

PS4 DIAPHRAGM SENSING PRESSURE SUSTAINING VALVES

INSTALLATION AND MAINTENANCE INSTRUCTIONS



GENERAL INFORMATION

- These instructions must be carefully read before performing any work involving VALSTEAM ADCA products. Failure to observe these instructions may result in hazardous situations.
- These instructions describe the entire life cycle of the product. Keep them in a location that is accessible to every user and make these instructions available to every new owner of the product.
- Current regional and plant safety regulations must be considered and followed during installation, operation, and maintenance work.
- The images shown in these instructions are for illustration purposes only.
- For problems that cannot be solved with the help of these instructions, please contact VALSTEAM ADCA or its representative.

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We reserve the right to change the design and material of this product without notice.

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1. SAFETY INFORMATION

1.1. Explanation of symbols



DANGER

Hazardous situation which, if not avoided by applying the correct preventive measures, will result in fatal or serious injury and/or considerable damage to property.



WARNING

Hazardous situation which, if not avoided by applying the correct preventive measures, could result in fatal or serious injury and/or considerable damage to property.



CAUTION

Hazardous situation which, if not avoided by applying the correct preventive measures, could result in moderately severe or minor injury.



NOTICE

Situation which, if not avoided, can result in property damage or product malfunction.



NOTE

Indicates additional information, tips and recommendations.

1.2. Intended use

Refer to the markings on the device, such as nameplate and laser markings, Information Sheet (IS) and these Installation and Maintenance Instructions (IMI) to check that the product was designed for the intended use and meets the specifications used for sizing and selection. This includes checking application, material suitability, process medium, pressure and temperature as well as their respective limiting values.

VALSTEAM ADCA does not assume any responsibility for damage resulting from inappropriate use of the product, damage caused by external stresses or any other external factors. Correct installation of the product is the full responsibility of the contractor.

Inappropriate use of the product is any use other than the one described in this chapter. Inappropriate use also includes:

- Use of spare parts which are not genuine;
- Performance of maintenance work not described in these instructions;
- Use outside the limits defined by the accessories connected to the product.
- Unauthorized modifications to the product.

If the product is to be used for an application or with a fluid other than the one it was designed for, contact VALSTEAM ADCA.

1.3. Qualification of personnel

Handling, installation, operation and maintenance work must be carried out by fully trained and qualified personnel, capable of judging the work which they are assigned to perform and recognizing potentially hazardous situations. They should be trained to properly use this product according to these Installation and Maintenance Instructions.

Where a formal “Permits to Work” system is implemented in the plant it must be complied with.

1.4. Personal protective equipment

Personal protective equipment should always be worn during work in order to protect against hazards posed by e.g. the process medium, dangerous temperatures, noise, falling or projected objects and working at height. These equipment includes a helmet, safety glasses, safety harness, protective clothes, safety shoes, hearing protection, etc.



NOTE

Always assess whether you or others in your vicinity require any protective equipment. When in doubt check with the plant's health & safety responsible personnel for details on required protective equipment.

1.5. The system

The complete system should be assessed as well as every action (e.g. closing of shut-off valves, disconnection of the power supply) to ensure this will not bring additional risk to personnel or property.

Dangerous actions that can result in a hazardous situation include isolation of protective devices such as safety valves, vents, vacuum relief valves, disconnection of electric safety devices, sensors and alarms.

1.6. ATEX

If the product is in the scope of the ATEX 2014/34/EU directive and as such bears the Ex marking, consult its specific Additional Instructions for use in Potentially Explosive Areas (IMI EX). In such cases, handling, installation, operation and maintenance work must only be performed by personnel qualified and authorized to work in potentially explosive areas.

1.7. General safety notes



DANGER

RISK OF BURSTING OR IMPLOSION IN PRESSURE EQUIPMENT

Valves, ancillaries and pipelines are pressure equipment. Working outside their operating limits, improper opening, malfunction, or system operation failure may result in component bursting or implosion.

