Pietro Fiorentini

Staflux 187 H2

High pressure regulator

Revision B - Edition 06/2024

USE, MAINTENANCE AND WARNING MANUAL

EN

1 - INTRODUCTION

FOREWORD

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The manufacturer is in no way responsible for the consequences of operations carried out in a manner not in accordance with the manual.

GENERAL CONSIDERATIONS

All operating, maintenance instructions and recommendations described in this manual must be observed. In order to obtain the best performance and to keep the equipment in efficient condition, the manufacturer recommends that maintenance operations be carried out regularly.
It is of particular importance that the personnel responsible for the equipment be trained in its use, maintenance and application of the safety instructions and procedures indicated in this manual.

Revision: B

1.1 - REVISION HISTORY

Revision index	Date
A	05/2022
B	06/2024

Tab. 1.1.

Pietro Fiorentini

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2 - GENERAL INFORMATION

2.1 - MANUFACTURER IDENTIFICATION

Manufacturer	PIETRO FIORENTINI S.P.A.
Address	Via Enrico Fermi, 8/10 36057 Arcugnano (VI) - ITALY **Tel. +39 0444 968511 Fax +39 0444 960468** **www.fiorentini.com sales@fiorentini.com**

Tab. 2.2.

2.2 - IDENTIFICATION OF THE PRODUCT

Equipment	HIGH PRESSURE REGULATOR
Model	STAFLUX 187 H2

Tab. 2.3.

2.3 - REGULATORY FRAMEWORK

PIETRO FIORENTINI S.P.A. with registered offices in Arcugnano (Italy) - Via E. Fermi, 8/10, declares under its sole responsibility that the equipment described in this manual is designed, manufactured, tested and checked in compliance with the requirements of EN 334 standard on gas pressure regulators.

NOTE!

EN 334 applies to regulators with inlet pressure values up to 100 bar. However, it can be used as a guideline for regulators outside its scope.

The equipment complies with the requirements of Directive 2014/68/EU ("Pressure Equipment Directive" PED). The assessment procedure adopted is in accordance with module H1 as per Annex III of the Directive.

NOTE!

The declaration of conformity in its original version is delivered together with the equipment and this operating and warning manual.

2.4 - WARRANTY

PIETRO FIORENTINI S.P.A. guarantees that the equipment was manufactured using the best materials, with high quality workmanship, and complies with the quality requirements, specifications and performance set out in the order.
The warranty shall be considered null and void and PIETRO FIORENTINI S.P.A. shall not be liable for any damage and/or malfunctioning:

- in the event of any acts or omissions by the purchaser or end-user, or any of their carriers, employees, agents, or any third party or entity;
- in the event that the purchaser, or a third party, makes changes to the equipment supplied by PIETRO FIORENTINI S.P.A. without the prior written approval of the latter;
- in the event of failure by the purchaser to comply with the instructions contained in this manual, as provided by PIETRO FIORENTINI S.P.A.

NOTE!

The warranty conditions are specified in the commercial contract.

2.5 - ADDRESSEES, SUPPLY AND STORAGE OF THE MANUAL

The manual is intended for the qualified operator in charge of operating and managing the equipment throughout its technical service life.
It contains the necessary information for the correct use of the equipment in order to maintain its functional and qualitative characteristics over time. All information and warnings for correct use in full safety are also provided.
The manual, as well as the declaration of conformity and/or test certificate, is an integral part of the equipment and must always accompany it whenever it is transferred or changes ownership. It is the user's responsibility to keep this documentation intact for consultation throughout the lifespan of the equipment.

⚠ WARNING!

Removing, rewriting or modifying the pages of the manual and their contents is not allowed.
Keep the manual near the equipment, in an accessible place known by all qualified technicians involved in using and running it.
PIETRO FIORENTINI S.p.A. shall not be held liable for any damage to people, animals and property caused by failure to adhere to the warnings and operating procedures described in this manual.

The original manual has been drawn up in Italian.
Any translations into additional languages are made from the original instructions.

2.1 - LANGUAGE

The original manual has been drawn up in Italian.
Any translations into additional languages must be made from the original manual.

⚠ HAZARD!

The translations into other languages cannot be fully verified. If any inconsistency is found, please refer to the text of the original manual.
If inconsistencies are found or the text does not make sense:

- **stop any actions;**
- **immediately contact PIETRO FIORENTINI S.p.A. at the addresses specified in paragraph 2.1.**

⚠ WARNING!

PIETRO FIORENTINI S.p.A. shall be held liable for the information provided in the original manual only.

2.6 - SYMBOLS USED IN THE MANUAL

Symbol	Definition
	Symbol used to identify important warnings for the safety of the operator and/or equipment.
	Symbol used to identify information of particular importance in the manual. The information may also concern the safety of the personnel involved in using the equipment.
	Referring to the instruction manual/booklet is mandatory. Indicates a requirement for the personnel to refer to (and understand) the operating and warning instructions of the equipment before working with or on it.

Tab. 2.4.

HAZARD!

Alerts to a hazard with a high level of risk, an imminent hazardous situation which, if not prevented, will result in death or severe damage.

WARNING!

Alerts to a hazard with a medium level of risk, a potentially hazardous situation which, if not prevented, may result in death or severe damage.

ATTENTION!

Alerts to a hazard with a low level of risk, a potentially hazardous situation which, if not prevented, could result in minor or moderate damage.

NOTE!

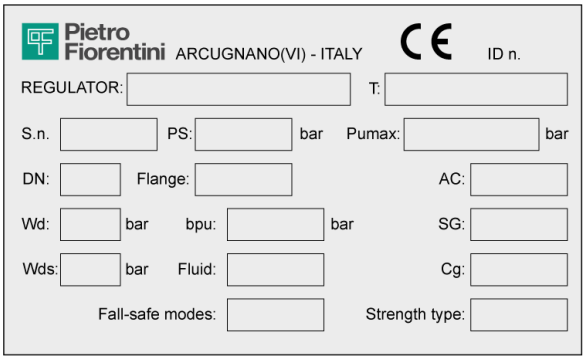
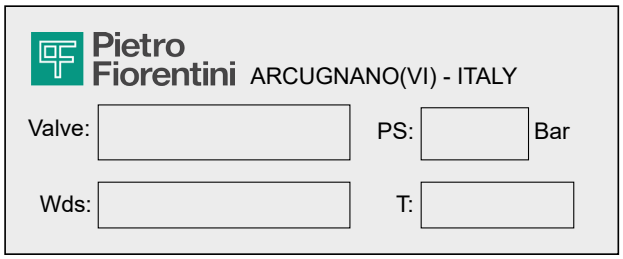
Alerts to specific warnings, directions or notes of particular concern, that are not related to physical injury, as well as practices for which physical injury is not likely to occur.

2.7 - NAMEPLATES APPLIED

⚠ WARNING!

Removing nameplates and/or replacing them with other plates is strictly not allowed. Should the plates be unintentionally damaged or removed, the customer must notify PIETRO FIORENTINI S.p.A.

The equipment and its accessories are provided with nameplates (from Id.1 to Id.8).
The nameplates specify identification details of the equipment and its accessories to be mentioned in case of need to PIETRO FIORENTINI S.p.A.
List of the nameplates applied:

Id.	Type	Image
1	NAMEPLATE REGULATOR (EC version)	
2	NAMEPLATE RELIEF VALVE VS/FI	

Tab. 2.5.

2.7.1 - GLOSSARY FOR NAMEPLATES

The terms and abbreviations used on the nameplates are described below:

Term	Description
AC	Accuracy class.
AG max	Accuracy class of pressure boosting slam-shut valves. “OPSO” (Over pressure shut off).
AG min	Accuracy class of safety devices for pressure drop. ”UPSO”(Under pressure shut off).
bpu	Range of inlet pressure for which the regulator ensures a given accuracy class.
CE	Mark certifying compliance with applicable European directives.
Cg	Flow rate coefficient.
Class	Alphanumeric designation used for references purposes related to a combination of mechanical and dimensional characteristics for flanges, in accordance with the relevant parts of EN 1759 series, which includes the word Class followed by a dimensionless whole number.
DN	Nominal size of connections.
Fail safe mode	Regulator reaction mode (Fail open or Fail close).
Flange	Type of flanged connections or type of connection threading.
Fluid	Type of fluid compatible with the equipment.
ID no.	Number of the Notified Body participating in the conformity assessment of the equipment.
Pilot	Pilot family.
PS	Maximum permissible pressure for which the equipment was designed.
Pumax	Maximum inlet pressure at which the regulator can operate continuously under specific conditions.
REGULATOR	Equipment family.
SG	Lock-up pressure class.
Slam shut device	Slam-shut valve family.
S.n.	Equipment serial number.
Strength type	Resistance class: Integral strength or differential strength (DS).
T	Permissible temperature range (min. and max.) for which the equipment was designed.
Triggering unit	Pressure switch family.
Type	Accessory type and family.
Wd	Full setpoint range that can be obtained from the regulator by adjusting and/or replacing certain components (e.g. replacement of valve seat or control element, e.g. spring).
Wdo	Full setpoint range as a result of triggering caused by pressure increase of the pressure switch incorporated in the slam-shut valve. This range can be obtained by adjusting and/or replacing the components (for example, spring or sensitive element).
Wds	Full setpoint range that can be obtained from the regulator by adjusting but not replacing the components.
Wdso	Full setpoint range as a result of triggering caused by pressure increase of the pressure switch incorporated in the slam-shut valve. This range can be obtained by adjusting but not replacing the components.
Wdu	Full setpoint range as a result of triggering caused by pressure decrease of the pressure switch incorporated in the slam-shut valve. This range can be obtained by adjusting and/or replacing the components (for example, spring or sensitive element).

Term	Description
Wdsu	Full setpoint range as a result of triggering caused by pressure decrease of the pressure switch incorporated in the slam-shut valve. This range can be obtained by adjusting but not replacing the components.

Tab. 2.6.

2.8 - GLOSSARY OF MEASUREMENT UNITS

Type of measurement	Unit of measurement	Description
Volumetric flow rate	Sm^3/h	Standard cubic metres per hour
	Scfh	Standard cubic feet per hour
Pressure	bar	Unit of measurement in the CGS system
	psi	Pounds per square inch
	“wc	water column inch
	Pa	Pascal
Temperature	°C	Degree centigrade
	°F	Fahrenheit Degree
	K	Kelvin
Tightening torque	Nm	Newton metro
	ft-lbs	Foot per pound
Sound pressure	dB	Decibel
Other measures	V	Volt
	W	Watt
	Ω	Ohm

Tab. 2.7.

2.9 - QUALIFIED PROFESSIONAL FIGURES

Qualified operators in charge of using and managing the equipment throughout its technical service life:

Professional figure	Definition
Maintenance mechanical technician	Qualified technician able to: • perform preventive/corrective maintenance operations on all mechanical parts of the equipment subject to maintenance or repair; • access all device parts for visual inspection, checking equipment status, making adjustments and calibrations. The maintenance mechanical technician is not authorised to operate on live electrical systems (if any).
Electrical maintenance technician	Qualified technician able to: • Qualified technician able to perform preventive/corrective maintenance operations on all electrical parts of the device subject to maintenance or repair; • read wiring diagrams and check the correct functional cycle; • perform adjustments and operate on electrical systems for maintenance, repair and replacement of worn parts. The electrical maintenance technician can operate in the presence of voltage inside electrical panels, junction boxes, control equipment etc. only if he/she is a suitable person (S.P.). For general requirements, refer to the CEI EN 50110-1: 2014 standard.
Worker in charge of transport, handling, unloading and placement on site	Qualified operator: • for the use of lifting equipment; • for the handling of materials and equipment. Lifting and handling of the equipment must be carried out strictly in accordance with the instructions provided by the manufacturer and in compliance with the regulations in force at the place where the equipment is installed.
Installer	Qualified operator able to: • carry out all the operations necessary to properly install the equipment; • perform all the operations necessary for the proper functioning of the equipment and the system in safety.
User's technician	Technician trained and authorised to use and manage the equipment for the activities it was supplied for. They must: • be able to perform all operations required for the proper functioning of the equipment and the system, and for their safety or that of any personnel present; • have proven experience in the correct use of equipment like that described in this manual and be trained, informed and instructed in this regard. The technician may carry out maintenance only if authorised/qualified to do so.

Tab. 2.8.

3 - SAFETY

3.1 - GENERAL SAFETY INSTRUCTIONS

⚠ WARNING!

The equipment described in this manual is:

- **a device subjected to pressure in pressurised systems;**
- **normally installed in systems carrying flammable gases (for example: natural gas or hydrogen).**

⚠ WARNING!

If the gas used is a combustible gas, the installation area of the equipment is defined as a "dangerous area" as there are residual risks of the formation of potentially explosive atmospheres.
In "dangerous areas" and in the immediate vicinity it is absolutely:

- **necessary that there are no effective sources of ignition;**
- **necessary that there is no smoking.**

⚠ ATTENTION!

Authorised operators must not carry out operations or interventions on their own initiative that are not within their competence.
Never operate the equipment:

- **while under the influence of intoxicating substances such as alcohol;**
- **if you are using drugs that may lengthen reaction times.**

NOTE!

The employer must train and inform operators on how to behave during operations and on the equipment to be used.

Before installation, commissioning or maintenance, operators must:

- take note of the safety regulations applicable to the place of installation that they are working in;
- obtain the necessary permits to operate when required;
- equip themselves with the necessary personal protection required in the procedures described in this manual:
- ensure that the area that they are operating in is equipped with the required collective protections and the necessary safety information.

3.2 - PERSONAL PROTECTIVE EQUIPMENT

Table 3.9 shows the personal protective equipment (PPE) and its description. An obligation is associated with each symbol.
Personal protective equipment means any equipment intended to be worn by the worker in order to protect them against one or several risks that are likely to threaten their safety or health during work.
For the operators in charge, depending on the type of work requested, the most appropriate PPE of the following will be reported and must be used:

Symbol	Meaning
	**Obligation to use safety or insulated gloves.** Indicates a requirement for personnel to use safety or insulated gloves.
	**Obligation to use safety goggles.** Indicates a requirement for personnel to use protective goggles for eye protection.
	**Obligation to use safety shoes.** Indicates a requirement for personnel to use accident-prevention safety shoes.
	**Obligation to use noise protection equipment.** Indicates a requirement for personnel to use ear muffs or ear plugs to protect their hearing.
	**Obligation to wear protective clothing.** Indicates a requirement for personnel to wear specific protective clothing.
	**Obligation to use a protective mask.** Indicates a requirement for personnel to use respiratory masks in the event of a chemical risk.
	**Obligation to use a protective helmet.** Indicates a requirement for personnel to use the protective helmet.
	**Obligation to wear a high visibility vest.** Indicates a requirement for personnel to use a high visibility vest.

Tab. 3.9.

⚠ WARNING!

Each licensed operator is obliged to:

- **take care of their own health and safety and that of other people present in the workplace, who are affected by their actions or omissions, in accordance with their training, instructions and means provided by the employer;**
- **use the PPE appropriately made available;**
- **immediately report to the employer, the manager or the person in charge of the deficiencies of the means and devices as well as any possible dangerous conditions of which they become aware.**

3.3 - RESIDUAL RISKS

In accordance with the requirements of PED 2014/68/EU, point 1.2 of Annex I, below is an assessment of the risks associated with the equipment and an indication of the principles adopted for their prevention, according to the following classification:

a) Elimination and/or reduction of the risk.
b) Application of the appropriate protective measures.
c) Information to users about residual risks.

3.3.1 - TABLE SHOWING RESIDUAL RISKS DUE TO PRESSURE

Risk and Hazard	Event and Cause	Effect and Consequence	Solution and Prevention
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	• Violent impact; • Impact (also due to falling, improper handling, etc.).	• Deformation; • Breakage of connections and, if pressurised, even burst.	a. Handling and installation with appropriate devices to avoid localised stress. b. Installation in suitable places and spaces with appropriate protections, suitable packaging. c. Information in the instructions for use and warning.
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	• Use of inappropriate fluids.	• Corrosion; • Embrittlement; • Explosion.	a. The user must check compliance of the used fluid with the specifications on the data plate.
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	• Operation at temperatures below the minimum permissible temperature.	• Embrittlement; • Breaking; • Explosion.	a. Install in places where the temperature is not below the minimum permissible temperature and/or insulate the equipment adequately. b. The minimum temperature allowed is indicated on the data plate.
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts. Explosion.	• Overpressure or exceeding of the rated limit values (maximum pressure allowed)	• Explosion; • Breaks; • Cracks; • Permanent deformation.	a. The device has appropriate design safety margins. b. The user must check the maximum pressure applicable to the equipment. c. The maximum allowable pressure is highlighted on the appropriate plate on the equipment.
Falling of the equipment.	• Dangerous handling.	• Deformation; • Cracking; • Breaking.	b. The user must have suitably sized lifting equipment. c. The above requirements are referred to in the equipment use and warning manual.
Pressurised fluid leakage. Projection of metallic and non-metallic pressurised parts.	• Incorrect fixing of the equipment.	• Deformation; • Breaking.	a.The device is equipped with unified type process connections and compression fittings. b. The user must ensure correct fixing to the line. c. Directions in the instructions for use and warning.
Explosion of the device pressurised fluid leakage. Projection of metallic parts.	• Operation at temperatures above the maximum permissible temperature.	• Reduction of mechanical resistance and breakage of the device; • Explosion.	a.The user must equip the system with suitable safety and control devices. b. The maximum temperature allowed is indicated on the data plate.
Pressurised gas leakage.	• Device maintenance with the system running.	• Inappropriate opening of pressurised chambers.	a. The user must perform any maintenance with the equipment not in operation. b. The above requirements are referred to in the use and warning manual.

