

Norflux

High pressure gas regulator



Revision B - Edition 09/2024

**USE, MAINTENANCE AND
WARNING MANUAL**

1 - INTRODUCTION

PREFACE

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GENERAL CONSIDERATIONS

All operating, maintenance instructions and recommendations described in this manual must be followed. To achieve the best performance and to keep the systems in efficient condition, the Manufacturer recommends that maintenance operations be performed regularly.

Training of the personnel responsible for the equipment both in its use, as well as in its maintenance and application of the safety directions and procedures given in this manual is of particular importance.

1.1 - REVISION HISTORY

Revision index	Date
A	04/2024
B	09/2024

Tab. 1.1.

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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 - PRODUCT IDENTIFICATION

Equipment	HIGH PRESSURE REGULATOR
Model	NORFLUX

Tab. 2.3.

2.3 - REGULATORY FRAMEWORK

PIETRO FIORENTINI S.P.A., with registered office in Arcugnano (Italy) - Via E. Fermi, 8/10, declares under its sole responsibility that the equipment of the series subject of this manual, is designed, manufactured, tested and controlled in accordance with the requirements of the standard ANSI B16.34 on gas pressure regulators.

NOTICE

The original version of the declaration of conformity is delivered together with the equipment and this instruction manual for use and warnings.

2.4 - WARRANTY

PIETRO FIORENTINI S.P.A. guarantees that the equipment has been made with the best materials, with fine workmanship and complies with the quality requirements, specifications and performance envisaged in the order.




The warranty will be considered null and void and PIETRO FIORENTINI S.P.A. will not be responsible for any damage and/or malfunctions:

- for any acts or omissions of 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 authorization of the latter;
- in case of non-compliance by the purchaser with the instructions contained in this manual, as supplied by PIETRO FIORENTINI S.P.A.

NOTICE

The warranty conditions are specified in the sales contract.

2.5 - SYMBOLS USED IN THE MANUAL

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

Tab. 2.4.

DANGER

It signals a hazard with a high level of risk, an imminent hazardous situation that, if not avoided, causes death or serious harm.

WARNING

It signals a hazard with a medium level of risk, a potentially hazardous situation that, if not avoided, could result in death or serious harm.

CAUTION

It signals a hazard with a low level of risk, a potential hazardous situation that, if not avoided, could cause minor or moderate harm.

NOTICE

It signals specific warnings, directions, or notes of special interest unrelated to physical injury and practices for which physical injury is not a credible possibility.

2.6 - RECIPIENTS, SUPPLY AND CONSERVATION OF THE MANUAL

The manual is intended for the qualified operator responsible and enabled to use and manage the equipment in all its phases of technical life.

It contains the information necessary for correct use of the equipment, in order to keep its functional and qualitative characteristics unchanged over time. All the information and warnings for correct use in complete safety are also provided.

The manual, like the declaration of conformity and/or test certification, is an integral part of the equipment and must always accompany it in every transfer or change of ownership. It is the user's duty to keep this documentation intact so that it can be consulted throughout the life of the equipment itself.

⚠ WARNING

It is forbidden to remove, rewrite or modify the pages of the manual and their contents.

Keep the manual near the equipment, in an accessible place known to all qualified technicians involved in its use and management.

PIETRO FIORENTINI S.p.A. disclaims all liability for any damage to people, animals and things caused by failure to observe the warnings and operating methods described in this manual.

The original manual was written in Italian.

Any translations into other languages are based on the original instructions.

2.7 - LANGUAGE

The original manual was written in Italian.

Any translations must be made starting from the original manual.

⚠ DANGER

Language translations cannot be fully checked. If an inconsistency is found, the text of the original manual must be followed.

If inconsistencies are found or the text is not understandable:

- suspend all action;
 - contact PIETRO FIORENTINI S.p.A. immediately at the addresses indicated in paragraph “2.1 - Manufacturer identification”.
-

⚠ WARNING

PIETRO FIORENTINI S.p.A. is only responsible for the information contained in the original manual.

