 835 16 48	4	Métro Lucknow	5	4,7 (0/-0.1)	3,5 ± 0,1	5 perm	4,5 ± 0,1	1 l	70	2 (+0.5/-0.75)	6,5 ± 1 s	-	08	08	727473D160	727473D130
728 835 17 38	3	Sans projet / *Without project*	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	4,2 ± 0,1	1 l	100	2 0/-1 s	7 ± 1 s		04	04	727473D125	727473D120
728 835 18 48	4	MIREO	5	4,7 (0/-0.1)	3,5 ± 0,1	8,5 perm	4,5 ± 0,1	1,3 l	40	3,5 ± 0,5 s de/from 0 à/to 3,8 bar	7 ± 1 s	-	08	08	727473D100	727473D150
728 835 19 68	6	RER NG	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,65 l	50	2 ± 0.5s	7 ± 1 s	FT0012994-100	04	04	7803600808	727473D215
FT0120345-100	7	XMU platform	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	1 l	40	2 ± 0.5s	7 ± 1 s	FT0012994-100	04	04	7803600308	727473D200
FT0120345-101	3	Metro Catania	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,5 l	200	1,5 (+0,25/-0,75)	6 ± 1 s	-	04	04	7803600808	727473D210
FT0120345-102	6	TET AMLD	5	4,7 (0/-0.1)	3,5 ± 0,1	9 perm	3,8 ± 0,1	2,65 l	50	2 ± 0.5s	7 ± 1 s	FT0012994-100	04	04	7803600808	727473D215

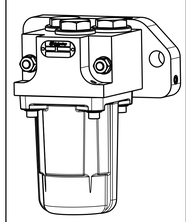
* Procédure de réglage interne Faiveley Transport FT0012869-000-F04TIN
Faiveley Transport internal setting process FT0012869-000-F04TIN

AE00

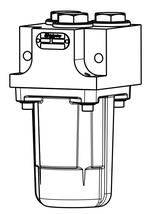
Type 0 , 5 et 6



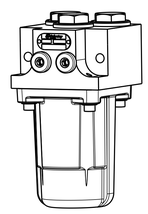
Type 1



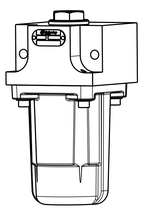
Type 2



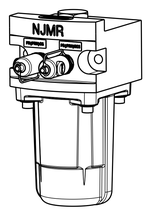
Type 3



Type 4



Type 7

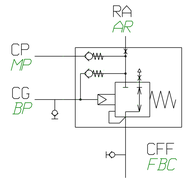


Paramètre de la colonne 1
Parameter of colonne 1

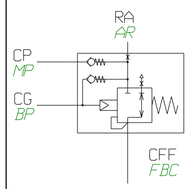
			Type N-JMR 0	1	2	3	4	5	6	7
Options *Options*	Interface Pneumatique *Pneumatique interface*	**AVEC** port **CP** ***WITH MP*** *port*	X	X	X	X		X	X	
		SANS port **CP** ***WITHOUT MP*** port					X			X
		Bride de JMR *Flange of JMR*		X						
	Prise de pression *Test point* — Avec *With*	Standard (IP55)	X					X		
		IP65							X	X
		Sans *Without* — Standard		X	X		X			
		Bouchon G1/4" *G1/4" Plug*				X				

Shéma pneumatique pour N-JMR
Pneumatic scheme for N-JMR

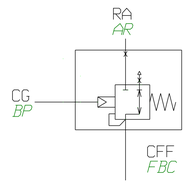
Type 0 - Type 5 - Type 6



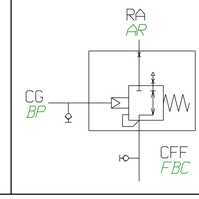
Type 1 - Type 2 - Type 3



- Type 4 -

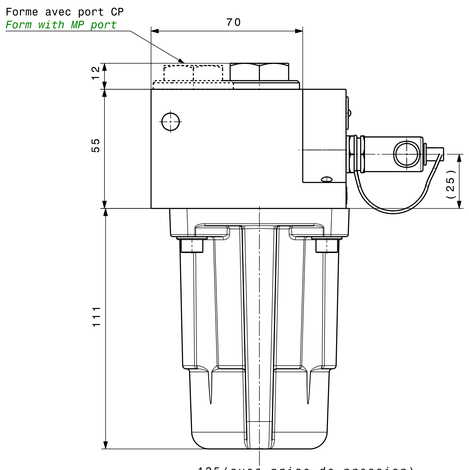


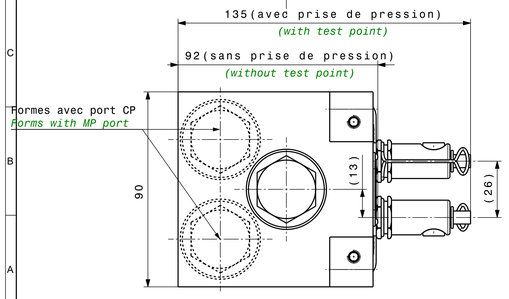
- Type 7 -



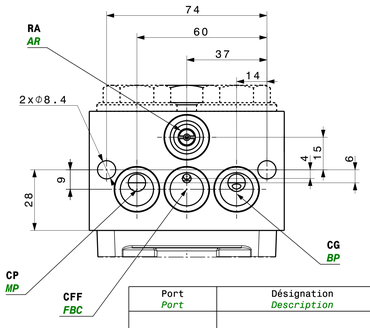
Interface pneumatique avec port CP
Pneumatic interface with MP port

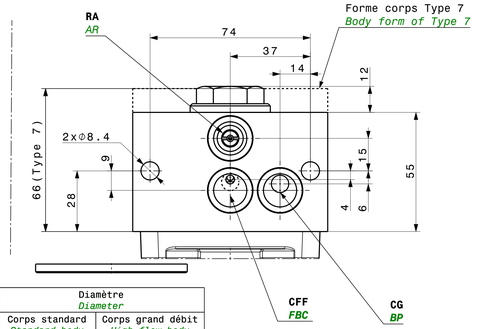
Forme avec port CP
Form with MP port





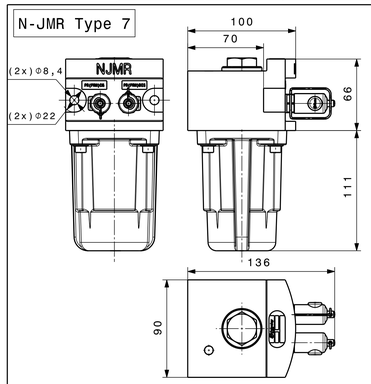
Interface pneumatique sans port CP
Pneumatic interface without MP port





Port *Port*	Désignation *Description*	Diamètre *Diameter*	
		Corps standard *Standard body*	Corps grand débit *High flow body*
CFF **FBC**	Cylindre de frein fictif *Fictive brake cylinder*	**⌀4**	**⌀8**
CG ***BP***	Conduite générale *Brake pipe*	**⌀8**	
CP ***MP***	Conduite principale *Main pipe*	**⌀8**	
RA ***AR***	Réservoir auxiliaire *Auxiliary reservoir*	**⌀6**	

N-JMR Type 7



	Type N-JMR 0-2-3-5-6	1	4-7
N° Type			
Kit de maintenance *Kit of maintenance*	7304390008	7304390108	FT0120345-K00

AE00

NOTA / *Note* :
- Pression maximum en service/*Maximum pressure* : 10 bar.
- Température de fonctionnement/*Operating temperature* : -40°C/+70°C.
- Indice de protection/*Protection index* : IP55.
- Tenue choc & vibration/*Shock & vibration resistance* : CEI 61373 cat. 1B.
- Qualité de l'air requis/*Required air quality*: 5-3-4 NF F 11-100

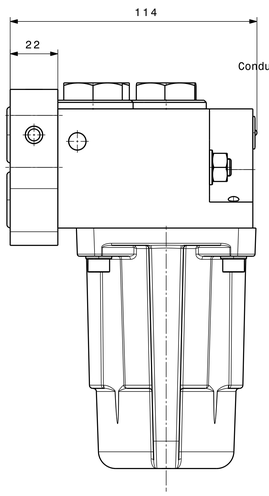
Protection de la visserie suivant DEA0053
(Sauf indication particulière)
Protection of bolts and screws according to DEA0053 (Except particular indication)

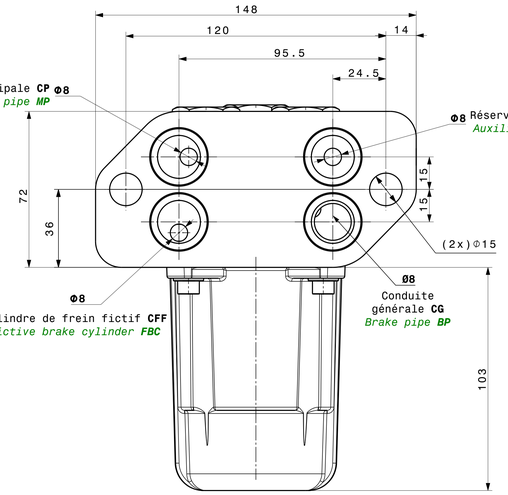
Tolérances générales suivant NF F 00-037
General tolerances according to NF F 00-037

	N° FAIVELEY TRANSPORT	N° SNCF
SR *Routine*	3747	10-9051 675
Notice *Pamphlet*	9171	10-9052 149
Graissage *Lubrification*	CM3056	10-9050 637
Documentation de marquage *Marking documentation*	FT0012869-000-F02DIS	-
Support pour montage sur tuyauterie *Bracket for mounting on pipe*	7301730108	-

Couple de serrage *Tightening Torque* (Nm) repère *Item*	N.m (±)
C & D	2.50 ± 15%
Autres/*Others* (N° SNCF)	CM 3079 (10-9006 441)

Interface JMR
JMR interface





AE00	Rep.10 FT0120716-000 w FT0010857-000 + Rep.16 FT0120718-000 w 7288420008 + Delete Rep. E + Add N°kit	(02)		
AD00	Ajout nouvelle variante FT0120345-102			
AC00	Ajout var. FT0120345-101, couple de serrage orifices C & D, rep. 9 & rep. 14 sur coupe A-A.			

Faiveley Transport — a Wabtec Company

Drawing	1:1	Prepared	02/2008
		Checked	08/2021
		Approved	08/2021
		Date	
		Name	
		Visa	

SL
RTE
SLE

DISTRIBUTEUR A RESSORT
TYPE NJMR
SPRING DISTRIBUTOR VALVE
TYPE NJMR

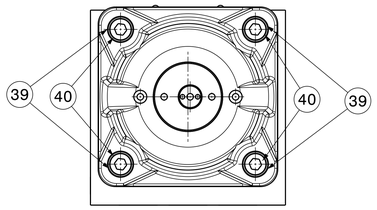
728 835 XX X8

AE00

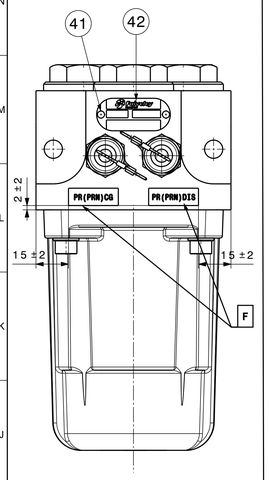
1 / 2

A0

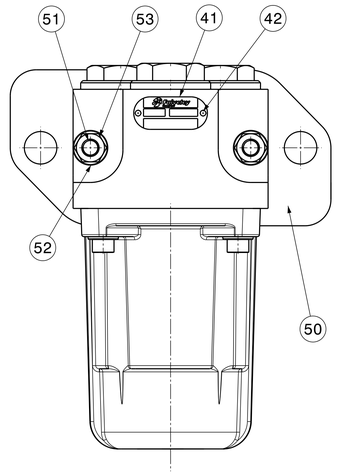
* Voir tableau couple de serrage page n°1
* *See page n°1 Tightening Torque Table*



Type 0 , 5 et 6



Type 1



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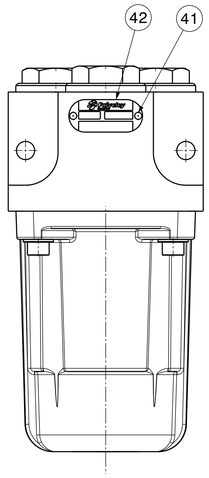
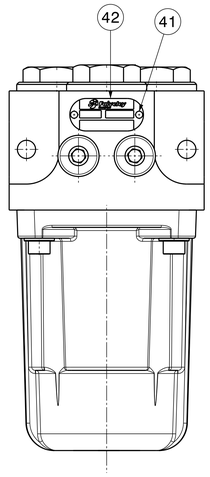
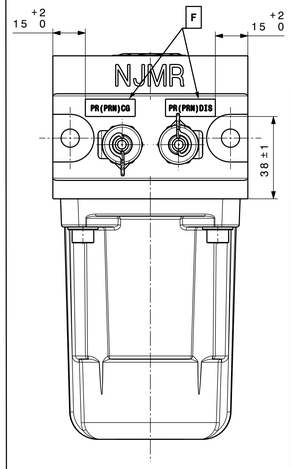
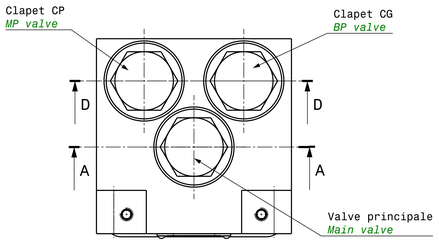


Type 3



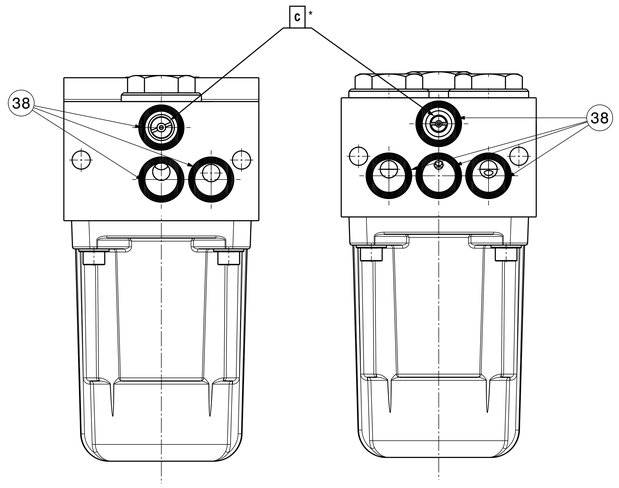
Type 7



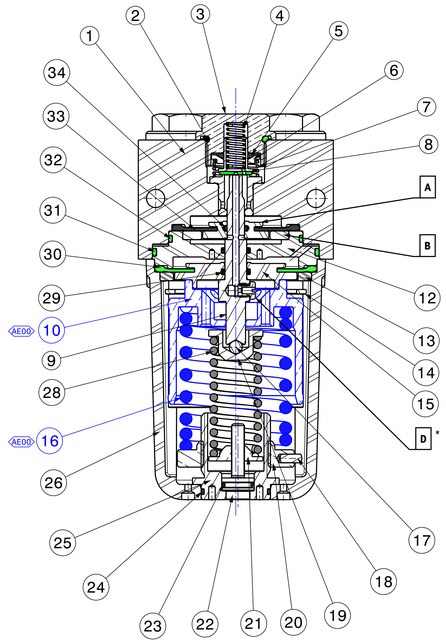


Interface sans port CP
Interface without MP port

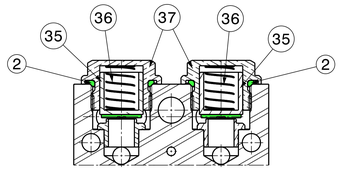
Interface avec port CP
Interface with MP port



A-A



D-D



1591230108	54	1	Plaque de firme Firm plate	10-3041 165 Rep. 2	CC
7048190408	2	1	Joint torique 3,6 x 24,60 svt FT0012869-000-E01WTS O ring 34,6x3,6 acc. to FT0012869-000-E01WTS	TF712D1	AA
FT0120346-100	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 3 à 40			Pièces détaillées ci-dessous *Items detailed below*		
Type	**7**		**N-JMR avec prises de pression IP54 et sans port CP** ***N-JMR with IP 54 test points and without MP port***	Weight (kg): 2,90±5%	
7288360608	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 2 à 42			Pièces détaillées ci-dessous *Items detailed below*		
Type	**6**		**N-JMR avec prises de pression IP54** ***N-JMR with IP 54 test points***	Weight (kg): 2,70±5%	
7288360508	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 2 à 42			Pièces détaillées ci-dessous *Items detailed below*		
Type	**5**		**N-JMR avec prises de pression** ***N-JMR with test points***	Weight (kg): 2,60±5%	
7012990408	38	3	Joint torique 15,54x2,62 svt FT0012869-000-E01WTS O-Ring 15,54x2,62 acc. to FT0012869-000-E01WTS	TF712D1	AA
7048190408	2	1	Joint torique 3,6 x 24,60 svt FT0012869-000-E01WTS O ring 34,6x3,6 acc. to FT0012869-000-E01WTS	TF712D1	AA
7288360408	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 3 à 34 - 39 à 42			Pièces détaillées ci-dessous *Items detailed below*		
Type	**4**		**N-JMR sans port CP** ***N-JMR without MP port***	Weight (kg): 2,60±5%	
7288360308	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 2 à 42			Pièces détaillées ci-dessous *Items detailed below*		
Type	**3**		**N-JMR avec bouchons** ***N-JMR with plugs***	Weight (kg): 2,70±5%	
7288360108	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 2 à 42			Pièces détaillées ci-dessous *Items detailed below*		
Type	**2**		**N-JMR** ***N-JMR***	Weight (kg): 2,60±5%	
7021070008	53	2	Ecrou hexagonal ISO 4032 - M8 Hexagonal nut ISO 4032 - M8	NF EN ISO 4032	CC
7016300008	52	2	Rondelle CS 8-16-1,4 Washer CS 8-16-1,4	NF E 25 511 CDC 3084	AA
7036530008	51	2	Goujon M8x80 bm=12 Stud M8x80 bm=12	NF E 25 135	CC
7288550108	50	1	Bride équipée Fitted hanger	728855XX08	BB
7288360108	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
A à F - 2 à 42			Pièces détaillées ci-dessous *Items detailed below*		
Type	**1**		**N-JMR** ***N-JMR***	Weight (kg): 3,10±5%	

See table	F	1	Kit étiquettes Label kit	-	CC
-	E	-	-	-	-
See table	D	1	Orifice de desserrage Release chocke	-	CC
See table	C	1	Orifice de serrage Filling chocke	-	CC
See table	B	1	Anneau Ring	-	BB
See table	A	1	Serre membrane Diaphragm clamp	-	BB
1591230008	42	1	Plaque de firme Firm plate	10-3041-165	CC
7016050608	41	2	Clou cannelé ISO 8746 - Ø2x4 Nail serrated ISO 8746 - Ø2x4	NF EN ISO 8746	CC
7133170008	40	4	Vis à tête cylindrique à six pans creux-ISO 4762 M8x25 Cylindrical head screw with hexagon hollow-ISO 4762 M8x25	NF EN ISO 4762	CC
7015370008	39	4	Rondelle CS 6x14x1.3 CDC 3084 Washer CS 6x14x1.3 CDC3084	NF E 25-511 CDC 3084	AA
7012990408	38	4	Joint torique 15,54x2,62 svt FT0012869-000-E01WTS O-Ring 15,54x2,62 acc. to FT0012869-000-E01WTS	TF712D1	AA
1918530008	37	2	Bouchon M28x1,5 Plug M28x1,5	191853xx08	CC
1919680008	36	2	Ressort Spring	10-516 352	BB
1901150008	35	2	Clapet Valve	1901150008	AC
7050210408	34	1	Joint torique 8x2 svt FT0012869-000-E01WTS O-ring 8x2 acc. to FT0012869-000-E01WTS	TF712D1	AA
7255120008	33	1	Membrane Diaphragm	CDC 3041	AC
7050790408	32	1	Joint torique 57,00 x 2.50 svt FT0012869-000-E01WTS O-ring 57,00 x 2,50 acc. to FT0012869-000-E01WTS	TF712D1	AA
7014100408	31	1	Joint torique 69.52x2.62 svt FT0012869-000-E01WTS O-ring acc. to FT0012869-000-E01WTS	TF712D1	AA
7288470008	30	1	Membrane Diaphragm	Cdc 3041	AC
7050231508	29	2	Joint torique 10,00x2,00 svt FT0012869-000-E01WTS O-ring 10,0x2,0 acc. to FT0012869-000-E01WTS	TF51D1	AA
7288460008	28	1	Ressort limitation Limiting pressure spring	7288460008	BB
-	27	-	-	-	-
7288370008	26	1	Corps inférieur Lower body	7288370008	CC
7288430008	25	1	Vis de réglage RC Adjusting screw RC	7288430008	CC
7050380408	24	1	Joint torique 27,0x2,0 svt FT0012869-000-E01WTS O-ring 27,0x2,0 acc. to FT0012869-000-E01WTS	TF712D1	AA
7050220408	23	1	Joint torique 9,50x2,00 svt FT0012869-000-E01WTS O-ring 9,50x2,00 acc. to FT0012869-000-E01WTS	TF712D1	AA
7285960008	22	1	Vis de réglage Setting screw	7285960008	CC
7253510008	21	1	Guide Guide	7253510008	CC
7288440008	20	1	Ecrou de réglage Adjusting nut	7288440008	CC
7288480008	19	1	Coupelle Cupel	7288480008	CC
7042320608	18	1	Goupille cannelée ISO 8740 - Ø4 x 10 Pin serrated ISO 8740 - Ø4x10	NF EN ISO 8740	CC
7005050608	17	1	Bille acier inox Ø6 Ball stainless steel Ø6	7005050608	CC
FT0120718-000	16	1	Ressort RC CR Spring	FT0120718-000	BB
7288410008	15	1	Serre membrane Ø56,5 Diaphragm clamp Ø56.5	7288410008	CC
5004890008	14	1	Circlips J62 Elastic ring J62	NF E 22 165 DIN 472	AA
7288540108	13	1	Anneau Ø 57,5 Ring Ø 57,5	728854xx08	CC
7288380008	12	1	Entretoise Brace	7288380008	BB
-	11	-	-	-	-
FT0120716-000	10	1	Guide Guide	FT0120716-000	CC
7289420008	9	1	Tige creuse Rod	728942XX08	BB
FT0010858-000	8	1	CLAPET ADHERISE RUBBER BOUNDED VALVE	185382XX08	AC
1855620008	7	1	Ressort Spring	10-517 713	BB
1829750008	6	1	Coupelle Cupel	1829750008	CC
7048090408	5	1	Joint torique 10,50 x 2,70 svt FT0012869-000-E01WTS O-ring 10,50 x 2,70 acc. to FT0012869-000-E01WTS	TF712D1	AA
7864350008	4	1	Ressort de rappel Spring	7864350008	BC
7285870008	3	1	Bouchon guide Guide plug	7285870008	BC
7048190408	2	3	Joint torique 3,6 x 24,60 svt FT0012869-000-E01WTS O ring 34,6x3,6 acc. to FT0012869-000-E01WTS	TF712D1	AA
7288360208	1	1	Corps équipé Equipped body	728836XX08	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
Type	**0**		**NJMR avec prises de pression** ***NJMR with test points***	Weight (kg): 2,70±5%	

AE00	Rep.10 FT0120716-000 et FT0010857-000 + Rep.16 FT0120718-000 et 7288420008 + Delete Rep. E + Add N°kit (04)
AD00	Ajout nouvelle variante FT0120345-102 B
AC00	Ajout var. FT0120345-101, couple de serrage orifices C & D, rep. 9 & rep. 14 sur coupe A-A

Rev.	Change Description				
AE00	21AM02298	27/08/21	SPN	SLE	
A000	EC021AM02266	29/06/21	ASM	SLE	
AC00	EC020SAM05113	01/10/20	RLE	SLE	
AB00	EC019AM05330	05/07/19	NC2	SLE	
AA00	EC019AM02222	30/04/19	SPN	SLE	
Z00	EC018AM05114	12/04/18	RLE	SLE	
Y00	EC018AM03390	11/02/18	JC	GBE	
X00	EC018AM05576	28/11/18	NC2	SLE	
Rev.	Change	Date	Check	Approved	

Scale	1:1	Prepared	02/2008 SL
		Checked	08/2021 RTE
		Approved	09/2021 SLE
		Date	
		Index	

Faiveley Transport Rotem Company

Drawing Identification number: 728 835 XX X8

Material: RELEASED
Document Classification: NOT RESTRICTED
Fire and smoke class: -
Safety class: CAT1
Wear proof: Yes

Weight kg: See BOM
Treatment surface ref.: AMIENS
Finish: Y
Edge: A0
Thread tolerances: -
Unless otherwise specified: ISO 2768-mK
Projection: 1
Customer reference number: 10-9010.344
Approved by Customer:

SNCF FREIN

Title: DISTRIBUTEUR A RESSORT
TYPE NJMR
SPRING DISTRIBUTOR VALVE
TYPE NJMR

Revision: AE00
Sheet: 2 / 2

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701 299 04 08	38	3	Joint torique Ø15,54 x Ø2,64 svt FT0012869-E01MTS O-ring	TF712D1	AA
704 819 04 08	2	1	Joint torique Ø24,60 x Ø3,60 svt FT0012869-E01MTS O-ring	TF712D1	AA
3 à/to 34 - 39			Pièces détaillées ci-dessous Items detailed below		
FT0120345-K00	102		**Kit de maintenance New JMR type 4 et 7** **New JMR maintenance kit type 4 and 7**		BB
-	-	-	- -	-	-
701 630 00 08	52	2	Rondelle CS 8X16X1,4 CS washer 8×16×1.4	NF E 25 511	AA
704 816 04 08	50-3	4	Joint torique Ø19,80x3,60 svt FT0012869-E01MTS O-ring	TF712D1	AA
2 à/to 39			Pièces détaillées ci-dessous Items detailed below		
730 439 01 08	101		**Kit de maintenance New JMR type 1** **New JMR maintenance kit type 1**		BB
-	-	-	- -	-	-
701 537 00 08	39	4	Rondelle CS 6X14X1,3 A2-70 CS washer 6×14×1.3 A2-70	NF E 25 511	AA
701 299 04 08	38	4	Joint torique Ø15,54 x Ø2,64 svt FT0012869-E01MTS O-ring	TF712D1	AA
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class

190 115 00 08	35	2	Soupape Adherisé Rubber bounded valve	-	AC
705 021 04 08	34	1	Joint torique Ø8.00x02.00 svt FT0012869-E01MTS O-ring	TF712D1	AA
725 512 00 08	33	1	Membrane Diaphragm	CDC 3041	AC
705 079 04 08	32	1	Joint torique Ø57,00 x Ø2.50 svt FT0012869-E01MTS O-ring	TF712D1	AA
701 410 04 08	31	1	Joint torique Ø69,52xØ2,62 svt FT0012869-E01MTS O-ring	TF712D1	AA
728 847 00 08	30	1	Membrane Diaphragm	CDC 3041	AC
705 023 15 08	29	2	Joint torique Ø10,00xØ2,00 svt FT0012869-E01MTS O-ring	TF510D1	AA
705 038 04 08	24	1	Joint torique Ø27,00 x Ø2,00 svt FT0012869-E01MTS O-ring	TF712D1	AA
705 022 04 08	23	1	Joint torique Ø9,50xØ2,00 svt FT0012869-E01MTS O-ring	TF712D1	AA
700 505 06 08	17	1	Bille Ø6 Ball Ø6	-	AA
500 489 00 08	14	1	Circlips J62 Elastic ring J62	NF E 22 165	AA
FT0010858-000	8	1	Clapet adhérisé Rubber bounded valve	-	AC
D00 704 809 04 08	5	1	Joint torique Ø10,50 x Ø2,70 svt FT0012869-E01MTS O-ring	TF712D1	AA
704 819 04 08	2	3	Joint torique Ø24,60 x Ø3,60 svt FT0012869-E01MTS O-ring	TF712D1	AA
730 439 00 08	**100**		**Kit de maintenance New JMR type 0-2-3-5-6** **New JMR maintenance kit type 0-2-3-5-6**	D00	BB
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class

Rev.	Change Description
D00	Mise à jour global suivant dernier indice du plan NJMR (05)
C00	Modification désignation joint torique rep.31: 701 410 04 08. (01)
B01	Ajout N° SNCF (ECR15AMS0059)

Rev.	Change	Date	Name	Approved
D00	EC019AMS0379	01/07/19	JCR	SLE
C00	EC017AMS0560	03/12/18	NC2	SLE
B01	F2015/39	03/08/16	NC2	SL
B00	F2014/111	05/03/14	SPe	E0

Application: -

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

General tolerances: -

Thread tolerances: -

Weight kg: -

Responsible site:

BOM:

Size: A3

Status: RELEASED

Document Classification: MTC017

Fire and smoke class: -

Safety class: -

Wear piece: -

Based on:

Replacement:

Replaced:

Customer name:

Customer revision indexes:

Approved by Customer:

Customer reference number: 10-9013 217

Scale			
1:1	Prepared	02/2008	SL
	Checked	01/07/2019	SPE
	Approved	01/07/2019	SLE
	Date		Name
	en		mm

Faiveley Transport
A Wabtec Company

Main title, subtitle:

Kit de maintenance NJMR
NJMR maintenance kit

Drawing identification number: 7304390008

Revision: D00

Sheet 1 / Sheets 1

A3

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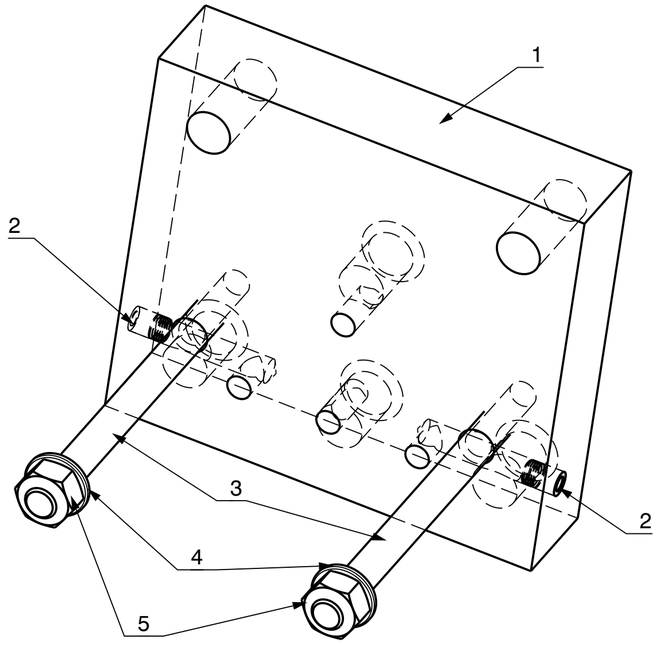
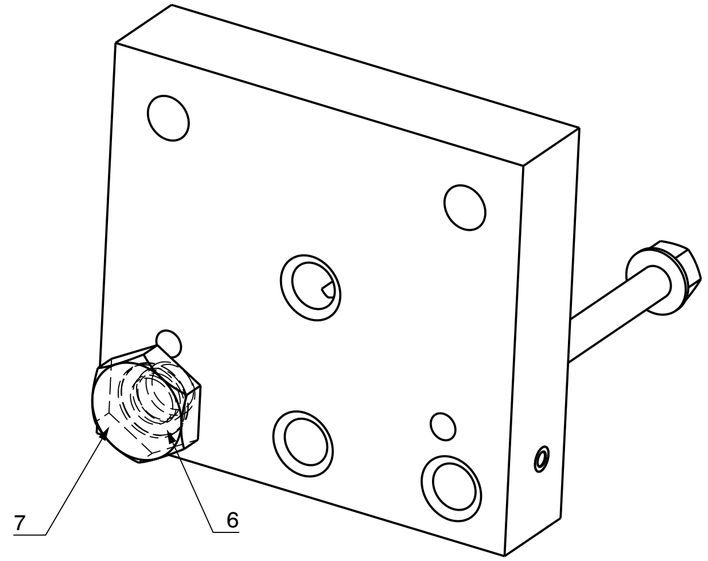
B00

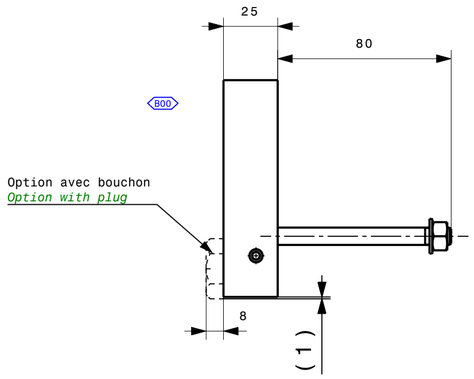
Face avant - Variante 01 et 02
Front side - Variant 01 and 02

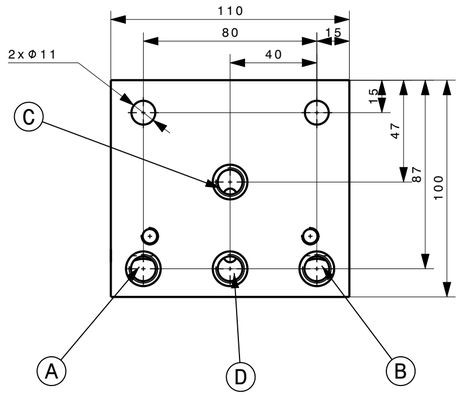


B00

Face arrière - Variante 02 (avec bouchon en CP)
Back side - Variant 02 (with plugon MP)







B00

Variante *Variant*	Position du bouchon *Plug position*
01	Sans bouchon *Without plug*
02	A

B00

A - Conduite principale CP G 1/4" H
Main pipe MP

B - Conduite générale CG - G 1/4" H
Brake pipe BP

C - Reservoir auxiliaire RA - G 1/4 "H
Auxiliary reservoir AR

D - Cylindre de frein fictif Cff - G 1/4" H
Dummy volume

N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
1890060208	7	1	Bouchon G1/4"B Plug G1/4"B	189006XX08	CC
7048100408	6	1	Joint torique Ø12.1x 2.7 svt FT0012869-000-E01MTS O-Ring Ø12.1x 2.7 acc. to FT0012869-000-E01MTS	FT0012869-000-E01MTS	AA
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
1 à/to 5			Pièces détaillées ci-dessous *Items detailed below*		
B00 **7301730208**	**102**		**Support équipé sans entrée CP** ***Equipped bracket without MP***	Weight (Kg): **0,822 ±5%**	
7021070008	5	2	Ecrou hexagonal ISO 4032 - M8 - 8 Hexagonal Nut ISO 4032 - M8 - 8	ISO4032	CC
7016300008	4	2	Rondelle CS 8x16x1,4 Washer CS 8x16x1.4	NF E 25-511	AA
7036530008	3	2	Goujon M8-80 bm12 / Stud M8-80 bm12 /	NF E 25-135	CC
B00 FT0011242-002	2	2	Bouchon étancheïté Ø6 Type 2961 Plug Ø6 Type 2961	FT0011242-002	CC
7301735108	1	1	SUPPORT JMR JMR BRACKET	730 173 00 08	CC
N° FAIVELEY	Ref.	Qty	Designation of parts	Notes	ABC class
7301730108	**101**		**Support équipé** ***Equipped bracket***	Weight (Kg): **0,802 ±5%**	

Rev.	Change Description	Date
-	-	
B00	Création variante 02 + changement réf. bouchon Rep.2 + MàJ plan	(07)
A00	Création	

Rev.	Change	Date	Name	Approved
B00	EC017AMS0736	19/06/17	SPN	SL
A00	FL2008/110	10/2008	RB	EO

Application: NEW JMR

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

General tolerances: -

Thread tolerances: -

Weight kg:

Responsible site: AMIENS

BOM: Y

Size: A2

Status: RELEASED

Document Classification: MTB006

Fire and smoke class: -

Safety class: CF1

Wear piece: NO

Based on: /

Replacement: /

Replaced: /

Customer name: /

Customer revision indexes:

Approved by Customer

Customer reference number: /

Scale	1:1		
Prepared	10/08	RB	
Checked	06/2017	ASK	
Approved	06/2017	SL	
	Date	Name	
	fr/en	mm	

Main title, subtitle:
SUPPORT JMR EQUIPE
EQUIPPED JMR BRACKET

Faiveley TRANSPORT

Drawing identification number: 7301730108

Revision: B00

Sheet: 1 / Sheets: 1

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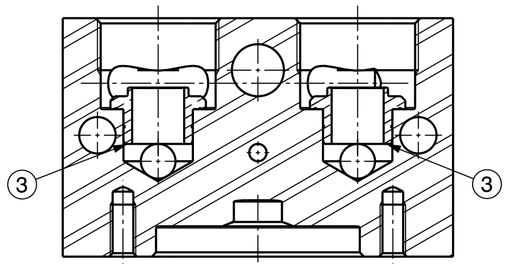
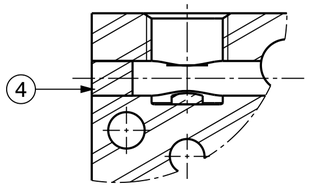
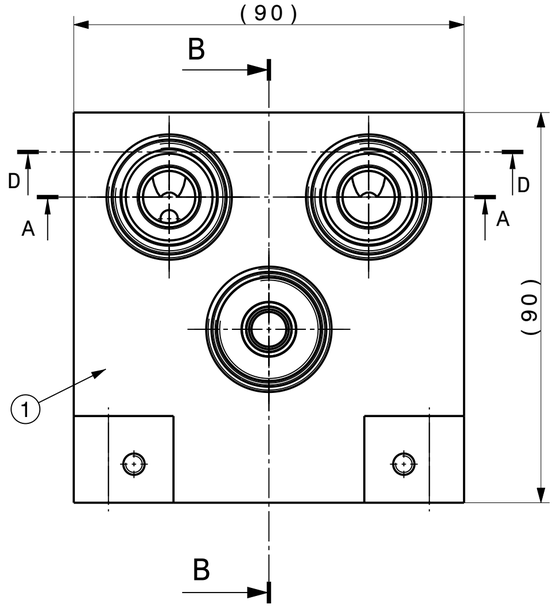
VARIANTE 01-03-05-06
VARIANT

A-A

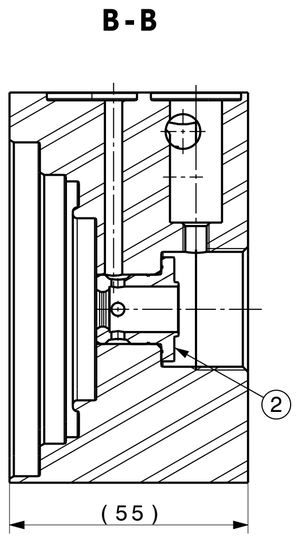


D-D



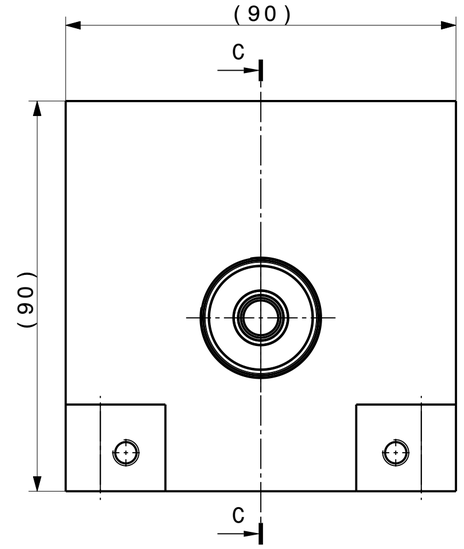


B-B



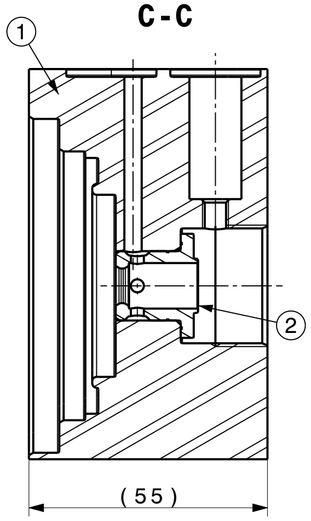
Les sièges rep.2 et 3 sont emmanchés collés avec A285080
The seats item.2 and 3 are assembled glued with A285080

Tolérances générales suivant NF F 00-037
General tolerances according to NF F 00-037

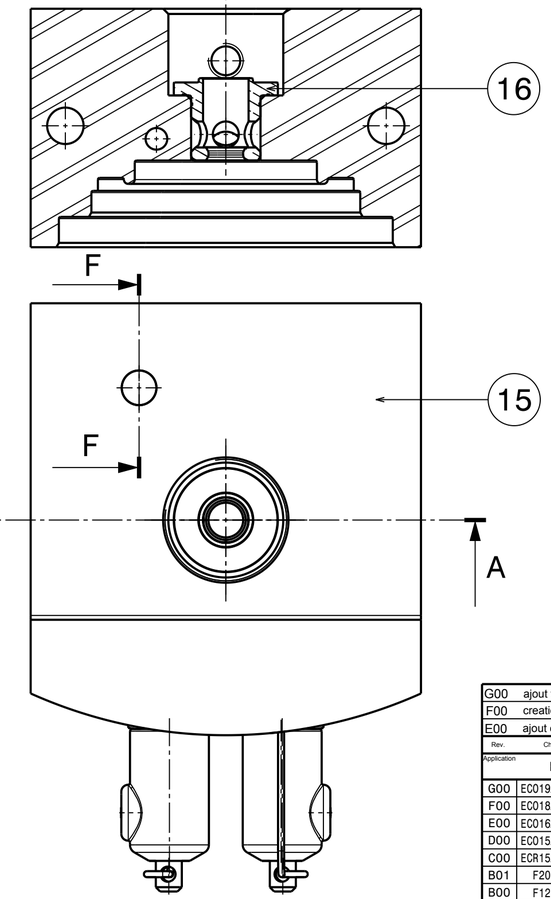


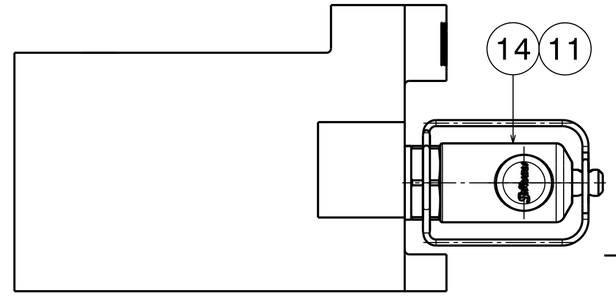
VARIANTE 04
VARIANT

C-C



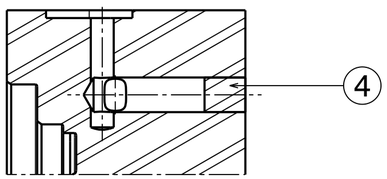
A-A





G00

VARIANTE 07
VARIANT



F-F

Rev.	Change Description			
G00	ajout variante 107 (FT0120346-100) (01)			
F00	creation variante 106 (corps GD + prise test IP54)			
E00	ajout couple de serrage rep.12			

Application	FT0012903-100	DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM		Status: RELEASED
G00	EC019AMS0090 13/02/19 JC GBE	General tolerances ISO 2768-mH	Weight kg: 0,81±5%	Responsible site: AMIENS
F00	EC018AMS0405 08/2018 ASK SL	Thread tolerances ISO 965 - 2 / ISO 228	BOM: Y	Size: A2
E00	EC016AMS0297 09/2016 ASK SL			
D00	EC015AMS0765 02/2016 RT SL			
C00	ECR15AMS0629 09/15 AG SL			
B01	F2015/91 04/15 ED SL			
B00	F12/0255 13/02/19 RB JB			
A00	FL07/139 02/08 SL JB			
Rev.	Change / Date / Name / Approved			

Document Classification: MTB006
Fire and smoke class: /
Safety class: CF1
Wear piece: YES
Based on: /
Replacement: /
Replaced: /
Customer name: /
Approved by Customer
Customer revision indexes
Customer reference number: /

Scale 1:1	Prepared	02/2008	SL
	Checked	13/02/2019	JS
	Approved	13/02/2019	GBE
	Date		Name
	f/en		mm

Main title, subtitle: Corps équipé / Equipped body

Faiveley Transport A Wabtec Company

Drawing identification number: 728836xx08

Revision: G00 | Sheet: 1 / Sheets: 3

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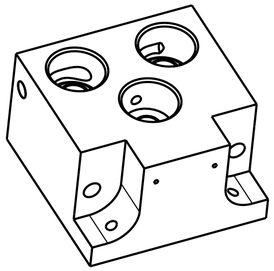
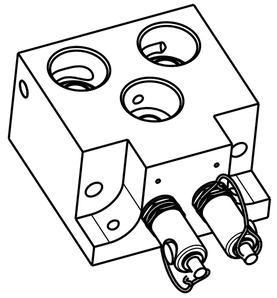
VARIANTE 01
VARIANT



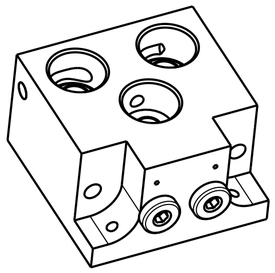
Vue isométrique
Isometric view
1:2

VARIANTE 02
VARIANT



Vue isométrique
Isometric view
1:2

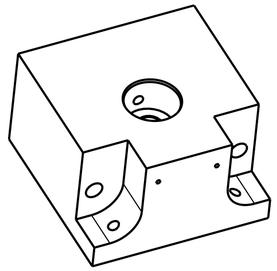
VARIANTE 03
VARIANT



Vue isométrique
Isometric view
1:2

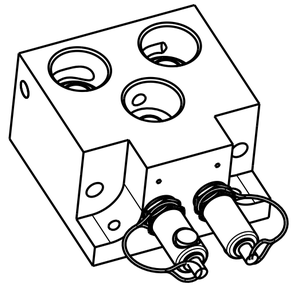
GOO

VARIANTE 04
VARIANT



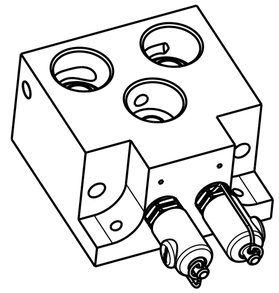
Vue isométrique
Isometric view
1:2

VARIANTE 05
VARIANT



Vue isométrique
Isometric view
1:2

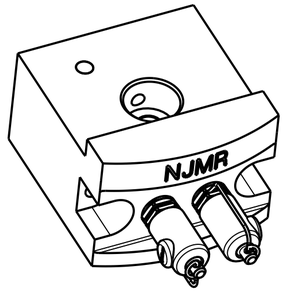
VARIANTE 06
VARIANT



Vue isométrique
Isometric view
1:2

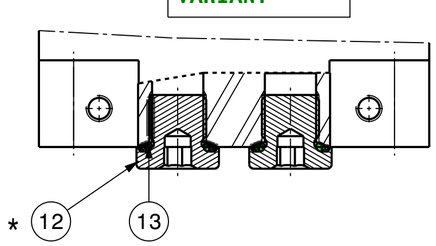
VARIANTE 07
VARIANT

GOO

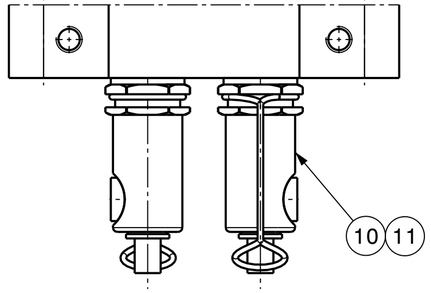


Vue isométrique
Isometric view
1:2

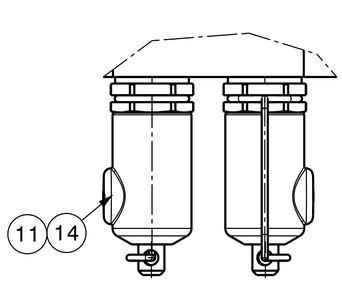
VARIANTE 03
VARIANT



VARIANTE 02-05
VARIANT



VARIANTE 06
VARIANT



VARIANTE 07
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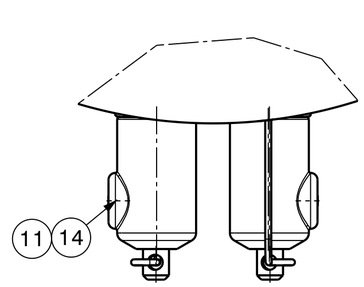

Nota/*Note*:
* : Couple de serrage Rep:12 8Nm±1
** : Tightening torque for Item:12 8Nm±1*
Tolérances générales suivant NF F 00-037
General tolerances according to NF F 00-037

Rev.	Change Description
G00	ajout variante 107 (FT0120346-100) (02)
F00	creation variante 106 (corps GD + prise test IP54)
E00	ajout couple de serrage rep.12

Application: FT0012903-100

Rev.	Change	Date	Name	Approved
G00	EC019AMS0090	13/02/19	JC	GBE
F00	EC018AMS0405	08/2018	ASK	SL
E00	EC016AMS0297	09/2016	ASK	SL
D00	EC015AMS0765	02/2016	RT	SL
C00	ECR15AMS0629	09/15	AG	SL
B01	F2015/91	04/15	ED	SL
B00	F12/0255	13/02/19	RB	JB
A00	FL07/139	02/08	SL	JB

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: RELEASED

General tolerances: ISO 2768-mH
Thread tolerances: ISO 965 - 2 / ISO 228
Weight kg: 0,81±5%
Responsible site: AMIENS
Document Classification: MTB006
Fire and smoke class: /
BOM: Y
Size: A2
Safety class: CF1
Wear piece: YES
Based on: /
Replacement: /
Replaced: /
Customer name: /
Approved by Customer
Customer revision indexes
Customer reference number: /

Scale	1:1		
	Prepared	02/2008	SL
	Checked	13/02/2019	JS
	Approved	13/02/2019	GBE
	Date		Name
	fr/en		mm

Faiveley Transport
A Wabtec Company

Main title, subtitle
Corps équipé
Equipped body

Drawing identification number: 728836xx08
Revision: G00
Sheet: 2 / Sheets: 3
A2

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	FT0013295-000	16	1	Siège de clapet grand débit Seat valve hight flow	FT0013295-000	CC
G00	FT0120346-000	15	1	Corps usiné *Machined body*	7288365x08	CC
	4-11-14	-	-	Pièces ci-dessous *Items below*		-
G00	**FT0120346-100**	**107**		**Corps équipé grand débit (avec prise de pressions IP)** **Fitted body hight flow (with IP test point)**	**sans port CP** ***without MP***	BB
	700 008 30 08	14	2	Raccord rapide RBE 03 - IP54 Test point RBE 03 - IP54	10-3181 885	CC
	FT0013295-000	2	1	Siège de clapet grand débit Seat valve hight flow	FT0013295-000	CC
	728 836 53 08	1	1	Corps usiné grand débit Machined body hight flow	7288365x08	CC
	3 à 4 - 11	-	-	Pièces ci-dessous et ci-contre Items below and opposite		
	728 836 06 08	**106**		**Corps équipé grand débit (avec prise de pressions IP)** **Fitted body hight flow (with IP test point)**		BB
	FT0013295-000	2	1	Siège de clapet grand débit *Seat valve hight flow*	FT0013295-000	CC
	728 836 53 08	1	1	Corps usiné grand débit *Machined body hight flow*	7288365x08	CC
	3 à 4 -10 à 11	-	-	Pièces ci-dessous et ci-contre *Items below and opposite*		
	728 836 05 08	**105**		**Corps équipé grand débit (avec prise de pressions)** **Fitted body hight flow (with test point)**		BB
	728 840 00 08	2	1	Siège *Seat*	7288400008	BB
	728 836 54 08	1	1	Corps usiné *Machined body*	7288365408	CC
	728 836 04 08	**104**		**Corps équipé** ***Fitted body***		BB
	704 810 04 08	13	2	Joint torique 12,10X2,70 svt FT0012869-000-E01MTS Oring 12,10X2,70 acc. to FT0012869-000-E01MTS	TF712D1	AA
	1754 000 218	12	2	Bouchon VSTI G1/4" à six pans creux G1/4' Plug VSTI G1/4" with hexagon hollow	NF EN ISO 1179-2	CC
	FT0013295-000	2	1	Siège de clapet grand débit *Seat valve hight flow*	FT0013295-000	BB
	728 836 53 08	1	1	Corps usiné grand débit *Machined body hight flow*	7288365x08	CC
	3 à 4	-	-	Pièces ci-contre *Items opposite*		-
	728 836 03 08	**103**		***Corps équipé grand débit (avec bouchons)*** ***Fitted body hight flow (with plugs)***		BB
	N° FAIVELEY	Rep. Ref.	Qté Qty	Désignation des pièces Designation of parts	Spécifications Specifications	ABC Class

Les plans des pièces classées AC, BC ou CC ne sont pas diffusables afin de protéger le savoir faire de Faiveley Transport
Drawings of parts AC, BC or CC cannot be released in order to protect FAIVELEY TRANSPORT's knowhow

Nota / Note
Enlever le joint du bouchon Rep.12 et le remplacer par le joint torique Rep.13
Delete the seal of plug Item.12 and replaced by the o-ring Item.13

Protection de la visserie suivant DEA0053
(Sauf indication particulière)
Protection of bolts and screws according
to DEA0053 (Except particular indication)

711 891 00 08	11	2	Joint plat G1/4" Ep:1.5 - Aluminium *Plate ring G1/4" Ep:1.5 - Aluminium*		CC
700 008 25 08	10	2	Raccord rapide RBE 03 *Test point RBE 03*		CC
728 836 52 08	1	1	Corps usiné *Machined body*	7288365x08	CC
2 à 4	-	-	Pièces ci-dessous *Items below*		-
728 836 02 08	**102**		**Corps équipé** ***Fitted body***		BB
FT0011242-004	4	1	Bouchon d'étanchéité Ø8 Sealing *plug Ø8*		CC
191 834 00 08	3	2	Siège *Seat*	1918340008	CC
728 840 00 08	2	1	Siège *Seat*	7288400008	BB
728 836 51 08	1	1	Corps usiné *Machined body*	7288365x08	CC
728 836 01 08	**101**		**Corps équipé** ***Fitted body***		BB
N° FAIVELEY	Rep. Ref.	Qté Qty	Désignation des pièces Designation of parts	Spécifications Specifications	ABC Class

Les plans des pièces classées AC, BC ou CC ne sont pas diffusables afin de protéger le savoir faire de Faiveley Transport
Drawings of parts AC, BC or CC cannot be released in order to protect FAIVELEY TRANSPORT's knowhow

Rev.	Change Description
G00	ajout variante 107 (FT0120346-100) (02)
F00	creation variante 106 (corps GD + prise test IP54)
E00	ajout couple de serrage rep.12

Rev.	Change	Date	Name	Approved
G00	EC019AMS0090	13/02/19	JC	GBE
F00	EC018AMS0405	08/2018	ASK	SL
E00	EC016AMS0297	09/2016	ASK	SL
D00	EC015AMS0765	02/2016	RT	SL
C00	ECR15AMS0629	09/15	AG	SL
B01	F2015/91	04/15	ED	SL
B00	F12/0255	13/02/19	RB	JB
A00	FL07/139	02/08	SL	JB

Application: FT0012903-100
DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM
Status: RELEASED
General tolerances ISO 2768-mH
Thread tolerances ISO 965 - 2 / ISO 228
Weight kg: 0,81±5%
Responsible site: AMIENS
Document Classification: MTB006
Fire and smoke class: /
BOM: Y
Size: A2
Safety class: CF1
Wear piece: YES
Based on: /
Replacement: /
Replaced: /
Customer name: /
Customer revision indexes:
Approved by Customer:
Customer reference number: /

Scale			
1:1	Prepared	02/2008	SL
	Checked	13/02/2019	JS
	Approved	13/02/2019	GBE
	Date		Name
	frien		mm

Main title, subtitle: Corps équipé / Equipped body

Faiveley Transport
A Wabtec Company

Drawing identification number: 728836xx08
Revision: G00
Sheet: 3 / Sheets: 3

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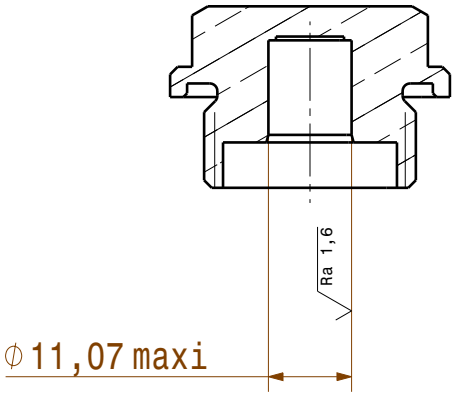

Rev.	Change Description
-	-
-	-
A00	Création

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: XXXXX

Surface: √Ra 3,2 (√Ra 6,3 √Ra 1,6)

Hardening	Hardness	Depth	Finish
/	/	/	/

Treatment	Raw part number	Model number
/	/	/

Tol.dim.	Deviation	Tol.dim.	Deviation

Application: NEW JMR

General tolerances: /

Thread tolerances: /

Weight (kg)	BOM	Responsible site	Size
0,081	N	AMIENS	A4

Material:

Document Classification: MTB007

Fire and smoke class

Safety class: CF1

Wear piece: NO

Rev.	Change	Date	Name	Approved
A00	FL07/139	04/06/14	RB	CG

Based on: /

Replacement: /

Replaced: /

Customer name: /

Customer revision indexes:

Approved by Customer:

Customer reference number: /

Scale			
1:1	Prepared	06/14	RB
	Checked	06/14	SP
	Approved	06/14	CG
	Date		Name
	en		mm

Main title, subtitle

BOUCHON
PLUG

Faiveley TRANSPORT
FAIVELEY TRANSPORT AMIENS

Drawing identification number: 728 587 00 08 PU

Revision: A00

Sheet: 1 / 1 Sheets

A4

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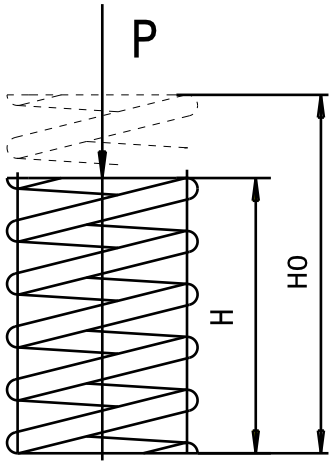

HAUTEUR (H) APPLIQUEE	EFFORT NOMINAL (P)	EFFORT MINI TOLERE (P)
APPLIED DIMENSION (H)	NOMINAL FORCE (P)	MINIMUM ALLOWED FORCE (P)
17,9 mm	16 N	14,7 N
15,6 mm	20 N	18 N

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status XXXXX

Surface

Hardening	Hardness	Depth	Finish
-	-	-	-

Treatment -

Raw part number -

Model number -

Tol.dim.	Deviation	Tol.dim.	Deviation

Application -

General tolerances -

Tapping tolerances -

Weight kg 0,05 | Size A4 | Responsible site AMS | Res. dept. AH | N

Material .

Document Classification

Fire and smoke class 0

Classification -

Wear piece Yes

Based on -

Replacement -

Replaced -

Customer name -

Customer revision indexes

Approved by Customer

Customer reference number -

Rev.	Qty.	Change	Date	Name	Approved
A00	-	F06/0167	04/06	SP	E0

Scale 1:1

Prepared	04/06	S.Panier
Checked		
Approved	04/06	
Date		Name
en/fr		mm

Main title, subtitle

RESSORT - SPRING -

Faiveley TRANSPORT

Drawing identification number 786 435 00 08 PU

Revision A00 | Sheet 1 / 1 | Sheets

A4

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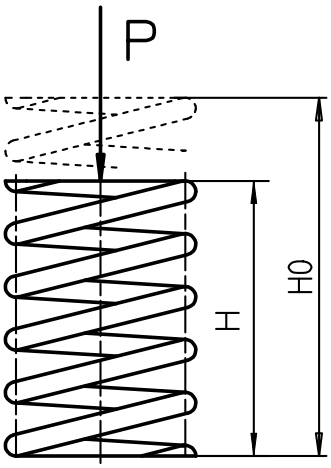
Issue / Indice	Design change n° / N° de modification	Date	Design change / Nature de la modification (A Added / Ajouté, D deleted / Supprimé, W Was / Etait)	Altered by / Modifié par	Approuved by / Approuvé par
A00	F03/0142	03/03	Première diffusion	S.Gé	M.Brûlé
B00	F03/0661	03/04	Modification application et ajout poids (02)	A. Charvot	M. Brûlé



HAUTEUR (H) APPLIQUEE	EFFORT NOMINAL (P)	EFFORT MINI TOLERE (P)
APPLIED DIMENSION (H)	*NOMINAL FORCE (P)*	*MINIMUM ALLOWED FORCE (P)*
8.5 mm	4.5 N	4.05 N

Replaced by · Replacement for ·
Based on · Application B Divers B Weight 0,003 Kg B

SNCF Frein

10-517 713 PU

Scale : */*

	Date	Name
Prepared		
Checked		
Approved	03/04	

SAB WABCO

RESSORT
SPRING

185 562 00 08 PU

Issue B00 | Sheet 1/1

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Ensemble - A4

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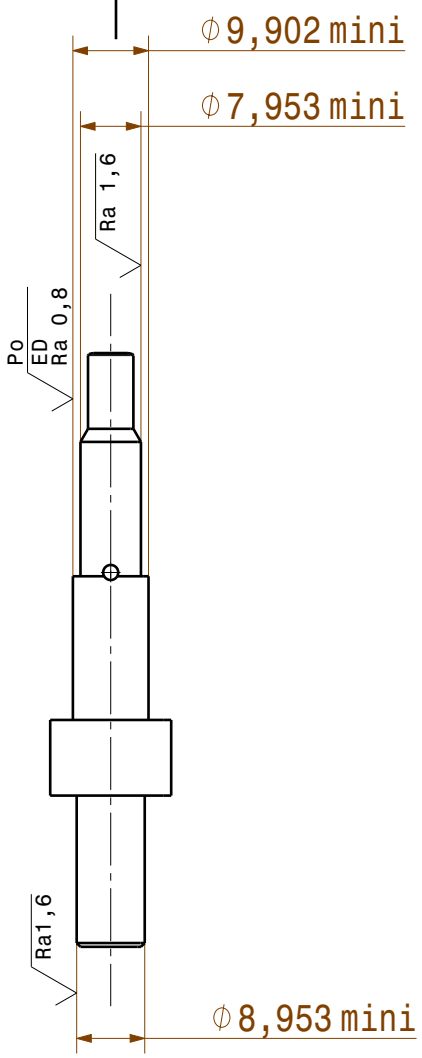

Rev.	Change Description
-	-
-	-
A00	Création

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: XXXXX

Surface: √Ra 3,2 (√Ra 6,3 √Ra 1,6 √E Ra 0,8 √Po ED Ra 0,8)

Hardening	Hardness	Depth	Finish
/	/	/	/

Treatment	Raw part number	Model number
/	-	/

Tol.dim.	Deviation	Tol.dim.	Deviation

Application: /

General tolerances: /

Thread tolerances: /

Weight (kg)	BOM	Responsible site	Size
0,036	N	AMIENS	A4

Material: X12 Cr Ni 18-9

Document Classification: MTB007

Fire and smoke class

Safety class: CF2

Wear piece: YES

Based on

Replacement: /

Replaced: /

Customer name: /

Customer revision indexes

Approved by Customer

Customer reference number: /

Rev.	Change	Date	Name	Approved
A00	FL07/139	03/06/14	RB	CG

Scale			
1:1	Prepared	06/14	RB
	Checked	06/14	SP
	Approved	06/14	CG
	Date		Name
	en		mm

Faiveley TRANSPORT
FAIVELEY TRANSPORT AMIENS

Main title, subtitle

Tige creuse
New JMR
Rod
New JMR

Drawing identification number: 728 942 00 08 PU

Revision: A00

Sheet: 1 / Sheets: 1

A4

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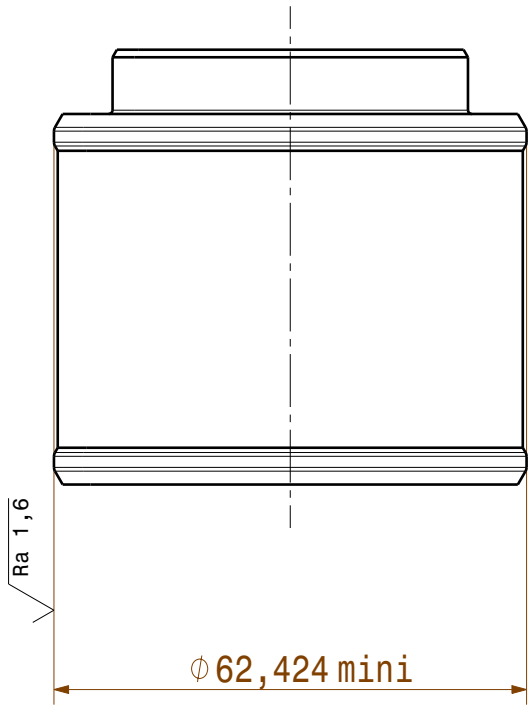

Rev.	Change Description
-	-
-	-
A00	Création

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

Status: XXXXX

Surface: $\sqrt{Ra\ 3,2}\ \left(\sqrt{Ra\ 1,6}\ \sqrt{Ra\ 6,3}\right)$

Hardening	Hardness	Depth	Finish
/	/	/	/

Treatment	Raw part number	Model number
/	-	/

Tol.dim.	Deviation	Tol.dim.	Deviation

Application: /

General tolerances: /

Thread tolerances: /

Weight (kg): 0,265 | BOM: N | Responsible site: AMIENS | Size: A4

Material: CW 612 N

Document Classification: MTB007

Fire and smoke class

Safety class: CF2

Wear piece: YES

Based on: -

Replacement: / | Replaced: /

Customer name: /

Customer revision indexes

Approved by Customer

Customer reference number: /

Rev.	Change	Date	Name	Approved
.	.	.	.	.
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A00	FL07/139	03/06/14	RB	CG

Scale			
1:1	Prepared	06/14	RB
	Checked	06/14	SP
	Approved	06/14	CG
	Date		Name
	en		mm

Main title, subtitle

GUIDE RESSORT
New JMR
Spring guide
New JMR

Faiveley TRANSPORT
FAIVELEY TRANSPORT AMIENS

Drawing identification number: 728 842 00 08 PU

Revision: A00 | Sheet: 1 | Sheets: 1

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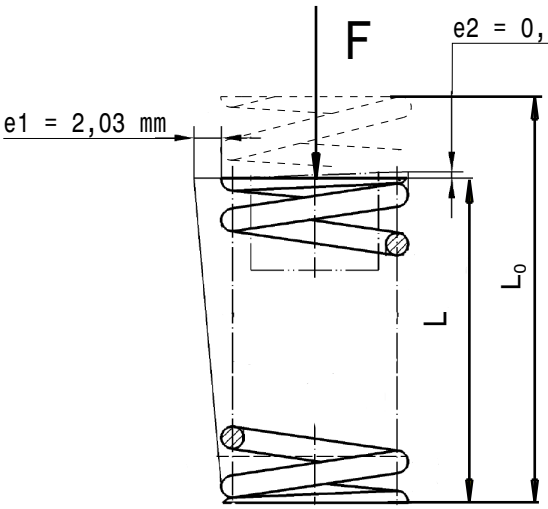

Hauteur (L) Appliquée	Effort Nominal (F)	Effort mini toléré* (F)
Applied Dimension (L)	*Nominal Force (F)*	*Minimum Allowed Force* (F)*
49mm	370N	338,5N
46mm	430N	338,55N

*Effort prenant en compte une relaxation théorique (selon logiciel IST) de 1,5% pour une compression à L=46mm d'une durée de 10 000h à 20°C.
La perte d'effort est reportée à l'identique en N sur la première hauteur.
**Theorical relaxation included (based on IST) Prediction of 1,5% for an operating position of L=46mm during 10 000h at 20°C.*
The force loss is applied with the same value in Newton on the 1st dimension.

Rev.	Change Description
-	-
-	-
A00	Création

Tol.dim.	Deviation	Tol.dim.	Deviation

Application

Rev.	Change	Date	Name	Approved
.	.	.	.	.
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.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
A00	ECR15AMS0752	11/02/16	GrB	SL

DRAWING SHALL NOT REVISED OUTSIDE CAD SYSTEM | Status

Surface: √ (√ √ √)

Hardening	Hardness	Depth	Finish
/	/	/	/

Treatment: Zinguage Lamellaire ou Cataphorèse

Raw part number: /

Model number: /

Material specifications:
EN 10270-1, EN 10270-2, EN 10270-3
EN 12166, EN 10089

Spring calculation:
EN 13906-1, EN 13906-2, EN 13906-3

Spring tolerances:
EN 15800, DIN 2096

Weight (kg) 0.05kg±5% | BOM N | Responsible site AMIENS | Size A4

Material: Acier Chrome Silisicum (FDSiCr) acc. to EN 10270-2

Document Classification MTB007
Fire and smoke class /
Safety class CF1
Wear piece YES

Based on /

Replacement / | Replaced /

Customer name /

Customer revision indexes

Approved by Customer

Customer reference number /

Scale 1:1	Prepared	11/02/2016	GBT
	Checked	11/02/2016	DB
	Approved	11/02/2016	SL
	Date		Name
	en		mm

Main title, subtitle

Ressort de limitation
Spring

Faiveley TRANSPORT
FAIVELEY TRANSPORT AMIENS

Drawing identification number: 7288460008PU

Revision: A00 | Sheet: 1 / Sheets: 1

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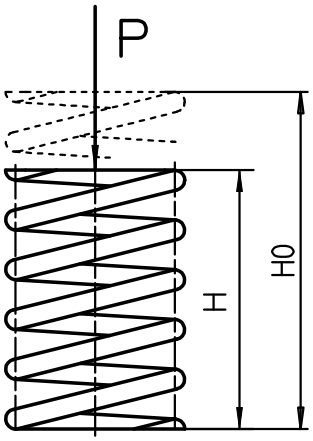

HAUTEUR (H) APPLIQUEE	EFFORT NOMINAL (P)	EFFORT MINI TOLERE (P)
APPLIED DIMENSION (H)	*NOMINAL FORCE (P)*	*MINIMUM ALLOWED FORCE (P)*
20 mm	0.507 N	0.427 N
17.5 mm	0.622 N	0.5598 N

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM | Status: -

Surface: xx√ (xx√ xx√ xx√)

Hardening	Hardness	Depth	Finish
-	-	-	-

Treatment	Raw part number	Model number
-	-	-

Tol.dim.	Deviation	Tol.dim.	Deviation

Application: -

General tolerances : ISO 2768-mH

Weight kg B 0.001 | Size A4 | Responsible site: AMS | Res. dept.: PP | N

Material: See note1

Document Classification
Fire and smoke class: 0
Classification: -
Wear piece: Y

Based on: - | Replacement: - | Replaced: -

Customer name: SNCF FREIN

Approved by Customer

Customer revision indexes

Customer reference number: 10-516 352 PU

Rev.	Qty.	Change	Date	Name	Approved
C00	00	F07/384	07/07	A.D	E.O
B00	01	F04/008	01/04	A.C	M.B
A00	-	F02/685	11/02	S.G	M.B

Scale 1:1			
	Prepared	02/07/2007	A.DEKERVEL
	Checked		
	Approved	02/07/2007	E.O
	Date	Name	
	en/fr	mm	

Main title, subtitle: -

RESSORT
SPRING

Faiveley TRANSPORT

Drawing identification number: 191 968 00 08 PU | Revision: C00 | Sheet 1 / 1 Sheets

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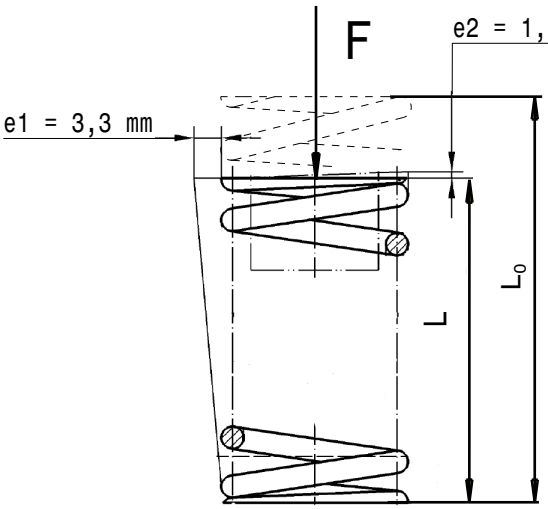

Hauteur (L) Appliquée	Effort Nominal (F)	Effort mini toléré* (F)
Applied Dimension (L)	*Nominal Force (F)*	*Minimum Allowed Force* (F)*
69mm	890N	808N
66mm	955N	873N

*Effort prenant en compte une relaxation théorique (selon logiciel IST) de 1,25% pour une compression à L=66mm d'une durée de 10 000h à 20°C.
La perte d'effort est reportée à l'identique en N sur la première hauteur.
**Theorical relaxation included (based on IST) Prediction of 1,25% for an operating position of L=66mm during 10 000h at 20°C.*
The force loss is applied with the same value in Newton on the 1st dimension.

Rev.	Change Description
-	-
-	-
A00	Création

Tol.dim.	Deviation	Tol.dim.	Deviation

Application

Rev.	Change	Date	Name	Approved
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A00	ECR15AMS0752	11/02/16	GrB	SL

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM | Status

Surface: √ (√ √ √)

Hardening	Hardness	Depth	Finish
/	/	/	/

Treatment: Zinguage Lamellaire ou Cataphorèse

Raw part number: /

Model number: /

Material specifications:
EN 10270-1, EN 10270-2, EN 10270-3
EN 12166, EN 10089

Spring calculation:
EN 13906-1, EN 13906-2, EN 13906-3

Spring tolerances:
EN 15800, DIN 2096

Weight (kg) 0.26kg±5% | BOM N | Responsible site AMIENS | Size A4

Material: Acier Chrome Silisicum (FDSiCr) acc. to EN 10270-2

Document Classification MTB007
Fire and smoke class /
Safety class CF1
Wear piece YES

Based on /

Replacement / | Replaced /

Customer name /

Customer revision indexes

Approved by Customer

Customer reference number /

Scale 1:1	Prepared	11/02/2016	GBT
	Checked	11/02/2016	DB
	Approved	11/02/2016	SL
	Date		Name
	en		mm

Main title, subtitle: Ressort Spring

FAIVELEY TRANSPORT AMIENS

Drawing identification number: 7288450008PU

Revision: A00 | Sheet 1 / Sheets 1

A4

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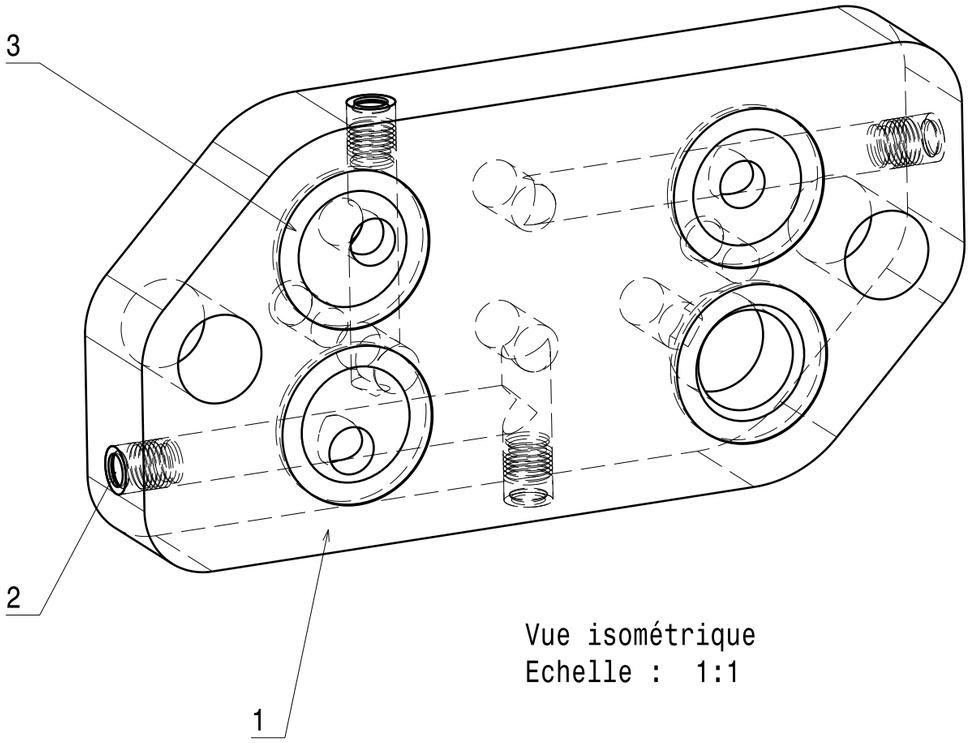

Vue isométrique
Echelle : 1:1

N° FAIVELEY	Rep. Ref.	Qté Qty	Designation des pièces Designation of parts	Spécifications Specifications	ABC Class
704 816 04 08	3	4	Joint torique Ø 19,80 x 3,60 O-ring	.	AA
175 400 01 70	2	4	Bouchon Ø8 SK 550-080 Plug	.	CC
728 855 51 08	1	1	Bride usinée Machined flange	.	CC
728 855 01 08	01		Bride JMR équipée Equipped JMR flange	. Basic weight (kg) :.	BB

Les plans des pièces classées AC, BC ou CC ne sont pas diffusables afin de protéger le savoir faire de SAB WABCO
Drawings of parts AC, BC or CC cannot be released in order to protect SAB WABCO's knowhow

Rev.	Change	Date	Name	Approved
-	-			
B00	Nouvelle bride + joint + bouchons			
A00	Création			

Application: NEW JMR

DRAWING SHALL NOT BE REVISED OUTSIDE CAD SYSTEM

General tolerances: /
Thread tolerances: -
Weight kg: 0,09kg
Responsible site: AMIENS
BOM: Y
Size: A3
Status: XXXXX
Document Classification: MTB006
Fire and smoke class: /
Safety class
Wear piece: YES
Based on: /
Replacement: /
Replaced: /
Customer name: /
Customer revision indexes
Approved by Customer
Customer reference number: /

Scale 1:1	Prepared	10/09	RB
	Checked		
	Approved	10/09	MR
	Date		Name
	en		mm

Faiveley TRANSPORT
FAIVELEY TRANSPORT AMIENS

Main title, subtitle
BRIDE JMR EQUIPEE
EQUIPPED JMR FLANGE

Drawing identification number: 728 855 xx 08
Revision: B00
Sheet 1 / Sheets 1
A3

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04.34_04.36_EP VALVE (Application) EVF

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Faiveley Transport
A Wabtec Company

/// 515182-E00MUM

Magnet Valve Type 3/2

P/Ns of validity listed in paragraph 3

Maintenance/Use manual

ECO/ECO: 20PSC0012
Compiled: E. Bosio (Bosio Cons.)
Checked: massimo.morando
Approved: francesco.grilli

Date: 09/07/2020 - Revision: A01

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	17/12/2009	First issue	.	Elan chezian	marco.de angelis	elisa. ruscello
A01	09/07/2020	General update	20PSC 0012	E. Bosio (Bosio Cons.)	massimo. morando	francesco. grilli
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/// 1. Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.
- Place the Warning Cartel “Maintenance on going” during the maintenance activities.
- The device must be maintained when and as prescribed by Faiveley Transport. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorised personnel must carry out installation and maintenance.
- For maintenance activities Faiveley Transport recommends using only original parts supplied by Faiveley Transport. This to be understood for all components and, in particular, for those containing rubbers and degradable materials. Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.