Risk and Hazard	Event and Cause	Effect and Consequence	Solution and Prevention
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	• External loads bearing on the device.	• Deformation; • Cracking and slot formation; • If pressurised, also bursting.	a. With the exclusion of what is set out in the project, the user must verify that no additional concentrated load bears on the device.
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	• Electrostatic potential, differential stray currents.	• Corrosion localised in the device.	b. The user must equip the device with the necessary protection and earthing devices. c. The above requirements are referred to in the use and warning manual.
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	• Humidity; • Environments with aggressive atmosphere.	• Deterioration of external surfaces; • Corrosion.	a. The user must periodically check the state of conservation of the external surfaces. b. The above requirements are referred to in the use and warning manual.

Tab. 3.10.

3.3.2 - TABLE OF RESIDUAL RISKS FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

Table 3.11 shows the conditions that can lead to the generation of a potentially explosive atmosphere.
The table is valid for use with hydrogen with a density of no more than 0.0695; for different densities, the installation and environmental conditions must also be evaluated.

⚠ WARNING!

If the gas used is a combustible gas, the installation area of the equipment is defined as a "dangerous area" as there are residual risks of the formation of potentially explosive atmospheres.
In the "dangerous areas" and in the immediate vicinity it is absolutely necessary that there are no effective sources of ignition.

⚠ WARNING!

If the gas used is a combustible gas, it must be verified downstream of the installation that electrical equipotentiality is ensured between the equipment and the rest of the installation (as described in paragraph 7.5)

Operating conditions	Potentially explosive atmosphere	Regulatory references	Management measures included in the instructions for use and warning
Commissioning	No	• During the production cycle and before the CE marking according to Directive 2014/68/EU, the external tightness of the equipment is checked at a value of 1.1 PS (in accordance with Standard EN 334). • Before commissioning, the external tightness of the portion of the system on which the equipment is installed is checked at a suitable pressure (in accordance with standards EN 12186 and EN 12279).	The instructions for use indicate the need to meet the requirements of Standards EN 12186 and EN 12279.
Operation in normal conditions	No	The indications in the previous point apply, in addition: • the equipment is installed outdoors or in an environment with natural ventilation (in accordance with Standards EN 12186 and EN 12279); • the installation is subject to surveillance according to current national rules/good practice/ the equipment manufacturer's instructions (in accordance with the provisions of Standard EN 12186 and Standard EN 12279).	The instructions for use indicate that: • any environment in which the equipment is installed must meet the requirement of Standards EN 12186 and EN 12279; • periodic checks and maintenance must be carried out during surveillance in accordance with the national rules in force (if any), and with the specific manufacturer's recommendations.

Operating conditions	Potentially explosive atmosphere	Regulatory references	Management measures included in the instructions for use and warning
Breakage of the control head diaphragm (malfunction)	No	This event must be considered as a rare malfunction. All atmospheric pressure chambers delimited on at least one side by a diaphragm must be channelled to a safe area (in accordance with the provisions of Standard EN 12186 and Standard EN 12279).	The instructions for use indicate the need to meet the requirements of Standards EN 12186 and EN 12279.
Breakage of other non-metallic parts (malfunction)	No	This type of malfunction is not reasonably expected as it involves static seals (to the outside) that cannot generate any external leakage.	-
Decommissioning	No	• The pressure of the system section in which the equipment is installed must be reduced with appropriate vent lines channelled to a safe area (in accordance with the provisions of Standard EN 12186 and Standard EN 12279). • The residual gas must be discharged as indicated above.	The instructions for use indicate the need to meet the requirements of Standards EN 12186 and EN 12279
Reboot	No	• After reassembling the regulator, carry out an external leakage test at a convenient pressure value as specified by the manufacturer. • Before commissioning, the external tightness of the portion of the system on which the equipment is installed is checked at a suitable pressure (in accordance with standards EN 12186 and EN 12279).	The instructions for use indicate: • the minimum conditions for testing internal leakage; • the need to meet the requirements of Standards EN 12186 and EN 12279

Tab. 3.11.

3.4 - OBLIGATIONS AND PROHIBITIONS

The following is a list of obligations and prohibitions to be observed for the safety of the operator.
It is obligatory to:

- carefully read and understand the instructions for use and warning;
- check whether the downstream equipment is suitably sized according to the performance required of the regulator in the actual operating condition;
- check the data on the nameplates before installing the equipment;
- avoid violent shocks and impacts that could damage the equipment and, as a result, cause the pressure fluid to escape.

It is forbidden to:

- operate in various capacities on the equipment without the PPE indicated in the work procedures described in these use and warning instructions;
- operate in the presence of open flames or bring open flames close to the work area;
- smoke near the equipment or while you are working on it;
- use the equipment with parameters other than those indicated on the nameplate;
- use the equipment with fluids other than those indicated on the nameplate and in these use and warning instructions;
- use the equipment outside the operating temperature range declared on the nameplate and in these use and warning instructions;
- service the equipment with the portion of the system on which it is installed in operation;
- install or use the equipment in environments other than those specified in these instructions for use and warning.

3.5 - SAFETY PICTOGRAMS

The following safety pictograms may be shown on the equipment and/or packaging PIETRO FIORENTINI S.p.A.:

Symbol	Definition
	Symbol used to identify an ELECTRICAL HAZARD.
	Symbol used to identify a GENERIC HAZARD.

Tab. 3.12.

HAZARD!

It is absolutely forbidden to remove the safety pictograms on the equipment.
The user is required to replace the safety pictograms which, following wear, removal or tampering, are illegible.

3.6 - RISK LEVEL

Depending on the operating conditions, use and configuration required, the equipment may generate noise other than that permitted by current legislation in the country of installation.
For the value of the noise generated by the equipment and further information, contact PIETRO FIORENTINI S.p.A.

ATTENTION!

The obligation to use headphones or ear plugs to protect the operator's hearing remains in the event that the noise in the installation environment of the equipment (depending on specific operating conditions) exceeds the value of 85 dBA.

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4 - DESCRIPTION AND OPERATION

4.1 - GENERAL DESCRIPTION

The equipment STAFLUX 187 H2 is a pressure regulator for high pressure which reduces the inlet gas pressure, keeping the downstream value stable even when the following varies:

- inlet pressure value;
- the required flow rate within the operating conditions of the equipment.

The main elements of the equipment are (see Fig. 4.1):

Pos.	Description	Pos.	Description
1	Plug	6	Stem
2	Main diaphragm	7	Spring load
3	Chamber	8	Calibration valve
4	Sealing gasket seat	9	Calibration valve
5	Safety valve for contro head		

Tab. 4.13.

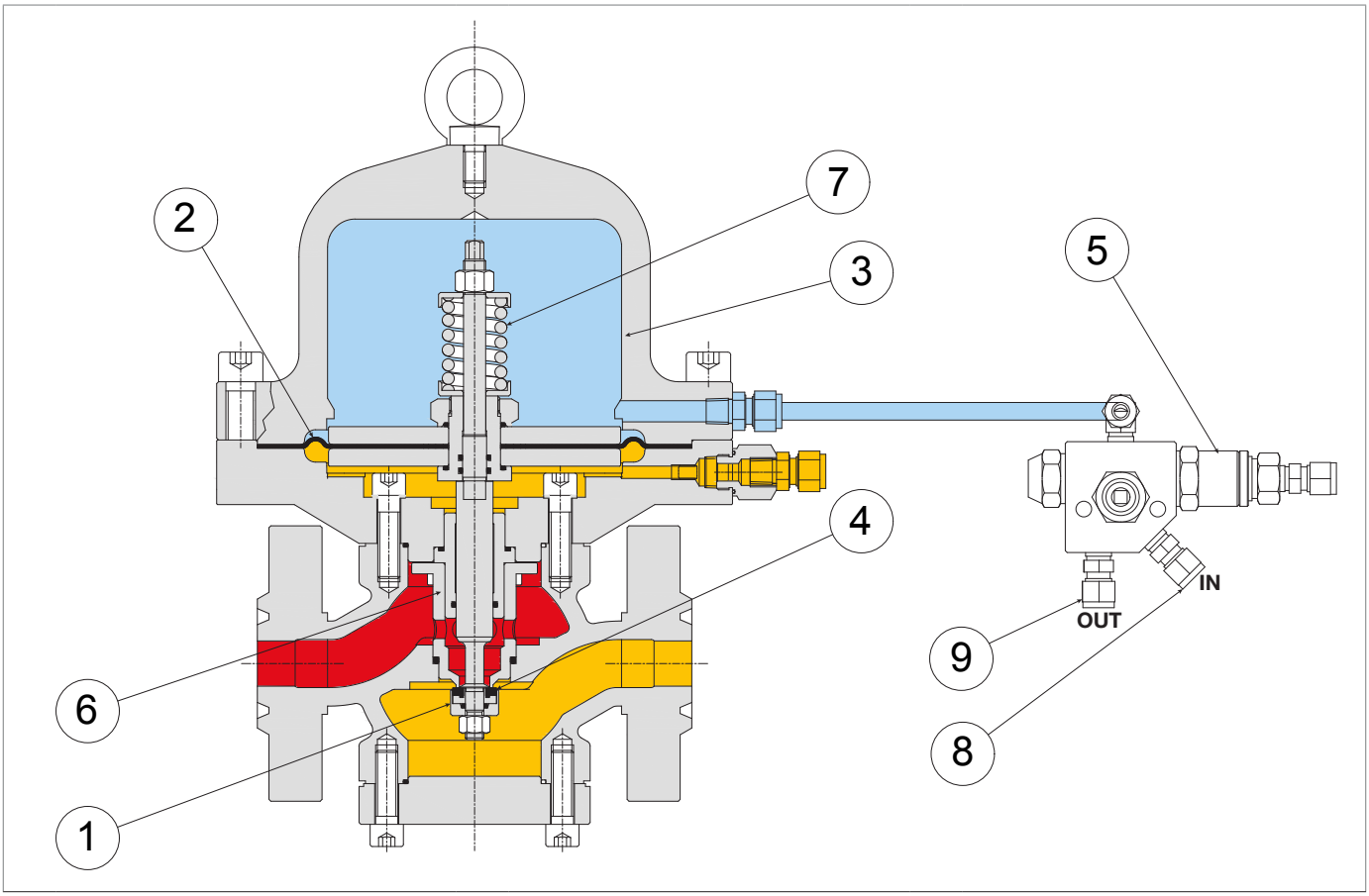


Fig. 4.1. General description STAFLUX 187 H2

4.1.1 - REGULATOR REACTION MODES

The STAFLUX 187 H2 equipment is a direct-acting regulator with a “fail open” reaction (on-opening reaction), that is, it opens in the event of:

- breakage of the main diaphragm
- lack of power supply.

4.2 - OPERATION

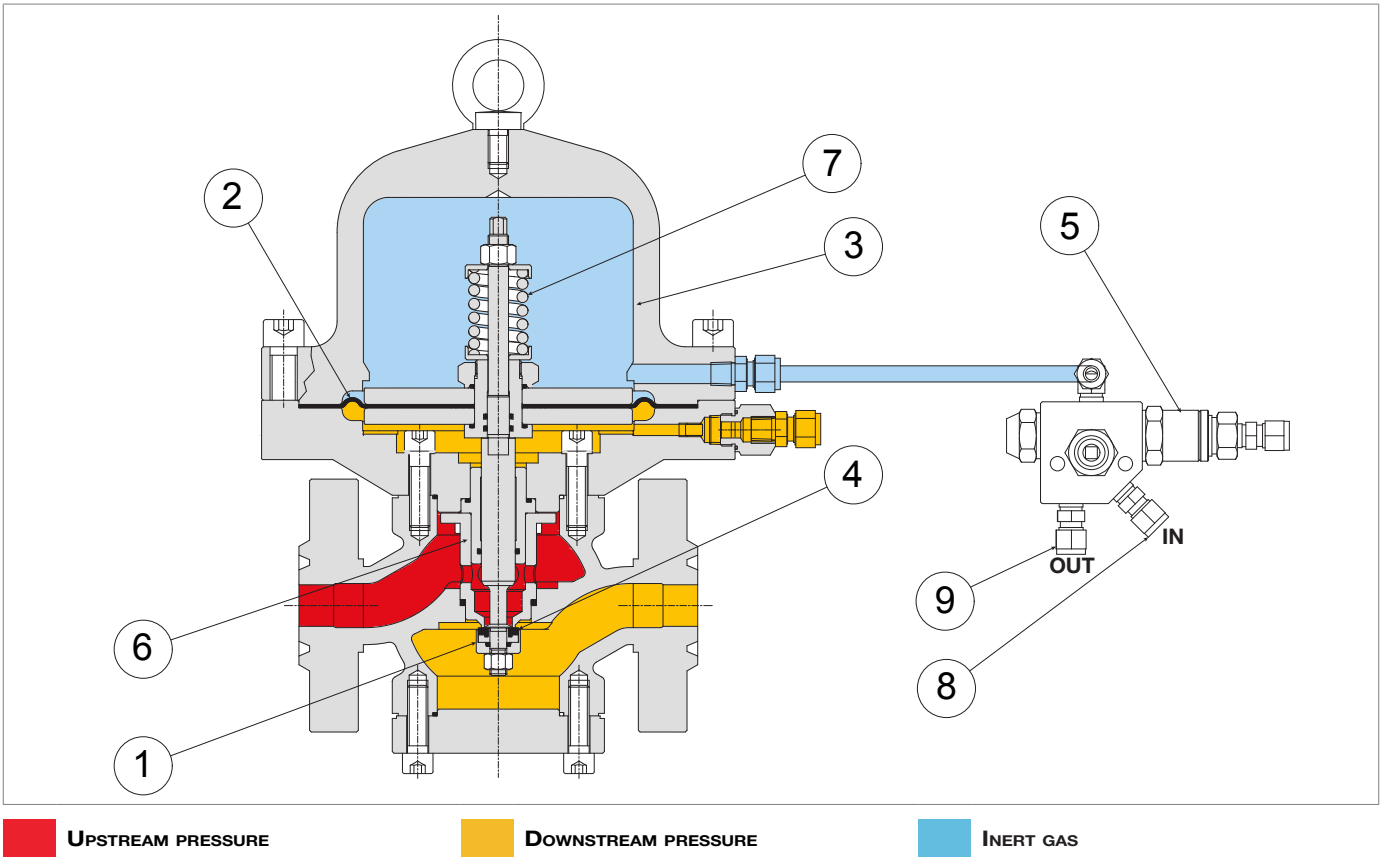


Fig. 4.2. Operation STAFLUX 187 H2

The operating principle is based on the balancing of forces acting on the main diaphragm (2), which is connected to the plug (1) via the stem (6).

The forces are the following:

- on the upper side of the diaphragm: the downstream pressure (Pd) contained in the sub-diaphragm chamber (3);
- on the lower side: thrusts deriving from the upstream (Pu) and downstream (Pd) pressure as well as residual dynamic components.

STAFLUX 187 H2 is equipped with two manual calibration valves:

- calibration valve (8) which provides pressure in the chamber (3) (pressurise the chamber with an external inert gas source, such as tank or compressed air)
- calibration valve (9) which drains the pressure in the chamber (3).

These two valves are required for regulator calibration.

The regulator is calibrated by means of the pressure of the gas contained in the chamber (3). The variations in ambient temperature can generate variations in the value of the pressure in the bell chamber and variations in the value of the regulated pressure.

Operating conditions	Operating consequences	Concluding outcome
Downstream pressure (Pd) decreases due to an increase in the required flow rate	• Imbalance of forces • Decrease of pressure in the sub-diaphragm chamber (3)	Opening of the plug (1) until the equilibrium condition is restored
Downstream pressure (Pd) increases due to a decrease in the required flow rate	• Imbalance of forces • Increase of pressure in the sub-diaphragm chamber (3)	Reduction of the passage section of the valve seat (4) until the equilibrium condition is restored

Tab. 4.14.

4.3 - INTENDED USE

4.3.1 - ENVISAGED USE

The equipment in question is intended for:

Permitted Operation		Unpermitted Operation	Work environment
Adjustment of the downstream pressure for:	Gaseous, and non-corrosive, fluids that have been filtered beforehand.	• Liquids. • Any product other than those permitted.	Installations for the transport and distribution of natural gas to supply networks for: • civil use; • industrial use

Tab. 4.15.