2.8 - IDENTIFICATION PLATES APPLIED

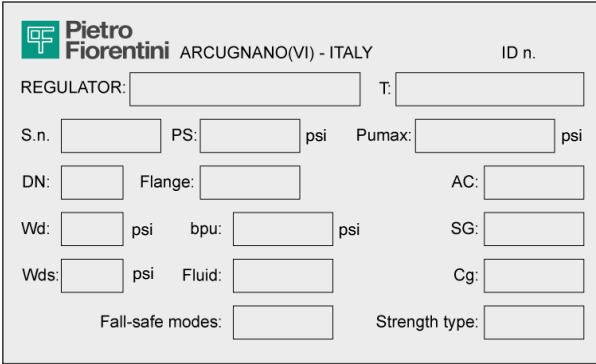
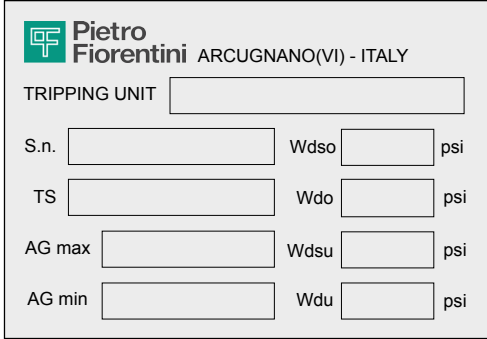
⚠ WARNING

It is absolutely forbidden to remove the identification plates and/or replace them with others. If, for accidental reasons, the plates are damaged or removed, the customer must inform PIETRO FIORENTINI S.p.A.

The equipment and its accessories are equipped with identification plates (Id.1 and Id.2).

The plates bear the identification details of the equipment and its accessories to be quoted if necessary to PIETRO FIORENTINI S.p.A.

Table "Tab. 2.5" illustrates the identification plates applied:

Id.	Type	Image
1	IDENTIFICATION PLATE REGULATOR AND REGULATOR WITH IN-LINE MONITOR FUNCTION	 <p>The image shows a rectangular identification plate with the Pietro Fiorentini logo and company name at the top. Below the logo, it reads 'ARCUGNANO(VI) - ITALY' and 'ID n.' followed by a blank box. The plate contains several fields for technical specifications: 'REGULATOR:' with a blank box, 'T:' with a blank box, 'S.n.' with a blank box, 'PS:' with a blank box and 'psi' unit, 'Pumax:' with a blank box and 'psi' unit, 'DN:' with a blank box, 'Flange:' with a blank box, 'AC:' with a blank box, 'Wd:' with a blank box and 'psi' unit, 'bpu:' with a blank box and 'psi' unit, 'SG:' with a blank box, 'Wds:' with a blank box and 'psi' unit, 'Fluid:' with a blank box, 'Cg:' with a blank box, 'Fall-safe modes:' with a blank box, and 'Strength type:' with a blank box.</p>
2	IDENTIFICATION PLATE SLAM-SHUT VALVE	 <p>The image shows a rectangular identification plate with the Pietro Fiorentini logo and company name at the top. Below the logo, it reads 'ARCUGNANO(VI) - ITALY'. The plate contains several fields for technical specifications: 'TRIPPING UNIT' with a blank box, 'S.n.' with a blank box, 'Wdso' with a blank box and 'psi' unit, 'TS' with a blank box, 'Wdo' with a blank box and 'psi' unit, 'AG max' with a blank box, 'Wdsu' with a blank box and 'psi' unit, 'AG min' with a blank box, and 'Wdu' with a blank box and 'psi' unit.</p>

Tab. 2.5.

2.8.1 - IDENTIFICATION PLATES GLOSSARY

The terms and abbreviations used on the identification plates are described below:

Term	Description
AC	Accuracy class.
AG max	Pressure increase slam-shut valve accuracy class. "OPSO" (Over pressure shut off).
AG min	Pressure decrease slam-shut valve accuracy class. "UPSO"(Under pressure shut off).
bpu	Inlet pressure range 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 as a reference in relation to a combination of mechanical and dimensional characteristics of the flanges in accordance with the relevant parts of the EN 1759 series, which includes the word Class followed by a dimensionless integer.
DN	Nominal size of the connections.
Fail safe mode	Regulator reaction mode (Fail open or Fail close).
Flange	Type of flanged connections or type of connection thread.
Fluid	Type of fluid compatible with the equipment.
ID no.	Number of the Notified Body involved in the conformity assessment of the equipment.
Pilot	Pilot's family.
PS	Maximum allowable 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	Shut-off pressure class.
Slam shut device	Slam-shut valve family.
S.n.	Serial number of the equipment.
Strength type	Strength class: Integral strength (IS) or differential strength (DS).
T	Admissible temperature range (min. and max.) for which the equipment was designed.
Tripping unit	Pressure switch family.
Type	Type and family of the accessory.
Wd	Complete range of set points that can be obtained by the regulator by adjusting and/or replacing some components (e.g. replacement of the valve seat or regulating element, e.g. spring).
Wdo	Full range of set points for tripping caused by pressure increase of the pressure switch incorporated in the slam-shut valve. This range can be achieved by adjusting and/or replacing the components (for example spring or sensing element).
Wds	Full range of set points that can be obtained by the regulator by adjustment but without component replacement.