  The above considerations are valid in order to assure the results of laboratory tests and Faiveley approval, taking into account both the design aspects, the production processes and materials’ supply and selection.

  Faiveley will not be responsible for any loss of performance of the products, as well as for any damage and / or defects resulting from the use of these components, if it is not unequivocally demonstrated the exclusive use of Faiveley original spare parts.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Before accessing to electric parts, make sure the power is duly switched off.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

NOTE. For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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NOTE. Faiveley Transport reserves the right to modify its equipment or the content of this manual at any time without giving any communication.

1.1 Storage conditions

- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust, temperature shocks and direct source of heat such as boilers, radiators and direct sunlight. The ambient temperature and humidity values must be the ones reported in the brake system maintenance manual. If the brake system maintenance manual is not foreseen, the ambient temperature must be within -25°C and +25°C and the relative humidity must be within 10% and 65%.
- If the storage is below 15°C, handle carefully all the stored products as they may have stiffened and become susceptible to distortion. The temperature of product taken from such low-temperature storage should be raised to approximately 30°C throughout their mass, before the products are put into service.
- Rubber parts, if out of their original packaging, must be kept in black bags, to avoid ingress of light. If out of their original packaging, equipment must be protected against bad weather and light (UV).
- Rubber parts should be protected from light sources, in particular direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury lamps or high-voltage electrical equipment giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap.
- Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.
- Take care that the packaging is protected from rodents.
- Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:
    - pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
    - prior to the installation of a pneumatic or electro-pneumatic component on the vehicle:
        - if the date of manufacture or last overhaul dates back more than **18 months** the equipment must undergo a functional test according to the applicable procedure. If the functional test fails, the product must be overhauled and then a functional test must be performed before installing it on the system.
        - if the component has not been used for more than the overhaul/replacement periodicity, it must be overhauled and then tested with the applicable functional test before the installation on the system or replaced with a new one if overhaul is not foreseen for the component.
- No component can be used if the prescription above is not followed. The disposal must be done according to the applicable regulations.

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- All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.
- All the protective plugs must be removed only at the time of installation.
- Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.
- Parts must be picked off the shelf in order of time of manufacture.

1.2 Cleaning instruction

CAUTION! While cleaning or drying parts, **DO NOT USE** high-pressure air jets and/or water jets and/or any liquid.

- Prior to proceed to any operation, like dismounting, perform a thorough external cleaning of the component.
- During the cleaning phase, provide to remove all the old marking signs made by a solid paste (STYLMARK paint, for example) by using a cutter only if the used paste is already polymerized (solid) by taking care not to damage the surrounding parts and the surface coating/painting , if foreseen; then clean with cleaner Metal Cleaner, applying it on a cloth. If the paint paste is still wet, just use the Metal Cleaner, applying it on a cloth. When the old marking signs are not made by a solid paste (Round tip paint marker, for example) use the cleaner Metal Cleaner, applying it on a cloth.

NOTE. Alcohol, solvent and soup are strictly prohibited for threaded part when glue (whatever it is, a threadlocker, an anti-seize compound or a sealant) is required.

1.3 Warning message

Messages and warning symbols are useful to have a clear focus of something strictly related to the maintenance
actions, so they are reported, if foreseen, before every action. Messages and warning symbols in this document are as follows:

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and /or and/or to damage to the unit or the environment.

Note: Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.

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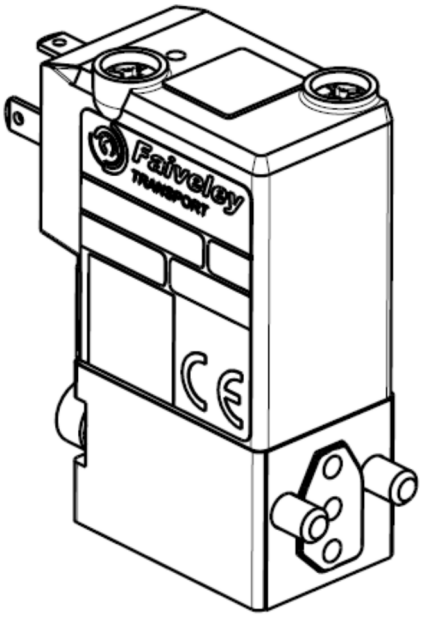
1.4 List of abbreviations

FT	Faiveley Transport
BP	Brake Pipe
MP	Main Pipe

/// 2. Description of equipment

The solenoid valve 15 mm 3/2 (3 way / 2 positions) can be NO (Normally Open) or NC (Normally closed).
The 15 mm electro-valves are used, on FT products, to charge or vent to atmosphere piloting circuits.



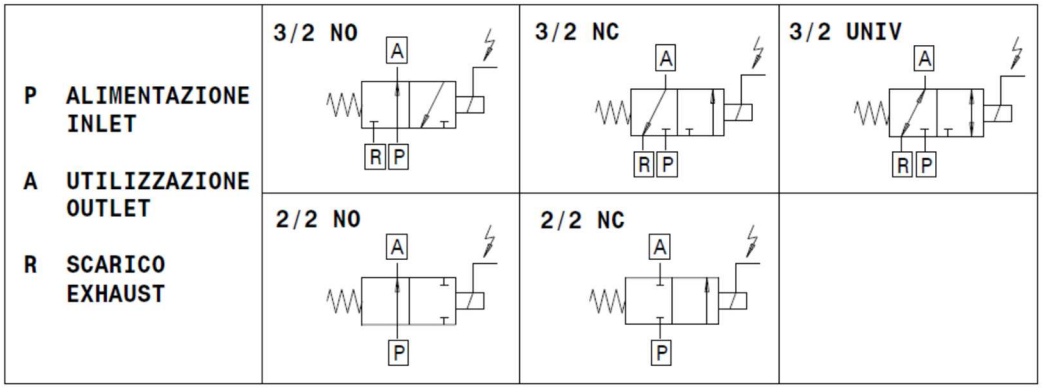


Figure 1: External view and ISO symbol

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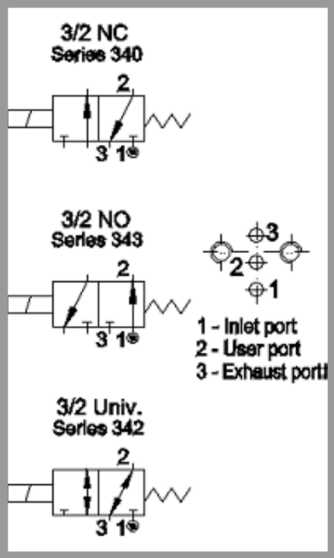
/// 3. Main features and data

- This device is available with several characteristics. The following table lists all the part numbers to which this document applies, old and new configuration, and their relative characteristics.

P/Ns ACL new pneumatic design, (ref. drawing FT0127517-100)	P/Ns 15 mm ACL pneumatic design, obsolete	P/Ns 15 mm ACL current design, (ref. drawing 2/515182)	Valve type	Voltage supply [V]	Tolerance [%]	Pressure [bar]	Port size 1 to 2 [mm]	Port size 2 to 3 [mm]	Connections
FT0127517-101	FT0028563-100NP	FT0028563-100	3/2 NC	5	±5	0÷8	0.8	0.9	
FT0127517-102	FT0028563-100NP	2/518056	3/2 NC	12	±5	0÷8	1.2	1.3	
FT0127517-103	2/518057NP	2/518057	3/2 NC			0÷10	0.8	0.9	
FT0127517-104	2/515184NP	2/515184	3/2 NO			0÷10	0.9	1.2	
FT0127517-105	2/515189NP	2/515189	3/2 Univ.			0÷6	0.8	0.9	
FT0127517-106	2/515187NP	2/515187	3/2 NC	24	-30 / +25	0÷10	0.8	0.9	
FT0127517-107	2/520494NP	2/520494	3/2 NC			0÷6	1.2	1.3	
FT0127517-108	2/515806NP	2/515806	3/2 NO			0÷10	0.9	1.2	
FT0127517-109	2/515807NP	2/515807	3/2 Univ.			0÷6	0.8	0.9	
FT0127517-110	FT0023153-100NP	FT0023153-100	3/2 NC	48	-30 / +25	0÷10	0.8	0.9	
FT0127517-111	2/515808NP	2/515808	3/2 NC	72	-30 / +25	0÷10	0.8	0.9	
FT0127517-112	2/515809NP	2/515809	3/2 NO			0÷10	0.9	1.2	
FT0127517-113	2/515810NP	2/515810	3/2 Univ.			0÷6	0.8	0.9	
FT0127517-114	2/515186NP	2/515186	3/2 NC	110	-30 / +25	0÷10	0.8	0.9	
FT0127517-115	FT0110334-100NP	FT0110334-100	3/2 NC			0÷6	1.2	1.3	
FT0127517-116	2/515191NP	2/515191	3/2 NO			0÷10	0.9	1.2	
FT0127517-117	2/515188NP	2/515188	3/2 Univ.			0÷6	0.8	0.9	
N.A.	N.A.	2/515186R**	3/2 NC			0÷10	0.8	0.9	
FT0127517-118	FT0028564-100NP	FT0028564-100	3/2 NO	5	±5	0 ÷ 8	0,9	0,8	



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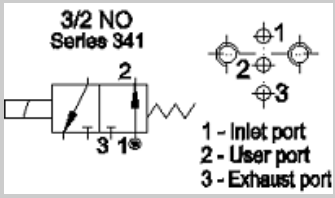
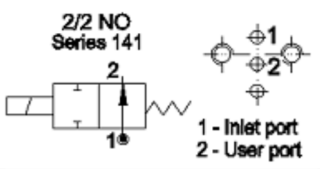
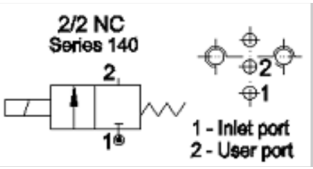
P/Ns ACL new pneumatic design, (ref. drawing FT0127517-100)	P/Ns 15 mm ACL pneumatic design, obsolete	P/Ns 15 mm ACL current design, (ref. drawing 2/515182)	Valve type	Voltage supply [V]	Tolerance [%]	Pressure [bar]	Port size 1 to 2 [mm]	Port size 2 to 3 [mm]	Connections
FT0127517-119	FT0028564-101NP	FT0028564-101	3/2 NO	12	±5	0 ÷ 10	0,9	1,2	
FT0127517-120	2/515811NP	2/515811	3/2 NO			0 ÷ 6	1,3	1,2	
FT0127517-121	2/515812NP	2/515812	3/2 NO	24	-30 / +25	0 ÷ 6	1,3	1,2	
FT0127517-122	FT0028564-102NP	FT0028564-102	3/2 NO			0 ÷ 10	0,9	1,2	
FT0127517-123	2/520495NP	2/520495	3/2 NO	48	-30 / +25	0 ÷ 6	1,3	1,2	
FT0127517-124	FT0028564-103NP	FT0028564-103	3/2 NO			0 ÷ 10	0,9	1,2	
FT0127517-125	2/515813NP	2/515813	3/2 NO	72	-30 / +25	0 ÷ 6	1,3	1,2	
FT0127517-126	2/517443NP	2/517443	3/2 NO			0 ÷ 10	0,9	1,2	
FT0127517-127	2/515814NP	2/515814	3/2 NO	110	-30 / +25	0 ÷ 6	1,3	1,2	
FT0127517-128	FT0028564-104NP	FT0028564-104	3/2 NO			0 ÷ 10	0,9	1,2	
N.A.	N.A.	2/515814R	3/2 NO			0 ÷ 6	1,3	1,2	
FT0127517-129	2/520175NP	2/520175	2/2 NO	5	±5	0 ÷ 10	0,9	N.A.	
FT0127517-130	2/520174NP	2/520174	2/2 NC	5	±5	0 ÷ 8	0,8	N.A.	

Table 1: 15 mm solenoid valves P/N and electro-pneumatic features

- AIR QUALITY ACCEPTED FOR WORKING 5-2-4 ISO 8573-1
- TEMPERATURE RANGE: -40°C ÷ +70°C:

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/// 4. Description of the Function/Operation

Refer to Figure 2:

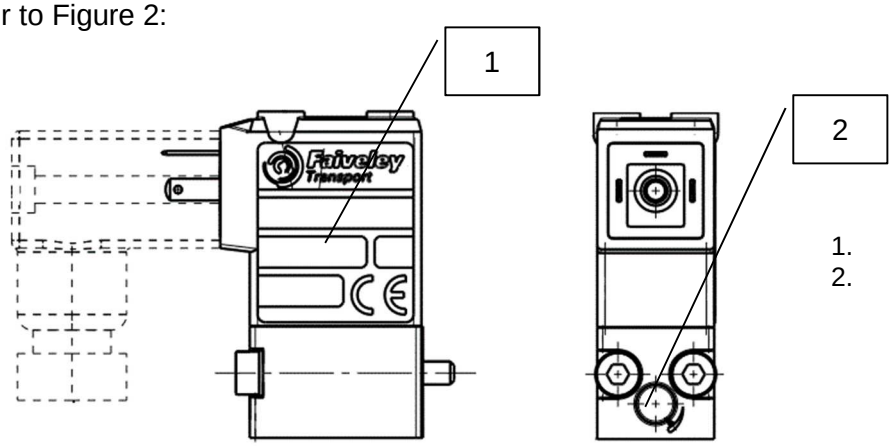
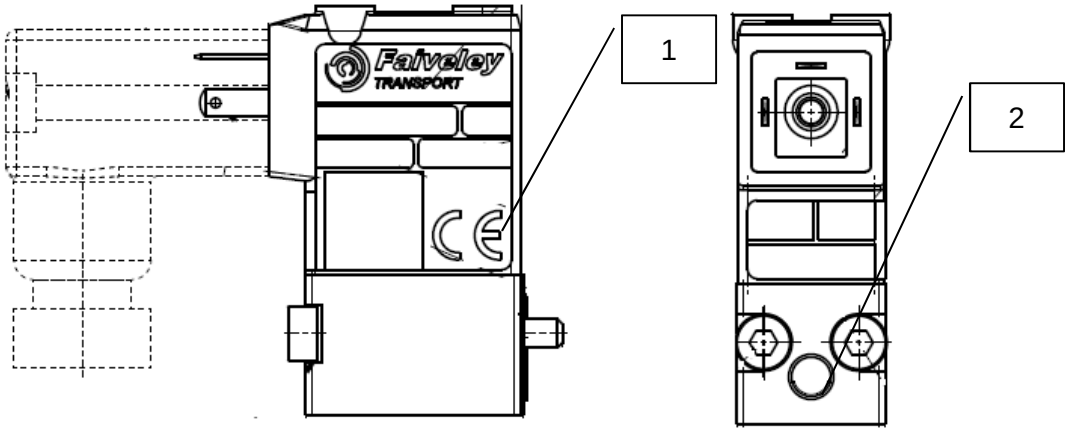


Figure 2: External view drawing 2/515182



Ref.	Description
1	Valve body

Ref.	Description
2	Manual override (if present)

Figure 3: External view drawing FT0127517-100

The valve is an electropneumatic operator directly actuated by the energy of a solenoid.

It is available in many variants each having a specific setting and ratings (refer paragraph /// 7).

It can be fitted with a provision made to facilitate the manual override whenever required.

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/// 5. Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance)**: not required.
2. **Second Level Maintenance**: replacement as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical replacement periodicity: 6 years.

NOTE. Maintenance periodicity must be counted from the date of manufacture of the device.

CAUTION! Equipment either stored on-the-shelf or mounted on inoperative vehicles must be replaced after 6 years from the date of manufacture or of last overhaul, since rubber parts age out even in optimum storage conditions.

Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than 18 months.

CAUTION!

Replacement periodicity must include both the years of functioning and the years of storage on-the-shelf or mounting on inoperative vehicles.

/// 6. Routine maintenance

This device doesn't require any light maintenance.

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/// 7. Removal procedure

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

CAUTION! Take care to prevent ingress of dirt or debris in the system.

NOTE. To remove the O-rings, use a Professional Tool Kit as shown in the figure below.

Figure 4: example of a Professional Tool Kit for O-ring

Refer to Figure 5:

1. Unplug the electrical connector (1).
2. Undo the two M3 screws (2) with flat washers (3) and remove the valve from the host panel.

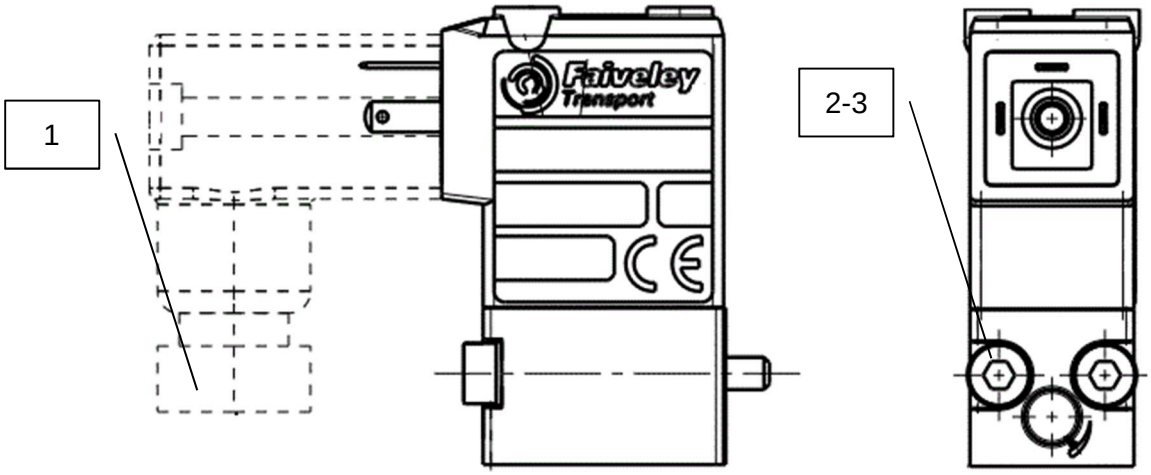

Figure 5: installation/removal procedure drawing 2/515182

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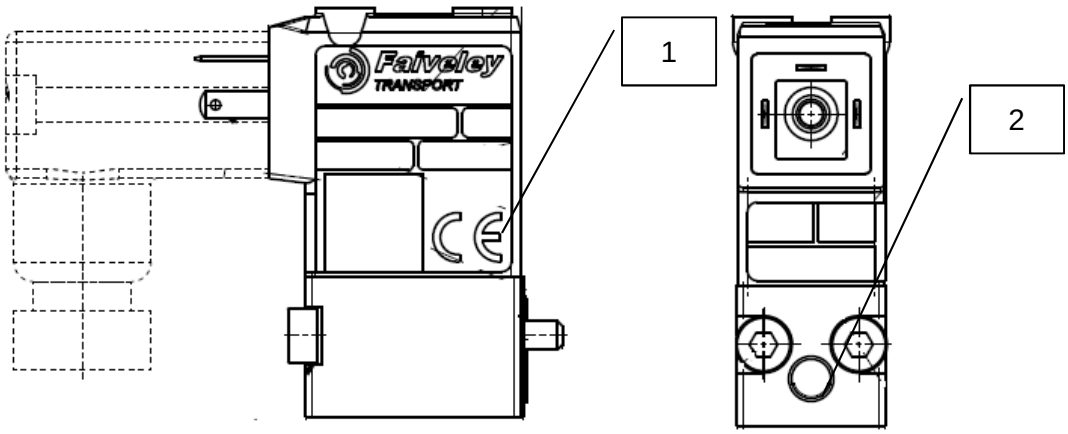

Figure 6: installation/removal procedure drawing FT0127517-100

/// 8. Installation Procedure

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

CAUTION! Take care to prevent ingress of dirt or debris in the system.

NOTE. Alcohol, solvent and soap are strictly prohibited for threaded part when glue (whatever it is, a threadlocker, an anti-seize compound or a sealant) is required.

CAUTION! The interface gasket is made of silicon and DOES NOT need any lubrication. DO NOT use any silicon-based grease on the interface gaskets.
DO NOT use any silicon-based grease on the brackets or panels on which the valve is installed.
Faiveley Transport suggest the using of UNIFLOR 8512s grease for all rubber parts.

NOTE! All the electric connectors, if not otherwise indicated, must be secured with a tightening torque of 0,5 Nm.

Refer to Figure 5 and Figure 6.

1. Make sure that the magnet valve is fitted with the interface gasket.
2. Re-install the device on system and secure the M3 screws (2) with flat washers (3). Tightening torque **0,6 Nm**.
3. Plug electrical connector (1).
4. Pressurise the system and switch on the power supply.

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CAUTION! Only if needed for troubleshooting purpose us the minimum amount of necessary leak detector paying attention to avoid the interface between electronic and pneumatic.

/// 9. Spare parts

- **Routine Maintenance** – Not applicable.
- **Installation** - Spare parts not required.

/// 10. Special Tools

No special tools required for servicing and installation.

/// 11. Disposal

The device is mainly composed by the following materials: brass, stainless steel, rubber.

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

/// 12. Data sheets and material safety data

See document 3000.00.550_All6 for the safety data sheet for the product **Uniflor 8512S**.

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04.37_Magnet valve Typ - EVSOCC

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Date/Date: 17/11/16 - Issue/Edition: A/00
Maintenance/Use manual
Manuel de Maintenance
ECO/ECO: .

FT0012869-001-F22MUM

GENERIQUE / GENERIC
ELECTROVALVE VE3 NO ET NF
MAGNET VALVE VE3 NO AND NC
781 006 xx 08 & 781 120 xx 08

Compiled/Rédigé: Morjane Himdi
Checked/Vérifié: C HALLOO

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Revisions / Editions						
Issue Edition	Date Date	Description Description	ECO ECO	Compiled Rédigé	Checked Vérifié	Approved Approuvé
A/00	17/11/16	Création / First issue Création suivant le plan d'ensemble n° 781 120 xx 08 et le plan d'ensemble 781 006 xx 08. *First issue according to the assembly drawing n° 781 120 xx 08 and the assembly drawing 781 006 xx 08.*	.	Morjane Himdi	C HALLOO	M LE FAOU
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1. MESURES DE SECURITE / *SAFETY INSTRUCTIONS*

1.1. Préface / *Foreword*

Ces règles font partie intégrantes de ce manuel d'entretien et ont pour but de fournir les notions nécessaires au personnel impliqué dans des opérations d'entretien, afin d'éviter les accidents, les blessures ou dommages pour l'environnement. / *The rules are integrating parts of this maintenance manual and are intended to provide the basic knowledge needed by staff involved in maintenance operations to avoid injuries, damage and environmental pollution*.

Les règles de sécurité sont sujettes à l'amélioration par l'opérateur ou par l'organisme responsable d'utiliser et d'entretenir le véhicule. En particulier, les facteurs non connus à la date de parution de ce document (par exemple réelles conditions de fonctionnement, outils disponibles, compétence du personnel, etc…) doivent être pris en compte avant d'effectuer les opérations. / *The safety rules are subject to improvement by the operator or by the authority in charge of using and maintaining the vehicle. In particular, the factors that are not known at the release date (for example, real operating conditions, tools available, skills of personnel, etc.) must be taken into account before the operations are carried out*.

L'appareil ne peut être utilisé, entretenu et réparé que par un personnel dûment formé à cet effet. Dans le cas contraire, la garantie prévue en vertu des conditions de livraison sera frappée de nullité. / *The device only be used, serviced and repaired by appropriately trained personnel. Otherwise, any warranty with respect to the terms of delivery will be forfeited*.

Ce manuel doit être facilement accessible à tout le personnel impliqué pour consultation immédiate. Avant d'entreprendre toute action, le personnel doit prendre connaissance du contenu de ce manuel. / *This manual must be easily accessible to all involved personnel for immediate consultation. Personnel must be informed of the content of this manual before undertaking any actions*.

Il est obligatoire que le personnel soit informé des conditions légales au sujet de la sécurité et de la santé au travail et de la prévention des accidents. Le personnel doit avoir la connaissance de base nécessaire dans le domaine des opérations (de : mécanique, système pneumatique, transport etc.). / *It is compulsory that staff is aware of the legal conditions that relate to health and safety at work and accident prevention. Personnel must have the basic knowledge necessary in the operations' domain (mechanics, pneumatic system, transport, etc.)*.

Faiveley transport décline toute responsabilité en cas d'accidents, dommages ou pollution environnementale provoqués par la mauvaise application des prescriptions, ou par la mauvaise utilisation des produits ou des outils. / ***Faiveley Transport*** *cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools*.

Ces prescriptions de sécurité viennent en complément aux règles de sécurité applicables sur le site d'intervention. / *The safety requirement comes in addition to safety rules on the site of intervention*

Outre ce manuel, il est également impératif de respecter et d'appliquer les réglementations générales légales et les autres réglementations relatives à la prévention des accidents et à la protection de l'environnement / *In addition to this manual, you must observe and apply the binding general statutory and other regulations on accident prevention and environmental protection.*

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1.2. Opération préliminaire / *Preliminary operation*

Le véhicule doit être arrêté et sécurisé avec les moyens appropriés afin d'empêcher qu'il ne se déplace intempestivement. AVERTISSEMENT: certaines opérations sur le circuit de freinage peuvent le rendre complètement inopérant et rendre le véhicule libre de se déplacer.

The vehicle must be stopped and secured with the appropriate means to prevent it from moving on its own. WARNING: some operations on the braking system can make it completely ineffective and make the vehicle free to move.

Risque générique
Generic risk

Indiquez clairement par une signalisation visible qu'une action de maintenance est en cours (par exemple mise en garde sur les pupitres des conducteurs ou les panneaux d'affichage) afin d'empêcher l'interférence anormale par d'autres.

Indicate clearly the obvious warning signs that a maintenance action is in progress (for example, warning on the driver desk offices or the display panels) to prevent abnormal interference by other parties.

Avant de faire toutes les actions, assurez-vous qu'elles ne représenteront pas un risque pour une autre personne travaillant sur une autre partie du véhicule.

Before carrying out any actions, make sure that they do not present any risks for anyone else working on any other part of the vehicle.

En général, la propreté doit être garantie pour éviter la contamination par la poussière, la saleté ou d'autres agents externes.

In general, cleanliness must be guaranteed to avoid contamination by dust, dirt or other external agents.

Récipient sous pression
Pressurised vessel

Avant intervention sur les pièces pneumatiques, assurez-vous que les appareils sous pression soient mis à l'atmosphère. Lors du démontage des éléments, faites attention aux possibles pressions résiduelles.

Before any intervention on the pneumatic parts, make sure that pressure devices are vented to atmosphere. During elements removal, pay attention to any potential residual pressure.

Pièce Sous Tension
HIGH VOLTAGE

Avant toute intervention, s'assurer de la mise hors tension des équipements.

Before any intervention, make sure that the power is cut off.

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1.3. Sécurité du personnel / *Personal safety*

Le lieu de travail doit être correctement dimensionné et préparé afin d'enlever tous les obstacles possibles. / *The workplace must have the right size and be correctly prepared to remove all possible obstacles*.

Pour le déplacement des pièces lourdes, le personnel doit utiliser les outils de levage appropriés (cric, poussoir, treuil, etc…) et porter des chaussures et gants de protection appropriés.

While heavy parts are being moved, personnel must use the appropriate lifting tools (jacks, piston, pulley, etc.) and wear the appropriate protective shoes and gloves.

Pour des opérations sous le véhicule, le personnel doit porter un casque de protection. / *Personnel must wear protective helmets for operations underneath the vehicle*.

Pour des opérations sur le toit, le personnel doit être maintenu à l'aide des moyens appropriés afin d'éviter toute chute (ceintures de sûreté, etc.). Le véhicule doit être situé sur une partie de la voie libre de caténaire.

For operations on the roof, personnel must be secured using the appropriate means to avoid fall (safety belts, etc.). The vehicle must be located on part of the road that is free of overhead contact lines.

Avant de démonter toutes pièces, lire soigneusement la documentation technique afin de prendre connaissance des risques possibles, comme la pression ou les ressorts sous pression. Dans ce cas, les lunettes de protection doivent être portées. ATTENTION ! L'étiquette d'avertissement est peut être absente.

Before removing any parts, read the technical documentation carefully to get acquainted on the potential risks, such as pressure or compressed springs. In this case, protective glasses must be worn. CAUTION! The warning label may be missing.

Risque générique

Generic risk

Concernent les produits chimiques émanant des lubrifiants, de graisse, des diluants, solvants, etc. suivre soigneusement les prescriptions du fabricant. Dans tous les cas, éviter de respirer les vapeurs et éviter le contact avec la peau et les yeux. Porter des gants de protection, des lunettes et un masque à filtres approprié.

For chemical products that emanate from lubricants, grease, thinners, solvents, etc., follow carefully the manufacturer's recommendations. In any case, avoid to breath the vapours and avoid contact with skin and eyes. Wear protective gloves, glasses and a filter mask.

Pour les matières consommables comme l'huile et la graisse, se référer à la fiche de sécurité du fournisseur. / *For consumables substances like oil and grease, refer to the supplier safety datasheet*.

Lors de l'utilisation des substances inflammables (lubrifiants, diluants, etc.), adopter toutes les précautions possibles pour éviter le risque d'incendie. Ne pas fumer. Ne pas employer de sources de chaleur ou de flammes. Ne pas provoquer d'étincelles. Maintenir la salle aérée. Stocker les produits selon la prescription du fabricant. / *When using flammable substances (lubricants, thinners, etc.) take all possible precautions to avoid the risk of fire. Do not smoke. Do not use sources of heat or flames. Do not cause any sparks. Keep the room ventilated. Store products according to the manufacturers' indications*.

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Lors du nettoyage ou du séchage des pièces, ne pas utiliser une source d'air à haute pression supérieure à 6 bars. / *Do not use a high pressure air source upper at 6 bar when cleaning or drying parts*.

Lors du nettoyage des filtres ou des ailettes de refroidisseur, utiliser un aspirateur adapté. / *Use an adapted vacuum cleaner when cleaning cooler filters or cooling fins*.

HOT SURFACE

Avant d'entreprendre toute action sur des pièces qui peuvent être chaudes (disques, garnitures, etc…) s'assurer que la température est d'un niveau acceptable. Si besoin, attendre jusqu'à ce que le composant ait refroidi ou utiliser des protections appropriées.

Before carrying out any actions on parts that may be hot (disks, pads, coolers, etc.), make sure that the temperature is at an acceptable level. If necessary, wait until the article has cooled down or use the appropriate protection.

Pour toutes les opérations, utilisez les outils appropriés. Les outils doivent être maintenus dans des conditions optimales. Les outils qui sont usés ou endommagés représentent un risque. / *For any operation, use appropriate tools. The tools must be maintained in optimum conditions. The tools which are worn out or damaged represent a risk*.

Lors du test des composants, ne jamais dépasser les limites de pression de fonctionnement maximales. / *When testing components, never exceed the maximum operating pressure limits*.

Avant d'effectuer des opérations sur les pièces mobiles (compresseurs, ventilateurs, etc…) assurer qu'elles ne peuvent pas démarrer inopinément. / *Before carrying out any operations on moving parts (compressors, fans, etc.) make sure that they cannot start up unexpectedly*.

Si un liquide (lubrifiant, liquide réfrigérant, solvants) s'est renversé sur le plancher, nettoyer aussitôt la zone concernée et prendre les précautions pour éviter de glisser. / *If liquids (lubricant, cooling fluid, solvents) are spilt over the floor, clean the area straight away and take precautions to avoid slipping*.

1.4. Sécurité fonctionnelle / *Functional safety*

La sécurité du produit ne peut être garantie que si des pièces de rechange d'origine **Faiveley** sont employées. Tous autres matériels peuvent compromettre la fonctionnalité et la sécurité.

*Product safety can only be guaranteed if genuine **Faiveley** spare parts are used. Any other materials can compromise functionality and safety*.

Suite à toute opération de maintenance, s'assurer que les composants et le système complet ont retrouvé une parfaite fonctionnalité.

After any maintenance operation, make sure that components and the complete system have been restored to their perfect functionality.

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Après toute opération de maintenance, rétablir les conditions d'origines du véhicule, en supprimant les dispositifs de protection (serrures, fils, etc…) sur les appareils.

After any maintenance operation, restore original conditions of vehicle, remove the protection devices (locks, wires, etc.) on the devices.

Risque générique

Generic risk

Il est fortement préconisé de ne pas remplacer toutes les garnitures de frein en même temps sur le véhicule, car ceci peut réduire l'efficacité du freinage. Il doit cependant être pris en compte lors du remplacement des garnitures, qu'une réduction provisoire des performances de freinage est générée.

It is strongly recommended not to replace all the brake pads at the same time on the vehicle as this may reduce braking effectiveness. However, it must be taken into account when the pads are replaced, that it generates a temporary reduction of braking performance.

1.5. Sécurité environnementale / *Environnemental safety*

Risque générique

Generic risk

Pendant la manipulation des lubrifiants, des diluants, solvants et d'autres substances qui peuvent être nocives pour l'environnement, prendre toutes les précautions pour éviter le renversement. Toutes les conditions applicables des lois doivent être respectées lorsque l'on se débarrasse de substances qui peuvent polluer l'environnement (lubrifiants, batteries, liquide réfrigérant, etc.).

When handling lubricants, thinners, solvents and other substances that may be harmful for the environment, take all precautions to avoid reversal. All applicable laws must be respected when disposing of substances that may pollute the environment (lubricants, batteries, cooling fluid, etc.).

1.6. Prescriptions spécifiques des équipements sous pressions / *Specific requirements for under pressure equipments*

Utilisation des équipements: tous les équipements du produit doivent exclusivement effectuer les fonctions pour lesquelles elles sont conçues. Par conséquent, toute autre utilisation, en dehors de celle du système sur lequel ils sont installés, est expressément interdite. / *Equipement use: all equipment must exclusively carry out the functions which they have been designed for. Consequently, any other use, outside the system on which they are installed, is expressly prohibited*.

Conditions dégradées: le système peut fonctionner seulement s'il est parfaitement efficace. Les défauts de fonctionnement ou les erreurs possibles doivent être considérés comme des conditions exceptionnelles et, en tant que tels, doivent être supprimés dès que possible.

Degraded conditions: the system can operate only if it is perfectly efficient. Possible malfunctions or errors are to be considered as exceptional conditions and, as such, must be eliminated as soon as possible.

Durée de fonctionnement: le système est conçu pour une durée de vie de **30 ans**, à échéance de laquelle, il doit être rendu inopérant en débranchant tous les alimentations en énergie (alim. élect., mécanique, pneumatique), en déchargeant toutes les capacités résiduelles afin de mettre à zéro la pression et en démontant tous les composants. En particulier, les réservoirs doivent être rendus inutilisables, les tuyaux doivent être démontés et les raccords jetés ainsi que les dispositifs de sécurité (par exemple soupapes de sûreté) doivent être rendus inutilisables.

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*Operating life: the system is designed for a life of **30 years** on condition that the maintenance plan is respected, at the end of which it must be made as non-operational by disconnecting all power supplies (electrical, mechanical, pneumatic elements), by discharging all residual capacities to bring the pressure to 0 pressure and by dismantling all the components. In particular, the reservoirs must be made unusable, the pipes must be dismantled and discarded, flexibles and safety devices (for example safety valves) must be made unusable*.

Maintenance: les opérations de maintenance nécessaires sont expliquées dans ce manuel. Elles doivent être effectuées comme décrite dans ce document. En cas de doute arrêter l'opération de maintenance et consulter le fabricant pour clarifications. / *Maintenance: the necessary maintenance operations are explained in this manual. They must be carried out as described in this document. In case of doubt, stop the maintenance and consult the manufacturer for clarification*.

Remplacement des pièces: au cas où une pièce devrait être remplacée, une pièce neuve de **FAIVELEY** doit être installée selon les prescriptions spécifiques et en évitant toute sorte de contrainte externe pouvant par conséquent l'endommager (par exemple effort, torsion, etc.). / *Replacement of parts: if a part needs to be replaced, a new **FAIVELEY** part must be installed according to the specific recommendations and avoiding all types of external stress that may consequently cause damage (for example stress, torsion, etc.)*.

Modifications et réparations statiques: toutes les modifications sur les réservoirs pressurisés sont absolument interdites. Il est possible de les dépanner seulement si ils sont déposés et suivant les prescriptions spécifiques des documents permettant la dépose des appareils sous pressions : il est absolument nécessaire avant d'enlever toutes les pièces de s'assurer que toutes les capacités ont été déchargées, puis enlever les pièces avec soin. L'utilisation de dispositifs de protection personnels (lunettes, gants) est cependant recommandée. Attention ! Même si un système est inopérant depuis longtemps, il risque de conserver des pressions résiduelles dangereuses.

Static modifications and repairs: all modifications on pressurised reservoir are strictly prohibited. They may be repaired only if they are removed and if the specific recommendations in the documents that enable pressurised appliances to be dismantled are respected; before removing any parts it is vital that you ensure that all the capacities have been discharged, then carefully remove the parts. The use of personal safety equipment (goggles, gloves) is still recommended. Caution! Even if a system has been out of operation for a long time, there is a risk that it has retained a certain level of hazardous residual pressure.

Les risques résiduels suivants n'ont pas été considérés durant la conception, donc il est de la responsabilité de l'utilisateur de respecter les textes de lois applicables. / *The following residual risks were not considered during design. Therefore, it is the user's responsibility to respect the texts in the applicable laws*.

Le feu externe: les risques inhérent à un feu externe n'ont pas été pris en compte, / *External fire: the external fire risks have not been considered*,

Les contraintes externes: le produit est conçu pour du matériel roulant ferroviaire, dans les conditions environnementales indiquées dans les spécifications applicables. Aucune autre condition n'a été prise en compte,

External stress: the product has been designed for rolling stock material and for environmental conditions indicated in the applicable specifications. No other conditions have not been taken into account,

Les abus: aucun abus prévisible n'a été identifié et n'a donc été considéré. / *Misuse: no foreseeable misuse abuse has been identified and therefore has not been considered*.

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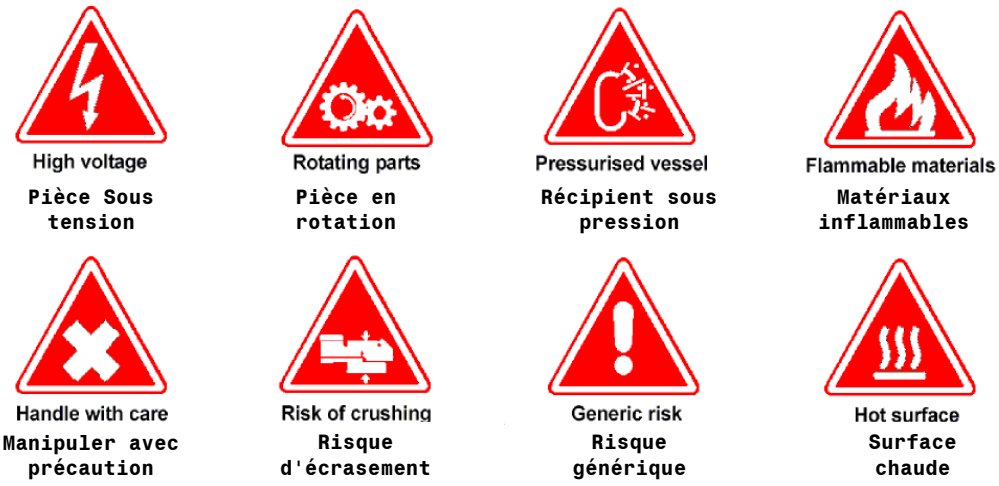
1.7. Symboles / *Symbols*

Dans ce document, les risques sont identifiés en utilisant les notes d'avertissement spécifiques et les symboles suivants:

In this document, the risks are identified using specific warning notes and the following symbols:



Nota / *Note*: Une note signale une information importante dans le texte ! / *A note indicates important information in the text !*

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1.8. Stockage des appareils / *Storage of the devices*

1.8.1. Stockage en magasin / *Storage in workshop*

Les équipements doivent être stockés dans leur emballage d'origine dans une pièce aérée et ne doivent pas être exposés à l'humidité, la poussière.

The components must be stored with their original packaging in a ventilated room and not exposed to humidity and dust.

La température de stockage doit être comprise entre 0°C et +35°C avec un taux d'humidité maximal de 80% et avec une variation de température de 15°C en 24h maximum.

The storage temperature must be within 0°C and +35°C, RH 80% maximum and with variation in temperature of 15°C in 24h maximum.

Protection des équipements: / *Protection of equipment*:

Si les équipements sont stockés en dehors de leur emballage d'origine, ils doivent être à l'abri des intempéries et de la lumière (rayons UV).

If out of their original packaging, equipment must be protected again bad weather and light (UV).

Toutes les entrées, sorties doivent être protégées (scotch) contre la poussière. / *All outlet / inlet parts must be protected (scotch) against dust*.

Les évents de mise à l'atmosphère des équipements doivent être dirigés vers le bas, il est important de respecter le sens de positionnement de l'équipement (Étiquettes haut / bas).

Blowholes of equipments must be turned downward, respect the position according to the sticker "up/down".

1.8.2. Conditions de stockage sur véhicule / *Environnement of storage on vehicle*

Les équipements montés sur le véhicule ne nécessitent pas de protection particulière. / *Equipments fitted on the vehicles don't need any particular protection*.

Ils peuvent supporter des températures de **- 25°C à + 60°C** lors du stockage sur véhicule. Ces conditions de stockage sont acceptables si la durée n'excède pas **6 mois** (Exemple : 1 année de stockage en extérieur sur véhicule est acceptable lorsque l'exposition de **- 25°C à 0°C en hiver** dure **3 mois** maximum et de **+25°C à +60°C en été** dure également **3 mois** maximum).

*They can meet temperature: from **- 25°C to + 60°C** during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed **6 months** (Example : 1 outside storage year on vehicle is acceptable if the temperature is, **in winter from -25°C to 0°C** maximum during **3 months** maximum and also, **in summer** from **+25°C to +60°C** maximum during **3 months** maximum)*.

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1.8.3. Conditions particulières / *Specific conditions*

Dans le cas d'un stockage sur véhicule inopérant, effectuer tous les 3 mois: / *In the case of equipment mounted on inoperative vehicle, perform every 3 months*:

- un desserrage du frein de parking. Puis réaliser au moins 10 actions de freinage / défreinage du frein de service afin de mettre en mouvement les pièces mécaniques, / *release brake of parking brake. Then carry out at least 10 brake / release actions of service brake in order to move the mechanical parts*,

- vérifier visuellement que les garnitures de frein soient en contacts avec les disques lors des phases de freinages. A la fin de la vérification, appliquer le frein de parking. / *visually check that brake pads are in contact with the disc during phases of braking. At the end of the checking, apply the parking brake*.

Etant donné que les pièces élastomères vieillissent même dans les conditions optimales de stockage, les règles suivantes doivent être suivies pour les équipements stockés en magasin ou sur un véhicule inopérant. / *Since rubber parts age out even if optimum storage conditions, the following rules must be followed for equipment stored on the shelf or mounted on inoperative vehicles*.

Les équipements pneumatiques doivent être renvoyés chez **FAIVELEY TRANSPORT** pour révision au bout de 2 ans à compter de la date de fabrication ou de la dernière révision. / *Pneumatic equipments must be sent back to **FAIVELEY TRANSPORT** after **2 years** from the date of manufacture or last overhaul, in order to be checked and reconditionned.*

1.9. Température de fonctionnement des appareils / *Operating temperature of devices*

Les équipements fonctionnent de manière optimale dans la plage de température **– 25°C à + 45°C** (classe T3 de la norme NF EN 50125-1).

*Equipments are operating in full satisfactory way in the temperature range from - **25°C to + 45°C** (class T3 of the EN 50125-1 standard*.

Pour les températures de -**40°C à - 25°C** et de **+45°C à +70°C**, les fonctions restent pleinement assurées, mais les caractéristiques et les performances peuvent être légèrement dégradées (ex: taux de fuite plus important).

*For temperature range from **-40°C to - 25 °C** and from **+45 °C to +70°C**, the function are fully performed, but characteristics and performances may slightly derivate (ex: leakage rate)*.

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2. CARACTÉRISTIQUES PRINCIPALES / *MAIN CHARACTERISTICS*

Pression maxi en service / *Maximum pressure*:	**10 bars**
Température de fonctionnement / *Operating temperature*:	**- 40°C / + 70°C**
Poids / *Mass*:	**0,6 kg**
Indice de protection / *Protection degree :*	**IP65**

3. DESCRIPTION GENERALE / *GENERAL DESCRIPTION*

3.1. Objet / *Object*

Ce document a pour but de décrire les opérations d'entretien, de méthode de contrôle et de dépose/pose à respecter sur les électrovalves VE3, lorsque celles-ci sont montées sur le véhicule dans le but d'assurer la fonctionnalité et la sécurité du système.

This document have for purpose to describe the servicing and exchange operation to respect on the magnet valves VE3, when this one is mounted on vehicle in order to assure the functionality and the safety of the system.

Les conflits et les contradictions avec les exigences des clients doivent être communiqués par écrit à **Faiveley transport**.

Conflict and contradiction with customers requirement must be deliver by mail to ***Faiveley transport***.

3.2. Liste des équipements / *Equipments list*

Electrovalve VE3 NO / *Magnet valve VE3 NO*	781 120 xx 08 indice / *index* **AD00**
Electrovalve VE3 NF / *Magnet valve VE3 NC*	781 006 xx 08 indice / *index* **AC01**

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3.3. Description de l'équipement / *Description of equipment*

Les électrovalves VE3 sont des appareils à commande électrique qui réalisent les fonctions d'admission, ou de mise à l'atmosphère d'un circuit pneumatique de pilotage.

The VE3 magnet valve is an electrically controlled device which performs the air inlet or return to atmospheric pressure functions of a compressed air circuit.

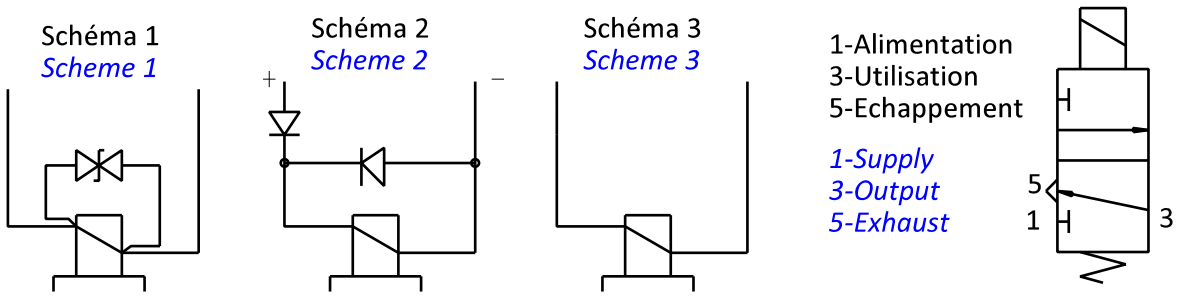

Figure 1: Schéma de principe des électrovalves VE3-NF / *Block diagram of magnet valves VE3-NC*

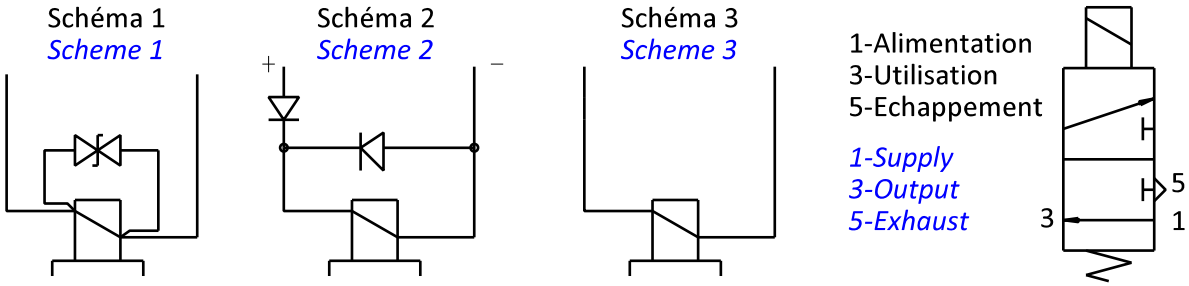

Figure 2: Schéma de principe des électrovalves VE3-NO / *Block diagram of magnet valves VE3-NO*

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4. DESCRIPTION FONCTIONNELLE / *FUNCTIONAL DESCRIPTION*

4.1. Electrovalve VE3 directe type NF / *NC type VE3 magnet valve (energized to open)*

L'électrovalve VE3 directe type NF alimente un circuit pneumatique quand la bobine est sous tension (VE excitée). / *The NF type VE3 magnet valve energized to open supplies a pneumatic circuit when the coil is powered (VE energized).*

L'alimentation en air comprimé s'effectue par la chambre inférieure **1**. / *The unit is supplied with compressed air via the lower chamber **1***.

Lorsque la bobine est mise sous tension, le noyau équipé **(3)** est attiré magnétiquement vers le haut et le clapet inférieur du noyau équipé s'éloigne du siège du clapet inférieur. La chambre d'admission **1** est mise en communication avec la chambre d'utilisation **3** qui est ainsi alimentée en air comprimé. Le clapet supérieur et la chambre d'utilisation **3** est isolée de la chambre d'échappement **5**.

*When the coil is powered up, the fitted core **(3)** is drawn upwards magnetically and the lower valve on the fitted core moves away from the lower valve seating. The inlet chamber **1** is then allowed to communicate with the output chamber **3**, which is thus supplied with compressed air. The upper valve and the output chamber **3** is isolated from the exhaust chamber **5***.

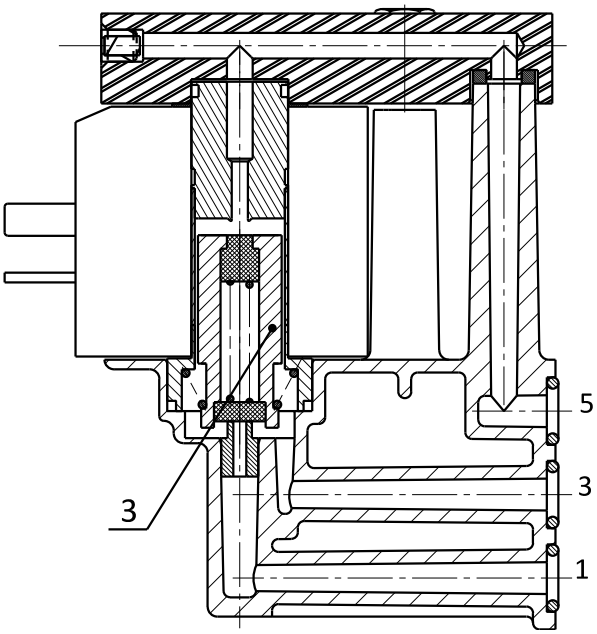

Figure 3: Schéma fonctionnel / *Functional diagram*

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4.2. Electrovalve VE3 INVERSE TYPE NO / *NO TYPE VE3 MAGNET VALVE ENERGIZED TO CLOSE*

L'électrovalve VE3 inverse alimente un circuit pneumatique quand la bobine n'est pas sous tension (VE désexcitée). / *The energized to close VE3 magnet valve supplies a pneumatic circuit when the coil is not powered (VE de-energized)*.

L'alimentation en air comprimé s'effectue par la chambre supérieure **1**. / *The unit is supplied with compressed air via the upper chamber **1***.

Dans la position non excitée, l'effort du ressort maintient le clapet inférieur du noyau équipé sur son siège. Le clapet supérieur du noyau mobile est éloigné du siège du clapet supérieur. La chambre d'utilisation **3** reçoit l'air comprimé de la conduite d'alimentation **1** alors qu'elle est isolée de la chambre inférieure (chambre d'échappement **5**). / *In non-energized position, the effort exerted by the spring keeps the lower valve on the fitted core on its seating. The upper valve on the mobile core is kept away from the upper valve seating. The output chamber **3** receives compressed air from the supply pipe **1** when it is isolated from the lower chamber (exhaust **5**)*.

Lorsque la bobine est mise sous tension, le noyau équipé **(3) ou (23) ou (40)** est attiré magnétiquement vers le haut du siège inférieur. La chambre d'utilisation **3** est mise en communication avec la chambre d'échappement **5**. Le clapet supérieur du noyau est appliqué sur le siège du clapet supérieur et la chambre d'utilisation **3** est isolée de la chambre d'alimentation **1**. / *When the coil is powered, the fitted core **(3) or (23) or (40)** is drawn upwards magnetically and the lower valve on the core assembly moves away from the lower seating. The output chamber **3** is allowed to communicate with the exhaust chamber **5**. The core's upper valve is applied against the upper valve seating and the output chamber **3** is isolated from the supply chamber **1***.

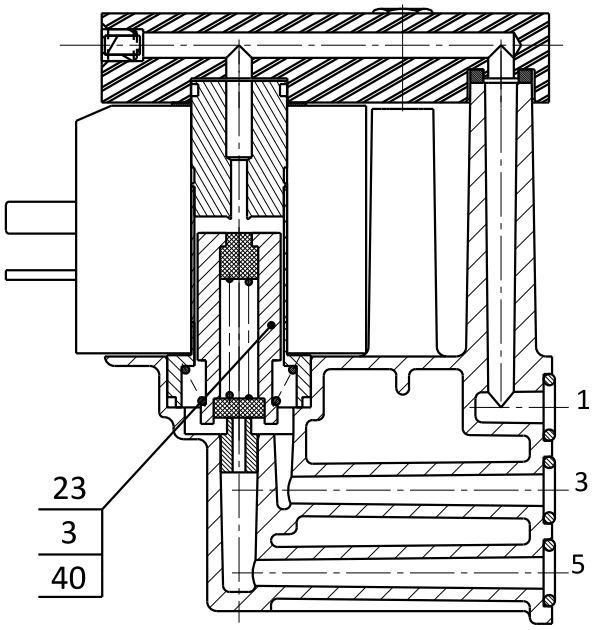

Figure 4: Schéma fonctionnel / *Functional diagram*

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5. PRESCRIPTIONS D'ENTRETIEN / *MAINTENANCE PRESCRIPTIONS*

Faire un contrôle fonctionnel et une révision générale comme prévu dans le plan de maintenance du projet. Si il n'y a pas de plan de maintenance pour le projet, respecter les périodicités ci-dessous.

Make a functional check and a general overhaul *as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below*.

5.1. Premier, deuxième et troisième niveau de maintenance (Contrôle fonctionnel) / *First, second and third level maintenance (Functional control)*

Pour réaliser les contrôles ci-dessous, il n'est pas nécessaire de démonter les équipements du véhicule. / *For the controls below, it is not necessary to remove the equipment from the vehicle.*

Respecter l'intervalle d'entretien suivant: / *Pay attention to the following maintenance interval*:

Maintenance (M1) **tous les 160 000 km ou tous les ans, au premier des deux termes échu.**

Maintenance (M1) ***every 160 000 km or every year, at the first of the two terms expired****.*

5.2. Quatrième niveau de maintenance (Révision générale) / *Fourth level maintenance (General overhaul)*

Réparation en atelier: / *Component Workshop*:

Révision (R1) **tous les 800 000 km ou tous les 5 ans, au premier des deux termes échu,**

Overhaul (R1) ***every 800 000 km or 5 years, at the first of the two terms expired****,*

L'exploitant peut adapter cette périodicité selon les conditions d'utilisation, sa politique de maintenance et son expérience propre, sous sa responsabilité. / *The owner can adapt this periodicity according to conditions of use, its maintenance policy and its own experiment, under its responsibility.*

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5.3. Tableau des travaux planifiés à réaliser / *Table of scheduled work to be performed*

Niveau de maintenance *Maintenance Level*	Travaux planifiés / *Scheduled work*	Paragraphe *Section*	M1	R1
2	Test d'étanchéité / *Leakage test*	**§ 6.1**	•	•
2	Test fonctionnel / *Functional test*	**§ 6.2**	•	
4	Les électrovalves VE3 seront déposées pour démontage, nettoyage, graissage, examen et remplacement des pièces d'usure. / *The VE3 magnet valves must be removed for disassembly, cleaning, greasing, verification, and replacement of worn parts*.	**§ 7**		•

6. CONTROLE FONCTIONNEL / *FUNCTIONAL CONTROL*

6.1. Test d'étanchéité / *Leakage test*

Les essais d'étanchéités doivent être conformes aux essais réalisés sur le véhicule à l'aide du document constructeur. / *The leakage tests must be consistent with tests performed on the vehicle using the manufacturer document*.

6.2. Test fonctionnel / *Functional test*

6.2.1. Electrovalve VE3 directe type NF / *NC type VE3 magnet valve (energized to open)*

Brancher un capteur de pression sur le circuit d'utilisation **(3)** et alimenter le circuit d'alimentation **(1)** avec une source d'air comprimé. / *Connect a pressure sensor on the output circuit **(3)** and supply the supply circuit **(1)** with a source of compressed air.*

Vérifier que la pression dans le circuit utilisation **(3)** soit de 0 bar. / *Verify that the pressure in output circuit **(3)** is of 0 bar.*

Exciter la bobine et s'assurer de la présence de pression dans le circuit d'utilisation (**3**). / *Energize coil and ensure the presence of pressure in the output circuit **(3)**.*

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Désexciter la bobine et s'assurer le circuit d'utilisation (**3)** est à l'échappement **(5)**. / *De-energize the coil and verify that the circuit output (**3)** is at the exhaust (**5)**.*

Si l'appareil n'est pas fonctionnel, le déposer et le remplacer (**voir le § 7**). / *If the device is not functional, remove and replace it (**see the § 7**)*.

6.2.2. Electrovalve VE3 inverse type NO / *NO type VE3 magnet valve (energized to close)*

Brancher un capteur de pression sur le circuit d'utilisation (**3)** et alimenter le circuit d'alimentation (**1)** avec une source d'air comprimé. / *Connect a pressure sensor on the output circuit (**3)** and supply the supply circuit (**1)** with a source of compressed air.*

S'assurer de la présence de pression dans le circuit d'utilisation (**3)**. / *Make sur of the presence of pressure in the circuit output (**3)**.*

Exciter la bobine et s'assurer le circuit d'utilisation (**3)** est à l'échappement **(5)**. / *Energize the coil and verify that the circuit output (**3)** is at the exhaust (**5)**.*

Si l'appareil n'est pas fonctionnel, le déposer et le remplacer (**voir le § 7**). / *If the device is not functional, remove and replace it (**see the § 7**)*.

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7. PROCEDURE DE DEPOSE ET D'INSTALLATION / *REMOVAL AND INSTALLATION PROCEDURES*

Attention! Débrancher l'alimentation électrique avant le démontage.

Warning! *Disconnect the power supply before disassembling*.

Vidanger le circuit pneumatique et assurez-vous que la pression est mise à l'air libre. Lors du démontage des éléments, faite attention aux possibles pressions résiduelles.

Drain the pneumatic circuit and make sure that the pressure is set to free air. When the elements are removed, pay attention to any potential residual pressure.

Utiliser les protections réglementaires aux normes en vigueur pour les produits dangereux.

When using dangerous products, observe the local workshop regulation in force.

FAIVELEY TRANSPORT AMIENS préconise l'utilisation d'un pulvérisateur manuel pour le nettoyage de ses produits avant de réaliser leurs déposes, ceci afin d'éviter que des impuretés rentrent dans les canalisations. Tout autre système de nettoyage est sous la responsabilité de l'agent de maintenance.

FAIVELEY TRANSPORT AMIENS recommends the use of a manual sprayer for cleaning products before performing their removals, in order to prevent impurities from returning into pipes. Any other cleaning system is the under responsibility of the maintenance worker.

FAIVELEY TRANSPORT AMIENS n'interdit pas le nettoyage de la caisse avec un nettoyeur haute pression ou au rouleau, mais déconseille une application directe sur ses produits.

FAIVELEY TRANSPORT AMIENS does not prohibit the car body cleaning with a high pressure cleaner or a roller but does not recommend a direct application its products.

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7.1. Remplacement de l'électrovalve VE3 / *Replacement of the VE3 magnet valve*

Oter la fiche ISO de la bobine de l'électrovalve en dévissant à la main la vis de fixation. / *Remove the plug ISO from the coil of magnet valve by unscrewing with the hand the fixing screw.*

Desserrer et ôter les écrous de fixation **(F)**, ôter et rebuter les rondelles, déposer l'électrovalve **(E)** du panneau **(P)**. / *Loosen and remove the fastening nuts **(F)**, remove and scrap the washers, remove the magnet valve **(E)** from the panel **(P)**.*

Graisser les trois joints toriques **(7) (réf: 705 019 04 08),** de la nouvelle électrovalve VE3, avec de la **MOLYKOTE 55 O-RING**. / *Lubricate the three O-rings **(7) (ref: 705 019 04 08),** of the new magnet valve VE3, with **MOLYKOTE 55 O-RING**.*

Positionner l'électrovalve **(E)** sur le panneau **(P)**, puis mettre en place les rondelles et écrous **(F)** et serrer au couple en respectant la valeur définie par la société responsable de l'intégration du produit. / *Position the magnet valve **(E)** on the panel **(P)**, then put in place the washers and nuts **(F)** and tighten at torque by respecting the value defined by the company responsible of the product integration*.

Positionner la fiche ISO sur l'électrovalve **(E)** et visser à la main la vis de fixation. / *Position the plug ISO on the magnet valve **(E)** and tighten by the hand the fixing screw*.

Après remplacement de l'appareil, faire un test fonctionnel (**voir le § 6**). / *After replacement of the device, make a functional test (**see the § 6**).*

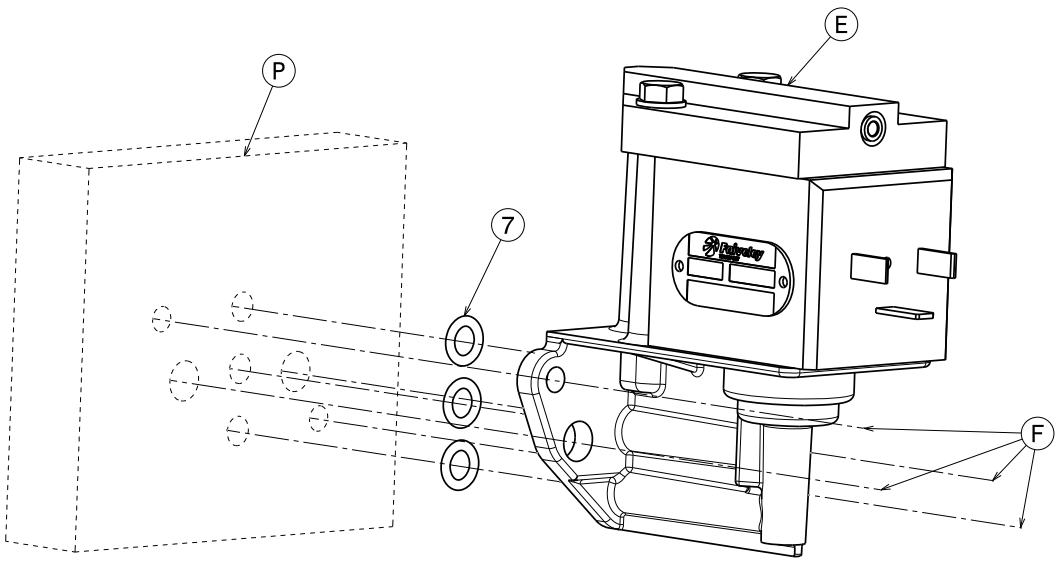

Figure 5: Remplacement de l'électrovalve VE3 / *Replacement of the VE3 magnet valve*

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8. REVISION GENERALE / *GENERAL OVERHAUL*

Déposer l'électrovalve VE3 et l'envoyer dans un atelier FAIVELEY pour révision. / *Remove the VE3 magnet valve and send it in a workshop FAIVELEY for overhaul*.

9. PIECES DE RECHANGES / *SPARE PARTS*

Aucune pièce de rechange n'est nécessaire pour le contrôle fonctionnel et la révision générale. / *No spare part required for the functional control and the general overhaul*.

10. OUTILLAGES SPECIAUX / *SPECIAL TOOLS*

Aucun outil spécial n'est nécessaire pour l'entretien et l'installation. / *No special tools required for servicing and installation*.

11. DEMANTELEMENT / *DISPOSAL*

L'appareil est principalement composé par les matériaux suivants: fonte, laiton, acier inoxydable, caoutchouc, cuivre et aluminium. / *The device is mainly composed by the following materials: cast iron, brass, stainless steel, rubber, copper and aluminum*.

Le démantèlement doit se faire conformément aux règles en vigueur dans les locaux de l'utilisateur final et en respectant la loi en vigueur dans le pays où le composant est utilisé. / *The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used*.

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04.41_TWO CONTROL PORT RELAY VALVE (P2K)

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Générique / Generic
Notice de niveau 3 / Level 3 manual
RELAIS P2K DN19
P2K DN19 RELAY VALVE
784 053 xx 08

Division:	Document Type:	Distribution:
.	Document Type	
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
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	Name, Title, Group	Signature	Date
Compiled:	Morjane.Himdi Design Engineer, Engineering		25/02/2022
Checked:	camille.halloo Systems Engineer, Engineering		25/02/2022
Approved:	mohamed.chebbi Manager, Engineering		28/02/2022
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	25/02/2022	Création / First issue Suivant dessin BE N° 784053xx08. / *According to design department drawing N° 784053xx08.*	.	Morjane .Himdi	camille. halloo	mohamed. chebbi
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/// 1. MESURES DE SECURITE / *SAFETY INSTRUCTIONS*

1.1 Préface / *Foreword*

Ces règles font partie intégrantes de ce manuel d'entretien et ont pour but de fournir les notions nécessaires au personnel impliqué dans des opérations d'entretien, afin d'éviter les accidents, les blessures ou dommages pour l'environnement. / *The rules are integrating parts of this maintenance manual and are intended to provide the basic knowledge needed by staff involved in maintenance operations to avoid injuries, damage and environmental pollution.*

Les règles de sécurité sont sujettes à l'amélioration par l'opérateur ou par l'organisme responsable d'utiliser et d'entretenir le véhicule. En particulier, les facteurs non connus à la date de parution de ce document (par exemple réelles conditions de fonctionnement, outils disponibles, compétence du personnel, etc...) doivent être pris en compte avant d'effectuer les opérations.

The safety rules are subject to improvement by the operator or by the authority in charge of using and maintaining the vehicle. In particular, the factors that are not known at the release date (for example, real operating conditions, tools available, skills of personnel, etc.) must be taken into account before the operations are carried out.

L'appareil ne peut être utilisé, entretenu et réparé que par un personnel dûment formé à cet effet. Dans le cas contraire, la garantie prévue en vertu des conditions de livraison sera frappée de nullité. / *The device only be used, serviced and repaired by appropriately trained personnel. Otherwise, any warranty with respect to the terms of delivery will be forfeited*.

Ce manuel doit être facilement accessible à tout le personnel impliqué pour consultation immédiate. Avant d'entreprendre toute action, le personnel doit prendre connaissance du contenu de ce manuel. / *This manual must be easily accessible to all involved personnel for immediate consultation. Personnel must be informed of the content of this manual before undertaking any actions*.

Il est obligatoire que le personnel soit informé des conditions légales au sujet de la sécurité et de la santé au travail et de la prévention des accidents. Le personnel doit avoir la connaissance de base nécessaire dans le domaine des opérations (de : mécanique, système pneumatique, transport etc.).

It is compulsory that staff is aware of the legal conditions that relate to health and safety at work and accident prevention. Personnel must have the basic knowledge necessary in the operations' domain (mechanics, pneumatic system, transport, etc.).

Faiveley transport décline toute responsabilité en cas d'accidents, dommages ou pollution environnementale provoqués par la mauvaise application des prescriptions, ou par la mauvaise utilisation des produits ou des outils. / ***Faiveley Transport*** *cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools*.

Ces prescriptions de sécurité viennent en complément aux règles de sécurité applicables sur le site d'intervention. / *The safety requirement comes in addition to safety rules on the site of intervention*.

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Outre ce manuel, il est également impératif de respecter et d'appliquer les réglementations générales légales et les autres réglementations relatives à la prévention des accidents et à la protection de l'environnement / *In addition to this manual, you must observe and apply the binding general statutory and other regulations on accident prevention and environmental protection.*

1.2 Opération préliminaire / *Preliminary operation*

Le véhicule doit être arrêté et sécurisé avec les moyens appropriés afin d'empêcher qu'il ne se déplace intempestivement. AVERTISSEMENT : certaines opérations sur le circuit de freinage peuvent le rendre complètement inopérant et rendre le véhicule libre de se déplacer.

The vehicle must be stopped and secured with the appropriate means to prevent it from moving on its own. WARNING: some operations on the braking system can make it completely ineffective and make the vehicle free to move.

Risque générique
Generic risk

Indiquez clairement par une signalisation visible qu'une action de maintenance est en cours (par exemple mise en garde sur les pupitres des conducteurs ou les panneaux d'affichage) afin d'empêcher l'interférence anormale par d'autres.

Indicate clearly the obvious warning signs that a maintenance action is in progress (for example, warning on the driver desk offices or the display panels) to prevent abnormal interference by other parties.

Avant de faire toutes les actions, assurez-vous qu'elles ne représenteront pas un risque pour une autre personne travaillant sur une autre partie du véhicule.

Before carrying out any actions, make sure that they do not present any risks for anyone else working on any other part of the vehicle.

En général, la propreté doit être garantie pour éviter la contamination par la poussière, la saleté ou d'autres agents externes.

In general, cleanliness must be guaranteed to avoid contamination by dust, dirt or other external agents.

Récipient sous pression
Pressurised vessel

Avant intervention sur les pièces pneumatiques, assurez-vous que les appareils sous pression soient mis à l'atmosphère. Lors du démontage des éléments, faites attention aux possibles pressions résiduelles.

Before any intervention on the pneumatic parts, make sure that pressure devices are vented to atmosphere. During elements removal, pay attention to any potential residual pressure.

Pièce Sous Tension
HIGH VOLTAGE

Avant toute intervention, s'assurer de la mise hors tension des équipements.

Before any intervention, make sure that the power is cut off.

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1.3 Sécurité du personnel / *Personal safety*

Le lieu de travail doit être correctement dimensionné et préparé afin d'enlever tous les obstacles possibles. / *The workplace must have the right size and be correctly prepared to remove all possible obstacles*.

Pour le déplacement des pièces lourdes, le personnel doit utiliser les outils de levage appropriés (cric, poussoir, treuil, etc...) et porter des chaussures et gants de protection appropriés.

While heavy parts are being moved, personnel must use the appropriate lifting tools (jacks, piston, pulley, etc.) and wear the appropriate protective shoes and gloves.

Pour des opérations sous le véhicule, le personnel doit porter un casque de protection. / *Personnel must wear protective helmets for operations underneath the vehicle*.

Pour des opérations sur le toit, le personnel doit être maintenu à l'aide des moyens appropriés afin d'éviter toute chute (ceintures de sûreté, etc.). Le véhicule doit être situé sur une partie de la voie libre de caténaire.

For operations on the roof, personnel must be secured using the appropriate means to avoid fall (safety belts, etc.). The vehicle must be located on part of the road that is free of overhead contact lines.

Avant de démonter toutes pièces, lire soigneusement la documentation technique afin de prendre connaissance des risques possibles, comme la pression ou les ressorts sous pression. Dans ce cas, les lunettes de protection doivent être portées. ATTENTION ! L'étiquette d'avertissement est peut être absente.

Before removing any parts, read the technical documentation carefully to get acquainted on the potential risks, such as pressure or compressed springs. In this case, protective glasses must be worn. CAUTION! The warning label may be missing.

Risque générique
Generic risk

Concernent les produits chimiques émanant des lubrifiants, de graisse, des diluants, solvants, etc. suivre soigneusement les prescriptions du fabricant. Dans tous les cas, éviter de respirer les vapeurs et éviter le contact avec la peau et les yeux. Porter des gants de protection, des lunettes et un masque à filtres approprié.

For chemical products that emanate from lubricants, grease, thinners, solvents, etc., follow carefully the manufacturer's recommendations. In any case, avoid to breath the vapours and avoid contact with skin and eyes. Wear protective gloves, glasses and a filter mask.

Pour les matières consommables comme l'huile et la graisse, se référer à la fiche de sécurité du fournisseur. / *For consumables substances like oil and grease, refer to the supplier safety datasheet*.

Lors de l'utilisation des substances inflammables (lubrifiants, diluants, etc.), adopter toutes les précautions possibles pour éviter le risque d'incendie. Ne pas fumer. Ne pas employer de sources de chaleur ou de flammes. Ne pas provoquer d'étincelles. Maintenir la salle aérée. Stocker les produits selon la prescription du fabricant.

When using flammable substances (lubricants, thinners, etc.) take all possible precautions to avoid the risk of fire. Do not smoke. Do not use sources of heat or flames. Do not cause any sparks. Keep the room ventilated. Store products according to the manufacturers' indications.

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Lors du nettoyage ou du séchage des pièces, ne pas utiliser une source d'air à haute pression supérieure à 6 bars. / *Do not use a high pressure air source upper at 6 bar when cleaning or drying parts*.

Lors du nettoyage des filtres ou des ailettes de refroidisseur, utiliser un aspirateur adapté. / *Use an adapted vacuum cleaner when cleaning cooler filters or cooling fins*.

Surface Chaude

HOT SURFACE

Avant d'entreprendre toute action sur des pièces qui peuvent être chaudes (disques, garnitures, etc...) s'assurer que la température est d'un niveau acceptable. Si besoin, attendre jusqu'à ce que le composant ait refroidi ou utiliser des protections appropriées.

Before carrying out any actions on parts that may be hot (disks, pads, coolers, etc.), make sure that the temperature is at an acceptable level. If necessary, wait until the article has cooled down or use the appropriate protection.

Pour toutes les opérations, utilisez les outils appropriés. Les outils doivent être maintenus dans des conditions optimales. Les outils qui sont usés ou endommagés représentent un risque. / *For any operation, use appropriate tools. The tools must be maintained in optimum conditions. The tools which are worn out or damaged represent a risk*.

Lors du test des composants, ne jamais dépasser les limites de pression de fonctionnement maximales. / *When testing components, never exceed the maximum operating pressure limits*.

Avant d'effectuer des opérations sur les pièces mobiles (compresseurs, ventilateurs, etc...) assurer qu'elles ne peuvent pas démarrer inopinément. / *Before carrying out any operations on moving parts (compressors, fans, etc.) make sure that they cannot start up unexpectedly*.

Si un liquide (lubrifiant, liquide réfrigérant, solvants) s'est renversé sur le plancher, nettoyer aussitôt la zone concernée et prendre les précautions pour éviter de glisser. / *If liquids (lubricant, cooling fluid, solvents) are spilt over the floor, clean the area straight away and take precautions to avoid slipping*.

1.4 Sécurité fonctionnelle / *Functional safety*

La sécurité du produit ne peut être garantie que si des pièces de rechange d'origine **Faiveley** sont employées. Tous autres matériels peuvent compromettre la fonctionnalité et la sécurité. / *Product safety can only be guaranteed if genuine **Faiveley** spare parts are used. Any other materials can compromise functionality and safety*.

Suite à toute opération de maintenance, s'assurer que les composants et le système complet ont retrouvé une parfaite fonctionnalité. / *After any maintenance operation, make sure that components and the complete system have been restored to their perfect functionality*.

Après toute opération de maintenance, rétablir les conditions d'origines du véhicule, en supprimant les dispositifs de protection (serrures, fils, etc...) sur les appareils. / *After any maintenance operation, restore original conditions of vehicle, remove the protection devices (locks, wires, etc.) on the devices*.

Après chaque prise de pression, remettre immédiatement les bouchons métalliques de protection sur les prises test. / *After each pressure measurement, immediately reinstall the metal protection caps on test points.*

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Risque générique
Generic risk

Il est fortement préconisé de ne pas remplacer toutes les semelles/garnitures de frein en même temps sur le véhicule (1/3 au maximum), car ceci peut réduire l'efficacité du freinage. Il doit cependant être pris en compte lors du remplacement des semelles, qu'une réduction provisoire des performances de freinage est générée. / *It is strongly recommended not to replace all the brake shoes/pads at the same time on the vehicle (1/3 maximum) as this may reduce braking effectiveness. However, it must be taken into account when the shoes are replaced, that it generates a temporary reduction of braking performance*.

Risque générique
Generic risk

Ne pas remplacer plus 1/3 des composants de frein ou des appareils par pas de maintenance. Dans le cas contraire, des essais de qualification du véhicule devront être réalisés. / *Do not replace more than 1/3 of brake components or devices by maintenance step. Otherwise, qualification tests of the vehicle must be realized*.

1.5 Sécurité environnementale / *Environnemental safety*

Risque générique
Generic risk

Pendant la manipulation des lubrifiants, des diluants, solvants et d'autres substances qui peuvent être nocives pour l'environnement, prendre toutes les précautions pour éviter le renversement. Toutes les conditions applicables des lois doivent être respectées lorsque l'on se débarrasse de substances qui peuvent polluer l'environnement (lubrifiants, batteries, liquide réfrigérant, etc.).

When handling lubricants, thinners, solvents and other substances that may be harmful for the environment, take all precautions to avoid reversal. All applicable laws must be respected when disposing of substances that may pollute the environment (lubricants, batteries, cooling fluid, etc.)

1.6 Prescriptions spécifiques des équipements sous pressions / *Specific requirements for under pressure equipments*

Utilisation des équipements : tous les équipements du produit doivent exclusivement effectuer les fonctions pour lesquelles elles sont conçues. Par conséquent, toute autre utilisation, en dehors de celle du système sur lequel ils sont installés, est expressément interdite. / *Equipement use: all equipment must exclusively carry out the functions which they have been designed for. Consequently, any other use, outside the system on which they are installed, is expressly prohibited*.

Conditions dégradées : le système peut fonctionner seulement s'il est parfaitement efficace. Les défauts de fonctionnement ou les erreurs possibles doivent être considérés comme des conditions exceptionnelles et, en tant que tels, doivent être supprimés dès que possible. / *Degraded conditions: the system can operate only if it is perfectly efficient. Possible malfunctions or errors are to be considered as exceptional conditions and, as such, must be eliminated as soon as possible*.

Durée de fonctionnement : le système est conçu pour une durée de vie de **30 ans**, à échéance de laquelle, il doit être rendu inopérant en débranchant toutes les alimentations en énergie (alim. élect., mécanique, pneumatique), en déchargeant toutes les capacités résiduelles afin de mettre à zéro la pression et en démontant tous les composants. En particulier, les réservoirs doivent être rendus inutilisables, les tuyaux doivent être démontés et les raccords jetés ainsi que les dispositifs de sécurité (par exemple soupapes de sûreté) doivent être rendus inutilisables.

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*Operating life: the system is designed for a life of **30 years** on condition that the maintenance plan is respected, at the end of which it must be made as non-operational by disconnecting all power supplies (electrical, mechanical, pneumatic elements), by discharging all residual capacities to bring the pressure to 0 pressure and by dismantling all the components. In particular, the reservoirs must be made unusable, the pipes must be dismantled and discarded, flexibles and safety devices (for example safety valves) must be made unusable.*

Maintenance : les opérations de maintenance nécessaires sont expliquées dans ce manuel. Elles doivent être effectuées comme décrite dans ce document. En cas de doute arrêter l'opération de maintenance et consulter le fabricant pour clarifications. / *Maintenance: the necessary maintenance operations are explained in this manual. They must be carried out as described in this document. In case of doubt, stop the maintenance and consult the manufacturer for clarification*.