- Observe the maximum and minimum operating limits of the product and check if they are within those of the system in which it is being installed. If not, ensure a safety device is included in the system to prevent operation outside those limits. Check the product Information Sheet (IS).
- In case the malfunction of any equipment installed on the system or a system operation failure may result in a dangerous overpressure, overtemperature or vacuum condition, ensure a safety device is included in the system to prevent such situation.
- Before starting any work on the product, depressurize it and cool or heat it up to ambient temperature. This also applies to the line in which it is fitted.
- Drain the process medium from the product and all the relevant plant sections.



WARNING

RISK OF BURNS

Depending on the operating conditions, products and pipelines may get very hot or cold and cause burn injuries.

- Do not touch the product while it is hot or cold, allowing it firstly to cool down or heat up.
- Wear protective clothing and safety gloves during working operation.
- Thermally insulate tubes and product's as a preventive measure.



WARNING

RISK OF INJURY CAUSED BY FLUID ATTACK ON PRODUCTS MATERIALS

The product must only be used with mediums that do not attack the materials of the product (body, gaskets, seals). Otherwise, leaks may occur, and hot and/or hazardous fluid can escape.

- Do not use the product with mediums other than the ones it was designed for. Check section 1.2 - Intended Use.
- Prevent medium contamination.

RISK OF INJURY CAUSED BY UNDER TIGHTENED PRODUCT OR ITS COMPONENTS

Excessively low tightening torques may cause medium to escape and/or components to be projected at high speed, which may result in a hazardous situation depending on the medium, chemical properties and/or its operating conditions.

- Do not loosen any screws while the equipment is pressurized.
- Observe the specified tightening torques on these Installation and Maintenance Instructions. If the relevant torque value is not mentioned contact VALSTEAM ADCA.

RISK OF HEARING LOSS

Depending on the operating conditions, the product may generate loud noises.

- Wear hearing protection when in the vicinity of the product.

RISK OF INJURY AS A RESULT OF ILLEGIBLE INFORMATION

Important information written in the product nameplate, markings and warning signs may wear overtime or get illegible due to e.g. dirt accumulation, resulting in hazardous situations and personal injury or property damage.

- Keep nameplates, markings and warning signs in a legible state, replacing when illegible, missing or damaged.



CAUTION

RISK OF INJURY DUE TO RESIDUAL PROCESS MEDIUM

Direct contact with dangerous process medium may lead to personal injury, e.g. smoke inhalation and chemical burns.

- Drain the process medium from the product and all the relevant plant sections.
- Wear protective clothing, safety gloves, mask, and eye protection.



CAUTION

RISK OF INJURY DUE TO IMPROPER HANDLING

Manual handling (e.g. lifting, carrying, pushing, pulling) of large and/or heavy products may result in personal injury.

- Assess the risk associated with the handling task.
- Use adequate handling methods and appropriate auxiliary handling equipment.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO EXCESSIVELY HIGH TIGHTENING TORQUES

High tightening torques may lead to premature wearing of product components.

- Observe the specified tightening torques on these Installation and Maintenance Instructions. If the relevant torque value is not mentioned contact VALSTEAM ADCA.

2. PRODUCT INFORMATION

The ADCA PS4 is a series of direct acting, spring-loaded diaphragm sensing, pressure sustaining valves designed for use with compressed air, water and other gases or liquids compatible with the construction.

The valve main purpose is to maintain the upstream pressure under control in applications where small loads are involved.

These valves are also specifically recommended to operate as pilot valves in combination with other pressure regulators.

2.1. Principle of operation

The function of a pressure sustaining valve, also commonly referred to as a back pressure regulator, is to limit and control upstream pressure of a medium to a specific adjusted set point. The regulator will open in case of excessive upstream pressure and close when the pressure drops below the set point.

During start-up the upstream pressure (P_1) is immediately supplied to the sensing chamber via a sensing pipe which connects to the threaded connection in the guide plate (3). Here, the upstream pressure, acts below the diaphragm (9) applying a force F_s that pushes the plug (6) upwards, opening the valve and admitting process medium to the downstream pipework, increasing downstream pressure (P_2).