The equipment in question is used as a main regulator and in-line monitor regulator.
It was designed to be used exclusively within the limits specified on the nameplate and according to the instructions and limits of use referred to in this manual.

Safe work indications are:
- use within the limits stated on the nameplate and in this manual;
- compliance with the user manual procedures;
- routine maintenance to be carried out when and how recommended;
- special maintenance to be carried out if required;
- do not tamper with and/or bypass the safety devices.

4.3.2 - REASONABLY FORESEEABLE MISUSE

Reasonably foreseeable misuse means using the equipment in a way that is not envisaged in the design phase but which may result from easily predictable human behaviour:
- corrosive fluids;
- fluids not properly treated upstream;
- liquids;
- instinctive reaction of an operator in the event of a malfunction, accident or breakdown while using the equipment;
- behaviour resulting from pressure to keep the machine running under all circumstances;
- behaviour resulting from carelessness;
- behaviour resulting from the use of the equipment by unauthorised and unsuitable people (children, disabled);
- using the equipment in a manner other than that referred to under “Intended use”.

Any use of the equipment other than the intended use must be previously approved in writing by PIETRO FIORENTINI S.p.A.
If no written approval is provided, use shall be considered improper.
In the event of “improper use”, PIETRO FIORENTINI S.p.A. shall not be held liable for any damage caused to people or property, and any type of warranty on the equipment shall be deemed void.

4.3.3 - TYPES OF FLUIDS

The equipment works with hydrogen used:
- in pressure control stations according to EN 12186 or EN 12279;
- in transmission and distribution networks;
- in commercial and industrial plants (after checking by contacting the Manufacturer).

NOTE!

The equipment may be also used with combustible and inert gases, subject to verification by contacting the manufacturer.

4.4 - TECHNICAL FEATURES/PERFORMANCE

The STAFLUX 187 H2 equipment is a medium and high pressure regulator.
STAFLUX 187 H2 is a “top entry” type regulator that can be easily serviced and equipped with on-site accessories. The regulation system is balanced and guarantees a stable outlet pressure even when the inlet pressure varies.
The main specifications for this regulator are:

Technical features	
Maximum allowable pressure	Up to 250 bar
Inlet gas temperature range	-20 °C + 60 °C
Ambient temperature range	-20 °C + 60 °C
Input pressure range (bpu)	from 5 to 250 bar
Possible regulation range (Wd)	from 4 to 74 bar
Minimum differential pressure	1 bar
Accuracy class (AC)	up to 5 (depending on operating conditions)
Lock up pressure class (SG)	up to 10 (depending on operating conditions)

Tab. 4.16.

Cg and K1 coefficients	
Nominal diameter [mm]	25
Size [inches]	1”
Coefficient Cg	130
Coefficient K1	106.78

Tab. 4.17

4.5 - POSSIBLE CONFIGURATIONS

NOTE!

No configurations other than the standard configuration are envisaged for the equipment referred to in this document.

5 - TRANSPORT AND HANDLING

5.1 - SPECIFIC WARNINGS FOR TRANSPORT AND HANDLING

NOTE!

Transport and handling must be carried out by personnel:

- **qualified (specially trained);**
- **who are familiar with accident prevention and workplace safety regulations;**
- **authorised to use lifting equipment;**
- **in compliance with the regulations in force in the country of destination of the equipment.**

Transport with forklift or crane	
Operator qualification	Person in charge of transport, handling, unloading and placing on site
PPE required	 **WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE necessary to protect against risks associated with the workplace, installation or operating conditions, it is necessary to refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**
Lifting equipment	Hoist crane, forklift truck or other suitable equipment.
Weights and dimensions of the equipment	For dimensions and weights, refer to paragraph 5.2 “Physical characteristics of the equipment”

Tab. 5.18.

5.1.1 - PACKAGING AND FASTENERS USED FOR TRANSPORT

The transport packaging is designed and manufactured to avoid damage during normal transport, storage and handling.
The equipment and spare parts must be kept in their packaging until they are installed.
Upon receiving the equipment:

- make sure that no part has been damaged during transport and/or handling;
- immediately report any damage found to PIETRO FIORENTINI S.p.A..

NOTE!

PIETRO FIORENTINI S.p.A. shall not be liable for any damage to people or property caused by accidents due to failure to comply with the instructions provided in this manual.

Below is a list of the types of packaging used:

Ref.	Type of packaging	Image
A	Cardboard box	
B	Wooden box	
C	Pallet	

Tab. 5.19.

5.2 - PHYSICAL CHARACTERISTICS OF THE EQUIPMENT

5.2.1 - STAFLUX 187 H2

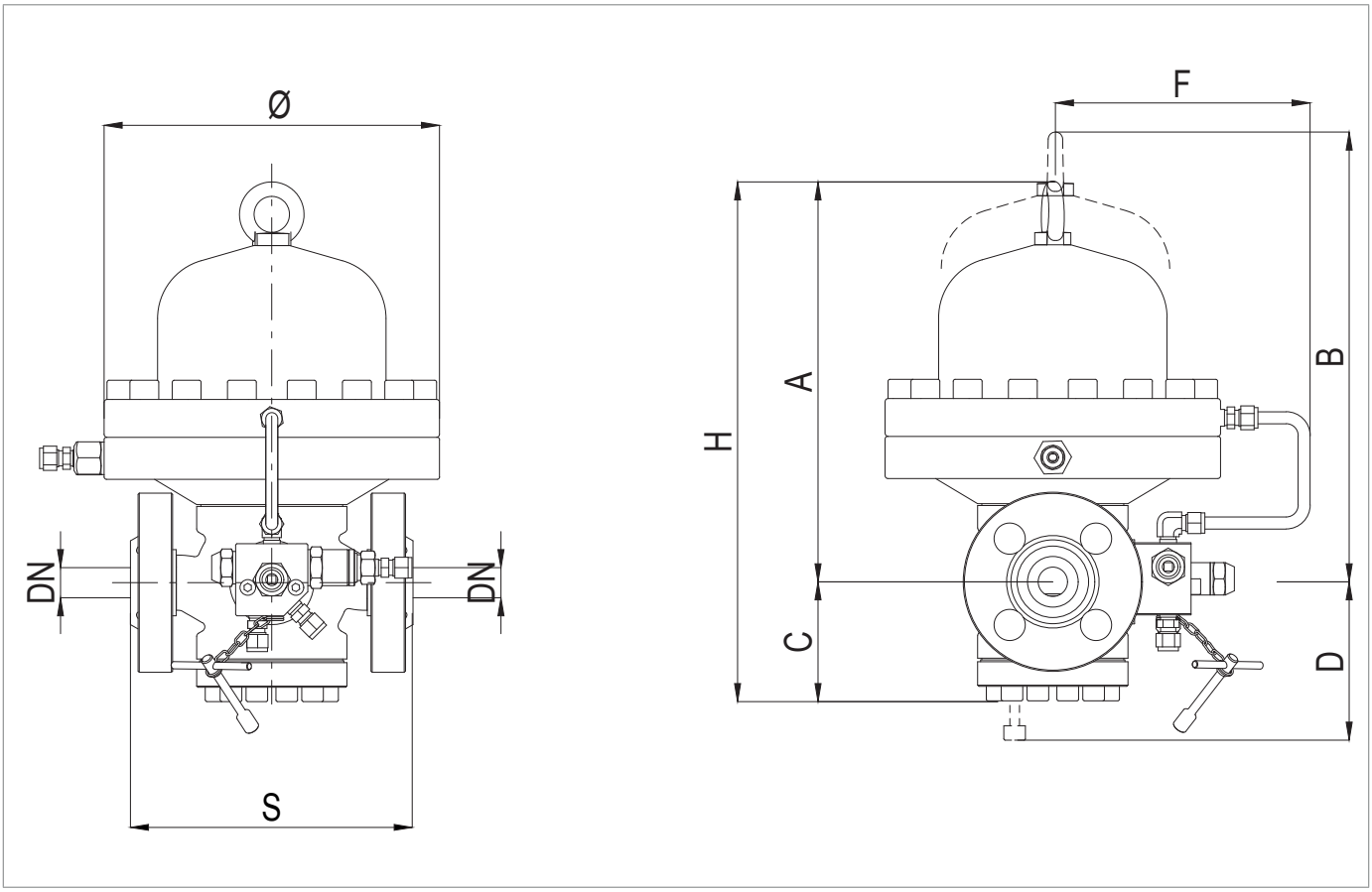


Fig. 5.3. STAFLUX 187 H2 physical characteristics

STAFLUX 187 H2 overall dimensions - CONNECTION WITH FLANGES	
Nominal diameter [mm]	25
Size [inches]	1”
S	235
Ø	280
A	335
B	435
C	100
D	130
F	195
H	433
Tubing connections	Øe 10 mm x Øi 8 mm

Tab. 5.20.

Weight [kgf]	
DN 25 / 1”	53

Tab. 5.21.

5.3 - EQUIPMENT ANCHORING AND LIFTING METHOD

HAZARD!

Before moving the equipment, make sure that the capacity of the lifting equipment is suitable for the load.

WARNING!

Unloading, transport and handling activities must be carried out by operators qualified and specially trained:

- **on accident prevention rules;**
- **on maximum safety in the workplace;**
- **on the use of lifting equipment.**

ATTENTION!

Before moving the equipment:

- **remove any movable or hanging component or firmly secure it to the load;**
- **protect fragile equipment;**
- **check that the load is stable.**

5.3.1 - FORKLIFT HANDLING METHOD

HAZARD!

Prohibitions:

- **Do not transit under suspended loads;**
- **Do not move the load overhead of the personnel operating in the site/plant area.**

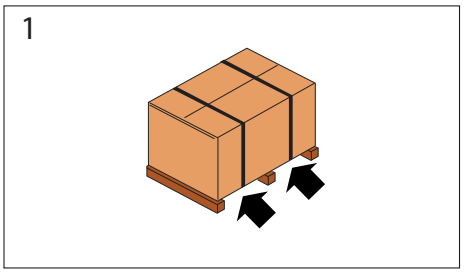
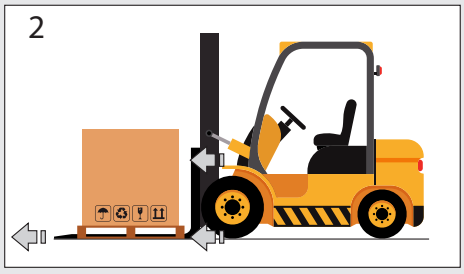
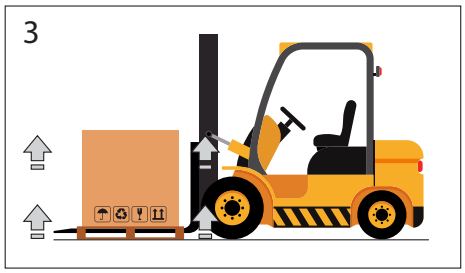
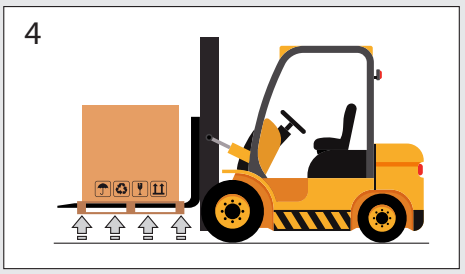
WARNING!

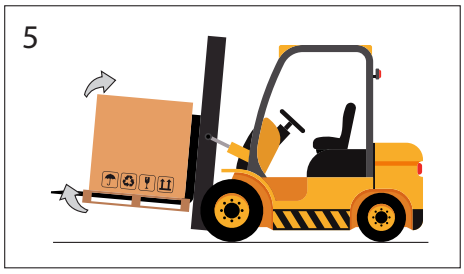
- **Do not use forklifts to carry people;**
- **Do not use forklifts to lift people.**

NOTE!

Packaging must always be handled in a vertical position

Proceed as follows:

Step	Action	Image
1	Place the forks of the forklift under the load surface.	
2	Make sure that the forks extend from the front of the load (by at least 5 cm), far enough to eliminate any risk of the transported load from tipping.	
3	Raise the forks until they are touching the load. **NOTE!** **Fasten the load to the forks with clamps or similar devices if required.**	
4	Slowly lift the load by a few dozen centimetres and check its stability, making sure that the centre of gravity of the load is positioned at the centre of the lifting forks.	

Step	Action	Image
5	Tilt the mast backwards (towards the driver's seat) to help the overturning moment and to ensure greater load stability during transport.	
6	Adjust transport speed according to the type of floor and load, avoiding sudden manoeuvres. **⚠ WARNING!** **If:** • **obstacles along the path;** • **particular operating situations;** **do not allow the operator a perfect view, the assistance of a ground operator performing hand signals is required outside the range of action of the lifting equipment.**	-
7	Place the load in the chosen installation area.	-

Tab. 5.22.

5.3.2 - CRANE HANDLING METHOD

⚠ WARNING!

CE-marked chains, ropes and eyebolts must be used. Do not use chains connected to each other by bolts.
Always check that:

- **the safety catch of the hook returns to the initial position;**
- **the ropes are in excellent condition and have an adequate section.**

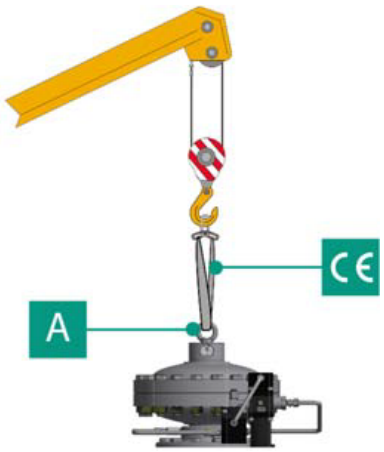
Prohibitions:

- **do not drag the load on the ground;**
- **do not operate near power lines;**
- **do not stand within the range of action of the crane.**

NOTE!

Packaging must be always handled in a vertical position.

The equipment must be handled using the lifting points provided on the equipment itself. To carry out transportation correctly, follow the procedure below:

Step	Action	Image
1	Attach the lifting rope or chain to the appropriate supports (A). **⚠ WARNING!** **The lifting point is sized for lifting only the equipment, and not other parts of the system connected to it.**	
2	Slightly lift the load making sure the ropes or chains are secure. **NOTE!** **Check whether the load is properly balanced.**	
3	Handle the load avoiding sudden movements.	
4	Place the load in the chosen installation area	

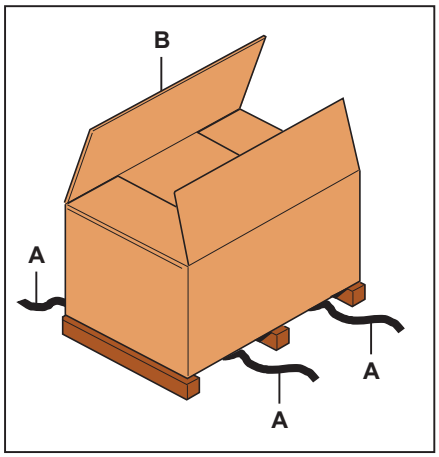
Tab. 5.23.

5.4 - PACKAGING REMOVAL

Packaging removal	
Operator qualification	• Person in charge of transport, handling, unloading and placing on site; • Installer.
PPE required	 **⚠ WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE necessary to protect against risks associated with the workplace or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**

Tab. 5.24.

To unpack the equipment in a cardboard box, proceed as follows:

Step	Action	Image
1	Remove the straps (A).	
2	Remove the packaging cardboard (B).	
3	Remove the fasteners that secure the equipment to the base (if any).	
4	Move the equipment from the base to the place intended for it. **NOTE!** **Have at least 2 operators manually move the equipment, if required due to its dimensions/weight.**	

Tab. 5.25.

NOTE!

After removing all packaging materials, check for any anomalies.
If there are anomalies:
- **do not install the equipment;**
- **contact PIETRO FIORENTINI S.p.A. and specify the details provided on the equipment nameplate.**

5.4.1 - PACKAGING DISPOSAL

NOTE!

Sort the various materials making up the packaging and dispose of them in compliance with the regulations in force in the country of installation.

5.5 - STORAGE AND ENVIRONMENTAL CONDITIONS

If the equipment needs to be stored for an extended period, the minimum environmental conditions for the intended storage are provided. Only by complying with these requirements can the declared performance be guaranteed:

Conditions	Data
Maximum storage period	Maximum 3 years. **NOTE!** **For installations in later periods, see paragraph "pre-installation warnings after prolonged storage.**
Temperature	Not above 25°C
Humidity	Not above 70%
Radiation	Away from radiation sources according to UNI ISO 2230:2009

Tab. 5.26.

5.5.1 - PRE-INSTALLATION WARNINGS AFTER PROLONGED STORAGE

For installations that have been stored for longer than 3 years, the condition of all rubber parts must be checked and, if found to be damaged, they must be replaced in order to ensure the correct functioning of the equipment.
To replace the rubber parts of the equipment, please refer to chapter 9 "Maintenance and functional checks".

NOTE!

PIETRO FIORENTINI S.p.A. recommends checking the condition of rubber parts in case of downtime or storage of more than 3 years.