Remplacement des pièces : au cas où une pièce devrait être remplacée, une pièce neuve de **FAIVELEY** doit être installée selon les prescriptions spécifiques et en évitant toute sorte de contrainte externe pouvant par conséquent l'endommager (par exemple effort, torsion, etc.).

Replacement of parts: if a part needs to be replaced, a new FAIVELEY part must be installed according to the specific recommendations and avoiding all types of external stress that may consequently cause damage (for example stress, torsion, etc.).

Modifications et réparations statiques : toutes les modifications sur les réservoirs pressurisés sont absolument interdites. Il est possible de les dépanner seulement si ils sont déposés et suivant les prescriptions spécifiques des documents permettant la dépose des appareils sous pressions : il est absolument nécessaire avant d'enlever toutes les pièces de s'assurer que toutes les capacités ont été déchargées, puis enlever les pièces avec soin. L'utilisation de dispositifs de protection personnels (lunettes, gants) est cependant recommandée. Attention ! Même si un système est inopérant depuis longtemps, il risque de conserver des pressions résiduelles dangereuses.

Static modifications and repairs: all modifications on pressurised reservoir are strictly prohibited. They may be repaired only if they are removed and if the specific recommendations in the documents that enable pressurised appliances to be dismantled are respected; before removing any parts it is vital that you ensure that all the capacities have been discharged, then carefully remove the parts. The use of personal safety equipment (goggles, gloves) is still recommended. Caution! Even if a system has been out of operation for a long time, there is a risk that it has retained a certain level of hazardous residual pressure.

Les risques résiduels suivants n'ont pas été considérés durant la conception, donc il est de la responsabilité de l'utilisateur de respecter les textes de lois applicables. / *The following residual risks were not considered during design. Therefore, it is the user's responsibility to respect the texts in the applicable laws*.

Le feu externe : les risques inhérent à un feu externe n'ont pas été pris en compte, / *External fire: the external fire risks have not been considered*,

Les contraintes externes : le produit est conçu pour du matériel roulant ferroviaire, dans les conditions environnementales indiquées dans les spécifications applicables. Aucune autre condition n'a été prise en compte, / *External stress: the product has been designed for rolling stock material and for environmental conditions indicated in the applicable specifications. No other conditions have not been taken into account*,

Les abus: aucun abus prévisible n'a été identifié et n'a donc été considéré. / *Misuse: no foreseeable misuse abuse has been identified and therefore has not been considered*.

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1.7 Symboles / *Symbols*

Dans ce document, les risques sont identifiés en utilisant les notes d'avertissement spécifiques et les symboles suivants : / *In this document, the risks are identified using specific warning notes and the following symbols*:

High voltage

Pièce Sous tension

Rotating parts

Pièce en rotation

Pressurised vessel

Récipient sous pression

Flammable materials

Matériaux inflammables

Handle with care

Manipuler avec précaution

Risk of crushing

Risque d'écrasement

Generic risk

Risque générique

Hot surface

Surface chaude

Nota / *Note* : Une note signale une information importante dans le texte ! / *A note indicates important information in the text !*

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1.8 Stockage des appareils / *Storage of the devices*

1.8.1 Stockage en magasin / *Storage in workshop*

Les équipements doivent être stockés dans leur emballage d'origine dans une pièce aérée et ne doivent pas être exposés à l'humidité, la poussière. / *The components must be stored with their original packaging in a ventilated room and not exposed to humidity and dust*.

La température de stockage doit être comprise entre 0°C et +35°C avec un taux d'humidité maximal de 80% et avec une variation de température de 15°C en 24h maximum. / *The storage temperature must be within 0°C and +35°C, RH 80% maximum and with variation in temperature of 15°C in 24h maximum*.

Protection des équipements : / *Protection of equipment*:

Si les équipements sont stockés en dehors de leur emballage d'origine, ils doivent être à l'abri des intempéries et de la lumière (rayons UV). / *If out of their original packaging, equipment must be protected against bad weather and light (UV)*.

Toutes les entrées, sorties doivent être protégées (scotch) contre la poussière. / *All outlet / inlet parts must be protected (scotch) against dust*.

Les évents de mise à l'atmosphère des équipements doivent être dirigés vers le bas, il est important de respecter le sens de positionnement de l'équipement (Étiquettes haut / bas). / *Blowholes of equipments must be directed downward, respect the position according to the sticker "up/down"*.

1.8.2 Conditions de stockage sur véhicule / *Environnement of storage on vehicle*

Les équipements montés sur le véhicule ne nécessitent pas de protection particulière. / *Equipments fitted on the vehicles don't need any particular protection*.

Ils peuvent supporter des températures de **- 25°C à + 60°C** lors du stockage sur véhicule. Ces conditions de stockage sont acceptables si la durée n'excède pas **6 mois** (Exemple : 1 année de stockage en extérieur sur véhicule est acceptable lorsque l'exposition de **- 25°C à 0°C en hiver** dure **3 mois** maximum et de **+25°C à +60°C en été** dure également **3 mois** maximum).

They can meet temperature: from - 25°C to + 60°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example : 1 outside storage year on vehicle is acceptable if the temperature is, ***in winter from -25°C to 0°C*** *during* ***3 months*** *maximum and also,* ***in summer from +25°C to +60°C*** *during* ***3 months*** *maximum)*.

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1.8.3 Conditions particulières / *Specific conditions*

Dans le cas d'un stockage sur véhicule inopérant, effectuer tous les 3 mois: / *In the case of equipment mounted on inoperative vehicle, perform every 3 months*:

- un desserrage du frein de parking. Puis réaliser au moins 10 actions de freinage / défreinage du frein de service afin de mettre en mouvement les pièces mécaniques, / *release of parking brake. Then carry out at least 10 brake / release actions of service brake in order to move the mechanical parts*,

- vérifier visuellement que les garnitures de frein soient en contacts avec les disques lors des phases de freinages. A la fin de la vérification, appliquer le frein de parking. / *visually check that brake pads are in contact with the disc during phases of braking. At the end of the checking, apply the parking brake*.

Etant donné que les pièces élastomères vieillissent même dans les conditions optimales de stockage, les règles suivantes doivent être suivies pour les équipements stockés en magasin ou sur un véhicule inopérant.

Since rubber parts age out even if optimum storage conditions, the following rules must be followed for equipment stored on the shelf or mounted on inoperative vehicles.

Les équipements pneumatiques doivent être renvoyés chez **FAIVELEY TRANSPORT** pour révision au bout de **2 ans** à compter de la date de fabrication ou de la dernière révision. / *Pneumatic equipments must be sent back to **FAIVELEY TRANSPORT** after **2 years** from the date of manufacture or last overhaul, in order to be checked and reconditionned.*

Lors d'un retour chez **FAIVELEY TRANSPORT** d'un produit, utiliser un emballage adapté permettant de ne pas endommager celui-ci pendant le transport. / *When returning to **FAIVELEY TRANSPORT** of a product, use a suitable packaging to avoid damaging it during transport*.

1.9 Température de fonctionnement des appareils / *Operating temperature of devices*

Les équipements fonctionnent de manière optimale dans la plage de température **– 25°C à + 45°C** (classe T3 de la norme NF EN 50125-1).

*Equipments are operating in full satisfactory way in the temperature range from - **25°C to + 45°C** (class T3 of the EN 50125-1 standard.*

Pour les températures de **-40°C à -25°C** et de **+45°C à +70°C**, les fonctions restent pleinement assurées, mais les caractéristiques et les performances peuvent être légèrement dégradées (ex: taux de fuite plus important).

*For temperature range from **-40 °C to -25°C** and from **+45 °C to +70°C**, the function are fully performed, but characteristics and performances may slightly derivate (ex: leakage rate).*

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/// 2. CARACTERISTIQUES PRINCIPALES / *MAIN CHARACTERISTICS*

Pression maximale en service / *Maximum operating pressure:*	**10 bars**
Indice de protection / *Degrees of protection:*	**IP56**
Température de fonctionnement / *Operating temperature:*	**-40°C / +70°C**
Poids / *Weight:*	**2,6 kg ± 5%**

/// 3. DESCRIPTION GENERALE / *GENERAL DESCRIPTION*

3.1 Objet / *Object*

Ce document a pour but de décrire les opérations d'entretien, de méthode de contrôle et de dépose/pose à respecter sur le relais P2K DN19, lorsque celui-ci est monté sur le véhicule dans le but d'assurer la fonctionnalité et la sécurité du système.

This document have for purpose to describe the servicing, inspection and removal/installation procedures to be respected on the P2K DN19 relay valve, when this one is mounted on vehicle in order to assure the functionality and the safety of the system.

Les conflits et les contradictions avec les exigences des clients doivent être communiqués par écrit à **Faiveley transport**.

*Conflict and contradiction with customers requirement must be delivered by mail to **Faiveley transport**.*

3.2 Liste des équipements / *Equipment list*

Relais P2K DN19 / *P2K DN19 relay valve*	784053xx08 ind / *rev* V00

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/// 4. DESCRIPTIF TECHNIQUE / *TECHNICAL DESCRIPTION*

4.1 Description du relais / *Devices of relay valve*

Le relais P2K-DN19 est destiné à l'alimentation en air comprimé à grand débit d'un "Circuit d'utilisation". Cette pression suit les variations des pressions dites "Pressions pilotes" issue de deux appareils pilotes à faible débit. / *The relay P2K-DN19 is used to supply an "output circuit" with high output compressed air. This pressure follows the variations of a pressures known as the "pilots pressures" from a low flow of pilots units.*

Il est constitué d'un étage supérieur et d'un étage inférieur bien séparés. En générale, ces étages sont alimentés avec la pression pilote du frein de service (FS) et la pression pilote du frein d'urgence (FU). / *It is made up of an upper level and a lower level well separated. In general, this levels are supplied with the pilot pressure of service brake (SB) and the pilot pressure of emergency brake (EB).*

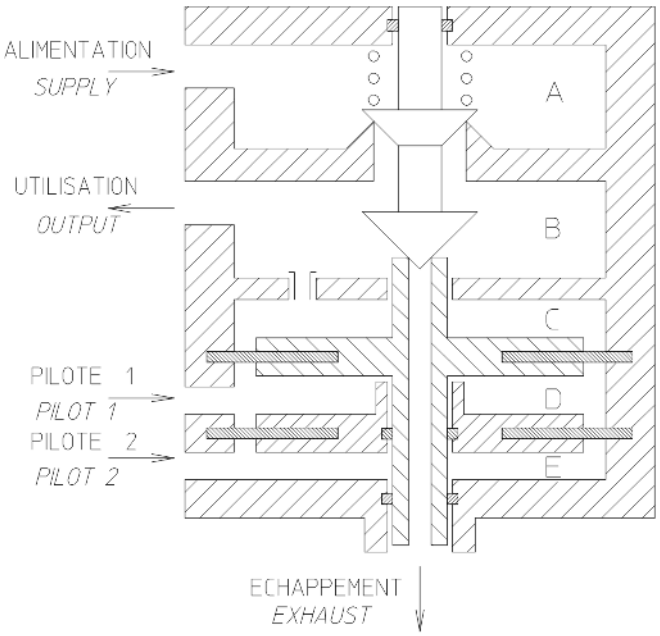

Figure 1: Schéma de principe / *Block diagram*

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4.2 Description des fonctions / *Functions description*

La chambre d'alimentation **(A)** est alimentée par l'air du réservoir principal ou du réservoir auxiliaire **(RA)** du véhicule. / *The supply chamber **(A)** is supplied by the air of the main reservoir or the auxiliary reservoir **(AR)**.of the vehicle.*

4.2.1 Pressions pilotes nulles / *Zero pilot pressures*

Lorsque les pressions pilotes 1 et 2 sont nulles dans les chambres **(D)** et **(E)**, (à l'atmosphère), le piston équipé **(2)** et le serre membrane **(3)** se trouvent en position basse.

*While the pilot pressures 1 and 2 are zero in the chambers **(D)** and **(E)**, (to the atmosphere), the equipped piston **(2)** and the clamp membrane **(3)** is found in a lower position.*

Le clapet d'admission **(21) (CLA)** de la tige de clapet **(7)** repose sur le siège du clapet d'admission **(6)**, il est donc fermé et confirme par l'effort du ressort **(10)**, l'interdiction de toute alimentation de la chambre d'utilisation **(B)**.

*The inlet valve **(21) (CLA)** of the valve rod **(7)** rests on the inlet valve seat **(6)**, it is then closed and confirms the effort of the spring **(10)**, the prevention of all supply of the output chamber **(B)**.*

L'extrémité supérieure du piston équipé **(2)**, constitue le siège du clapet d'échappement **(21) (CLE)**, celle-ci étant éloignée de ce clapet, elle est ouverte et la chambre d'utilisation **(B)** est mise à l'atmosphère.

*The upper extreme of the equipped piston **(2)**, is made up of the exhaust valve seat **(21) (CLE)**, the latter being removed from this valve, it is open and the output chamber **(B)** is put in the atmosphere.*

4.2.2 Pression pilote / Pilot pressure

4.2.2.1 Chambre (D) (Frein de service) / *Chamber (D) (Service brake)*

Lorsque la pression pilote 1 (frein de service) arrive dans la chambre **(D)**, l'effort de cette pression sur les diaphragmes **(14)** déplace le piston équipé **(2)** vers le haut et le serre membrane **(3)** vers le bas, en appui sur le couvercle **(5)**.

*While the pilot pressure 1 (service brake) arrives in the chamber **(D)**, the effort of this pressure on the diaphragms **(14)** moves the equipped piston **(2)** towards the top and the clamp membrane **(3)** towards the bottom, supporting on the cover **(5)**.*

L'extrémité supérieure du piston équipé **(2)** vient se plaquer sur le clapet d'échappement **(21) (CLE)**, puis soulève la tige de clapet **(7)** qui ouvre le clapet d'admission **(21) (CLA)**.

*The upper extreme of the equipped piston **(2)** comes to be flattened on the exhaust valve **(21) (CLE)**, then lift the valve rod **(7)** which opens the inlet valve **(21) (CLA)**.*

L'air de la chambre d'alimentation **(A)** pénètre par le clapet d'admission **(21) (CLA)** dans la chambre d'utilisation **(B)** et alimente le circuit d'utilisation. / *The air of the supply chamber **(A)** penetrates by the inlet valve **(21) (CLA)** in the output chamber **(B)** and supplies the output circuit.*

L'air de la chambre d'utilisation **(B)** pénètre également dans la chambre de réaction **(C)** par le gicleur **(13)** et sollicite le piston équipé **(2)** vers le bas. / *The air of the output chamber **(B)** penetrates equally in the reaction chamber **(C)** by the calibrated choke **(13)** and attracts the equipped piston **(2)** towards the bottom.*

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4.2.2.2 Pression stabilisée / *Stabilised pressure*

Lorsque la pression dans la chambre de réaction **(C)** atteint sa valeur nominale le piston équipé **(2)** redescend, le clapet d'admission **(21) (CLA)** se ferme sans que le clapet d'échappement **(21) (CLE)** ne s'ouvre : le piston équipé **(2)** est en position d'équilibre.

*While the pressure in the reaction chamber **(C)** attains its nominal value, the equipped piston **(2)** returns back down, the inlet valve **(21) (CLA)** closes without the exhaust valve **(21) (CLE)** coming out: the equipped piston **(2)** is in a stable position.*

Si pour une raison quelconque, la pression diminue dans la chambre d'utilisation **(B)** (ex : fuite dans le circuit d'utilisation), la pression pilote 1 devient prépondérante et soulève le piston équipé **(2)**.

*If for any other reason, the pressure diminishes in the output chamber **(B)** (ex : leak in the output circuit), the pilot pressure 1 becomes predominant and lift the equipped piston **(2)**.*

La chambre d'utilisation **(B)** est alors ré-alimentée par la chambre d'alimentation **(A)** jusqu'au rétablissement de l'équilibre.

*The output chamber **(B)** is therefore supplied by the supply chamber **(A)** up to the re-establishment of equilibrium stability.*

4.2.2.3 Chambre (E) (Frein d'urgence) / *Chamber (E) (Emergency brake)*

Lorsque la pression pilote 2 arrive dans la chambre **(E)**, l'effort de cette pression sur le second diaphragme **(14)** déplace le serre membrane **(3)** vers le haut, il vient en butée contre le piston équipé **(2)** et entraîne son déplacement vers le haut.

*While the pilot pressure 2 arrive in the chamber **(E)**, the effort of this pressure on the second diaphragm **(14)** moves the clamp membrane **(3)** towards the top, it comes in full lock against the equipped piston **(2)** and brings about its movement towards the top.*

L'extrémité supérieure du piston équipé **(2)** vient se plaquer sur le clapet d'échappement **(21) (CLE)** et soulève la tige de clapet **(7)** qui ouvre le clapet d'admission **(21) (CLA)**.

*The upper extreme of the equipped piston **(2)** comes to be flattened on the exhaust valve **(21) (CLE)** and lift the valve rod **(7)** which opens the inlet valve **(21) (CLA)**.*

L'air de la chambre d'alimentation **(A)** pénètre par le clapet d'admission **(21) (CLA)** dans la chambre d'utilisation **(B)** et de là, dans le circuit d'utilisation.

*The air of the supply chamber **(A)** penetrates the inlet valve **(21) (CLA)** in the output chamber **(B)** and from there, in the output circuit.*

L'air de la chambre d'utilisation **(B)** pénètre également dans la chambre de réaction **(C)** par le gicleur **(13)** et sollicite le piston équipé **(2)** et le serre membrane **(3)** vers le bas.

*The air of the output chamber **(B)** penetrates equally in the reaction chamber **(C)** by the calibrated choke **(13)** and attracts the equipped piston **(2)** and the clamp membrane **(3)** towards the bottom.*

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4.2.3 Pressions pilotes décroissantes / *Decreasing pilot pressures*

Lorsque les pressions pilotes 1 ou 2 diminuent dans les chambres **(D)** ou **(E)**, la pression dans la chambre de réaction **(C)** devient prépondérante et le piston équipé **(2)** et le serre membrane **(3)** se déplacent vers le bas.

*During the pilot pressures 1 or 2 reduce in the chambers **(D)** or **(E)**, the pressure in the reaction chamber **(C)** becomes predominant and the equipped piston **(2)** and the clamp membrane **(3)** moves itself towards the bottom.*

Le clapet d'admission **(21) (CLA)** reste fermé, le clapet d'échappement **(21) (CLE)** s'ouvre et l'air de la chambre d'utilisation **(D)**, donc celui du circuit d'utilisation, s'évacue à l'échappement par l'orifice du piston équipé **(2)**, jusqu'à ce qu'un nouvel équilibre s'établisse.

*The inlet valve **(21) (CLA)** remains closed, the exhaust valve **(21) (CLE)** opens and the air of the output chamber **(D)**, those of the output circuit, escapes through the hole of the equipped piston **(2)**, until a new equilibrium/stability is established.*

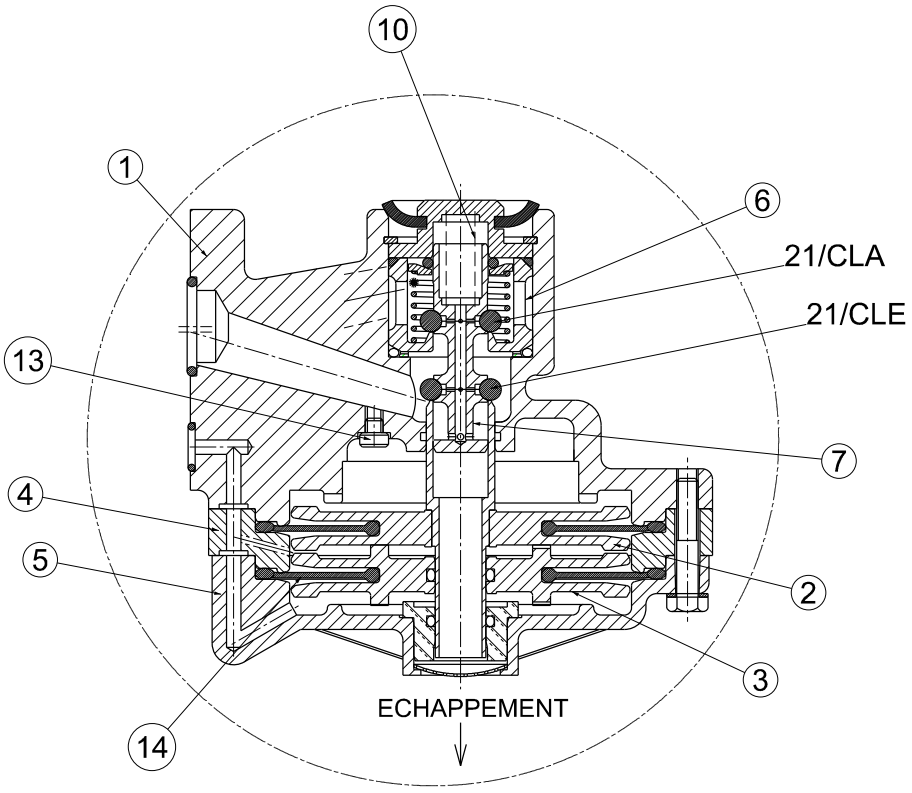

Figure 2: Schéma fonctionnel / *Functional diagram*

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/// 5. PRESCRIPTION D'ENTRETIEN / *MAINTENANCE PRESCRIPTIONS*

Risque générique

Generic risk

Respecter la prescription et les intervalles de maintenance afin de ne pas nuire à la sécurité. / *To respect the maintenance prescription and intervals in order to not impair safety.*

Faire un contrôle fonctionnel et une révision générale comme prévu dans le plan de maintenance du projet. S'il n'y a pas de plan de maintenance pour le projet, respecter les périodicités ci-dessous.

Make a functional check and a general overhaul *as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.*

5.1 Premier, deuxième et troisième niveau de maintenance (Contrôle fonctionnel) / *First, second and third level maintenance (Functional control)*

Pour réaliser les contrôles ci-dessous, il n'est pas nécessaire de démonter les équipements du véhicule. / *For the controls below, it is not necessary to remove the equipment from the vehicle.*

Respecter l'intervalle d'entretien suivant: / *Pay attention to the following maintenance interval:*

Maintenance (M1)	tous les **160 000 km ou tous les ans, au premier des deux termes échu**.
Maintenance (M1)	*every **160 000 km or every year, at the first of the two terms expired**.*

5.2 Quatrième niveau de maintenance (Révision générale) / *Fourth level maintenance (General overhaul)*

Réparation en atelier : / *Rapair in Workshop*:

Révision (R1)	tous les **800 000 km ou tous les 5 ans, au premier des deux termes échu,**
Overhaul (R1)	*every **800 000 km or 5 years, at the first of the two terms expired***,

L'exploitant peut adapter cette périodicité selon les conditions d'utilisation, sa politique de maintenance et son expérience propre, sous sa responsabilité. / *The owner can adapt this periodicity according to conditions of use, its maintenance policy and its own experiment, under its responsibility.*

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5.3 Tableau des travaux planifiés à réaliser / *Table of scheduled work to be performed*

Niveau de maintenance *Maintenance Level*	Travaux planifiés / *Scheduled work*	Paragraphe *Section*	M1	R1
2	Test d'étanchéité / *Leakage test*	**§ 6.1**	•	•
2	Entretien correctif / *Corrective maintenance*	**§ 6.2**		
4	Le relais P2K DN19 sera déposé pour démontage, nettoyage, graissage, examen et remplacement des pièces d'usure. / *The relay P2K DN19 must be removed for disassembly, cleaning, greasing, verification, and replacement of worn parts*.	**§ /// 7**		•

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/// 6. CONTROLE FONCTIONNEL / *FUNCTIONAL CONTROL*

6.1 Test d'étanchéité / *Leakage test*

Les essais d'étanchéités doivent être conformes aux essais réalisés sur le véhicule à l'aide du document constructeur. / *The leakage tests must be consistent with tests performed on the vehicle using the manufacturer document.*

6.2 Entretien correctif / *Corrective maintenance*

Brancher un manomètre sur le circuit utilisation. / *Connect a pressure gauge on output circuit*.

Brancher un manomètre sur le circuit pilote 1 et mettre la deuxième chambre pilote à l'atmosphère. / *Connect a pressure gauge on pilot circuit 1 and vent the second pilot chamber to the atmosphere.*

Ajuster la pression pilote 1 à une valeur comprise entre **1 et 5 ± 0,01 bars** et vérifier que la pression d'utilisation soit bien identique à **± 0,1 bar**. / *Adjust the pilot pressure 1 at a value between **1 and 5 ± 0,01 bar** and check that the output pressure is identical at **± 0,1 bar**.*

Augmenter et diminuer la pression pilote 1 pour effectuer plusieurs paliers de serrage desserrage et vérifier que la pression d'utilisation augmente ou diminue en suivant la pression pilote. / *Increase and decrease the pilot pressure 1 in order to perform several levels of brake release and check that output pressure increase or decrease according to pilot pressure.*

Brancher un manomètre sur le circuit pilote 2 et mettre la première chambre pilote à l'atmosphère. / *Connect a pressure gauge on pilot circuit 2 and vent the first pilot chamber to the atmosphere.*

Ajuster la pression pilote 2 à une valeur comprise entre **1 et 5 ± 0,01 bars** et vérifier que la pression d'utilisation soit bien identique à **± 0,1 bar**. / *Adjust the pilot pressure 2 at a value between **1 and 5 ± 0,01 bar** and check that the output pressure is identical at **± 0,1 bar**.*

Augmenter et diminuer la pression pilote 2 pour simuler plusieurs valeurs de pesée et vérifier que la pression d'utilisation augmente ou diminue en suivant la pression pilote. / *Increase and decrease the pilot pressure 2 in order to simulate several weighing values and check that output pressure increase or decrease according to pilot pressure.*

Si les valeurs ne sont pas correctes, le relais P2K DN19 n'est pas fonctionnel, le déposer et le remplacer (**voir /// 7**). / *If the values are not correct, the relay P2K DN19 is not functional, remove and replace it (**see /// 7**).*

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/// 7. PROCEDURE DE DEPOSE ET D'INSTALLATION / *REMOVAL AND INSTALLATION PROCEDURES*

Attention ! Débrancher l'alimentation électrique avant le démontage.

Warning! *Disconnect the power supply before disassembling.*

Vidanger le circuit pneumatique et assurez-vous que la pression est mise à l'air libre. Lors du démontage des éléments, faite attention aux possibles pressions résiduelles.

Drain the pneumatic circuit and make sure that the pressure is set to free air. When the elements are removed, pay attention to any potential residual pressure.

Utiliser les protections réglementaires aux normes en vigueur pour les produits dangereux.

When using dangerous products, observe the local workshop regulation in force.

FAIVELEY TRANSPORT AMIENS préconise l'utilisation d'un pulvérisateur manuel pour le nettoyage de ses produits avant de réaliser leurs déposes, ceci afin d'éviter que des impuretés rentrent dans les canalisations. Tout autre système de nettoyage est sous la responsabilité de l'agent de maintenance.

FAIVELEY TRANSPORT AMIENS recommends the use of a manual sprayer for cleaning products before performing their removal, in order to prevent impurities from returning into pipes. Any other cleaning system is the under responsibility of the maintenance worker.

FAIVELEY TRANSPORT AMIENS n'interdit pas le nettoyage de la caisse avec un nettoyeur haute pression ou au rouleau, mais déconseille une application directe sur ses produits.

FAIVELEY TRANSPORT AMIENS does not prohibit the car body cleaning with a high pressure cleaner or a roller but does not recommend a direct application on its products.

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7.1 Remplacement du relais P2K DN19 / *Replacement of relay P2K DN19*

A l'aide d'une clé à douille, desserrer et ôter les éléments de fixation du panneau, puis déposer le relais **P2K DN19**.

*From the panel, loosen and remove the fastening elements by means of a socket spanner, then remove the relay **P2K DN19**.*

Rebuter les joints toriques **(24)** et **(25)** d'interface. / *Reject the interface O-rings **(24)** and **(25)**.*

Graisser les joints toriques d'interface **(24) (réf: 705 022 04 08)** et **(25) (réf: 701 246 04 08)** neufs, avec de la **MOLYKOTE 55 O-ring**. / *Lubricate the new interface O-rings **(24) (ref: 705 022 04 08)** and **(25) (ref: 701 246 04 08)** with the **MOLYKOTE 55 O-ring**.*

Mettre en place le nouveau relais **P2K DN19** sur le panneau puis positionner les éléments de fixation et les serrer. / *On the panel put in place the new relay **P2K DN19** then position the fastening elements and tighten them.*

Après la repose du relais **P2K DN19,** faire un contrôle fonctionnel (**voir /// 6**). / *After installing the relay **P2K DN19**, make a functional control (**see /// 6**)*.

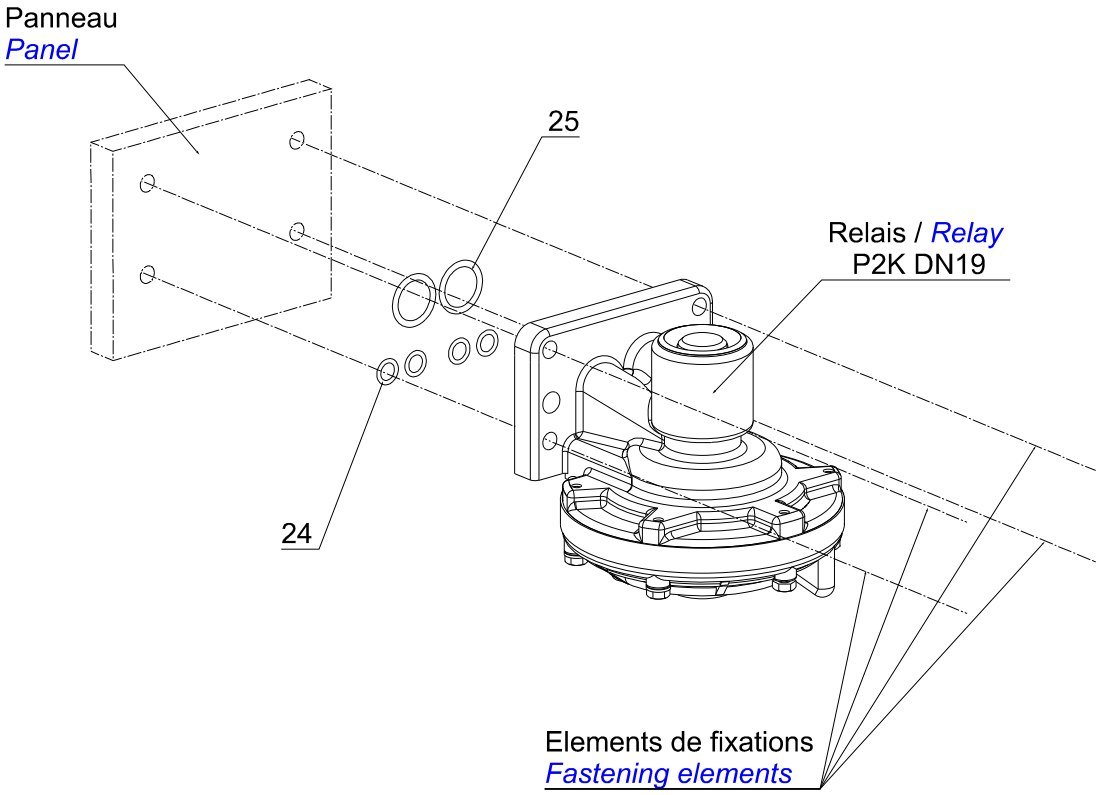

Figure 3: Remplacement du relais **P2K DN19** / *Replacement of the relay **P2K DN19***

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/// 8. REVISION GENERALE / *GENERAL OVERHAUL*

Déposer le relais **P2K DN19** et l'envoyer dans un atelier FAIVELEY pour révision. / *Remove the relay **P2K DN19** and send them in a workshop FAIVELEY for overhaul.*

/// 9. PIECES DE RECHANGE / *SPARE PARTS*

Aucune pièce de rechange n'est nécessaire pour l'entretien courant et la révision générale. / *No spare part required for the routine maintenance and the general overhaul.*

/// 10. OUTILLAGES SPECIAUX / *SPECIAL TOOLS*

Aucun outil spécial n'est nécessaire pour l'entretien et l'installation. / *No special tools required for servicing and installation.*

/// 11. DEMANTELEMENT / *DISPOSAL*

L'appareil est principalement composé par les matériaux suivants: fonte, laiton, acier inoxydable, caoutchouc, cuivre et aluminium. / *The device is mainly composed by the following materials: cast iron, brass, stainless steel, rubber, copper and aluminum.*

Le démantèlement doit se faire conformément aux règles en vigueur dans les locaux de l'utilisateur final et en respectant la loi en vigueur dans le pays où le composant est utilisé.

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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05.14_FLANGED LOAD SIMULATION TEST POINT (T-TEST POINT)

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Maintenance / Use manual
Manuel de maintenance

TOUT / ALL

Prise test de simulation IP65
IP65 Test point of simulation
FT0013186-000

B00	21/01/2019	Modification	.	Camille Halloo	stephane.lesage	luewen.blas
Issue	*Date*	*Description*	*ECO*	*Compiled*	*Checked*	*Approved*

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REVISIONS /

Issue	Date	Description	ECO	Compiled	Checked	Approved
A00	16/03/16	Création / First issue Création suivant le plan d'ensemble n° FT0013186-000. / *First issue according to the assembly drawing n° FT0013186-000*.	.	Camille Halloo	Stéphane Panier	Emmanuel Orlando
B00	21/01/2019	Modification Ajouter page 20, la référence des joints d'interface 704 804 04 08. / *Page 20 add the reference of interface O-rings 704 804 04 08.*	.	Camille Halloo	stephane.lesage	guewen.blasi
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1 MESURES DE SECURITE / SAFETY INSTRUCTIONS

1.1 Préface / *Foreword*

Ces règles font partie intégrantes de ce manuel d'entretien et ont pour but de fournir les notions nécessaires au personnel impliqué dans des opérations d'entretien, afin d'éviter les accidents, les blessures ou dommages pour l'environnement. / *The rules are integrating parts of this maintenance manual and are intended to provide the basic knowledge needed by staff involved in maintenance operations to avoid injuries, damage and environmental pollution*.

Les règles de sécurité sont sujettes à l'amélioration par l'opérateur ou par l'organisme responsable d'utiliser et d'entretenir le véhicule. En particulier, les facteurs non connus à la date de parution de ce document (par exemple réelles conditions de fonctionnement, outils disponibles, compétence du personnel, etc...) doivent être pris en compte avant d'effectuer les opérations.

The safety rules are subject to improvement by the operator or by the authority in charge of using and maintaining the vehicle. In particular, the factors that are not known at the release date (for example, real operating conditions, tools available, skills of personnel, etc.) must be taken into account before the operations are carried out.

L'appareil ne peut être utilisé, entretenu et réparé que par un personnel dûment formé à cet effet. Dans le cas contraire, la garantie prévue en vertu des conditions de livraison sera frappée de nullité. / *The device only be used, serviced and repaired by appropriately trained personnel. Otherwise, any warranty with respect to the terms of delivery will be forfeited*.

Ce manuel doit être facilement accessible à tout le personnel impliqué pour consultation immédiate. Avant d'entreprendre toute action, le personnel doit prendre connaissance du contenu de ce manuel. / *This manual must be easily accessible to all involved personnel for immediate consultation. Personnel must be informed of the content of this manual before undertaking any actions*.

Il est obligatoire que le personnel soit informé des conditions légales au sujet de la sécurité et de la santé au travail et de la prévention des accidents. Le personnel doit avoir la connaissance de base nécessaire dans le domaine des opérations (de : mécanique, système pneumatique, transport etc.).

It is compulsory that staff is aware of the legal conditions that relate to health and safety at work and accident prevention. Personnel must have the basic knowledge necessary in the operations' domain (mechanics, pneumatic system, transport, etc.).

Faiveley transport décline toute responsabilité en cas d'accidents, dommages ou pollution environnementale provoqués par la mauvaise application des prescriptions, ou par la mauvaise utilisation des produits ou des outils. / ***Faiveley Transport*** *cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools*.

Ces prescriptions de sécurité viennent en complément aux règles de sécurité applicables sur le site d'intervention. *The safety requirement comes in addition to safety rules on the site of intervention*.

Outre ce manuel, il est également impératif de respecter et d'appliquer les réglementations générales légales et les autres réglementations relatives à la prévention des accidents et à la protection de l'environnement / *In addition to this manual, you must observe and apply the binding general statutory and other regulations on accident prevention and environmental protection.*

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1.2 Opération préliminaire / *Preliminary operation*

Le véhicule doit être arrêté et sécurisé avec les moyens appropriés afin d'empêcher qu'il ne se déplace intempestivement. AVERTISSEMENT : certaines opérations sur le circuit de freinage peuvent le rendre complètement inopérant et rendre le véhicule libre de se déplacer.

The vehicle must be stopped and secured with the appropriate means to prevent it from moving on its own. WARNING: some operations on the braking system can make it completely ineffective and make the vehicle free to move.

Risque générique
Generic risk

Indiquez clairement par une signalisation visible qu'une action de maintenance est en cours (par exemple mise en garde sur les pupitres des conducteurs ou les panneaux d'affichage) afin d'empêcher l'interférence anormale par d'autres.

Indicate clearly the obvious warning signs that a maintenance action is in progress (for example, warning on the driver desk offices or the display panels) to prevent abnormal interference by other parties.

Avant de faire toutes les actions, assurez-vous qu'elles ne représenteront pas un risque pour une autre personne travaillant sur une autre partie du véhicule.

Before carrying out any actions, make sure that they do not present any risks for anyone else working on any other part of the vehicle.

Récipient sous pression
Pressurised vessel

En général, la propreté doit être garantie pour éviter la contamination par la poussière, la saleté ou d'autres agents externes.

In general, cleanliness must be guaranteed to avoid contamination by dust, dirt or other external agents.

Avant intervention sur les pièces pneumatiques, assurez-vous que les appareils sous pression soient mis à l'atmosphère. Lors du démontage des éléments, faites attention aux possibles pressions résiduelles.

Before any intervention on the pneumatic parts, make sure that pressure devices are vented to atmosphere. During elements removal, pay attention to any potential residual pressure.

Pièce Sous Tension
HIGH VOLTAGE

Avant toute intervention, s'assurer de la mise hors tension des équipements.

Before any intervention, make sure that the power is cut off.

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1.3 Sécurité du personnel / *Personal safety*

Le lieu de travail doit être correctement dimensionné et préparé afin d'enlever tous les obstacles possibles. / *The workplace must have the right size and be correctly prepared to remove all possible obstacles*.

Pour le déplacement des pièces lourdes, le personnel doit utiliser les outils de levage appropriés (cric, poussoir, treuil, etc...) et porter des chaussures et gants de protection appropriés.

While heavy parts are being moved, personnel must use the appropriate lifting tools (jacks, piston, pulley, etc.) and wear the appropriate protective shoes and gloves.

Pour des opérations sous le véhicule, le personnel doit porter un casque de protection. / *Personnel must wear protective helmets for operations underneath the vehicle*.

Pour des opérations sur le toit, le personnel doit être maintenu à l'aide des moyens appropriés afin d'éviter toute chute (ceintures de sûreté, etc.). Le véhicule doit être situé sur une partie de la voie libre de caténaire.

For operations on the roof, personnel must be secured using the appropriate means to avoid fall (safety belts, etc.). The vehicle must be located on part of the road that is free of overhead contact lines.

Avant de démonter toutes pièces, lire soigneusement la documentation technique afin de prendre connaissance des risques possibles, comme la pression ou les ressorts sous pression. Dans ce cas, les lunettes de protection doivent être portées. ATTENTION ! L'étiquette d'avertissement est peut être absente.

Before removing any parts, read the technical documentation carefully to get acquainted on the potential risks, such as pressure or compressed springs. In this case, protective glasses must be worn. CAUTION! The warning label may be missing.

Risque générique
Generic risk

Concernent les produits chimiques émanant des lubrifiants, de graisse, des diluants, solvants, etc. suivre soigneusement les prescriptions du fabricant. Dans tous les cas, éviter de respirer les vapeurs et éviter le contact avec la peau et les yeux. Porter des gants de protection, des lunettes et un masque à filtres approprié.

For chemical products that emanate from lubricants, grease, thinners, solvents, etc., follow carefully the manufacturer's recommendations. In any case, avoid to breath the vapours and avoid contact with skin and eyes. Wear protective gloves, glasses and a filter mask.

Pour les matières consommables comme l'huile et la graisse, se référer à la fiche de sécurité du fournisseur. / *For consumables substances like oil and grease, refer to the supplier safety datasheet*.

Lors de l'utilisation des substances inflammables (lubrifiants, diluants, etc.), adopter toutes les précautions possibles pour éviter le risque d'incendie. Ne pas fumer. Ne pas employer de sources de chaleur ou de flammes. Ne pas provoquer d'étincelles. Maintenir la salle aérée. Stocker les produits selon la prescription du fabricant.

When using flammable substances (lubricants, thinners, etc.) take all possible precautions to avoid the risk of fire. Do not smoke. Do not use sources of heat or flames. Do not cause any sparks. Keep the room ventilated. Store products according to the manufacturers' indications.

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Lors du nettoyage ou du séchage des pièces, ne pas utiliser une source d'air à haute pression supérieure à 6 bars. / *Do not use a high pressure air source upper at 6 bar when cleaning or drying parts*.

Lors du nettoyage des filtres ou des ailettes de refroidisseur, utiliser un aspirateur adapté. / *Use an adapted vacuum cleaner when cleaning cooler filters or cooling fins*.

Avant d'entreprendre toute action sur des pièces qui peuvent être chaudes (disques, garnitures, etc...) s'assurer que la température est d'un niveau acceptable. Si besoin, attendre jusqu'à ce que le composant ait refroidi ou utiliser des protections appropriées.

Before carrying out any actions on parts that may be hot (disks, pads, coolers, etc.), make sure that the temperature is at an acceptable level. If necessary, wait until the article has cooled down or use the appropriate protection.

Pour toutes les opérations, utilisez les outils appropriés. Les outils doivent être maintenus dans des conditions optimales. Les outils qui sont usés où endommagés représentent un risque. / *For any operation, use appropriate tools. The tools must be maintained in optimum conditions. The tools which are worn out or damaged represent a risk*.

Lors du test des composants, ne jamais dépasser les limites de pression de fonctionnement maximales. / *When testing components, never exceed the maximum operating pressure limits*.

Avant d'effectuer des opérations sur les pièces mobiles (compresseurs, ventilateurs, etc...) assurer qu'elles ne peuvent pas démarrer inopinément. / *Before carrying out any operations on moving parts (compressors, fans, etc.) make sure that they cannot start up unexpectedly*.

Si un liquide (lubrifiant, liquide réfrigérant, solvants) s'est renversé sur le plancher, nettoyer aussitôt la zone concernée et prendre les précautions pour éviter de glisser. / *If liquids (lubricant, cooling fluid, solvents) are spilt over the floor, clean the area straight away and take precautions to avoid slipping*.

1.4 Sécurité fonctionnelle / *Functional safety*

La sécurité du produit ne peut être garantie que si des pièces de rechange d'origine **Faiveley** sont employées. Tous autres matériels peuvent compromettre la fonctionnalité et la sécurité. / *Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety*.

Suite à toute opération de maintenance, s'assurer que les composants et le système complet ont retrouvé une parfaite fonctionnalité. / *After any maintenance operation, make sure that components and the complete system have been restored to their perfect functionality*.

Après toute opération de maintenance, rétablir les conditions d'origines du véhicule, en supprimant les dispositifs de protection (serrures, fils, etc...) sur les appareils. / *After any maintenance operation, restore original conditions of vehicle, remove the protection devices (locks, wires, etc.) on the devices*.

Après chaque prise de pression, remettre immédiatement les bouchons métalliques de protection. / *After each pressure release, immediately reinstall the metal protection caps.*

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Risque générique
Generic risk

Il est fortement préconisé de ne pas remplacer toutes les garnitures de frein en même temps sur le véhicule, car ceci peut réduire l'efficacité du freinage. Il doit cependant être pris en compte lors du remplacement des garnitures, qu'une réduction provisoire des performances de freinage est générée.

It is strongly recommended not to replace all the brake pads at the same time on the vehicle as this may reduce braking effectiveness. However, it must be taken into account when the pads are replaced, that it generates a temporary reduction of braking performance.

1.5 Sécurité environnementale / *Environnemental safety*

Risque générique
Generic risk

Pendant la manipulation des lubrifiants, des diluants, solvants et d'autres substances qui peuvent être nocives pour l'environnement, prendre toutes les précautions pour éviter le renversement. Toutes les conditions applicables des lois doivent être respectées lorsque l'on se débarrasse de substances qui peuvent polluer l'environnement (lubrifiants, batteries, liquide réfrigérant, etc.).

When handling lubricants, thinners, solvents and other substances that may be harmful for the environment, take all precautions to avoid reversal. All applicable laws must be respected when disposing of substances that may pollute the environment (lubricants, batteries, cooling fluid, etc.).

1.6 Prescriptions spécifiques des équipements sous pressions / *Specific requirements for under pressure equipments*

Utilisation des équipements : tous les équipements du produit doivent exclusivement effectuer les fonctions pour lesquelles elles sont conçues. Par conséquent, toute autre utilisation, en dehors de celle du système sur lequel ils sont installés, est expressément interdite. / *Equipement use: all equipment must exclusively carry out the functions which they have been designed for. Consequently, any other use, outside the system on which they are installed, is expressly prohibited*.

Conditions dégradées : le système peut fonctionner seulement s'il est parfaitement efficace. Les défauts de fonctionnement ou les erreurs possibles doivent être considérés comme des conditions exceptionnelles et, en tant que tels, doivent être supprimés dès que possible.

Degraded conditions: the system can operate only if it is perfectly efficient. Possible malfunctions or errors are to be considered as exceptional conditions and, as such, must be eliminated as soon as possible.

Durée de fonctionnement : le système est conçu pour une durée de vie de **30 ans**, à échéance de laquelle, il doit être rendu inopérant en débranchant tous les alimentations en énergie (alim. élect., mécanique, pneumatique), en déchargeant toutes les capacités résiduelles afin de mettre à zéro la pression et en démontant tous les composants. En particulier, les réservoirs doivent être rendus inutilisables, les tuyaux doivent être démontés et les raccords jetés ainsi que les dispositifs de sécurité (par exemple soupapes de sûreté) doivent être rendus inutilisables.

Operating life: the system is designed for a life of 30 years on condition that the maintenance plan is respected, at the end of which it must be made as non-operational by disconnecting all power supplies (electrical, mechanical, pneumatic elements), by discharging all residual capacities to bring the pressure to 0 pressure and by dismantling all the components. In particular, the reservoirs must be made unusable, the pipes must be dismantled and discarded, flexibles and safety devices (for example safety valves) must be made unusable.

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Maintenance : les opérations de maintenance nécessaires sont expliquées dans ce manuel. Elles doivent être effectuées comme décrite dans ce document. En cas de doute arrêter l'opération de maintenance et consulter le fabricant pour clarifications. / *Maintenance: the necessary maintenance operations are explained in this manual. They must be carried out as described in this document. In case of doubt, stop the maintenance and consult the manufacturer for clarification*.

Remplacement des pièces : au cas où une pièce devrait être remplacée, une pièce neuve de **FAIVELEY** doit être installée selon les prescriptions spécifiques et en évitant toute sorte de contrainte externe pouvant par conséquent l'endommager (par exemple effort, torsion, etc.).

Replacement of parts: if a part needs to be replaced, a new FAIVELEY part must be installed according to the specific recommendations and avoiding all types of external stress that may consequently cause damage (for example stress, torsion, etc.).

Modifications et réparations statiques : toutes les modifications sur les réservoirs pressurisés sont absolument interdites. Il est possible de les dépanner seulement si ils sont déposés et suivant les prescriptions spécifiques des documents permettant la dépose des appareils sous pressions : il est absolument nécessaire avant d'enlever toutes les pièces de s'assurer que toutes les capacités ont été déchargées, puis enlever les pièces avec soin. L'utilisation de dispositifs de protection personnels (lunettes, gants) est cependant recommandée. Attention ! Même si un système est inopérant depuis longtemps, il risque de conserver des pressions résiduelles dangereuses.

Static modifications and repairs: all modifications on pressurised reservoir are strictly prohibited. They may be repaired only if they are removed and if the specific recommendations in the documents that enable pressurised appliances to be dismantled are respected; before removing any parts it is vital that you ensure that all the capacities have been discharged, then carefully remove the parts. The use of personal safety equipment (goggles, gloves) is still recommended. Caution! Even if a system has been out of operation for a long time, there is a risk that it has retained a certain level of hazardous residual pressure.

Les risques résiduels suivants n'ont pas été considérés durant la conception, donc il est de la responsabilité de l'utilisateur de respecter les textes de lois applicables.

The following residual risks were not considered during design. Therefore, it is the user's responsibility to respect the texts in the applicable laws.

Le feu externe : les risques inhérent à un feu externe n'ont pas été pris en compte, *External fire: the external fire risks have not been considered*,

Les contraintes externes : le produit est conçu pour du matériel roulant ferroviaire, dans les conditions environnementales indiquées dans les spécifications applicables. Aucune autre condition n'a été prise en compte,

External stress: the product has been designed for rolling stock material and for environmental conditions indicated in the applicable specifications. No other conditions have not been taken into account,

Les abus : aucun abus prévisible n'a été identifié et n'a donc été considéré. / *Misuse: no foreseeable misuse abuse has been identified and therefore has not been considered*.

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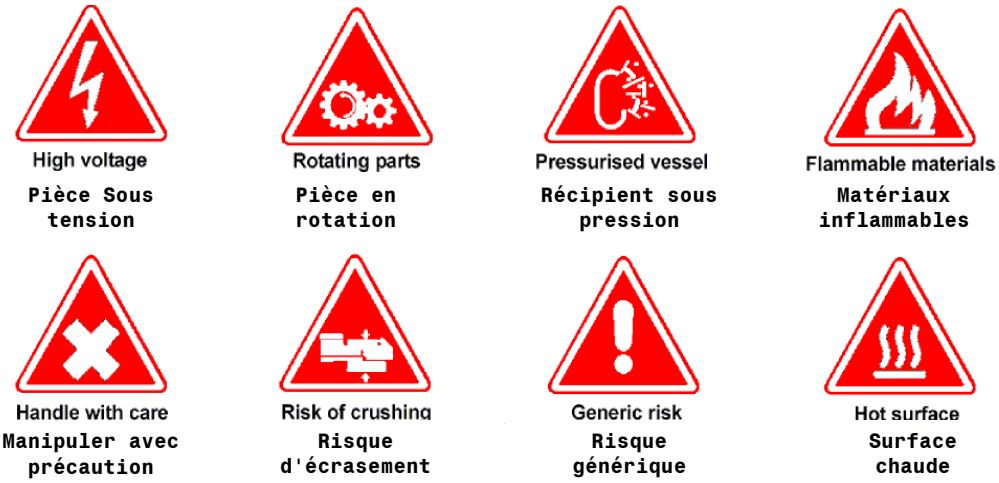
1.7 Symboles / *Symbols*

Dans ce document, les risques sont identifiés en utilisant les notes d'avertissement spécifiques et les symboles suivants. / *In this document, the risks are identified using specific warning notes and the following symbols*.



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1.8 Stockage des appareils / *Storage of the devices*

1.8.1 Stockage en magasin / *Storage in workshop*

Les équipements doivent être stockés dans leur emballage d'origine dans une pièce aérée et ne doivent pas être exposés à l'humidité, la poussière. / *The components must be stored with their original packaging in a ventilated room and not exposed to humidity and dust*.

La température de stockage doit être comprise entre -40°C et +85°C avec un taux d'humidité maximal de 100% et avec une variation de température de 15°C en 24h maximum. / *The storage temperature must be within -40°C and +85°C, RH 100% maximum and with variation in temperature of 15°C in 24h maximum*.

Ces conditions de stockage sont acceptables si la durée n'excède pas **6 mois** (Exemple : 1 année de stockage en magasin est acceptable lorsque l'exposition de **- 40°C à 0°C en hiver** dure **3 mois** maximum et de **+25°C à +85°C en été** dure également **3 mois** maximum). / *These storage conditions are acceptable if the duration doesn't exceed **6 months** (Example : 1 storage year in workshop is acceptable if the temperature is, in winter from **-40°C to 0°C maximum** during **3 months** maximum and also, **in summer** from **+25°C to +85°C** maximum during **3 months** maximum).*

Protection des équipements: / *Protection of equipment:*

Si les équipements sont stockés en dehors de leur emballage d'origine, ils doivent être à l'abri des intempéries et de la lumière (rayons UV). / *If out of their original packaging, equipment must be protected again bad weather and light (UV)*.

Toutes les entrées, sorties doivent être protégées (scotch) contre la poussière. / *All outlet / inlet parts must be protected (scotch) against dust*.

Les évents de mise à l'atmosphère des équipements doivent être dirigés vers le bas, il est important de respecter le sens de positionnement de l'équipement. (Étiquettes haut / bas). / *Blowholes of equipments must be turned downward, respect the position according to the sticker "up/down"*.

1.8.2 Conditions de stockage sur véhicule / *Environnement of storage on vehicle*

Les équipements montés sur le véhicule ne nécessitent pas de protection particulière. / *Equipments fitted on the vehicles don't need any particular protection*.

Ils peuvent supporter des températures de **- 25°C à + 60°C** lors du stockage sur véhicule. Ces conditions de stockage sont acceptables si la durée n'excède pas **6 mois** (Exemple : 1 année de stockage en extérieur sur véhicule est acceptable lorsque l'exposition de **- 25°C à 0°C en hiver** dure **3 mois** maximum et de **+25°C à +60°C en été** dure également **3 mois** maximum).

They can meet temperature: from - 25°C to + 60°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example : 1 outside storage year on vehicle is acceptable if the temperature is, in winter from -25°C to 0°C maximum during 3 months maximum and also, in summer from +25°C to +60°C maximum during 3 months maximum).

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1.8.3 Conditions particulières / *Specific conditions*

Effectuer au moins 10 actions de freinage / défreinage tous les 3 mois dans le cas d'un stockage sur véhicule inopérant. / *For equipment mounted on inoperative vehicles, to perform at least 10 brake / release actions every 3 months.*

Etant donné que les pièces élastomères vieillissent même dans les conditions optimales de stockage, les règles suivantes doivent être suivies pour les équipements stockés en magasin ou sur un véhicule inopérant. / *Since rubber parts age out even if optimum storage conditions, the following rules must be followed for equipment stored on the shelf or mounted on inoperative vehicles*.

Les équipements pneumatiques doivent être renvoyés chez **FAIVELEY TRANSPORT** pour révision au bout de **2 ans** à compter de la date de fabrication ou de la dernière révision. / *Pneumatic equipments must be sent back to **FAIVELEY TRANSPORT** after **2 years** from the date of manufacture or last overhaul, in order to be checked and reconditionned.*

Lors d'un retour chez FAIVELEY TRANSPORT d'un produit, utiliser un emballage adapté permettant de ne pas endommager celui-ci pendant le transport. / *When returning to FAIVELEY TRANSPORT of a product, use a suitable packaging to avoid damaging it during transport*.

2 Température de fonctionnement des appareils / *Operating Temperature of devices*

Les équipements fonctionnent de manière optimale dans la plage de température **– 25°C à + 45°C** (classe T3 de la norme NF EN 50125-1). / *Equipments are operating in full satisfactory way in the temperature range from **- 25°C to + 45°C** (class T3 of the EN 50125-1 standard.*

3 CARACTÉRISTIQUES PRINCIPALES / *MAIN CHARACTERISTICS*

Pression maxi en service / *Maximum pressure* :	**10 bars**
Température de fonctionnement / *Operating temperature* :	**-25°C / +45 °C**
Indice de protection / *Degree of protection* :	**IP65**
Poids / *Mass* :	**0,178 kg**

4 DESCRIPTION GENERALE / *GENERAL DESCRIPTION*

4.1 Objet / *Object*

Ce document a pour but de décrire les opérations d'entretien, de méthode, de contrôle et de dépose/pose à respecter sur la prise test de simulation, lorsque celle-ci est montée sur le véhicule dans le but d'assurer la fonctionnalité et la sécurité du système.

This document have for purpose to describe the servicing and exchange operation to respect on the test point of simulation, when this one is mounted on vehicle in order to insure the functionality and the safety of the system.

Les conflits et les contradictions avec les exigences du client doivent être communiqués par écrit à **Faiveley transport**. / *Conflicts and contradictions with customers requirement must be delivered by email to Faiveley transport*.

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4.2 Liste des équipements / *Equipment list*

La prise test de simulation / *The test point of simulation* **FT0013186-000**.

4.3 Description de l'équipement / *Description of equipment*

La prise test de simulation permet lorsqu'elle est munie d'une prise test mobile d'effectuer une simulation du système de suspension ou des mesures de pression. / *The test point of simulation allows, while it's furnished with a mobile test point, to carry out an operating test simulation of the suspension system or of the pressure measures.*

La prise test de simulation est flasquable sur un panneau du type collé, et sa fixation sur goujons est réalisée par l'intermédiaire de deux trous ∅ **6,5**. / *The test point of simulation is flange-mounted on a bonded type panel, and secured with studs by means of two holes of ∅**6,5**.*

Trois positions d'utilisation de la prise test de simulation sont possibles: / *Three service positions are possible:*

Position A: Position passante (avec son bouchon de protection ou la prise test mobile), / *Open position (with protection plug or the mobile test point),*

Position B: Position test (avec la prise test mobile), / *Testing position (with the mobile test point)*,

Position C: Position contrôle (avec la prise test mobile). / *Checking position (with the mobile test point)*,

Position D: Position inutilisée. / *Not use position.*

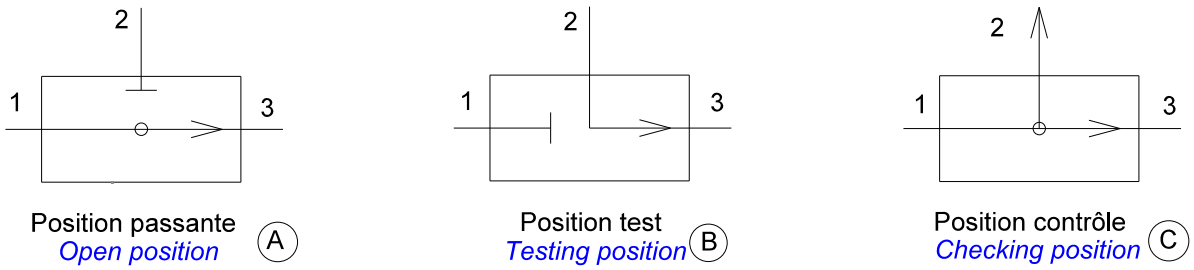

Figure 1: Schéma de principe / *Block diagram*

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4.3.1 Description fonctionnelle / *Functional description*

Lorsque la prise test de simulation est munie de la prise test mobile, trois types d'utilisation différents sont possibles: / *When the test point of simulation is fitted with the mobile test point, three different types of use are possible:*

☞ **POSITION A:**

La prise test de simulation est protégée par son bouchon **(B)**. / *The test point of simulation is protected by its plug **(B)**.*

La **position A** représente la position «passante». / *The **position A** represents the "open" position.*

Dans ce cas, le piston est en position haute, ce qui autorise le passage de la pression de la conduite d'alimentation directement vers la conduite d'utilisation. / *In this case, the piston is in high position, enabling the passing of the pressure of the supply pipe directly toward the output pipe.*

Les circuits d'alimentation et d'utilisation sont en communication. / *The supply and output circuits communicate together.*

☞ **POSITION B:**

La prise test de simulation est munie soit d'un about standard ou d'un about spécifique dans la position **B**. / *The test point of simulation has equipped either a standard profile or specific profile in the position **B**.*

La **position B** est une position «test », lorsqu'elle est dans cette position, elle permet à partir d'une alimentation extérieure d'effectuer divers essais, ainsi que des simulations de fonctionnement du système de suspension. / *The **position B** is a « testing» position, when this position, it allows starting from the outer supply to carry out tests or operating simulations on the suspension system.*

Dans ce cas, le piston est en position moyenne, c'est-à-dire que le piston empêche le passage de l'air entre le circuit d'alimentation du système, dans lequel l'appareil est intégré, et le circuit d'utilisation. / *In this case, the piston is in medium position, it means the piston stops the air passing between the supply circuit, in which the device is incorporated, and the output circuit.*

La pression extérieure alimente la prise test mobile et passe, par les orifices du piston, vers le circuit d'utilisation. / *The external supply pressure supplies the mobile test point and passes, by the chokes of the piston, toward the output circuit*.

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☞ **POSITION C:**

La prise test de simulation est munie d'un about spécifique dans la position **C**. / *The test point of simulation has equipped of specific profile in the position **C**.*

La **position C** est une position «contrôle», lorsqu'elle est dans cette position, elle permet des mesures de pression lorsque le système de suspension est en état de marche (alimenté en air). / *The **position C** is a "checking" position, when this position, it allows pressure measures when the suspension system is in operation (supplied in air).*

Dans ce cas, le piston est en position basse, ce qui autorise le passage de la pression d'alimentation directement vers la conduite d'utilisation, et permet ainsi au travers de l'orifice de la prise test mobile, de contrôler la pression du circuit. / *In this case, the piston is in low position, which allows the passage of the supply pressure directly toward the output pipe, and permits also to control the circuit pressure via the hole of the mobile test point.*

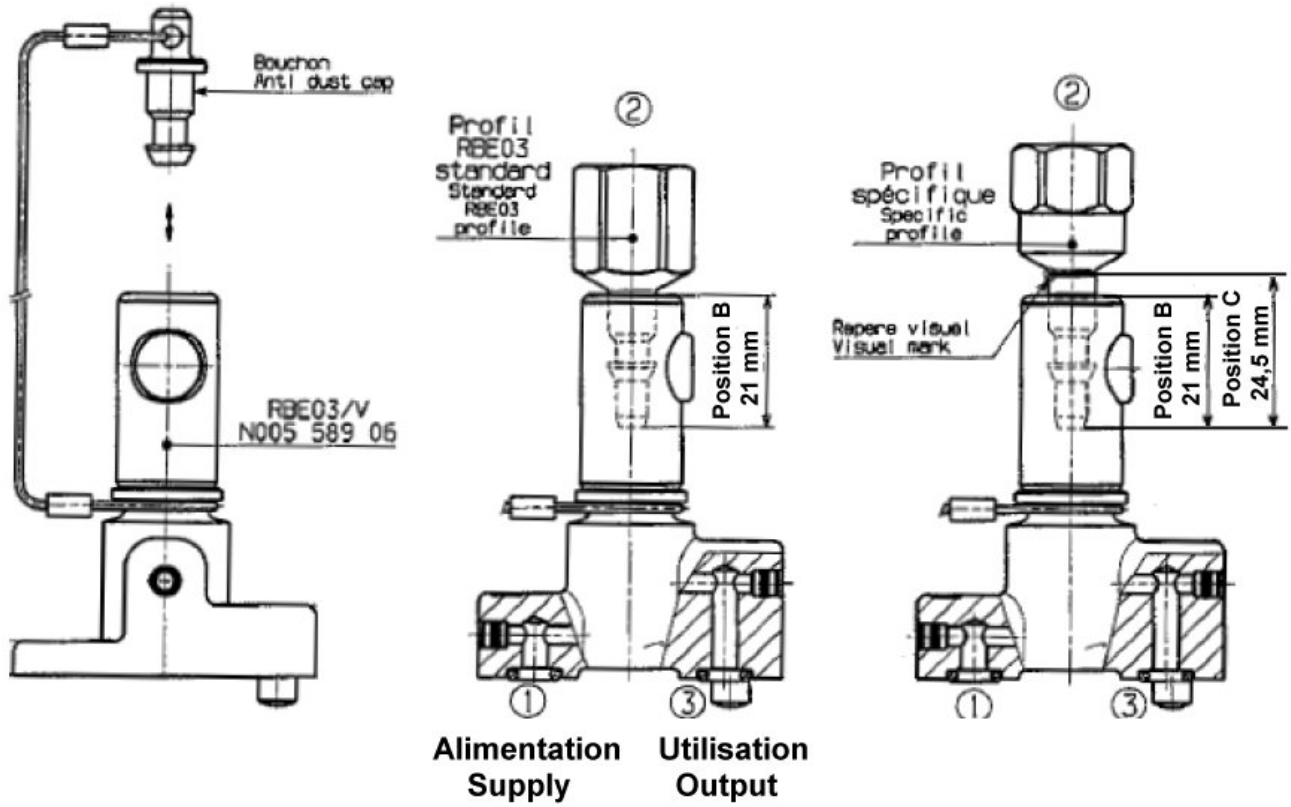

Figure 2: Schéma fonctionnel / *Functional diagram*

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5 ENTRETIEN / *MAINTENANCE*

Faire un contrôle fonctionnel et une révision générale comme prévu dans le plan de maintenance du projet. Si il n'y a pas de plan de maintenance pour le projet, respecter les périodicités ci-dessous.

Make a functional check and a general overhaul *as scheduled in the project maintenance plan. If there is no maintenance plan for the project, respect the periodicity below.*

5.1 Premier, deuxième et troisième niveau de maintenance (contrôle fonctionnel) / *First, second and third level maintenance (functional control)*

Pour réaliser les contrôles ci-dessous, il n'est pas nécessaire de démonter les équipements du véhicule. / *For the controls below, it is not necessary to remove the equipment from the vehicle.*

Respecter les intervalles d'entretien suivants: / Pay attention to the following maintenance intervals:

Maintenance (M1) tous les **160 000 km ou tous les ans, au premier des deux termes échu,**

Maintenance (M1) *every **160 000 km or every years**, **at the first of the two terms expired**,*

5.2 Quatrième niveau de maintenance (Révision générale) / *Fourth level maintenance (General overhaul)*

Réparation en atelier: / *Component Workshop*:

Pas nécessaire. / *Not required*.

5.3 Tableau des travaux planifiés à réaliser / *Table of scheduled work to be performed*

Niveau de maintenance *Maintenance Level*	Travaux planifiés / *Scheduled work*	Paragraphe *Section*	M1	*R1*
3	Test d'étanchéité / *Leakage test*	**§ 6.1**	●	
4	Entretien correctif / *Corrective maintenance*	**§ 6.2**		

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6 CONTROLE FONCTIONNEL / *FUNCTIONAL CONTROL*

6.1 Test d'étanchéité / *Leakage test*

Les essais d'étanchéités doivent être conformes aux essais réalisés sur le véhicule à l'aide du document constructeur. / *The leakage tests must be consistent with tests performed on the vehicle using the manufacturer document*.

6.2 Maintenance corrective / *Corrective maintenance*

Connecter le circuit d'alimentation **(1)** à une source d'air comprimé*. / Connect the supply circuit **(1)** to a source of compressed air.*

Mettre la prise test de simulation dans la position **(A)** et vérifier que le circuit d'alimentation **(1)** est en communication avec le circuit d'utilisation **(3)***. / Put the test point of simulation in the position **(A)** and check that the supply circuit **(1)** is in communication with the output circuit (**3**).*

Mettre la prise test de simulation dans la position **(B)**, alimenter le circuit **(2)** et vérifier que: */ Put the test point of simulation in the position **(B)**, supply the circuit **(2)**, and check that:*

le circuit d'alimentation **(1)** est isolé, / *the supply circuit **(1)** is isolated,*

le circuit **(2)** est en communication avec le circuit d'utilisation **(3)***. / the circuit **(2)** is in communication with the output circuit **(3).***

Mettre la prise test de simulation dans la position **(C)** et vérifier que les trois circuits **(1), (2)** et **(3)** sont en communication. / *Put the test point of simulation in the position **(C)** and check that the three circuits **(1), (2)** and **(3)** are in communication.*

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7 PROCEDURE DE DEPOSE ET D'INSTALLATION / *REMOVAL AND INSTALLATION PROCEDURES*

Vidanger les circuits pneumatiques et assurez-vous que la pression est mise à l'air libre. Lors du démontage des éléments, faite attention aux possibles pressions résiduelles. / *Drain the pneumatic circuits and make sure that the pressure is set to free air. When the elements are removed, pay attention to any potential residual pressure.*

Utiliser les protections réglementaires aux normes en vigueur pour les produits dangereux.

When using dangerous products, observe the local workshop regulation in force.

FAIVELEY TRANSPORT AMIENS préconise l'utilisation d'un pulvérisateur manuel pour le nettoyage de ses produits avant de réaliser leurs déposes, ceci afin d'éviter que des impuretés rentrent dans les canalisations. Tout autre système de nettoyage est sous la responsabilité de l'agent de maintenance.

FAIVELEY TRANSPORT AMIENS recommends the use of a manual sprayer for cleaning products before performing their removals, in order to prevent impurities from returning into pipes. Any other cleaning system is the under responsibility of the maintenance worker.

FAIVELEY TRANSPORT AMIENS n'interdit pas le nettoyage de la caisse avec un nettoyeur haute pression ou au rouleau, mais déconseille une application directe sur ses produits.

FAIVELEY TRANSPORT AMIENS does not prohibit the car body cleaning with a high pressure cleaner or a roller but does not recommend a direct application its products.

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7.1 Remplacement de la prise test de simulation / *Replacement of the test point of simulation*

Desserrer et enlever les éléments de fixation **(F)** puis déposer la prise test de simulation **(P)** du support **(S)** puis enlever et rebuter les deux joints toriques **(J)** d'interface **(réf :704 804 04 08)**. / *Loosen and remove the fastening elements **(F)** then remove the test point of simulation **(P)** from the bracket **(S)** then remove and to scrap the two O-rings **(J)** of interface **(réf :704 804 04 08)**.*

Prendre la précaution d'obturer les orifices du support **(S)** afin d'éviter sa pollution interne. / *Take the precaution to seal the bracket **(S)** apertures in order to avoid its internal pollution.*

Graisser les deux joints toriques **(J)** d'interface avec de la MOLYKOTE 55 O-ring. / *Lubricated the two interface O-rings **(J)** with MOLYKOTE 55 O-ring.*

Positionner sur le support **(S)**, la nouvelle prise test de simulation **(P)**, équipée de deux joints toriques **(J)** neuves, les éléments de fixation **(F)** et les serrer au couple, / *Position on the bracket **(S)**, a new test point of simulation **(P)** equipped with two new O-rings **(J)**, the fastening elements **(F)** and tighten them at torque.*

Après la repose de la prise test de simulation **(P)** faire un essai fonctionnel des fonctions (voir le paragraphe 6). / *After installing the test point of simulation **(P)** Make a functional test of functions (see paragraph 6).*

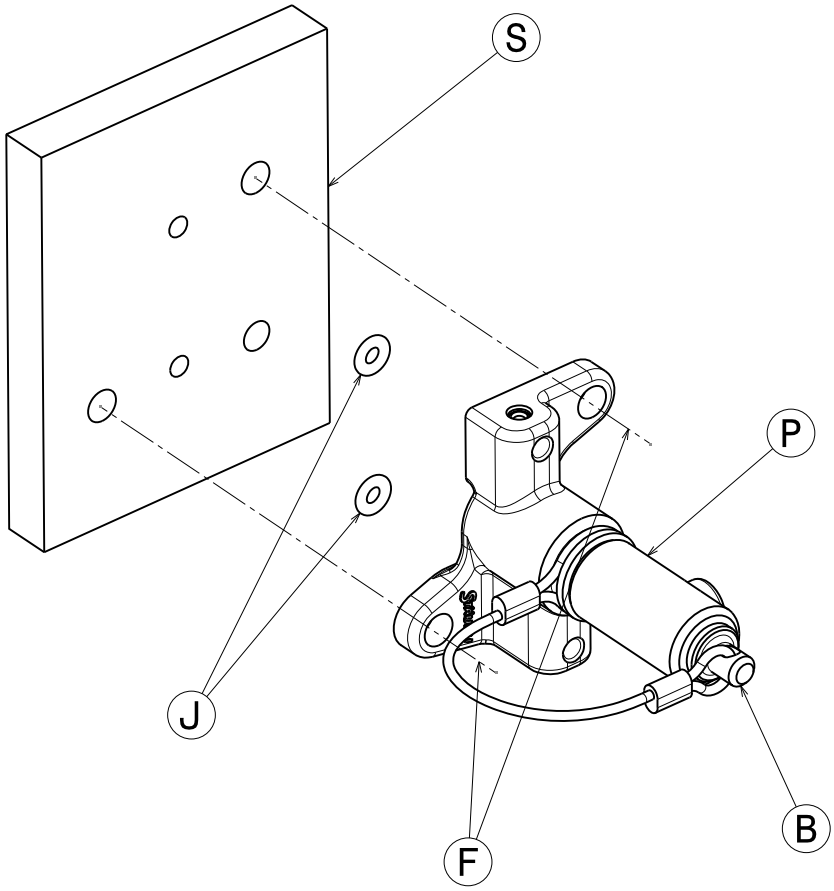

Figure 3: Dépose de la prise test de simulation / *Removal of test point of simulation*

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8 REVISION GENERALE / *GENERAL OVERHAUL*

Pas nécessaire. / *Not required*.

9 PIECES DE RECHANGES / *SPARE PARTS*

Aucune pièce de rechange n'est nécessaire pour la révision générale et l'installation. / *No spare part required for overhaul and installation*.

10 OUTILLAGES SPECIAUX / *SPECIAL TOOLS*

Aucun outil spécial n'est nécessaire pour l'entretien et l'installation. / *No special tools required for servicing and installation*.

11 DEMANTELEMENT / *DISPOSAL*

L'appareil est principalement composé par les matériaux suivants: fonte, laiton, acier inoxydable, caoutchouc, cuivre et aluminium. / *The device is mainly composed by the following materials: cast iron, brass, stainless steel, rubber, copper and aluminum*.

Le démantèlement doit se faire conformément aux règles en vigueur dans les locaux de l'utilisateur final et en respectant la loi en vigueur dans le pays où le composant est utilisé. / *The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used*.

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07.10_DUMP VALVE TYPE DV12 DC

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/// FT0126060-100-E00MUM

Dump Valve DV-12 DC & SC

DV-12DC FT0126060-100..107 (With Bracket)
DV-12DC FT0126050-100..107 (Without Bracket)
DV-12SC FT0126510-100..107 (With Bracket)
DV-12SC FT0126500-100..107 (Without Bracket)

Maintenance/Use manual

ECO/**ECO**: **.**
Compiled: **WITEC**
Checked: **alessandro.capezzera**
Approved: **francesco.grilli**

Date: 31-05-2021 - Revision: A00
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	31-05-2021	First Issue	.	WITEC	alessandro.capecchi	francesco.grilli
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/// 1. Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools.
- Place the Warning Cartel "Maintenance on going" during the maintenance activities.
- The device must be maintained when and as prescribed. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorised personnel must carry out installation and maintenance.
- Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Before accessing to electric parts, make sure the power is duly switched off.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

IMPORTANT! For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

IMPORTANT! Faiveley Transport reserves the right to modify its equipment or the content of this manual at any time without giving any communication.

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1.1 Storage conditions

- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust, temperature shocks and direct source of heat such as boilers, radiators and direct sunlight. The ambient temperature and humidity values must be the ones reported in the brake system maintenance manual. If the brake system maintenance manual is not foreseen, the ambient temperature must be within - 25°C and +25°C and the relative humidity must be within 10% and 65%.
- If the storage is below 15°C care should be exercised during the handling of stored products as they may have stiffened and become susceptible to distortion if not handled carefully. The temperature of product taken from such low-temperature storage should be raised to approximately 30°C throughout their mass, before the products are put into service.
- Rubber parts, if out of their original packaging, must be kept in black bags, to avoid ingress of light. If out of their original packaging, equipment must be protected against bad weather and light (UV).
- Rubber parts should be protected from light sources, in particular direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury lamps or high-voltage electrical equipment giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap.
- Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.
- Take care that the packaging are protected from rodents.
- Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:
    - pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
    - prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than:
        - **6 months:** safety valves;
        - **18 months:** brake manipulator, distributor, emergency valves, magnet valves for brake control, emergency push-button valve;
        - **36 months:** all other equipment.

- No component can be used after the date of expiration. It must be disposed of according to the applicable regulations.
- All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.
- All the protective plugs must be removed only at the time of installation.
- Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.

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- Parts must be picked off the shelf in order of time of manufacture.

1.2 Warning messages

Messages and warning symbols in this document are as follows:

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and/or and/or to damage to the unit or the environment.

NOTE: Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.

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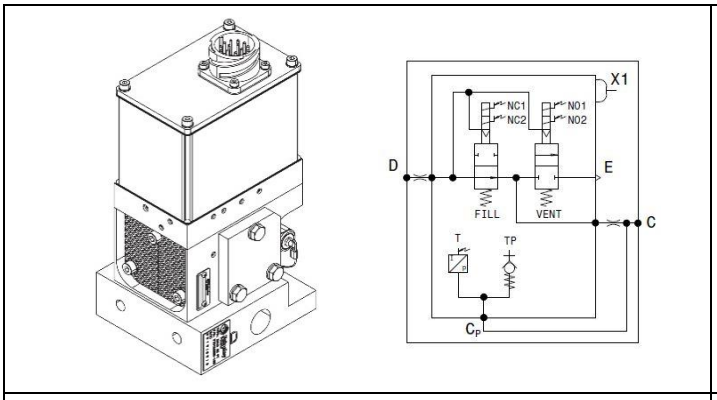
/// 2. Description of equipment

The dump valve is used to prevent the wheel blocking in situations of low adhesion between wheel and rail. It is used to regulate the pressure in the brake cylinders in order to maximize the braking effort for any given wheel/rail interface coefficient of friction, thus achieving the shortest stopping distance and preventing wheel flats. According to P/N it can be fitted with bracket, transducer, test point.



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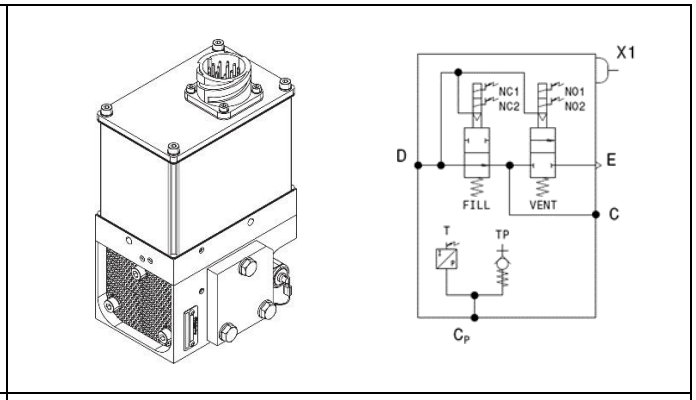

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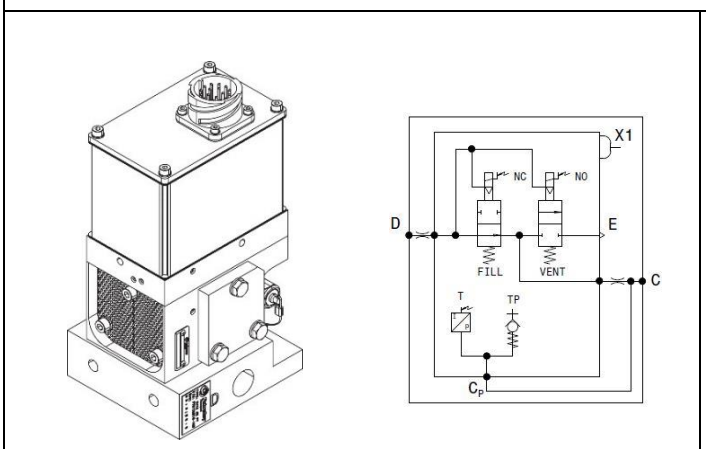

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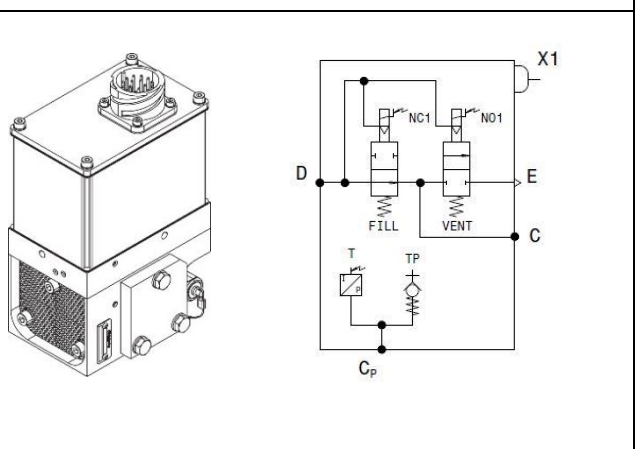

FT0126500-100

Pipes	
Feed	D
Delivery	C
Exhaust	E
Pressure Signal	C_P

Figure 1: External view and ISO symbol

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/// 3. Main features and data

This device is available with many characteristics. The following table lists all the part numbers to which this document applies and their relative characteristics.