Clockwise rotation of the adjustment knob (17) allows setting of the desired set pressure, by compressing the adjustment spring (13) and increases the loading force F_L . When the loading force exceeds the counteracting force F_s , the valve closes.

When upstream pressure (P_1) rises, the force it applies on the lower side of the diaphragm increases. The valve opens as a result, exhausting the excess pressure above the set point after which the plug will reseat and the valve will close once again.

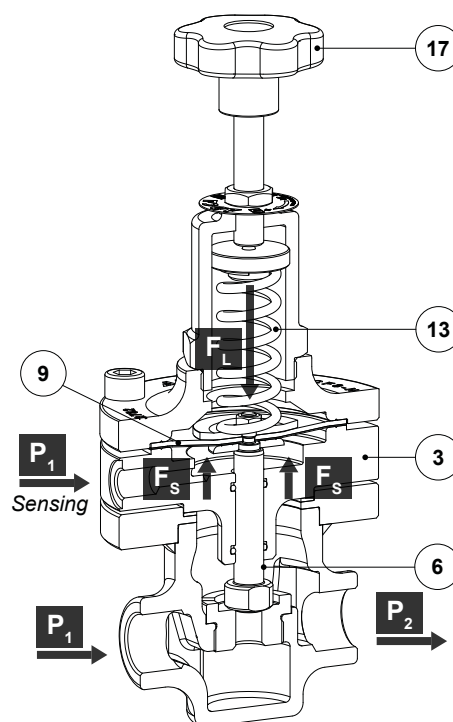


Fig. 1



NOTE

A pressure sustaining valve is not a shut-off device and as such there is almost always a small amount of leakage between seat and plug. For this reason, a shut-off valve should be used downstream of the regulator when isolation is required.



NOTE

A pressure sustaining valve is not by any means a safety relief valve. A safety relief valve is a safety device designed to protect system and personnel from overpressure via rapid exhaust of pressure as it “pops-up” wide open. A pressure sustaining valve on the other hand senses upstream pressure changes and reacts proportionally by closing or opening.

2.2. Certification

This product has been specifically designed for use with liquids and gases which are in Group 2 of the European PED – 2014/68/EU Pressure Equipment Directive and it complies with its requirements.

CE MARKING – GROUP 2 (PED – European Directive)	
PN 40	Category
1/2" to 1"	SEP



NOTE

If the product falls within category SEP it must not be CE marked, unless other directives are applicable.

This product is not in the scope of the ATEX 2014/34/EU directive as it does not have its potential ignition source. Personnel responsible for the plant installation must assess the risks caused by static electricity and take the necessary precautionary measures to prevent static charge. These measures include e.g. connection of the product to the equipotential bonding system.

2.3. Product identification

The following items are indicated on the product nameplate or directly on its body:

- Manufacturer
- Product model (e.g. PS4)
- Pressure rating (e.g. PN40) or maximum allowable pressure (e.g. Pmax = 15 bar).
- Nominal size (e.g. 1/2")
- Max. operating temperature (e.g. Tmax = 80°C)
- Flow direction (indicated by an arrow)
- Serial number and year of manufacturing (e.g. Reg.:17483/19)
- CE Marking (when applicable – see section 2.2 – Certification)
- EX Marking (when applicable e.g. EX h IIB T6...T3 Gb – see section 2.2 – Certification)

2.4. Technical data

For technical data including dimensions, materials, limiting conditions and versions refer to the product's respective Information Sheet (IS).

3. TRANSPORT, STORAGE, AND PACKAGING



WARNING

RISK DUE TO FALLING LOADS

Loads may tip or fall over resulting in damage to property, serious injury or death.

- Use suitable equipment when moving or lifting suspended loads.
- Make sure no one is standing below the suspended load.



CAUTION

RISK OF INJURY DUE TO IMPROPER HANDLING

Manual handling (e.g. lifting, carrying, pushing, pulling) of large and/or heavy products may result in personal injury such as back injury.