6 - INSTALLATION

6.1 - INSTALLATION PRE-REQUISITES

6.1.1 - ENVIRONMENTAL CONDITIONS ALLOWED

⚠ WARNING!

To safely use the equipment, adhere to the environmental conditions allowed and to the data provided on the nameplate of the regulator and any accessories (refer to paragraph 2.7 “Nameplates applied”).

The installation site must be suitable for the safe use of the equipment.
The installation area of the equipment must be properly lit to ensure that the operator has good view when working on the equipment.

NOTE!

The equipment must operate in places that are properly lit by artificial lighting that is suitable for the protection of the operator (in compliance with UNI EN 12464-1:2011 and UNI EN 12464-2:2014). If maintenance work is to be performed in areas and/or parts that are poorly lit, it is mandatory to:

- **use all the light sources of the installation plant;**
- **be equipped with a lighting system handheld or connected to the power supply network, compliant with Directive 2014/34/EU (ATEX) for use in environments at risk of explosion;**
- **adhere to the temperature specified on the equipment nameplate.**

6.1.2 - CHECKS BEFORE INSTALLATION

The equipment does not require any further safety device upstream to be protected against any overpressure with respect to its **PS admissible pressure** when, for the upstream reduction station, the maximum incidental downstream pressure is:

MIPd ≤ 1.1 PS

MIPd = Maximum incidental downstream pressure value (for further information, see UNI EN 12186:2014).

⚠ ATTENTION!

If the installation of the equipment requires the on-site application of compression fittings, these must be installed in accordance with the instructions of the Manufacturer of the fittings themselves.
The choice of fittings must be compatible with:

- **the use specified for the equipment;**
- **the plant specifications when required.**

Before installation, it must be ensured that:

- the expected dimensions of the installation site are compatible with those of the equipment;
- there are no impediments for the workers in charge to perform maintenance;
- the upstream and downstream pipes are at the same level and can bear the weight of the equipment;
- the inlet and outlet connections of the pipes are aligned on the flanges;
- the inlet and outlet connections of the equipment are clean and have not been damaged;
- the inside of the upstream pipe is clean and free of processing residues such as welding slag, sand, paint residues, water, etc…

Installation	
Operator qualification	Installer
PPE required	 **⚠ WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE necessary to protect against risks associated with the workplace, installation or operating conditions, it is necessary to refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**
Required equipment	Refer to chapter 7 “Equipment for commissioning / maintenance”.

Tab. 6.27.

6.2 - SPECIFIC SAFETY INSTRUCTIONS FOR THE INSTALLATION STEP

⚠ WARNING!

Before proceeding with installation, make sure that the upstream and downstream valves installed on the line are closed.

⚠ WARNING!

Installation may also take place in areas where there is a risk of explosion, and this implies that all necessary prevention and protection measures must be taken.
For these measures, please refer to the regulations in force at the place of installation.

6.3 - GENERAL INFORMATION ON CONNECTIONS

The equipment must be installed in the line with the arrow on the body pointing in the gas flow direction.
For installation in line as well as in a square pattern, the following must be on hand:

Pos.	Description
1	1 **shut-off valve upstream** of the equipment
2	2 **vent valves** located one upstream and one downstream of the equipment
3	2 **pressure gauges** one upstream and one downstream of the equipment
4	1 **pressure regulator**
5	1 **downstream shut-off valve**

Tab. 6.28.

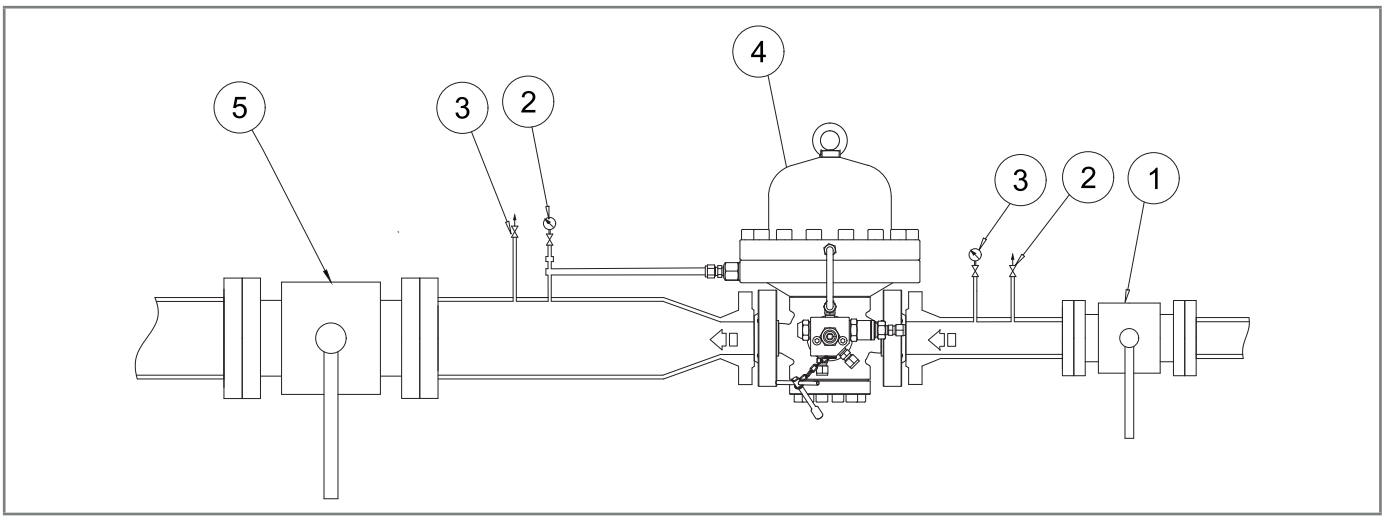


Fig. 6.4. In-line installation

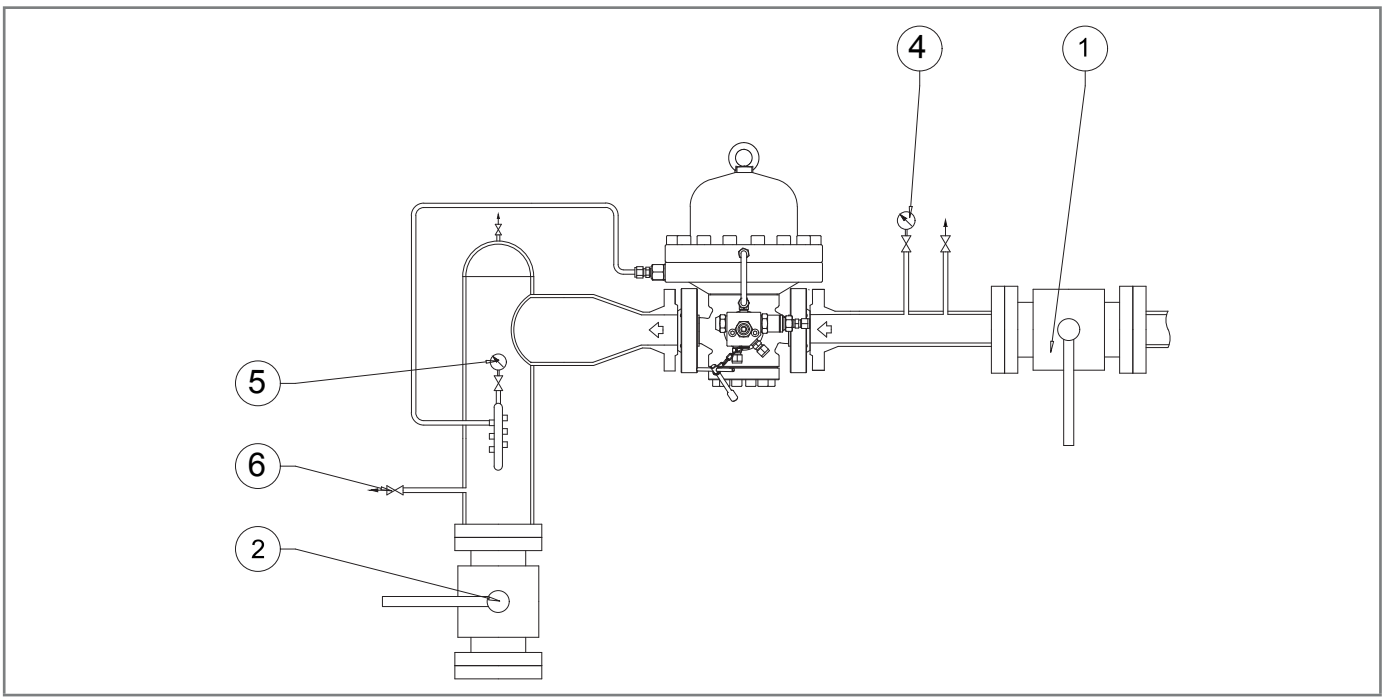


Fig. 6.5. Installation in a square pattern

NOTE!

When used in gas pressure reduction stations, the device must be installed at least according to the requirements of standards UNI EN 12186:2014 or UNI EN 12279:2007.
Equipment vents must be ducted in accordance with UNI EN 12186:2014 or UNI EN 12279:2007 or the standards in force at the place of installation of the equipment.

6.4 - REGULATOR INSTALLATION POSITIONS

The regulator is typically installed as in Fig. 6.6 and Fig. 6.7:

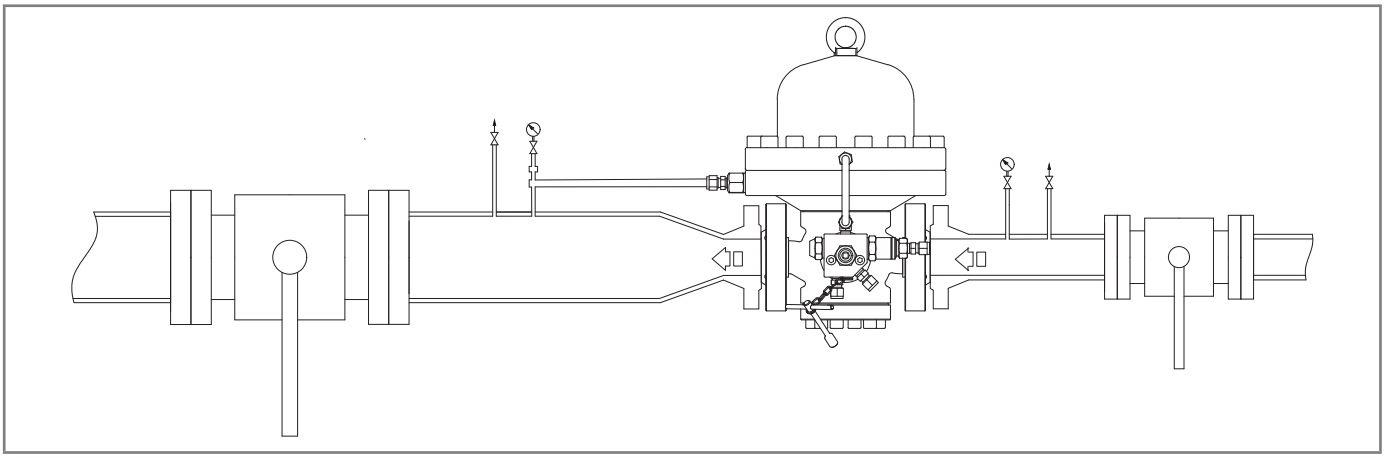


Fig. 6.6. Standard position

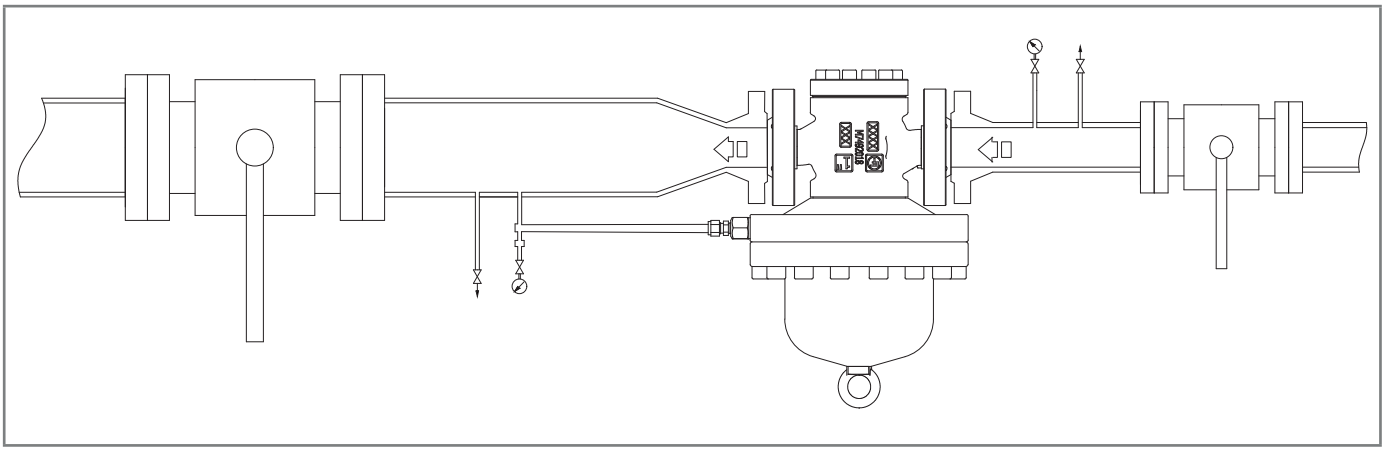


Fig. 6.7. Inverted position

6.5 - INSTALLATION PROCEDURES

6.5.1 - EQUIPMENT INSTALLATION PROCEDURE

To install the equipment in line and in a square pattern, proceed as follows:

Step	Action
1	Place the equipment in the section of the line designated for it.
2	Place the gaskets between the line flange and the regulator flange.
3	Insert the bolts into the appropriate holes of the connecting flanges.
4	Screw the bolts following the technical rules for tightening flanges.

Tab. 6.29.

6.5.2 - CONNECTION OF THE SENSING LINES TO THE DOWNSTREAM PIPING

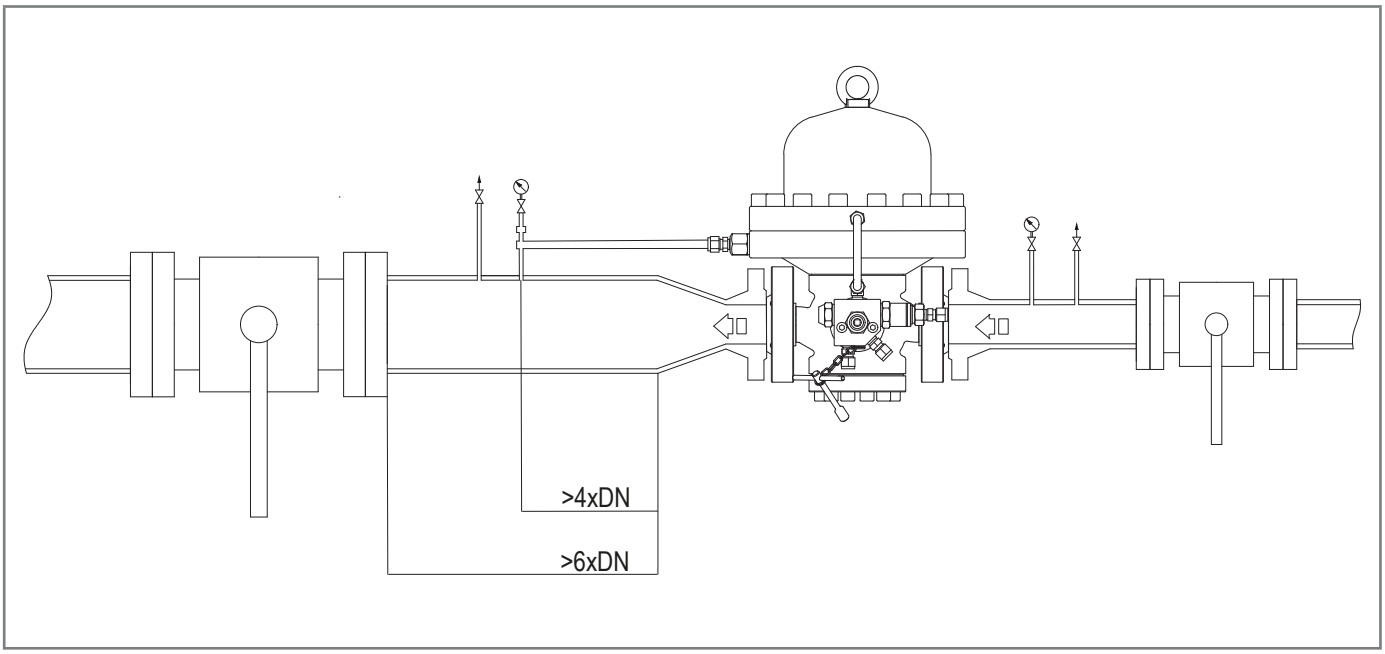


Fig. 6.8. Connection of sensing lines to the downstream piping

To obtain proper regulation, it is essential that:

- the downstream shut-off valve is placed at a distance of least 6 times the rated diameter of the pipe downstream of the regulator;
- the downstream sensing lines are placed on a straight section of pipe (with uniform diameter) having a length equal to at least 4 times the rated diameter of the pipe itself;

⚠ ATTENTION!