Term	Description
Wdso	Full range of set points for tripping caused by pressure increase of the pressure switch incorporated in the slam-shut valve. This range can be achieved by adjustment but without component replacement.
Wdu	Full range of set points for tripping caused by pressure drop of the pressure switch incorporated in the slam-shut valve. This range can be achieved by adjusting and/or replacing the components (for example spring or sensing element).
Wdsu	Full range of set points for tripping caused by pressure drop of the pressure switch incorporated in the slam-shut valve. This range can be achieved by adjustment but without component replacement.

Tab. 2.6.

2.9 - UNIT OF MEASUREMENT GLOSSARY

Measurement type	Unit of measurement	Description
Volumetric flow rate	Sm ³ /h	Standard cubic meters per hour
	Scfh	Standard cubic feet per hour
Pressure	bar	Unit of measurement in the CGS system
	psi	Pounds per square inch
	"wc	inch of water column
	Pa	Pascal
Temperature	°C	Celsius degree
	°F	Fahrenheit degree
	K	Kelvin
Tightening torque	Nm	Newton meter
	ft-lbs	Foot-pounds
Sound pressure	dB	Decibels
Other measurements	V	Volt
	W	Watt
	Ω	Ohm

Tab. 2.7.

2.10 - QUALIFIED PROFESSIONALS

Qualified operators in charge of using and managing the equipment in all its phases of its service life:

Professional	Definition
Mechanical maintenance technician	<p>Qualified technician able to:</p> <ul style="list-style-type: none"> • carry out preventive/corrective maintenance activities on all mechanical parts of the equipment subject to maintenance or repair; • have access to all parts of the device for visual analysis, equipment status checking, adjustments and calibrations. <p>The mechanical maintenance technician is not authorized to work on live electrical systems (if present).</p>
Electric maintenance technician	<p>Qualified technician able to:</p> <ul style="list-style-type: none"> • carry out preventive/corrective maintenance activities on all the electrical parts of the device subject to maintenance or repair; • read wiring diagrams and verify their correct functional cycle; • intervene on the adjustments and on the electrical systems for maintenance, repair and replacement of worn parts. <p>The electrical maintenance technician can operate in the presence of voltage inside the electrical panels, junction boxes, control equipment, etc. only if he is a suitable person (PEI). For the general requirements, refer to the IEC EN 50110-1:2014 standard.</p>
Worker in charge of transport, handling, unloading its placement on site	<p>Operator qualified to:</p> <ul style="list-style-type: none"> • use lifting equipment; • handle materials and equipment. <p>The lifting and handling of the equipment must be done by strictly following the instructions provided by the Manufacturer and in compliance with the regulations in force in the place of installation of the equipment itself.</p>
Installer	<p>Qualified operator able to:</p> <ul style="list-style-type: none"> • carry out all the operations necessary for a correct and safe installation of the equipment; • carry out all the operations necessary for the correct operation of the equipment and the system in safety.
User's technician	<p>Technician trained and qualified to use and manage the equipment for the activities for which it was supplied. He/she must:</p> <ul style="list-style-type: none"> • be able to carry out all the operations necessary for the proper operation of the equipment and system, guaranteeing their own safety and that of other personnel present; • have proven experience in the correct use of equipment such as those described in this manual and be trained, informed and instructed accordingly. <p>The technician can carry out maintenance only if authorized/qualified.</p>

Tab. 2.8.

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3 - SAFETY

3.1 - GENERAL SAFETY WARNINGS

⚠ WARNING

The equipment described in this manual is:

- a device subject to pressure in pressurized systems;
 - normally included in systems transporting flammable gases (for example: natural gas).
-

⚠ WARNING

If the gas used is a combustible gas, the area where the equipment is installed is called a "danger zone" because there are residual risks of the formation of potentially explosive atmospheres.

In and around "danger zones" it is absolutely:

- necessary there are no effective ignition sources present;
 - prohibited to smoke.
-

⚠ CAUTION

Authorized operators shall not perform operations or interventions on their own initiative that are not within their competence.