- Assess the risk associated with the handling task.
- Use adequate handling methods and appropriate auxiliary handling equipment.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO IMPROPER STORAGE

- Do not remove any packaging or protective covers until immediately before installation at the site.
- Store the product in a solid base in a dry, cool and dust-free environment.
- Until its installation, protect it from the weather, dirt, corrosive atmospheres and other harmful influences.

RISK OF PRODUCT DAMAGE DUE TO LONG TERM STORAGE

Some product components may deteriorate with time (e.g. valve packings, seals).

- Do not store the product for more than 12 months.
- If for any reason the product must be stored for longer periods of time contact VALSTEAM ADCA.

Products are individually wrapped in plastic film, thermo shrinkable plastic and/or stored in a cardboard box as they leave VALSTEAM ADCA. Avoid removing packaging and any protective cover until immediately before installing the product at the site.



NOTE

If the transport packaging has any shipping damage contact VALSTEAM ADCA or its representative.

Before storing and transporting the product protect it from impacts and mechanical damage, paying special care with sealing surfaces and other fragile parts.



NOTE

If the corrosion protection (paint and other surface coatings) of the product is damaged during transport or other handling procedures repair it immediately.

4. INSTALLATION

Before performing any installation work, refer to section 1 – Safety information.



WARNING

RISK OF INJURY DUE TO INSUFFICIENT SUPPORT DURING INSTALLATION

Insufficient support of the product during installation may cause it to fall and cause personal injury.

- Ensure the product is safely held in place during installation.
- Wear protective safety shoes.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO STRESS

The product is not intended to withstand external stresses that may be induced by the system to which it is being connected to.

- Make sure that the connected pipe does not subject the body to any stress (forces or torques) during installation and operation.
- Do not use the product as an elevation point.

4.1. Preparation for installation

Before installation, make sure the following conditions are met:

- The installation area has easy access and the product is to be installed in a position where operation and maintenance work can be performed safely.
- The product will be installed with proper support and free of any stresses that can be induced by the system due to e.g. pipe expansions. The necessary precautions are recommended during system design.
- The pipeline where the product will be installed is designed in such a way that it takes into account the weight of the product. The pipeline may require support on both sides next to the product, particularly if its size and weight are considerable

and especially if vibrations are to be expected in the system.

- The product is not damaged.
- Make sure all the necessary materials and tools are readily available during installation work.
- Referring to this Installation and Maintenance Instructions (IMI), Information Sheet (IS) and nameplate, check that the product is suitable for the intended installation: temperature, medium, pressure, temperature, etc. – see section 1.2 – Intended use.
- Check that there are no foreign bodies inside the pipelines and ancillaries, flushing may be necessary. These should be thoroughly cleaned.
- A filter may be necessary to install upstream of the regulator in some applications, protecting it from solid particles.
- A shut-off valve is installed upstream and downstream of the regulator to facilitate start-up, maintenance and troubleshooting. A bypass line is recommended as it additionally prevent system shutdown during maintenance procedures, in which case a manual valve should be fitted to allow regulation of downstream pressure.
- The pressure regulator will not be thermally insulated.
- A pressure gauge is installed both upstream and downstream of the regulator for monitorization, set point adjustment and troubleshooting.
- A sensing pipe must be connected upstream. The sensing pipe should be 8 mm diameter copper or stainless steel. Weld a 3/8" threaded coupling at the side in the middle of the pipeline. In case of gas service the sensing pipe may also be welded on the top of the pipeline.



NOTE

Assembly Drawings (AD) with assembly details and parts lists are available on request.

4.2. Installation procedure

1. Remove plastic film and other packaging, as well as the protective covers which are placed on flanges or connection ends. Make sure the air vent is free from foreign matter.
2. An ADCA pipeline strainer or filter should be installed upstream of the valve, preventing solid particles from the process medium from damaging the regulator. A bypass line with shut-off valves is recommended, upstream and downstream of the product ensuring the plant can still operate while it is isolated for maintenance.
3. The regulator recommended installation position is horizontal with the adjustment knob pointing upwards. Other installation positions may increase wear and shorten its service lifetime.
4. The regulator has an arrow or inlet/outlet designation, be sure that it is installed in

the appropriate direction according to fluid flow.