P/N DV12 WITH BRACKET	TYPE	P/N DV12 WITHOUT BRACKET	PRESSURE TRANSDUCER P/N	TEST POINT P/N	TEST POINT TYPE	FEED CHOKE	DELIVERY CHOKE	MASS WITH BRACKET	MASS WITHOUT BRACKET
FT0126060-100	DV12 DC PT	FT0126050-100	FT0126082-101	FT0027358-000	INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126060-101	DV12 DC PT	FT0126050-101	FT0126082-101	700 008 2508	STANDARD	Ø6	Ø9	2.95 kg	2 kg
FT0126060-102	DV12 DC PT	FT0126050-102	FT0126082-101	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.95 kg	2 kg
FT0126060-103	DV12 DC PT	FT0126050-103	FT0126082-101	FT0026571-000	PLUG INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126060-104	DV12 DC	FT0126050-104	FT0026571-000 (PLUG)	FT0027358-000	INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126060-105	DV12 DC	FT0126050-105	FT0026571-000 (PLUG)	700 008 2508	STANDARD	Ø6	Ø9	2.95 kg	2 kg
FT0126060-106	DV12 DC	FT0126050-106	FT0026571-000 (PLUG)	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.95 kg	2 kg
FT0126060-107	DV12 DC	FT0126050-107	FT0026571-000 (PLUG)	FT0026571-000	PLUG INOX	Ø6	Ø9	2.95 kg	2 kg
FT0126510-100	DV12 SC PT	FT0126500-100	FT0126082-101	FT0027358-000	INOX	Ø6	Ø9	2.9 kg	2 kg
FT0126510-101	DV12 SC PT	FT0126500-101	FT0126082-101	700 008 2508	STANDARD	Ø6	Ø9	2.9 kg	2 kg
FT0126510-102	DV12 SC PT	FT0126500-102	FT0126082-101	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.9 kg	2 kg
FT0126510-103	DV12 SC PT	FT0126500-103	FT0126082-101	FT0026571-000	PLUG INOX	Ø6	Ø9	2.9 kg	2 kg
FT0126510-104	DV12 SC	FT0126500-104	FT0026571-000 (PLUG)	FT0027358-000	INOX	Ø6	Ø9	2.9 kg	2 kg
FT0126510-105	DV12 SC	FT0126500-105	FT0026571-000 (PLUG)	700 008 2508	STANDARD	Ø6	Ø9	2.9 kg	2 kg
FT0126510-106	DV12 SC	FT0126500-106	FT0026571-000 (PLUG)	700 008 3008	DUST PROTECTION	Ø6	Ø9	2.9 kg	2 kg
FT0126510-107	DV12 SC	FT0126500-107	FT0026571-000 (PLUG)	FT0026571-000	PLUG INOX	Ø6	Ø9	2.9 kg	2 kg

Table 1: Different setting of the P/Ns

- Exhaust section .....Ø 12 mm
- Connections pipe.....G ½”
- Working temperature:.....-40°C / +60°C

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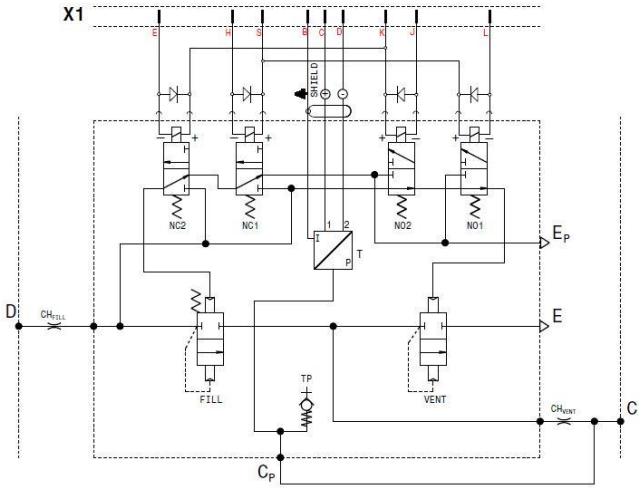
- Supply voltage.....24 V_{DC} (+25% / -30%)
- Power consumption.....5 W for each control channel
- Working pressure .....0.2 ÷ 6 bar
- Duty cycle (t_{ON}).....100%
- Electric-pneumatic scheme



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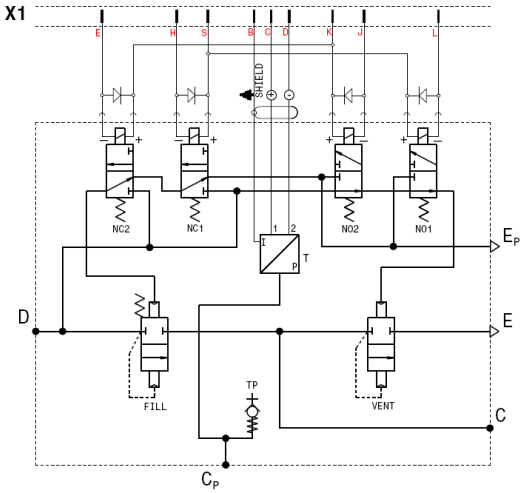

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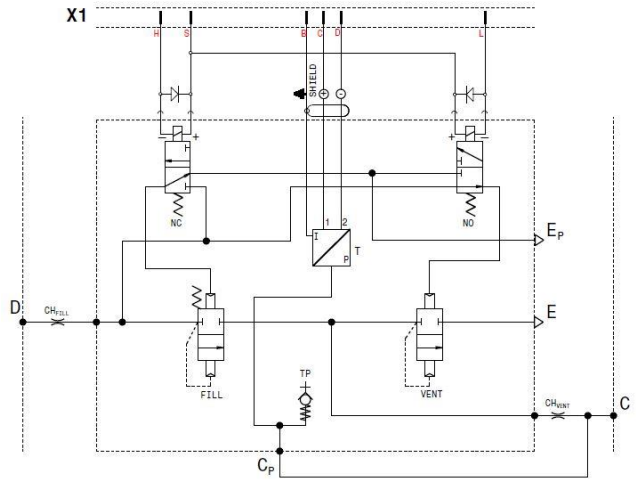

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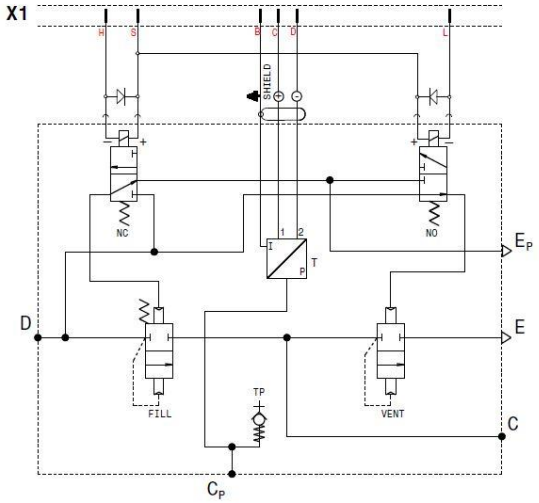
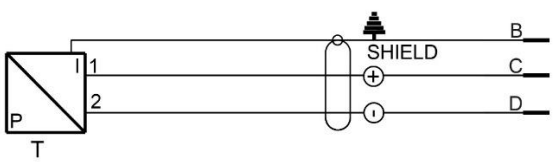


FT0126500-100

- Pressure transducer electric scheme:



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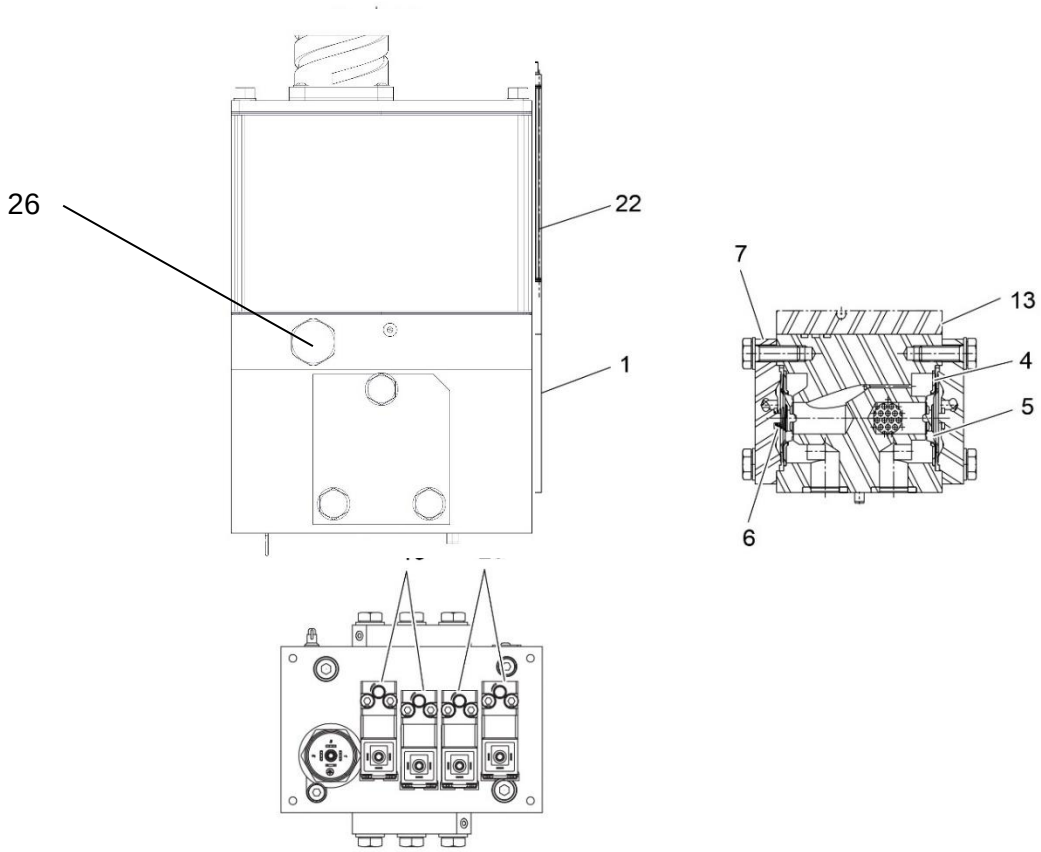
/// 4. Description of the Function/Operation

Refer to 26 Osmotic plug

Figure 2.

NOTE. The following picture has been used for illustrative purposes only. It can be different according to P/Ns listed in paragraph /// 3.



1	Complete body
4	Plate
5	Membrane
6	Spring
7	Complete cover
13	Complete plate
19	Magnet valves NC
20	Magnet valves NO
22	Liner cover
26	Osmotic plug

Figure 2: Functional scheme

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NOTE.

- Dump valve DV12 DC type with bracket (FT0126060-100) and without bracket (FT0126050-100) have double coil and 4 magnet valves inside.
- Dump valve DV12 SC type with bracket (FT0126510-100) and without bracket (FT0126500-100) have single coil and 2 magnet valves inside.

The valve consists of a body (1) with two complete covers (7) housing, one membrane (5) with plate (4) for side and a spring (6) and located on feel side of valve.The control of the valve is done by valves (19) and (20) mounted on the valve's plate (13). This allows three-point regulation of the brake cylinder pressure.

An osmotic plug (26) if fitted to discharge the overpressure inside to the liner cover.

The valve is equipped with two couples of magnet-valves (19) and (20) housed into the liner cover (22). One couple for safety and availability reasons (in case of fail of one magnet-valve there is a back-up one). Each of them is made of one normally open magnet-valve and one normally closed one.

If none of the valve coils are powered the braking cylinder is pressurized regularly. If the inlet valve coil is powered, the pressure in the braking cylinder is held to the existing value. Only if, both coils are powered, the brake cylinder is vented (exhaust position) and the brake cylinder pressure decreases.

Where fitter the in-built test point enables the diagnostics and maintenance activities and the transducer acts as the interface between the dump valve and the brake cylinder control devices.

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/// 5. Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance)**: osmotic plug visual check as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 1 year.
2. **Second Level Maintenance** : Overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhaul regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 6 years.

NOTE. Repair and overhaul must be carried out by qualified personnel in authorised workshops.

NOTE. FTI provides an overhauling service for its own units. FTI performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.

The FTI Service Centers have the experience and technical equipment needed for performing professional overhauls.

CAUTION! Equipment either stored on-the-shelf or mounted on inoperative vehicles must be overhauled or replaced after 5 years from the date of manufacture or of last overhaul, since rubber parts age out even in optimum storage conditions.

Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than (indicate only the applicable periodicity) 18 months (brake manipulator, distributor, emergency valves, magnet valves for brake control, emergency push-button valve, safety valve) OR 36 months (all other equipment).

CAUTION! Overhaul or replacement periodicity must include both the years of functioning and the years of storage on-the-shelf or mounting on inoperative vehicles.

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/// 6. Routine maintenance

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 3.

1. Check carefully that the osmotic plug (1) is clean and free from damage.
2. **DO NOT clean the osmotic plug**, if necessary, replace it as described hereafter:
   a) Unscrew the osmotic plug (1) using a 19mm spanner and discard it.
   b) Screw a new osmotic plug (1) P/N FT0126921-000 using a dynamometric key with 19mm open end. Tightening torque 0.7±0.1 Nm.

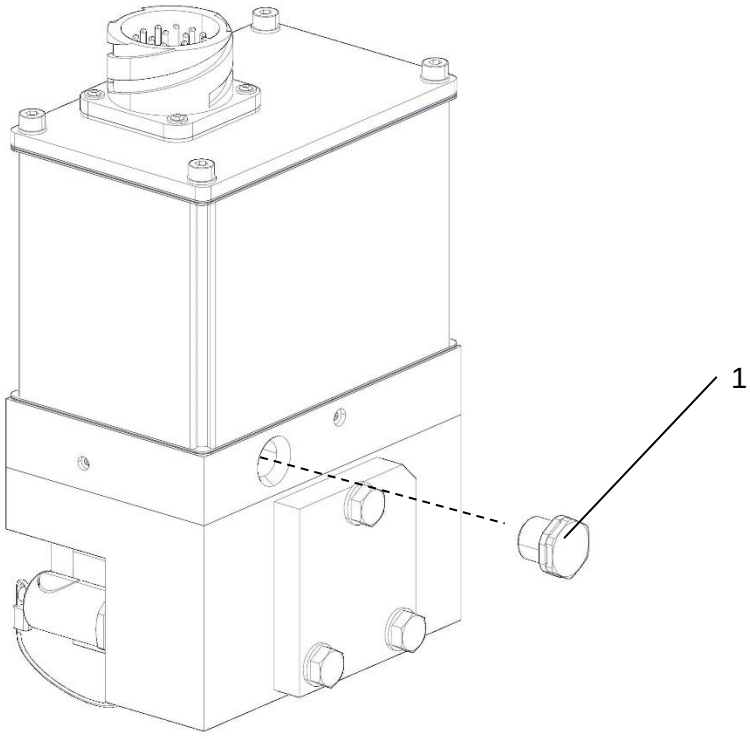

Figure 3: osmotic plug

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/// 7. Removal procedure

7.1 Removal procedure for valve with bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. The following picture has been used for illustrative purposes only. It can be different according to P/Ns listed in paragraph /// 3.

Refer to Figure 4.

3. Unplug the electrical connections from connector (1).
4. Release the pipes (3) and remove the device (2) with the complete support (4) from the system.

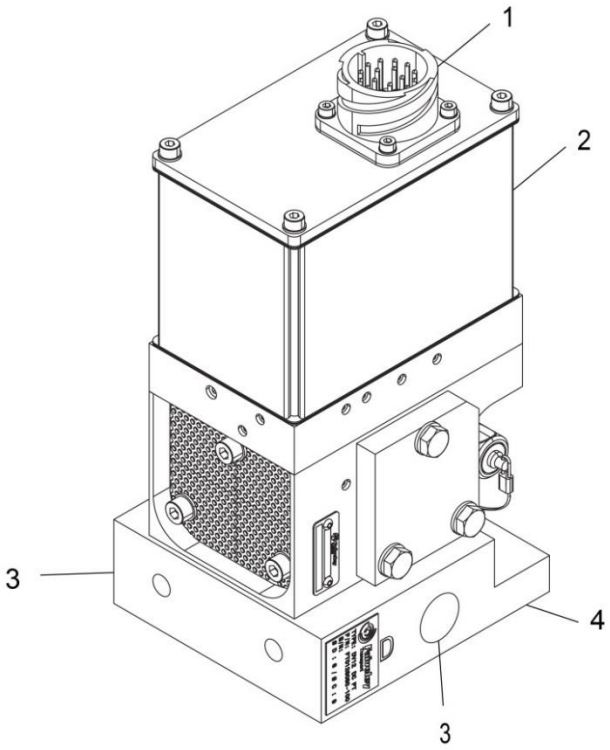

Figure 4: Installation/removal procedure for valve with bracket

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7.2 Removal procedure of valve from bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. The following procedure can be used both to remove the device from the bracket on the system and to remove the device from the bracket off train.

NOTE. The following picture has been used for illustrative purposes only. It can be different according to P/Ns listed in paragraph 3.

Refer to Figure 5.

1. Unplug the electrical connections from connector (1).
2. Unscrew the two screws M8x40 (3) with the two conic washers M8 (4) and detach the device (2) from the complete support (5).
3. Remove the fill choke (6) and vent choke (7) from the complete support (5) by using the special tool 053177.
4. Remove and discard the o-rings (8), (9), and (10).

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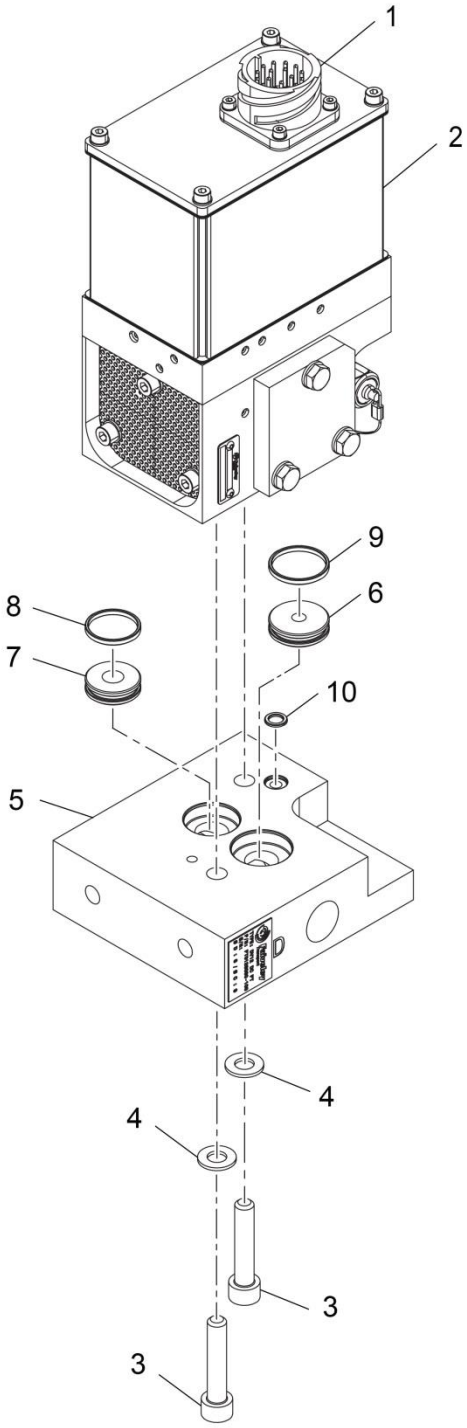

Figure 5: installation/removal procedure of valve from bracket

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/// 8. Installation Procedure

8.1 Installation procedure for valve with bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 4.

1. Re-install the device (2) with complete support (4) on system and connect the pipes (3).
2. Plug the electrical connections on connector (1).
3. Pressurise the system and check for leakages by using a water soap solution.

8.2 Installation procedure of valve on bracket

WARNING! Pressurised system! Discharge the pressure before removal.

DANGER! Electric equipment! Before accessing to electric parts, make sure the power is duly switched off.

NOTE. The following procedure can be used both to remove the device from the bracket on the system and to remove the device from the bracket off train.

Refer to Figure 5.

1. In case the component has the o-rings (8), (9), and (10) already installed in place, analyse them and:
   - if they have signs of damage or wear, replace them with new ones according to the codes reported in paragraph 9 and lubricate them with a light amount of grease type Uniflor 8512S;
   - if they are intact and in proper condition, slightly lubricate them with grease type Uniflor 8512S and proceed with point 3.
2. In case the component doesn't have the o-rings (8), (9), and (10) already installed in the place in which they are foreseen, put in place new o-rings according to P/Ns indicated in paragraph 9 and slightly lubricate them with grease type Uniflor 8512S.
3. Re-fit the fill choke (6) and vent choke (7) to the complete support (5).
4. Re-install the device (2) on complete support (5) and secure it with the two screws M8x40 (3) and the two conic washers M8 (4).
5. Tightening torque the two screws M8x40 (3) to 14 Nm.
6. Plug the electrical connections to 17 contact connector (1).
7. Pressurise the system and check for leakages by using a water soap solution.

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/// 9. Spare parts

- **Routine Maintenance** - With reference to the exploded view of Figure 3, paragraph /// 6, ONLY IF NECESSARY, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
1	Osmotic plug	FT0126921-000	1

- **Installation**
  - With reference to the exploded view of Figure 4, paragraph 7.1, no spare parts are required for installation.
  - With reference to the exploded view of Figure 5, paragraph 7.2, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
8	O-ring	2/517031	1
9	O-ring	2/517032	1
10	O-ring	2/517022	1
-	Uniflor 8512S	3000.00.550	as need

- **Screws**
  - With reference to the exploded view of Figure 4, paragraph 7.1, no screws are required for installation.
  - With reference to the exploded view of Figure 5, paragraph 7.2, the screws required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
3	Screw M8x40	FT0040158-031	2
4	Conic washer M8	FT0020338-000	2

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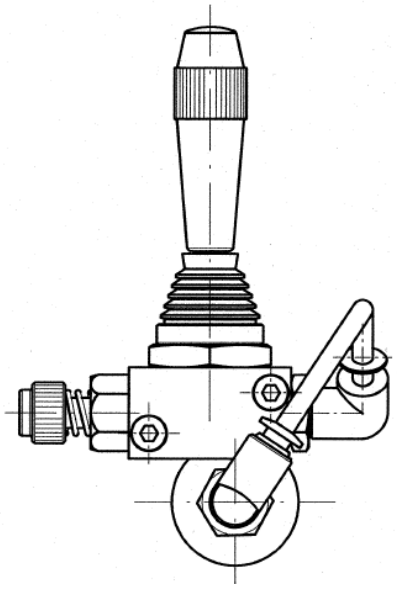
/// 10. Special Tools

To remove the chokes, use the special tool 053177.



/// 11. Disposal

The device is mainly composed by the following materials: aluminium alloy, stainless steel, rubber. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

/// 12. Data sheets and material safety data

See document 3000.00.550_All6 for the safety data sheet for the product **Uniflor 8512S**.

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01.04_01.21_01.23_05.02_CUT-OUT COCK WITH DRAIN

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/// FT0050522-102-E00MUM

ISOLATING COCK 3/4"
FT0050522-102

Maintenance/Use manual

ECO: DRC 1675
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 21/09/2021 - Revision: B00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/03/2016	NEW RELEASE	.	SRC	.MMR	.VC
B00	21/09/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1675	VP	.KMS	.BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Isolating Cock 3/4" is used to open/close a pneumatic circuit. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position. The Isolating Cock 3/4" is panel mounted type.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

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- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

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- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE “PED”)

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;

- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;

- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to +40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Isolating Cock 3/4" must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Isolating Cock 3/4" and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Isolating Cock 3/4" P/N FT0050522-102 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Full Name
HD	Head
HEX	Hexagonal
mm	millimetre
Nm	Newton meter
P/N	Part Number
QTY	Quantity
SOC	Socket

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Isolating Cock 3/4" is used to open/close a pneumatic circuit. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position. The Isolating Cock 3/4" is panel mounted type.

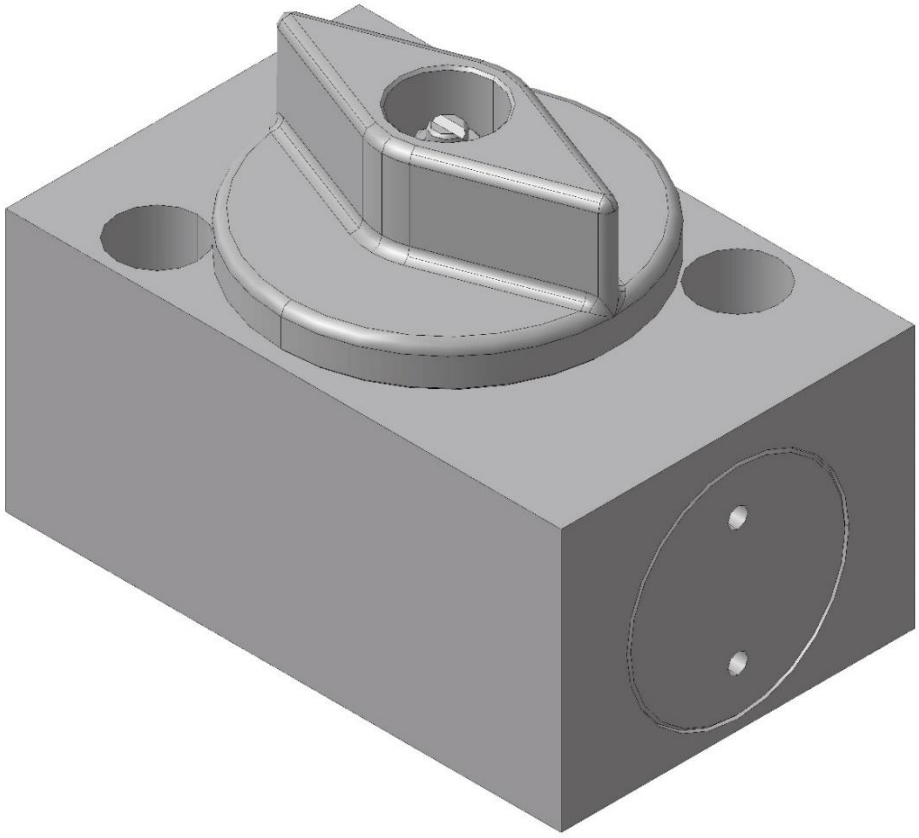

Figure 1a Isolating Cock 3/4", Isometric View

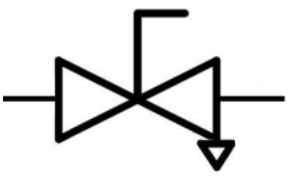

Figure 1b CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

- Port size .....19 mm
- Max operating pressure.....10 bar
- Working pressure range .....0-10 bar
- Mass.....1.4 Kg

/// 3.OPERATIONS

Refer to Figure 2a and 2b

The device consists of a cock body, which has an inlet and an outlet port. The ball plug is housed in the cock body using a ball seat. Ball seat and the ball plug are held in the assembly using the ball seat holder. Spindle along with O-ring forms the spindle assembly. The spindle assembly is secured using the stopper plug. Handle is mounted on top of the spindle assembly using washer and the nut.

3.1 OPEN CONDITION

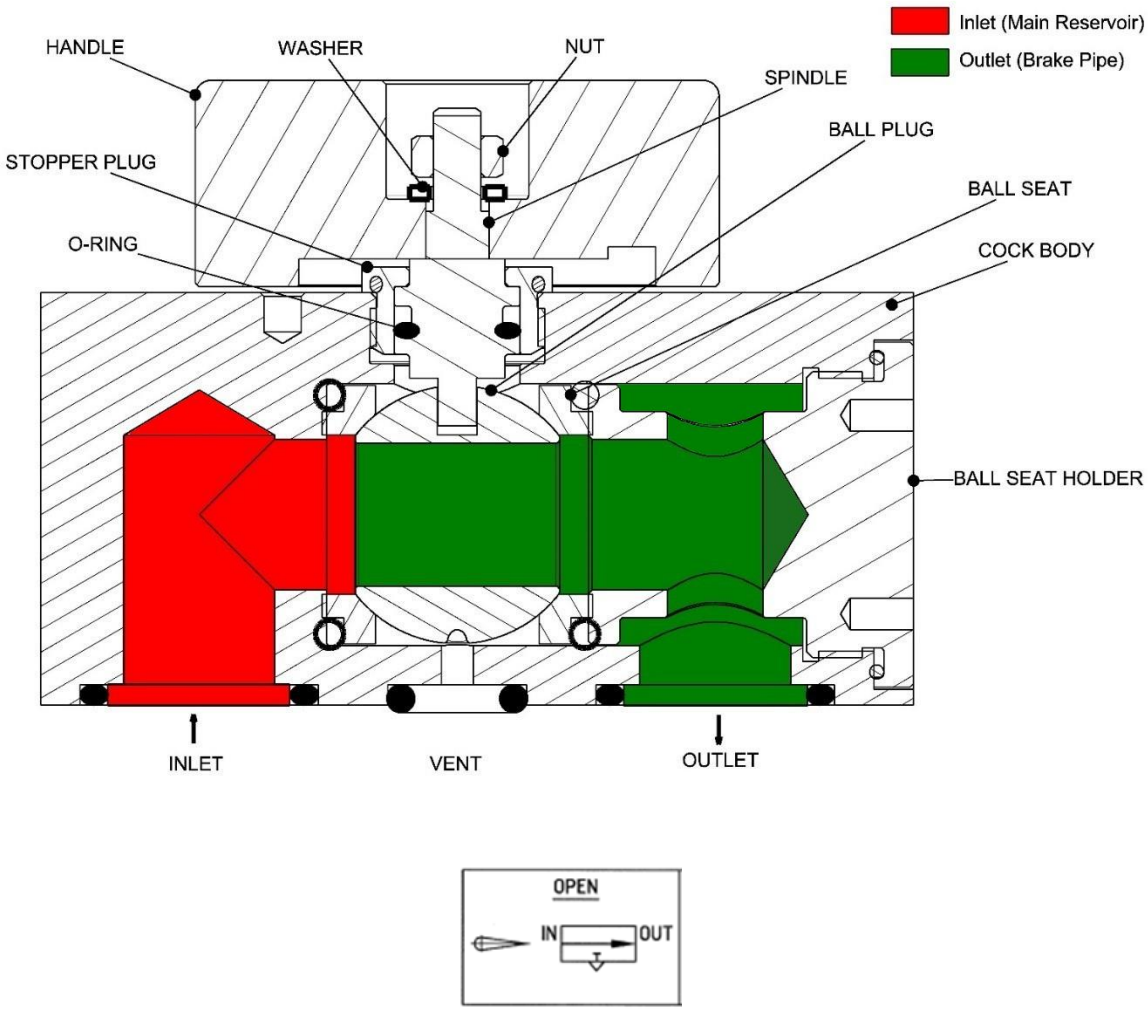

Figure 2a Isolating Cock 3/4", Open Condition

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Refer to Figure 2a

In open condition, the handle has to be rotated to open position. As the handle rotates, it inturns rotates the vented ball plug such that the inlet port is connected to the outlet port.

3.2 CLOSED CONDITION

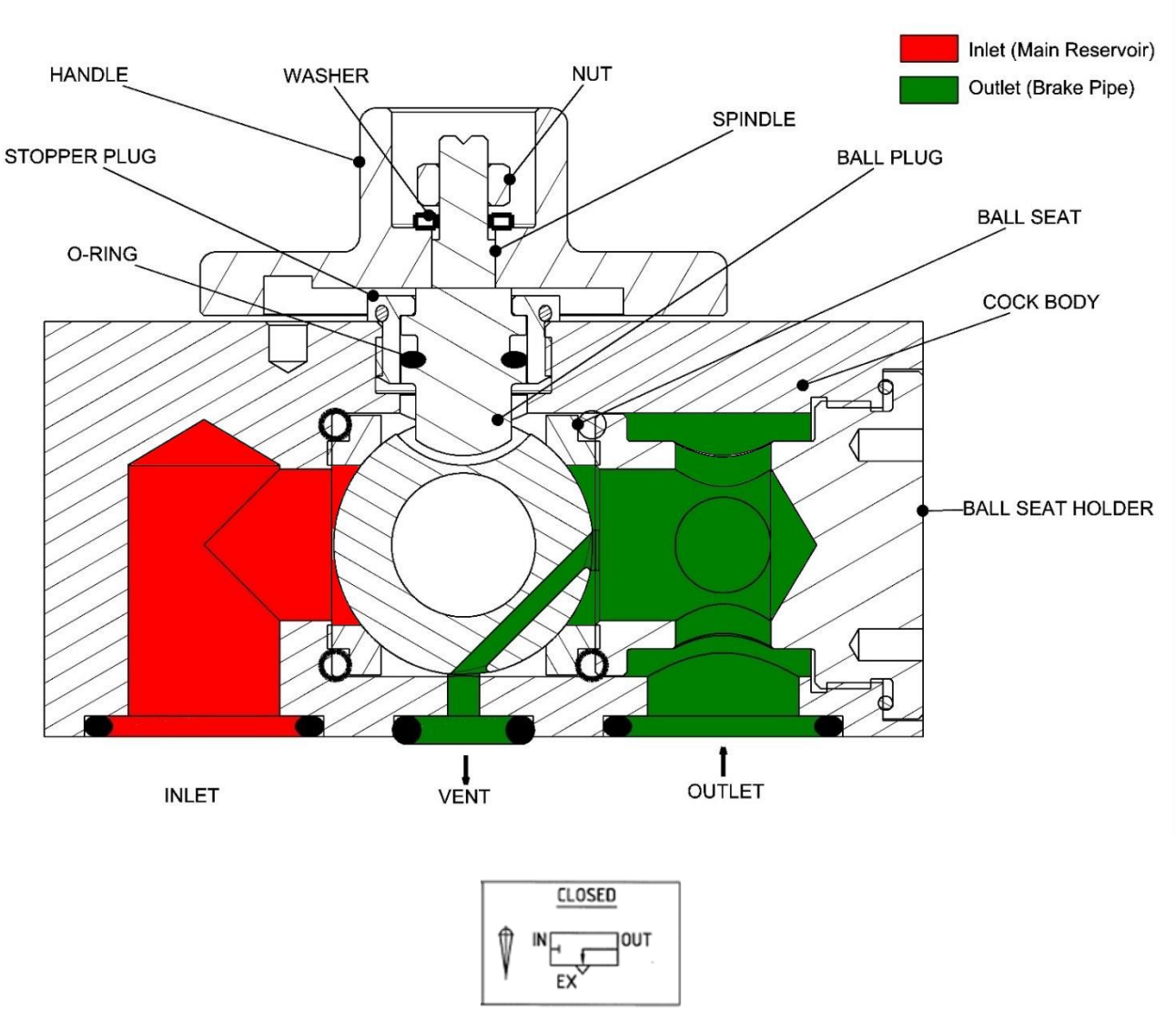

Figure 2b Isolating Cock 3/4", Closed Condition

Refer to Figure 2b

In closed condition, the handle has to be rotated to the closed position. As the handle rotates, it inturns rotates the vented ball plug such that the outlet port is connected to the vent port and also the inlet and outlet are isolated from each other. When the cock is in closed position the outlet port is connected to vent port and the air is vented to atmosphere.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
6mm allen key	Tighten/loosen the fasteners
Torque wrench 3-14 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

Name	Application
Molykote M33 or M55	Lubricant for parts
Loctite 242 or 243	Thread locking
Lint free cloth	Cleaning
Stylmark	Torque marker

/// 5.MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Functional test as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions. (Refer to section 5.2.1).
   Typical functional test periodicity: 1 year.

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the Operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/Handle turns free. The test must be done with the system pressurised.
3. At the end of the test, make sure all the initial conditions are restored.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge main pipe pressure and air suspension circuit pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 3

1. Open the brake panel front cover to access the Isolating Cock (1).
2. Remove the Isolating Cock (1) by unscrewing the two soc hd cap screws (2) along with the two washers (3) using 6mm allen key from the brake panel.
3. Remove and **DISCARD** the two O-rings (4) and the O-ring (5) from the Isolating Cock (1).

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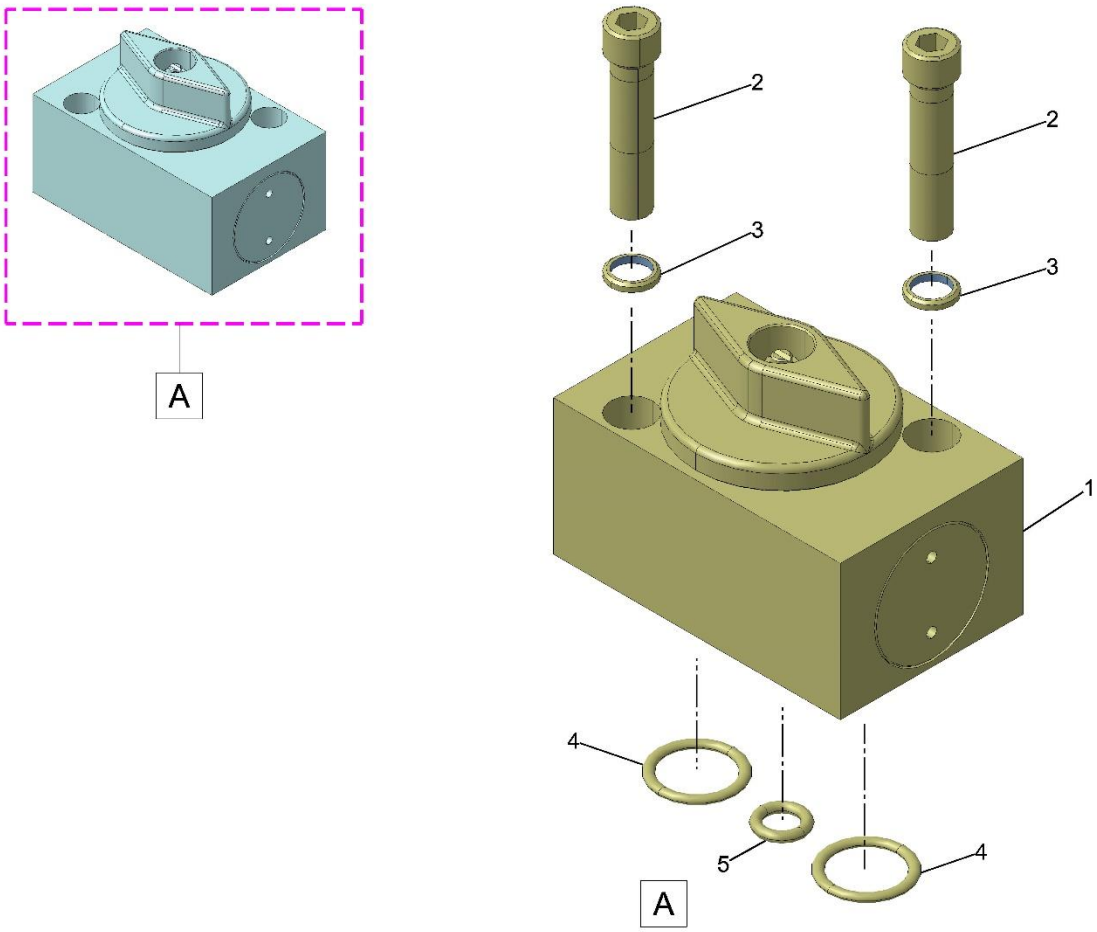

Figure 3 - Isolating Cock 3/4", Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	ISOLATING COCK	FT0050522-102	1
2	HEX SOC HD CAP SCREW M8	901039800	2
3	WASHER DIA 8	FT0020809-001	2
4	O RING	006720000A	2
5	O RING	013701000	1

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Smear Molykote M55 grease to the two **NEW** O-rings (4), **NEW** O-ring (5), and to the groove portion of the Isolating Cock (1).
2. Install the two O-rings (4) and the O-ring (5) into the groove of Isolating Cock (1).
3. Apply Loctite 242 on the threads of the two soc hd cap screws (2).
4. Mount the Isolating Cock (1) on to the brake panel using the two soc hd cap screws (2) along with the two washers (3) using 6mm allen key.
5. Torque tighten the two soc hd cap screws (2) to 14 Nm. Apply torque mark using Stylmark on it.

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NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

6. Pressurise the system and perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder's general system check.
7. Close and secure the brake panel front cover.

/// 6.SPARE PART LIST

- Routine Maintenance - Not applicable.
- Installation - the spare parts required for installation are listed in the below table:

Refer to Figure 3

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
4	O RING	006720000A	2
5	O RING	013701000	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the law in force in the Country where the component is used.

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01.08_04.08_CHECK VALVE

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/// FT0051874-100-E00MUM

3/4" CHECK VALVE
FT0051874-100

Maintenance/Use manual

ECO: DRC 1659
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 10/08/2021 - Revision: B00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	12/09/2016	NEW RELEASE	.	SRC	.MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The 3/4” Check Valve allows the airflow in single direction, preventing the backflow. It is a panel mounted valve mounted directly on panel.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

- The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer’s prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE “PED”

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to +40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

3/4” Check Valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on 3/4” Check Valve and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the 3/4” Check Valve P/N FT0051874-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
HD	Head
mm	Millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The 3/4” Check Valve allows the airflow in single direction, preventing the backflow. It is a panel mounted valve mounted directly on panel. The Check Valve is placed in the main pipe feeding into the brake panel.

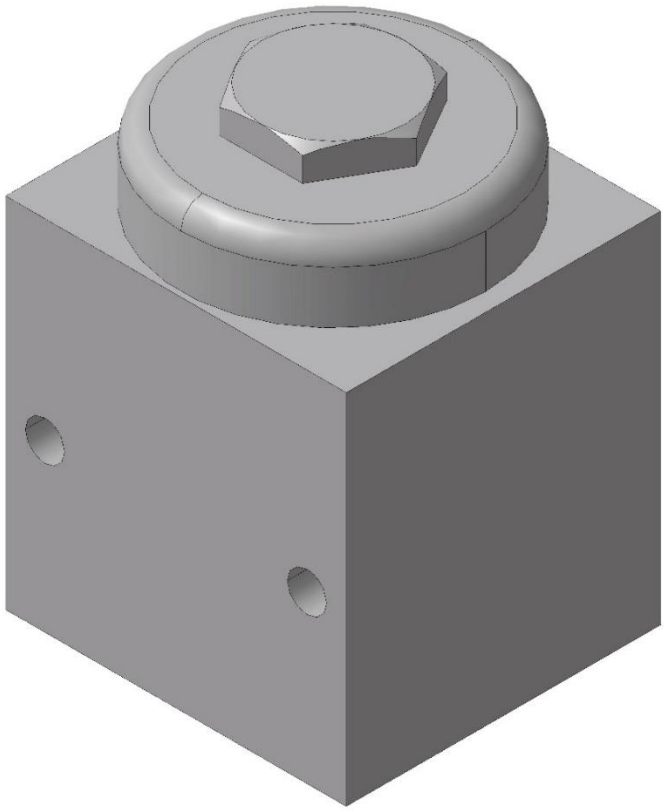

Figure 1a - 3/4” Check Valve, Isometric View

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Nominal diameter..... 19mm
Max operating pressure ... 10 bar
Working pressure range... 0-10 bar

/// 3.OPERATIONS

3.1 OPEN CONDITION

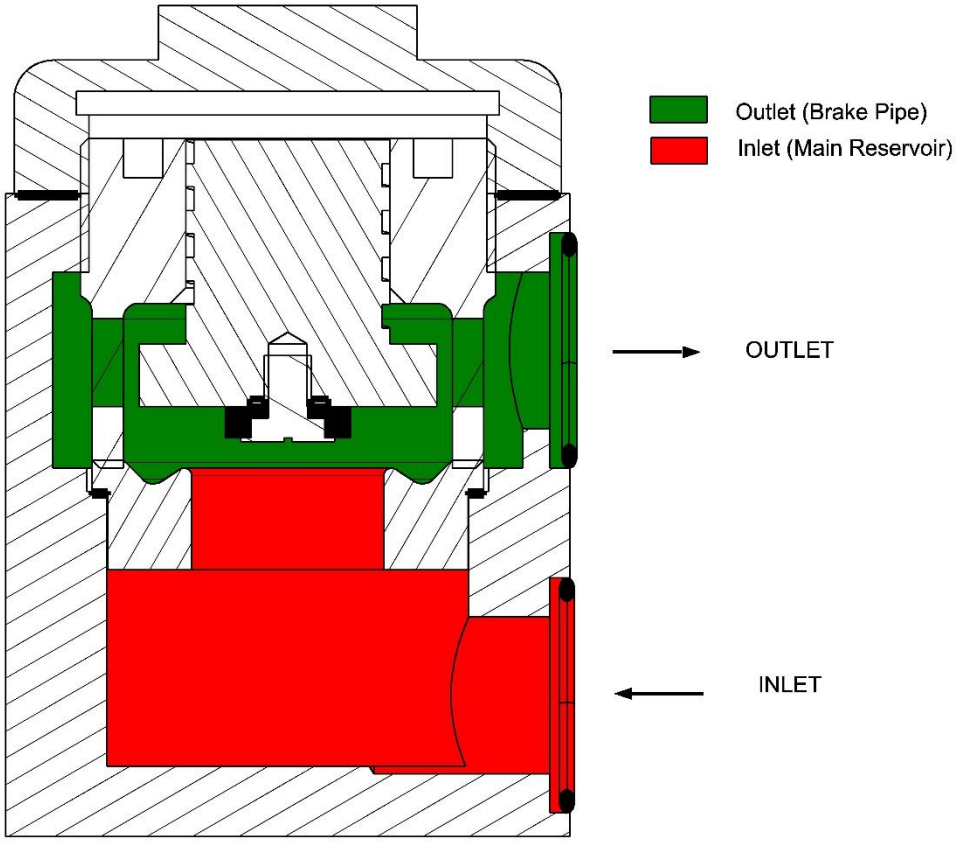

Figure 2a - 3/4” Check Valve, Open Condition

Refer to Figure 2a

Device that allows the air flow in one direction (from inlet to delivery) preventing the backflow.

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3.2 CLOSED CONDITION

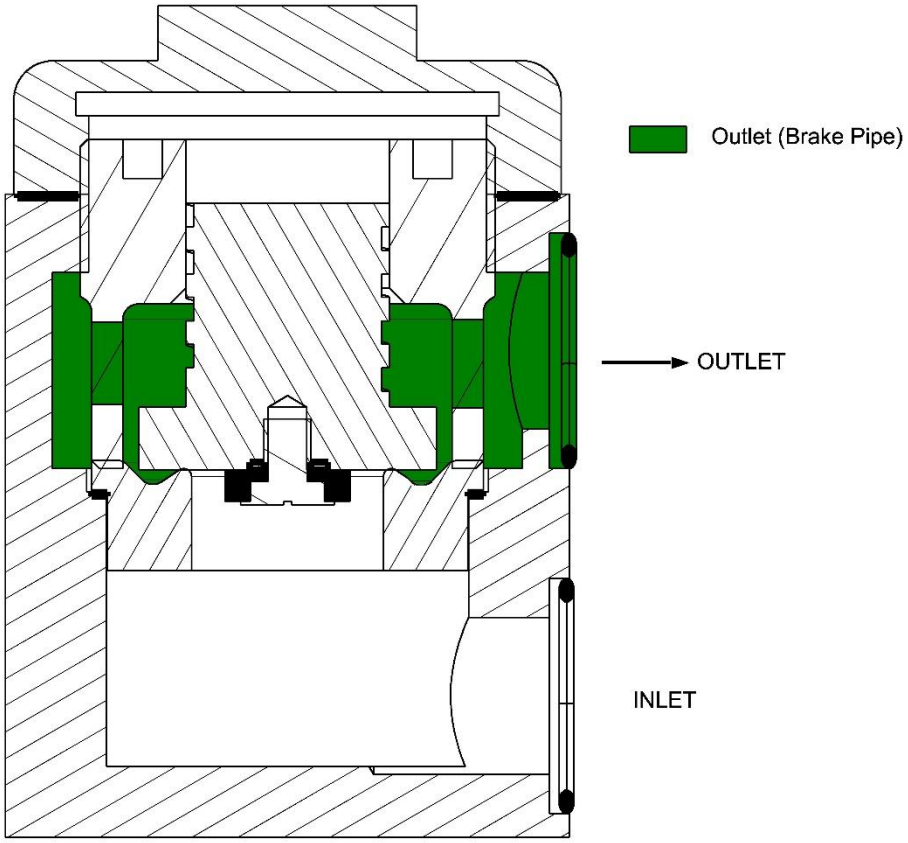

Figure 2b - 3/4” Check Valve, Closed Condition

Refer to Figure 2b

If the pressure of the air supply falls below that held on the output side of the check valve, then the valve closes, preventing a back feed.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
13mm socket wrench	Tighten/loosen the fasteners
Torque wrench 1-20 Nm	Torque tighten

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Lubricant for parts
Loctite 242/243	Thread locking
Stylmark	Torque marker

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/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

5.3 REMOVAL PROCEDURES OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal. The main reservoir pressure must be drained to remove the Check Valve.

Refer to Figure 3

1. Open the brake panel front cover to access the Check Valve (1).
2. Remove the following parts that attach the Check Valve (1) from the brake panel:
   - Two hexagonal head bolts (2) using 13mm socket wrench.
   - Two washers (3).
3. Remove and **DISCARD** the two O-rings (4).

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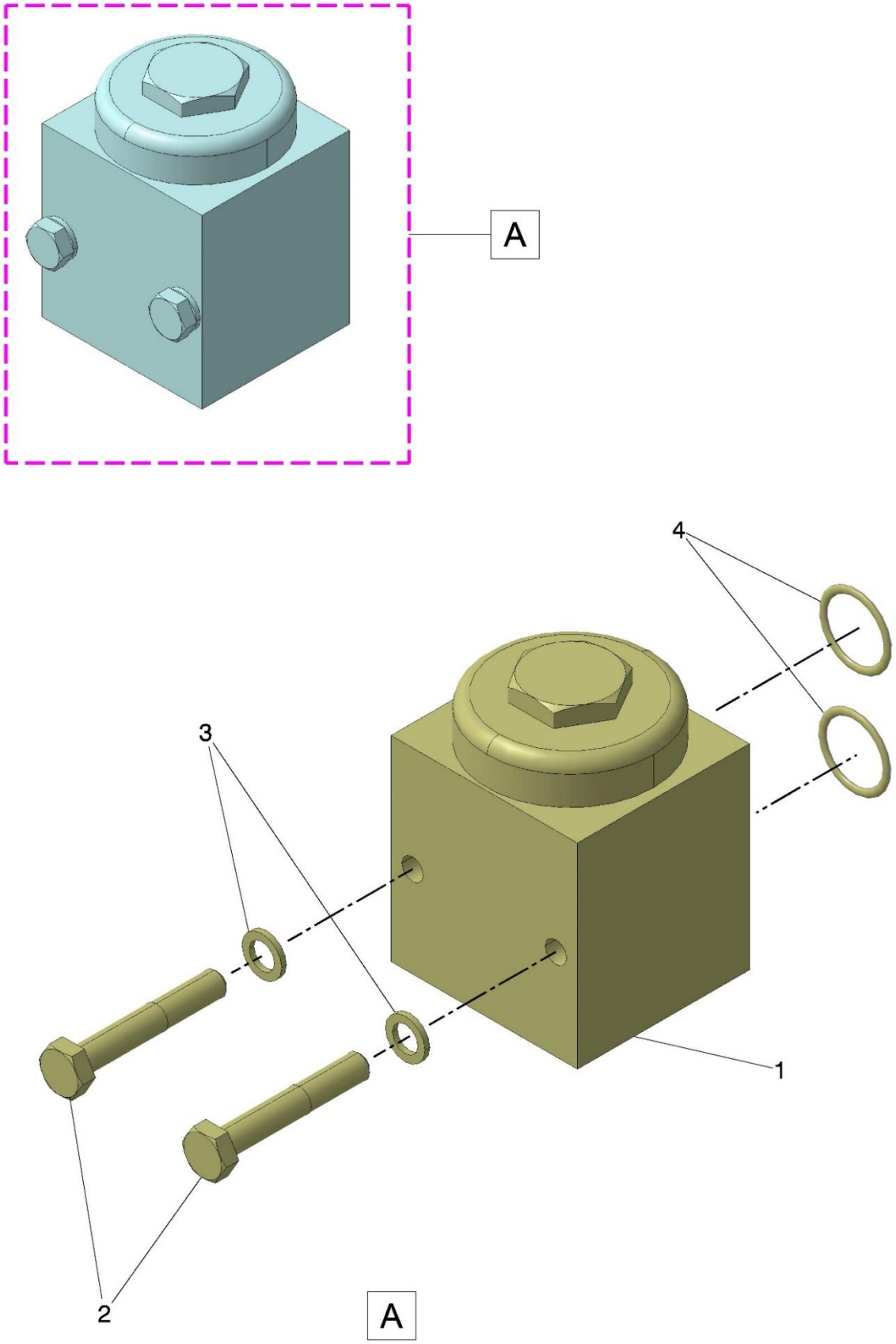

Figure 3 - 3/4” Check Valve, Removal/Installation

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	CHECK VALVE	FT0051874-100	1
2	HEX HD BOLT M8x85	FT0051654-009	2
3	WASHER DIA 8	FT0020809-001	2
4	O RING	006720000A	2

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Apply Molykote M33 grease to the O-ring groove portion on the valve body.
2. Smear Molykote M33 grease to the **NEW** O-ring (4) and place the O-ring (4) on the groove position.
3. Apply Loctite 242/243 to the threads of the bolt (2).
4. Position the 3/4" Check Valve (1) on to the brake panel and secure with the following parts:
   - Two washers (3).
   - Two hexagonal head bolts (2) using 13mm socket wrench.
5. Torque the bolts (2) to 14 Nm.
6. Apply torque mark on the bolt head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

7. Close and secure the brake panel front cover.
8. Pressurise the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6.SPARE PART LIST

- Routine maintenance: Not required
- Installation: The spare parts required for installation are:

  Refer to Figure 3

INSTALLATION SPARE PART LIST			
ITEM NO.	DESCRIPTION	PART NUMBER	QTY
4	O RING	006720000A	2

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

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/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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01.25_04.51_06.01_PRESSURE REGULATOR

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/// FT0051995-101-E00MUM

PRESSURE REGULATOR
FT0051995-101: 6 bar
FT0051995-103: 6.05 bar
FT0051995-104: 8 bar
FT0051995-105: 6.5 bar
FT0051995-106: 2.5 bar
AB746-W15: 5 bar

Maintenance/Use manual

ECO: DRC 1675
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 03/11/2021 - Revision: B01

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	06/06/2016	NEW RELEASE	.	SRC	.MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
B01	03/11/2021	Section 3: Updated working principle	DRC 1675	VP	.KMS	.BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

Pressure Regulator regulates the inlet pressure to the outlet pressure to the pre-defined set value.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

- The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer’s prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE “PED”

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 6.1 for test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 6.2.2. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 6.2.3. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease;
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to +40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Pressure Regulator must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Pressure Regulator and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Pressure Regulator for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
HD	Head
HEX	Hexagonal
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity
SOC	Socket

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The function of the Pressure Regulator is to regulate the inlet pressure to the output pressure to the pre-defined set value. The valve is mounted directly on the brake panel.

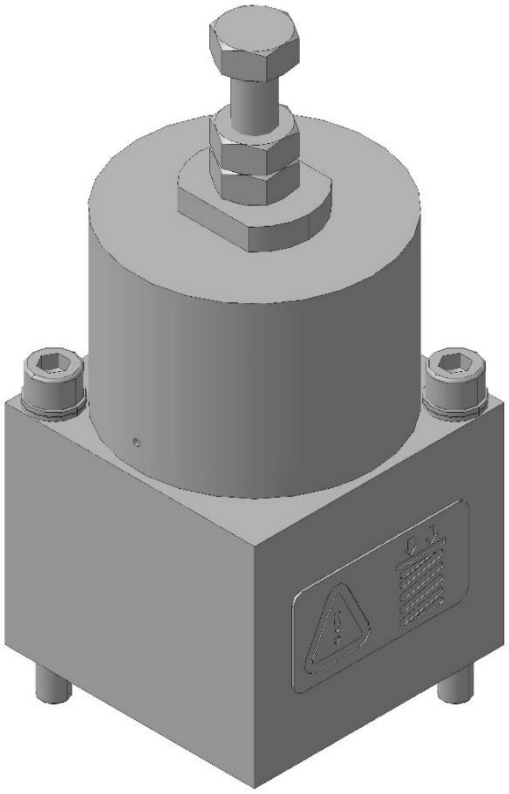
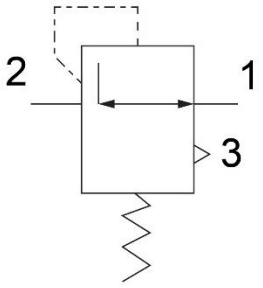


Figure 1a - Pressure Regulator, Isometric View



1 Inlet
2 Outlet
3 Exhaust

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	SET PRESSURE	MAX OPERATING PRESSURE	WORKING PRESSURE RANGE
FT0051995-101	6 bar	10 bar	4.5-7 bar
FT0051995-103	6.05 bar	10 bar	4.5-7 bar
FT0051995-104	8 bar	10 bar	6.5-8.5 bar
FT0051995-105	6.5 bar	10 bar	4.5-7 bar
FT0051995-106	2.5 bar	10 bar	1.5-3.5 bar
AB746-W15	5 bar	10 bar	4.5-7 bar

/// 3.OPERATIONS

3.1 WORKING CONDITION

The valve consists of a valve bottom body that is joined with the valve upper body through two screws. The valve upper body contains the main spring, spring guides, and the regulating screw along with lock nuts secured by a regulating valve seat. While the valve bottom body contains the spring, limiting valve seat, diaphragm ring, and a regulating valve that is the seat on the regulating valve seat with diaphragm.

- Outlet pressure less than setting pressure

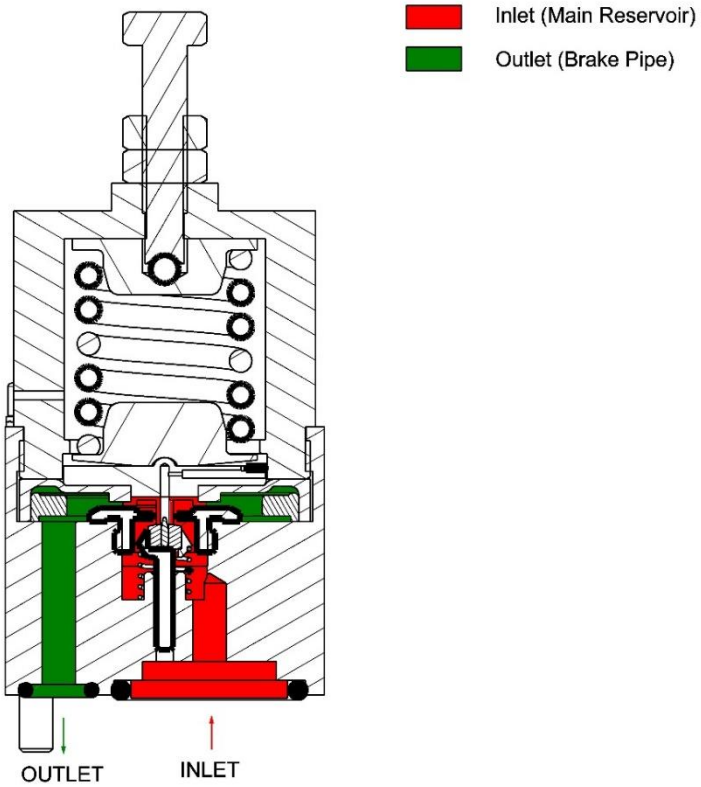

Figure 2a - Pressure Regulator, Working Condition (1 of 2)

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Refer to Figure 2a

When the output pressure is lower than the setting value of the valve. The pressure under the diaphragm is lower than the spring effort and the regulating valve with diaphragm moves downwards opening the communication between the inlet and the output port.

- Outlet pressure exceeds the setting pressure

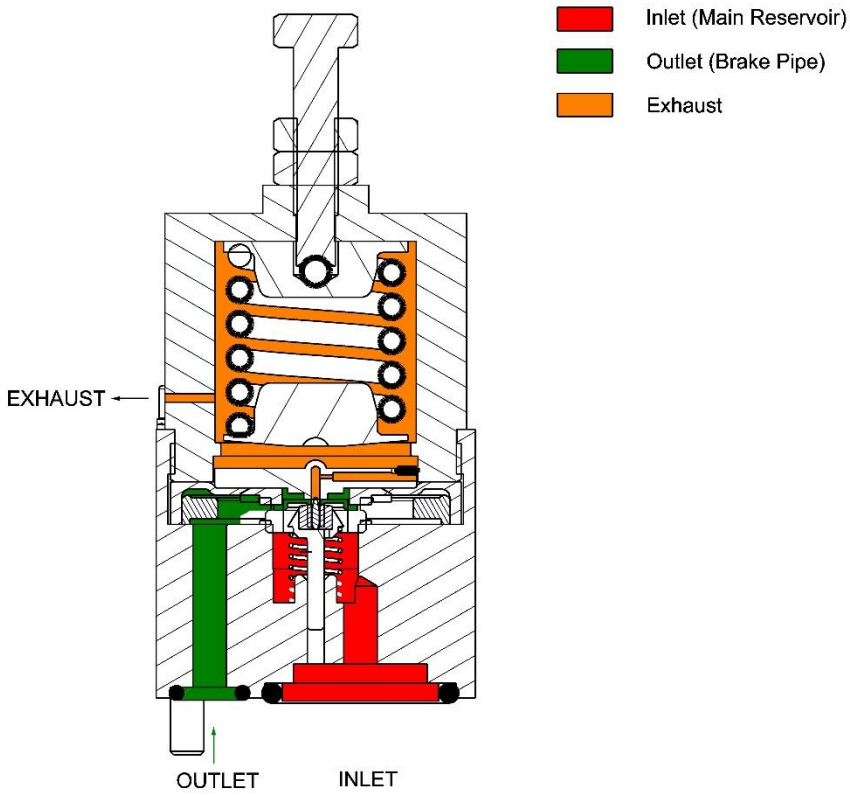

Figure 2b - Pressure Regulator, Working Condition (2 of 2)

Refer to Figure 2b

When the output pressure achieves the setting value the pressure under the diaphragm equilibrates the spring effort and regulating valve comes back in its rest position closing the communication between the inlet port and the output port. The outlet pressure exceeds the setting pressure, the valve stem further moves upwards, which causes the excess air to get vented at the vent port through the valve stem.

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/// 4.MAINTENANCE PRESCRIPTION

4.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be maintained regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical periodicity as below:
   - **FUNCTIONAL TEST** every 1 year (refer section 6.1).
   - **REPLACEMENT OF FILTER** every 1 year (refer section 6.2).

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years

/// 5.TOOLS AND CONSUMABLES

5.1 LIST OF TOOLS

NAME	APPLICATION
5mm allen key	Tighten/loosen the fasteners
Torque wrench (3-14 Nm)	Torque tighten the fasteners

5.2 LIST OF SPECIAL TOOLS

No special tools are required for this component

5.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Lubricant for parts
Loctite 242/243	Thread locking
Stylmark	Torque marker

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/// 6.PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This equipment is installed in either enveloped brake unit or mounted on pipeline.

1. If located in the enveloped brake unit: the brake unit cover should be opened to access the equipment.
2. If located on the pipeline: the valve portion alone must be removed to avoid disconnection of train line piping.

6.1 FUNCTIONAL TEST

This procedure must be performed once in every year.

6.1.1 ON TRAIN TESTING

Refer to Figure 3

The setting of the regulator can be checked by measuring the pressure at the test point 06.02/01 or appropriate test point in brake panel. If no test point is provided, other measurement methods must be followed, possibly by removing the valve and checking it on a test rig.

In case the setting needs to be adjusted, release the locknuts (2) and turn the adjusting screw in anti-clock wise or clock wise direction (1) as necessary. When the desired setting is achieved, secure the setting by tightening the lock nuts (2).

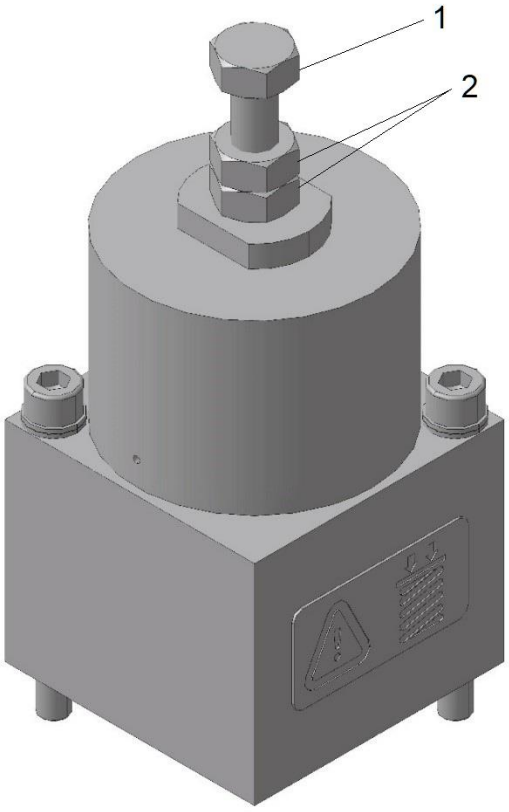

Figure 3 - Pressure Regulator, Setting Procedure

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NOTE:

Alternatively testing may be carried out in test bench as per section 6.1.2 or 6.1.3, when testing on train is not possible.

6.1.2 OFF TRAIN TESTING

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

CAUTION! Pressurised system! Discharge the pressure before removal.

Refer to Figure 4

1. Remove Pressure Regulator from the brake unit / pipe line and fit to test bench.
2. Open cock C1 and ensure all other cocks in test bench are in closed condition
3. Check the pressure in gauge G2, it should be equal to the setting pressure
4. In case the setting needs to be adjusted, release the locknuts (7) and turn the adjusting screw (8) as necessary
5. When the desired setting value is achieved in gauge G2, secure the valve by tightening the lock nuts (7). Restore the locking.

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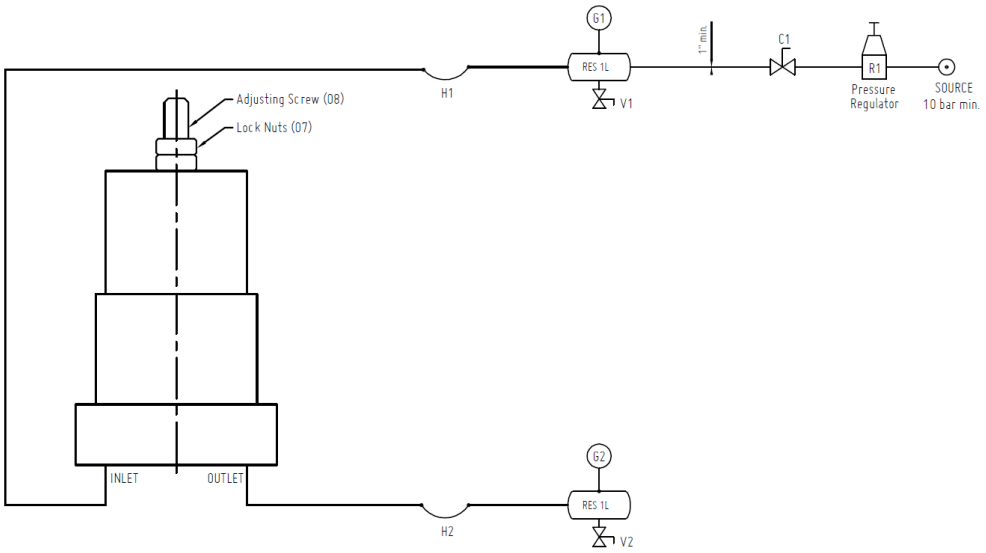

Figure 4: Test Set up for Pressure Regulator

6.1.3 TESTING ON TEST RIG

This test can be performed as per test specification in below table:

SL. NO.	PRODUCT P/N	TEST SPECIFICATION
1	FT0051995-101	FT0051995-101-E00STS
2	AB746-W15	
3	FT0051995-103	FT0051995-103-E00STS
4	FT0051995-104	
5	FT0051995-105	
6	FT0051995-106	

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6.2 FILTER REPLACEMENT

6.2.1 SPARE PART LIST

- Routine maintenance: The spare parts required for routine maintenance are:

Refer to Figure 5

REF NO.	DESCRIPTION	PART NO.	QTY
4	FILTER	AB578-37A	1
5	O-RING	003 7035 00A	1
6	O-RING	0015-11A	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

6.2.2 REMOVAL PROCEDURE FOR FILTER REPLACEMENT

Refer to Figure 5

Generic risk

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Pressurised vessel

CAUTION! Pressurised system! Discharge the pressure before removal.

1. Open the brake panel front cover to access the limiting valve (1) (If mounted on the brake unit).
2. Remove the following parts that secure the valve assembly (1) to the brake panel using a 5mm allen key:
   - Two cap screws (2);
   - Two lock washers (3).
3. Remove and **DISCARD** the filter (4) and the O-rings (5) and (6).

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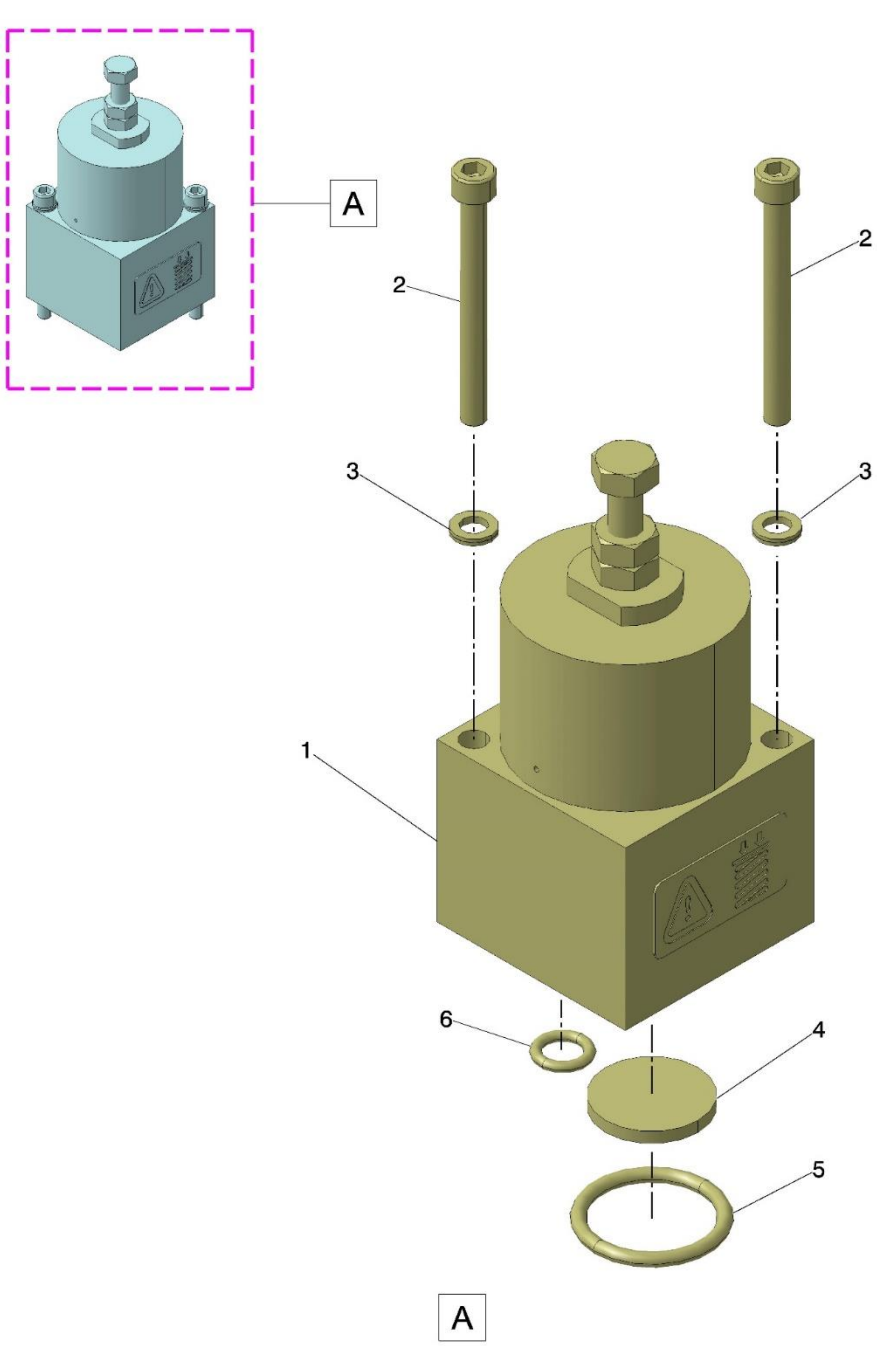

Figure 5 - Pressure Regulator, Filter Replacement

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	VALVE ASSEMBLY	FT0051995-101	1
2	HEX SOC HD CAP SCREW M6	901042100	2
3	WASHER DIA 6	FT0020809-003	2
4	FILTER	AB578-37A	1
5	O-RING	003 7035 00A	1
6	O-RING	0015-11A	1

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6.2.3 INSTALLATION PROCEDURE AFTER FILTER REPLACEMENT

Refer to Figure 5

1. Replace with a **NEW** filter (4).
2. Apply the Molykote M33 grease on the groove portion of the valve (1).
3. Smear the Molykote M33 grease on the **NEW** O-rings (5) and (6).
4. Install the O-rings (5) and (6) on the valve (1).
5. Apply Loctite 242 on the threaded portion of the cap screw (3).
6. Position the valve assembly (1) on the brake panel and secure with the parts that follow:
   - Two lock washers (3);
   - Two cap screws (2) using 5mm allen key.
7. Torque the two cap screws (3) to 5.2 Nm.
8. Apply torque mark on the bolt head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

9. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
10. Close and secure the brake panel front cover. (If mounted on the brake unit).

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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04.07_FILTER

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Date/Data: 28/07/15 - Issue/Revisione: A00
Maintenance/Use manual
Manuale di Uso e Manutenzione
ECO/ECO: .

FT0044798-100-E00MUM

Coalescing Filter, panel mounted

FT0044798-100

Compiled/Compilato: Teoresi - C.T.
Checked/Verificato: M BOBES
Approved/Approvato: A PERABONI

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REVISIONS / Revisioni						
Issue Revisione	Date Data	Description Descrizione	ECO ECO	Compiled Compilato	Checked Verificato	Approved Approvato
A00	28/07/15	First Issue	.	Teoresi - C.T.	M BOBES	A PERABONI
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1 Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- This manual must be easily accessible to all involved personnel for immediate reference. Personnel must be informed of the content of this manual before undertaking any actions.
- Faiveley Transport cannot be held responsible for any accidents, damage or environmental pollution caused by the non-respect of these recommendations, or by any incorrect use of the products or tools .
- Place the Warning Cartel " Maintenance on going" during the maintenance activities.
- The device must be maintained when and as prescribed. In case of doubt, stop the maintenance and consult the manufacturer for clarification.
- Authorised personnel must carry out installation and maintenance.
- For maintenance activities Faiveley recommends to use only original parts supplied by Faiveley. This to be understood for all components and, in particular, for those containing rubbers and degradable materials. Only original spare parts can be used. Product safety can only be guaranteed if genuine Faiveley spare parts are used. Any other materials can compromise functionality and safety.

  The above considerations are valid in order to assure the results of laboratory tests and Faiveley approval, taking into account both the design aspects, the production processes and materials' supply and selection.

  Faiveley will not be responsible for any loss of performance of the products, as well as for any damage and / or defects resulting from the use of these components, if it is not unequivocally demonstrated the exclusive use of Faiveley original spare parts.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Before accessing to electric parts, make sure the power is duly switched off.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

NOTE. For consumables like sealants, greases and similar, please refer to the single product safety datasheet.

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NOTE. Faiveley Transport reserves the right to modify its equipment or the content of this manual at any time without giving any communication.

1.1 Storage conditions

- For unassembled rubber part (i.e. flexible connections, etc.) considering the International Standard ISO 2230:2002 - Rubber products - Guidelines for storage.
- All the components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust, temperature shocks and direct source of heat such as boilers, radiators and direct sunlight. The ambient temperature and humidity values must be the ones reported in the brake system maintenance manual. If the brake system maintenance manual is not foreseen, the ambient temperature must be within -25°C and +25°C and the relative humidity must be within 10% and 65%.
- If the storage is below 15°C care should be exercised during the handling of stored products as they may have stiffened and become susceptible to distortion if not handled carefully. The temperature of product taken from such low-temperature storage should be raised to approximately 30°C throughout their mass, before the products are put into service.
- Rubber parts, if out of their original packaging, must be kept in black bags, to avoid ingress of light. If out of their original packaging, equipment must be protected against bad weather and light (UV).
- Rubber parts should be protected from light sources, in particular direct sunlight or intense artificial light having a high ultra-violet content.
- Precautions should be taken to protect products from all sources of ionizing radiation likely to cause damage to the products. As ozone is particularly deleterious to rubber, storage rooms should not contain any equipment that is capable of generating ozone, such as mercury lamps or high-voltage electrical equipment giving rise to electrical sparks or silent electrical discharges. Combustion gases and organic vapours should be excluded from storage rooms, as they may give rise to ozone via photochemical processes.
- During the storage of heavy equipment verify that integrity of packaging in order to ensure the overlap.
- Rubber should be stored free from superimposed tensions and compressive stresses or other causes of deformation. Pay attention to the storage if products are packaged in a strain-free condition.
- Take care that the packaging are protected from rodents.
- Since rubber parts age out even in optimum storage conditions, the following rules must be followed for equipment either stored on-the-shelf or mounted on inoperative vehicles:
    - pneumatic equipment must be overhauled according to the prescription of the maintenance plan from the date of manufacture or of last overhaul;
    - prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than:
        - **6 months:** safety valves;
        - **18 months:** brake manipulator, distributor, emergency valves, magnet valves for brake control, emergency push-button valve;
        - **36 months:** all other equipment.
- No component can be used after the date of expiration. It must be disposed of according to the applicable regulations.