Never work on the equipment:

- Under the influence of intoxicating agents such as, for example, alcohol;
 - In the case of using drugs that can slow down reaction time.
-

NOTICE

The employer must train and inform operators on how to behave during operations and what equipment to use.

Before installation, commissioning or maintenance, operators must:

- Take note of the safety regulations applicable to the installation site where they are to operate;
- Obtain, when required, the necessary authorizations to operate;
- Equip themselves with the necessary personal protective equipment required in the procedures described in this manual;
- Ensure that the area in which they are to work is equipped with the required collective protections and necessary safety signs.

3.2 - PERSONAL PROTECTIVE EQUIPMENT

In Table “Tab. 3.9”, Personal Protective Equipment (PPE) and its description are shown. An obligation is attached to each symbol.

Personal protective equipment means any equipment intended to be worn by the worker for the purpose of protecting him/her against one or more hazards likely to threaten his/her safety or health while at work.

For the assigned workers, depending on the type of work required, the most appropriate PPE of the following will be reported and should be used:

Symbol	Meaning
	Mandatory to use protective or insulating gloves. Indicates a requirement for personnel to use protective or insulating gloves.
	Mandatory to use safety goggles. Indicates a requirement for personnel to use protective goggles to protect their eyes.
	Mandatory to use safety shoes. Indicates a requirement for personnel to use safety shoes to protect their feet.
	Mandatory to use noise protection devices. Indicates a requirement for personnel to use earmuffs or earplugs for hearing protection.
	Mandatory to wear appropriate protective clothes. Indicates a requirement for personnel to wear the specific protective clothing.
	Mandatory use of protective mask. Indicates a requirement for personnel to use masks for respiratory protection in the event of a chemical hazard.
	Mandatory to use hard hat. Indicates a requirement for personnel to use the hard hat.
	Mandatory to wear high-visibility vest. Indicates a requirement for personnel to use high-visibility vests.

Tab. 3.9.

⚠ WARNING

Each licensed operator is required to:

- take care of his own health and safety and that of other persons in the workplace, on whom the effects of his actions or omissions fall, in accordance with his training, instructions and means provided by the employer;
- use the PPE provided appropriately;
- Immediately report to the employer, manager or supervisor deficiencies in the means and devices as well as any hazardous conditions of which they become aware.

3.3 - RESIDUAL RISKS

The risks associated with the equipment and the principles adopted for their prevention are evaluated below, according to the following classification:

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

3.3.1 - TABLE OF RESIDUAL RISKS DUE TO PRESSURE

Risk and hazard	Event and cause	Effect and consequence	Solution and prevention
Pressurized gas outlet. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> Violent impact; Impact (also from falling due to improper handling, etc.). 	<ul style="list-style-type: none"> Deformation; Broken connections and, if pressurized, even bursting. 	a. Handling and installation by appropriate means to avoid localized stresses. b. Installation in suitable places and spaces with appropriate protection, suitable packaging. c. Information in the instructions for use and warnings.
Pressurized gas outlet. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> Use of inappropriate fluids. 	<ul style="list-style-type: none"> Corrosion; Embrittlement; Explosion. 	a. The user must verify that the fluid used corresponds to what is stated on the rating plate.
Pressurized gas outlet. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> Operation at temperatures below the minimum allowable temperature. 	<ul style="list-style-type: none"> Embrittlement; Breaking; Explosion. 	a. Install in locations with temperatures no lower than the minimum allowable temperature and/or properly insulate the equipment. b. The minimum allowable temperature is indicated on the rating plate.
Pressurized gas outlet. Projection of metal and non-pressurized parts. Explosion.	<ul style="list-style-type: none"> Overpressure or exceeding rating plate limits (maximum allowable pressure) 	<ul style="list-style-type: none"> Explosion; Breakage; Cracking; Permanent deformations. 	a. The device has appropriate design safety margins. b. The user should check the maximum pressure available to the equipment. c. The maximum allowable pressure is highlighted in the appropriate plate on the equipment.
Dropping of the equipment.	<ul style="list-style-type: none"> Hazardous handling. 	<ul style="list-style-type: none"> Deformation; Cracking; Breaking. 	b. The user must equip himself with appropriately sized lifting equipment. c. The above requirements are given in the operating and warning instructions of the equipment.
Pressurized fluid outlet. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> Improper fixing of the equipment. 	<ul style="list-style-type: none"> Deformation; Breaking. 	a. The equipment is provided with unified type process connections and compression fittings. b. The user must ensure proper attachment to the line. c. Indications in the instructions for use and warnings.
Explosion of the device. Pressurized fluid outlet. Projection of metal parts.	<ul style="list-style-type: none"> Operation at temperatures above the maximum allowable temperature. 	<ul style="list-style-type: none"> Reduction in mechanical strength and breakage of the device; Explosion. 	a. The user must equip the plant with suitable control and safety equipment. b. The maximum allowable temperature is indicated on the rating plate.