5. Connect a sensing pipe upstream of the valve. The connection must be at the top or at the side of the pipeline. The sensing pipe connects to the female thread on the guide plate (3) with a suitable compression fitting (not included).
6. Take care with jointing materials and sealing compounds to ensure that none may be permitted to block or enter the regulator causing malfunction. In case of flanged connections use appropriate flange gaskets. For dome-loaded regulators, connect the control pressure line to the dome chamber threaded port using suitable fittings and tubing.

5. START-UP

Before performing the start-up procedure, refer to section 1 – Safety Information.

The start-up procedure must be followed every time the product is put back into service.

5.1. Preparation for start-up

Before starting up, make sure the following conditions are met:

- All works on the system have been completed.
- All the necessary safety devices have been installed.
- When required, warning notices are used to alert others that the system is starting up.
- The product is correctly installed – see section 4 – Installation.
- Referring to these Installation and Maintenance Instructions (IMI), Information Sheet (IS) and nameplate, check that the product is suitable for the intended installation: temperature, medium, pressure, temperature, etc. – see section 1.2 – Intended use.
- A safety check was performed by qualified personnel. Checking for leaks, structural damage and integrity of system components.



NOTICE

RISK OF PRODUCT DAMAGE DUE TO CONTAMINATION

The plant operator is responsible for cleaning the pipelines in the plant as well as keeping the product well maintained. At start-up, the presence of small particles in the medium (dirt, scale, weld splatters, etc.) may damage the product or cause malfunction.

- Flush pipelines before start-up.
- Clean protection varnishes from pipes and flanges, leftover paint, graphite, grease, etc.
- Use a pipeline strainer or a filter.

5.2. Start-up procedure

1. Slowly open the downstream shut-off valve to prevent sudden surges of pressure that can damage the regulator.
2. Operation is performed by turning the adjustment knob (17) clockwise to increase set pressure and counterclockwise to decrease set pressure.
3. Partially open the upstream shut-off valve to allow the regulator to sense the inlet pressure with minimal flow.
4. Close the upstream shut-off valve and verify the set pressure with the aid of the upstream pressure gauge.
5. Turn the adjustment knob (17) to adjust the set pressure and repeat steps 3 and 4 as necessary. Make sure the final adjustment is made in the direction of increasing pressure (clockwise rotation of the adjustment knob) to obtain the most accurate set pressure.
6. Adjust the system supply pressure to its normal working value and continue to slowly open the upstream shut-off valve.
7. Check for any leaks.
8. Check the pressure regulator to ensure it is operating correctly.



NOTE

24 hours after system start-up, it is recommended to check the pipe connection for leaks and retighten when necessary. Clean strainers/filters to avoid blocking.

6. OPERATION

Before operating the product refer to section 1 – Safety Information.

Immediately after completing the start-up procedure, the product is ready for operation.



WARNING

RISK OF INJURY DUE TO VENTING IN SPRING LOADED REGULATORS

Spring loaded regulators with self-relieving option and without captured vent will vent the medium to the atmosphere through the cover.

- When working with hazardous fluids in regulators with self-relieving option make sure it is also fitted with captured vent/leakage line connection directed to a safe place.

7. SHUTDOWN

Before performing the shutdown procedure, refer to section 1 – Safety information.

7.1. Shutdown procedure

1. Switch of the system and secure it so it cannot be turned on by unauthorized personnel.
2. Fully close the upstream shut-off valve, to stop the process medium from flowing through the pressure regulator.
3. Allow medium to cool down and completely drain it from the pipeline and pressure regulator.
4. Make sure the pipeline and pressure regulator are not under pressure and are at a safe temperature.
5. Fully close the downstream shut-off valve.
6. If the pressure regulator won't be put back in operation for a long period of time relax the regulating spring or disconnect the loading control pressure supply.
7. If the pressure regulator is to be removed from the pipeline – see section 3 - Transport, storage and packaging.