The pilot drain must not be connected to the multi-socket switch.

For optimum performance, the velocity of the pressurised fluid at the sampling point does not exceed the following values:

Vmax = 30 m/s for Pa > 5 bar

Vmax = 25 m/s for Pa < 5 bar

As a limit for use, the velocity of the fluid under pressure at the point of pick-up does not exceed the following value:

Vmax = 40 m/s for Pa > 5 bar

To calculate the flow rate, use the following formula:

$$V = 345{,}92\ x\ \frac{Q}{DN^2}\ x\ \frac{1 - 0{,}002xPd}{1 + Pd}$$

V = gas velocity in m/sec
Q = gas flow rate Sm^3/h
DN = nominal diameter of the regulator in mm
Pd = regulator outlet pressure in barg

NOTE!

All on-site pneumatic connections must have pipes with a minimum internal diameter of 8 mm

To prevent the sensing line pipes from collecting impurities and condensation, it is necessary that:

- the pipe connections are always welded on the upper part or at maximum 90 degrees on the axis of the pipe (refer to Fig. 6.9);
- the hole in the piping has no burrs or internal protrusions;
- the slope of the pipe is always 5-10% towards the downstream pipe connection.

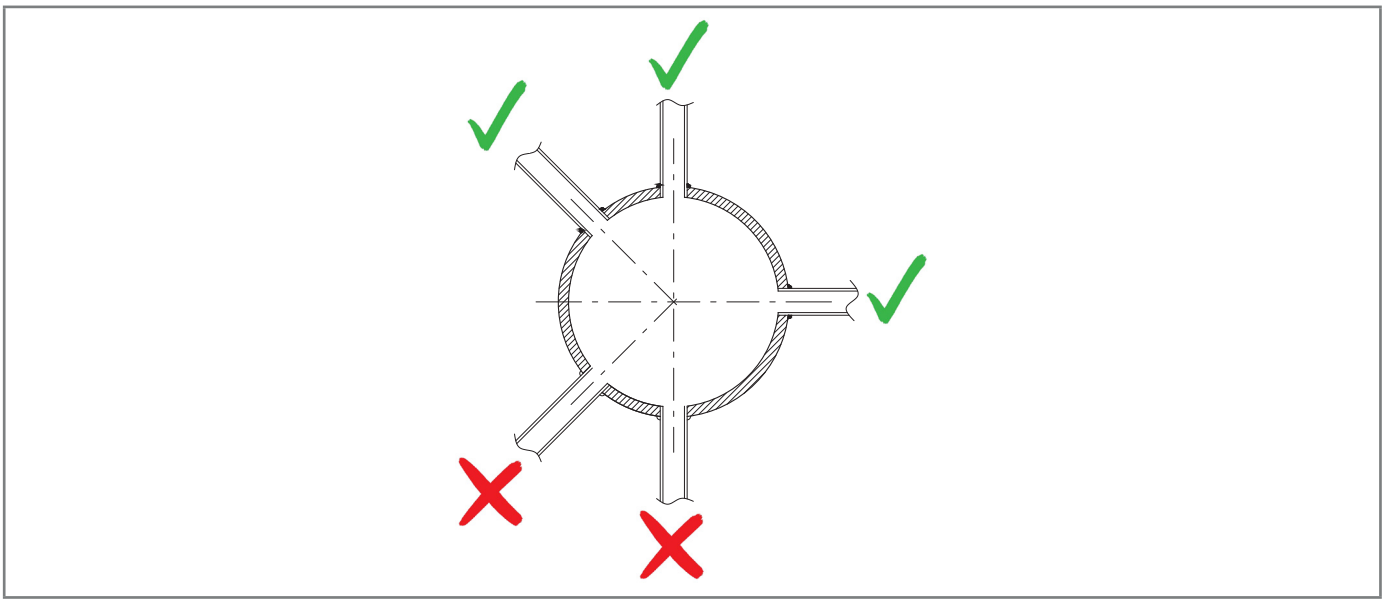


Fig. 6.9. Welded pipe connections

If there is a sensing line, provide equipment connections as shown below:

- 1 and 2 to the discharge outlet of the control head of the monitor, if any;
- 3 and 4 to the pilot sensing lines;
- 5 and 6 to the sensing lines of the accelerator of the slam-shut device, if any.

NOTE!

If there is a multiple sensing line, it is not recommended to place shut-off valves on sensing lines. In any case, follow the regulations in force in the place of installation and use of the equipment.

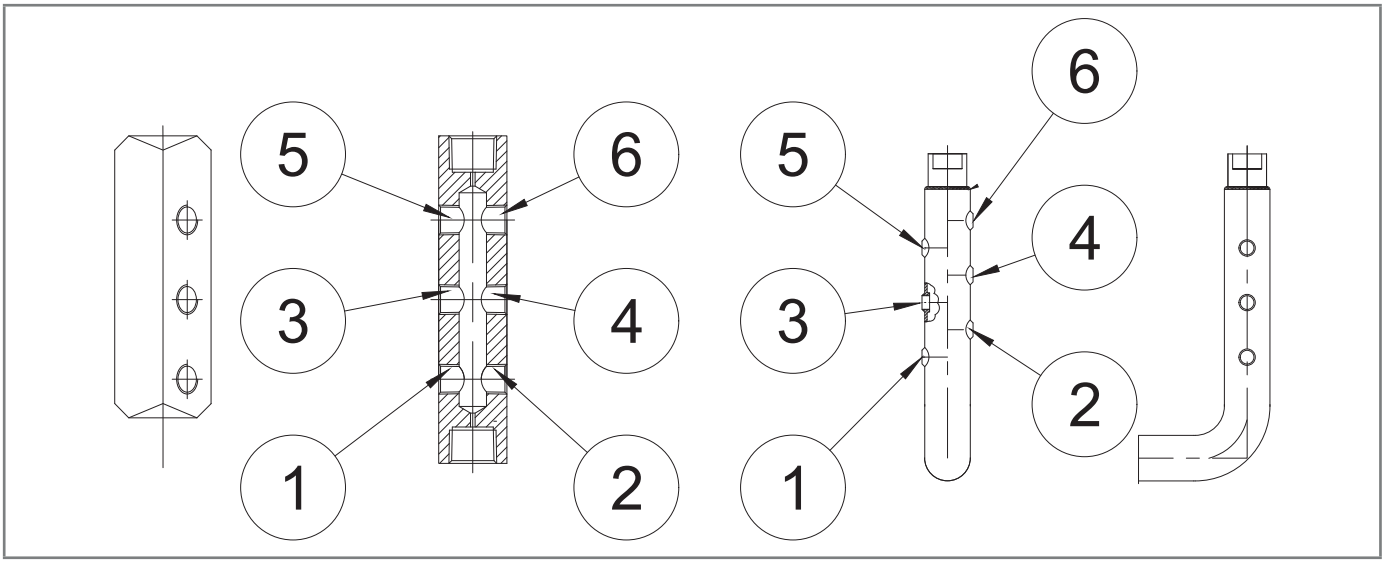


Fig. 6.10. Equipment connections

6.6 - POST-INSTALLATION AND PRE-COMMISSIONING CHECKS

When the equipment is operating, make sure that all connections are:

- properly secured/tightened to prevent any leakage during commissioning;
- connected correctly.

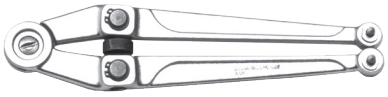
7 - COMMISSIONING/MAINTENANCE EQUIPMENT

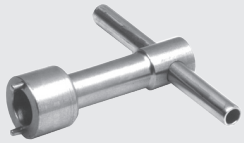
7.1 - LIST OF EQUIPMENT

Commissioning/maintenance equipment	
Operator qualification	• Mechanical maintenance technician; • Electrical maintenance technician; • Installer; • User's technician.
PPE required	 **⚠ WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**

Tab. 7.30.

In Tab. 7.31 we list the types of equipment required for commissioning and maintenance of the equipment:

Ref.	Equipment type	Image
A	Combination wrench	
B	Adjustable wrench	
C	Roller compass wrench	
D	Double ended bi-hex tubular socket wrench	
E	Bent male hex key	
F	Male T-handle hex wrench	

Ref.	Equipment type	Image
G	T-handle hex socket wrench	
H	Phillips screwdriver	
I	Slotted screwdriver	
L	O-ring extraction tool	
M	Circlip pliers	
N	Fiorentini special key	
O	Fiorentini special key	

Tab. 7.31.

7.2 - EQUIPMENT NEEDED FOR THE DIFFERENT CONFIGURATIONS

Tab. 7.32 provides the following details:

Term	Description
K.	Key, with reference to the equipment indicated in tab. 7.30
Code	Code, referring to the equipment
DN	Indicates the Nominal Diameter of the reference configuration
L.	Length, referred to the equipment
Ref.	Reference to the equipment indicated in tab. 7.48
Type	Type (size) or code of the equipment

Tab. 7.32.

STAFLUX 187 H2		
Equipment		**DN | mm**
Ref.	**Type**	**25 | 1”**
A	K.	6 - 7 - 14 - 15 - 19 - 24 - 27 - 41
B	L.	300
C	Ø	4
E	K.	3 - 8 - 9 - 17
F	K.	6
L	Code	7999099

Tab. 7.33.

8 - COMMISSIONING

8.1 - GENERAL WARNINGS

8.1.1 - SAFETY REQUIREMENTS FOR COMMISSIONING

HAZARD!

During commissioning the risks associated with any discharges to the atmosphere of flammable or noxious gases must be evaluated.

HAZARD!

In case of installation on hydrogen or natural gas distribution networks, one should consider the risk of explosive mixtures (gas/air) forming inside the piping, if the line is not subjected to inertisation.

WARNING!

During commissioning, any unauthorised personnel must be removed.
The delimited area must be marked with signs and/or fencing.

NOTE!

Commissioning must be carried out by authorised and qualified personnel.

The equipment is supplied with a non-pressurised pressure chamber. Only the VS/FI relief valve is calibrated.

NOTE!

It is possible that for various reasons (e.g. vibrations during transport) the calibration of the equipment's accessories may vary, although within the values indicated on the identification plates.

Before commissioning the equipment, it is necessary to check that:
- all shut-off valves (inlet, outlet, any bypass) are closed;
- the gas is at a temperature within the limits specified on the data plate.

Commissioning	
Operator qualification	• Installer; • Qualified technician.
PPE required	 **WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**
Necessary equipment	Refer to chapter 7 “Equipment for commissioning/maintenance”.

Tab. 8.34.

8.2 - PRELIMINARY PROCEDURES FOR COMMISSIONING

⚠ HAZARD!

Before commissioning the equipment, it must be ensured that any source of potential explosion has been eliminated if there is such a danger.

⚠ WARNING!

Before commissioning, you need to make sure that the characteristics of the equipment are suitable for the conditions of use.

⚠ ATTENTION!

To protect the equipment from damage, the following operations must never be carried out:

- **pressurisation through a valve located downstream of the equipment;**
- **depressurisation through a valve located upstream of the equipment.**

Commissioning can be carried out using two different procedures:

Commissioning types	
Injection of an inert fluid	Pressurising the equipment by injecting an inert fluid (e.g. nitrogen) to avoid potentially explosive mixtures for services with combustible gases. **⚠ WARNING!** **During pressurisation, always check that the equipment has no leaks.**
Direct injection	Direct injection of gas into pipes, keeping the gas velocity in the pipes as low as possible (maximum permitted value of 5 m/s).

Tab. 8.35.

8.3 - PROPER COMMISSIONING CHECK

Completely sprinkle the equipment with a foaming solution in order to check the tightness of the regulator's external surfaces and of the connections made during installation (or equivalent control system).

8.4 - CALIBRATION OF ANY ACCESSORIES

AVVISO!

To properly calibrate the equipment and all the accessories, refer to the accuracy class indicated on the nameplate (see paragraph 2.8).

8.5 - COMMISSIONING THE REGULATOR

In the application consisting of two pressure adjusting lines, it is advisable to commission one line at a time, starting with the line with the lowest set point.
The set point value is mentioned on the test certificate enclosed with each piece of equipment.

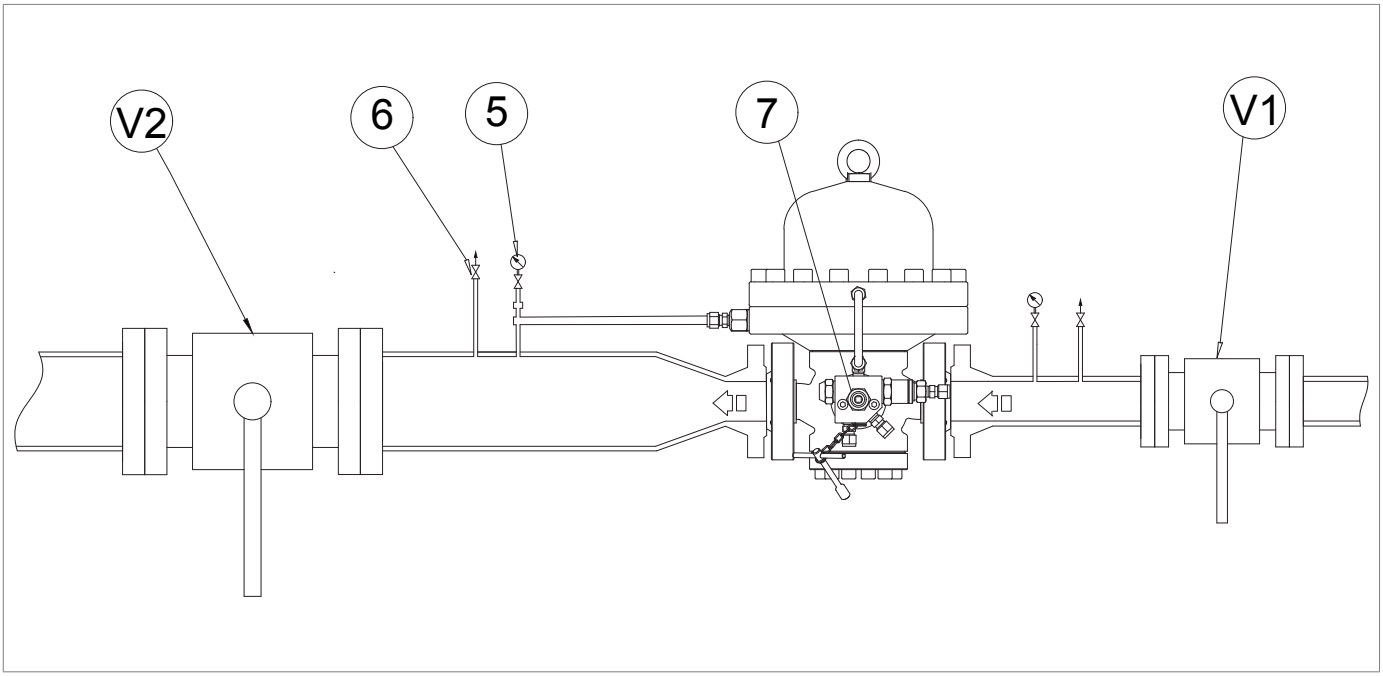


Fig. 8.11. Commissioning the regulator

Step	Action
1	Open the air vent valve (6). **NOTE!** **Check the pressure by referring to the pressure gauge (5) located downstream.**
2	Open very slowly the inlet shut-off valve (V1).
3	Adjust the setting value of the VS/FI relief valve by means of the pressure gauge valve (7).
4	Close the air vent valve (6).
5	Check the closing pressure and internal sealing.
6	Check the tightness of all elements and joints between the shut-off valves (V1) and (V2). **NOTE!** **Using a foaming substance (or alternative methods).**
7	Open very slowly the (V2) outlet shut-off valve downstream to complete commissioning of the line.

Tab. 8.36.

8.5.1 - WORKING PRESSURE ADJUSTMENT

8.5.1.1 - OUTLET PRESSURE REGULATION VIA PRESSURE GAUGE VALVE

The pressure gauge valve allows the pressure inside the equipment head to be charged or discharged.
To adjust the downstream pressure of the regulator via the pressure gauge valve connect inlet pressure connection pipe with a external source of inert gas or compressed air for instrument.