Risk and hazard	Event and cause	Effect and consequence	Solution and prevention
Pressurized gas leakage.	<ul style="list-style-type: none"> Maintenance of the device with the system in operation. 	<ul style="list-style-type: none"> Inappropriate opening of pressurized chambers. 	<p>a. The user shall perform any maintenance with the equipment not in operation.</p> <p>b. The above requirements are given in the instructions for use and warning.</p>
Pressurized gas leakage. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> External loads bearing on the device. 	<ul style="list-style-type: none"> Deformation; Crack formation; If pressurized, also burst. 	<p>a. With the exception of what is provided in the design, the user must verify that additional concentrated loads do not bear on the equipment.</p>
Pressurized gas leakage. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> Stray currents, differentials, electrostatic potentials. 	<ul style="list-style-type: none"> Localized corrosion in the device. 	<p>b. The user shall equip the equipment with the necessary means of protection and grounding.</p> <p>c. The above requirements are given in the instructions for use and warning.</p>
Pressurized gas leakage. Projection of metal and non-pressurized parts.	<ul style="list-style-type: none"> Humidity; Environments with aggressive atmosphere. 	<ul style="list-style-type: none"> Deterioration of exterior surfaces; Corrosion. 	<p>a. The user should periodically check the condition of the exterior surfaces.</p> <p>b. The above requirements are given in the instructions for use and warning.</p>

Tab. 3.10.

3.3.2 - RESIDUAL RISKS TABLE FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

Table "Tab. 3.11" shows the conditions that can lead to the generation of potentially explosive atmosphere by respectively:

- the pressure regulator NORFLUX;
- the SB slam-shut valve.

The table is valid for use with natural gas with a density not exceeding 0.8; for different densities, installation conditions and environmental conditions will also need to be evaluated.

⚠ WARNING

If the gas used is a combustible gas, the area where the equipment is installed is called a "danger zone" because there are residual risks of the formation of potentially explosive atmospheres.

No effective sources of ignition are absolutely necessary in and around the "danger zones."

Operating conditions	Potentially explosive atmosphere	Normative references	Management measures included in the operating and warning instructions
First start-up	No	<ul style="list-style-type: none"> • The external tightness of the equipment is checked at a value of 1.1 PS. • Before commissioning, the external tightness of the portion of the system on which the equipment is installed is tested at a convenient pressure (as specified in EN 12186 and EN 12279). 	The instructions for use indicate the need to meet the requirements of EN 12186 and EN 12279.
Normal operating conditions	No	<p>The above point applies, as well as:</p> <ul style="list-style-type: none"> • the installation of the equipment is outdoors or in a naturally ventilated room (according to EN 12186 and EN 12279); • the installation is subject to supervision in accordance with applicable national regulations, good practice, and the equipment manufacturer's instructions (in accordance with EN 12186 and EN 12279). 	<p>The instructions for use state that:</p> <ul style="list-style-type: none"> • the environment in which the equipment is installed must meet the requirement stated in EN 12186 and EN 12279; • periodic inspection and maintenance should be carried out during supervision in accordance with applicable national regulations (if any) and the manufacturer's specific recommendations.
Breakage of the control head diaphragm (malfunction)	No	<p>This event should be considered as a rare malfunction.</p> <p>All atmospheric pressure chambers bounded on at least one side by a diaphragm must be routed to a safe area (as per EN 12186 and EN 12279).</p>	The instructions for use indicate the need to meet the requirements given in EN 12186 and EN 12279.