8. PARTS LIST

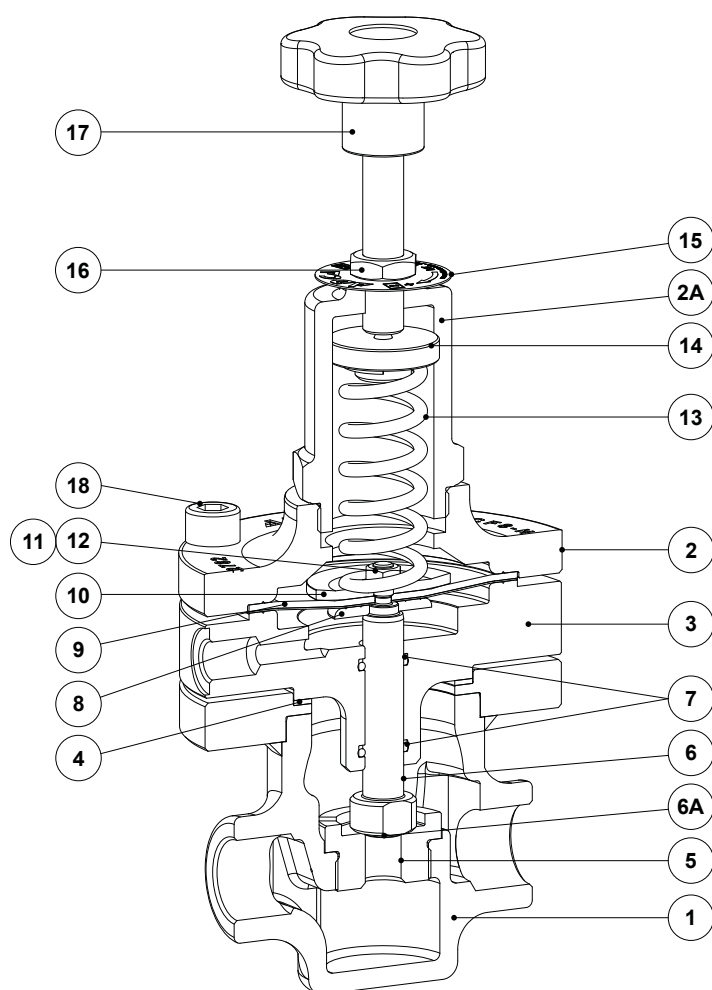


Fig. 2

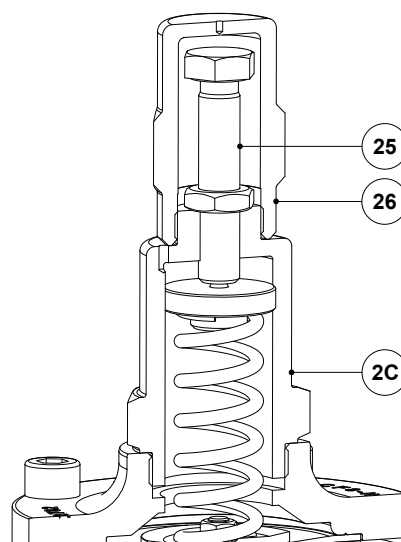


Fig. 3 - Top cap

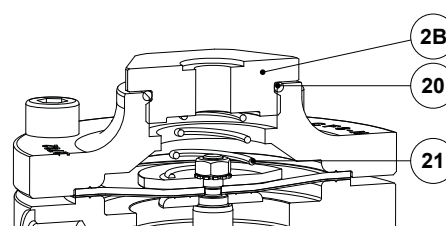


Fig. 4 - Dome loaded

POS. N°	DESIGNATION	SPARE PARTS	POS. N°	DESIGNATION	SPARE PARTS
1	Valve body		10	Spring plate	
2	Cover		11	Nut	
2A	Spring cover		12	Washer	X
2B	Dome-loading cover		13	Adjustment spring	X
2C	Spring cover		14	Top spring plate	
3	Guide plate		15	Spring ID plate	
4	Gasket	X	16	Locknut	
5	Valve seat	X	17	Adjustment knob	
6	Plug	X	18	Bolt	
6A	Valve seal	X	20	O-ring	X
7	O-ring	X	21	Spring	
8	Pusher disc		25	Adjustment screw	
9	Diaphragm	X	26	Top cap	

9. MAINTENANCE

Before performing a maintenance procedure, refer to section 1 – Safety information.