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- All outlet / inlet devices must be adequately protected (plugs or scotch) against dust and must be removed only at the time of installation.
- All the protective plugs must be removed only at the time of installation.
- Protection on untreated surfaces (e.g. disks) must be periodically checked and, if necessary, restored.
- Parts must be picked off the shelf in order of time of manufacture.

1.2 Warning messages

Messages and warning symbols in this document are as follows:

DANGER:
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING:
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION:
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and /or and/or to damage to the unit or the environment.

Note:
Information considered important. Contains hint necessary for the proper performance of maintenance and proper operation of the component to the next, but not linked to any risk for the operator.

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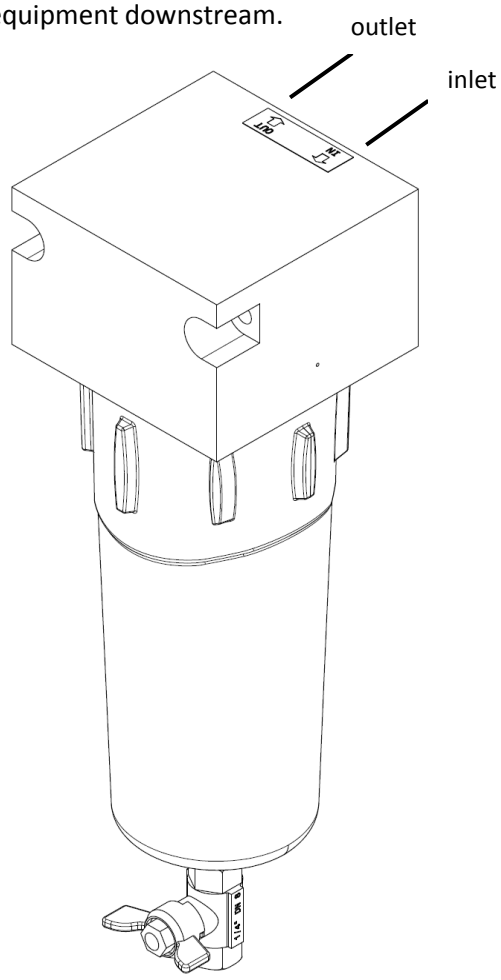
2 Description of equipment

The panel mounted filter is used to collect and trap the impurities conveyed by the airflow in order to protect the equipment downstream.



1 Supply

2 Outlet

Ex Exhaust

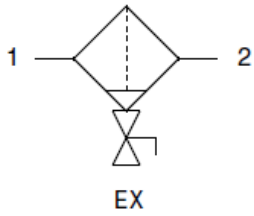


Figure 1:External view and ISO symbol

3 Main features and data

- Max operating pressure: ..... 12 bar
- Mass: ..... 1.9 kg
- Material cast bell:..... EN AC-Al Si9Cu3 (fe)
- Head material: ..... EN-AW Alsi1MgMn – T6
- Surface treatment: ..... anodic oxidation according to YTS-1025 / painted black RAL 9005 according to YTS-1201
- Working temperature:..... -40 ÷ 80 °C
- Filtering capacity (solids removal): ... 0.01 µ
- Filtering capacity (residual oil):..... 0.01 ppm
- Purity class of compressed air: ..... ISO 8573-1 [1-NA-1]
- Load loss with satured cartridge: ..... 0,2 bar
- Dimension: ..... 120x118x391 mm

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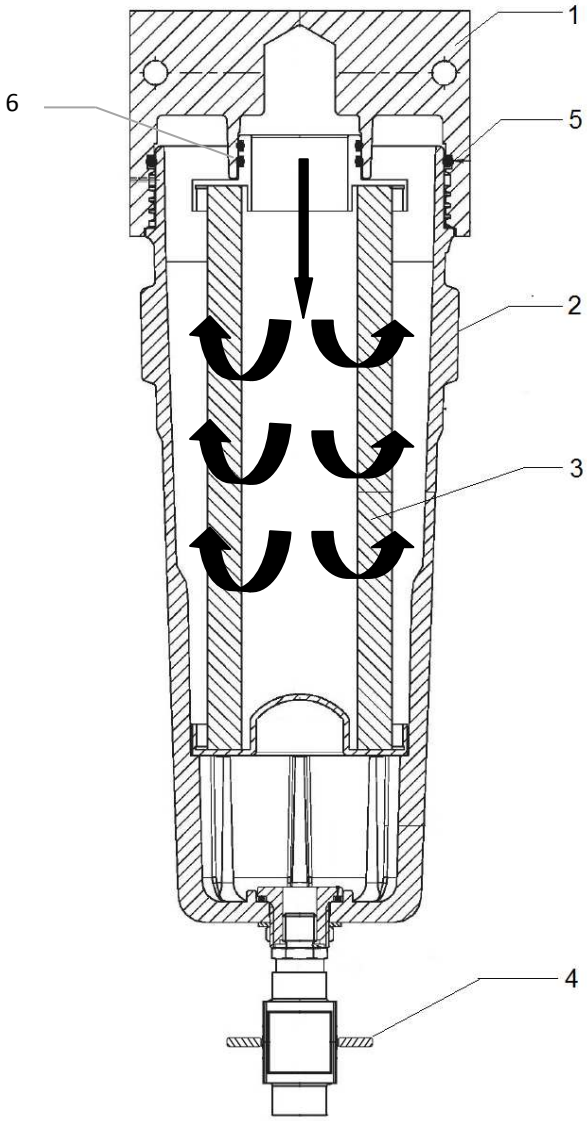
4 Description of the Function/Operation

Refer to Figure 2:



1 Filter head
2 Filter body
3 Filter cartridge
4 Drain cock 1/4"
5 O-ring
6 O-rings

Figure 2: functional scheme

The filter consists in a body (2) screwed in a head (1). A cartridge (3) is fitted to the head (1) and an O-ring (5) is provided between the head (1) and the body (2).

The body (2) is fitted with a draining device, namely a drain cock (4).

As shown in the figure above, airflow enters in the filter head (1), passes through the cartridge (3) from inside to outside and exits from the filter head (1). The impurities are collected in the cartridge (2).

Cartridge is provided with two O-rings (6).

All the impurities can be periodically discharged through a drain cock (4) placed at the bottom of the body (2).

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5 Maintenance prescriptions

This device requires the following maintenance operations:

1. **First Level Maintenance (Routine maintenance):**

   Typical draining periodicity: every 3 months.

   Filter cartridge replacement: every year (see paragraph 6).

   At the same time check filter structural integrity and if compromised, replace the whole filter assembly.

2. **Second Level Maintenance**: not required.

NOTE. FTI provides an overhauling service for its own units. FTI performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality. The FTI Service Centers have the experience and technical equipment needed for performing professional overhauls.

CAUTION! Equipment either stored on-the-shelf or mounted on inoperative vehicles must be replaced after 1 years from the date of manufacture or of last overhaul, since rubber parts age out even in optimum storage conditions. Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than 36 months.

NOTE! Replacement periodicity must include both the years of functioning and the years of storage on-the- shelf or mounting on inoperative vehicles.

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6 Routine maintenance

WARNING! Pressurized system! Discharge the pressure before removal.

CAUTION! Filtering elements may contain oil. They must be disposed of according to the law.

CAUTION! Ensure that a minimum clearance of 100 mm is foreseen under the cock, in order to make all the operations possible.

CAUTION. Take care to avoid ingress of dirt or debris into the system.

CAUTION. The drain cock must be removed only if it must be replaced.

Refer to Figure 2.

1. Before dismantling the filter, purge the filter by opening the drain cock (4).
2. Unscrew the canister (2) and remove the cartridge (3).

NOTE! If the body is not easily to remove by hand, use the strap wrench if necessary.

3. Clean carefully the canister (2) and the head (1) by means of a dry and lint free cloth.
4. Replace the cartridge (3) with a new one.
5. Lubricate the two O-rings (ref. a in Figure 3 below) of the new cartridge, the one in the head (ref. b in Figure 3 below), the threads of the head (ref. d in Figure 3 below) and the hole in which the cartridge has to be inserted (ref. c in Figure 3 below) with grease Uniflor NYE 8512S (indicated datasheet at the end of document).

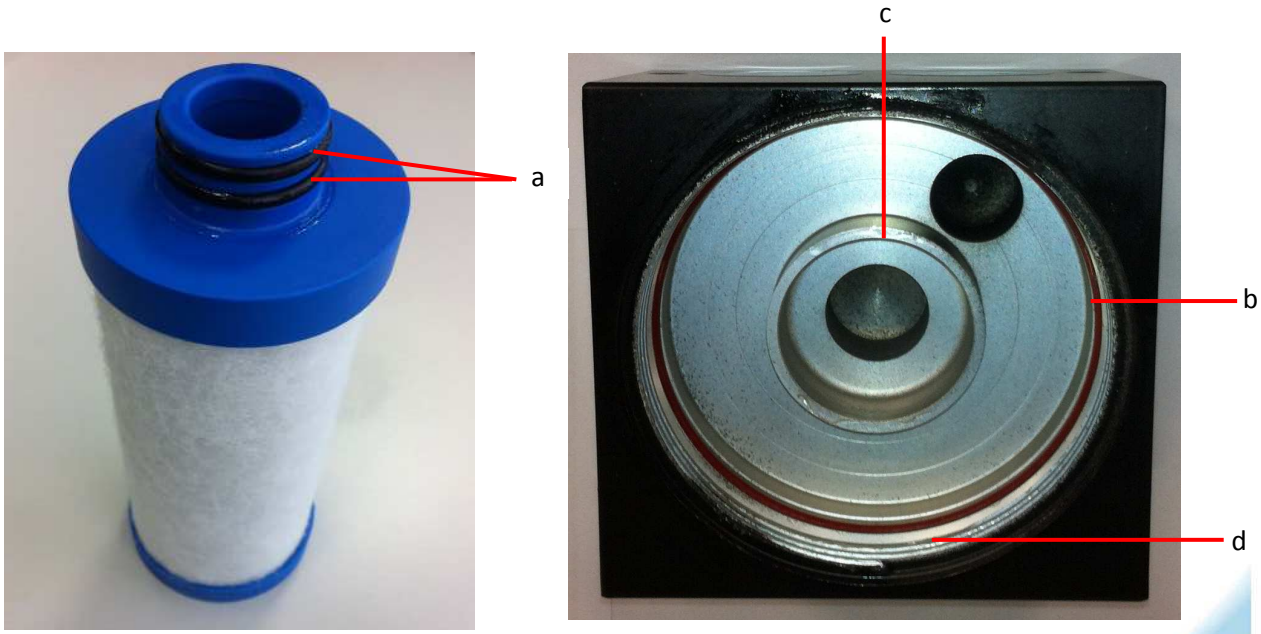

Figure 3: Details of the cartridge and filter's head for the lubrication

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6. Then screw the canister (ref. 2 of Figure 2) by hands till the correct position between the head and the canister, is reached. The canister stops turning when it reaches its mechanical stop.
7. Pressurize the system and check for leakages by using a water soap solution.

7 Removal procedure

WARNING! Isolate the filter (inlet and outlet) and reduce the pressure to zero with gradual opening of the drain cock and leave it in open position.

NOTE! During maintenance operations beware to keep the maximum cleanliness, avoiding contamination of the pneumatic circuit from any possible debris.

NOTE! Fittings are application dependent.

Refer to Figure 4:

1. Unscrew the two screws (3) and remove the filter assembly (1).

CAUTION! Take care to prevent ingress of dirt or debris in the system.

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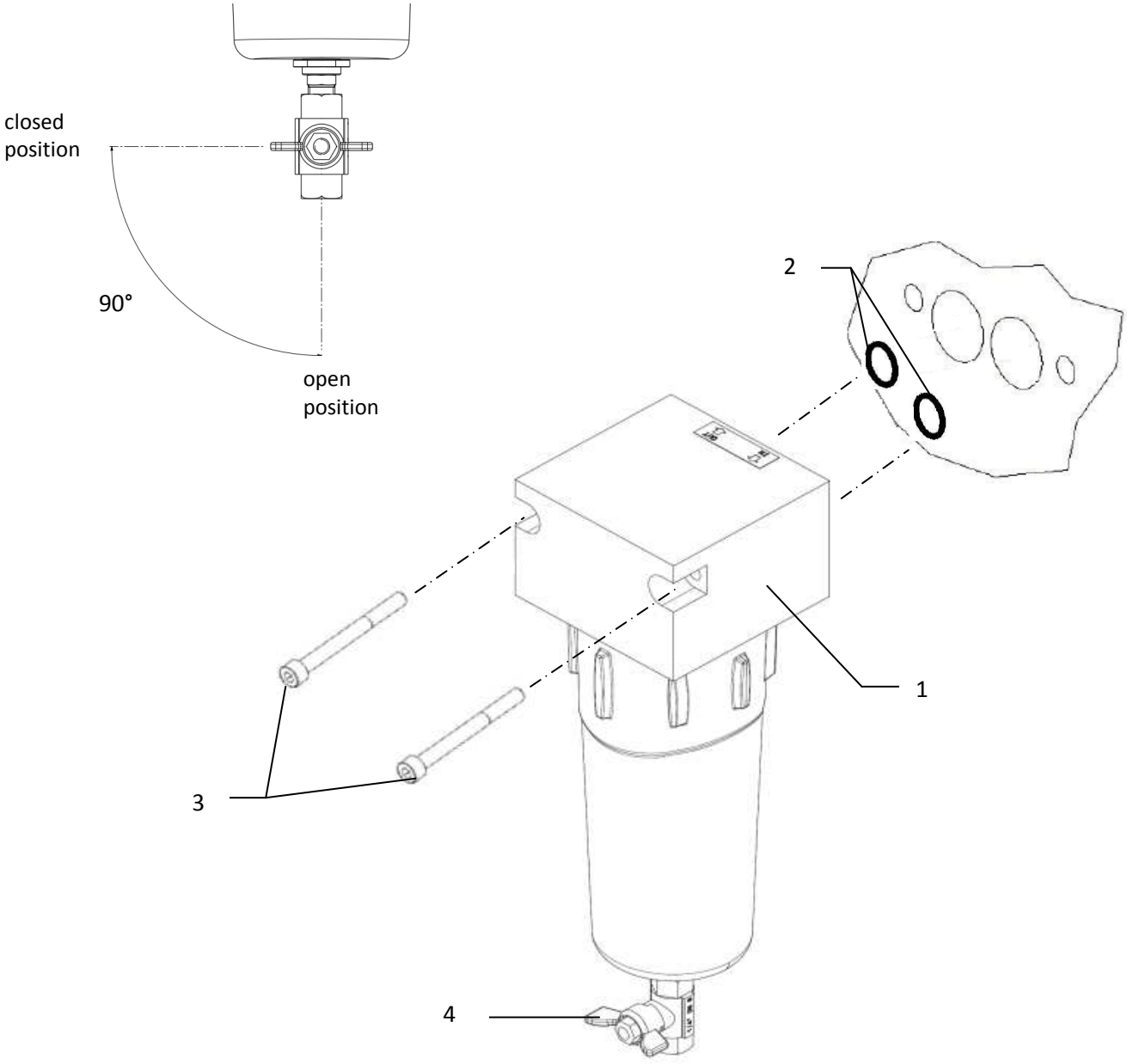

Figure 4: installation/removal procedure

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8 Installation Procedure

CAUTION! Take care to prevent ingress of dirt or debris in the system.

NOTE! Fittings are application dependent.

Refer to Figure 4:

1. In case the component has the interface O-rings already installed in place, analyse them and:
   - if they have signs of damage or wear, replace them with new ones according to the codes reported in paragraph 9 and lubricate them with a light amount of grease type Uniflor 8512S;
   - if they are intact and in proper condition, slightly lubricate them with grease type Uniflor 8512S and proceed with point 3.
2. In case the component doesn't have the interface O-rings already installed in the place in which they are foreseen, slightly lubricate the new O-rings, according to P/Ns indicated in paragraph 9, with grease type Uniflor 8512S and put them in place.
3. Remove the two plugs or other protection type of inlet and outlet supplies.
4. Install the filter (1) onto the host panel and secure it by means of the two screws (3) with relevant washers.
5. Pressurise the system and check for leakages by using leakages by using a leak finder (for example bubble soap).

9 Spare parts

- **Routine Maintenance** – With reference to the exploded view of par. 6 , the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
3	Filter element	FT0040586-000	1

Table 1: spare parts' codes

- **Installation** - With reference to the exploded view of Figure 4, paragraph 7, the spare parts required for installation are:

REF.	DESCRIPTION	P/N	QUANTITY
2	O-ring-ISO 3601-1-122A-28,25x2,62-N Compound VMQ 70Sh.	FT0023874-006	2
-	Uniflor 8512S	3000.00.550	as needed

Table 2: spare parts' codes

10 Special Tools

No special tools required for servicing and installation.

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11 Disposal

The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

The device is mainly composed by the following materials: aluminium alloy, brass, stainless steel, rubber, plastic.

12 Data sheets and material safety data

See document 3000.00.550_All6 for the safety data sheet for the product **Uniflor 8512S** .

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04.08_04.42_06.04_CUT-OUT COCK WITH DRAIN AND MICRO

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/// FT0050523-100-E00MUM

CUT-OUT COCK WITH DRAIN AND MICRO SWITCH
FT0050523-100

Maintenance/Use manual

ECO: DRC 1659
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 10/08/2021 - Revision: B00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/03/2016	NEW RELEASE	.	SRC	.MMR	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Cut-Out Cock with Drain and Micro Switch is used to open/close a pneumatic circuit. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position. The Cut-Out Cock with Drain and Micro Switch is also equipped with a micro switch. The Cut-Out Cock with Drain and Micro is a panel mounted type.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

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- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

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- While cleaning, do not use salt water.
- While cleaning filters or cooler fins, use adequate air aspirator.
- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.
- While testing the components, never exceed the maximum operating pressure limits.
- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.
- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.
- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.
- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE “PED”)

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from - 10°C to + 40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Cut-Out Cock with Drain and Micro Switch must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Cut-Out Cock with Drain and Micro Switch and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Cut-Out Cock with Drain and Micro Switch P/N FT0050523-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Full Name
BSPP	British Standard Parallel Pipe
MS	Micro Switch
P/N	Part number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Cut-Out Cock with Drain & MS is used to open and close a pneumatic circuit. It has a vent port, which vents the delivery pressure to atmosphere, when it is in closed position. The Cut-Out Cock with Drain and Micro Switch is also equipped with a micro switch. The Cut-Out Cock with Drain & MS is a panel mounted type.

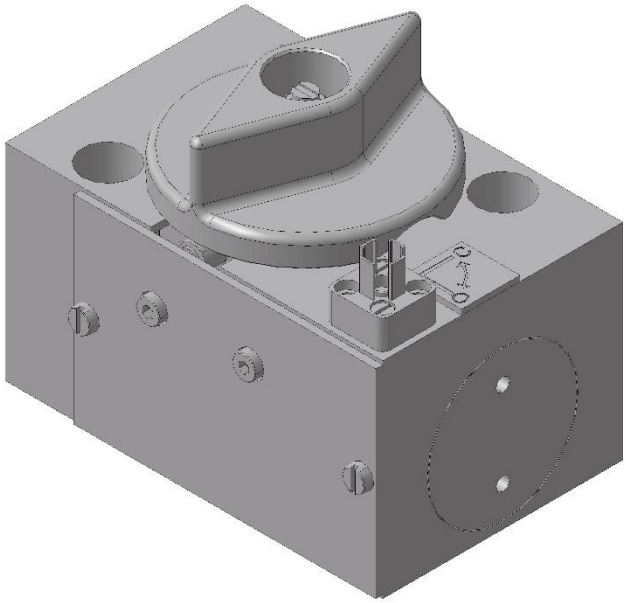
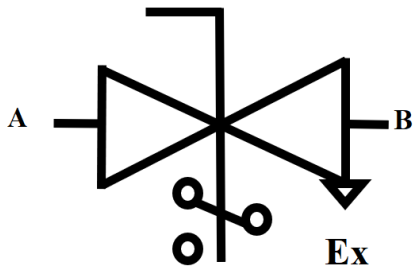


Figure 1a - Cut-Out Cock with Drain & MS, Isometric View



A Input
B Output
Ex Exhaust

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

- Port size .....19 mm
- Max operating pressure.....10 bar
- Working pressure range .....0-10 bar

/// 3.OPERATIONS

The device consists of an Isolating cock body having the inlet and delivery ports. Micro switch is mounted on the cock body. The handle is connected to a spindle, which in-turn operates the micro switch.

3.1 OPEN CONDITION

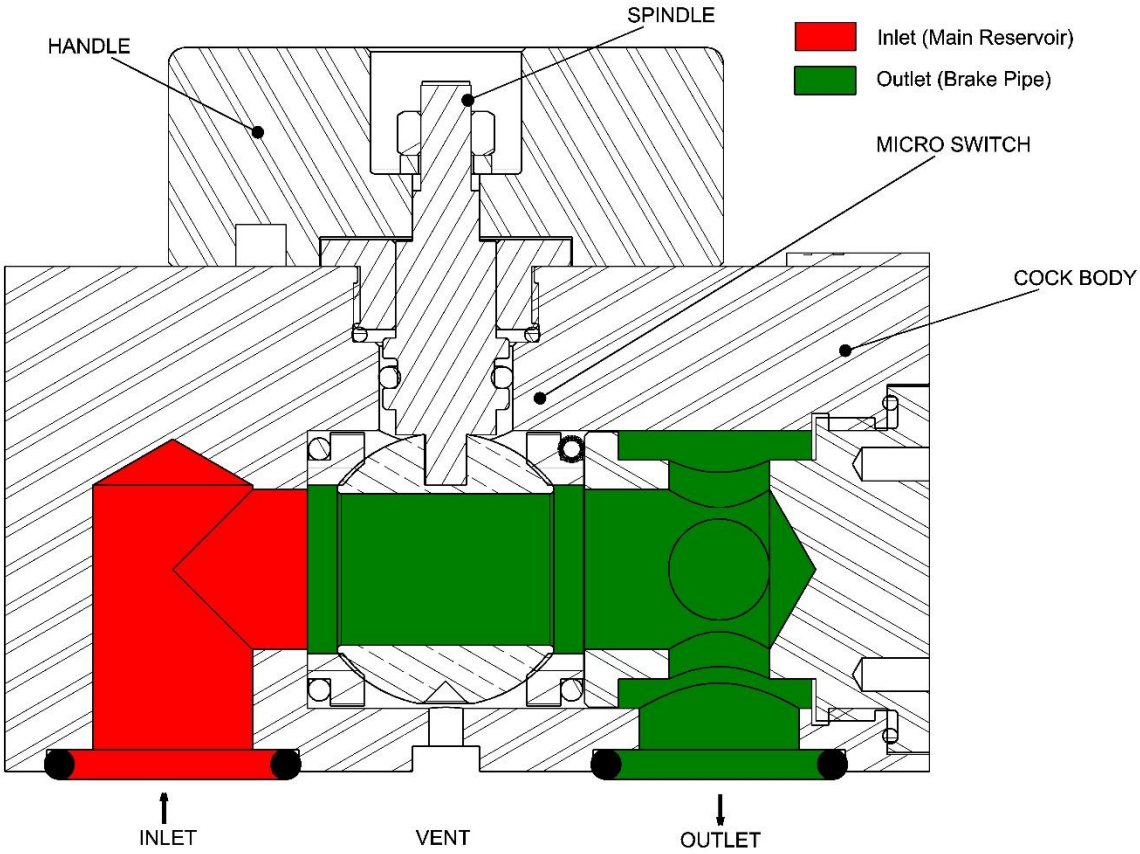
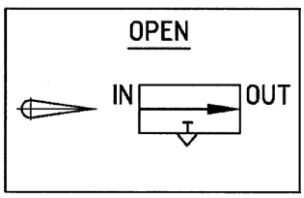


Figure 2a - Cut-Out Cock with Drain & MS, Open Condition



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Refer to Figure 2a

In working condition handle is in open position. The inlet port is connected to the outlet port through vented ball and the microswitch is deactivated.

3.2 CLOSED CONDITION

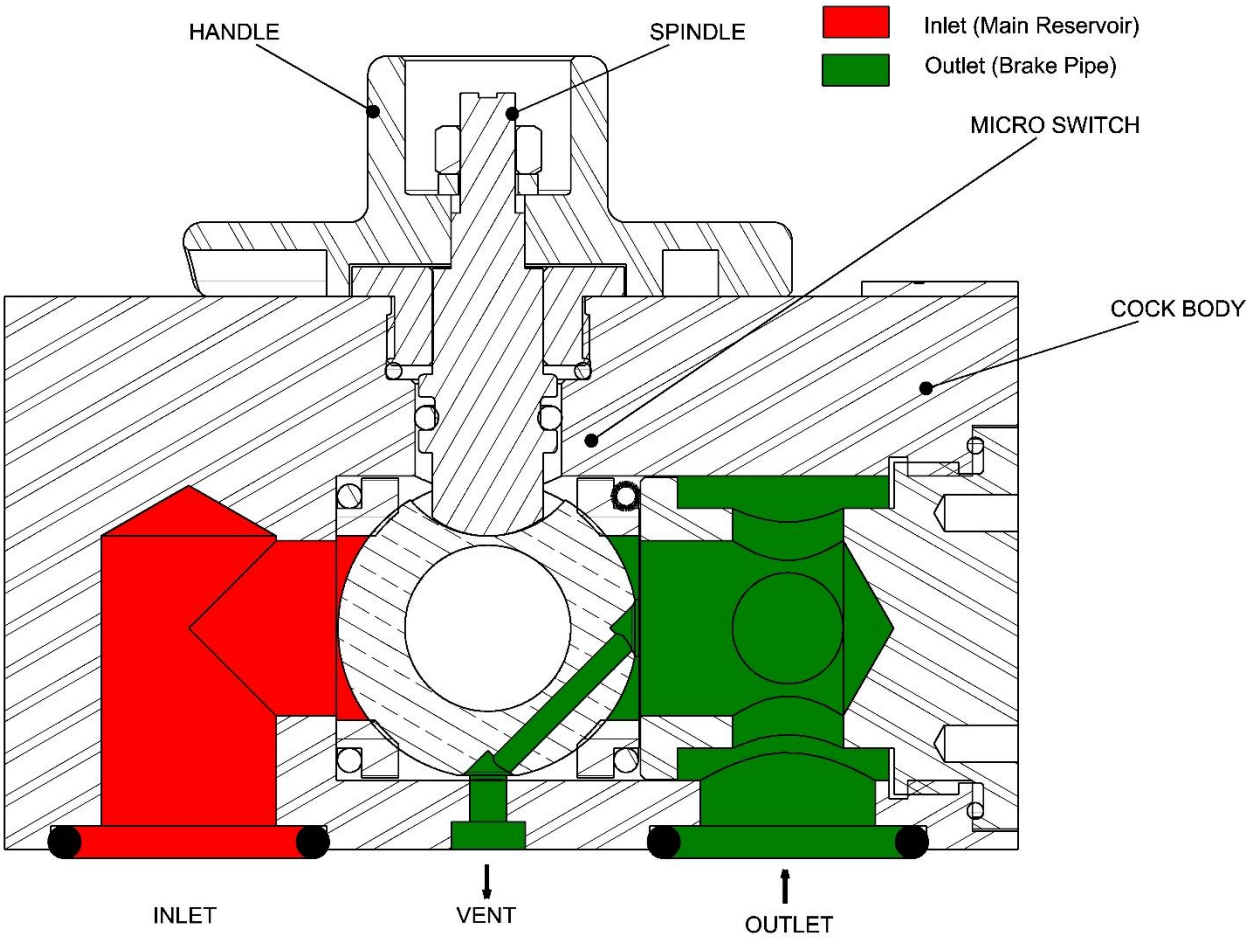
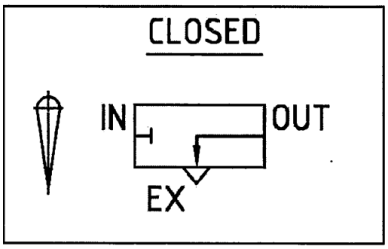


Figure 2b - Cut-Out Cock with Drain & MS, Closed Condition



Refer to Figure 2b

In closed condition, the handle has to be rotated to the closed position. When handle is rotated it rotates the ball plug via spindle. The inlet and outlet are isolated from each other. The outlet pressure is vented to atmosphere through vented port. The micro switch is activated.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

Name	Application
6mm Allen key	Tighten/loosen the fasteners
Screw driver	Tighten/loosen the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

Name	Application
Loctite 242 or 243	Thread locking
Molykote M33 or M55	Lubricant for parts
Stylmark	Torque marker

/// 5.MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be maintained regularly as required by the Operator's rules; the mission profile and the environmental conditions. (Refer to section 5.2.1).
   Typical functional test periodicity: 1 year.

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the Operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

CAUTION! Make sure the manoeuvre can be done without risk.

1. Perform an external cleaning of the device and check there are no signs of damage or wear.
2. Perform the functional check as described in the system maintenance manual. If no system maintenance manual is provided, operate the cock and verify that it works properly, without

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seizure or hard point and that there are no leakages. During the manoeuvre check that the knob/Handle turns free and that the micro switch gives the right indication. The test must be done with the system pressurised.

3. At the end of the test, make sure all the initial conditions are restored.

5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the Main pipe pressure and the circuit pressure for which the cock is used in the application before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Refer to Figure 3

1. Open the brake panel front cover to access the Cut-Out Cock (1).
2. Remove the electrical connections by using screw driver and remove the pipe fittings using appropriate tool from the Cut-Out Cock inlet and delivery ports.
3. Remove the Cut-Out Cock (1) by unscrewing two screws (2) along with two washers (3) using 6mm allen key.
4. Remove and **DISCARD** both the O-rings (4).

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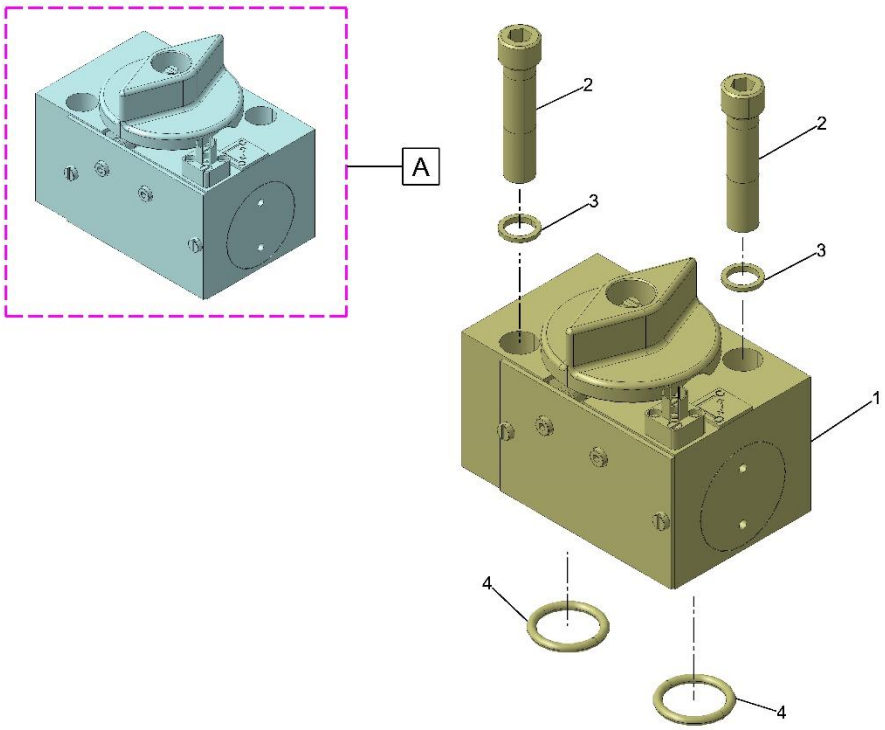

Figure 3 - Cut-Out Cock with Drain & MS, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	CUT-OUT COCK WITH DRAIN & MS	FT0050523-100	1
2	HEX SOC HD CAP SCREW M8x65	901042100	2
3	WASHER DIA 8	FT0020809-001	2
4	O-RING	006720000A	2

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Smear Molykote M33 grease to the two **NEW** O-rings (4) and to the groove portion of the Cut-Out Cock (1).
5. Install two O-rings (4) into the groove portion of the Cut-Out Cock (1).
6. Apply Loctite 242/243 on threads of the two screws (2).
7. Mount the Cut-Out Cock (1) on to the panel using the two screws (2) along with the two washers (3) using 6mm allen key.
8. Torque tighten the two screws (2) to 14 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

9. Connect the Cut-out Cock to the pipe fitting. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.

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10. Re-connect the electrical connector and tighten using screw driver.
11. Pressurize the system and perform a complete functional test, verifying that the device works properly, without seizure or hard point check for leakages as per the system level procedure performed during car builder's general system check.
12. Close and secure the brake panel front cover.

/// 6.SPARE PART LIST

- Routine Maintenance - Not applicable.
- Installation -the spare parts required for installation are listed in the below table:

Refer to Figure 3

INSTALLATION SPARE PARTS LIST			
ITEM NO.	**DESCRIPTION**	**PART NUMBER**	**QTY**
4	O-RING	006720000A	2

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, stainless steel, rubber, brass, etc. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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04.33_CHECK VALVE

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/// FT0051875-100-E00MUM

1/2" CHECK VALVE
FT0051875-100

Maintenance/Use manual

ECO: DRC 1659
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 10/08/2021 - Revision: B00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	06/09/2016	NEW RELEASE		SRC	.MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The 1/2” Check Valve allows the airflow in single direction, preventing the backflow. It is a panel / manifold mounted valve.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

- The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer’s prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing any operations ensure that the adjacent moving parts (compressors, fans, actuators, etc.) should not be in operating condition.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
  Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between 0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from 0°C to +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

1/2” Check Valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on 1/2” Check Valve and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the 1/2” Check Valve P/N FT0051875-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
ID	Internal Diameter
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The 1/2” Check Valve allows the airflow in single direction, preventing the backflow. It is a panel /manifold mounted valve.

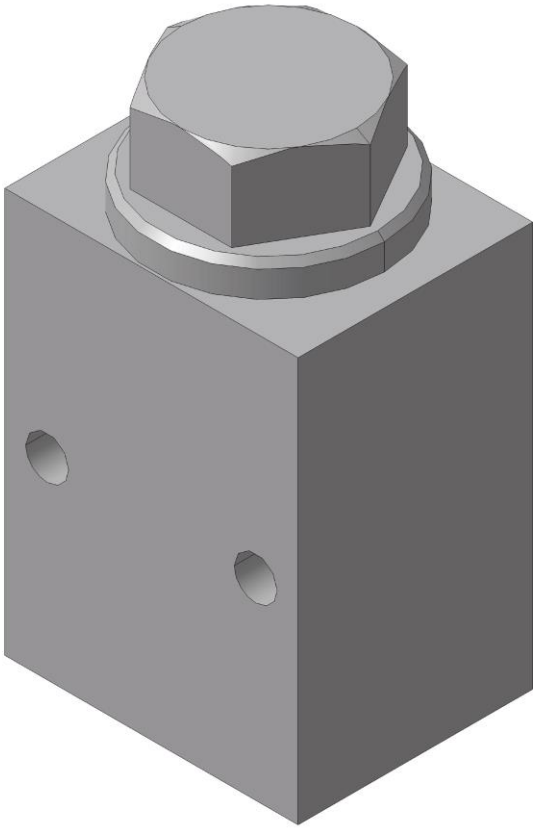

Figure 1a – 1/2” Check Valve, Isometric View

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Nominal diameter..... 1/2 “
Max operating pressure ... 10 bar
Working pressure range... 0-10 bar
Mass……...4 Kg

/// 3.OPERATIONS

3.1 OPEN CONDITION

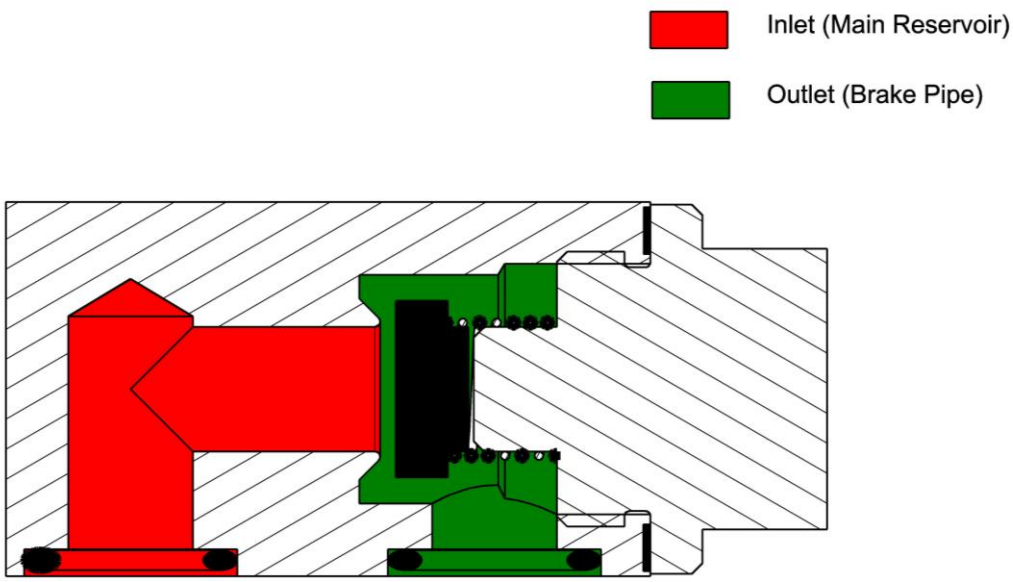

Figure 2a - 1/2” Check Valve, Open Condition

Refer to Figure 2a

Device that allows the air flow in one direction (from inlet to delivery) preventing the backflow.

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3.2 CLOSED CONDITION

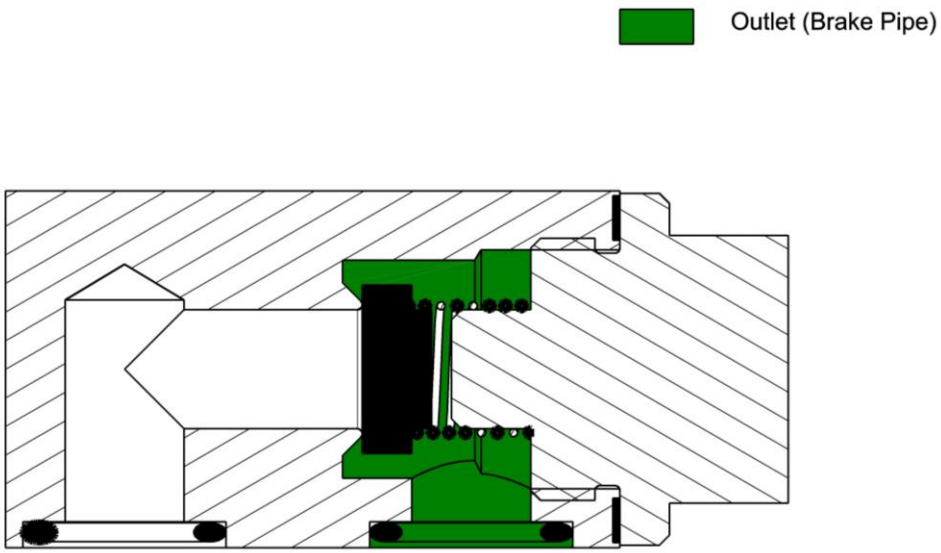

Figure 2b - 1/2” Check Valve, Closed Condition

Refer to Figure 2b

If the pressure of the air supply falls below that held on the output side of the check valve, then the valve closes, preventing a back feed.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
10mm Socket wrench	Tighten/loosen the fasteners
Torque wrench 3-14 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Lubricant for parts
Loctite 242/243	Thread locking
Stylmark	Torque marker

/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal.

Refer to Figure 3

1. Remove the following parts that attach the valve (1) from the panel/manifold:
   - Two hexagonal head bolts (2) using 10mm socket wrench
   - Two washers (3).
2. Remove and **DISCARD** the two O-ring (4).

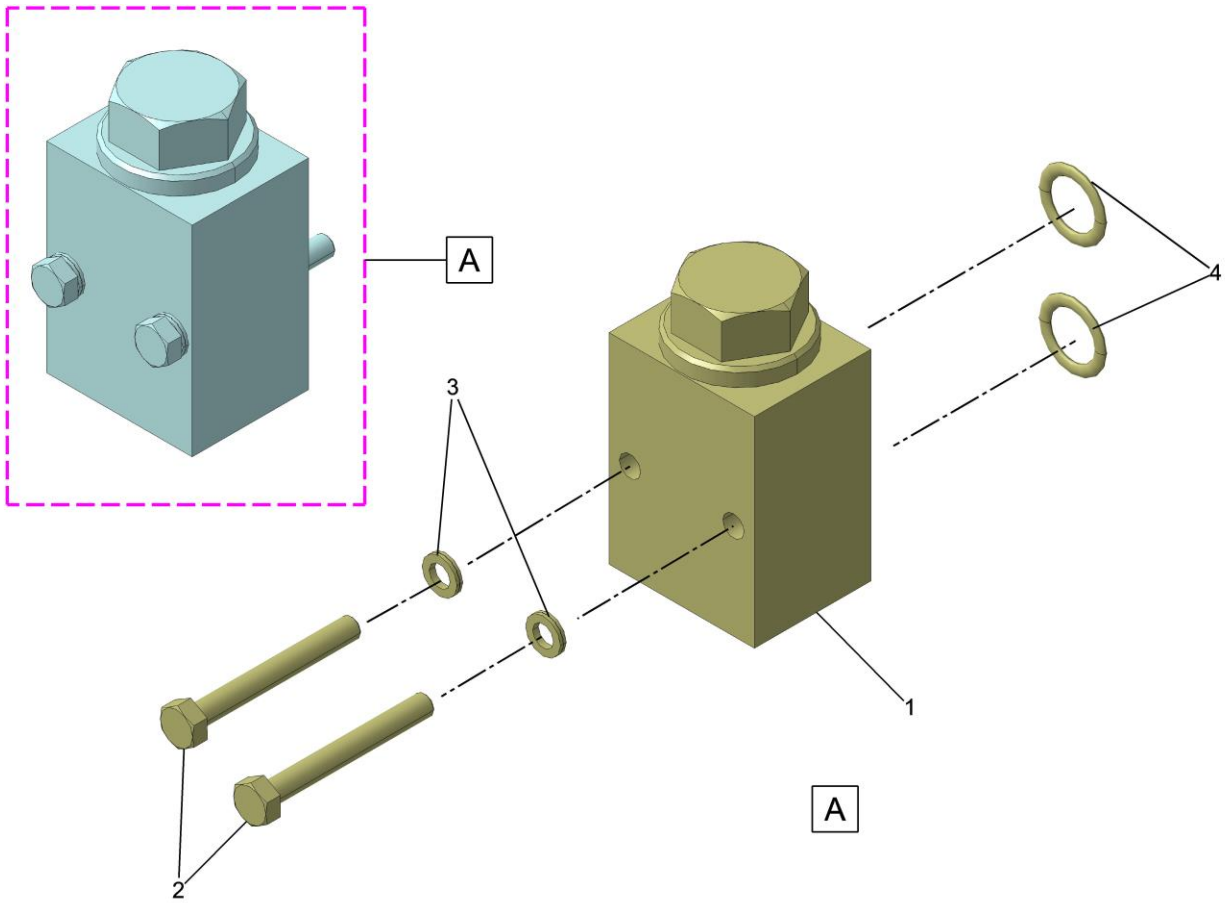

Figure 3 - 1/2” Check Valve, Removal/Installation

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	1/2” CHECK VALVE PORTION	-	1
2	HEX HD BOLT M6	920047800	2
3	WASHER DIA 6	FT0020809-003	2
4	O RING	006701000	2

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Smear Molykote M33 grease to the two **NEW** O-ring (4) and spot face on the valve body (1).
2. Place the O-ring (4) on the spot face portion of the valve body (1).
3. Apply Loctite 242 to the threads of the two hexagonal head bolts (2).
4. Position the Check Valve (1) on to the panel/manifold and secure with the following parts:
   - Two washers (3)
   - Two hexagonal head bolts (2) using 10mm socket wrench.
5. Torque the hexagonal head screws (2) to 5.2 Nm.
6. Apply torque mark on the bolt head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

7. Pressurise the system and check for leakages as per the system level procedure performed during car builder’s general system check.

/// 6.SPARE PART LIST

- Routine maintenance: Not required.

Refer to Figure 3

- Installation: The spare parts required for installation are:

SPARE PART LIST			
ITEM NO.	**DESCRIPTION**	**PART NUMBER**	**QTY**
4	O RING	006701000	2

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

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/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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04.35_VARIABLE PRESSURE REGULATOR

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/// FT0053765-100-E00MUM

VARIABLE PRESSURE REGULATOR
AB697-W31/T54, AB697-W31/T55
AB697-W31/T56, AB697-W31/T57
FT0053765-100, -101, -102, -103,
FT0053765-104, -105, -106, -107,
FT0053765-108, -109, -110, -111, -112
FT0053765-113, -114, -115, -116

Maintenance/Use manual

ECO: DRC 1922
Compiled: KJ
Checked: .RRK
Approved: .KMS

Date: 10/20/2022 - Revision: D00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	05/14/2019	NEW RELEASE	.	NSR	.KMS	.VC
B00	04/03/2020	VAR. 106 to 110 ADDED, VAR.100 &101 SET PR.VALUE UPDATED	DRC XXXX	NSR	.KMS	.BSH
C00	08/10/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
C01	11/03/2021	VAR. FT0053765-113, -114, -115, -116 added. Section 2.1.1 and 6.1.3: Updated parameters. Section 4: Updated overhaul typical periodicity.	DRC 1675	VP	.KMS	.BSH
D00	10/20/2022	Removed projects ML3 and RRTS from table 1 Section 4: Updated overhaul typical periodicity. Section 1.4, 1.6 and 6.2.3: Updated	DRC 1922	KJ	.RRK	.KMS
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Variable Pressure Regulator automatically regulates the output pressure in a fixed proportion to the input pressure, depending on the suspension pressure.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer’s prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

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- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 6.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 6.2.2. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 6.2.3. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to +40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Variable Pressure Regulator must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Variable Pressure Regulator and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Variable Pressure Regulator for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Full Name
Approx.	Approximate
HD	Head
HEX	Hexagonal
mm	millimeter
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b.

The variable pressure limiting valve is a compact Variable Pressure Regulator which automatically regulates the output pressure in a fixed proportion to the input pressure, depending on the suspension pressure. The output pressure also compensates for the bogie weight which is a fixed quantity always for a given design. It incorporates an additional safety feature that in case of a bellow failure, the output pressure is automatically raised to a value corresponding to the crush laden weight of the vehicle.

Figure 1a - Variable Pressure Regulator, Isometric View

Figure 1b - CETOP Symbol

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2.1.1 TECHNICAL DATA OF THE EQUIPMENT

- This device is available for many settings, one for each part number. The Table-1 list out the part number to which this document applies and their relative setting.

  - Bore size: .....6 mm
  - Max operating pressure.....10 bar
  - Working pressure range.....0-10 bar
  - Mass.....2 Kg approx.

Table: 1

VPR PART NO.	PROJECT	TYPE OF CAR	Suspension Pressure in Gauge G4 (bar)		Output Pressure in Gauge G11 (bar) (±0.1)	
			Tare (*SP2*)	**Crush (*SP3*)**	**Tare (*P2*)**	**Crush (*P3*)**
AB697-W31/T54	KMRL	DM	3.45	6.12	3.0	4.25
AB697-W31/T55	KMRL	T CAR	3.3	6.2	2.6	3.95
AB697-W31/T56	LMRCL	DM CAR	3.5	6.1	2.7	4.0
AB697-W31/T57	LMRCL	T CAR	3.7	6.6	2.42	3.81
FT0053765-100	UT 115	M CAR	3.8	6.82	3.29	4.84
FT0053765-101	UT 115	T CAR	2.9	5.95	3.32	4.84
FT0053765-102	TRAIN 18	DTC	3.1	3.55	2.67	2.92
FT0053765-103	TRAIN 18	MC	3.15	3.85	3.17	3.57
FT0053765-104	TRAIN 18	TC	3.5	4.25	2.91	3.29
FT0053765-105	TRAIN 18	NDTC	3.15	3.85	2.69	3.08
FT0053765-106	-	-	3.62	6.1	3.0	4.19
FT0053765-107	-	-	4.16	6.63	2.65	3.84
FT0053765-108	-	-	3.39	5.86	2.76	4.01
FT0053765-109	-	-	3.78	6.25	3.04	4.21
FT0053765-110	-	-	3.67	6.15	2.94	4.13
FT0053765-111	CATANIA	BOGIE 1 & 4	2.62	4.02	3.26	4.15
FT0053765-112	CATANIA	BOGIE 2 & 3	2.62	4.42	3.26	4.15
FT0053765-113	-	-	3.22	4.44	3.02	3.68
FT0053765-114	-	-	3.43	5.69	2.79	3.80
FT0053765-115	-	-	3.01	4.89	2.87	3.88
FT0053765-116	-	-	3.20	5.01	3.00	3.92

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/// 3.OPERATIONS

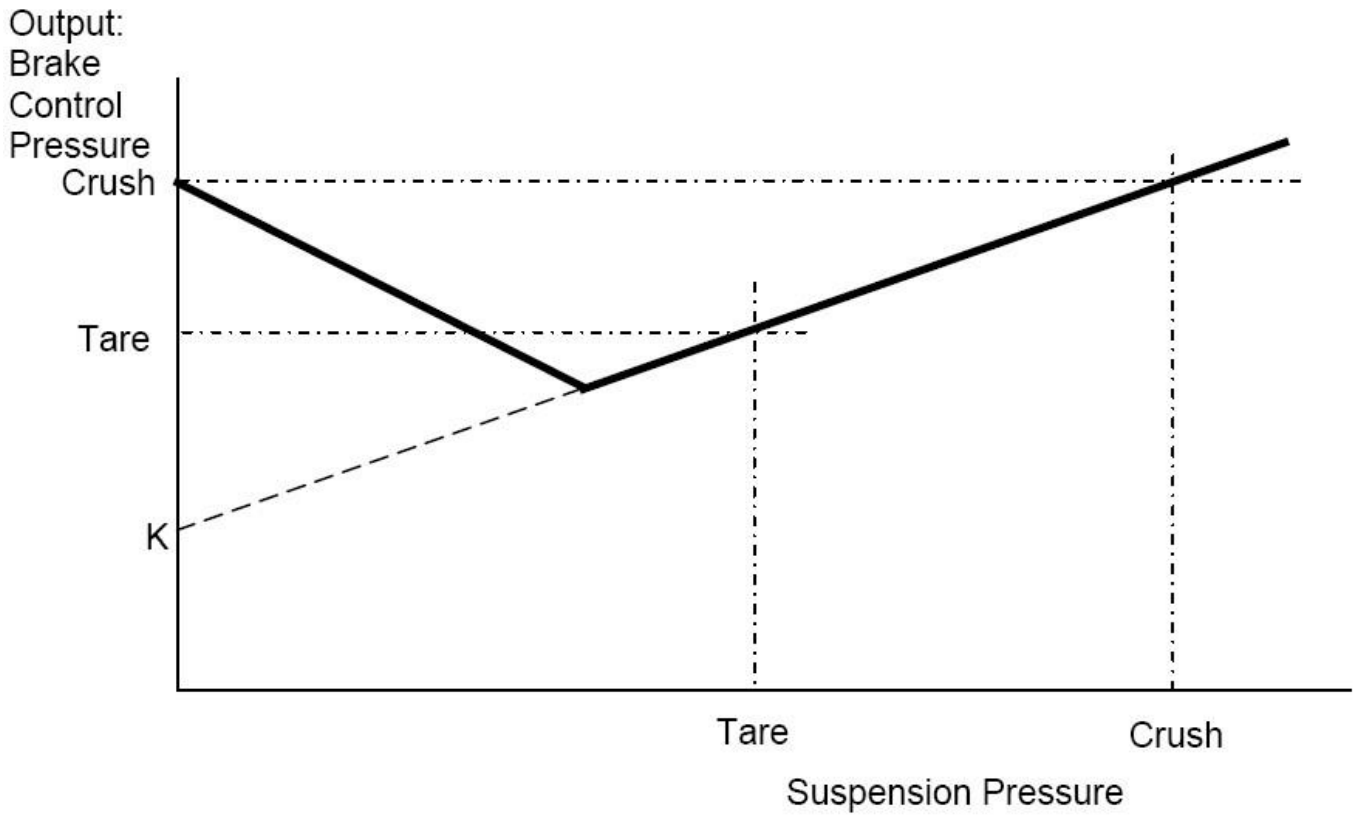

Figure 2 - Input/output Characteristic Diagram

Refer to Figure 2, 3a, 3b, 3c, and 3d

The input - output graph in Figure 2 shows how the output varies with the input suspension pressure. The thick line is the actual output that is seen as the suspension pressure varies from zero up to the crush value. The characteristic without the “fail to crush” feature is the straight line that continues in dotted form to meet the vertical axis at “K”. The pressure “K” is set by the spring. which can be loaded as desired by the separate adjusting screw. The force of the spring is transferred to the valve seat via the pushrod.

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3.1 CHARGING CONDITION

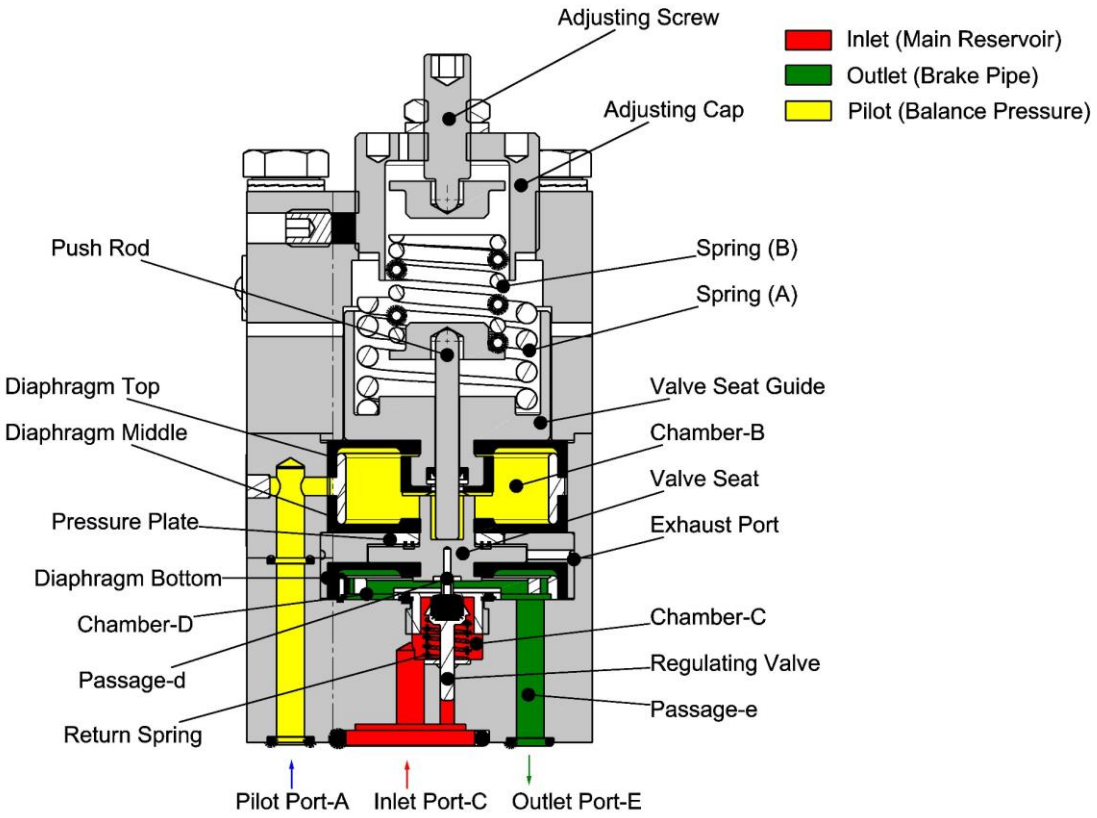

Figure 3a - Charging

Refer to Figure 3a

Input pressure from the vehicle suspension, having been averaged out at an averaging valve, is fed into the inlet port “A” as a pilot pressure, from which it reaches the chamber “B” which is sealed by two diaphragms one at the top and the other at the bottom of chamber “B”. The force due to this pressure acting on the upper diaphragm lifts the valve seat guide overcoming the force of the spring “A” and ensuring that the force from spring “B” does not act on valve seat as there is a clearance between it and valve guide. In the normal course of its function, the suspension pressure, apart from lifting the valve seat guide also acts on the bottom pressure plate through the middle diaphragm. This force due to the suspension pressure plus the spring force acting via push rod, push the valve seat downward to open the regulating valve, admitting MR pressure into chamber “D” to pass into outlet port “E”.

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3.2 VALVE LAPPING CONDITION

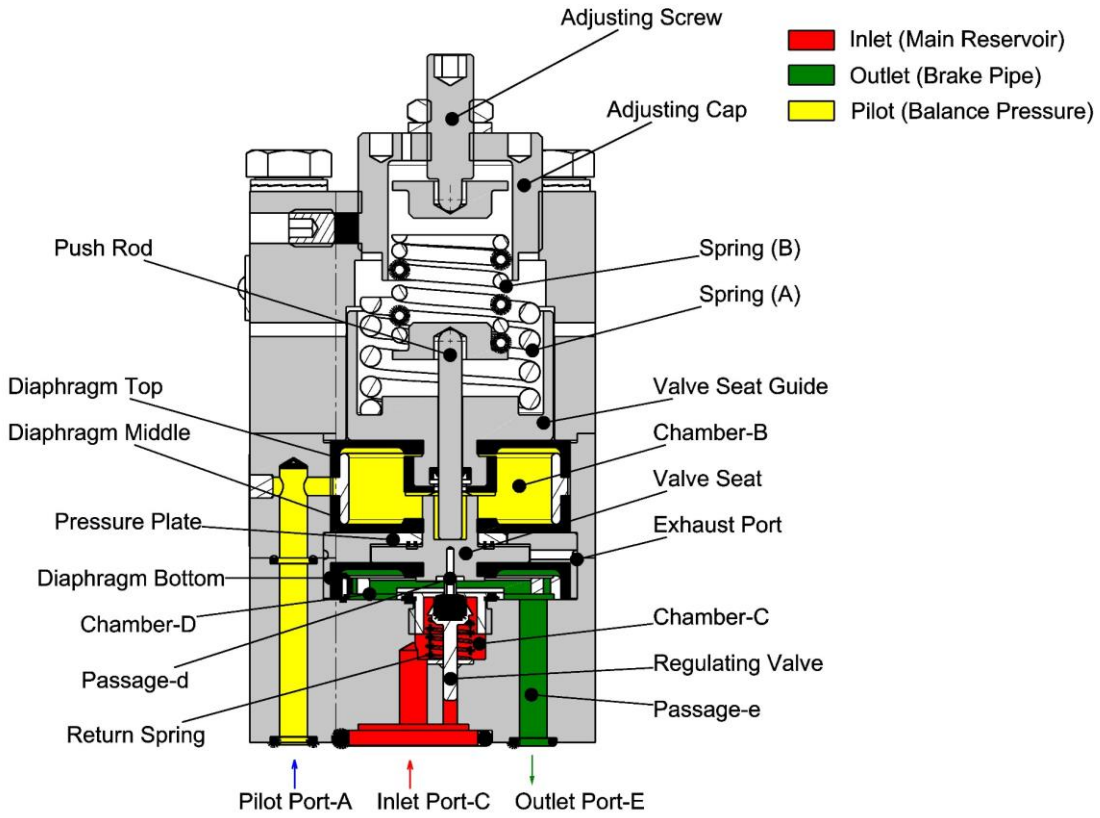

Figure 3b - Valve Lapping

Refer to Figure 3b

When the pressure in the chamber “D” increases to a level to push the valve seat upwards, the regulating valve also is moved up by the return spring to close the inlet passage and thus lap the valve. The area of the valve seat on which the bottom diaphragm is seated bears a fixed ratio to that of the pressure plate on which the suspension pressure acts and thus a predetermined regulated output pressure is obtained for a given suspension pressure, setting the slope of the graph in Figure 2.

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3.3 REDUCED SUSPENSION PRESSURE CONDITION

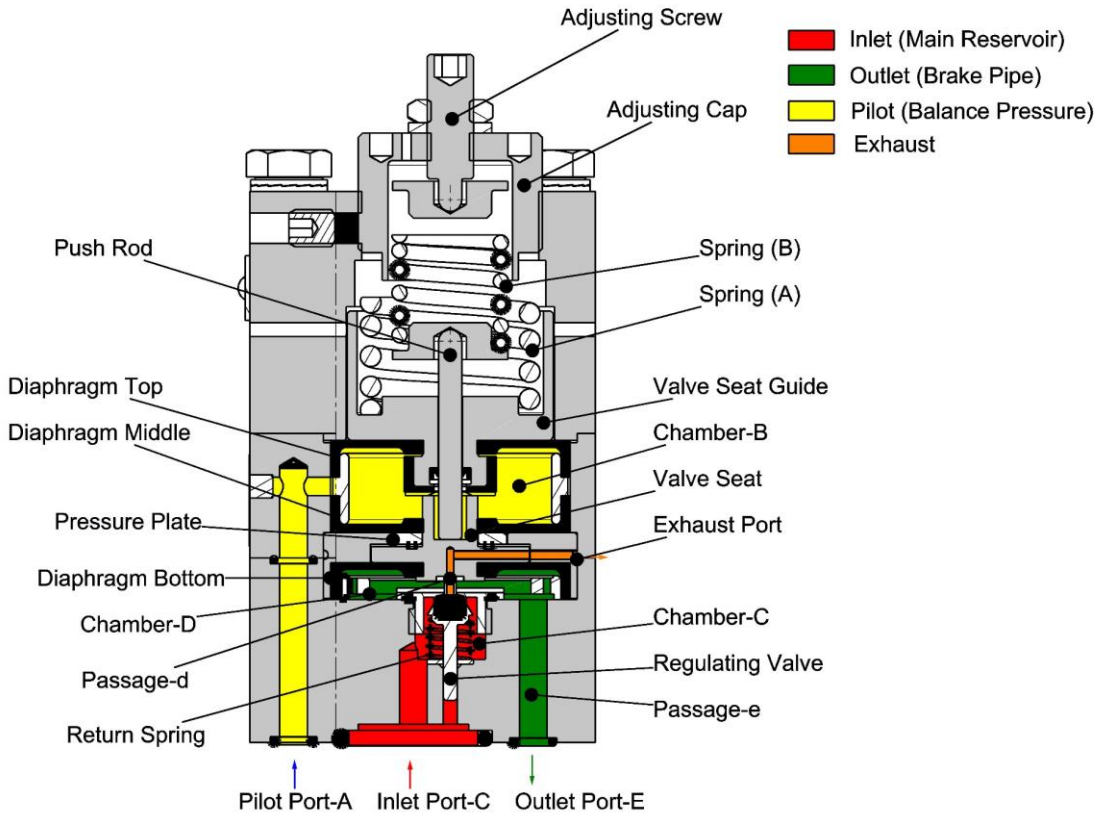

Figure 3c - Reduced Suspension Pressure

Refer to Figure 3c

When the pressure in chamber “B” is reduced due to a reduction in weight on the bogie, the upward force caused by the outlet pressure in chamber “D” overcomes the downward force of the spring “B” and acts on the bottom face of valve seat guide through diaphragm top. This force imbalance causes the valve seat guide to be lifted up away from the regulating valve, exposing the exhaust passage-d. The output pressure escapes to the atmosphere through the exhaust port causing a reduction in the upward force acting on the underside of diaphragm bottom. The escape to atmosphere of output pressure continues until the downward and upward forces become equal at which point the regulating valve is pushed up by its return spring to a lap position cutting off chamber “C” from chamber “D”. The valve delivers a reduced output which fits the slope of the thick line in Figure 2.

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3.4 TOTAL LOSS OF SUSPENSION PRESSURE CONDITION

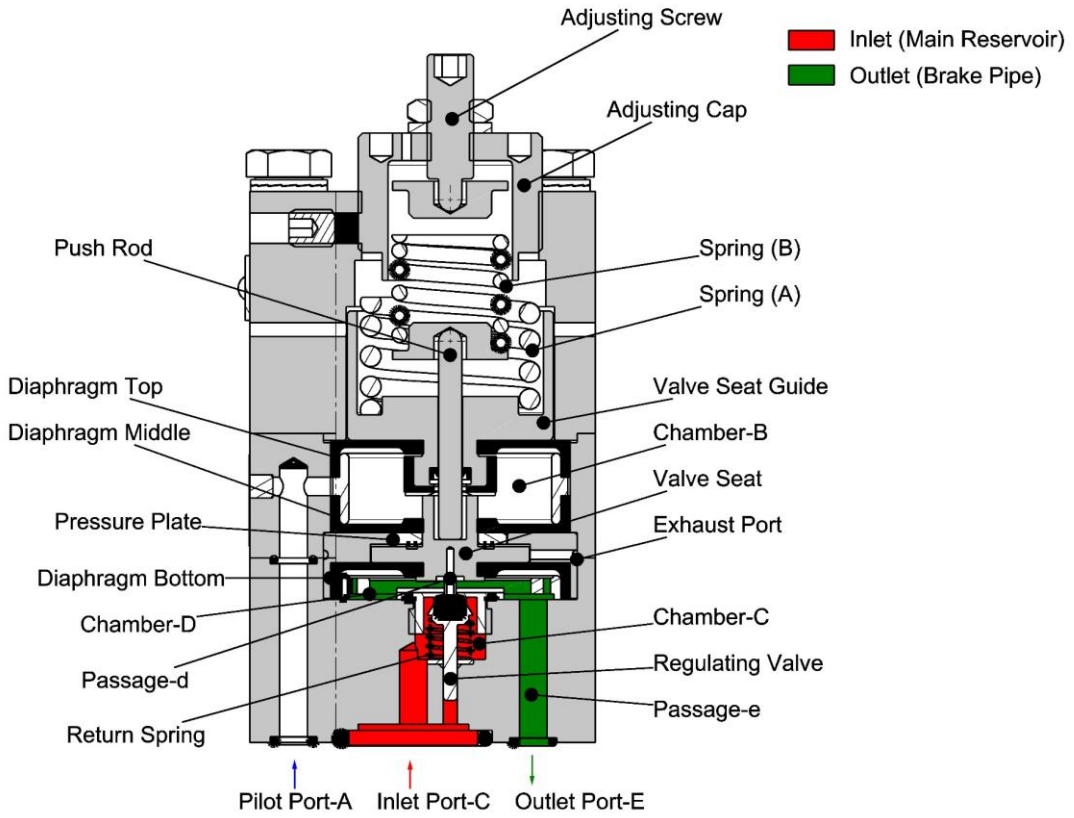

Figure 3d - Total Loss of Suspension Pressure

Refer to Figure 3d

To increase the downward force due to the spring “A”, valve is set by screwing down the adjusting cap, such that when there is a loss of suspension pressure below the level at which spring “A” is balanced, the spring expands and pushes the valve seat guide downwards to bear on the valve seat through the guide cap, thus forcing the valve seat to push open the regulating valve . Spring “B” also continues to act on valve seat via push rod .When the inlet valve opens, MR pressure connected at port “C” charges in to chamber “D” and from there to passage-e and when the pressure in the chamber “D” increases to a level to push the valve seat upwards, the regulating valve also is moved up by the spring to close the inlet passage and thus lap the valve. With total loss of suspension pressure, the output pressure in chamber “D” is the crush value. When the suspension pressure is zero, the output pressure will be equal to the crush pressure.

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/// 4.MAINTENANCE PRESCRIPTIONS

4.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical periodicity as below:

   - **FUNCTIONAL TEST:** 1 year or 160 000 kilometres at the first of the two terms expired. (refer section 6.1).
   - **REPLACEMENT OF FILTER**: 1 year (refer section 6.2)

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

/// 5.TOOLS AND CONSUMABLES

5.1 LIST OF TOOLS

Name	Application
4mm Allen key	Tighten/loosen the fasteners
5mm Allen key	Tighten/loosen the fasteners
16/17mm spanner	Tighten/loosen the fasteners
Torque wrench 5-35 Nm	To Torque the fasteners

5.2 LIST OF SPECIAL TOOLS

Name	Application
MM2344	Install the Adjusting cap

5.3 LIST OF CONSUMABLES

Name	Application
Molykote M33 or M55	Lubricant for parts
Loctite 242 or 243	Thread locking
Stylmark	Torque marker

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/// 6.PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

The brake unit cover should be opened to access the equipment.

6.1 FUNCTIONAL TEST

6.1.1 ON TRAIN TESTING

Refer to Figure 4

This procedure must be performed once in every year.

The setting of the regulator can be checked by measuring the pressure at the appropriate test point (refer to the system maintenance manual for this information) when fitted. If no test point is provided, other measurement methods must be followed, possibly by removing the valve and checking it on a test rig.

In case the setting needs to be adjusted, release the locknuts (2) and turn the adjusting screw (1) in anti-clock wise or clock wise direction as necessary. When the desired setting is achieved, secure the setting by tightening the lock nuts (2).

Figure 4 - Variable Pressure Regulator, Setting Procedure

NOTE: Alternatively testing may be carried out in test bench as per section 6.1.2 or 6.1.3, when testing on train is not possible.

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6.1.2 OFF TRAIN TESTING

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

CAUTION! Pressurised system! Discharge the pressure before removal.

Refer to Figure 5

1. Depending upon variants, the valve has to be set pressure accordingly. See Table-1 for pressure setting values.
2. Ensure clean dry air supply 10 to 12 bar in the test rig.
3. Ensure all the isolating cocks are in closed position in the test rig.
4. Open cock C1 in test rig.
5. Using regulator R1, set pressure in G1 to 10 bar.
6. Based up on variants, set the suspension pressure in gauge G2 using regulator R2 to the tare SP2 value shown in Table-1. Turn adjusting screw (23) using 5mm Allen key (lock nut (25) to be loosened) until the output pressure on gauge G3 shows the P2 value shown in Table-1.
7. Reduce the suspension pressure in gauge G2 to zero by using regulator R2.
8. Hold the adjusting screw (23) using 5mm Allen key and turn the adjusting cap (22) using tool MM2344 to set the crush output pressure (fail to ‘crush’) P3 on gauge G3.

NOTE: Ensure that the setting of the adjusting screw (23) is not disturbed when adjusting the cap (22).

9. Hold the adjusting screw (23) with 5mm Allen key and tighten the lock nut (25) using 17mm spanner. If the adjusting screw (23) is accidentally disturbed, repeat the above test from 3 to 8.
10. Tighten the set screw (30) using 4mm Allen key.
11. Vent the output pressure using drain cock V3 and allow output pressure in gauge G3 to fall below P3 value (0 bar permitted).
12. Close drain cock V3 and check the output pressure in G3 raises to the set value of P3.
13. Re-adjust if necessary, by repeating the above test from 3 to 11.
14. Increase the suspension pressure to the tare SP2 value in G2 using regulator R2 and check that the output pressure in G3 returns to tare P2 value.
15. Increase the suspension pressure to the crush SP3 value in G2 using regulator R2 and check the output pressure in gauge G3 rises to crush P3 value.

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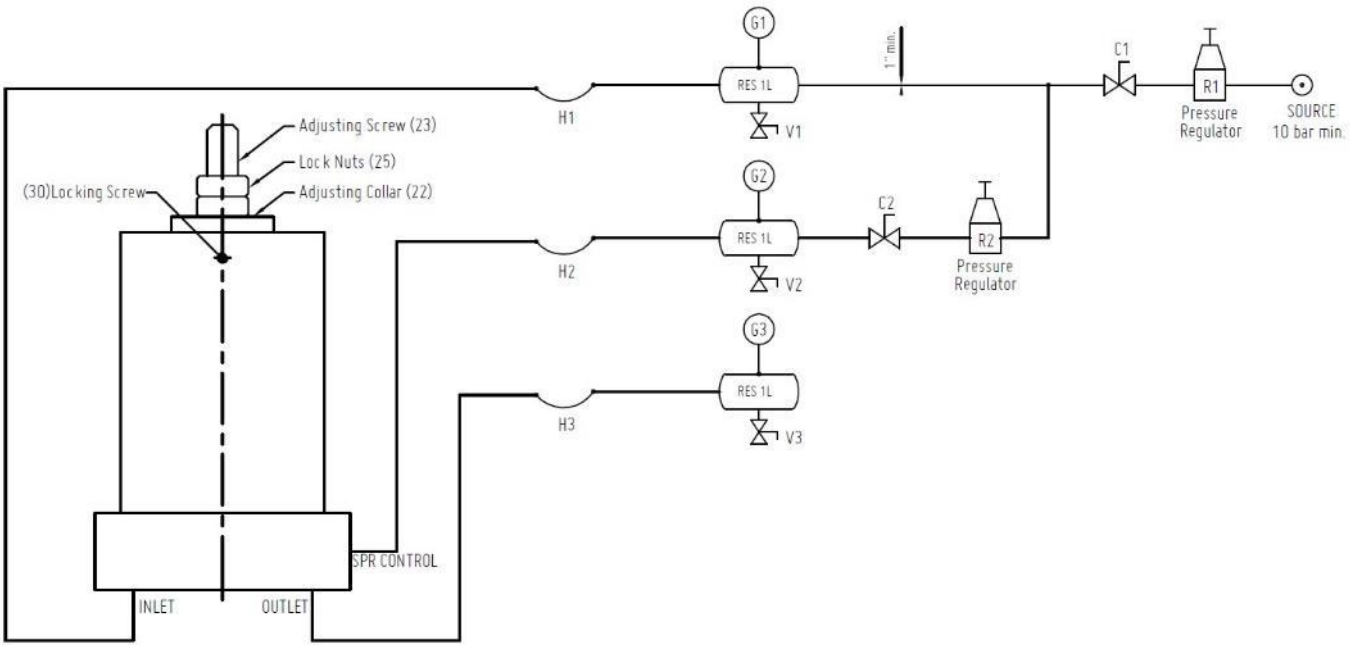

Figure 5 - Test diagram of Variable Pressure Regulator

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6.1.3 TESTING ON TEST RIG

This test can be performed as per test specification in below table

SL. NO.	PRODUCT P/N	TEST SPECIFICATION
1	AB697-W31/T54	AB697-W31T54-E00STS
2	AB697-W31/T55	
3	AB697-W31/T56	AB697-W31T56-E00STS
4	AB697-W31/T57	
5	FT0053765-100	FT0053765-100-E00STS
6	FT0053765-101	
7	FT0053765-102	
8	FT0053765-103	
9	FT0053765-104	
10	FT0053765-105	
11	FT0053765-106	
12	FT0053765-107	
13	FT0053765-108	
14	FT0053765-109	
15	FT0053765-110	
16	FT0053765-111	
17	FT0053765-112	
18	FT0053765-113	
19	FT0053765-114	
20	FT0053765-115	
21	FT0053765-116	

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6.2 FILTER REPLACEMENT

6.2.1 SPARE PART LIST

- Routine Maintenance - Spare parts required for routine maintenance are:

Refer to Figure 6

INSTALLATION SPARE PARTS LIST			
ITEM NO.	**DESCRIPTION**	**PART NUMBER**	**QTY**
3	O-RING	0015-6A	2
4	FILTER	AB578-37A	1
5	O-RING	0015-36A	1

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

6.2.2 REMOVAL PROCEDURE FOR FILTER REPLACEMENT

Refer to Figure 6

Generic risk

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Pressurised vessel

CAUTION! Pressurised system! Discharge the pressure before removal

1. Open the brake panel front cover to access the Variable pressure regulator (6).

Generic risk

CAUTION: Remove only bolts with “X” stamped mark next to them.

2. Remove the Variable Pressure Regulator (6) by using 17mm spanner from the host panel by removing the parts that follows:
   - Two bolts (1) identified by the “X” stamped next to them.
   - Two lock washers (2).
3. Remove and **DISCARD** the filter (4), two O-rings (3), and the O-ring (5).

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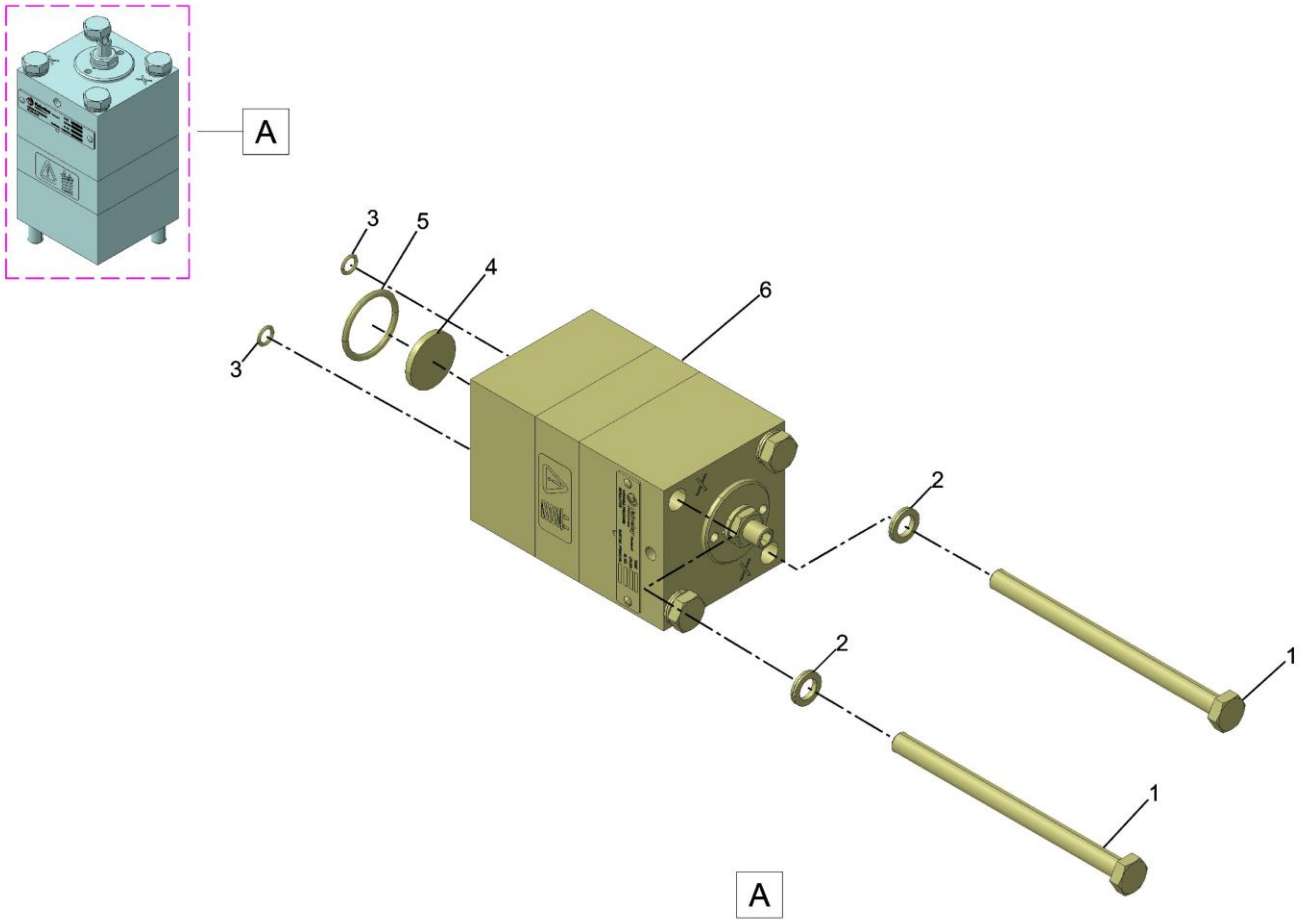

Figure 6 - Variable Pressure Regulator, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	HEX HD BOLT M10	FT0051564-007	2
2	NORDLOCK WASHER DIA 10	FT0020809-004	2
3	O-RING	0015-6A	2
4	FILTER	AB578-37A	1
5	O-RING	0015-36A	1
6	VARIABLE PRESSURE REGULATOR	Refer Table 1	1

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6.2.3 INSTALLATION PROCEDURES FOR FILTER REPLACEMENT

Refer to Figure 6

1. Smear Molykote M33 grease to the two **NEW** O-rings (3) using brush.
2. Smear Molykote M33 grease to the O-ring seating area on the bottom side of the Variable Pressure Regulator (6).
3. Install the lubricated two O-rings (3) into the groove of the Variable Pressure Regulator (6).
4. Place the **NEW** filter (4) into the inner diameter on the centre of the bottom side on the Variable Pressure Regulator (6).
5. Smear Molykote M33 grease to the **NEW** O-ring (5).
6. Insert the O-ring (5) to the bottom side of the Variable Pressure Regulator (6).
7. Apply Loctite 242 or 243 on the threads of the bolts (1).
8. Locate the Variable Pressure Regulator (6) on brake panel such that the inlet, delivery and pilot ports of Variable Pressure Regulator (6) are matched with the Brake panel ports.
9. Install the Variable Pressure Regulator (6) to the host panel with the parts that follow:
   - Two bolts (1) **identified by the "X" stamped** next to them, by using 17mm spanner.
   - Two lock washers (2)
10. Torque the two bolts (1) to 27.3 Nm. Apply torque mark using stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

11. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
12. Close and secure the brake panel front cover.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the laws in force in the country where the component is used.