Operating conditions	Potentially explosive atmosphere	Normative references	Management measures included in the operating and warning instructions
Breakage of other non-metallic parts (malfunction)(malfunction)	No	This type of malfunction is not reasonably expected since it involves static (outward) seals.	-
Decommissioning	No	<ul style="list-style-type: none"> Pressure reduction of the section of the system where the equipment is installed must be accomplished with appropriate venting lines routed to a safe area (as per EN 12186 and EN 12279). Exhaust of residual gas should be done as indicated above. 	In the instructions for use, the need to meet the requirements given in EN 12186 and EN 12279 is indicated
Restart	No	<ul style="list-style-type: none"> After a new regulator assembly, an external leak test should be performed 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 tested at a convenient pressure (as specified in EN 12186 and EN 12279). 	The instructions for use state: <ul style="list-style-type: none"> The minimum conditions for performing external leak tests; The need to meet the requirements outlined in EN 12186 and EN 12279.

Tab. 3.11.

3.4 - OBLIGATIONS AND PROHIBITIONS

The list of obligations and prohibitions to be observed for operator safety is given below.

It is mandatory to:



- carefully read and understand the operating and warning instructions;
- verify that the downstream equipment is properly sized according to the performance required of the regulator under the actual operating condition;
- view the data on the identification plates before installing the equipment;
- avoid violent shocks and impacts that could damage the equipment resulting in the leakage of pressurized fluid.

It is forbidden to:

- operate in various capacities on the equipment without the PPE specified in the work procedures described in these operating and warning instructions;
- operate in the presence of open flames or approach open flames to the work area;
- smoke near the equipment or while you are working on it;
- use the equipment with parameters different from those indicated on the rating plate;
- use the equipment with fluids other than those indicated on the rating plate and in these operating and warning instructions;
- use the equipment outside the operating temperature range stated on the rating plate and in these operating and warning instructions;
- maintain the equipment with the portion of the plant, on which the equipment is installed, in operation;
- install or use the equipment in environments other than those specified in these operating and warning instructions.

3.5 - SAFETY PICTOGRAMS

The following safety pictograms may appear on 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.

DANGER

It is strictly forbidden to remove the pictograms and safety labels on the equipment.

The user is required to replace pictograms and safety labels that, as a result of wear and tear, removal or tampering are illegible.

3.6 - NOISE LEVEL

Depending on the operating conditions, usage and required configuration, the equipment may generate noise beyond the limits allowed by the regulations in force in the country of installation.

For the generated noise value of the equipment and further information, please contact PIETRO FIORENTINI S.p.A.

CAUTION

The requirement to use ear muffs or earplugs to protect the operator's hearing remains if noise in the equipment installation environment (depending on specific operating conditions) exceeds 85 dBA.

4 - DESCRIPTION AND OPERATION

4.1 - GENERAL DESCRIPTION

The NORFLUX equipment is a direct-operated pressure regulator for high pressure that reduces the pressure of the incoming gas while keeping its downstream value stable even when the following change:

- the 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	Regulator body	4	Stem
2	Calibration spring	5	Plug
3	Main diaphragm	6	Reinforced gasket

Tab. 4.13.