The product requires maintenance to ensure that it operates correctly and safely throughout its lifetime. Maintenance work should be performed in a planned manner at periodic intervals. These intervals must be defined by the operator according to the service conditions.

9.1. Maintenance procedure

1. Make sure all the necessary materials and tools are readily available during maintenance work.
2. Perform the shutdown procedure – see section 7 – Shutdown.
3. Perform the maintenance procedure – see the following sections.
4. Put the product back into operation – see section 5 – Start-up.

9.2. Replacing the diaphragm, plug and seat

1. Completely relax the adjustment spring (13) or disconnect control pressure supply. If the valve is removed from the line, fix the valve body (1) in a vise with soft jaws, with the cover (2) pointing upwards.
2. Unscrew the bolts (18) and separate cover (2), guide plate (3) and body (1). Remove top spring plate (14) and adjustment spring (13).
3. Remove the body gasket (4) and clean surfaces thoroughly, leaving no remaining graphite leftovers
4. Secure the plug (6) via the flats on its head and unscrew the nut (11).
5. Remove washer (12), spring plate (10), diaphragm (9) and pusher disc (8). Discard the diaphragm.
6. Pull the plug (6) and replace O-rings (7) if necessary, using a suitable tool with care to avoid damage to metal surfaces.
7. Inspect the soft sealing surfaces (6A) of the plug. If damaged or worn, replace plug.
8. Inspect the valve seat (5). If replacement is necessary contact VALSTEAM ADCA.
9. Apply a suitable lubricant to the O-rings (7) before sliding in the plug (6).
10. Install the pusher disc (8), diaphragm (9), spring plate (10) and a new serrated washer (12). Hold the plug (6) and tighten the nut (11) until the diaphragm just starts to deform.
11. Fit a new body gasket (4) and place the guide plate with assembled plug and diaphragm over the body, followed by the adjustment spring (13), top spring plate (14) and cover (2).
12. Apply a suitable lubricant to the bolts (18) and tighten in a crisscross pattern until the recommended torque is achieved – see section 9.3 – Tightening torques.

9.3. Tightening torques

POS. N°	DESIGNATION	TORQUE (Nm)
		All sizes
18	Bolt	40

10. DISPOSAL

Once the product has reached the end of its working life, it should be sent for disposal in accordance with the prevailing national and local regulations.

Before disposal make sure that the product is clean and free from fluid residues.

During its disposal, pay special attention to rubbers, resins and polymer components (PVC, PTFE, PP, PVDF, FKM, NBR, etc.).

Do not dispose of components and hazardous substances together with household waste.

11. RETURNING PRODUCTS

Information regarding hazards and precautionary measures to be considered due to contaminating fluids and residues or mechanical damage that may represent a health, safety or environmental risk, must be provided in writing when returning products to VALSTEAM ADCA.



WARNING

RISK DUE TO PRESENCE OF HAZARDOUS RESIDUES ON RETURNED PRODUCTS

Contaminated fluids and residues may represent an environmental risk, or risk to VALSTEAM ADCA personnel.

- Information regarding any hazards or precautionary measures to be considered must be provided in writing when returning products to VALSTEAM ADCA.
- Health and Safety information sheets relating to any substances identified as hazardous or potentially hazardous must be provided outside the packaging.
- Use Hazmat labels on the packaging.

IMPORTANT NOTE

Total or partial disregard of these Installation and Maintenance Instructions involves loss of any right to warranty.

The extent and warranty period are specified in the “General sales conditions”.