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04.39_AVERAGING RELAY VALVE

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/// AB587-T6-E00MUM

AVERAGING RELAY VALVE
AB587-T6

Maintenance/Use manual

ECO: DRC 1659
Compiled: VP
Checked: .KMS
Approved: .BSH

Date: 02/11/2021 - Revision: B00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	06/06/2015	NEW RELEASE	.	SRC	.MK	.VC
B00	02/11/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Averaging Relay Valve takes two air signals from the suspension (either bogie) at each end of the vehicle and feeds out an air signal, which is the average of the two input signals.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

- The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer’s prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE “PED”)

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

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- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:
- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:
- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

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1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 FUNCTIONAL CHECK/SYSTEM CALIBRATION

Depending on the type of component that is replaced, a common functional check can be sufficient or more complex operations may be required: calibrations of other equipment, drainage, topping-up, etc. The procedure to be carried out is prescribed in the product-relevant maintenance documentation.

1.3.10 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between -10°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to +40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Averaging Relay Valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable for 36 months from supply or 24 months from date of revenue service.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Averaging Relay Valve and speaks about the Operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for Operational and maintenance of the Averaging Relay Valve P/N AB587-T6 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Full Name
Assy	Assembly
HD	Head
HEX	Hexagonal
Nm	Newton metre
P/N	Part Number
QTY	Quantity
SOC	Socket

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Averaging Relay Valve takes two air signals from the suspension (either bogie) at each end of the vehicle and feeds out an air signal, which is the average of the two input signals. The air supply for the output signal is taken from the higher of the two input signals. The valve is directly mounted on the brake panel.

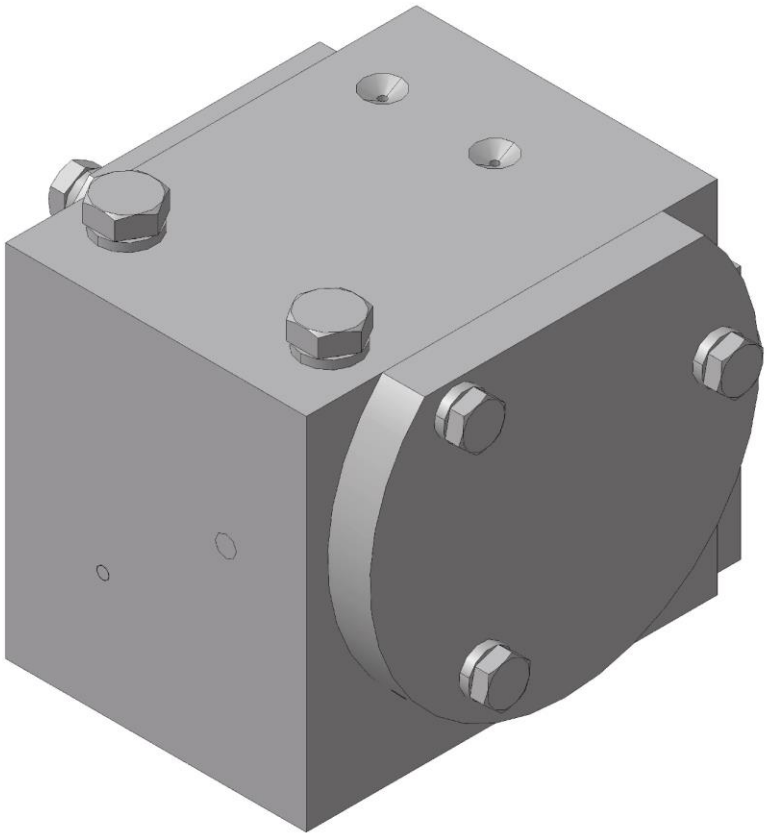

Figure 1a - Averaging Relay Valve, Isometric view

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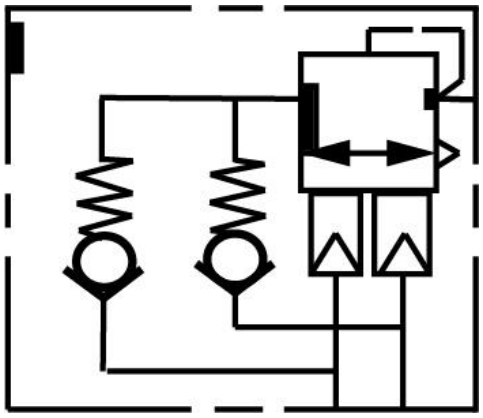

Figure 1b - CETOP Symbol

2.2 TECHNICAL DATA OF THE EQUIPMENT

- Max service pressure: .....10 bar
- Working pressure range: .....0-10 bar
- Tolerance on averaged output pressure: .....± 0.15 bar
- Mass: …….....1.75 kg

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/// 3.OPERATIONS

3.1 WORKING CONDITION

- Outlet averaging pressure is equal to inlet averaging pressure

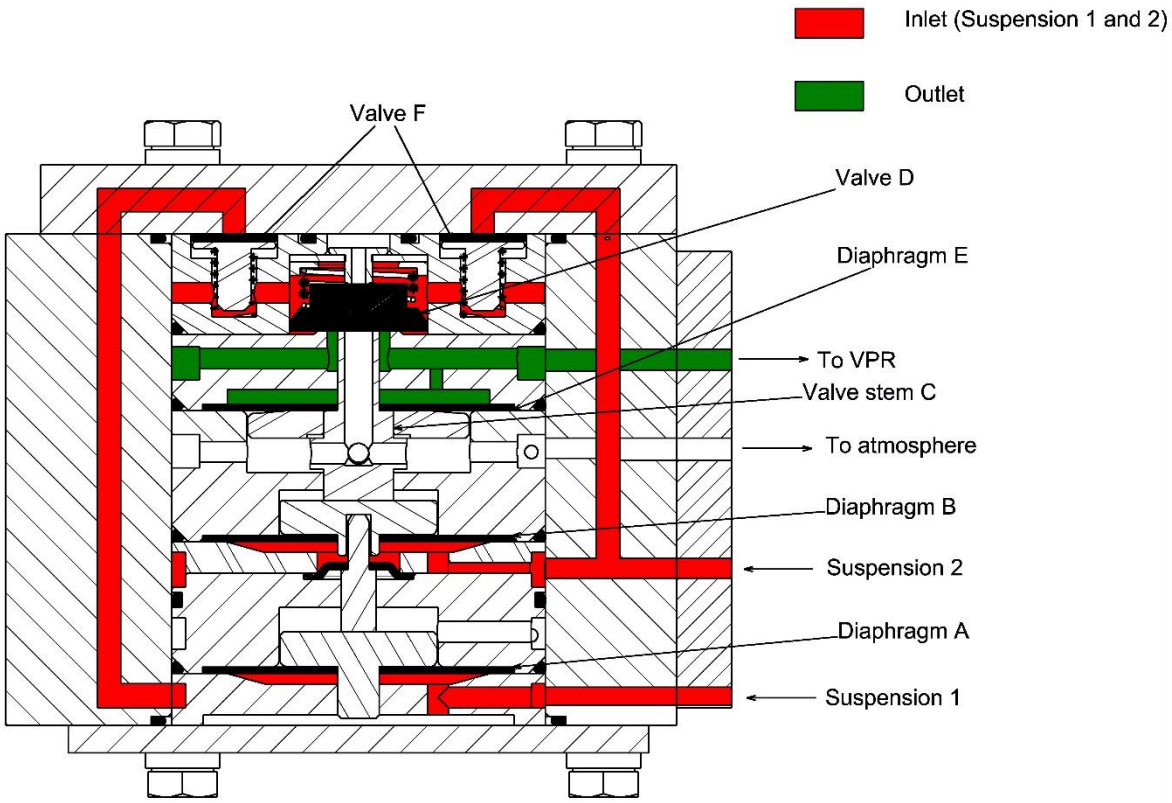

Figure 2a - Averaging Relay Valve, Working Condition (1 of 2)

Refer to Figure 2a

The Averaging Relay valve is used to provide a signal proportional to the average of the two suspension unit pressures. The air pressure from one suspension unit acts on diaphragm A and that from the other unit on diaphragm B. valve stem C, therefore, receives a force on it proportional to the sum of the two suspension unit pressures. This force causes valve D to open, allowing air to flow from the double check valve F to the Variable Pressure Regulator (VPR). This output pressure also acts on the right hand side of diaphragm E providing a balancing force on the valve stem. The effective area of diaphragm E is arranged to be equal to the combined area of diaphragms A and B. Thus, as soon as the output pressure acting on diaphragm E becomes equal to the average of the pressures acting on diaphragms A and B, the valve stem C moves to the left, valve D re-seats, and prevents any further increase in output air pressure.

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- Outlet averaging pressure is higher than inlet averaging pressure:

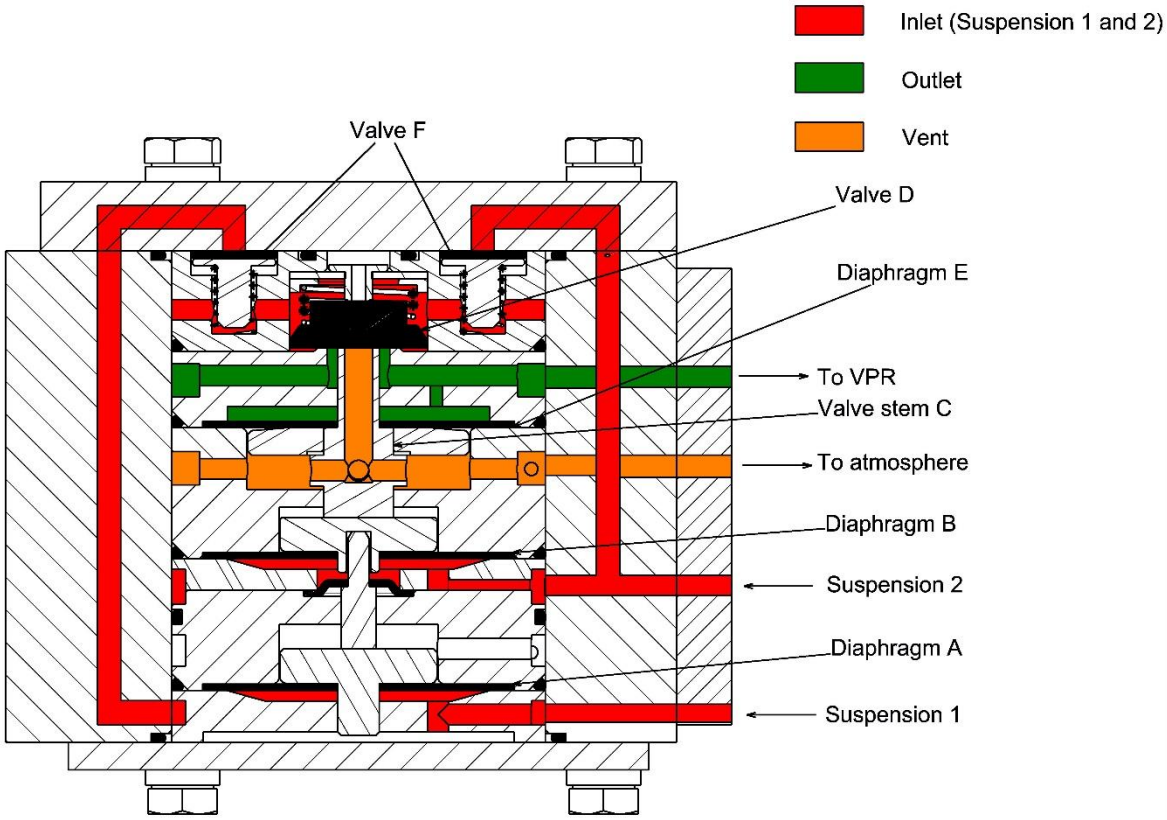

Figure 2b - Averaging Relay Valve, Working Condition (2 of 2)

Refer to Figure 2b

If the pressure in either of the suspension units falls, valve stem C moves further to the left, unseats itself from valve D and allows the air pressure in the output chamber to escape to atmosphere, via the hollow valve stem C, until a balance is again achieved. double check valve F is provided to ensure that the output air supply to the Variable Pressure Regulator is taken from the higher of the pressures in the two suspension units.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS AND SPECIAL TOOLS

Name	Application
13mm socket wrench	Tighten/loosen the fasteners
Torque wrench 5-35 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

Name	Application
Loctite 242 or 243	Thread locker
Molykote M33 or M55	Lubricant for O-rings
Stylmark paint	Torque marker

/// 5.MAINTENANCE

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.

2. Second Level Maintenance: Overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be overhauled regularly as required by the operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn't require any light maintenance.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

Refer to Figure 3

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. Bogie suspension Isolating cocks to be closed and suspension pressure to be drained before removal of the valve.

IMPORTANT! For the disposal of parts replaced during removal procedure (e.g. seals, etc.), follow the rules in force at the End-user premises and the law in force in the Country where the component is used.

1. Open the brake panel front cover to access the Averaging Relay Valve (3).
2. Unscrew the two screws (1) using 13mm socket wrench to remove the two screws (1) and the two washers (2) to remove the Averaging Relay Valve (3) from the brake panel.
3. Remove and **DISCARD** the three O-rings (4).

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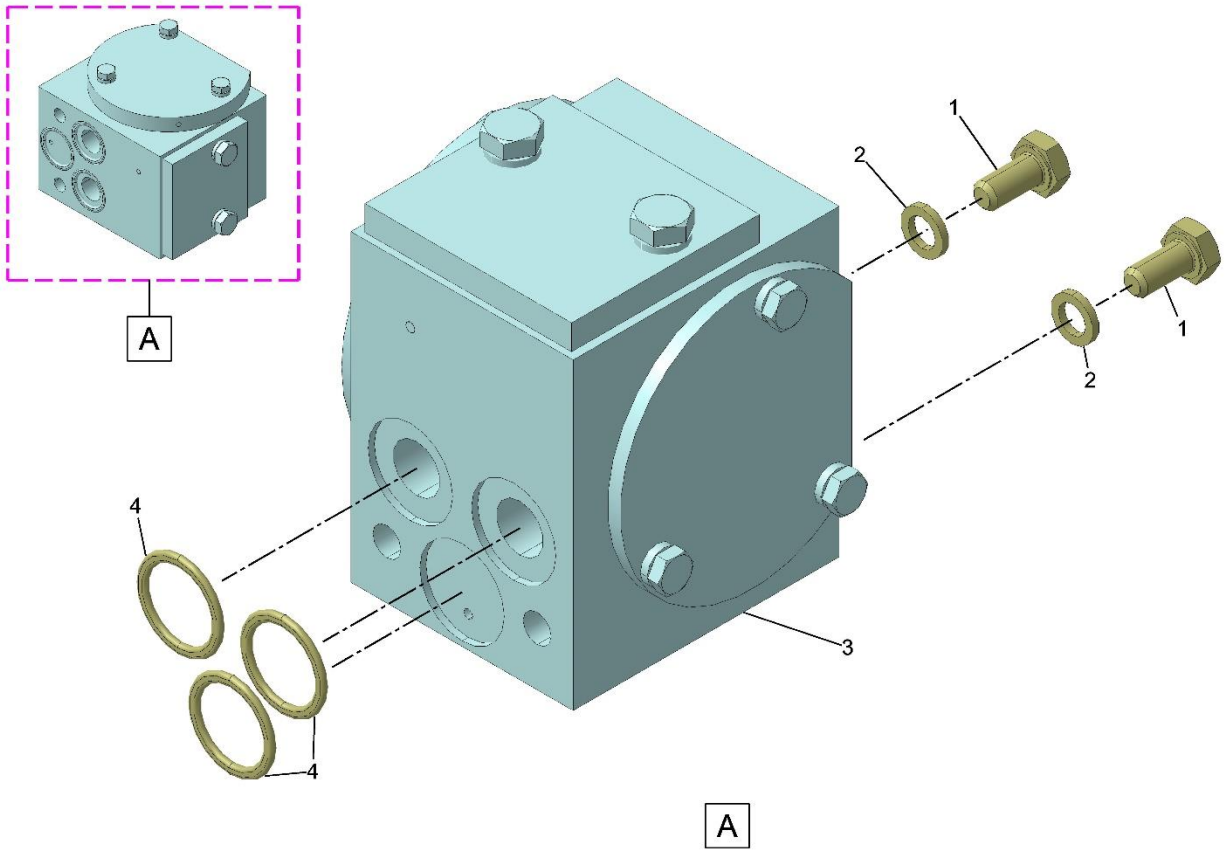

Figure 3 - Averaging Relay Valve, Removal/Installation

ITEM NO.	DESCRIPTION	PART NO.	QTY
1	HEX HD BOLT M8	FT0051564-008	2
2	WASHER DIA 8	FT0020809-001	2
3	AVERAGING RELAY VALVE	AB587-T6	1
4	O-RING	0015-30A	3

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Smear the three **NEW** O-rings (4) with the Molykote M33 grease.
2. Place the O-ring (4) on the bottom face of the valve assembly.
3. Apply the Loctite 242 on the threads of the two bolts (1).
4. Install the valve assembly (3) onto the brake panel and secure with the parts that follow using 13mm spanner:
   - Two hexagonal bolts (1);
   - Two washers (2).
5. Torque the two bolts (1) to 21 Nm.
6. Apply torque mark on the bolt head using stylmark paint.

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NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
8. Close and secure the brake panel front cover.

/// 6.SPARE PART LIST

- Routine Maintenance - Spare parts not required.
- Installation - the spare parts required for installation are listed in the below table:

Refer to Figure 3

INSTALLATION SPARE PARTS LIST			
ITEM NO.	**DESCRIPTION**	**PART NUMBER**	**QTY**
4	O-RING	0015-30A	3

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the law in force in the Country where the component is used.

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05.09_CHARGING CHECK VALVE 7,8 bar SET

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/// AB746-W20-E00MUM

CHARGING CHECK VALVE
AB746-W20
FT0055821-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	KJ Design Engineer, Engineering		26/12/2023
Checked:	.NRS Systems Engineer, Engineering		26/12/2023
Approved:	.BSH Manager, Engineering		26/12/2023
Expert:	KMS Name / Title, Group		26/12/2023
Customer acceptance:	 Position, Railroad Name		

Filename:	Revision:	Status:
AB746-W20-E00MUM.docx	C00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	06/06/2016	NEW RELEASE	.	SRC	.MK	.VC
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1659	VP	.KMS	.BSH
C00	26/12/2023	1. Document updated with new template. 2. Added new part number: FT0055821-100 3. Updated sections: 2.2 and 5.3.	DRC1751 /4	KJ	.NRS	.BSH
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The charging check valve is used to stop the air flow to the vehicle (suspension) levelling valves until the supply pressure for brake system has reached a preset value.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the operator or by the authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. Real operating conditions, available tools, skill of personnel, etc.) Must be taken into due account when carrying out the operations.

Furthermore, the operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

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- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

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1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature -10°C to +70°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

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1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, refer section 5.2.1 for test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section /// 5. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +0°C and +40°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from -10°C to +40°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from 0°C to 25°C during 3 months maximum and also, in summer from +25°C to +50°C during 3 months maximum).

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- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Charging check valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on charging check valve and speaks about the operational procedures, and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the charging check valve for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Full Name
Approx	Approximate
DIA	Diameter
ISO	International Organization for Standardization
HD	Head
HEX	Hexagonal
Kg	Kilogram
Nm	Newton metre
P/N	Part number
QTY	Quantity
UV	Ultraviolet

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/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The charging check valve is used to stop the air flow to the vehicle (suspension) levelling valves until the supply pressure for brake system has reached a preset value. A vent to atmosphere is provided on the outlet to prevent a build-up of air pressure affecting the operating values. The valve is directly mounted on the brake panel.

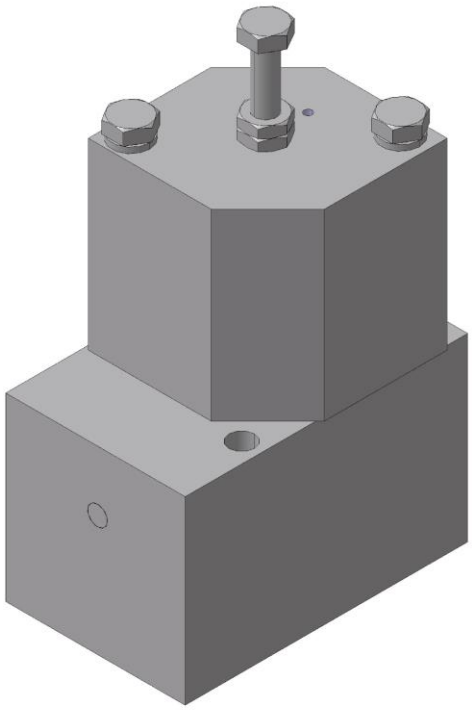

Figure 1: Charging Check Valve, Isometric View

Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	NOMINAL DIAMETER	SETTING PRESSURE	
		RISING	FALLING
AB746-W20	6 mm	7.8 to 8.1 bar	6.8 to 7.1 bar
FT0055821-100		4.2 to 4.5 bar	3.5 to 3.8 bar

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/// 3. OPERATIONS

3.1 CHARGING CONDITION

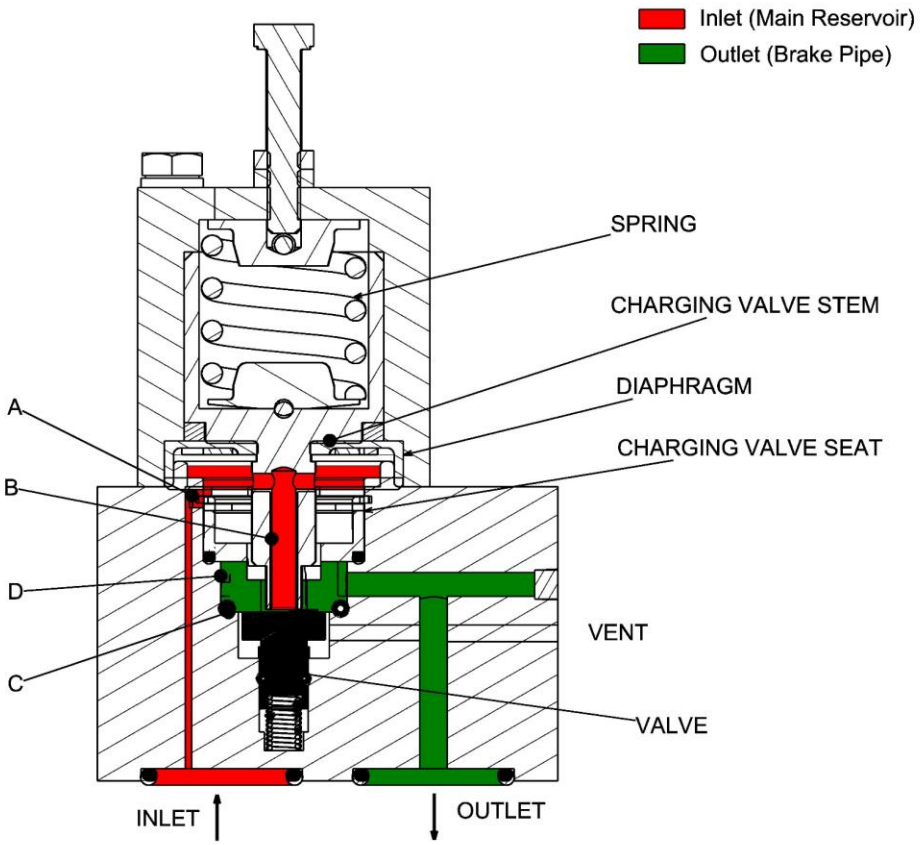

Figure 3: Charging Check Valve, Charging Condition

Refer to Figure 3

The inlet port is connected to chamber A and the inlet air pressure acts upwards on the diaphragm which is supported by the charging valve stem. Chamber A is always connected to chamber B which is sealed off from chamber C by the valve seat, formed on the extension of the charging valve stem, in contact with the valve stem assembly. Chamber C is connected to chamber D by the space between the charging valve stem and the charging valve seat and is permanently vented to atmosphere.

As the inlet pressure rises the state remains constant until the air pressure equals the downward force exerted by the spring, a further pressure increase causes the charging valve stem to rise and the valve stem assembly follows it upwards until the valve stem assembly makes contact with the charging valve seat. This blocks the connection between chamber C and D so that chamber D is no longer vented to atmosphere and as the charging valve stem rises further chamber B is connected to chamber D allowing a free flow of air from inlet to outlet

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3.2 RELEASE CONDITION

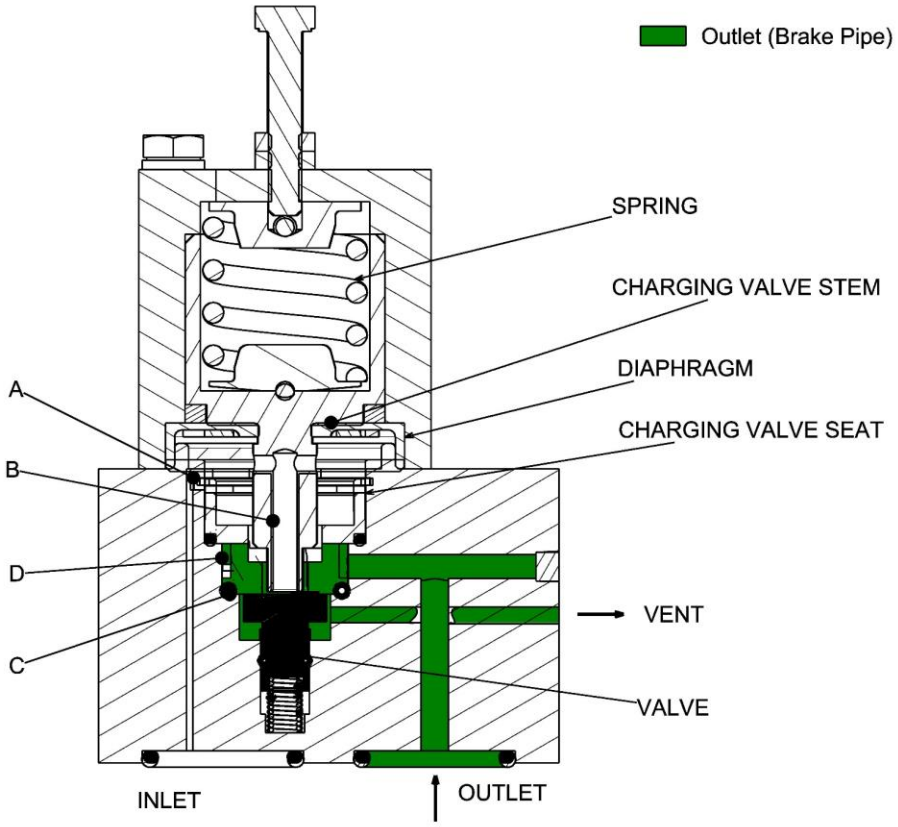

Figure 4: Charging Check Valve, Release Condition

Refer to Figure 4

When air pressure falls, the valve operation reverses, first blocking the connection between chambers B and D, then opening the connections D to C thus venting the outlet pipe to atmosphere. The operating pressures can be set by adjusting the regulating screw which controls the tension of the spring.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
13mm spanner	Tighten/loosen the fastener

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote M33/M55 grease	Lubricant for parts
Loctite 242/243	Thread locking
Stylmark	Torque marker

/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be checked regularly as required by the Operator's rules; the mission profile and the environmental conditions.
   Pressure setting test - Typical periodicity: 1 year. (Refer to section 5.2.1)

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the Operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 5 years.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 SETTING TEST

Refer to Figure 5

The setting of the reducing valves can be checked by measuring the pressure at the test point 05.03/01 or appropriate test point in brake panel. If no test point is provided, other measurement methods must be followed, possibly by removing the valve and checking it on a test rig.

In case the setting needs to be adjusted, release the locknuts (2) and turn the adjusting screw in anti-clock wise or clock wise direction (1) as necessary. When the desired setting is achieved, secure the setting by tightening the lock nuts (2).

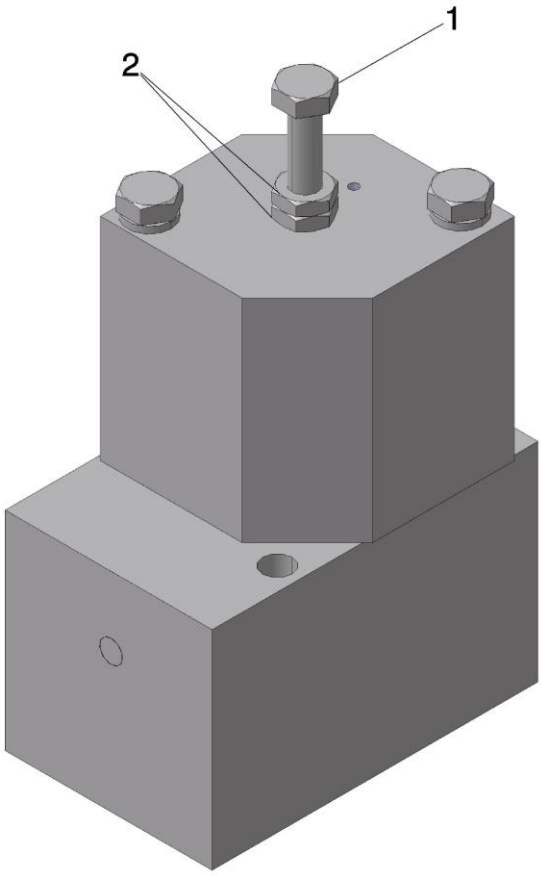

Figure 5: Charging Check Valve, Setting pressure

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5.3 REMOVAL PROCEDURE OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch off power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

Refer to Figure 6

1. Open the brake panel front cover to access the charging check valve (1).
2. Remove the parts that follow that attach the valve assembly (1) to the brake panel using 13mm spanner:
   - Two hexagonal head bolts (2).
   - Two washers (3).
3. Remove and **DISCARD** the O-rings (4).

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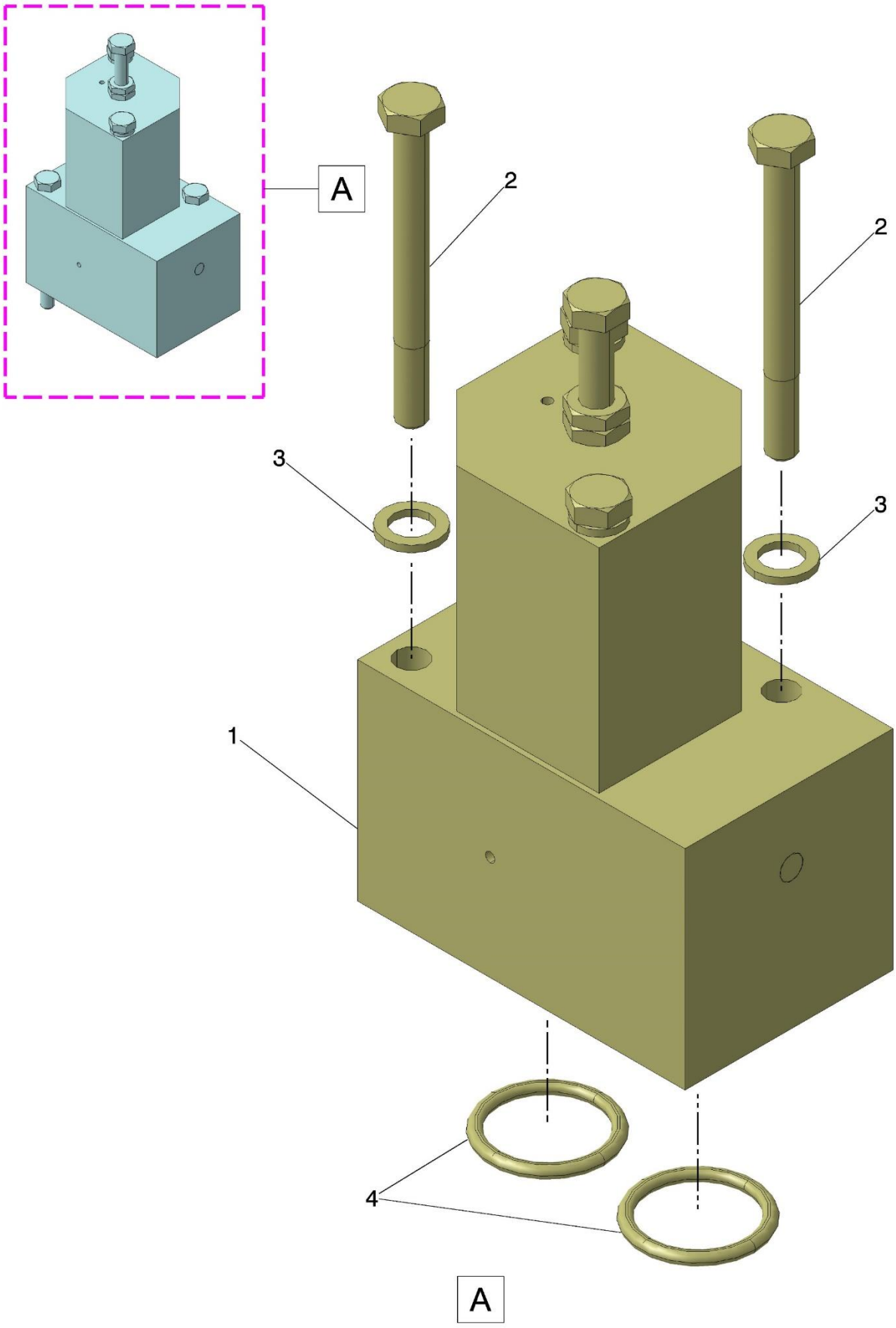

Figure 6: Charging Check Valve, Removal and Installation

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	VALVE ASSEMBLY	REFER BELOW TABLE	1
2	HEX SOC HD CAP SCREW M8X80	FT0051943-021	2
3	WASHER DIA 8	FT0020809-001	2
4	O-RING	003703500A	2

ITEM NO.	PART NUMBER
1	AB746-W20-BFX
	FT0055821-100

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 6

1. Smear the two **NEW** O-rings (4) with Molykote M33 grease.
2. Place the O-ring (4) on the bottom face of the valve assembly (1).
3. Apply Loctite 242 to the threads of the two bolts (2).
4. Install the valve assembly (1) onto the brake panel and secure with the parts that follow using 13mm spanner:
   - Two hexagonal bolts (2).
   - Two washers (3).
5. Torque the two bolts (2) to 21 Nm.
6. Apply torque mark on the bolt head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.
8. Close and secure the brake panel front cover.

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/// 6. SPARE PART LIST

- Routine Maintenance – Not required.

Refer to Figure 6

- Installation: The spare parts required for installation are:

INSTALLATION SPARE PARTS			
REF NO.	DESCRIPTION	PART NUMBER	QTY
4	O-RING	003703500A	2

NOTE:

- For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, stainless steel, rubber, brass, etc. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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/// FT0051763-100-E00MUM

SAFETY VALVE
(3/4” BSP)
024 0010 00; 024 0010 00; 24003600; FT0052383-100
(1/4” BSP)
024 0030 00; 024 0031 00; 024 0032 00
24003500; 24004000;
FT0053157-100; FT0051763-100

Maintenance/Use manual

ECO: DRC 1661
Compiled: VP
Checked: .JP
Approved: .AE

Date: 10/08/2021 - Revision: B00
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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	30/12/2015	NEW RELEASE	.	SRC	.JP	.AE
B00	10/08/2021	Document updated with detailed maintenance procedures and illustrated views using global template.	DRC 1661	VP	.JP	.AE
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

Safety valves protect the air system against air pressure increasing above the normal working range by opening to release the compressed air.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing any operations ensure that the adjacent moving parts (compressors, fans, actuators, etc.) should not be in operating condition.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

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1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 6 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C and +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Safety Valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Safety Valve and speaks about the operational procedures, customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Safety Valve for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
BSP	British Standard Pipe
Kg	kilogram
mm	millimetre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

Safety valves are connected directly to the main reservoir and protect the air system against air pressure increasing above the normal working range by opening to release the compressed air. The valves have a large capacity sufficient to pass the volume of air delivered by compressors and are of the ‘pop’ action type.

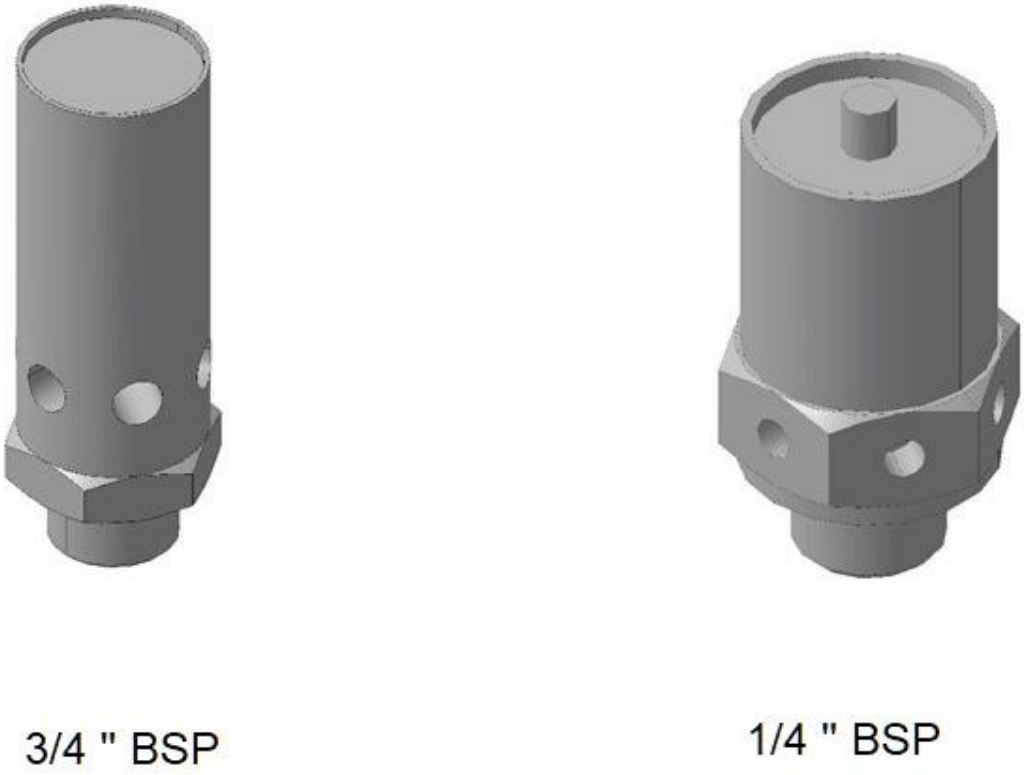

Figure 1a – Safety Valve, Isometric View

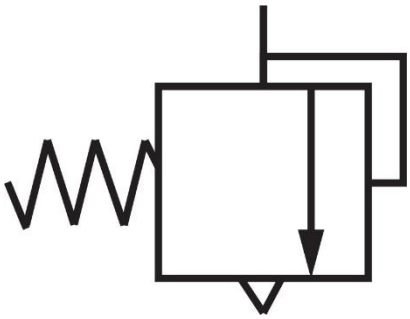

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	Setting (X) bar	Start to blow		"POP out" fully open (1.1 X)	Reset (0.9 X)	Connection
		Min	Max			
FT0054556-100	11.5	11.2	11.8	12.65	10.35	3/4” BSP
024 0010 00	10.7	10.4	11	11.77	9.63	3/4” BSP
024 0030 00	8.5	8.05	8.65	9.185	7.515	1/4” BSP
024 0031 00	3.6	3.3	3.9	3.96	3.24	1/4” BSP
024 0032 00	12.5	12.2	12.8	13.75	11.25	1/4” BSP
024003500	11	10.7	11.3	12.1	9.9	1/4” BSP
024003600	10.5	10.2	10.8	11.55	9.45	3/4” BSP
024004000	9	8.7	9.3	9.9	8.1	1/4” BSP
FT0052383-100	11.0	10.7	11.3	12.1	9.9	3/4” BSP
FT0053157-100	8.8	8.5	9.1	9.68	7.92	3/4” BSP
FT0051763-100	10.5	10.2	10.8	11.55	9.45	3/4” BSP

/// 3.OPERATIONS

The safety valve consists of a single valve located within a tubular housing. The pressure at which the valve opens is stamped on the housing and is controlled by the spring pressure. The cover/nameplate is wired in position so that the valve setting remains undisturbed.

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3.1 PRESSURE BUILD UP

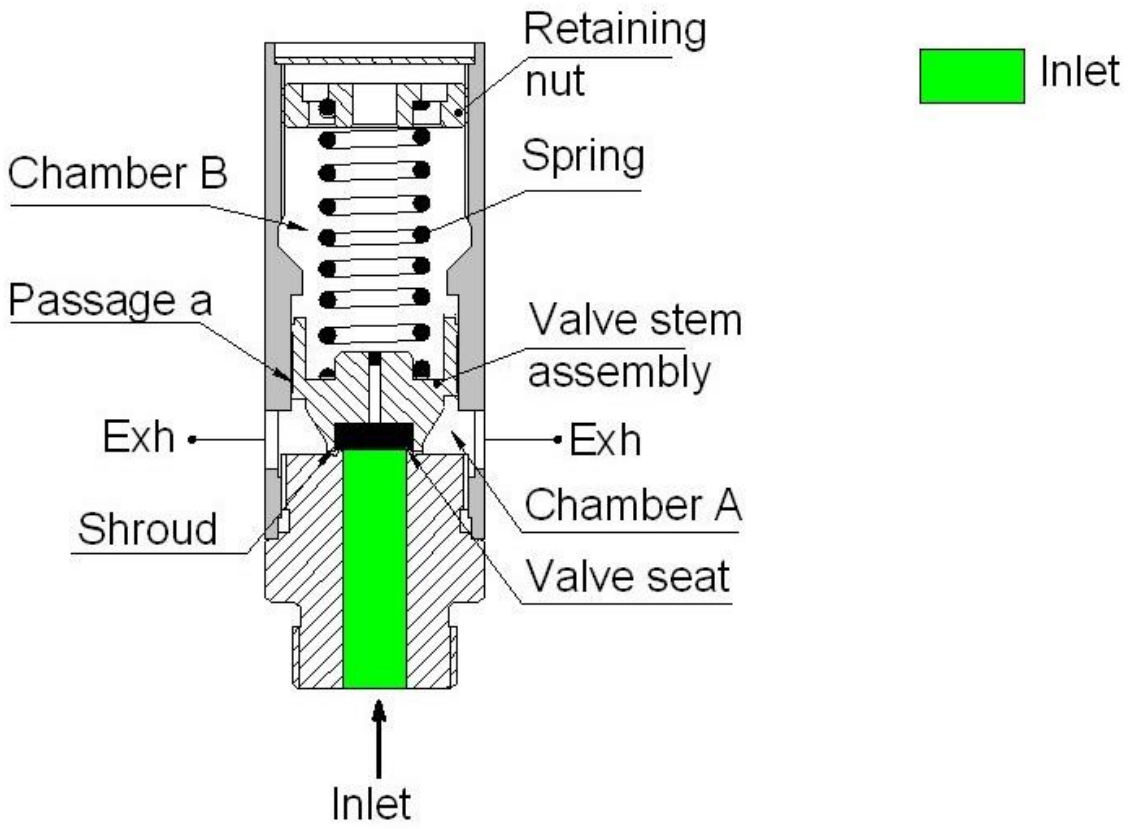

Figure 2a – Safety Valve, Pressure Build Up

Refer to Figure 2a

Compressed air charges into Safety valve Inlet port where pressurised air is held by sealed Valve stem assembly, isolating it from Chamber ‘A’ and hence from atmosphere. The pressure builds up continuously under the Valve seat until the upward force exerted by the pressure on the Valve Stem assembly overcomes the downward force on the Valve stem assembly by the Spring.

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3.2 START TO BLOW

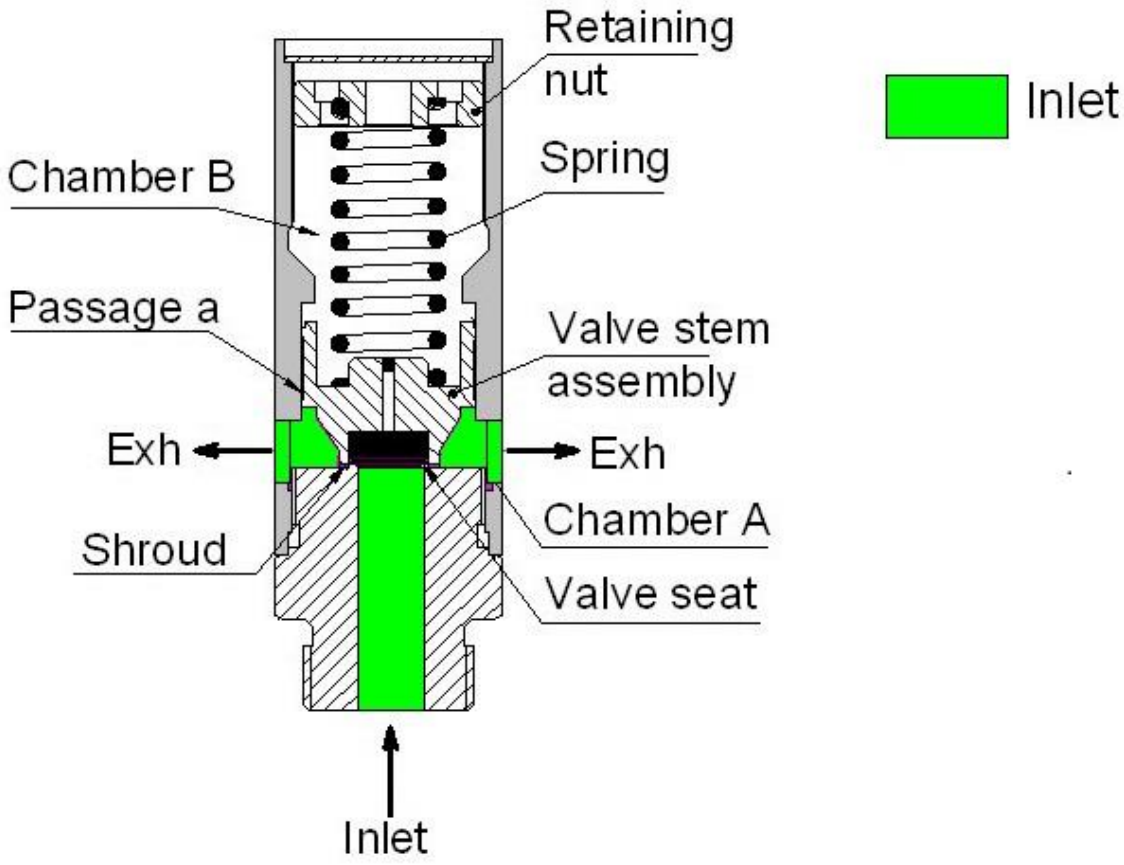

Figure 2b – Safety Valve, Start to Blow

Refer to Figure 2b

When the upward force is more than the downward force, the Valve stem assembly is lifted off its seat compressing the Spring.

In this condition Compressed air escapes into the annular gap inside the Shroud and starts leaking away. This leaking condition is called Start to Blow. Since the annular gap inside the Shroud is not adequate for a heavy discharge of air, pressure still builds up under the lifted Valve stem assembly inside the Shroud, causing the Valve stem assembly to lift further up creating a larger flow passage for air to escape into Chamber 'A'.

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3.3 POP OUT

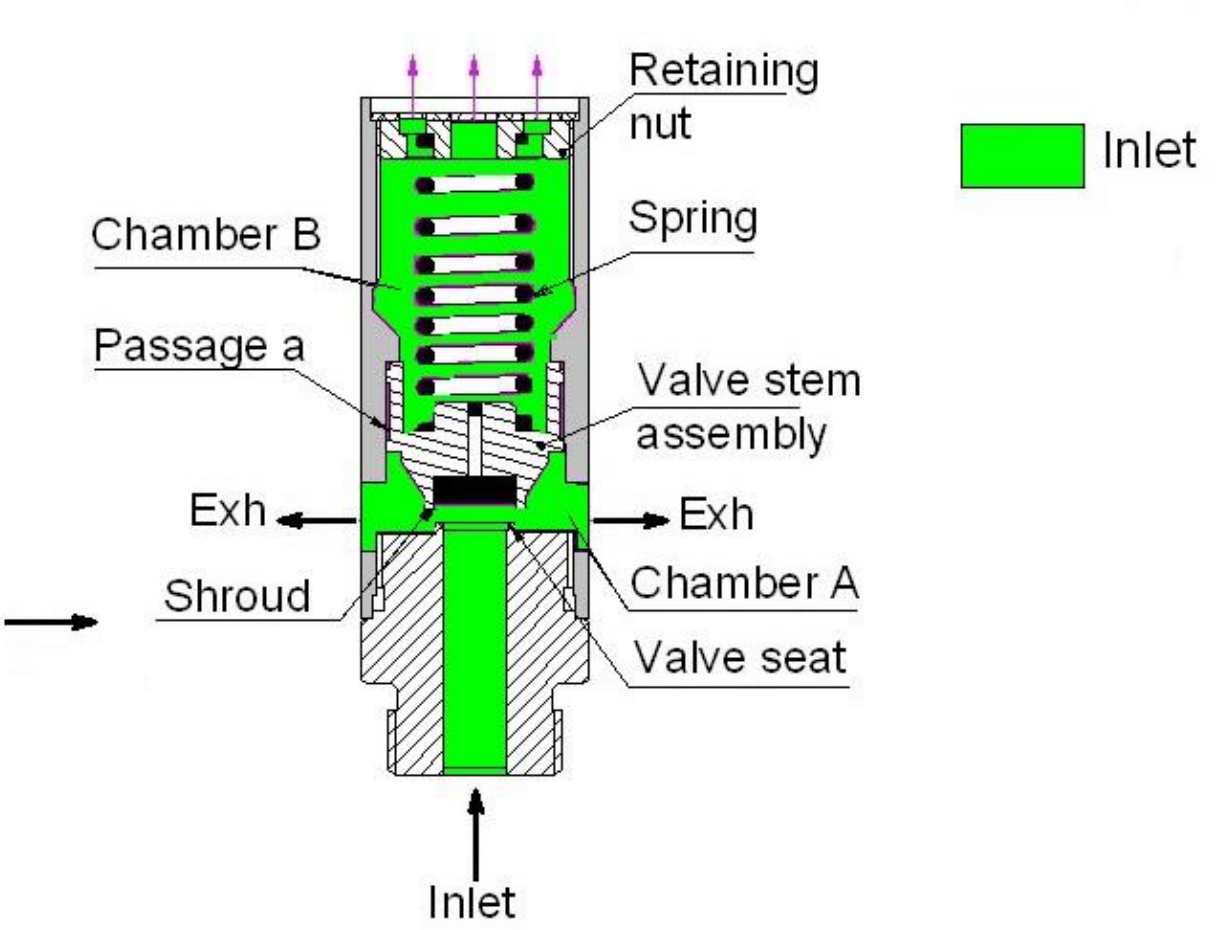

Figure 2c – Safety Valve, POP out

Refer to Figure 2c

When air occupies a larger area under the Valve stem assembly, the upward force due to air pressure at the same POP out setting will be more than the downward force exerted by the Spring which was set to a particular blow off pressure. Hence the Valve stem assembly is lifted further up to its maximum travel increasing the flow area to more than the Inlet area. This sudden exposure to a larger area causes a very rapid discharge of compressed air to atmosphere through Chamber 'A' in such a way that there is an instant pressure drop in Inlet port to below the blow off pressure.

While escaping to atmosphere, pressure also escapes into Chamber 'B' on top of the Valve stem assembly and builds up some downward force which will aid the Spring force in reseating the valve when the Inlet pressure has dropped down to less than the preset blow off limits.

Once the Valve stem assembly is reseated, the pressure in the Chambers 'A' & 'B' escape to atmosphere allowing the Inlet pressure to build up normally.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
24 - 35 mm spanner	Tighten/loosen the safety valve

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Molykote supergliss or WD-40	Lubricant for parts
Loctite 270	Thread locking

/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): **Functional test** as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions.
   Typical check periodicity: 1 year. Refer to section 5.2.1.

2. Second Level Maintenance: Replacement as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be replaced regularly as required by the Operator's rules; the mission profile and the environmental conditions.
   Typical replacement periodicity: 6 years

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL TEST

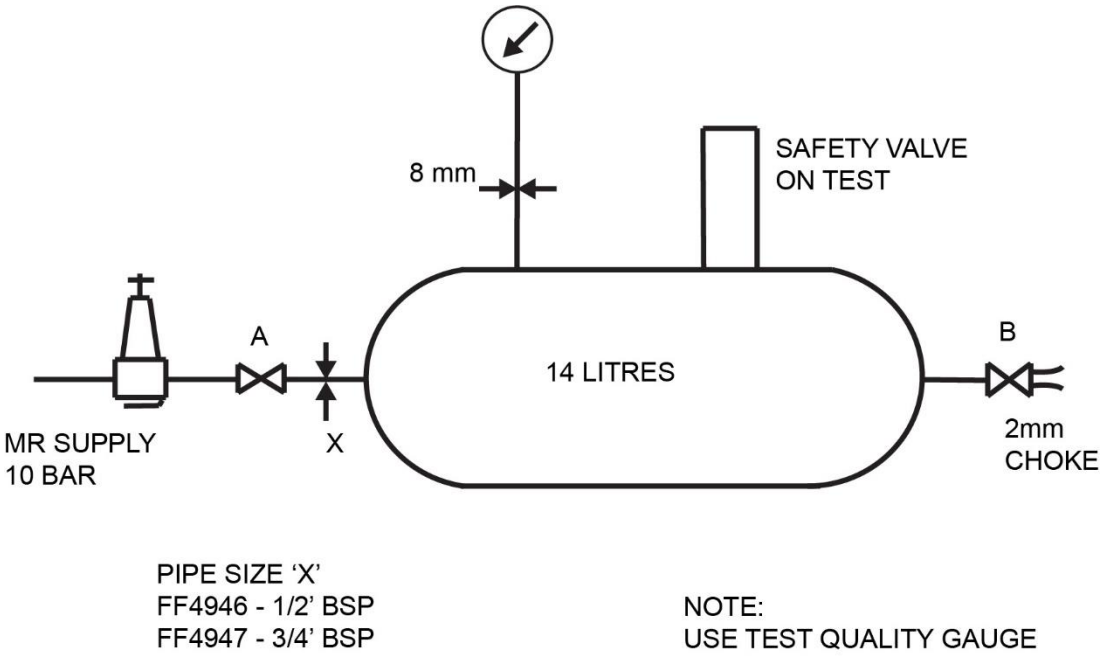

Figure 3 – Safety Valve, Test Bench

Refer to Figure 3

1. Screw safety valve into the reservoir and make pipe connections as shown above. Start test with all isolating cocks closed and the regulator wound fully off.
2. Open isolating cock A slowly, to allow a gradual build-up of pressure in the reservoir and gauge to rise accordingly. Record the pressure at which the safety valve commences to blow. This must be the 'set' pressure of the valve. A tolerance of ± 3% of the 'set' pressure is permissible.
3. Continue building up the pressure in the reservoir. The valve will continue to blow and then 'pop' fully open. The pressure at which the valve 'pops' open must not exceed 1.1 x set pressure.
4. Close isolating cock A. Open isolating cock B sufficiently to drop the reservoir pressure, gauge 1, and when the safety valve stops blowing, i.e. resets, close isolating cock B. Record the 'reset' pressure. This 'reset' pressure must be greater than 0.9 x set pressure.
5. Drain pressure to 0.5 -1.5 kg/cm² below the 'reset' pressure and wind the regulator part way to fully off.
6. Repeat steps 3, 4 and 5 for three times noting the pressure each time.
7. Check valve for leakage with soapy water solution.
8. Open isolating cock B and drain system. Remove valve and seal port to prevent entry of foreign matter.
9. Ensure the sealing wire and seal are in place.
10. In case of anomaly the valve must be replaced.
11. Re-install the valve on the system.

NOTE: Do not tamper with or modify the valve. Faulty valves must be replaced.

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal.

Caution! Take care to avoid ingress of dirt or debris into the system.

Refer to Figure 4

1. Unscrew and remove the safety valve from the valve seat using a 24 - 35 mm spanner.

NOTE: During dismantling, if the safety valve is found jammed or hard to remove, it is recommended to clean the projected threads by using the Molykote supergliss or WD-40 to clean the deposited muddy particles. Despite this precaution, if the metal end of the stud gets loosened, then clean the metal end of the stud and assemble with Loctite 270.

2. Perform the functional test as per section 5.2.1 on the test bench.

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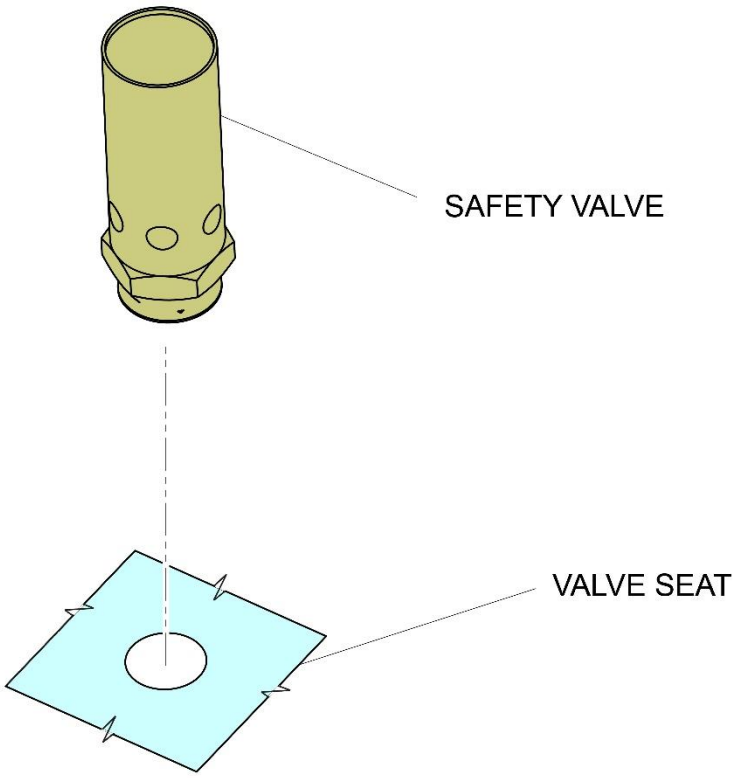

Figure 4 – Safety Valve, Removal/Installation

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 4

1. Clean the seat carefully; make sure no foreign object or dirt enters into the pipe work.

NOTE: In case a new valve is fitted, make sure its setting is correct (verify the setting marked on the body).

2. Screw the safety valve on its seat using a 24 - 35 mm spanner.

NOTE: Safety Valves must not be painted or coated with any substance, which could possibly obstruct or restrict free and full discharge through the valve. Any condition that could lead to blockage of discharge piping or discharge ports on safety valves must be avoided.

/// 6.SPARE PART LIST

- Routine maintenance: The spare parts are not required.
- Installation: The spare parts are not required.

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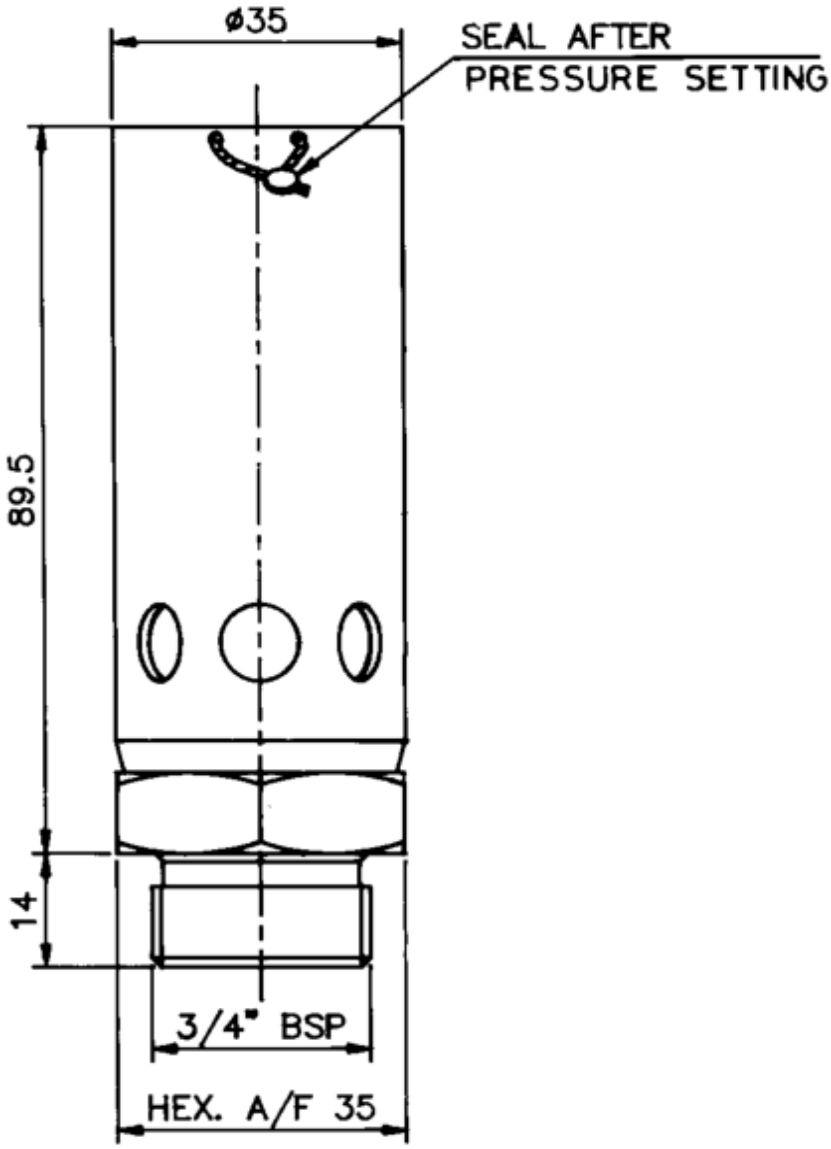
/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, copper, steel, rubber, brass and stainless steel. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

/// 8.OUTLINE DRAWING

Safety Valve – FT0051763-100 and FT0052383-100



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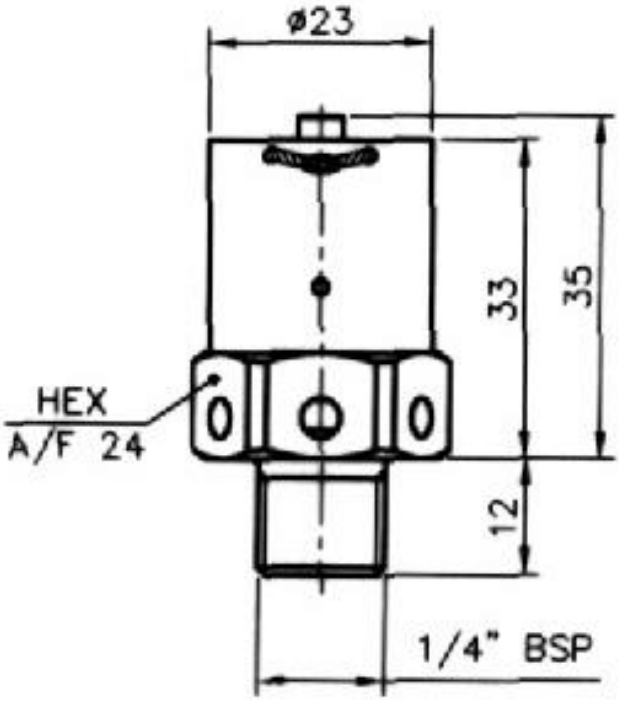
Safety Valve – 024 0030 00



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08.04_13.14_SAFETY VALVE SET

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08.11_AUXILIARY COMPRESSOR BURAN 0

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/// FT0026423-102-E00MUM

COMPRESSOR ASSEMBLY
FT0026423-102

Maintenance/Use manual

ECO: DRC 1661
Compiled: VP
Checked: . JP
Approved: . AE

Date: 10/08/2021 - Revision: A00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1661	VP	.JP	.AE
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The Compressor Assembly is of the "oil-free" type and is used for the production of the compressed air supplied to low flow user systems.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

FAIVELEY TRANSPORT cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

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- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.
- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. FAIVELEY TRANSPORT cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

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1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under sections 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under sections 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 36 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every FAIVELEY TRANSPORT product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Compressor Assembly must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Compressor Assembly and speaks about the operational procedures, bill of material of each component and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Compressor Assembly P/N FT0026423-102 for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
db	decibel
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity
rpm	revolutions per minute

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Compressor Assembly is of the "oil-free" type and is used for the production of the compressed air supplied to low flow user systems as, for example, the pantograph lift unit.

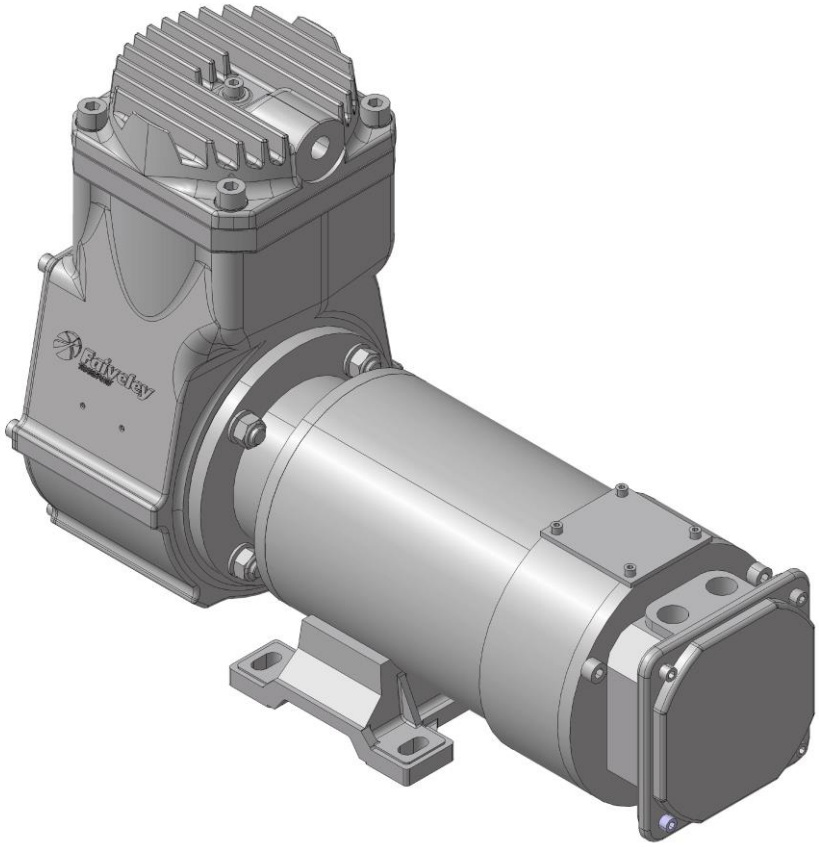

Figure 1a - Compressor Assembly, Isometric View

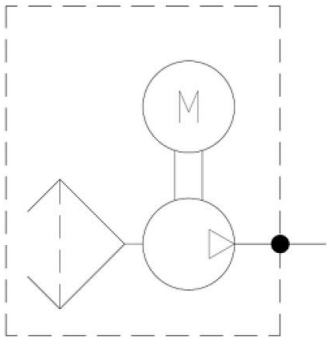

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

- Air delivery at 5 bar .....70 l/min
- Air delivery at 6 bar .....65 l/min
- Nominal pressure PN .....7 bar
- Sound level @ 1 meter.....70 dB(A) Lp
- Shaft power at 6 bar.....700 ± 10% W
- Mass.....16.2 kg
- Voltage.....110 Vdc
- Protection type (motor).....65 IP
- Current consumption at 6 bar.....9 A
- Rotation speed at 6 bar.....2400 ± 10% rpm

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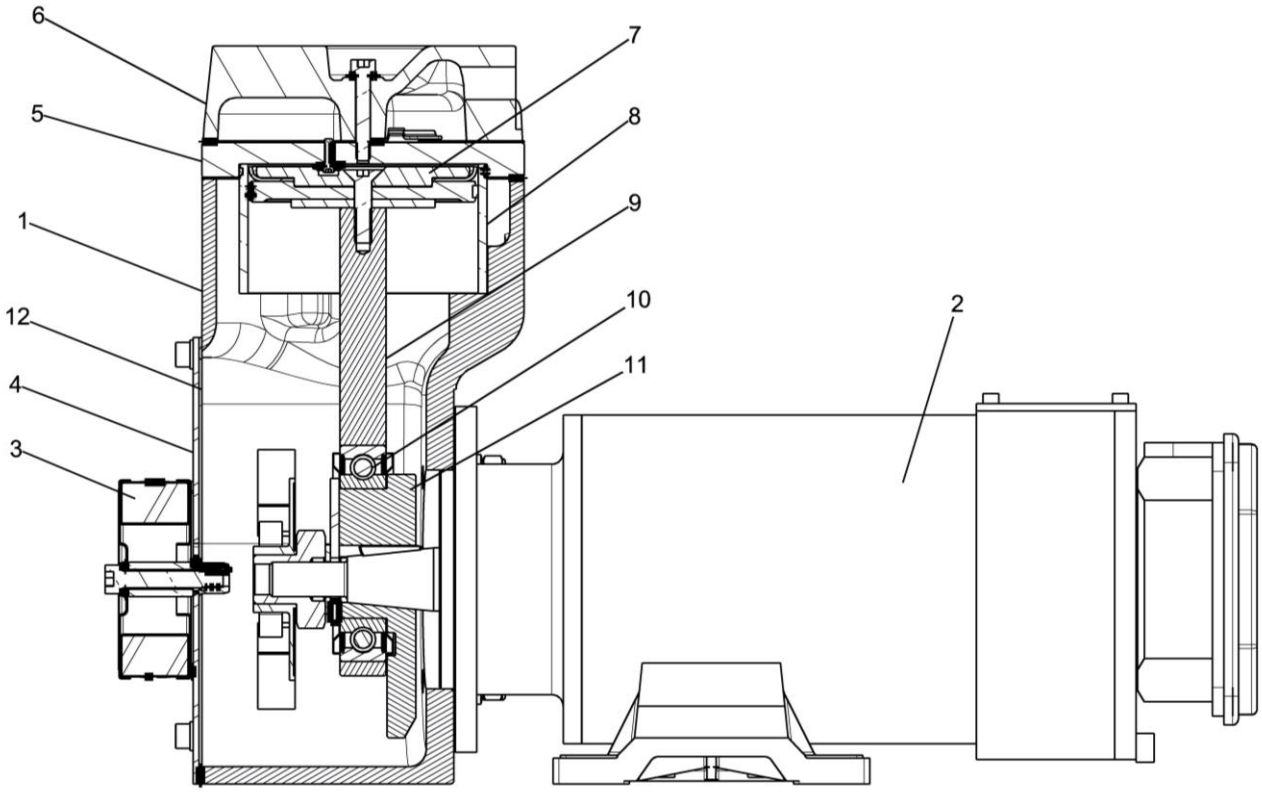
/// 3.OPERATIONS



Ref.	Description	Ref.	Description
1	Main carter	7	Compression piston
2	Electric motor	8	Internal cylinder
3	Air filter	9	Conrod
4	Cover	10	Bearing
5	Valve assembly	11	Eccentric
6	Cylinder head	12	Gasket

Figure 2 - Compressor Assembly, Major Components

Refer to Figure 2

The Compressor Assembly is mainly composed by the following elements:

- an intake air filter (3) to preserve the duration of the compressor. The filter is made by a dry filtering element mounted between two plates and protected by a circular drilled plate on the external side;
- the casted cylinder head (6) fitted of cooling fins and with a threaded outlet air port of 1/4" Gas;
- the compression piston (7) connected with the internal cylinder (8) and mounted on the conrod (9);
- the conrod (9) connected to the shaft of the electric motor by means of an eccentric (11) and a bearing (10), of long-life type, that doesn't require any lubrication;

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- the valve assembly (5) on which are fitted the inlet and outlet reed;
- a main carter (1) assembled on the electric motor (2) and secured by four fixing nuts. The main carter (1) is closed by the cover (4) on which is housed the air filter (3), whose tightness is assured by the gasket (12);
- an electric motor (2) that transmits the movement to the compression piston (7) through the eccentric (11) and the conrod (9). Since there are various voltages available, refer to the technical characteristics as per section 2.2.

The air coming from the atmosphere is aspirated via the intake filter (3) and is compressed by the piston (7) in the internal cylinder (8). The inlet valve cuts off in single flow direction, in this way the compressed air is forced to the delivery port.

/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
4mm allen key	Tighten/loosen the fasteners
5mm allen key	Tighten/loosen the fasteners
13mm socket wrench	Tighten/loosen the fasteners
Nose pliers	Extract the carbon brush

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Dry and fluff-free cloth	Cleaning
Loctite 242/243	Thread locking
Loctite 577	Sealant for pipe fittings

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/// 5.MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be regularly as required by the Operator's rules; the mission profile and the environmental conditions.
   Typical periodicity: As per below table.

Maintenance Level	Interval time	Task	Section
1 LEVEL	6 months	Motor compressor Inspections and cleaning	5.2.1
1 LEVEL	1 year	Air filter replacement	5.2.2
1 LEVEL	6 years	Electrical motor cleaning and carbon brushes inspection	5.2.3

2. Second Level Maintenance: overhaul as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the Operator's rules; the mission profile and the environmental conditions. Typical overhaul periodicity: 8 years.

NOTE: FAIVELEY TRANSPORT provides an overhauling service for its own units. FAIVELEY TRANSPORT performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the productions processes, giving top priority to safety and quality.

The FAIVELEY TRANSPORT Service Centres have the experience and technical equipment needed for performing professional overhauls.

IMPORTANT: Equipment either stored on-the-shelf or mounted on inoperative vehicles must be overhauled after 8 years from the date of manufacture or of last overhaul, since rubber parts age out even in optimum storage conditions.

Prior to installation on the vehicle, the equipment must be functionally checked according to the applicable procedure if the date of manufacture or last overhaul dates back more than 36 months.

NOTE: Overhaul periodicity must include both the years of functioning and the years of storage on-the shelf or mounting on inoperative vehicles.

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 COMPRESSOR INSPECTION AND CLEANING

WARNING! The compressor has hot surfaces! Wait until the item has cooled down or use suitable protection.

CAUTION! Pressurized system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

CAUTION! Rotating parts!

Refer to Figure 3

1. Clean all the surfaces of the equipment with a dry and fluff-free cloth.
2. Remove the cover (3) by unscrewing six screws (1) and six washers (2) using 4mm allen key.
3. Clean the ventilation openings of the crankcase chamber and the cylinder head from dust and dirt.
4. Verify the seal is in good conditions, then remount the cover (3). If necessary, replace the seal.
5. Check that all the screws, nuts and bolts are all present and not loosened, in case restore those missing (with the relative washers) and fasten the loosened ones.
6. Start the compressor and check it for regular operation free from any anomalous vibration or noise. They may be caused by bearing and/or piston segments faulty.
7. Accurately clean all identification, signalling and danger plates located on the equipment using an appropriate detergent that does not compromise their legibility.
8. If necessary, replace the compressor.

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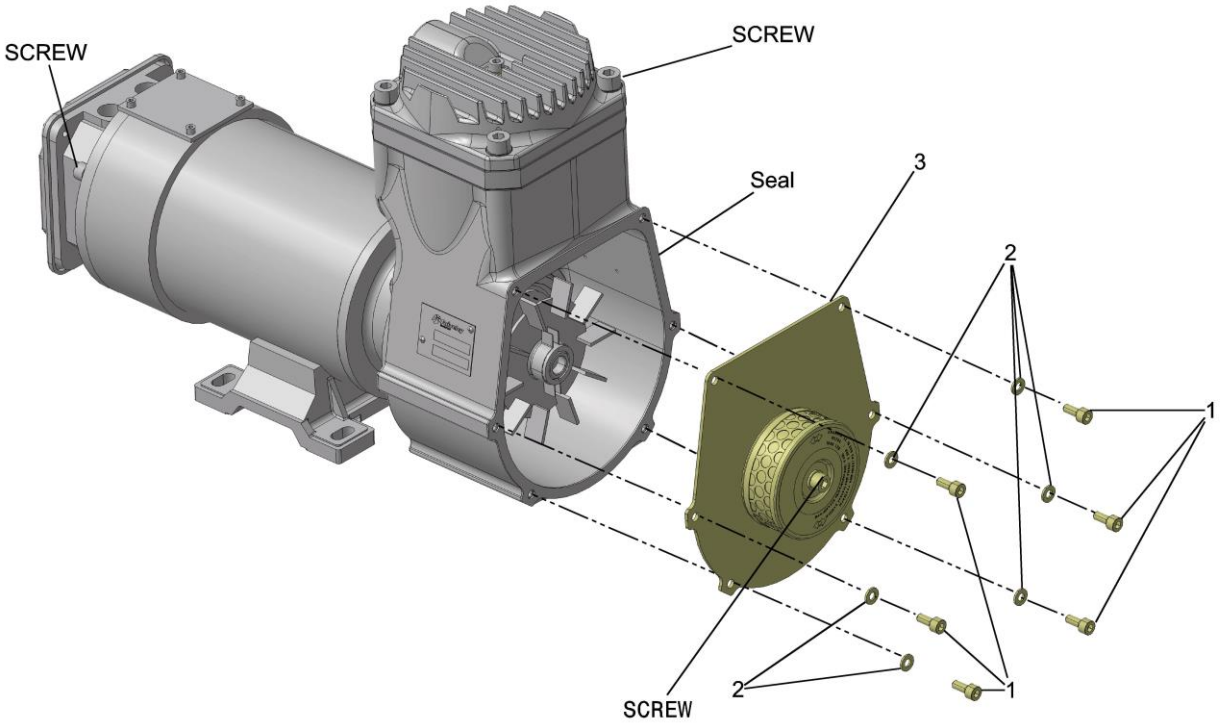

Figure 3 - Compressor Assembly Inspection and Cleaning.