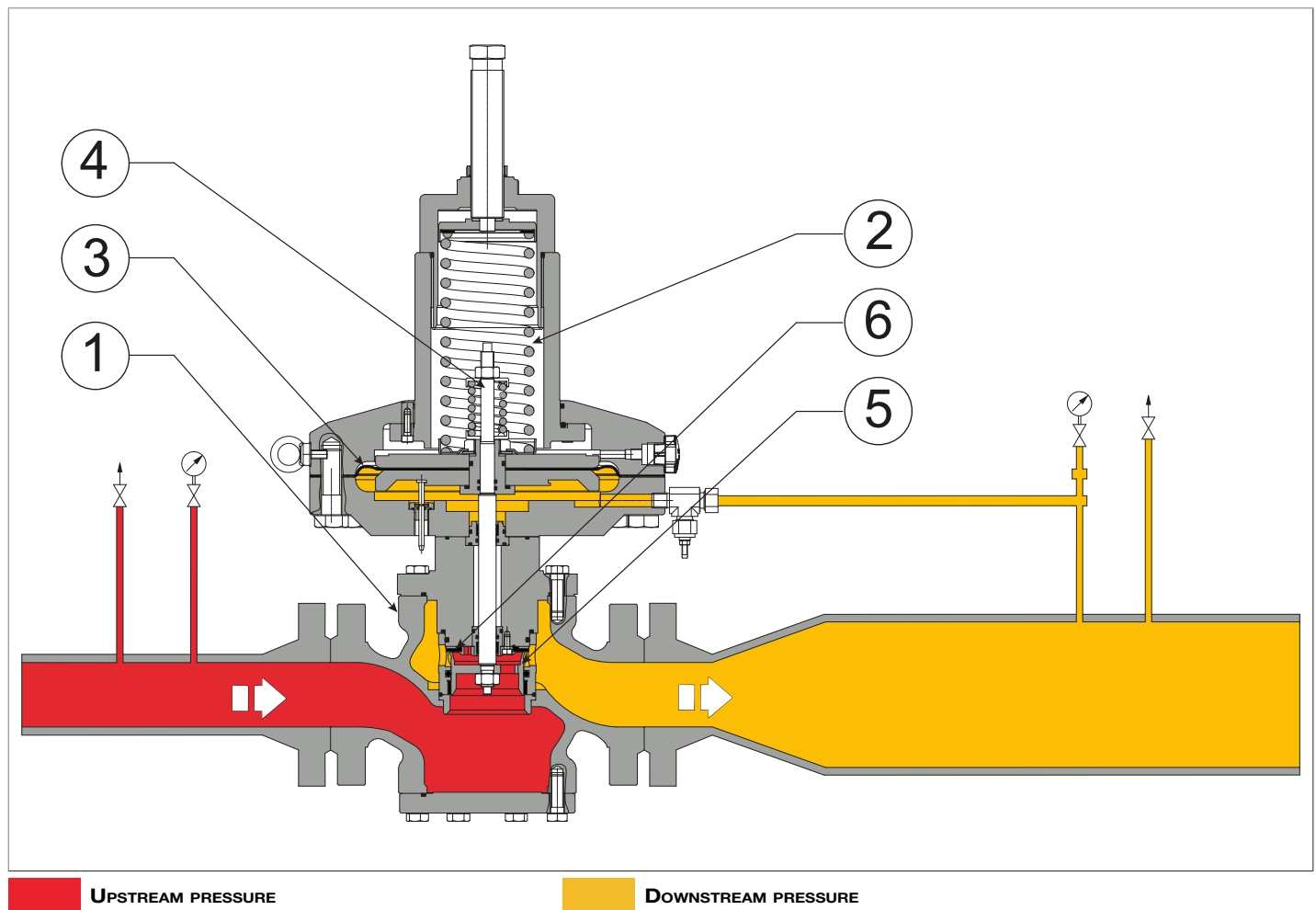


Fig. 4.1. General description NORFLUX

4.1.1 - REGULATOR REACTION MODES

The NORFLUX equipment is a direct-operated regulator with a "fail open" reaction, i.e. it opens in case of:

- rupture of the main diaphragm;
- lack of downstream pressure signal.