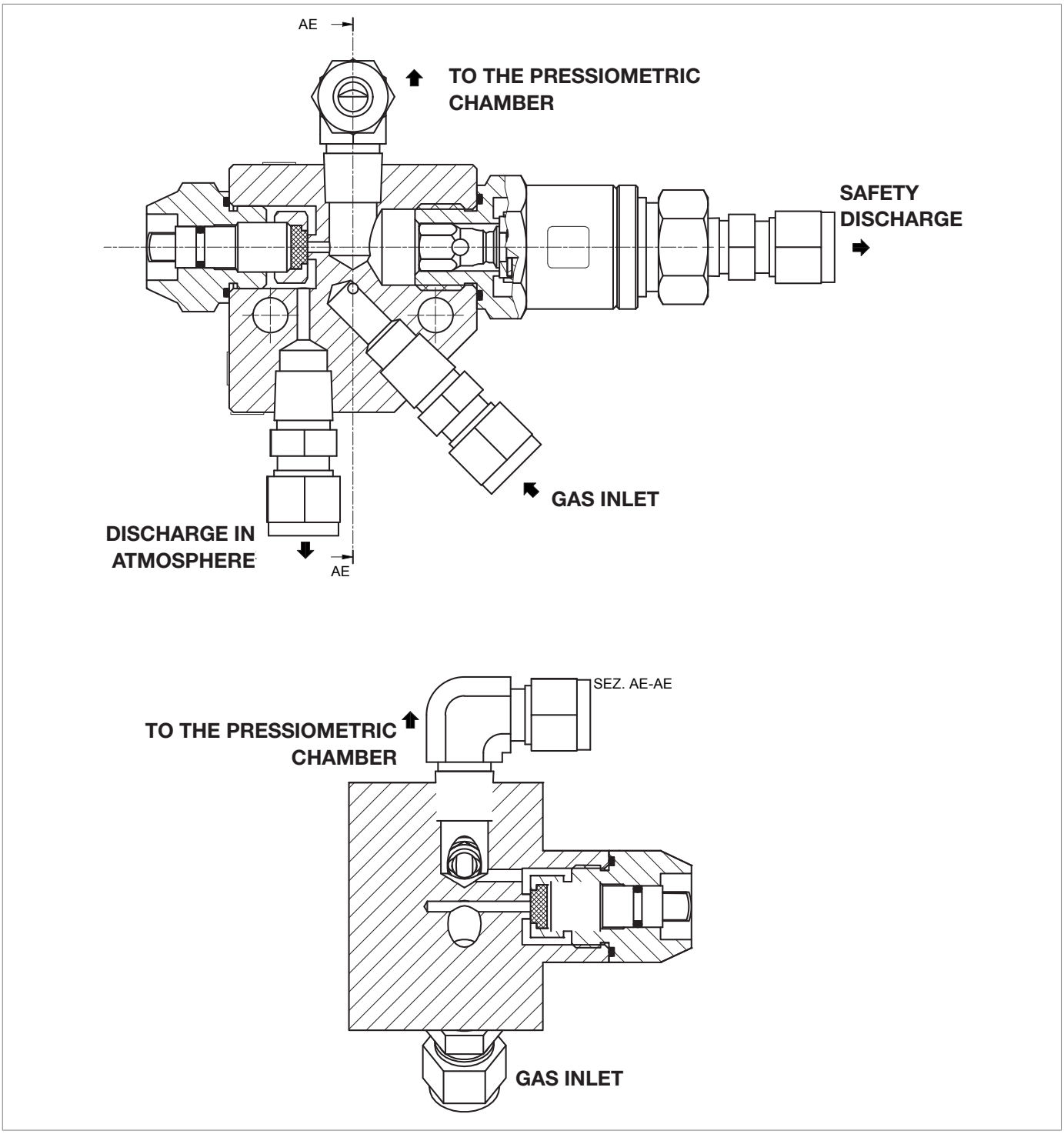


Fig. 8.12. Pressure gauge valve

Step	Action
1	Turn the adjustment screws to increase or decrease the calibration pressure: • to **increase** the calibration pressure: open the screw until the desired setting is reached and close it again when the desired setting value is reached • to **decrease** the calibration pressure: open the screw until the desired setting is reached and close it again when the desired setting value is reached

Tab. 8.37.

8.5.1.2 - CALIBRATION PROCEDURE FOR THE VS/FI RELIEF VALVE

The pressure gauge valve allows the pressure inside the equipment head to be charged or discharged.
To adjust the downstream pressure of the regulator via the pressure gauge valve connect inlet pressure connection pipe with a external source of inert gas or compressed air for instrument.

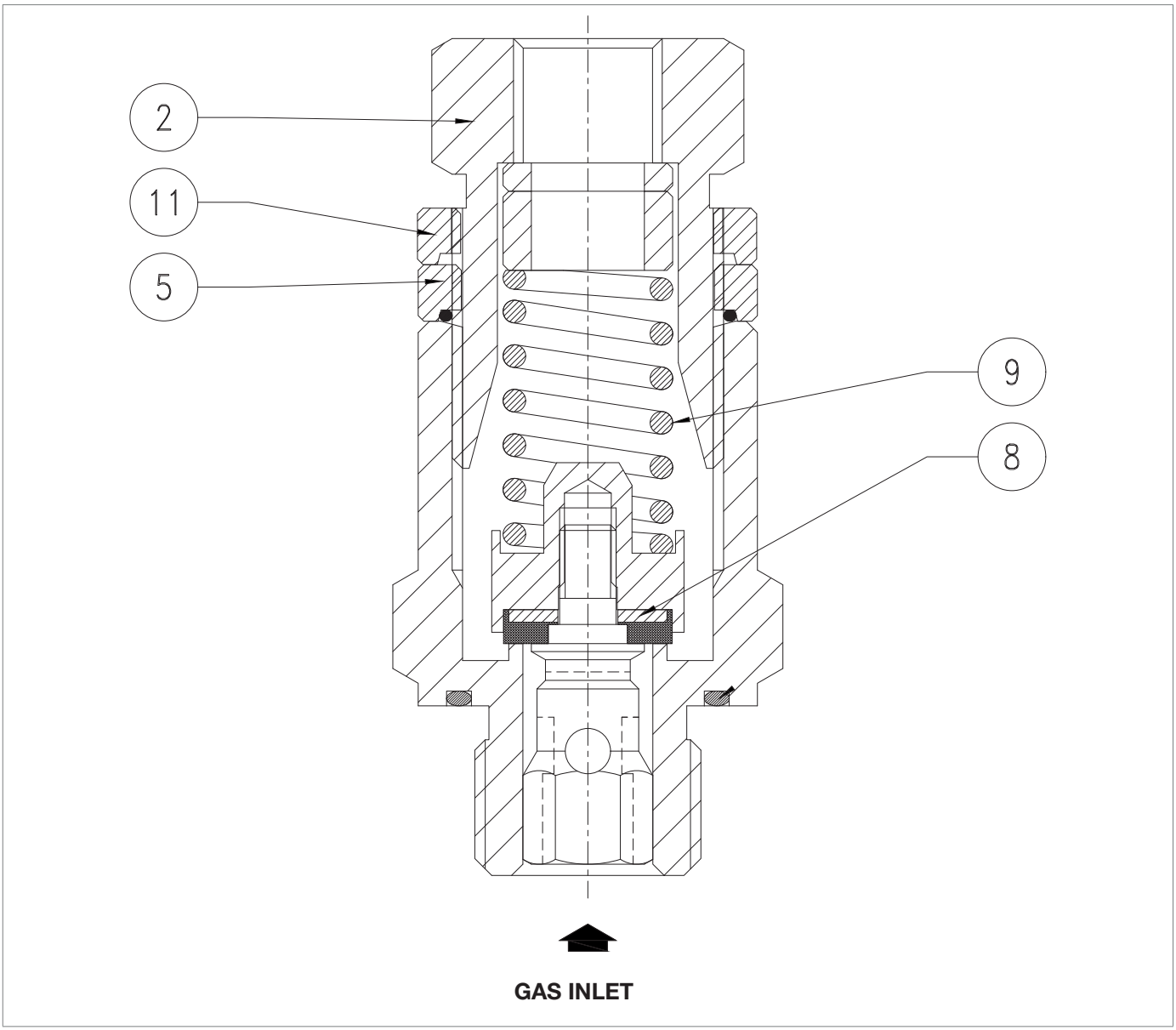


Fig. 8.13. VS/FI Relief valve

Step	Action
1	Loosen the ring nuts (5, 11).
2	Increase the pressure in the bell chamber in order to increase the downstream pressure (Pd) until the desired cut-in pressure of the VS/FI relief valve is reached. **AVVISO!** **Check the pressure by referring to the pressure gauge (fig. 8.25 rif. 5) located downstream.** **If the valve:** • **opens before the expected pressure value: screw in (clockwise) the adjustment cap (xx) so as to compress the spring inside it more;** • **does not open at the expected pressure value: unscrew (anticlockwise) the adjustment cap (xx), so as to relieve the spring inside.**
3	Reduce the downstream pressure (Pd) by using the atmosphere relief valve (x) located downstream.
4	Tighten ring nuts (5, 11) to lock the VS/FI relief valve setting.
5	Discharge the pressure inside the regulator's head by acting on the pressure gauge valve.
6	Recharge the pressure of the regulator's head until the VS/FI relief valve's cut-in pressure value is reached downstream of the equipment.
7	Repeat the steps 2-3-4-5 at least three times.
8	Discharge the downstream pressure (Pd) through the pressure gauge valve to the desired pressure value downstream of the equipment. **NOTE!** • **Check the pressure by referring to the pressure gauge (fig. 8.11, rif. 5) located downstream** • **Reduce the downstream pressure (Pd) by using the atmosphere relief valve located downstream**

Tab. 8.38.

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9 - MAINTENANCE AND FUNCTIONAL CHECKS

9.1 - GENERAL WARNINGS

HAZARD!

- **Maintenance work must be carried out by qualified personnel trained on safety in the workplace and authorised to carry out equipment-related activities.**
- **Repair or maintenance work not provided for in this manual may be carried out only if approved by the PIETRO FIORENTINI S.p.A.. PIETRO FIORENTINI S.p.A. shall not be held liable for damage to persons or property resulting from operations other than those described herein or carried out in ways other than as indicated.**

WARNING!

Before conducting any work, make sure that the line on which the equipment is installed:

- **has been shut off downstream and upstream;**
- **has been discharged.**

WARNING!

In case of doubt, do not perform any work. Contact PIETRO FIORENTINI S.p.A. for the necessary clarifications.

The management and/or use of the equipment includes interventions that are necessary as a result of normal use such as:

- inspection and checks;
- functional checks;
- routine maintenance;
- special maintenance.

NOTE!

Maintenance work is strictly related to:

- **the quality of the conveyed gas (impurities, humidity, corrosive substances);**
- **the effectiveness of filtration;**
- **the equipment conditions of use.**

To properly run the equipment, one should:

- follow the service frequency referred to in the manual for functional checks and routine maintenance.
- do not exceed the time interval between servicing. The time interval is to be understood as the maximum acceptable; it can, on the other hand, be shortened;
- promptly check the causes of any anomalies such as excessive noise, leakage of fluids or similar and remedy them. The timely removal of any causes of anomaly and/or malfunction prevents further damage to the equipment and ensures operator safety.

Before beginning disassembly of the equipment, make sure that:

- the spare parts and parts used in replacements have adequate requirements to ensure the original performance of the equipment. Use recommended original spare parts;
- the operator has the necessary equipment (see chapter 7 “Equipment for commissioning/maintenance”).

NOTE!

The recommended spare parts are unambiguously identified with tags indicating:

- **the assembly drawing number of the equipment where they are installed (see Chapter 12 “Recommended spare parts”);**
- **the position specified in the assembly drawing of the equipment.**

The equipment maintenance operations are divided, from an operational point of view, into three main categories:

Commissioning and maintenance operations	
Periodic checks and inspections	All those checks that the operator must carry out on a regular basis to ensure that the equipment is in proper working order.
Routine maintenance	All those operations that the operator must preventively carry out to ensure proper operation of the device over time. Routine maintenance includes: • inspection; • control; • adjustment; • cleaning; • lubrication; • replacement; of all spare parts.
Special maintenance	All those operations to be carried out by the operator when the equipment requires them. **HAZARD!** **Special maintenance:** • **requires extensive and specialised knowledge of the machines, operations required, risks involved and correct procedures to operate safely;** • **must be provided by qualified, trained and authorised technicians.**

Tab. 9.39.

9.2 - PERIODICALLY CHECKING AND INSPECTING THE EQUIPMENT FOR PROPER OPERATION

Periodic checks and inspections	
Operator qualification	Mechanical maintenance technician
PPE required	 **⚠ WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**

Tab. 9.40.

Checks and inspections do not require any manual operation on the equipment.
Some of them can be replaced by remote monitoring using suitable remote control equipment. The following is listed below:

Activity description	Equipment/accessories involved	Evaluation criterion	Minimum frequency
Significant performance check*	Pressure regulators	• No fluctuations in the adjusted pressure. • Significant pressure values within preset limits.	Monthly
	Gas flow lock type safety devices (external position indicator)	• Fully open position.	
	Stand-by monitor (external position indicator)	• Fully open position.	
Visual inspection equipment external condition	All	• No visible damage. • External surface protection as per UNI 9571-1:2012.	Half-yearly

Tab. 9.41.

** These checks may be carried out remotely if there is a remote control system capable of analysing the significant performance of the equipment and of sending alerts/alarms when pre-set thresholds are reached.*

9.3 - ROUTINE MAINTENANCE

9.3.1 - GENERAL SAFETY WARNINGS

HAZARD!

- **Put the equipment in a safe condition (close the downstream and then the upstream shut-off valve, drain the equipment completely and lastly drain the line);**
- **Ensure that the pressure upstream and downstream of the equipment is “0”.**

NOTE!

Before installing new sealing elements (o-rings, diaphragm, etc.), they must be checked for integrity.

9.3.2 - REPLACEMENT FREQUENCY FOR COMPONENTS SUBJECT TO WEAR

NOTE!

The following provisions shall apply to equipment components only.

The non-metallic parts of the equipment concerned are divided into the following two categories:

Preventive maintenance work	
Category 1	Covers parts subject to wear and/or abrasion, where: • wear and tear means the normal degradation of a part after prolonged use under normal operating conditions; • abrasion is the mechanical action on the surface of the affected part resulting from the passage of gas under normal operating conditions.
Category 2	takes into account parts subject to aging only, including parts that also require lubrication and/or cleaning.

Tab. 9.42.

NOTE!

Check, within the minimum frequency specified in Tab. 9.42, the available components for wear/abrasion/aging.

Category	Part description	Evaluation criterion	Minimum replacement frequency
1	Sealing rings for non-metallic valve and plugs seats	Pressure regulators	6 years
		Safety devices	
		Pressure safety system equipment	
1	Non-metallic parts with internal sealing function of valve seats and accessories of individual equipment	Pilots	6 years
		Pre-reducers	
		Accelerators	
		Other	
1	Non-metallic parts with a sealing function between parts, at least one of which is in motion under normal working/operating conditions	Pressure regulators	6 years
		Gas flow blocking type safety devices	
		Relief devices with discharge to atmosphere	
1	Non-metallic parts with sealing function involved in disassembly operations during maintenance	Equipment subject to maintenance	6 years
2	Non-metallic parts providing feedback (sensing elements) of the controlled pressure of safety equipment	Safety equipment and/or accessories	6 years
2	Non-metallic parts with sealing and performance functions (diaphragms) of equipment	Pressure regulators and accessories	6 years
		Gas flow blocking type safety devices	6 years
		Relief device with discharge to atmosphere	6 years
2	Non-metallic parts of equipment with an internal sealing function: under normal operating conditions during maintenance	Relief valves	6 years
		Regulation lines disconnection equipment	If there are proven leaks
2	Non-metallic parts with a static sealing function only	Various equipment	If there are proven leaks

Category	Part description	Evaluation criterion	Minimum replacement frequency
2	Lubricating parts	Shut-off valves	Yearly
		Other equipment	Yearly
2	Filter elements	Filters	As needed

Tab. 9.43.

9.4 - ROUTINE MAINTENANCE PROCEDURES

Routine maintenance	
Operator qualification	Mechanical maintenance technician
PPE required	 **WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**
Necessary equipment	Refer to chapter 7 “Equipment for commissioning/maintenance”.

Tab. 9.44.