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	SCREW M5	4/900033/0	4
2	WASHER DIA 5	2/519040	4
3	COVER	FT0023100-000	4

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5.2.2 AIR INTAKE FILTER REPLACEMENT

WARNING! The compressor has hot surfaces! Wait until the item has cooled down or use suitable protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

CAUTION! Rotating parts!

Refer to Figure 4

1. Loosen and remove the hexagonal socket head screw (3) with its washer (4) from the cover (5) using 5mm allen key.
2. Remove the complete air intake filter (1) and the spacer (2). **DISCARD** the air intake filter (1).
3. Apply Loctite 242 on threads of the hexagonal socket head screw (3).
4. Mount a **NEW** air intake filter (1) with the spacer (2) onto the cover (5) and secure the parts by tightening the hexagonal socket head screw (3) with its washer (4) using 5mm allen key.
5. Torque tighten the hexagonal socket head screw (3) to 8 Nm. Apply torque mark using Stylmark on it.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

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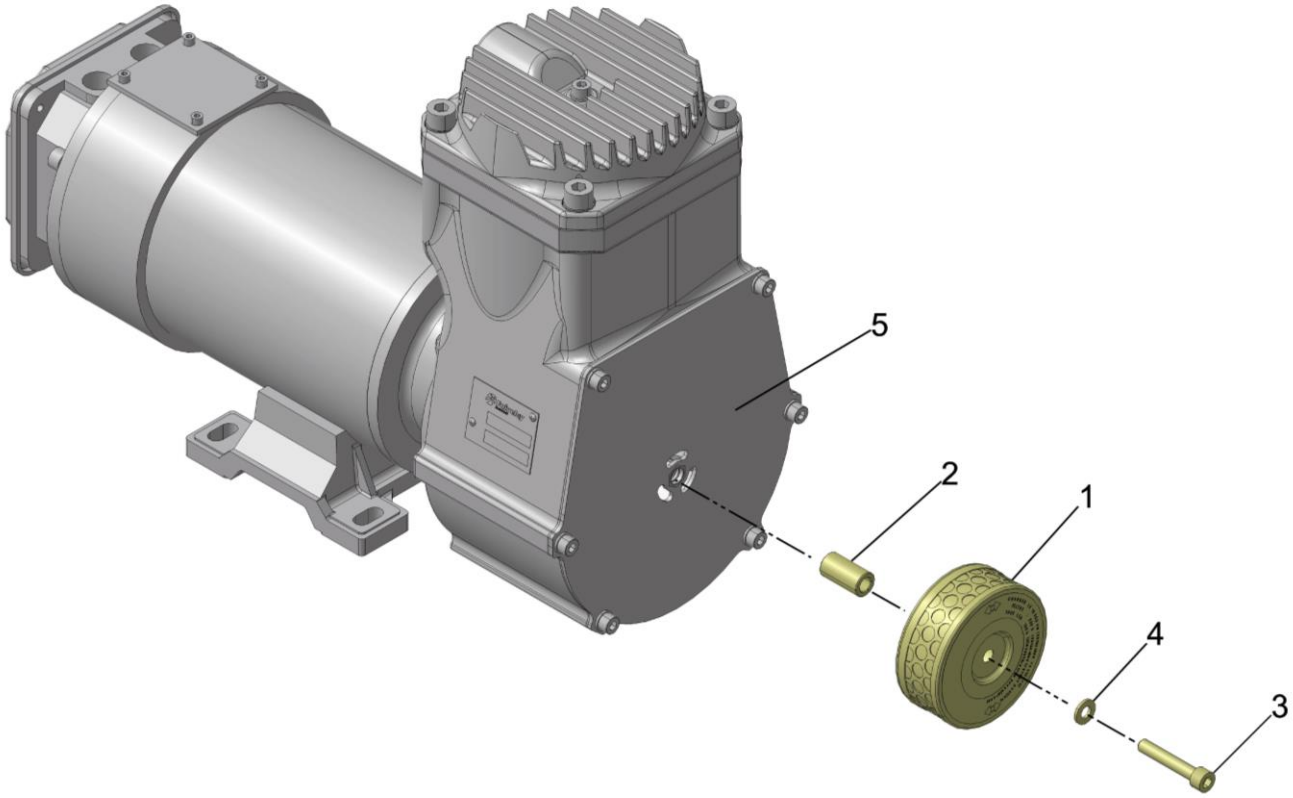

Figure 4 – Air Intake Filter Replacement

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	FILTER	1558440008	1
2	SPACER	FT0025766-000	1
3	HEXAGONAL SOCKET HEAD SCREW M6x5	4-065043-0	1
4	WASHER	2/519041	1
5	COVER	FT0023100-000	1

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5.2.3 ELECTRIC MOTOR CLEANING AND CARBON BRUSHES INSPECTION

WARNING! The compressor has hot surfaces! Wait until the item has cooled down or use suitable protection.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

CAUTION! Rotating parts!

Refer to Figure 5a and 5b

1. Remove the inspection maintenance brushes panel from the rear side of the electric motor.
2. Clean the interior from the dirt and dust by means of an industrial aspirator.
3. Remove the faston connection. Using a pair of nose pliers, move apart the spring and extract the carbon brush.
4. Verify the length of the carbon brush: the residual length must be greater than 7 mm.
5. Insert the carbon brush into the brush rocker and put in place the spring.
6. Loosen and remove the three fixing screws from the rear flange.
7. Rotate the rear part until the second carbon brush appears through the inspection window.
8. Repeat the steps 4 to 6 for second carbon brush.
9. Verify the conditions of the collector: it must be replaced in case of severe damages to the grounding connection or in case the commutator segments are “burned”. Reach to FAIVELEY TRANSPORT technical support service for assistance.
10. Check the collector doesn't present any scrapes, scratches and/or grooves deeper than 0.2 mm that could jeopardize its normal functioning and also doesn't present any signs of abnormal wear.
11. Rotate the rear flange in order to have the faceting coincident with the flat face of the rear ring.
12. Secure the flange by tightening the three fixing screws to the torque of 5.8 Nm.
13. Replace the seal of the maintenance brushes panel.
14. Close the maintenance brushes panel by means the four screws tightened to the torque of 2 Nm.

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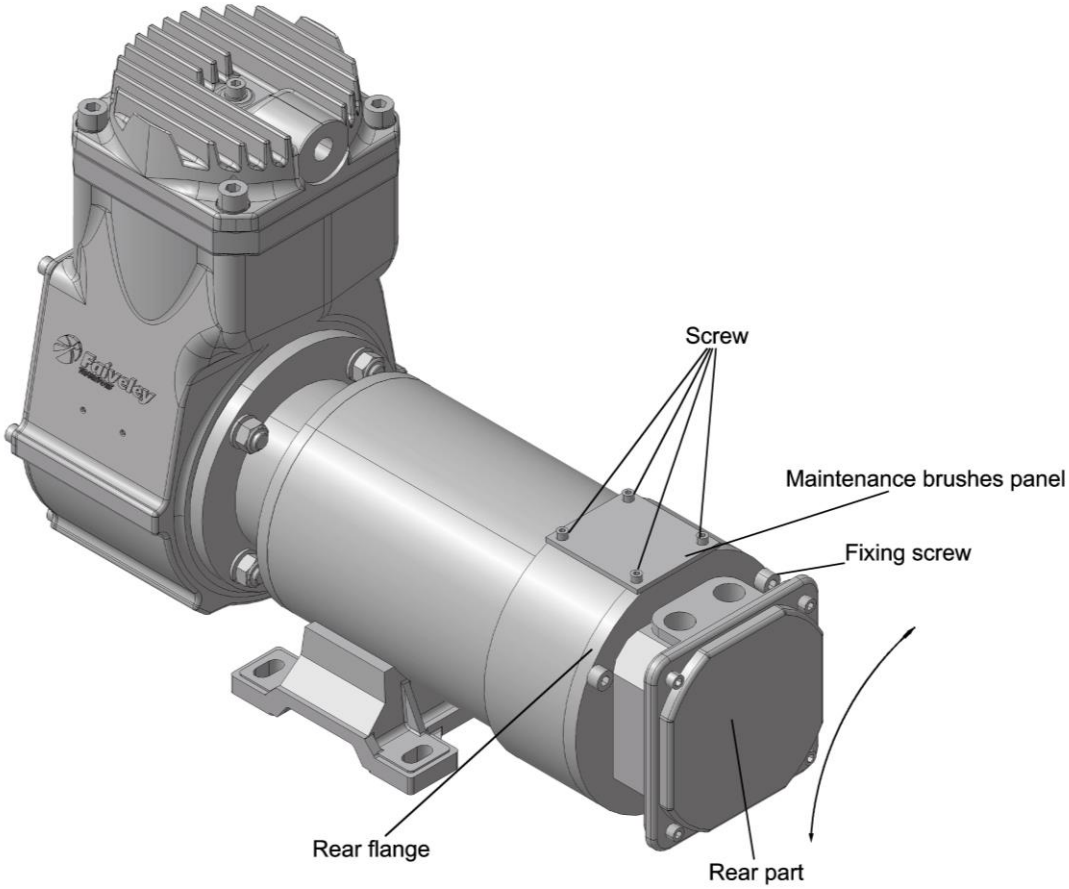

Figure 5a - Electric motor cleaning – carbon brushes inspection

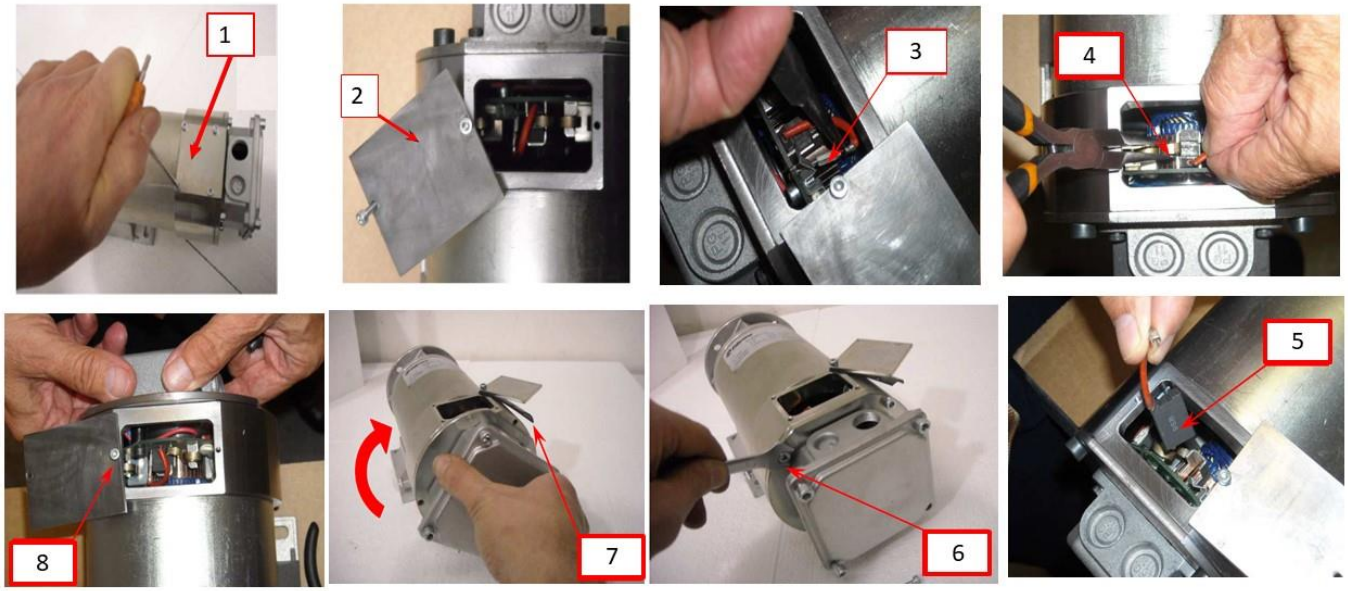

Figure 5b - Carbon brushes inspection

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

WARNING! The compressor has hot surfaces! Wait until the item has cooled down or use suitable protection.

CAUTION! Pressurised system! Discharge the pressure before removal.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

CAUTION! Rotating parts!

Refer to Figure 6

1. Disconnect the electrical and pneumatic connections from the compressor (4).
2. Unscrew and remove the four nuts (1) with four contact washer (2) and four washer (3) that attaches the compressor (4) to the frame using 13mm socket wrench.

NOTE: To remove compressor (4), lift the compressor (4) upwards and then slide over towards the outside side and remove compressor (4) out.

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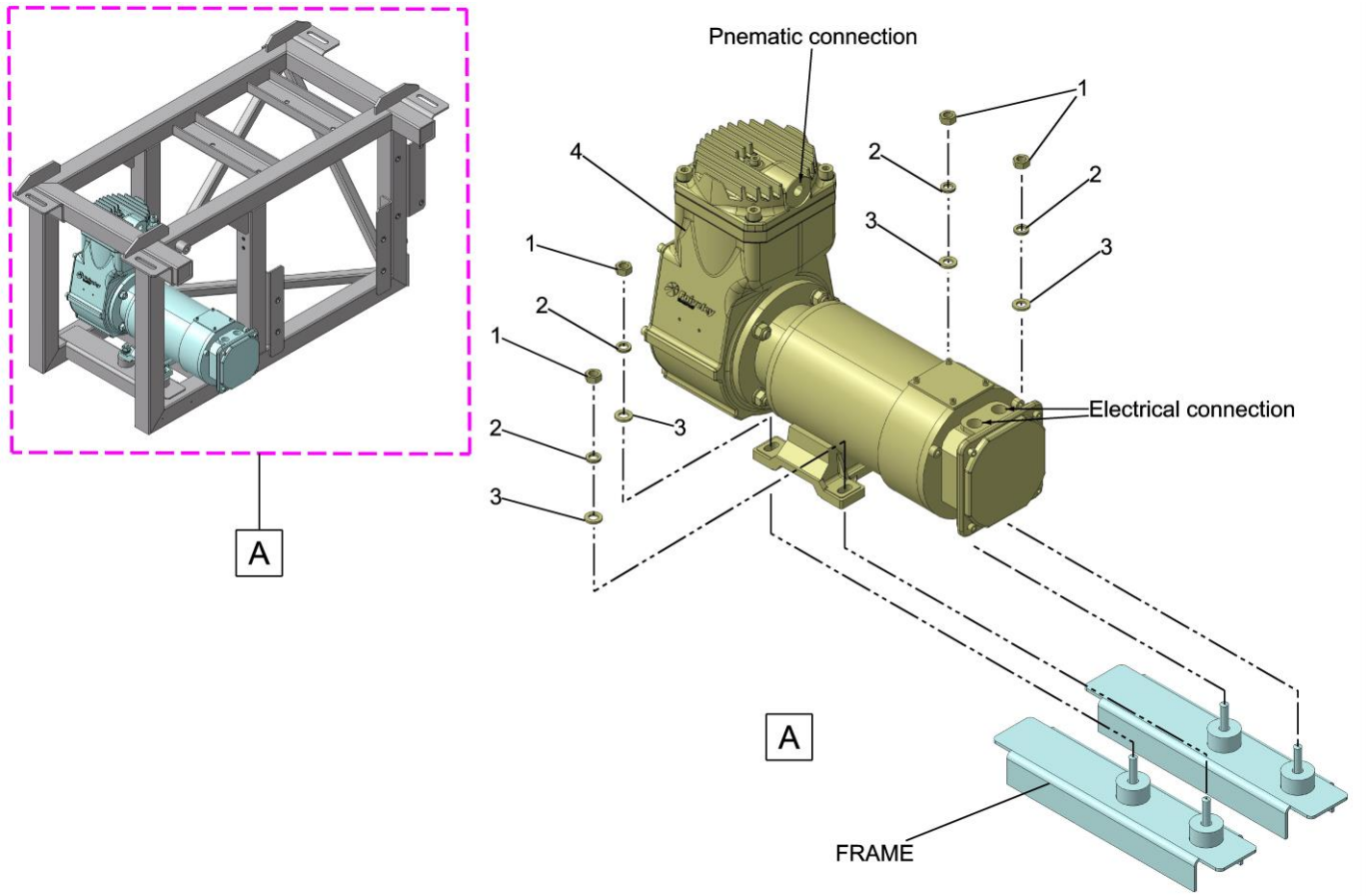

Figure 6 - Compressor Assembly, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	NUT M8	906019600	4
2	CONTACT WASHER DIA 8	2/519042	4
3	PLAIN WASHER DIA 8	908205100	4
4	COMPRESSOR	FT0026423-102	1

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 6

1. Apply Loctite 242 on threads of the nut (1).
2. Install the compressor (4) to the frame and secure with four nuts (1) with four contact washers (2) and four washers (3) using 13mm socket wrench.
3. Before assembly of pipe connection perform cleaning of piping on the vehicle.
4. Pneumatic ports connection should be BSPP fittings.
5. Do not use tuflon tape on the threaded ports.
6. Apply Loctite 577 on threads of pipe fittings.
7. Connect the electrical connection and pneumatic connection to the compressor (4). Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.

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8. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6.SPARE PART LIST

Routine Maintenance - The spare parts required for routine maintenance are listed in the below table:

SEC.NO.	FIGURE	P/N	DESCRIPTION	QTY
5.2.2	FIGURE 4	1558440008	AIR FILTER	1
5.2.3	FIGURE 5a	FT0039508-K00	CARBON BRUSHES KIT	1
5.2.3	FIGURE 5b	FT0039509-K00	GASKET KIT	1

- Installation -the spare parts not required.

NOTE:

- For FAIVELEY TRANSPORT scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the law in force in the Country where the component is used.

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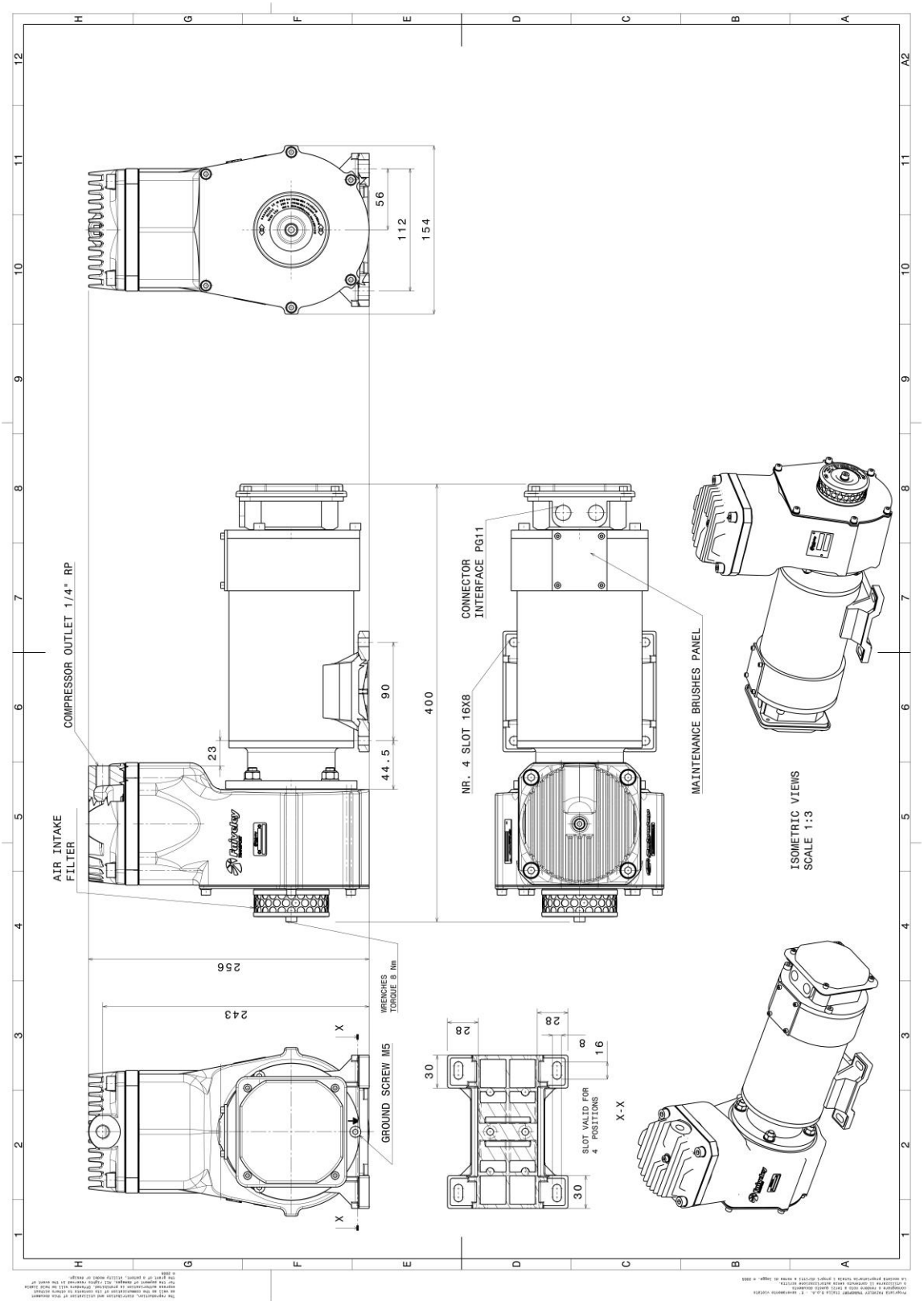
/// 8.OUTLINE DRAWING

Compressor Assembly - FT0026423-102



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13.12_AIR DRYER (GW MODEL 975)

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/// FT0052317-101-E00MUM

AIR DRYER (GW MODEL 975)
FT0052317-101
FT0052317-100
FT0053022-100

Division:	Document Type:	Distribution:
FAIVELEY TRANSPORT RAIL TECHNOLOGIES INDIA LTD	Maintenance/Use manual	External
Customer CDRL:	**Customer Specification Reference:**	**ECO:**
.	.	DRC1751/4

	Name, Title, Group	Signature	Date
Compiled:	DC Design Engineer, Engineering		07/02/2023
Checked:	.SMC Systems Engineer, Engineering		07/02/2023
Approved:	.AE Manager, Engineering		07/02/2023
Expert:	Name / Title, Group		
Customer acceptance:	Position, Railroad Name		

Filename:	Revision:	Status:
FT0052317-101-E00MUM.docx	B00	RELEASE

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	08/10/2021	NEW RELEASE	DRC 1661	VP	.JP	.AE
B00	07/02/2023	Document updated with new template and added P/N: FT0053022-100. Updated sections- 2, 5 and 6.	DRC1751 /4	DC	.SMC	.AE
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/// 1. GENERAL DESCRIPTION

1.1 INTRODUCTION

The Air Dryer (GW model 975) system includes a pre-coalescer which removes impurities from the compressed air supply, and desiccants (activated alumina) located in the drying towers which remove moisture.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections /// 2 and /// 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

WABTEC cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

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- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.
- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

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- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

1.2.6 SYMBOLS

- Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED")

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

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- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residualcapacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. WABTEC cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

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1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

For external cleaning of the component, take care to the following points:

- For heavily soiled exterior surfaces of components, Strike is recommended, this is manufactured by Hydra Research Laboratories Ltd.

- Metal components are suspended in ICI Triklone vapour within a proprietary cleaning plant. Any components with re-usable rubber parts are cleaned with a detergent dissolved in hot water. This is applied at high pressure if necessary. Rubber components must not be exposed to Strike, Triklone or any other similar cleaning solvent.

- Where cloths are used for the final wiping over of items, these should be clean and lint free to avoid re-contamination.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +47°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

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1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

1.3.9 STORAGE OF THE DEVICES

- **Storage in workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +47°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of storage on vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to + 47°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months (Example: 1 outside storage year on vehicle is acceptable if the temperature is, in winter from +3°C to 25°C during 3 months maximum and also, in summer from +25°C to +47°C during 3 months maximum).

- **Specific conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every WABTEC product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Air Dryer (GW model 975) must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Air Dryer (GW model 975) and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Air Dryer (GW model 975) P/N FT0052317-101, 100 and FT0053022-100 for the service and the maintenance staff.

1.6 ABBREVIATIONS

Abbreviation	Meaning
HD	Head
Mm	millimetre
Nm	Newton metre
P/N	P/N
QTY	Quantity

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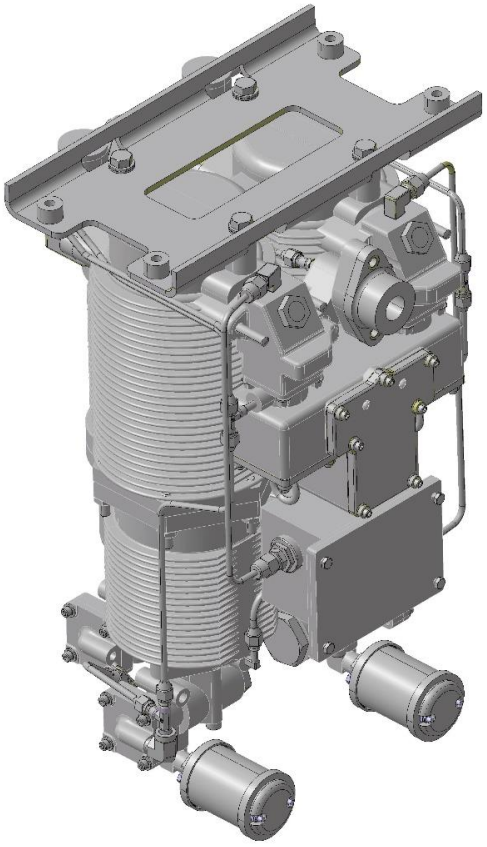
/// 2. COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1 and Figure 2

The FAIVELEY TRANSPORT 975-124 series twin tower Air Dryers have been developed especially to suit traction requirements. The dryers remove moisture from the compressed air supply and ensure that only clean dry air reaches all air operated equipment. A supply of clean dry air ensures that all air operated equipment functions more efficiently and that the high maintenance costs associated with contaminated systems are eliminated.

The twin tower Air Dryer system includes a pre-coalescer which removes impurities from the compressed air supply, and desiccants (activated alumina) located in the drying towers which remove moisture.



FT0052317-101, 100 and FT0053022-100

Figure 1: Air Dryer, Isometric View

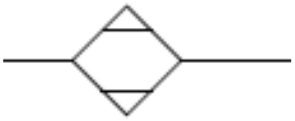


Figure 2: CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

P/N	NOMINAL INLET/OUTLET DIAMETER	MINIMUM OPERATING PRESSURE	MASS	POSITIONS
FT0052317-100	1-1/4”	75 psi	55 kg	Vertical installation
FT0052317-101	3/4”	75 psi	55 kg	Vertical installation
FT0053022-100	1-1/4”	75 psi	55 kg	Vertical installation

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/// 3. OPERATIONS

Refer to Figure 3

3.1 HUMIDITY INDICATOR

A coloured indicator is located at each Outlet Check Valve as a visual aid to monitor the condition of air after passing through each desiccant dryer.

- Blue indicates dry air.
- White indicates contaminated air.

3.2 PRE-COALESCER

A borosilicate element designed to collect and restrict tiny aerosol contaminants, primarily oil and other contaminants which may prove detrimental to the successful operation of any form of desiccant.

3.3 FILTER/ DRYER BODY

The desiccant beads, which extract the moisture from the air, are housed in two aluminium towers with fins on the outside to provide efficient heat transfer. Consequently, internal heat from the compressed air dissipates efficiently.

3.4 PNEUMATIC COMPACTOR

Air Dryers are provided with pneumatic compactors which provide a constant packing density throughout the period of operation in the dryer. In comparison, the standard spring loaded compactors provide a decreasing compacting pressure as the spring expands due to attrition of the desiccant beads which is unavoidable. Each desiccant canister contains a pneumatic compactor which is charged with compressed air to maintain a constant mechanical pressure upon a movable disc located in the bottom of the sump cap. Consequently, the alumina remains compact and tight preventing attrition of the desiccant beads.

3.5 PRESSURE SWITCH

An integral pressure sensing device is located internally to control the air drying cycle. The Air Dryer cycles only when the pre-determined pressure is reached.

If an emergency arises and air pressure drops below the pre-determined level, cycling stops immediately and air flows through both Air Dryers to support the immediate air requirements.

3.6 MEMORY TYPE PCB

This is an electronic assembly fully potted to prevent arcing due to moisture and also to protect the circuit from induced emf (electromagnetic force). This incorporates a timer with a cycling frequency of 1 minute to energise the Solenoid Valve of each tower.

When the compressor unloads (stops pumping), the electronic timer will de-energise both solenoid valves and both dryer towers will return to ‘dehydrating’ mode. In addition, both the purge valves as well as the double seated purge valve of the pre-coalescer will remain closed stopping discharge of air from the system. During this stage, any air drawn from air reservoirs upstream of the Air Dryer will be dehydrated. When the compressor is loaded again, the dryer will commence the cycling from the point where it has stopped previously in the same tower. The air filter - dryer system is complete with two individual sump mounted purge valves and a double seated sump mounted drain valve.

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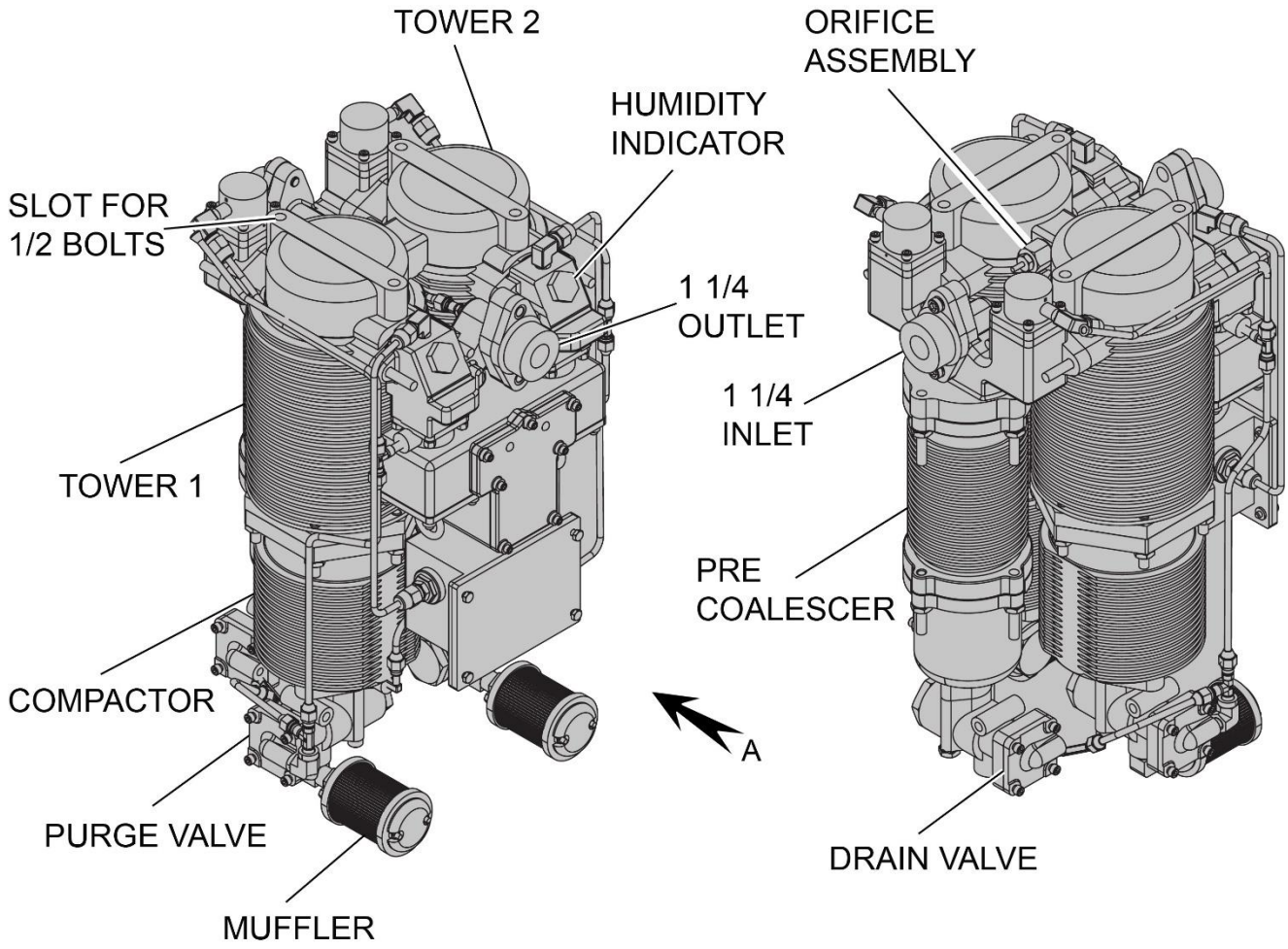

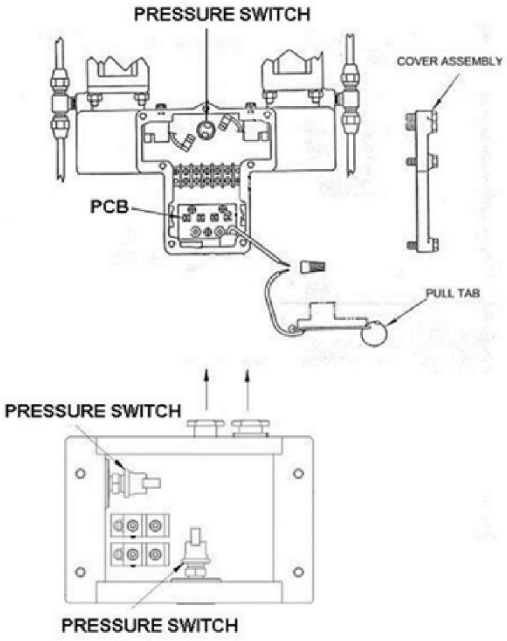

VIEW A

Figure 3*:* Air Dryer, Major Components

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3.7 OPERATING CONDITION

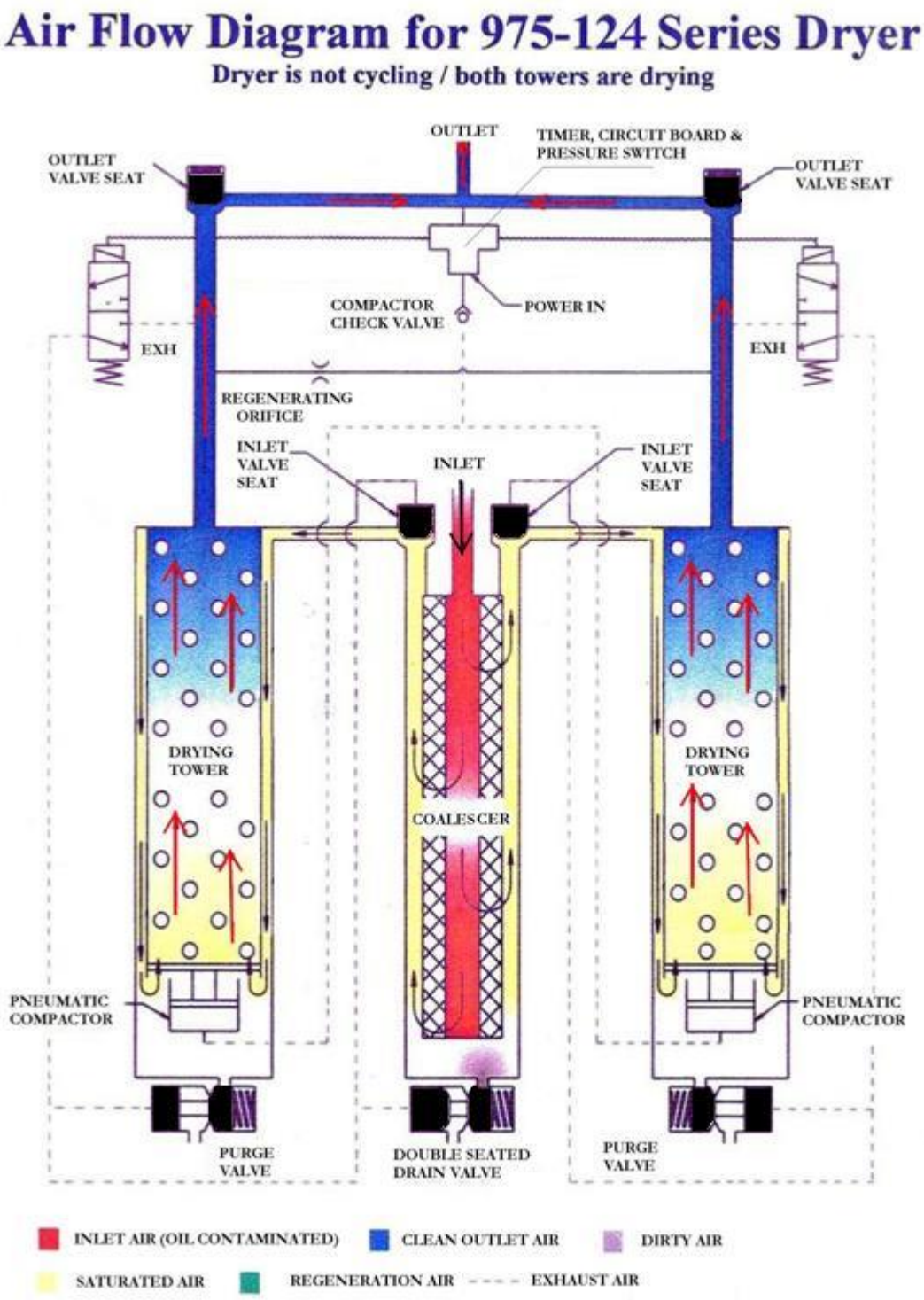

Figure 4: Functional scheme during both towers Drying

Refer to Figure 4

Compressed air enters the inlet manifold and flows into the pre-coalescer. It passes through a borosilicate coalescer element comprising four pleated plies which are supported, externally and internally, by two layers of corrugated / perforated stainless steel. The coalescer removes microscopic oil aerosols of one micron or less from the compressed air preventing them from entering the drying towers.

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Construction of the coalescer filter element is in two layers of pleated borosilicate media supported on both sides by pleated polyester media. The first layer of polyester media serves as a particulate pre-filter and helps to evenly distribute the flow of air into the first coalescing layer. The first coalescing layer coalesces the water and oil aerosols into larger droplets. The second coalescing layer completes the coalescing operation while the last layer of polyester media enhances drainage.

A desiccant (activated alumina) in the Air Dryer towers then removes water vapour from the compressed air.

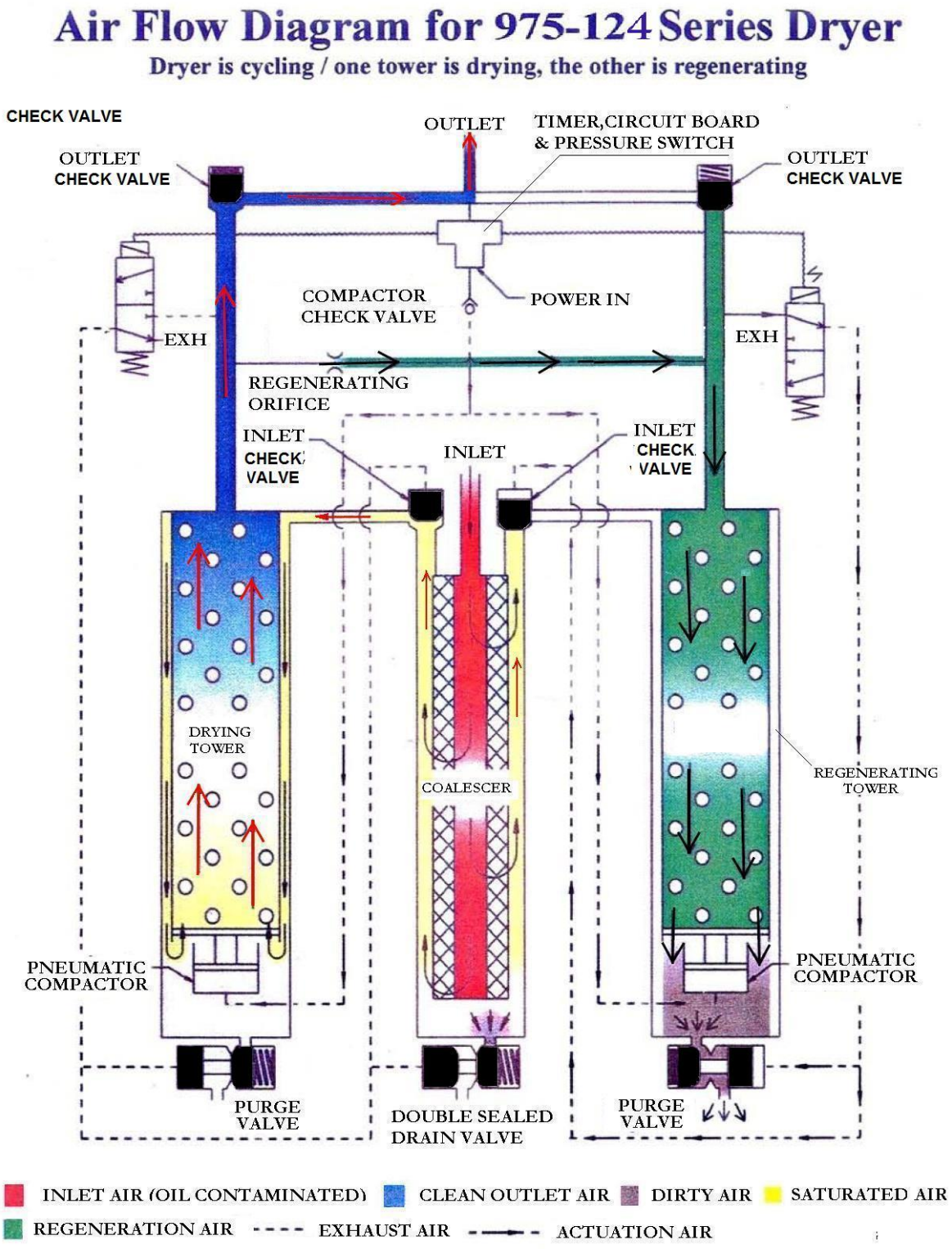

Figure 5: Functional scheme during one tower drying and the other regenerating

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Refer to Figure 5

With the compressor pumping and the predetermined pressure reached (approximately 5.17 bar, 75 psi) the right hand side dryer tower begins to ‘regenerate’ while the Solenoid Valve is energized allowing air to pass and to close the right inlet check valve. Simultaneously, the right spring loaded outlet check valve closes. When both inlet and outlet check valves are closed and the right Air Dryer is isolated, the right sump mounted purge valve opens causing a sudden drop in air pressure. The drop in pressure forces the collected impurities from the right Air Dryer tower to atmosphere while the moisture absorbed by the desiccant beads is released to the surface of the beads.

A small amount of dry air from the left hand side Air Dryer tower then flows through the ‘regenerating’ orifice in a reverse direction over and through the right hand side Air Dryer desiccant beads. Moisture, released to the surface of the desiccant beads, is picked up by the dry air and exhausted through the open purge valve at a level slightly above atmospheric pressure. In addition, the double seated automatic drain valve located at the sump of the pre-coalescer exhausts any collected impurities to atmosphere.

While the right hand side dryer tower is in the ‘regenerating’ phase, the left hand side tower is in the ‘dehydrating’ phase and is removing moisture from the compressed air passing over and through the desiccant beads on its way to the Main Reservoir. The left Solenoid Valve is de-energised i.e. closed during this operation, the left inlet and outlet check valves are open, and the left sump mounted purge valve is closed.
Approximately one minute later the operating cycle reverses. The right hand side dryer ‘dehydrates’ removing moisture as air passes over and through the desiccant beads and on to the Main Reservoir while the left hand side dryer ‘regenerates’, purging itself and the desiccant beads of all collected moisture and impurities. As before, the automatic double seated drain valve on the pre-coalescer sump exhausts the collected impurities to atmosphere.

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/// 4. SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
9/16” socket wrench	Tighten/loosen nut
9/16” socket with 10” extension	Tighten/loosen nut
19mm Spanner	Tighten/loosen the fasteners
Screw driver	Tighten/loosen the fasteners
Torque wrench (25 -135 Nm)	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Dow Corning 55 M or equivalent	To Lubricate seal
Loctite 242/243/270	Thread locking
Loctite 270	Thread locking
Loctite 577	Sealant for pipe fitting
Molykote supergliss or WD-40	To clean mud
Stylmark	Torque marker

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/// 5. MAINTENANCE PRESCRIPTIONS

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance):

    - **Functional test** as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer Section 5.2.1
      Typical functional test periodicity: 1.5 month.

    - **Desiccant visual inspection** as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer Section 5.2.3.
      Typical **desiccant visual inspection** periodicity: 1 year.

    - **Pre-coalescer filter replacement** as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer Section 5.2.2.
      Typical **pre-coalescer filter replacement** periodicity: 1 year.

NOTE: The replacement of pre-coalescer filter element and the desiccant material is over and above the Second level maintenance schedules, during which the entire assembly will be dismantled, and the recommended parts replaced.

2. Second Level Maintenance: replacement as scheduled in the **system maintenance plan**. If no system maintenance plan is provided; the device must be overhauled regularly as required by the operator's rules; the mission profile and the environmental conditions.
   Typical overhaul periodicity: 4 years

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

CAUTION! Pressurised system! Discharge the pressure before removal. Compressor must be put OFF. AGTU delivery cock to be closed and the air pressure within the system to be drained by opening the drain cock in final filter before removal of Air Dryer assembly.

NOTE: During dismantling the nuts in Air Dryer, if it is found jammed or hard to remove, it is recommended to clean the projected nut end threads by using Molykote supergliss or WD-40 to clean the deposited muddy particles. Despite this precaution, if the metal end of the stud gets loosened, then clean the metal end of the stud and assemble with Loctite 270.

CAUTION! Although classified "Non Hazardous", the adsorbing granules may release dust during handling. Such dust is highly de-hydrating. As a precaution, wear protective glasses, gloves and mask, keep the room ventilated. Max concentration of dust should not exceed 10 mg/m3. In case of contact with skin or mucosa, rinse with abundant water and call a doctor in case symptoms develop. Sweep away the granules possibly fallen onto ground as they may make the floor slippery. The desiccants removed from the service should be disposed of according to the law in force, as it may contain oil.

5.2.1 FUNCTIONAL TEST OF AIR DRYER (AD)

Refer to Figure 6

Typical test periodicity: 1.5 month - 12500 KM.

1. There should be a slight continuous exhaust of air at the exhaust port of the purge valve on the tower.
2. After a predetermined time, interval of approximately 1 minute, there should be short loud discharge of air at the exhaust port of the opposite tower purge valve, followed by a slight continuous exhaust of air.
3. Approximately, 1 minute later, there should be similar discharge of air at the opposite tower.
4. In conjunction, the drain valve on the sump of the pre-coalescer should exhaust every time the dryer cycles.
5. The change in the exhaust of air from one tower to the other indicates the dryer is operating properly.
6. In conjunction, the drain valve on the sump cap of the pre-coalescer should exhaust each time the Air Dryer cycles.
7. Apart from the above the humidity indicator also helps in checking the fitness of the Air dryer and Final filter.

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Figure 6: Humidity Indicator

- BLUE INDICATOR – Indicates Dryer has been performing correctly
- LAVENDER INDICATOR – Dryer is suspect
- WHITE INDICATOR – Possible damaged Dryer. Check for water in Final Filters
- YELLOW OR BROWN INDICATOR – Damaged Dryer

5.2.2 REPLACEMENT OF PRE-COALESCER ELEMENT

Refer to Figure 7

1. Disconnect the actuating airline from the drain valve using a 9/16” wrench.
2. Using a 9/16” socket with extension, remove four nuts-3/8" (2) with multi-toothed washers (3) at the sump cap, permitting the sump cap complete with Drain Valve to drop down.
3. Remove and **DISCARD** the O ring (7)
4. Turn 3/8" elastic stop nut (6) with 9/16” socket counter-clockwise and remove coalescer retainer (5) and coalescer element (4). **DISCARD** the coalescer element (4) and elastic stop nut (6).

NOTE: During dismantling the nuts in Air Dryer, if it is found jammed or hard to remove, it is recommended to clean the projected nut end threads by using Molykote supergliss or WD-40 to clean the deposited muddy particles. Despite this precaution, if the metal end of the stud gets loosened, then clean the metal end of the stud and assemble with Loctite 270.

5. Install the **NEW** coalescer element (4), **NEW** O ring (7) and the **NEW** elastic stop nut (6).
6. Apply Loctite 242 on threads of four nuts (2).
7. Re-assemble and tighten the four nuts (2) & four multi-toothed washers (3). Torque tighten the four nuts (2) to 27.3 Nm. Apply Stylmark on the head of the nuts (2).

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

NOTE: The multi toothed washers (part no. 099 8007 00) are intended for single use.

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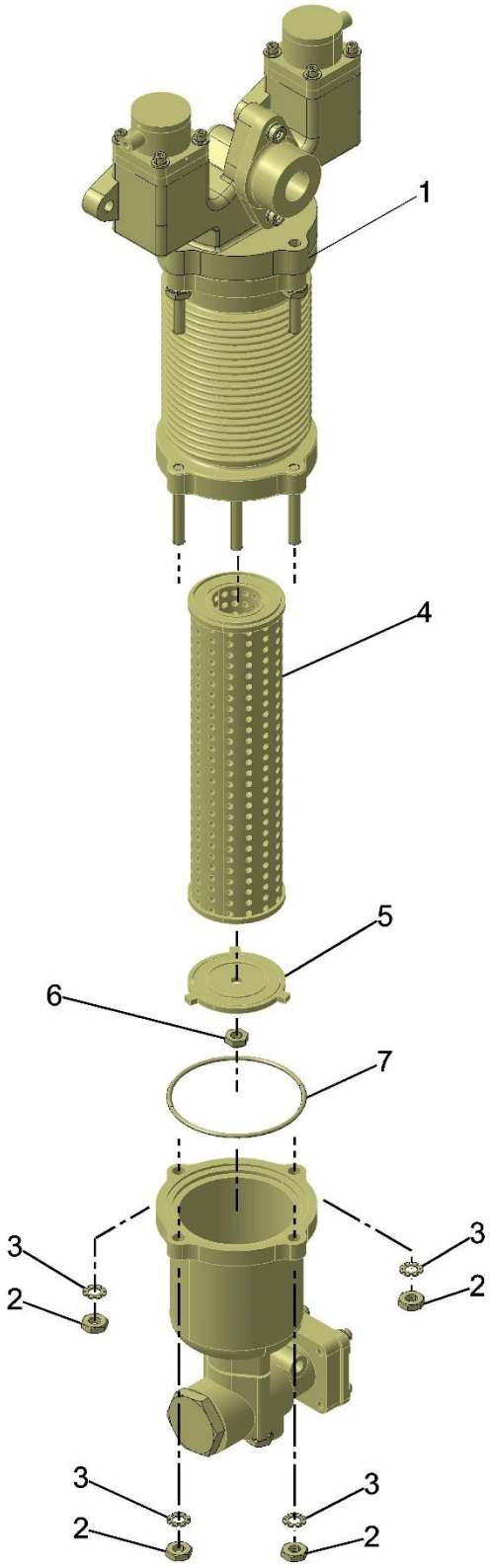

Figure 7: Replacement of pre-coalescer element

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	PRE - COALESCER CYLINDER	029335000	1
2	HEX NUT 3/8	099800600	4
3	MULTI - TOOTH LOCK WASHER	099800700	4
4	COALESCER ELEMENT FILTER (AD)	029204000	1
5	COALESCER RETAINER	029309000	1
6	ELASTIC STOP NUT 3/8 UNC	FT0054289-000	1
7	O-RING	FT0050293-013	1

5.2.3 VISUAL INSPECTION

Refer to Figure 8

1. Using a 9/16” wrench, disconnect the actuating airlines to the purge valve (4).
2. Use a 9/16” socket with 10” extension to remove 3/8" Nut (1) and multi-tooth lock washers (2) to allow the bottom cap (3) to be dropped down. Remove the desiccant canister assembly (5).
3. Remove and **DISCARD** the O ring (6).
4. Visually check that the Desiccant should not be in the powder condition. If the Desiccant is in powder condition, replace the Desiccant, refer to Section 5.2.4.
5. Install the **NEW** O ring (6).
6. Apply Loctite 242 on the threads of the nuts (1).
7. Install the Desiccant, re-assemble and tighten the nut (1) and multi-toothed washers (2) and torque tighten it to 27.3 Nm. Apply Stylmark on the head of the nuts (1).

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

8. Repeat the above steps for another Desiccant Canister.

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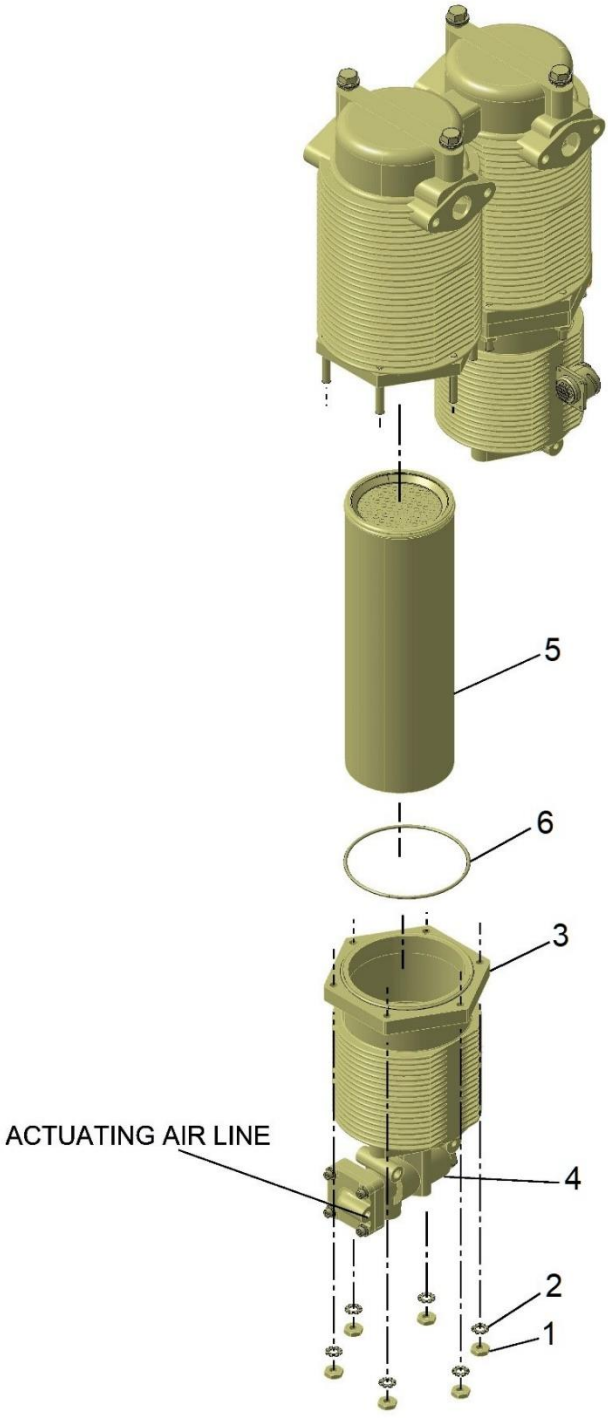

Figure 8: Installation/removal procedure of Desiccant Canister

ITEM NO.	DESCRIPTION	PART NUMBER	QTY/TOWER	TOTAL QTY
1	HEX NUT 3/8"	099800600	6	12
2	MULTI - TOOTH LOCK WASHER	099800700	6	12
3	BOTTOM CAP	FT0052003-100	1	2
4	PURGE VALVE	FT0052002-100	1	2
5	CANISTER ASSEMBLY	029118500	1	2
6	O-RING	FT0050293-012	1	2

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5.2.4 DESICCANT REPLACEMENT ON CONDITION BASIS

NOTE: Look for the colour of the humidity indicator to identify the condition of the desiccant. If required, renew the desiccant as described hereafter. The seals and gaskets should be renewed at the same time.

Refer to Figure 9

1. Using a Screw driver, remove the top Retaining Ring (1) and then extract the Canister Disc Assembly (2) and seal (5). **DISCARD** both the Retaining Ring (1) and seal (5).
2. **DISCARD** the old desiccant (3).
3. Using a screw driver, remove the bottom Retaining Ring (1) and then extract the Canister Disc Assembly (2). **DISCARD** the Retaining Ring (1).
4. Remove and **DISCARD** the screen disc (2.1) from the Canister Disc Assembly (2).
5. Install the **NEW** screen disc (2.1) to the canister disc assembly (2).
6. Install the one off canister disc assembly (2) and **NEW** retaining ring (1) to the bottom of the canister desiccant (4).
7. Refill the canister with **NEW** desiccant.
8. Place the another canister disc assembly (2) next to the desiccant beads on top of the desiccant canister beads and push down while tightly tapping with a soft tip hammer and rotating the canister desiccant (4). Tap and rotate the unit, canister disc assembly (2) drops below the retaining ring (1) groove.
9. Remove the canister disc assembly (2) and add more desiccant as required.
10. Place the canister disc assembly (2) and continue tapping and rotating procedure until the top of the canister assembly lines up with the bottom edge of the retaining ring groove.
11. Place the **NEW** retaining ring (1) into the groove on the top of the canister disc assembly (2).
12. Smear the **NEW** seal with Dow Corning 55 M or equivalent.
13. Place the seal on the top of the canister disc assembly.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying stylmark.

14. Repeat the above steps for another Desiccant Canister.

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Figure 9: Desiccant Refill Procedure (sheet 1 of 2)

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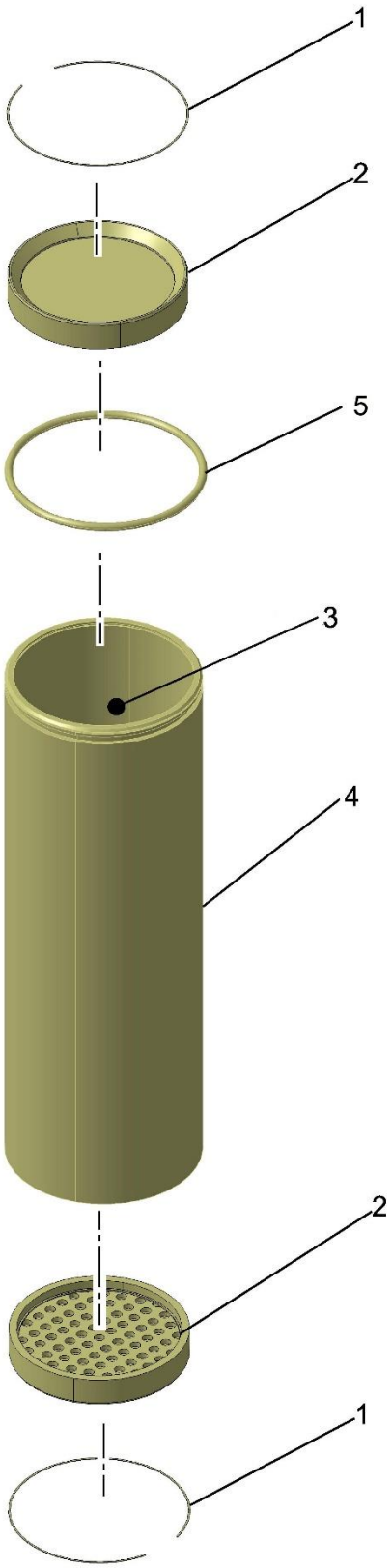

Figure 9: Desiccant Refill Procedure (sheet 2 of 2)

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ITEM NO.	DESCRIPTION	PART NUMBER	QTY/TOWER	TOTAL QTY
1	RETAINING RING	029814000	2	4
2	CANISTER DISC ASSY	029210000	2	4
2.1	SCREEN DISC	029812500	2	4
3	DESICCANT CHARGE ALUMINA BALLS	029902000	2.5 kg	5 kg
4	CANISTER DESICCANT	029302200	1	2
5	SEAL	FT0050293-011	1	2

NOTE: Item 2.1 is the sub part of Item 2.

5.3 REMOVAL PROCEDURES OF EQUIPMENT

WARNING! Closely observe all applicable car builder rules and procedures governing:

- Switch of power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection.

CAUTION! Pressurised system! Discharge the pressure before removal. Compressor must be put OFF. AGTU delivery cock to be closed and the air pressure within the system to be drained by opening the drain cock in final filter before removal of Air Dryer assembly.

CAUTION! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

CAUTION! Take care to avoid ingress of dirt or debris into the system.

Refer to Figure 10

1. Remove the pneumatic connections.
2. Unscrew and remove the four M12 bolts (2), four contact washers (3), four plain washers (4) using 19mm spanner.
3. Remove the Air Dryer (1) from the support bracket that attaches the frame of the AGTU.

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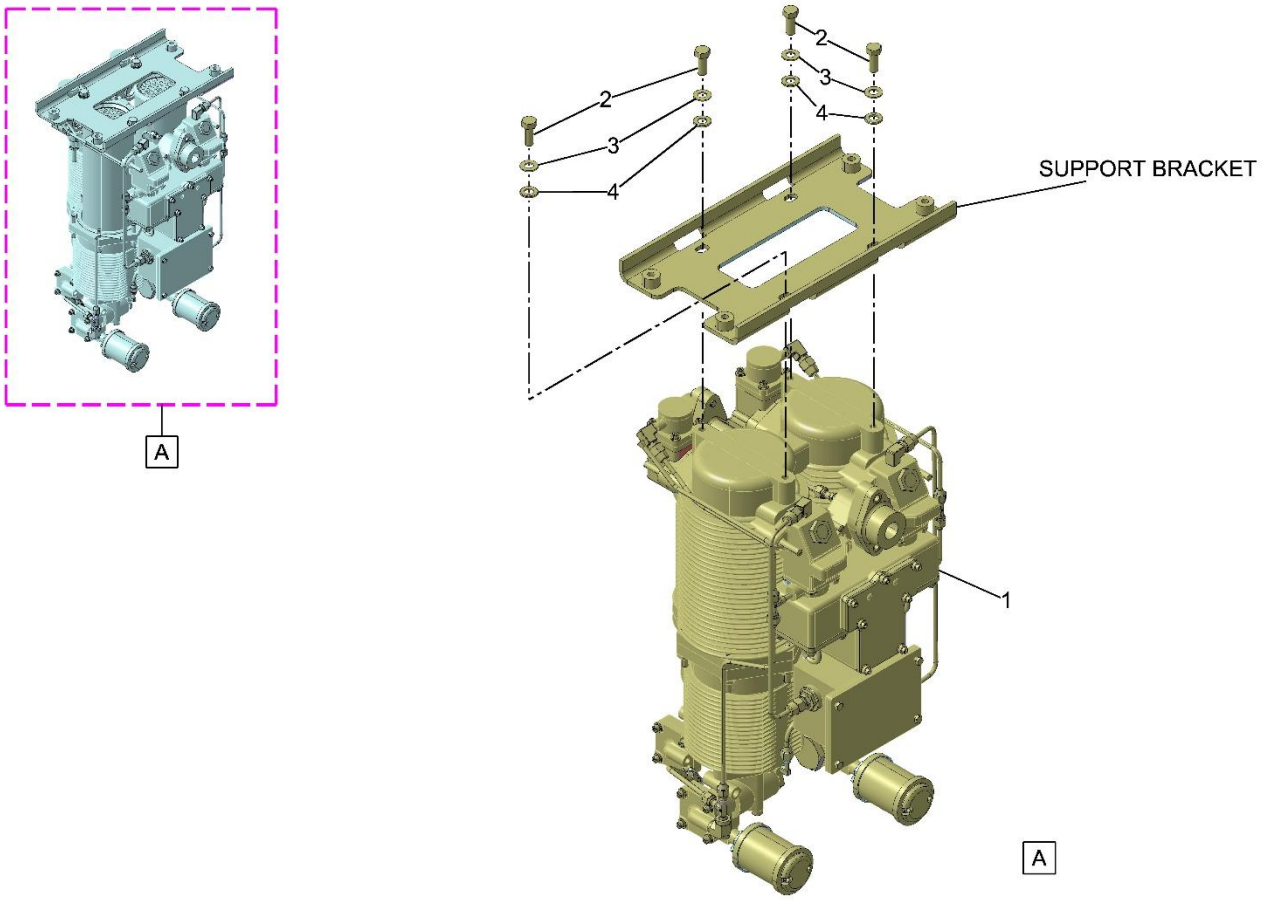

Figure 10: Air Dryer, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	AIR DRYER	Refer below table	1
2	HEX HD BOLT M12X30	920046900	4
3	CONTACT WASHER DIA 12	2/519044	4
4	PLAIN WASHER DIA 12	908021000	4

ITEM NO.	PART NUMBER	QTY
1	FT0052317-101	1
1	FT0052317-100	1
1	FT0053022-100	1

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 10

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242 to the threads of the four M12 bolts (2).
5. Install the Air dryer (1) on to the support bracket with the parts that follow:
    - Four M12 bolts (2) using 19mm spanner
    - Four contact washers (3)
    - Four plain washers (4).
6. Torque the four M12 bolts (2) to 88 Nm.
7. Apply torque mark on the bolt head using Stylmark paint.

NOTE: Refer document FT0044924-000-I00TIN for procedure on applying Stylmark.

8. Apply Loctite 577 on the pneumatic fittings.
9. Connect the pipe fittings on inlet and outlet pipe fittings of the Air dryer (1). Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
10. Pressurise the system, perform a complete functional test, verifying that the device works properly, without seizure or hard point and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6. Spare Part List

- Routine Maintenance - The spare parts required are

Refer to Figure 7, Figure 8 and Figure 9

DESCRIPTION	P/N	QTY	BASIS
Pre-Coalescer Element Kit	790029165	1	Must change
Desiccant Canister Kit	790029195	1	On condition
Multi-toothed washer	099800700	16	On condition

ROUTINE MAINTENANCE SPARE PART LIST				
FIG. REF.	ITEM NO.	DESCRIPTION	P/N	TOTAL QTY
Figure 7	4	Coalescer Element filter (AD)	029204000	1
Figure 7	6	Elastic Stop Nut	FT0054289-000	1
Figure 7	7	O Ring	FT0050293-013	1
	Kit	**Pre-Coalescer Element Kit**	790029165	1
Figure 9	1	Retaining ring	029814000	4
Figure 9	2.1	Screen Disc	029812500	4
Figure 9	3	Desiccant Charge Alumina Balls	029902000	5 kg
Figure 9	5	Seal	FT0050293-011	2
Figure 8	6	O Ring	FT0050293-012	2
	Kit	**Desiccant Canister Kit**	790029195	1

- Installation - Spare parts not required.

NOTE: For WABTEC scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7. DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel. The disposal must be done according to rules in force at End-user premises and to the laws in force in the Country where the component is used.

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Date/Date: 30/12/15 - Issue/Revision: A00
Maintenance/Use manual
Maintenance/Use manual
ECO/ECO: .

FT0051762-100-E00MUM

FINAL FILTER
To P/N. FT0051762-100

For KOCHI METRO

Compiled/Compiled: SRC
Checked/Checked: . JP
Approved/Approved: .AE

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REVISIONS / Revision						
Issue Revision	Date Date	Description Description	ECO ECO	Compiled Compiled	Checked Checked	Approved Approved
A00	30/12/15	NEW RELEASE	.	SRC	.JP	.AE
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Summary

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Symbols

Warning/Caution! The rule must be strictly observed.

Information, recommendation.

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1 Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- The device must be maintained when and as prescribed.
- Authorised personnel must carry out installation and maintenance.
- Only original spare parts can be used.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed. .
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to accessing electric parts, make sure the power is duly switched off.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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2 Description of the equipment

The Final filter assembly is an aluminium casting finned on the external surface of the filter body for efficient heat transfer. The Final Filter is mounted separately from the Air Dryer as the next component in the Outlet Pipe. The Final Filter ensures that minute dust and dirt particles, which may have escaped purging in the main Dryer system, are removed.

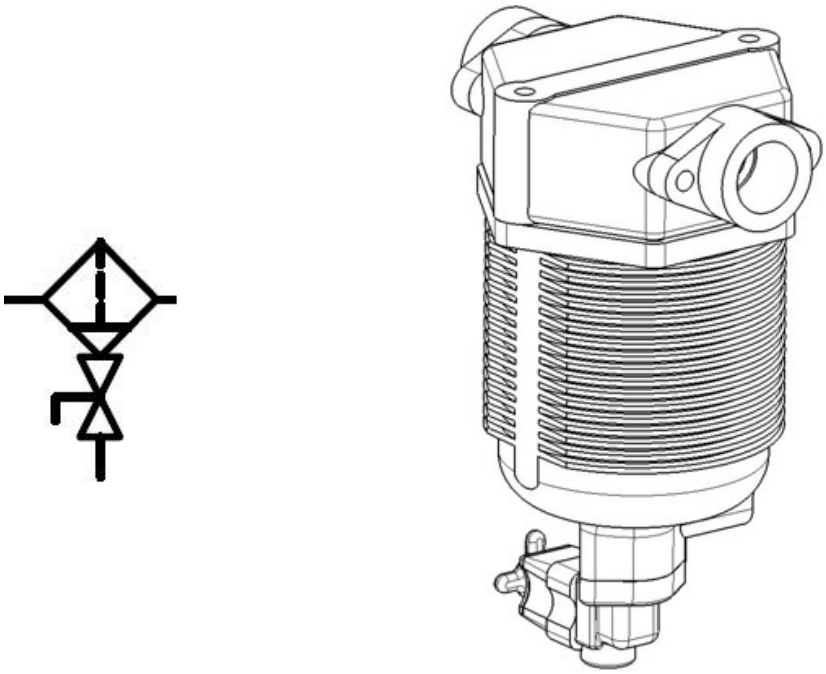

Figure 1: ISO symbol and external view

3 Main features and data

- Drain Port size ..... 3/8" NPT
- Mass: ..... 7 kg
- Inlet and Outlet port size:.....1-1/4” BSPT

4 Description of function/operation

Refer to *Figure 2*

Air enters into the Body (1) of the Filter and passes through the Filter element (5) which collects any remaining impurities from the air. A manually operated drain cock (2) is situated at the foot of the Final Filter. The Air dryer assembly is provide with a separate final filter assembly in the outlet piping of the dryer leading to the Main Reservoir.

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The Final filter assembly consists of a corrugated paper filter, which is capable of trapping the air born particulate matter of the desiccant material due to compacting and attrition. Without the Final filter element (5) such fine particulate matter will make its way into the downstream pneumatic devices and render them inoperative quickly due to a continuous deposit. The entire assembly is a static one and consists of only one moving part in the Shut-off valve only under manual operation and does not need any maintenance other than periodic draining of condensates and replacement of the filter cartridge at the recommended intervals. The design is made in such a way that such replacement of the filter cartridge can be done without having to remove the piping connections.

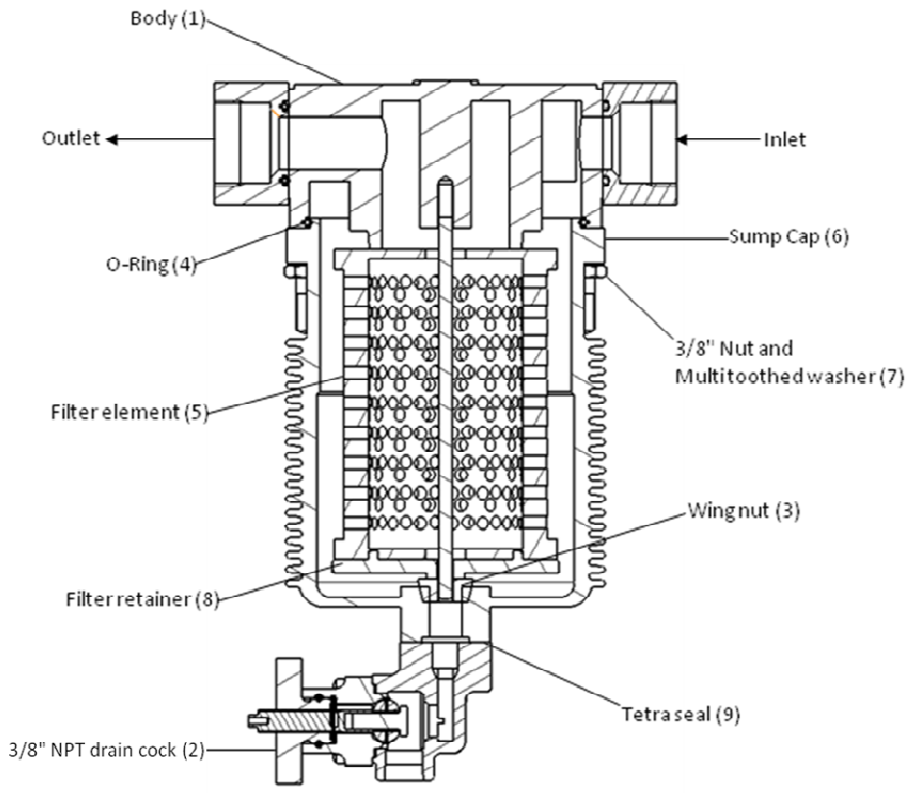

Figure 2: Functional scheme

5 Maintenance prescriptions

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Filter element replacement every 1 year.

2. Second Level Maintenance: Overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhauled regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 5 years.

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6 Routine maintenance

Caution! Pressurized system! Discharge the pressure before any operation. Main compressor to be in OFF condition, AGTU delivery cock to be closed and the air pressure within the system to be drained by opening the drain cock in final filter before removal.

Note: During dismantling the nuts, if it is found jammed or hard to remove, it is recommended to clean the projected nut end threads by using the Molykote supergliss or WD-40 to clean the deposited muddy particles. Despite this precaution, if the metal end of the stud gets loosened, then clean the metal end of the stud and assemble with Loctite 270.

Important! The used cartridges could contain oil, they must be disposed of according to the law in force.

Ref.	Description	Qty
1	Filter Body	1
2	3/8" NPT Drain Cock	1
3	Wing nut	1
4	O-Ring	1
5	Filter element	1
6	Sump Cap	1
7	3/8" Nut and Multi toothed washer	6
8	Filter retainer	1
9	Tetra seal	1

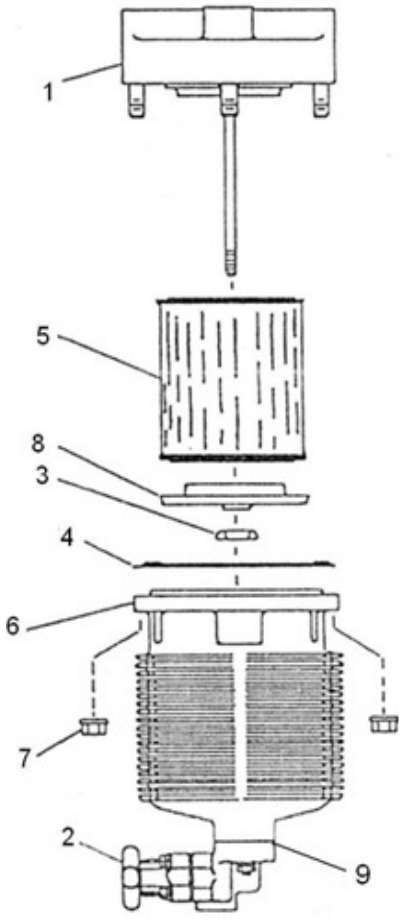

Figure 3: Exploded view

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1. Unscrew the 3/8" Nuts (7) using 9/16" socket spanner along with its toothed washer.
2. Remove the Sump cap (6) and the other internal parts along with the Filter element (5).
3. Renew the Filter element (5), O-ring (4) and Tetra seal applying Molykote M33 grease.
4. Tighten the sump cap with the nuts with multi-tooth washers. The multi-toothed washers to part no. 099 8007 00 are intended for single use. During reassemble, if any of the nuts having a multi toothed washer is unscrewed, the washer has to be replaced. After replacing the multi toothed washer with new, the nut has to be tightened to a torque value of 27.3 Nm.
5. Pressurize the system and check for leakages.

7 Removal procedure

Refer to *Figure 4*

1. Remove the piping connections to the Inlet and Outlet port.
2. Unscrew the M12 Bolts (3) using 19mm Spanner.
2. Remove and retain the washers (2) and the bolts.
3. Remove the Final filter assembly (1) from the mounting frame.

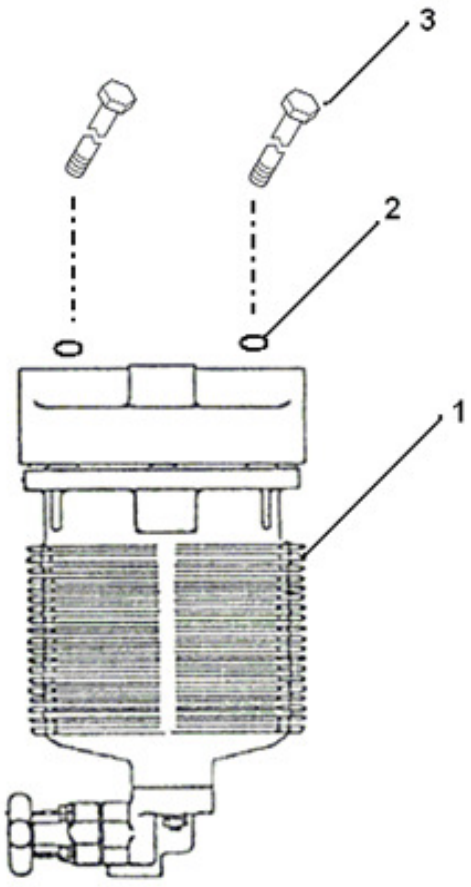

Figure 4: Installation/removal procedure

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8 Installation procedure

Refer to *Figure 4*

1. Fix the piping connections to the Inlet and Outlet ports and secure the assembly by screwing the two bolts (3) with their washers (2) using thread Loctite 242 with a torque of 46.7 Nm.
2. Check that all the service conditions are restored and that there are no leakages.

9 Spare parts

- **Routine Maintenance** – With reference to *Figure 3*, paragraph 6, the spare parts required for routine maintenance are:

Ref	Description	Part Number	Qty
4	O-ring	FT0050293-012	1
5	Filter Cartridge	029108000	1
9	Tetra seal	FT0050293-018	1
Kit	**Contains parts- Final filter**	FT0050398-K275	1

Additional item:

Ref	Description	Part Number	Qty
7	Multi-toothed washer	099 8007 00	6

- **Installation –** Spare parts not required.

10 Special tools

No special tools required for servicing and installation.

11 Disposal

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel.

The disposal must be done according to rules in force at End-user premises and to the laws in force in the Country where the component is used.