9.4.1 - TIGHTENING TORQUES STAFLUX 187 H2

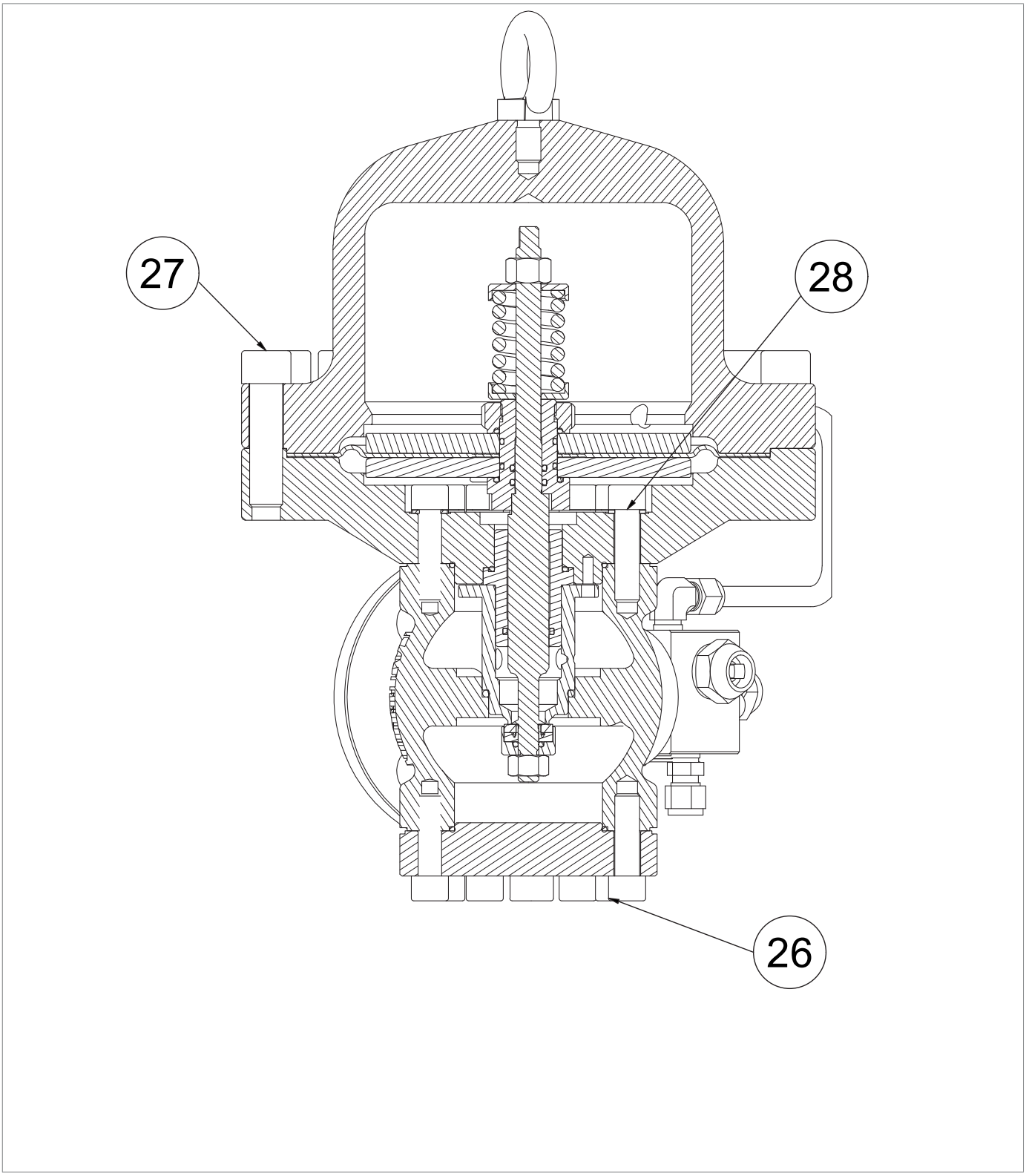


Fig. 9.14. Tightening torques STAFLUX 187 H2

STAFLUX 187 H2 1”			
Pos.	**Description**	**Torque (nm)**	**Torque (ft - lb)**
26	Screw	50	37
27	Screw	50	37
28	Screw	50	37

Tab. 9.45.

9.4.2 - REPLACING ELEMENTS SUBJECT TO WEAR AND ABRASION

9.4.2.1 - INITIAL OPERATIONS

⚠ ATTENTION!

Before carrying out any work, it is important to ensure that the line on which the regulator is installed has been shut off upstream and downstream, and discharged.

⚠ ATTENTION!

During assembly, make sure to tighten the screws as per the tables (tightening torques), according to the size for which maintenance is being carried out.

Proceed as follows:

Step	Action
1	Unscrew the conical seal fittings to disconnect all power outlets and sensing lines for the pilot and regulator.
2	Loosen the nut securing the pilot support bracket to the regulator.

Tab. 9.46.

9.4.2.2 - CROSS DIAGRAM FOR TIGHTENING SCREWS

When indicated by the maintenance procedure, refer to the following diagram to tighten the screws:

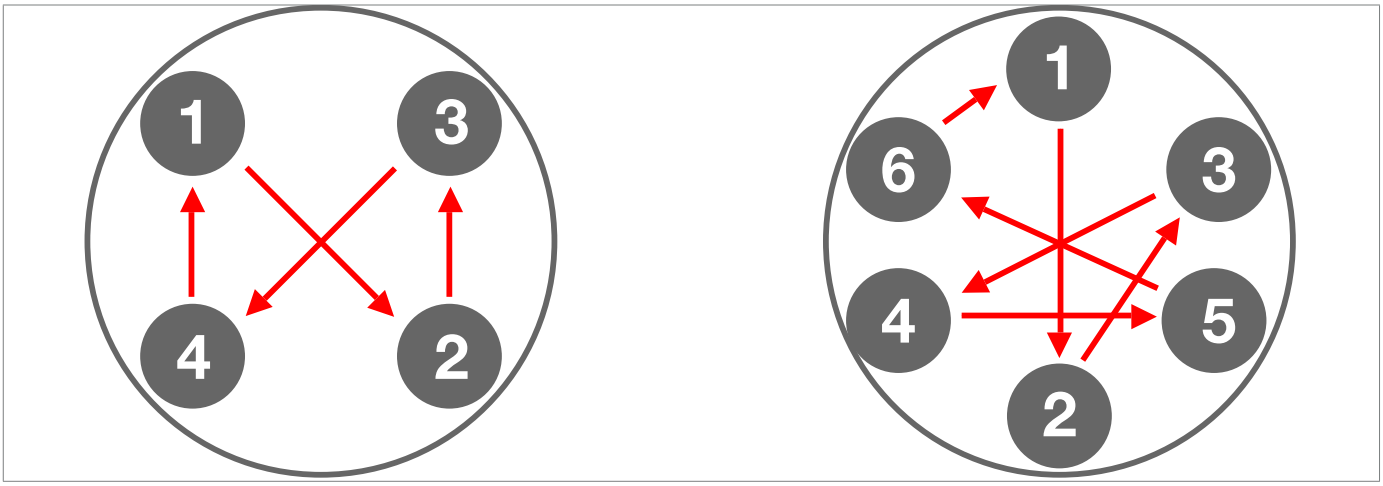


Fig. 9.15. Cross diagram

9.4.3 - REGULATOR STAFLUX 187 H2 1”

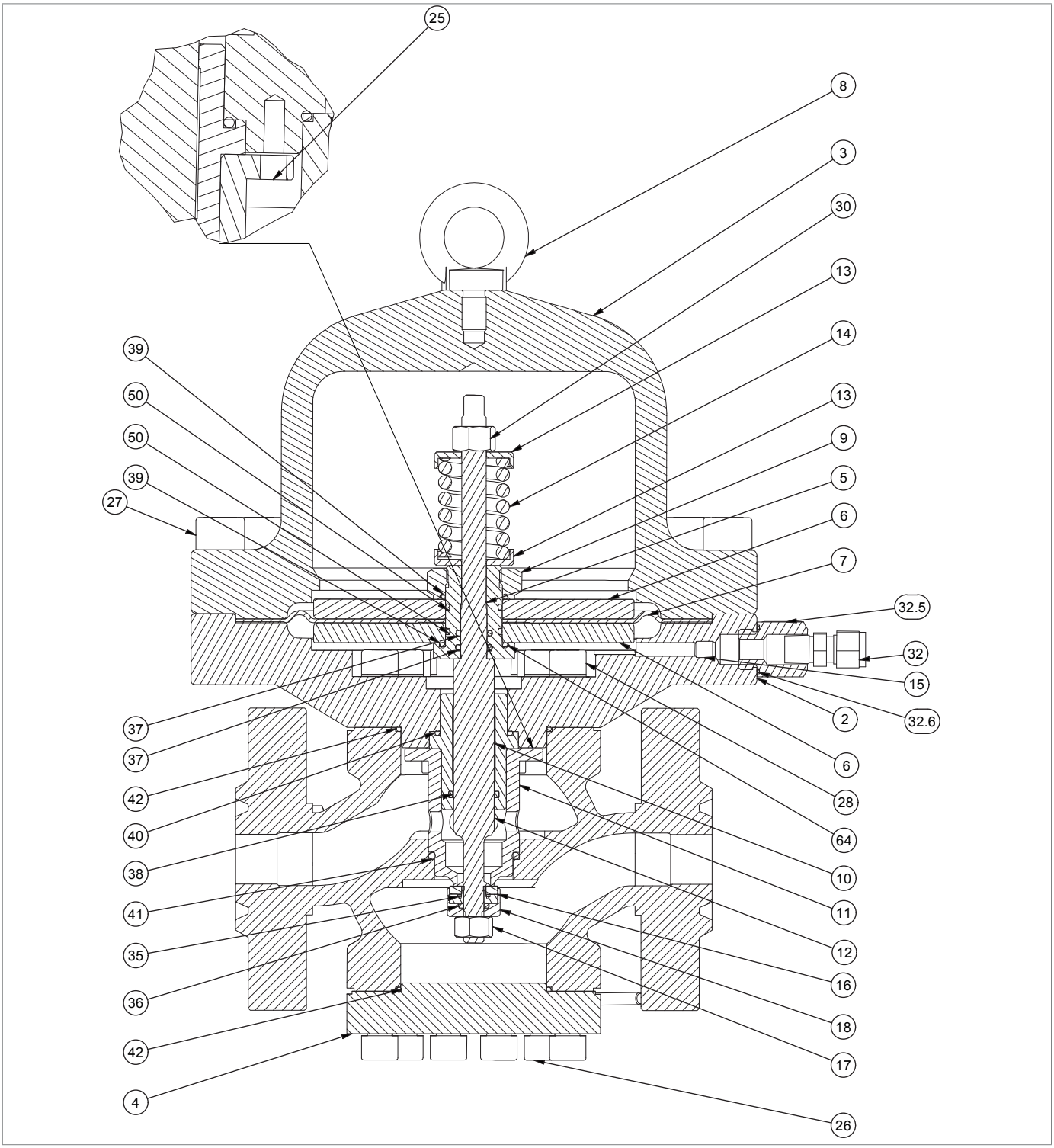
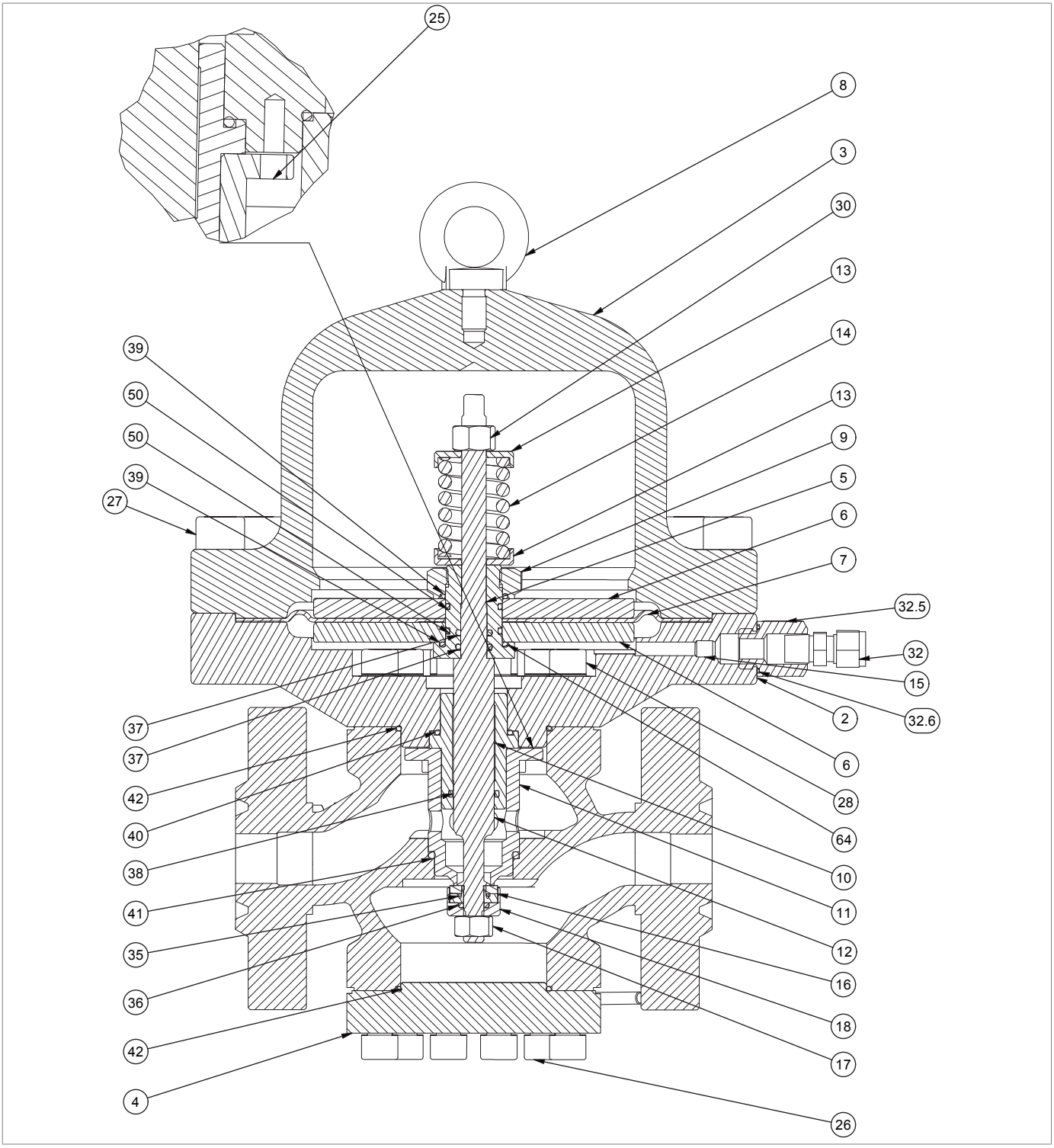


Fig. 9.16. Regulator STAFLUX 187 H2 1”

Step	Action
1	Unscrew and remove the screws (26) from the lower flange (4).
2	Remove the lower flange (4).
3	Remove the guide O-ring (42) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
4	Unscrew and remove the screws (27) from the cover (3).
5	Remove the cover (3) by lifting it with the eyebolt (8).
6	While keeping the stem (12) still, unscrew and remove the nut (30).
7	Remove the spring guide discs (13) and spring (14).
8	Remove the diaphragm group (5, 6, 7, 9, 37, 39, 50, 64).
9	While keeping the diaphragm support (5) still, unscrew and remove the nut (9).
10	Remove the upper diaphragm protection disc (6).
11	Remove and replace the diaphragm support (5).
12	Remove the lower diaphragm protection disc (6).
13	Remove the guide O-rings (37, 39, 64, 50) and replace them, taking care to lubricate them with synthetic grease. **AVVISO!** **Before inserting the replacement guide rings, clean the retaining slots with a cleaning solution.**
14	Put the lower diaphragm protection disc (6) in place.
15	Insert the new diaphragm support (5).
16	Put the upper diaphragm protection disc (6) in place.
17	While keeping the diaphragm support (5) still, insert and fix the nut (9)
18	Unscrew and remove the screws (28) of the lower flange (2) to the body (1).
19	Remove the flange (2) from the body (1) together with the support (11), stem guide (10), gasket (16), nut (17), gasket support (18), O-rings (35, 36, 38, 40, 41).
20	Unscrew and remove the screws (25) from the flange (2).
21	Remove the support (11) together with the stem (12), nut (17), gasket support (18), gasket (16), O-rings (35, 36, 38, 40, 41).
22	Remove the stem guide (10).
23	Remove the guide O-rings (38, 40) and replace them, taking care to lubricate them with synthetic grease. **AVVISO!** **Before inserting the replacement guide rings, clean the retaining slots with a cleaning solution.**
24	Remove the guide O-ring (41) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
25	While keeping the stem (12) still, unscrew and remove the nut (17).
26	Remove the gasket support (18).
27	Remove the guide O-rings (35, 36) and replace them from the gasket (16), taking care to lubricate them with synthetic grease. **AVVISO!** **Before inserting the replacement guide rings, clean the retaining slots with a cleaning solution.**



Regulator STAFLUX 187 H2 1”

Step	Action
28	Put the gasket support (18) in place.
29	While keeping the stem (12) still, insert and fix the nut (17).
30	Put the stem guide (10) together with guide O-ring (40) back on the flange (2).
31	Put the support (11) together with stem (12), nut (17), support gasket (18), gasket (16) and the guide O-rings (35, 36, 41, 38).
32	Insert and fix the screw (25) in the flange (2).
33	Remove the guide O-ring (42) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
34	Put the flange (2) on the body (1).
35	Insert and fix the screw (28) in the lower flange (2), according to the following tightening torques: • 1": Tab. 9.45 **AVVISO!** **Tighten the screws according to the cross diagram in paragraph 9.4.2.2.**
36	Insert the diaphragm group (5, 6, 7, 9, 37, 39, 50, 64).
37	Put the spring guide discs (13) and spring (14) back in place.
38	While keeping the stem (12) still, insert and fix the nut (30).
39	Put the cover (3) in place, by lifting it with the eyebolt (8).
40	Insert and fix the screw (27) in the cover (3) according to the following tightening torques: • 1": Tab. 9.45 **AVVISO!** **Tighten the screws according to the cross diagram in paragraph 9.4.2.2.**
41	Put the flange (4) back in place.
42	Insert and fix the screw (26) in the lower flange (4) according to the following tightening torques: • 1": Tab. 9.45 **AVVISO!** **Tighten the screws according to the cross diagram in paragraph 9.4.2.2.**
43	Slacken and remove the fitting (32.5)
44	Remove the guide O-ring (32.6) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
45	Put the fitting (32.5) together with guide O-ring (32.6) back in place.

Tab. 9.47.

WARNING!

Ensure that all parts have been fitted correctly.

9.4.4 - MAINTENANCE PROCEDURE FOR THE PRESSURE GAUGE VALVE

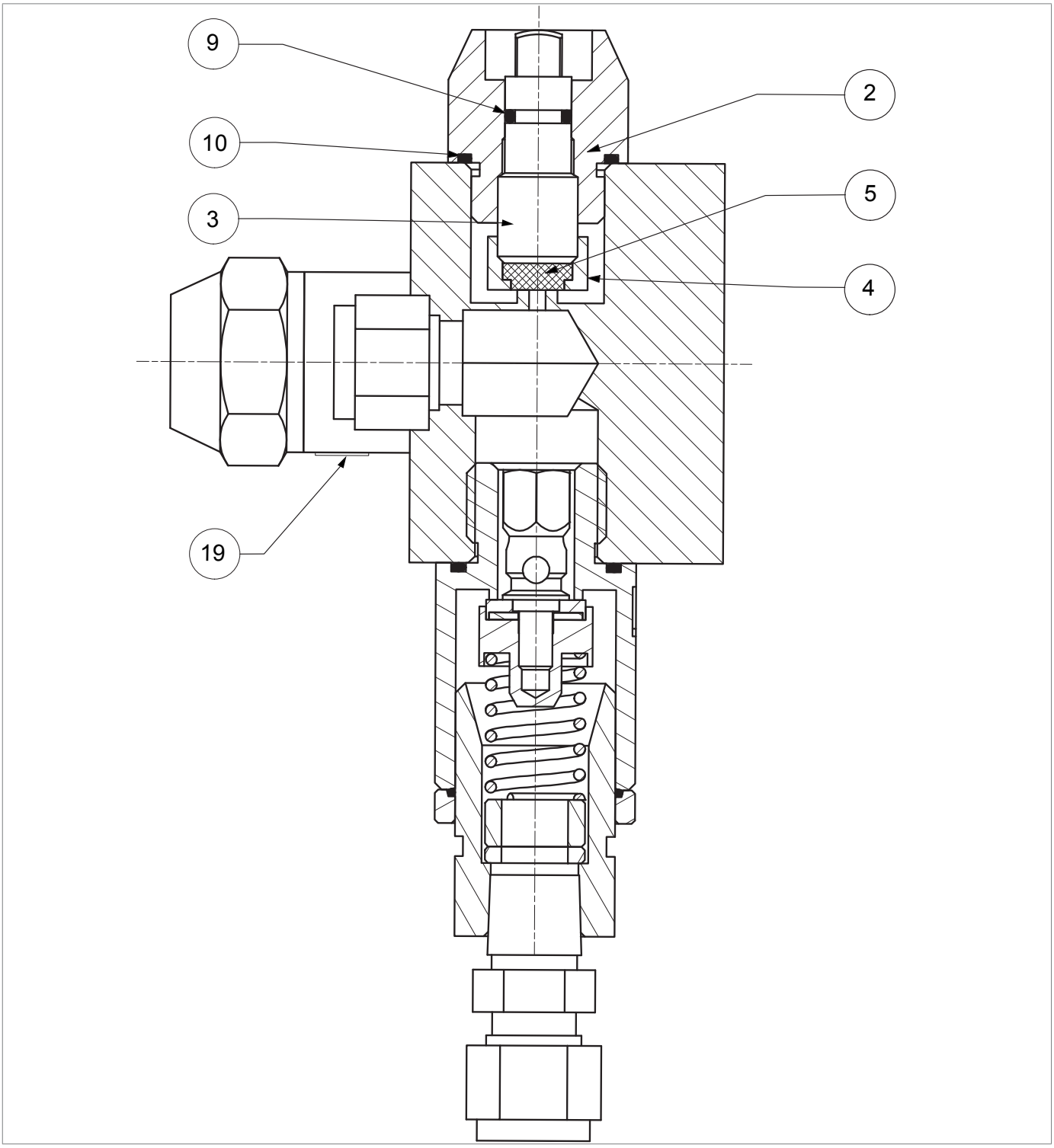


Fig. 9.17. Pressure gauge valve

Step	Action
1	Unscrew and remove the cap (2).
2	Unscrew and remove the shaft (3) from the cap (2).
3	Remove the guide O-ring (10) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
4	Unscrew and remove the nut (4).
5	Replace the gasket (5).
6	Insert and fix the nut (4).
7	Remove the guide O-ring (9) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
8	Insert and fix the shaft (3) in the cap (2).
9	Insert and fix the cap (2).

Tab. 9.48.

WARNING!

Ensure that all parts have been fitted correctly.

9.4.5 - MAINTENANCE PROCEDURE FOR VS/FI RELIEF VALVE

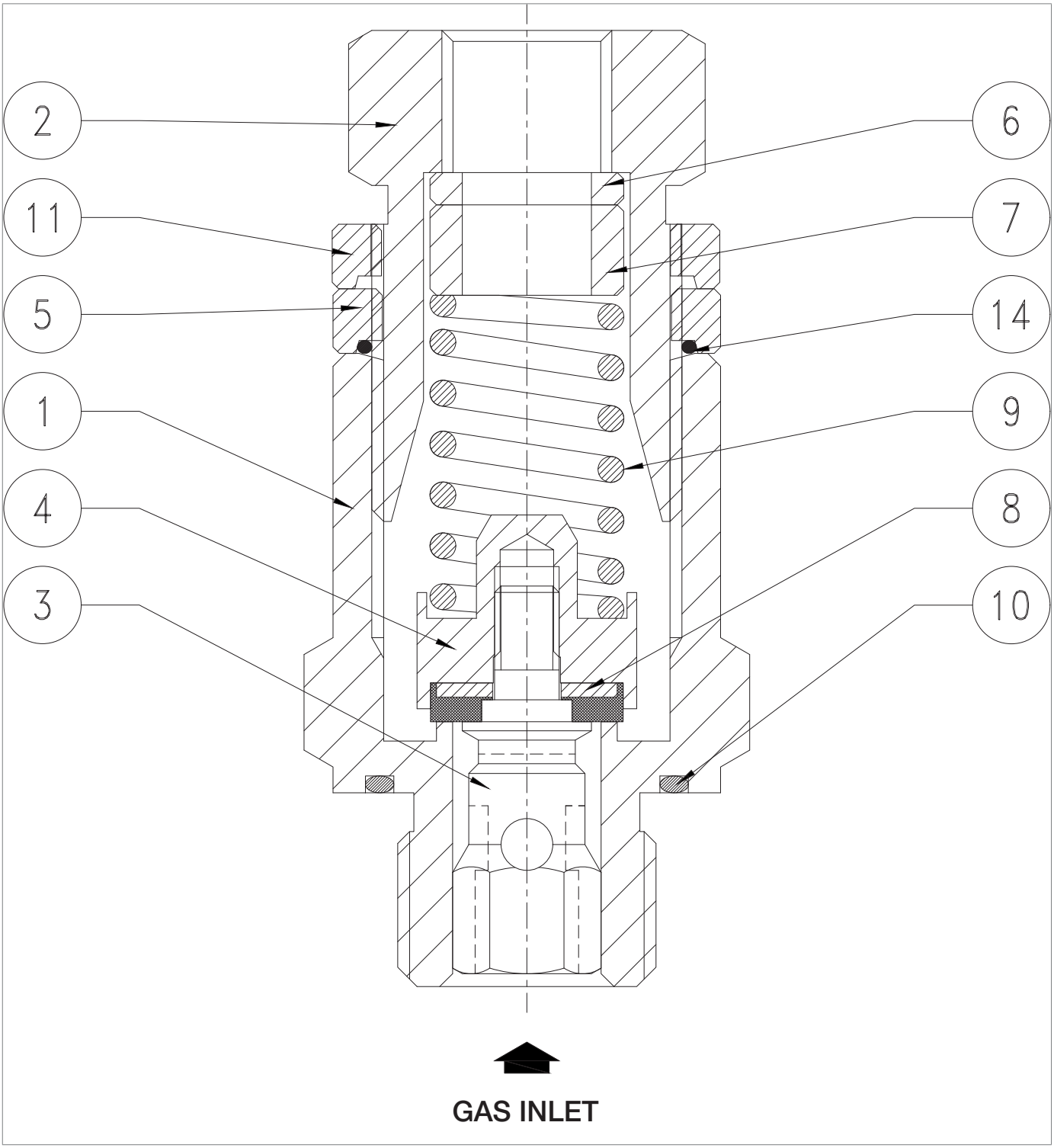


Fig. 9.18. VS/FI Relief valve

Step	Action
1	Loosen ring nuts (5, 11).
2	Unscrew the adjustment cap (2).
3	Remove the guide O-ring (14) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
4	Remove the spacers (6, 7) together with the spring (9).
5	Remove the spring assembly (3, 4, 8) holder (4) and screw (3)
6	Remove the spring holder (4).
7	Unscrew and remove the screw (3).
8	Remove and replace the gasket (8).
9	Insert the screw (3).
10	Put the spring holder (4) back in place.
11	Fix the screw (3) by adding thread sealant on the thread.
12	Remove the valve body (1).
13	Remove the guide O-ring (10) and replace it, taking care to lubricate it with synthetic grease. **AVVISO!** **Before inserting the replacement guide ring, clean the retaining slots with a cleaning solution.**
14	Put the valve body (1) back in place.
15	Put the the spacers (6, 7) back in place.
16	Put the spring (9) back in place.
17	Insert the adjustment cap (2).
18	Insert and tighten the ring nuts (5, 11).

Tab. 9.49.

WARNING!

Ensure that all parts have been fitted correctly.

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10 - TROUBLESHOOTING

Below is a list of the cases (causes and services) that may occur over time in the form of malfunctions of various kinds. These situations depend on the conditions of the gas as well as on the natural ageing and wear of the materials.

10.1 - GENERAL WARNINGS

HAZARD!

Maintenance work must be carried out by qualified personnel:

- **trained on workplace safety also based on the regulations in force in the place of installation of the work equipment;**
- **qualified and authorised to carry out activities related to the equipment.**

WARNING!

PIETRO FIORENTINI S.p.A. shall not be held liable for any damage to people and property due to services:

- **other than those described;**
- **performed according to methods other than those specified;**
- **carried out by unsuitable personnel.**

NOTE!

If an operating fault occurs and qualified personnel are not available for the specific intervention, call the Assistance Centre authorised by PIETRO FIORENTINI S.p.A.

10.2 - OPERATOR QUALIFICATION SPECIFICATION

Commissioning	
Operator qualification	• Mechanical maintenance technician; • Electrical maintenance technician; • Installer; • Name of the user.
PPE required	 **⚠ WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**
Necessary equipment	Refer to chapter 7 “Equipment for commissioning/maintenance”.

Tab. 10.50.

10.3 - TROUBLESHOOTING PROCEDURES

For proper troubleshooting, proceed as follows:
- close the upstream and downstream shut-off valves;
- refer to the troubleshooting tables listed below.

10.4 - TROUBLESHOOTING TABLES

NOTE!

Refer to chapter 9 “Maintenance and functional checks” for the pictures of the STAFLUX 187 H2 regulator and its accessories.

10.4.1 - STAFLUX 187 H2 TROUBLESHOOTING

Failure	Appliance	Possible causes	Service
No sealing at zero flow	REGULATOR	Valve seat (11) damaged	Replace
		Plug (13) worn	Clean and replace if necessary
		O-Ring (12) worn	Clean and replace if necessary
		O-Ring (22) worn	Clean and replace if necessary
		O-Ring (17) worn	Clean and replace if necessary
		O-Ring (15) worn	Clean and replace if necessary
		Dirt or foreign bodies in the sealing area	Clean
		Stem (12) blocked by dirt or foreign bodies	Clean
	PRESSURE GAUGE VALVE	Damaged pressure chamber filling valve plug	Replace
Pumping	REGULATOR	Friction of the plug assembly	Clean and replace the sealing and/or guiding element if necessary
		Insufficient volume of the downstream section pipeline	Increase the volume
Downstream pressure increases	REGULATOR	Stem (12) blocked by dirt or foreign bodies	Clean
		Damaged plug (13)	Replace
	PRESSURE GAUGE VALVE	Damaged pressure chamber filling valve plug	Replace
Downstream pressure decreases	REGULATOR	Stem (12) blocked by dirt or foreign bodies	Clean
		Excessive flow demand	Reduce the flow rate
		Inlet pressure decreases	Check inlet pressure
		O-Ring (xx) worn	Clean and replace if necessary
		O-Ring (xx) worn	Clean and replace if necessary
		O-Ring (xx) worn	Clean and replace if necessary
	PRESSURE GAUGE VALVE	Damaged pressure chamber discharge valve plug	Replace

Tab. 10.51.

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11 - UNINSTALLATION AND DISPOSAL

11.1 - GENERAL SAFETY WARNINGS

HAZARD!

Make sure that there are no potentially explosive ignition sources in the work area set up to uninstall and/or dispose of the equipment.

WARNING!

Before proceeding with uninstallation and disposal, make the equipment safe by disconnecting it from any power supply.

11.2 - QUALIFICATION OF THE APPOINTED OPERATORS

Commissioning	
Operator qualification	Installer
PPE required	 **WARNING!** **The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:** • **the regulations in force in the country of installation;** • **any information provided by the Safety Manager at the installation facility.**
Necessary equipment	Refer to chapter 7 “Equipment for commissioning/maintenance”.

Tab. 11.52.

11.3 - UNINSTALLATION

ATTENTION!

Before uninstalling the equipment, completely drain the fluid in the reduction line and inside the equipment.

NOTE!

To uninstall the equipment, refer to the installation steps (see the “Installation” chapter) and proceed in reverse order.

11.4 - INFORMATION REQUIRED IN CASE OF RE-INSTALLATION

NOTE!

Should the equipment be reused after uninstallation, refer to chapter:

- **“Installation”;**
- **“Commissioning”.**

11.5 - DISPOSAL INFORMATION

NOTE!

Bear in mind that the laws in force in the country of installation must be complied with.
Illegal or improper disposal involves the application of the penalties provided for by the legislation in force in the country of installation.

NOTE!

Proper disposal prevents damage to humans and the environment and promotes the reuse of precious raw materials.

The equipment was manufactured with materials that can be recycled by specialised companies.
For proper disposal of the equipment, proceed as specified in table 11.52:

Step	Action
1	Set up a large work area free from obstacles where to safely dismantle the equipment.
2	Sort the various components by type of material for easier recycling through separate collection.
3	Send the materials obtained in **Step 2** to a specialised company.

Tab. 11.53.

The equipment in any configuration consists of the following materials:

Material	Disposal/recycling provisions
Plastic	It must be dismantled and disposed of separately.
Lubricants/Oils	They must be collected and delivered to the appropriate specialised and authorised collection and disposal centres.
Iron/Cast iron	Disassemble and collect separately. It must be recycled through the specific collection centres.
Stainless steel	Disassemble and collect separately. It must be recycled through the specific collection centres.
Aluminium	Disassemble and collect separately. It must be recycled through the specific collection centres.
Pneumatic/electric components	They must be dismantled in order to be reused if they are still in good condition or, if possible, overhauled and recycled.

Tab. 11.54.

NOTE!

Refer to chapter 9 “Maintenance and functional checks” to better identify the composition of the equipment and its parts.

12 - RECOMMENDED SPARE PARTS

12.1 - GENERAL WARNINGS

NOTE!

If spare parts not marked are used, PIETRO FIORENTINI S.p.A. their declared performance cannot be guaranteed.
It is recommended to use original spare parts PIETRO FIORENTINI S.p.A.
PIETRO FIORENTINI S.p.A. shall not be held liable for any damage caused by using non-original parts.

12.2 - HOW TO REQUEST SPARE PARTS

NOTE!

For specific information, please refer to the sales network of PIETRO FIORENTINI S.p.A.

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13 - CALIBRATION TABLES

13.1 - VS/FI RELIEF VALVE CALIBRATION TABLE

Relief valve							
Pos.	**Spring item code**	**Spring colour**	**d**	**Lo**	**De**	**Min.**	**Max**
1	2700713	Green	2.3	40	15	3.5	9.5
2	2700750	Black	2.5			9	18.5
3	2700985	Brown	3			16	44
4	2701182	Blue	3.4			35	77
d = Wire Diameter (mm) **Lo =** Spring Length (mm) **De =** External Diameter (mm)							

Tab. 13.55.

Pietro Fiorentini