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13.15_MINIMUM PRESSURE VALVE

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/// 2/517329-E00MUM

MINIMUM PRESSURE VALVE
2/517329

Maintenance/Use manual

ECO: DRC 1661
Compiled: VP
Checked: .JP
Approved: .AE

Date: 10/08/2021 - Revision: A00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1661	VP	.JP	.AE
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The minimum pressure valve is used to guarantee the minimum pressure for the correct functioning of the items after the valve.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

FAIVELEY TRANSPORT cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing operations on moving parts (compressors, fans, actuators, etc.) make sure they cannot start unexpectedly.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. FAIVELEY TRANSPORT cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

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1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +47°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every FAIVELEY TRANSPORT product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Minimum Pressure Valve must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Minimum Pressure Valve and speaks about the operational procedures, customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Minimum Pressure Valve P/N 2/517329 for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
Assy	Assembly
Kg	Kilogram
mm	millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Minimum Pressure Valve is used to guarantee the minimum pressure for the correct functioning of the items after the valve. This valve has even the function of check valve in case the pressure before the valve itself blows under the opening pressure.

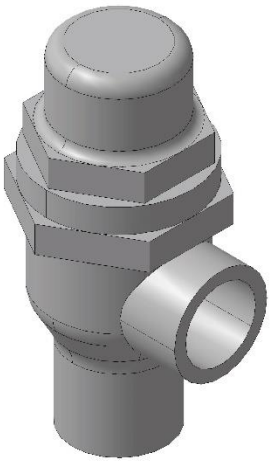
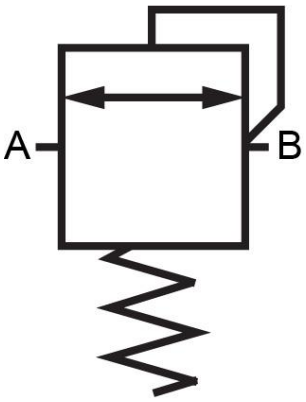


Figure 1a – Minimum Pressure Valve, Isometric View



A Input
B Output

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Service pressure ..... 0 ÷ 10 bar
Max pressure ..... 11 bar
Setting ..... 4 ± 0.5 bar
Mass ..... 0.45 kg

/// 3.OPERATIONS

The valve consists of a body fitted with the inlet and outlet port. Above the body it is screwed an upper body with O-ring. Inside this assembly are housed the piston, the check valve assembly, the springs.

3.1 OPEN CONDITION

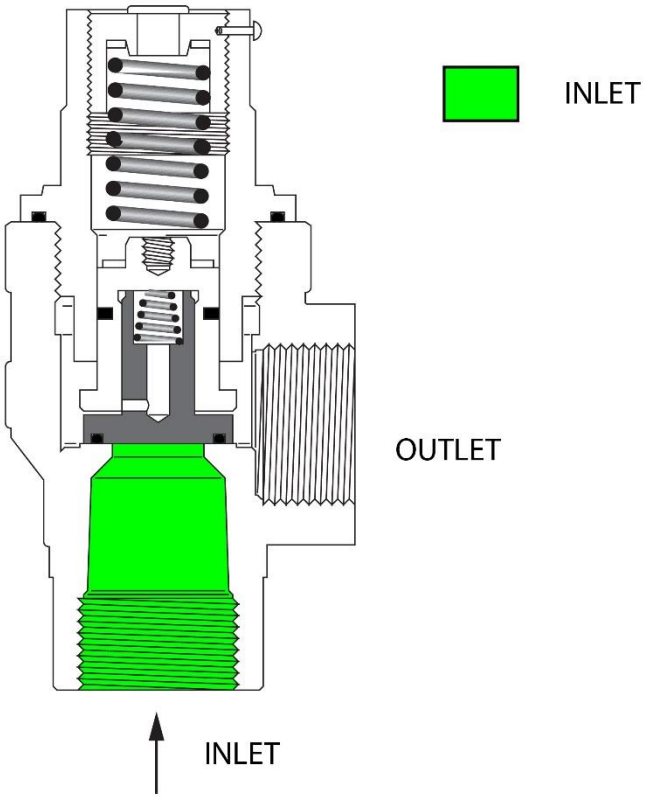

Figure 2a – Minimum Pressure Valve, Closed Condition

Refer to Figure 2a

When the input pressure is lower than 4 bar, the spring hold the piston against the body closing the connection between the input port and the output port.

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3.2 CLOSED CONDITION

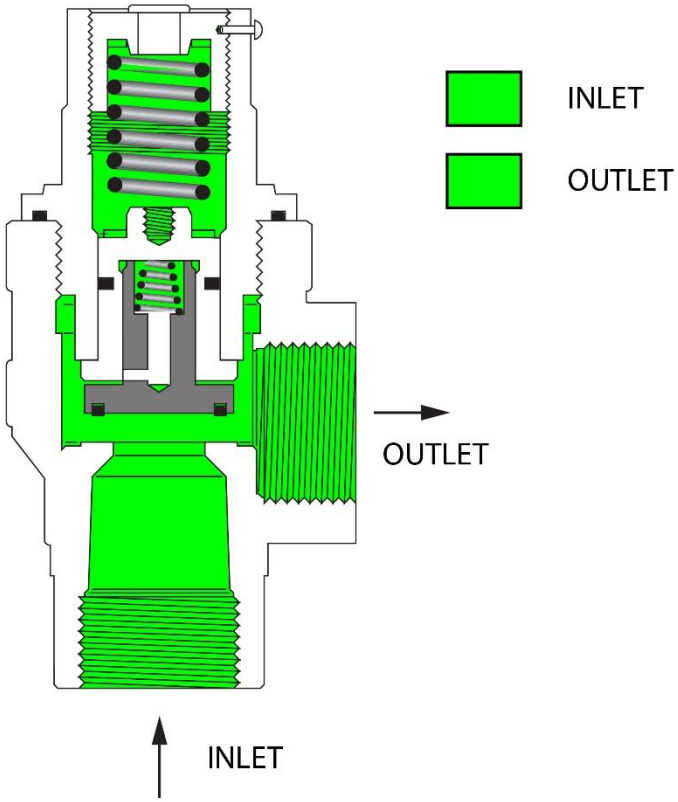

Figure 2b – Minimum Pressure Valve, Open Condition

Refer to Figure 2b

When the input pressure rises above 4 bar, the check valve assembly overcomes the spring effort and pushes the assembly flange-stopper against the upper body opening the connection between input port and output port.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
30mm wrench	Tighten/loosen the fittings
55mm wrench	Tighten/loosen the fittings

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 577	Sealant for pipe fitting

/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Not required.

2. Second Level Maintenance: Replacement as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 6 years

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

This device doesn’t require any light maintenance.

5.3 REMOVAL PROCEDURES OF EQUIPMENT

Warning! Closely observe all applicable car builder rules and procedures governing:

- Continuous isolation of power;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal.

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Important! During maintenance operations beware to keep the maximum cleanliness, avoiding contamination of the pneumatic circuit from any possible debris.

Refer to Figure 3

1. Disconnect the pneumatic connection using a 30mm wrench.
2. Remove the Minimum Pressure Valve (1) using a 55mm wrench.

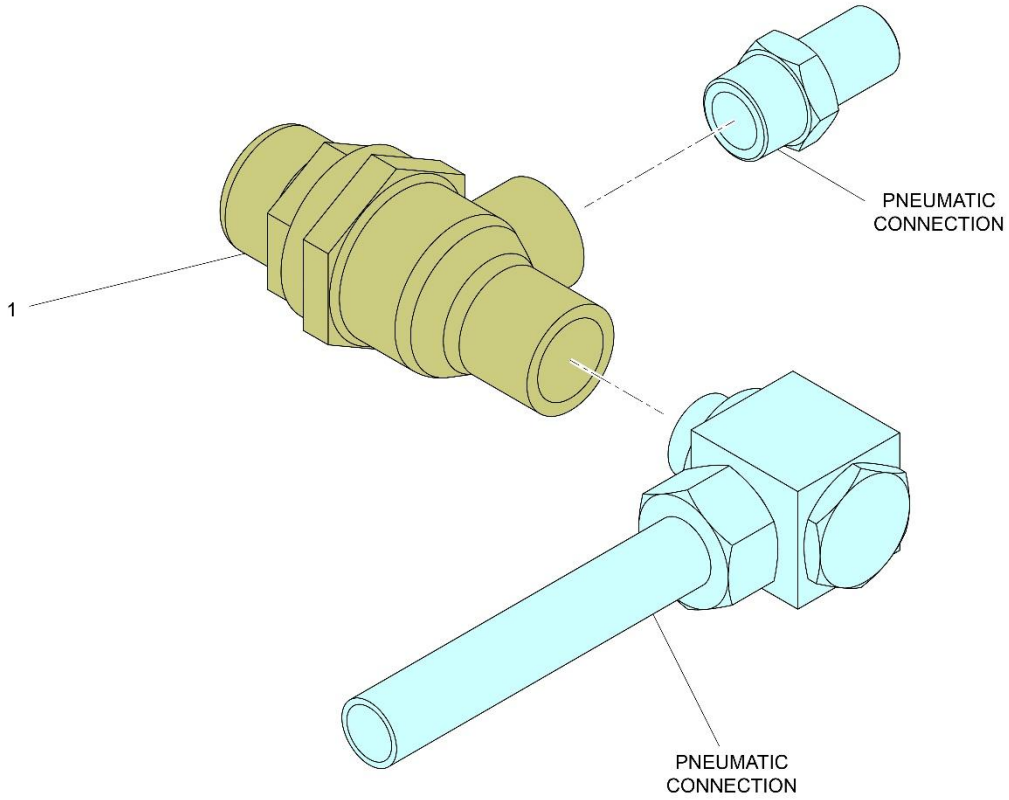

Figure 3 – Minimum Pressure Valve, Removal/Installation

REF	DESCRIPTION	PART NUMBER	QTY
1	MINIMUM PRESSURE VALVE	2/517329	1

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5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Caution! Pressurised system! Discharge the pressure before removal.

Important! During maintenance operations beware to keep the maximum cleanliness, avoiding contamination of the pneumatic circuit from any possible debris.

Refer to Figure 3

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 577 on the pneumatic fittings.
5. Place the Minimum Pressure Valve (1) on the system and connect the pneumatic connection (3) using 33mm and 55mm wrench.
6. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

/// 6.SPARE PART LIST

- Routine maintenance: The spare parts are not required.

- Installation: The spare parts are not required.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, copper, steel, rubber, brass and stainless steel. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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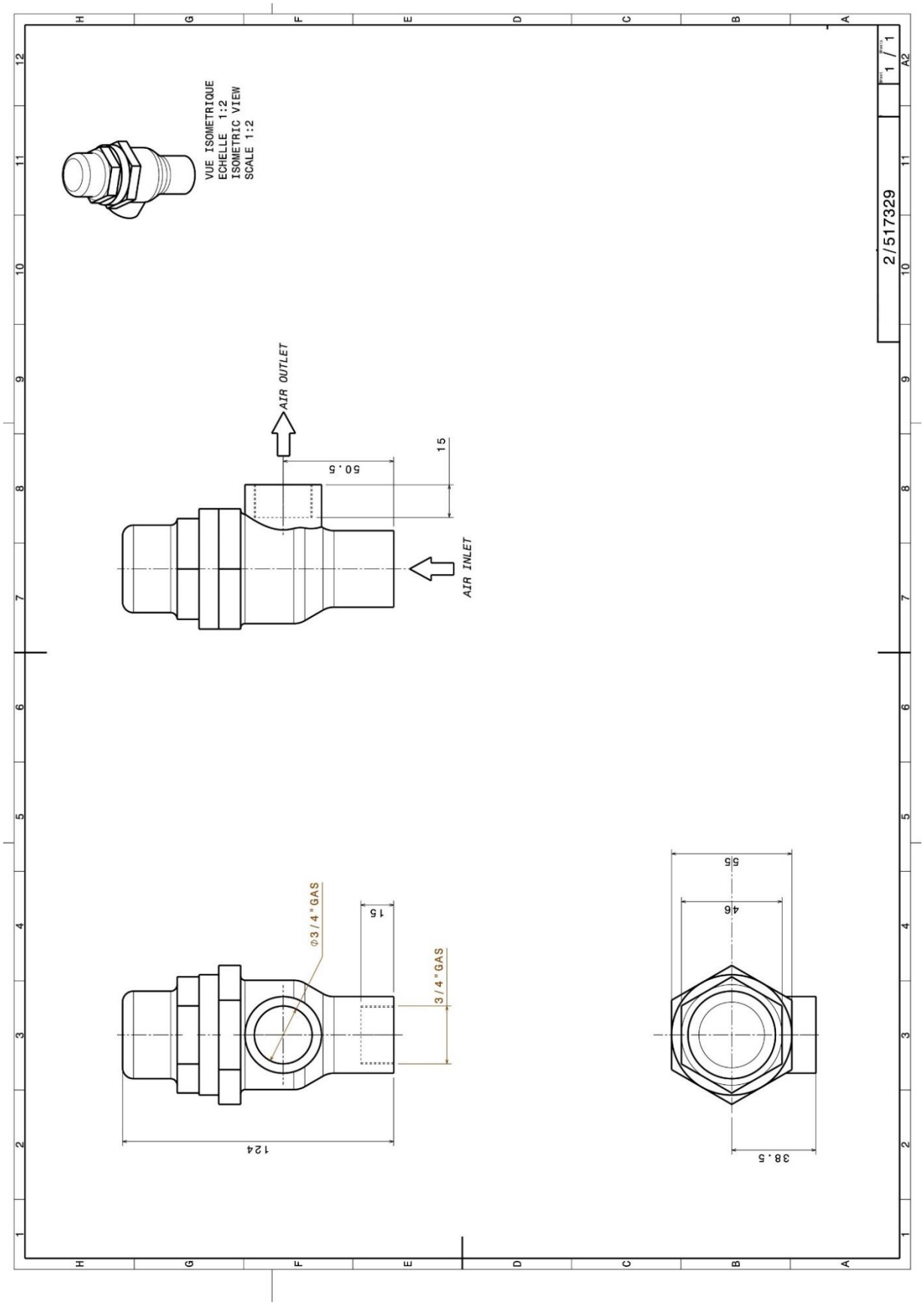
/// 8.OUTLINE DRAWING

Minimum Pressure Valve – 2/517329



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13.18_AIR INTAKE FILTER

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/// 1/320658-E00MUM

AIR INTAKE FILTER
1/320658
1/320518

Maintenance/Use manual

ECO: DRC 1661
Compiled: VP
Checked: . JP
Approved: .AE

Date: 10/08/2021 - Revision: A00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1661	VP	.JP	.AE
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The air intake filter is used to collect and trap the impurities of the inlet air order to protect the equipment downstream.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

FAIVELEY TRANSPORT cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver’s desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

- The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing any operations ensure that the adjacent moving parts (compressors, fans, actuators, etc.) should not be in operating condition.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. FAIVELEY TRANSPORT cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

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1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

For this component, functional check not applicable for the first level maintenance.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C to +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every FAIVELEY TRANSPORT product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Air Intake Filter must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Air Intake Filter and speaks about the operational procedures and customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Air Intake Filter P/N 1/320658 and 1/320518 for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
BSPP	British Standard Parallel Pipe
HD	Head
mm	Millimetre
Nm	Newton metre
P/N	Part Number
QTY	Quantity

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The Air Intake Filter is used to collect and trap the impurities of the inlet air order to protect the equipment downstream.

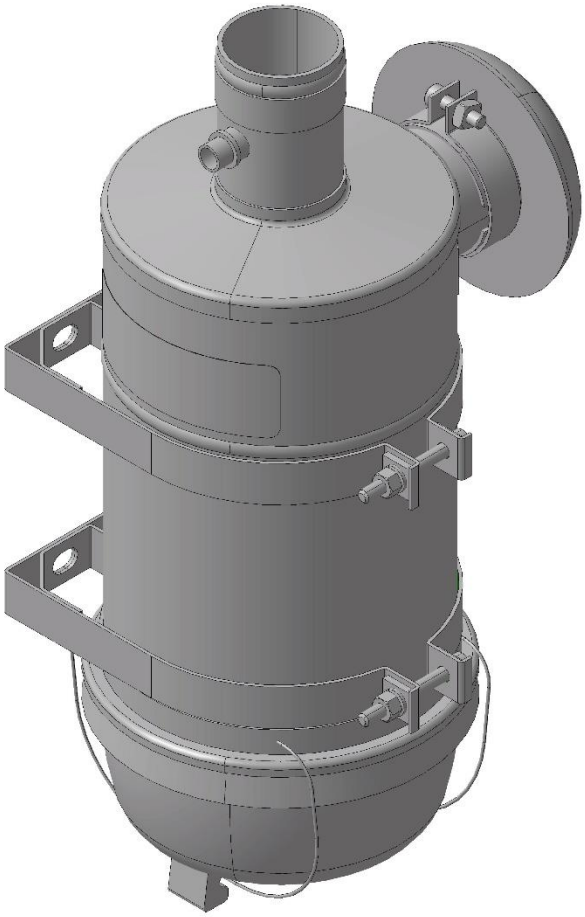

Figure 1a - Air Intake Filter, Isometric View

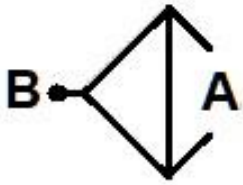

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Part number	Outer diameter	Filtering efficiency (ISO 5011)	Mass
1/320658	50 mm	99,8%	2.6 kg
1/320518	50 mm	99,8%	2.6 kg

/// 3.OPERATIONS

3.1 WORKING CONDITION

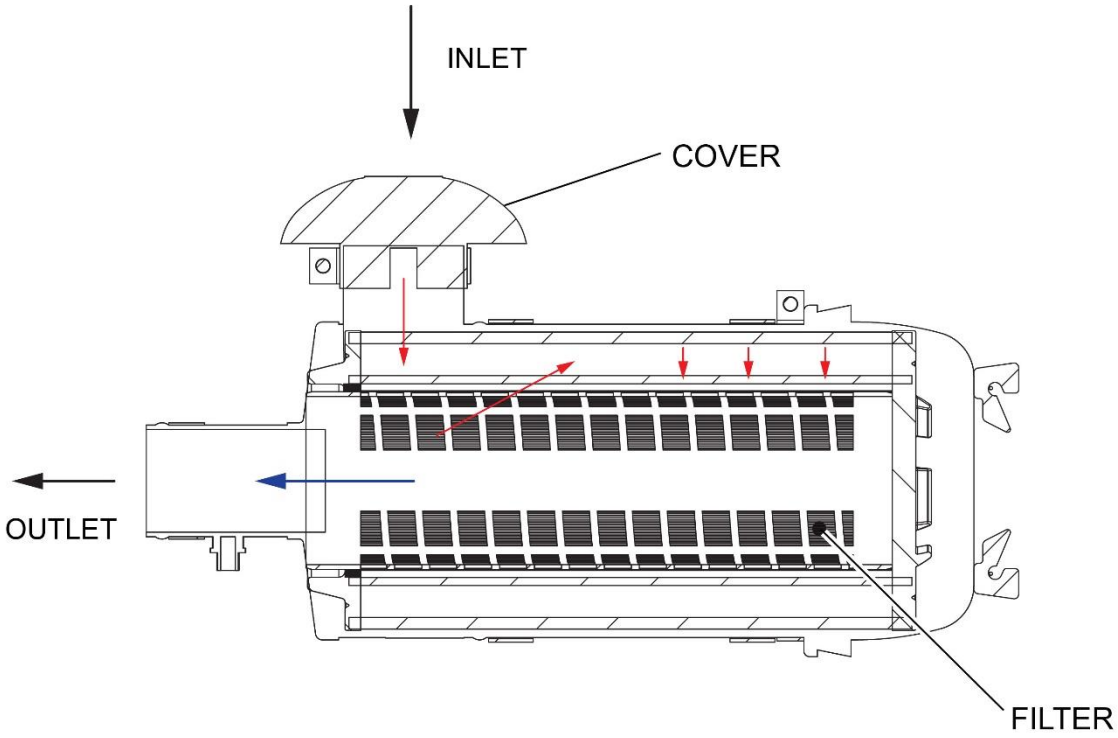

Figure 2 - Air Intake Filter, Working Condition

Refer to Figure 2

The inlet air enters into the filter through the cover and, after the cleaning process inside the filter, flows through the outlet port. The cleaning process is done through a filtering element in double stage configuration and consists of an external metallic part, a high resistance filter cartridge in propylene and a cyclonic separator.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
24mm spanner	Install/remove the nut
13mm Socket wrench	Tighten/loosen the fasteners
Torque wrench 1-50 Nm	Torque tighten the fasteners

4.2 LIST OF SPECIAL TOOLS

No special tools required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 242/243	Thread locking
Loctite 577	Sealant for pipe fitting
Powerful degreaser solvent	Cleaning
Stylmark	Torque marker
Soft cloth,	Cleaning
Soft brush	Cleaning

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/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance):
   Cleaning/inspection as scheduled in the **system maintenance plan.** If no maintenance plan is provided, the device must be checked regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer section 5.2.1.
   Typical check periodicity: 2 months.

   Cartridge replacement as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be maintained regularly as required by the Operator's rules, the mission profile and the environmental conditions. Refer section 5.2.2
   Typical cartridge replacement periodicity: 1 year.

2. Second Level Maintenance: not required.

NOTE: Maintenance periodicity must be counted from the date of manufacture of the device.

5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 CLEANING/INSPECTION

Warning! Pressurised system! Discharge the pressure before removal.

IMPORTANT: Cartridge may contain oil! Collect the drainage waste as prescribed by the law in force.

Caution! Never wash out or brush out the filter’s cartridge. When blowing out make sure that no dust reaches the inside of the main element.

Refer to Figure 3, 4 and 5

1. Clean carefully the external part of the filter with a soft cloth, a soft brush and a powerful degreaser solvent.
2. Remove the cover (1) unlocking the fixing hooks (2).
3. Unscrew the nut (4) through a 24mm spanner and extract the cartridge (3).
4. Clean carefully the interior part of the body with a moist cleaning rag.

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5. Dry the cleaned part with a soft jet of compressed air.

Caution! Take care during this action to ensure that no dust enters the clean air line, i.e. gets to the motor compressor.

6. Clean the cartridge (3) using dry pressurised air at max 5 bar and using a tube with the end bent by approx. 90° as showed in Figure 3. It must be of sufficient length to reach down to the bottom of the element (the cartridge's length is 22,5 cm).

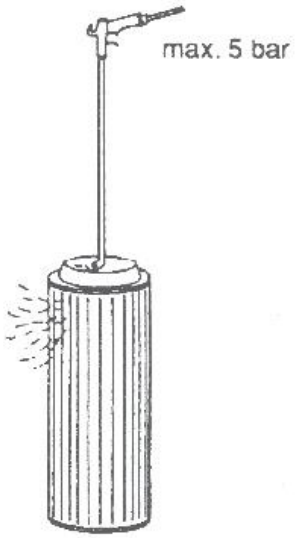

Figure 3 – Filter's Cartridge Cleaning

7. Before re-assembly, the cleaned cartridge (3) must be carefully checked for damage to the paper bellow and the rubber seal.

Caution! Use a suitable flashlight to examine every fold of the paper bellow for cracks and holes as showed in Figure 4. In order also to identify small defects, the examination should not be carried out in direct sunshine, but rather in a darkened room.

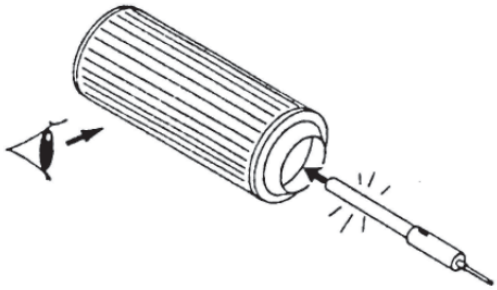

Figure 4 – Filter's Cartridge Inspection

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IMPORTANT: In case of damage replace the cartridge (3) as described in the section 5.2.2;

8. Assemble the filter placing the cleaned cartridge (3) inside the body and locking the nut (4) using a 24mm spanner. Tightening torque 20 Nm.
9. Before reinstalling the cover (1), separate the plug (5) from the cap (6) and empty it.
10. When reassembling the plug (5) onto the cap (6), take care that they are correctly assembled. A recess in the plug (5) rim and a lug on the cap (6) must interlock.
11. Close the cover (1) onto the body through the hooks (2).

5.2.2 CARTRIDGE REPLACEMENT

Warning! Pressurised system! Discharge the pressure before removal.

IMPORTANT: Cartridge may contain oil! Collect the drainage waste as prescribed by the law in force.

Caution! Never wash out or brush out the filter's cartridge. When blowing out make sure that no dust reaches the inside of the main element.

Refer to Figure 5

1. Clean carefully the external part of the filter with a soft cloth, a soft brush and a powerful degreaser solvent.
2. Remove the cover (1) unlocking the fixing hooks (2).
3. Unscrew the nut (4) through a 24mm spanner and extract the cartridge (3). **DISCARD** the cartridge (3).
4. Clean carefully the interior part of the body with a moist cleaning rag.
5. Dry the cleaned part with a soft jet of compressed air.
6. Assemble the filter placing the **NEW** cartridge (3) inside the body and locking the nut (4) using a 24mm spanner. Tightening torque 20 Nm.
7. Before reinstalling the cover (1), separate the plug (5) from the cap (6) and empty it.
8. When reassembling the plug (5) onto the cap (6), take care that they are correctly assembled. A recess in the plug (5) rim and a lug on the cap (6) must interlock.
9. Close the cover (1) onto the body through the hooks (2).

Caution! In cases where filter is installed horizontally, be sure that arrow on cover (1) is

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pointing upwards.

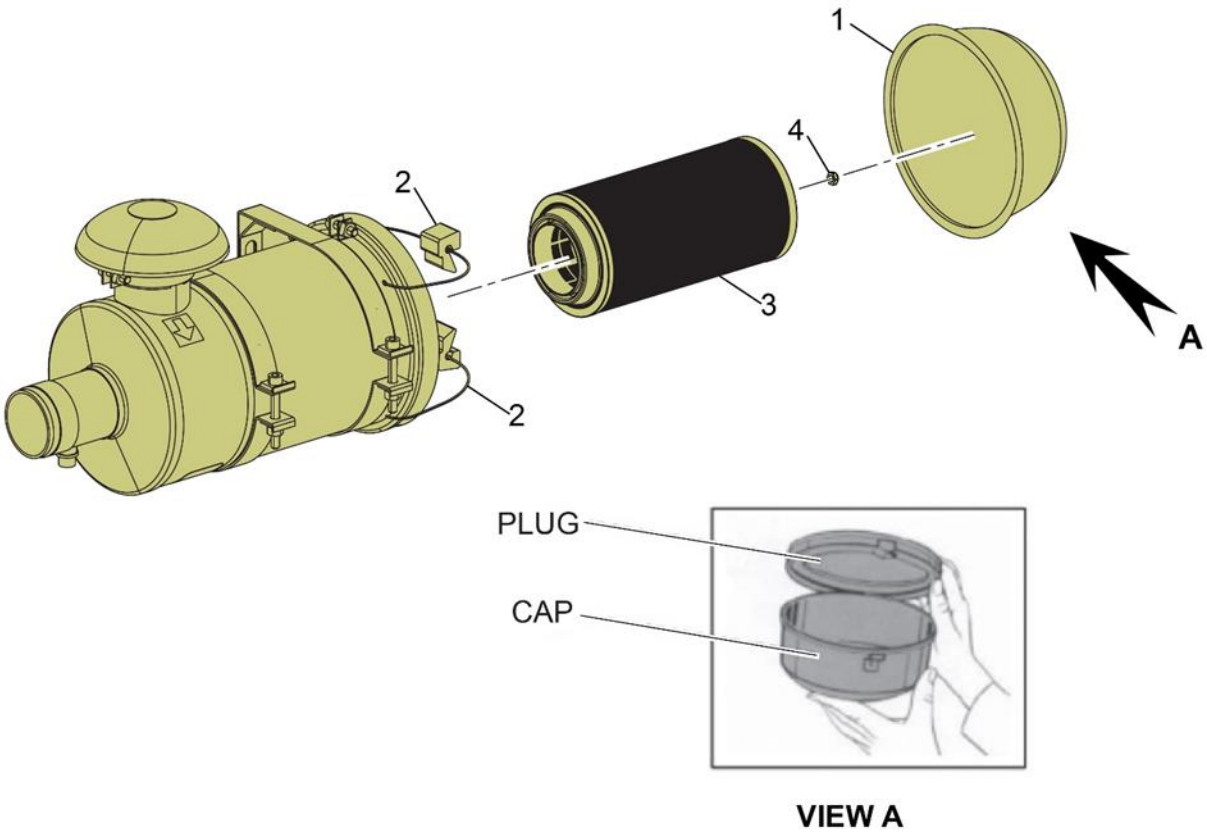

Figure 5 – Filter Cartridge Replacement

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5.3 REMOVAL PROCEDURES OF EQUIPMENT

Danger! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Warning! Closely observe all applicable car builder rules and procedures governing:

- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Warning! Pressurised system! Discharge the pressure before removal.

Caution! Take care to avoid ingress of dirt or debris into the system.

NOTE: Fittings are application dependent.

Refer to Figure 6

1. Disconnect the pneumatic connection from the Air Intake Filter (1).
2. Unscrew and remove the four M8 screws (2), eight plain washers (3), four contact washers (4) and four nuts (5) that attaches the filter (1) to the frame using a 13mm socket wrench then remove the filter (1).

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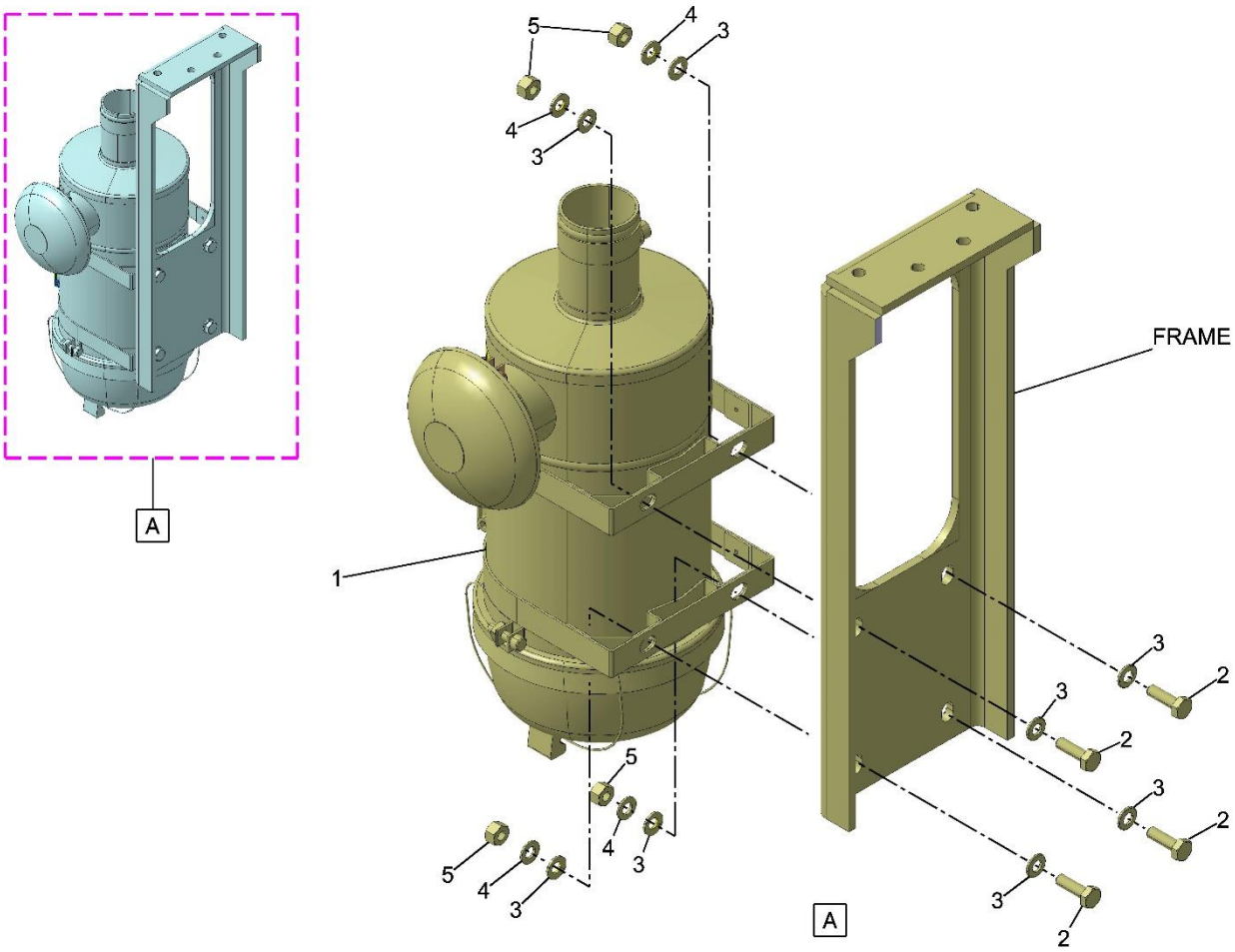

Figure 6 – Air Intake Filter, Removal/Installation

ITEM NO.	DESCRIPTION	PART NUMBER	QTY
1	AIR INTAKE FILTER	1/320658	1
2	HEX HEAD SCREWS M8x25	920043500	4
3	PLAIN WASHER DIA 8	908205100	8
4	CONTACT WASHER DIA 8	2/519042	4
5	HEX NUT M8	906019600	4

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 6

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 242 to the threads of the four hex head screws (2).
5. Install the four hex head screws (2), eight plain washers (3), four contact washers (4) and four nuts (5) using a 13mm socket wrench to secure the filter (1) to the frame.
6. Torque the four screws (2) to 14 Nm using torque wrench.
7. Apply torque mark on the screw head using Stylmark paint.
8. Apply Loctite 577 on the pneumatic fittings.

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9. Connect the pipe fittings on the Air Intake Filter (1). Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer
10. Ensure the pneumatic connections are leak proof.

/// 6.SPARE PART LIST

- Routine maintenance: the spare parts required for routine maintenance are:

Refer to Figure 5

ROUTINE SPARE PART LIST			
ITEM NO.	**DESCRIPTION**	**PART NUMBER**	**QTY**
3	Filter element	4046380008	1

- Installation: The spare parts not required.

NOTE:

- For FAIVELEY TRANSPORT scope of supply of fasteners, based on condition, if it corroded, rusted, threads worn, it shall be replaced with **NEW** ones.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium, steel, stainless steel and rubber. The disposal must be done according to rules in force at end-user premises and to the laws in force in the country where the component is used.

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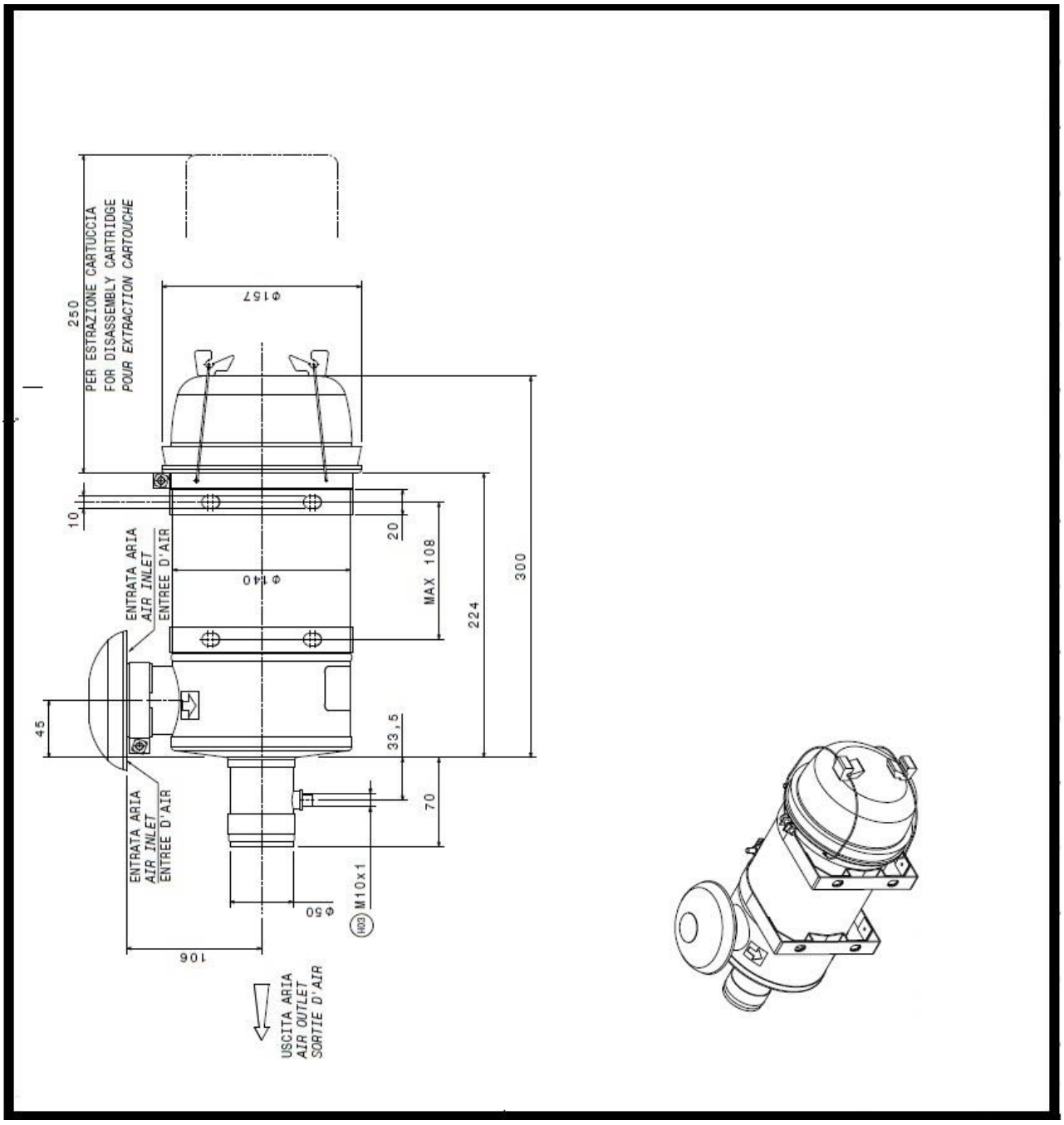
/// 8.OUTLINE DRAWING

Air Intake Filter - 1/320658



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13.24_WATER SEPERATOR

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Faiveley Transport
A Wabtec Company

/// FT0053017-100-E00MUM

WATER SEPARATOR

FOR P/N FT0053017-100

Maintenance/Use manual

ECO/**ECO**: .
Compiled: **JP**
Checked: .SMC
Approved: .AE

Date: 04/04/2018 - Revision: A00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	04/04/2018	FIRST RELEASE	.	JP	.SMC	.AE
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Faiveley Transport
A Wabtec Company

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/// 1. Safety precautions

- The device must be used as specified in the designated system. Any other use is not allowed.
- The device must be maintained when and as prescribed.
- Authorised personnel must carry out installation and maintenance.
- Only original spare parts can be used.
- It is the responsibility of the person who carries out the work to make sure that all regulations for safety at work and also any environmental regulations are respected and observed. .
- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Do not use chromated tools.
- Prior to proceeding with any operations perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.
- Prior to removing the device, make sure the pressure is relieved. While dismounting elements, take however care as there could be residual pressure.
- Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.). Plug open pipeworks when the device is removed.
- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.
- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.
- The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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/// 2. Description of the equipment

The water separator is used in compressed air systems to remove unwanted liquid and solid contaminants from the air supply.

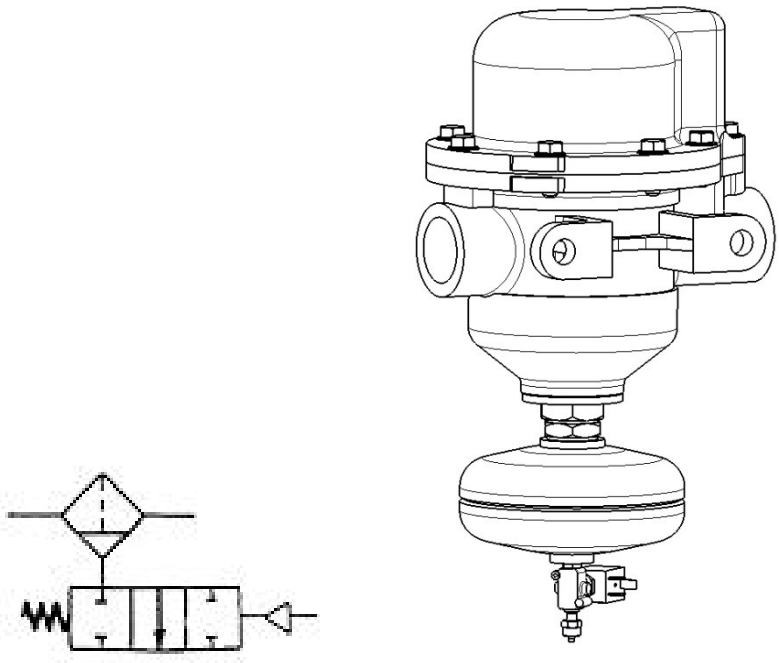

Figure 1: Isometric view and symbol

/// 3. Main features and data

Nominal diameter: of drain outlet ..... 1/4 ”

Mass: ..... 11.5 kg

/// 4. Description of function/operation

The drip cup should be mounted in the compressor delivery line in such a manner that the inlet pipe slopes down to the drip cup, so that condensate etc., automatically drains into the body. The drip cup must be mounted vertically with the drain valve at the bottom; two lugs are provided for securing the drip cup to a suitable bracket. Care must be taken to position the drip cup in an accessible position where the automatic drain valve can be easily checked. Clearance should be provided for removal of the cover to gain access to the filter for routine cleaning purposes.

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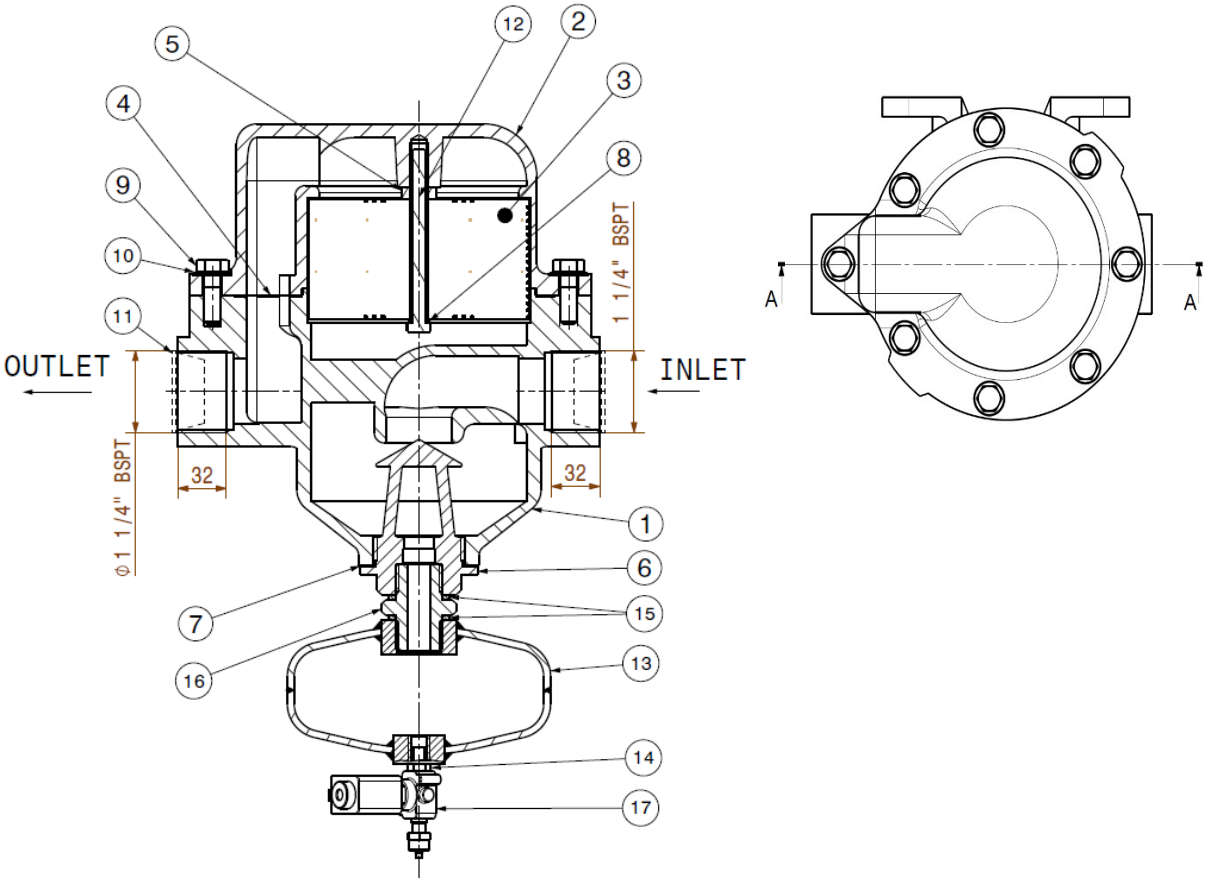

SECTION VIEW A-A

rawing

Item	Description	Qty.
1	Body Machined	1
2	Drip cup cover	1
3	Strainer	1
4	Gasket	1
5	Spacer	1
6	Screwed Buffle Piece MCD	1
7	Joint	1
8	Spring Lock Washer B10(SS)	1
9	Hex .HD. Screw M10 25 -8.8	8
10	Plain Washer A 10	8
11	Closure Plug	2
12	Hex .HD. Screw 3/8"BSW 4"LONG-SS	1
13	Reservoir	1
14	Hex NIPPLE - 1/8" BSPT	1
15	Hobb Seal	2
16	Adapter	1
17	Electro Valve	1

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/// 5. Maintenance Precautions

1. **First Level Maintenance (Routine maintenance)**: not required.

2. **Second Level Maintenance**: Overhaul as scheduled in the system maintenance plan. If no system maintenance plan is provided, the device must be overhauled regularly as required by the Operator's rules, the mission profile and the environmental conditions. Typical overhaul periodicity: 5 years.

/// 6. Removal procedure:

Refer to *Figure 3*

1. Unscrew the M16 Bolts (2) using 24 mm Spanner.
2. Remove and retain the nuts (3) and the bolts.
3. Remove the Inlet and Outlet pipe fittings to remove the Water Separator (1) from the frame (4).

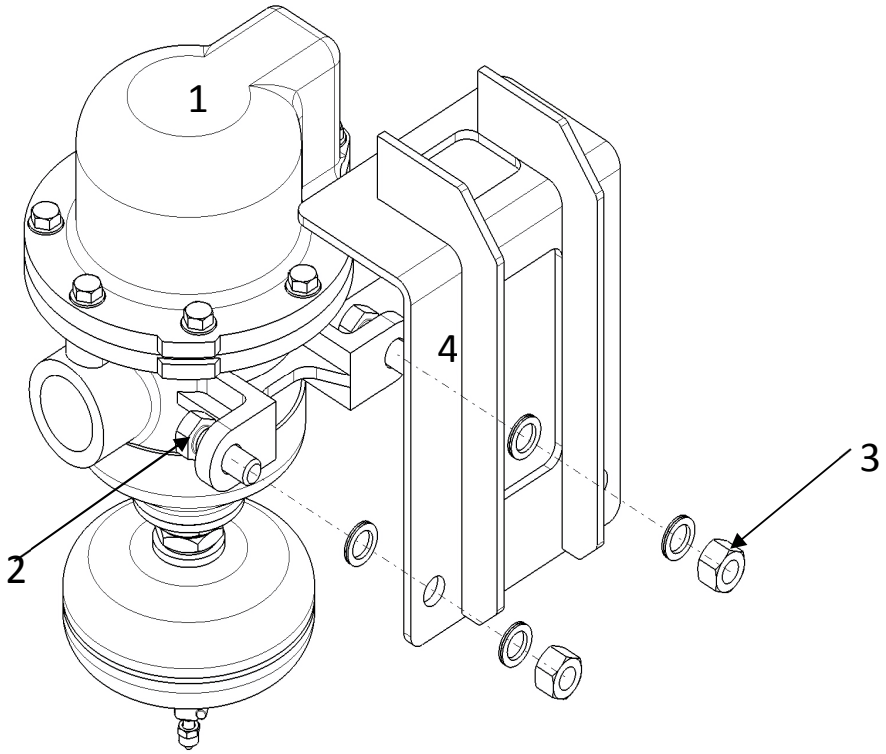

Figure 3: Removal Procedure

/// 7. Installation procedure

Re-assembly is the reverse of the dismantling procedure in *clause /// 6.*

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Important! The automatic drain valve body is stamped ‘DRAIN’ under the drain pipe connection. Ensure this connection is located directly below the water separator outlet.

/// 8. Special Tools

No special tool is required.

/// 9. Spare parts

Routine Maintenance – Not applicable.

Installation – Spare parts not required.

/// 10. Disposal

The device is mainly composed by the following materials: aluminium alloy, steel, copper, rubber, brass, and stainless steel.

The disposal must be done according to rules in force at End-user premises and to the laws in force in the Country where the component is used.

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13.25_DRAIN VALVE FOR WATER SEPERATOR

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/// FT0025443-102-E00MUM

DRAIN VALVE
FT0025443-102
FT0025443-100
FT0025443-101
FT0025443-103
2/515361 & 2/515362
2/517372
FT0025293-100 & -102
FT0041994-100

Maintenance/Use manual

ECO: DRC 1661
Compiled: VP
Checked: .JP
Approved: .AE

Date: 10/08/2021 - Revision: A00

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Revision						
Issue	**Date**	**Description**	**ECO**	**Compiled**	**Checked**	**Approved**
A00	10/08/2021	NEW RELEASE	DRC 1661	VP	.JP	.AE
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/// 1.GENERAL DESCRIPTION

1.1 INTRODUCTION

The valve is an electro-pneumatic operator directly acted by the energy of a solenoid.

This document defines the maintenance activities that to be carried out in the unit. Detailed description about functions of the unit also included as a part of this manual under sections 2 and 3.

1.2 SAFETY PRECAUTIONS

1.2.1 FOREWORD

These rules are integral parts of this maintenance user manual and have the purpose of providing necessary notions to the personnel involved in maintenance operations, in order to avoid injuries, damages and environmental pollution.

The safety rules are subject to improvement by the Operator or by the Authority in charge of using and maintaining the vehicle. In particular, factors not known at the time of release (e.g. real operating conditions, available tools, skill of personnel, etc.) must be taken into due account when carrying out the operations.

Furthermore, the Operator cannot forget the legal prescriptions in force at the time of use of the vehicle, however notion of sound judgment is applicable under all the circumstances. All the practices that can put at risk the safety of personnel, driver and passengers must be avoided.

This manual must be easily accessible to all the involved personnel for immediate reference. Before undertaking any actions, the personnel must gain knowledge of the content of this manual. It is mandatory that the personnel are aware of the legal requirements concerning the safety and health at work and the prevention of accidents. The personnel must have the necessary basic knowledge in the field of operations (mechanics, pneumatics, hydraulics, etc.)

FAIVELEY TRANSPORT cannot be held responsible for any accidents, damages or environmental pollution caused by these prescriptions being not applied, or by improper use of the product or of the tools.

1.2.2 PRELIMINARY OPERATIONS

- The vehicle must be stopped and secured with adequate means in order to prevent spontaneous and unexpected moving.

WARNING: Some operations on the unit can make it completely ineffective and make the vehicle free to move.

- Put clear and evident signs that a maintenance action is being undertaken (e.g. signs on driver's desks or on control panels) in order to prevent undue interference by others.

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- Prior to doing any actions, make sure that it will not represent a risk for someone else possibly working on another part of the vehicle.

- Prior to accessing the pneumatic or hydraulic parts, make sure the pressure is vented to atmosphere. While dismounting elements, take care of possible residual pressure.

- Prior to accessing the electric parts, make sure the power is duly switched off.

- In general, cleanliness must be guaranteed to avoid contamination by dust, dirt and external agents.

1.2.3 PERSONAL SAFETY

The working place must be adequately prepared in order to remove all possible obstacles and hindrances.

- While moving heavy parts, personnel must use adequate lifting tools (jacks, lifter, winch, etc.) and wear suitable protective shoes and gloves.

- For operations under the vehicle, personnel must wear protective helmet.

- For operations on the roof, personnel must be secured with adequate means to prevent falling down (safety belts, etc.). The vehicle must be located on a catenary-free portion of the track.

- Before dismounting any parts, read carefully the technical documentation in order to get acquainted on possible risks like pressure or loaded springs. In this case wear protective goggles.

WARNING! The safety warning label could be missing.

- While manipulating chemicals like lubricants, grease, solvents, etc. follow carefully the manufacturer's prescriptions. In any case, avoid breathing the vapour and avoid contact with skin and eyes. Wear protective gloves, goggles and filter-mask.

- When using flammable substances (lubricants, solvents, etc.), adopt all possible precautions to avoid the risk of fire. Do not smoke. Do not use heat sources or un-contained flames. Do not develop sparks. Keep the room ventilated. Store as prescribed by the manufacturer.

- While cleaning or drying parts, do not use high-pressure air jets. (Maximum 0.5 bar compressed air pressure shall be used).

- While cleaning, do not use salt water.

- While cleaning filters or cooler fins, use adequate air aspirator.

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- Prior to undertaking any actions on parts that are hot (disks, pads, coolers, etc.), make sure the temperature is at acceptable level. In case, wait until the item has cooled down or use suitable protection.

- For any operations, use the appropriate tool. Tools must be kept in optimum conditions. Tools that are worn-out or damaged represent a risk.

- While testing the components, never exceed the maximum operating pressure limits.

- Prior to performing any operations ensure that the adjacent moving parts (compressors, fans, actuators, etc.) should not be in operating condition.

- Should some liquid (lubricant, coolant, solvents) be spread on the floor, clean the area as soon as possible and take precautions to avoid slipping.

1.2.4 FUNCTIONAL SAFETY

- Product safety can only be guaranteed if genuine spare parts are used. Any other materials can prejudice functionality and safety.

- Make sure that the air used to supply the system externally (e.g. through the air service point group) is dry and free from dirt and debris. The air supply quality MUST be class 3-3-2 according to ISO 8573-1; otherwise the devices will be damaged.

- After any maintenance operations, make sure that the component and the complete system have been restored to their perfect functionality.

- After any maintenance operations, restore all the original conditions, especially the protection devices (locks, lead-wires, etc.) on components, system and vehicle.

1.2.5 ENVIRONMENTAL SAFETY

- During handling of lubricants, solvents and other substances that may be harmful for the environment, take all the precautions to avoid dispersion.

- All the applicable law requirements must be respected when disposing of substances that may pollute the environment (lubricants, batteries, coolant, etc.).

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1.2.6 SYMBOLS

Within this document, the risks are identified using specific warning notes and the following symbols.

High voltage

Rotating parts

Pressurised vessel

Flammable materials

Handle with care

Risk of crushing

Generic risk

Hot surface

1.2.7 PRESCRIPTIONS SPECIFIC TO PRESSURISED EQUIPMENT (EU DIRECTIVE 97/23/CE "PED"

- **Use of product**: all the product components can exclusively carry out the functions which they are designed for. Therefore, any other use, in particularly those outside the system on which they are installed, is expressly prohibited.

- **Degraded conditions**: the system can operate only if perfectly efficient. Possible malfunctioning or failures are to be considered exceptional conditions and, as such, must be removed as soon as possible.

- **Operating life**: the product is designed for a life of 35 years, at the end of which, it must be made inoperative by disconnecting all the energy supplies (electrical, mechanical, pneumatic, and hydraulic), by discharging all the residual capacities in order to bring the pressure to zero and dismounting all the components. In particular, the reservoirs must be suitably made unusable, pipes must be dismounted and discarded, flexible connections and the safety devices (e.g. safety valves) must be suitably made unusable.

- **Maintenance**: the necessary maintenance operations are shown in this manual. They must be carried out at the time and in the way described herein. In case of doubt do not proceed further but consult the manufacturer for clarifications.

- **Replacement of parts**: in case a part must be replaced, the new one must be installed according to the specific prescriptions and taking care to avoid any kind of external stress that may result in damage (e.g. static stress, torsion, etc.).

- **Modifications and repairs**: any modification to pressurised vessels is absolutely prohibited. Possible repairs must be made only if allowed and following the specific prescriptions.

- **Risks from pressure blow-off**: it is absolutely necessary, before removing any parts, to make sure that all the capacities have been discharged and, in any case, remove parts with care. The use of personal protection devices (goggles, gloves) is however recommended.

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CAUTION! Even if inoperative for a long time, a system may retain hazardous residuals of pressure.

- **Residual risks**: the following risks have not been considered during the design; therefore, it is the responsibility of the user to take them into due account.
    - External fire: risks from external fire have not been considered.
    - External stresses: the product is designed to operate on a rail vehicle and in the environmental conditions as required in the applicable specifications. Any other conditions have not been taken into account.

1.3 GENERAL MAINTENANCE RULES

1.3.1 FOREWORD

These norms have the purpose of providing the main notions to maintenance staff on servicing and overhauling the system and its parts, in order to prevent damages or malfunctions. An incorrect maintenance may seriously jeopardise the functionality of the item and the safety of the system.

The prescribed operations must be carried out as scheduled in the maintenance plan. FAIVELEY TRANSPORT cannot be held responsible for any consequence of not having performed the prescribed operation as and when scheduled.

1.3.2 SCHEDULE

In the maintenance plan, two types of intervals are indicated: cumulated mileage and elapsed time. They are linked by the applicable mission profile, and the one occurring first must be respected. This is due to the fact that some parts degrade over time and not over travelled distance.

1.3.3 TOOLING

All tools must be kept in optimum conditions. Do not employ any tools for an improper use, as this could damage the items and produce debris and particles.

Do not use chromate tools, as chrome debris could get detached and contaminate the equipment. Whenever prescribed, use exclusively the specific tools.

1.3.4 EXTERNAL CLEANING

Prior to proceeding in any operations like dismounting, perform a thorough external cleaning of the component. Unless otherwise specified, only adequate cleaning agents can be used, in terms of compatibility, dielectric strength and environmental impact.

Prior to any installation, make sure the system piping is free from particles that may influence the correct operations (debris, contaminants, etc.).

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1.3.5 INSPECTION

The purpose of the inspection is to discover, by visual check, possible anomalies like:

- Damages caused by external agents such as ballast hit etc
- Air or liquid leakages
- Oxidation or corrosion
- Cracks in rubber parts (hoses, bellows, belts, etc.)
- Clogging/dirt in filters, etc.
- Loosened bolts and screws.
- Lack of labels, connections, fixing or locking items, etc.
- Traces of overheating occurs if the component is not working within operating temperature +3°C to +50°C.
- Any visual damages to cables and connectors due to excessive higher and lower temperature and humidity.
- Seizure of mechanical parts due to corrosion or lack of lubrication.

These operations must be carried out in optimum light conditions.

1.3.6 FUNCTIONAL CHECK

Its purpose is to verify the functionality of the equipment by testing it and verifying the effects at system level.

Refer to section 5.2.1 for functional test details.

1.3.7 REMOVAL OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.3. In general, take care to the following points:

- Before dismounting, take careful note of the position of all connections attached to the component, so that the original conditions can be restored when re-installing the component itself;
- Put adequate protection to the exposed portion of the connections that have been detached, in order to prevent ingress of contaminating parts;
- Avoid any possible mechanical stress to avoid damage to the equipment and to its fixing support.

1.3.8 RE-INSTALLATION OF COMPONENTS

Operations must be carried out according to the specific instructions under section 5.4. In general, take care to the following points:

- Prior to re-installation, equipment must be functionally checked;
- All connections must be cleaned to avoid contamination;
- Replace all rubber seals, spreading a thin layer of grease.
- Once removed, seals (static, dynamic, rotating) cannot be reused but must be exchanged.

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1.3.9 STORAGE OF DEVICES

- **Storage in Workshop**

  The components must be stored within their original packaging in a ventilated room and not exposed to humidity, dust.

  - Long term storage permitted under controlled environmental temperature between +3°C and +50°C with relative humidity <60% and original packaging for a period not exceeding 18 months. If exceeding, overhaul to be performed before usage.

  - Performance test to be repeated if storage period exceeds 6 months.

- **Protection of Equipment**

  If out of their original packaging, equipment must be protected against bad weather and light (UV).

  Equipment must be turned downward, respect the position according to the sticker up/down".

- **Environment of Storage on Vehicle**

  Equipment fitted on the vehicles don't need any particular protection.

  They can meet temperature: from +3°C and +50°C during the storage on vehicle. These storage conditions are acceptable if the duration doesn't exceed 6 months.

- **Specific Conditions**

  In the case of equipment mounted on inoperative vehicle, then carry out at least 10 brake / release actions of service brake every 3 months in order to move the mechanical parts.

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1.4 WARRANTY

For every FAIVELEY TRANSPORT product supplied, it provides a warranty for proper and correct manufacture within the scope of the contractual and delivery terms.

Drain Valve for water separator must be operated/assembled/disassembled only by the trained personnel. Otherwise any warranty in accordance with the delivery terms may become null and void.

Warranty is applicable as per contract terms.

1.5 PURPOSE OF THIS DOCUMENT

This document contains information on Drain Valve and speaks about the operational procedures, customer end maintenance procedures.

This manual also includes information about design and function and gives practices for operational and maintenance of the Drain Valve for the service and the maintenance staff.

1.6 ABBREVIATIONS

ABBREVIATION	FULL NAME
Assy	Assembly
mm	Millimetre
Nm	Newton metre
NO	Normally Open
P/N	Part Number
QTY	Quantity
UV	Ultra Violet
Vdc	Volts of Direct Current
W	Watts

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/// 2.COMPONENT SPECIFICATIONS AND DESCRIPTION

2.1 DESCRIPTION OF THE EQUIPMENT

Refer to Figure 1a and 1b

The valve is an electro-pneumatic operator directly acted by the energy of a solenoid.

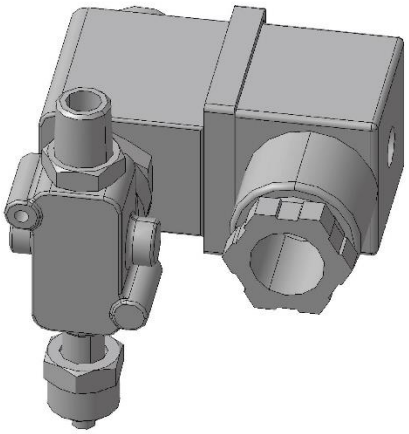

Figure 1a – Drain Valve, Isometric View

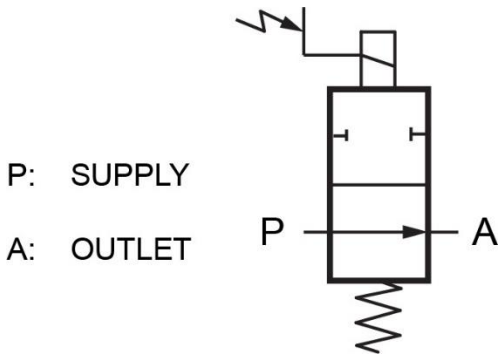

Figure 1b - CETOP Symbol

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2.2 TECHNICAL DATA OF THE EQUIPMENT

Part Number	Valve type	Supply	Pressure	Orifice	Power
FT0025443-100	NO	72 Vdc +25% to -30%	0÷14 bar	Ø 1.5 mm	8 W
FT0025443-101	NO	24 Vdc +25% to -30%	0÷14 bar	Ø 1.5 mm	8 W
FT0025443-102	NO	110 Vdc +25% to -30%	0÷14 bar	Ø 1.5 mm	8 W
FT0025443-103	NO	230 Vdc +15% to -10%	0÷14 bar	Ø 1.5 mm	8 W
2/515361	NO	24 Vdc +25% to -30%	0÷14 bar	Ø 2.0 mm	8 W
2/515362	NO	110 Vdc +25% to -30%	0÷14 bar	Ø 2.0 mm	8 W
2/517372	NO	72 Vdc +25% to -30%	0÷14 bar	Ø 2.0 mm	8 W
FT0025293-100	NO	110 Vdc +25% to -30%	0÷14 bar	Ø 1.5 mm	8 W
FT0025293-102	NO	24 Vdc +25% to -30%	0÷14 bar	Ø 1.5 mm	8 W
FT0041994-100	NO	24 Vdc +25% to -30%	0÷14 bar	Ø 1.5 mm	8 W

/// 3.OPERATIONS

The device consists of a body on which is fitted the spool valve assembly that is fixed by the guide-pin sleeve assembly. Over the body is mounted the solenoid secured by the locking nut.

3.1 NORMAL CONDITION

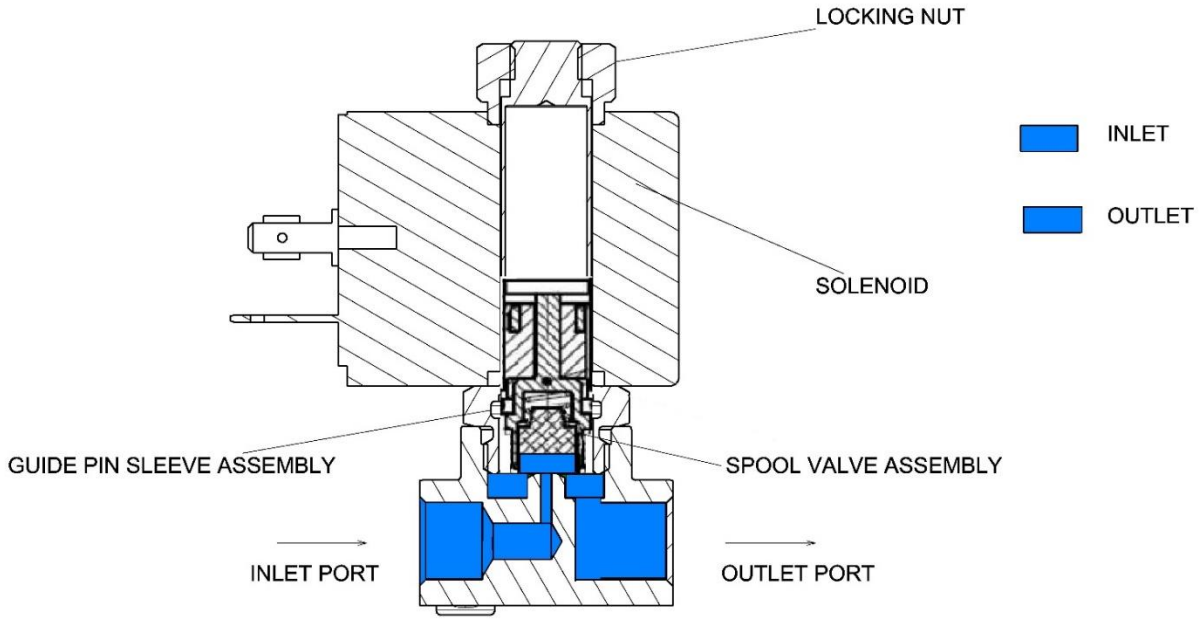

Figure 2a – Drain Valve, Normal Condition

Refer to Figure 2a

In normal position, with solenoid de-energized, the inlet port is connected to the outlet port.

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3.2 ENERGIZED CONDITION

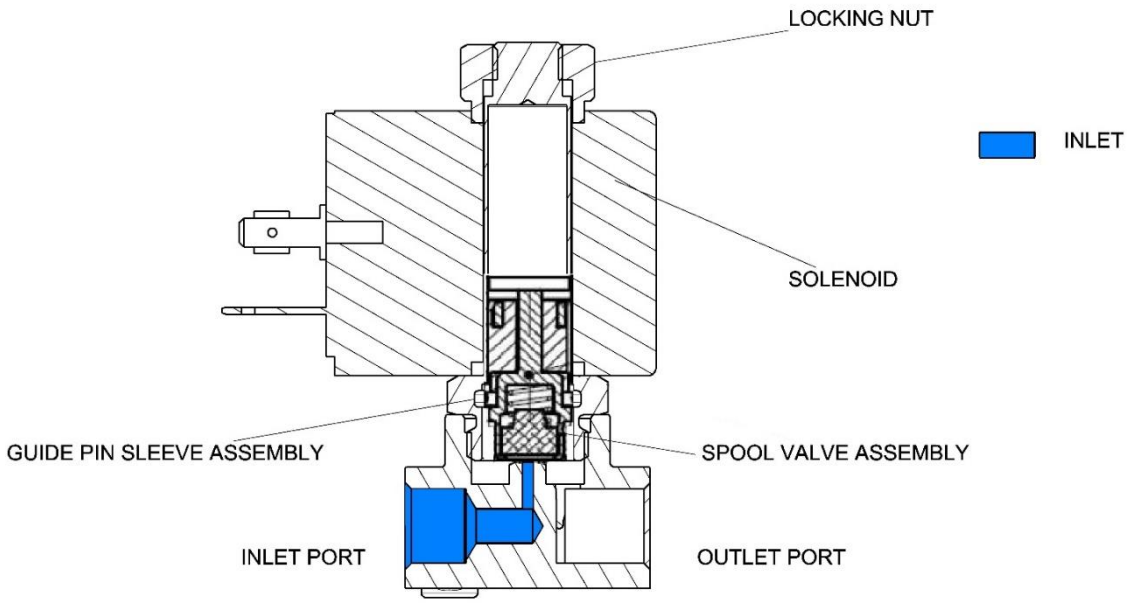

Figure 2b – Drain Valve, Energized Condition

Refer to Figure 2b

When the solenoid is energized, the spool valve closes the orifice and block the flow from the inlet port towards the outlet port.

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/// 4.SPECIAL TOOLS AND CONSUMABLES

4.1 LIST OF TOOLS

NAME	APPLICATION
Screw driver	Tighten/loosen the fasteners
24mm spanner	Tighten/loosen the valve

4.2 LIST OF SPECIAL TOOLS

No special tools are required.

4.3 LIST OF CONSUMABLES

NAME	APPLICATION
Loctite 577	Sealant for pipe fitting

/// 5.MAINTENANCE PRESCRIPTION

5.1 MAINTENANCE SCHEDULE

This device requires the following maintenance operations:

1. First Level Maintenance (Routine maintenance): Functional test as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions.
   Typical functional test periodicity: 1 year. Refer to section 5.2.1.

2. Second Level Maintenance: Replacement as scheduled in the **system maintenance plan**. If no system maintenance plan is provided, the device must be replaced regularly as required by the Operator's rules, the mission profile and the environmental conditions.
   Typical overhaul periodicity: 6 years

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5.2 PREVENTIVE AND CORRECTIVE MAINTENANCE PROCEDURE

5.2.1 FUNCTIONAL CHECK

CAUTION! Make sure that all of the described manoeuvres can be done without risks.

1. Thoroughly clean the exterior of the device and check for signs of damages or wear.
2. Check the electrical connector is firmly plugged to the valve.
3. Energize the solenoid and verify that the airflow at the outlet port is interrupted.
4. De-energize the solenoid and check that the airflow to the outlet port is restored.
5. At the end of the test, make sure all the initial conditions are restored.

5.3 REMOVAL PROCEDURES OF EQUIPMENT

Danger! Electric equipment! Prior to accessing to electric parts, make sure the power is duly switched off.

Warning! Closely observe all applicable car builder rules and procedures governing:

- Switch off the power supply;
- Prevention of vehicle movement;
- Performing undercar procedures;
- Eye and breathing protection;

Caution! Pressurised system! Discharge the pressure before removal.

Important! Take care to prevent ingress of dirt or debris in the system.

Refer to Figure 3

1. Disconnect the electrical connector from the Drain Valve (1).
2. Unscrew the screw using a screw driver to remove the DIN connector from the valve.
3. Unscrew and remove the pneumatic connections.
4. Remove the Drain Valve (1) using a 24 mm spanner.

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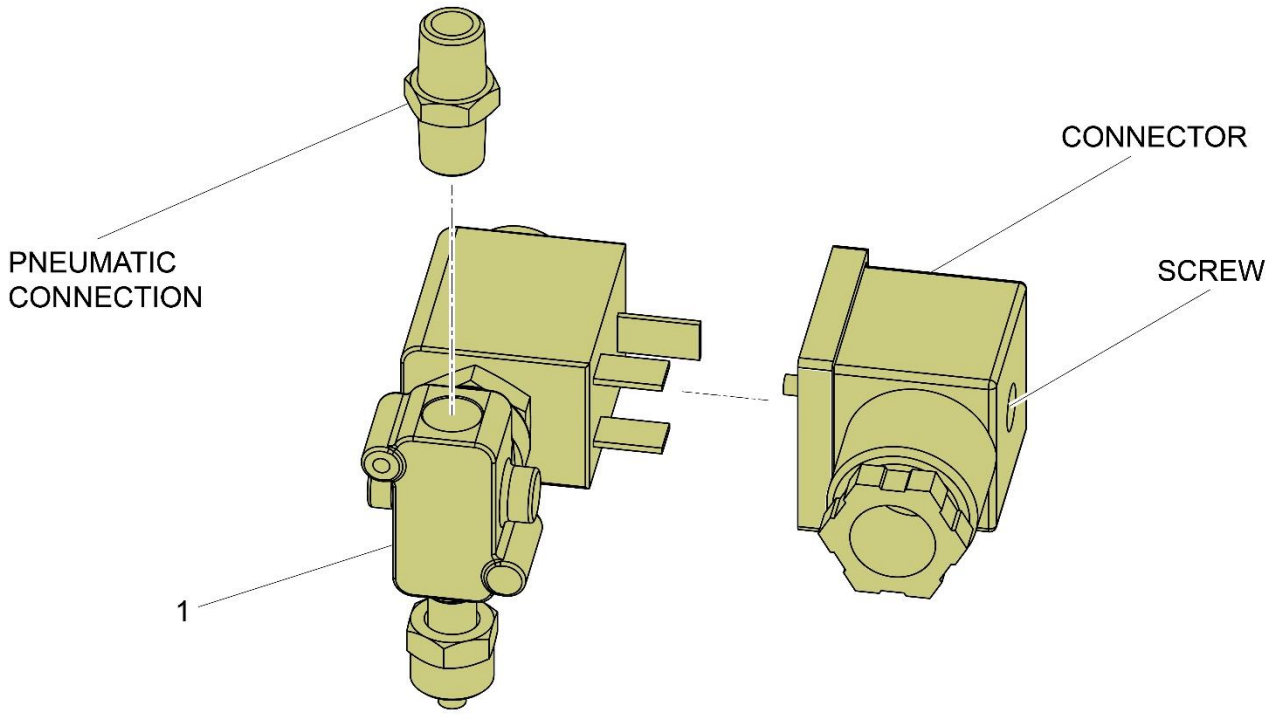

Figure 3 – Drain Valve, Removal/Installation

REF	DESCRIPTION	PART NUMBER	QTY
1	DRAIN VALVE	FT0025443-102	1

5.4 INSTALLATION PROCEDURES OF EQUIPMENT

Refer to Figure 3

1. Before assembly of pipe connection perform cleaning of piping on the vehicle.
2. Pneumatic ports connection should be BSPP fittings.
3. Do not use tuflon tape on the threaded ports.
4. Apply Loctite 577 on the pneumatic fittings.
5. Install the Drain Valve (1) using a 24mm spanner. Pipe fittings shall be locked using the driving torque indicated by the fitting manufacturer.
6. Connect the electrical connectors.
7. Pressurize the system and check for leakages as per the system level procedure performed during car builder's general system check.

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/// 6.SPARE PART LIST

- Routine maintenance: The spare parts are not required.
- Installation: The spare parts are not required.

/// 7.DISPOSAL

7.1 STANDARD DISPOSAL INSTRUCTION

The device is mainly composed by the following materials: aluminium alloy, copper, steel, rubber, brass and stainless steel. The disposal must be done according to rules in force at the End-user premises and to the law in force in the Country where the component is used.

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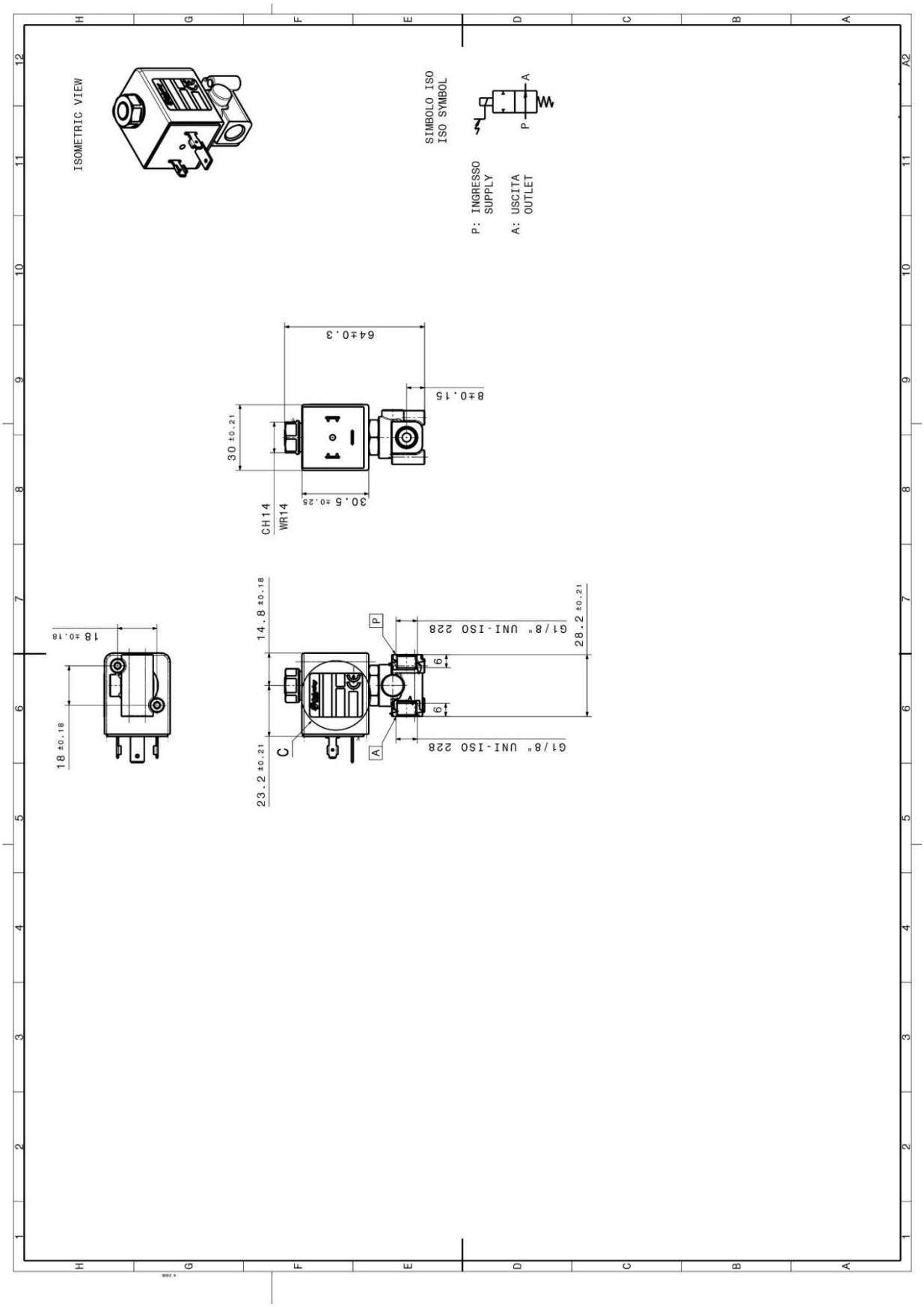
/// 8.OUTLINE DRAWING

Drain Valve - FT0025443-102



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