4.2 - OPERATION

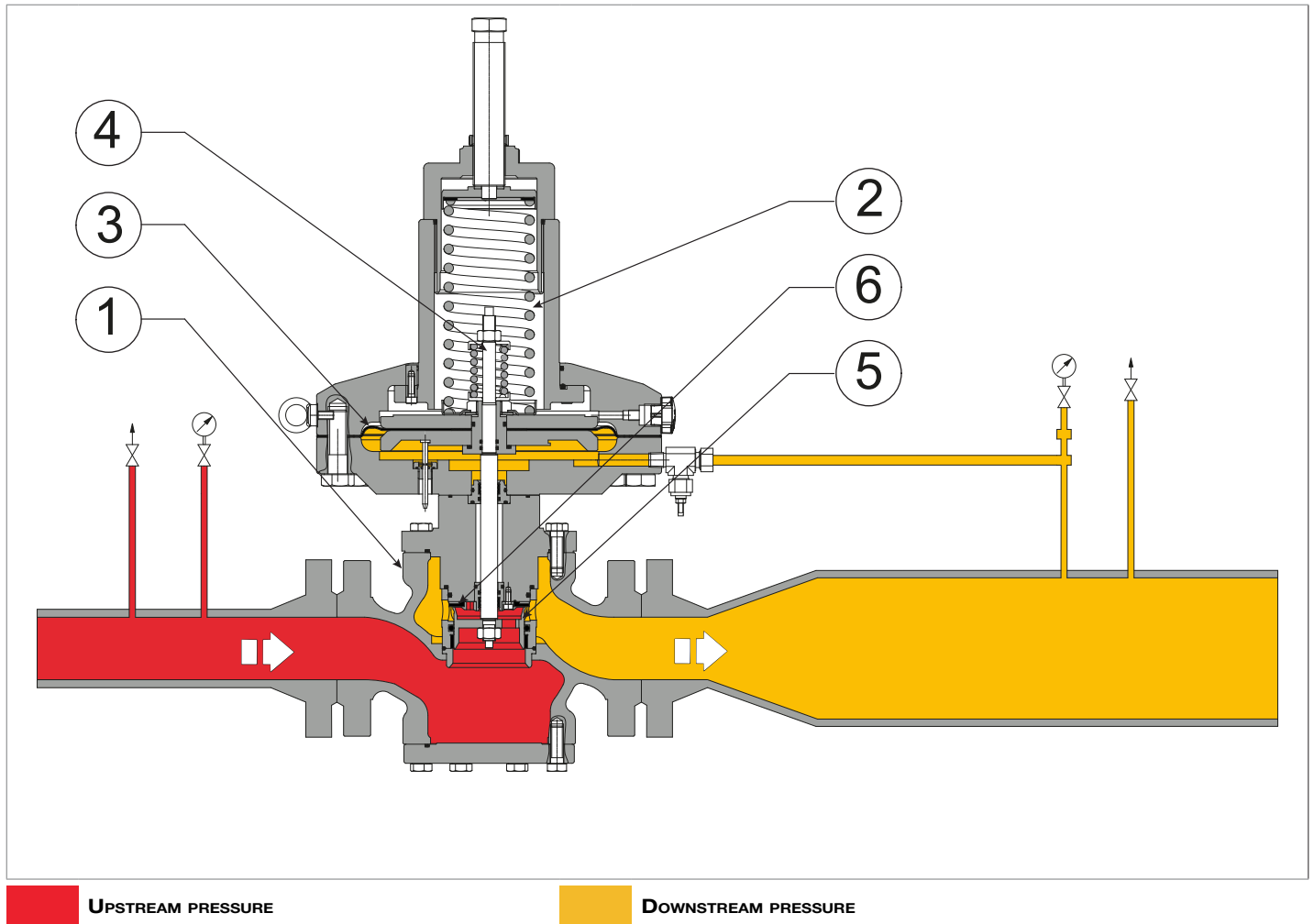


Fig. 4.2. Operation NORFLUX

In the absence of pressure, the plug (5) is held in open position by the spring (2).

The regulation of the downstream pressure value (Pd) takes place through the comparison between:

- the calibration spring load (2);
- the thrust on the main diaphragm (3) deriving from the downstream pressure (Pd).

The main diaphragm (3) moves the stem (4) integral with the plug (5). The stem (4) moves perpendicular to the gas flow. The reinforced gasket attached to the plug (5) ensures the tightness of the regulator in case of zero flow rate.

Under normal working conditions, the plug (5) is positioned to maintain the downstream pressure (Pd) around the predetermined calibration value.

The position of the plug (5) is controlled by the movements of the main diaphragm (3). The forces that affect the position of the plug (5) are:

- towards the closed position: the thrust resulting from the downstream pressure (Pd) in the chamber;
- towards the opening position: the load of the calibration spring (2).

The weight of the moving equipment acts toward the closed or open position depending on the installation position of the regulator.

Changes in the upstream pressure (Pu) do not change the value of the downstream pressure (Pd) as the mobile equipment is fully balanced.

If, during operation, the following should occur:

Operating conditions	Operational consequences	Final outcome
<p>Decrease in downstream pressure (Pd) due to:</p> <ul style="list-style-type: none"> • increase in the required flow rate; • drop in upstream pressure (Pu). 	<p>Imbalance that causes the plug to open (5).</p>	<p>Increase in flow rate until the predetermined value of the downstream pressure (Pd) is restored.</p>
<p>Increased downstream pressure (Pd) due to:</p> <ul style="list-style-type: none"> • drop in the required flow rate; • increase in upstream pressure (Pu). 	<p>Imbalance that causes the plug to close (5).</p>	<p>Decrease of the flow rate until the predetermined value of the downstream pressure (Pd) is restored.</p>

Tab. 4.14.

4.3 - INTENDED USE

4.3.1 - INTENDED USE

The equipment in question is intended for:

Operation	Allowed	Not allowed	Processing environment
Downstream pressure regulation for:	Gaseous fluids, non-corrosive, preliminarily filtered.	<ul style="list-style-type: none"> Liquids. Any product other than the one allowed. 	Installations for the transport and distribution of combustible gas for the supply of networks for use: <ul style="list-style-type: none"> civil; industrial.

Tab. 4.15.

The equipment in question is used as the main regulator and in-line monitor regulator.

It is designed to be used only within the limits indicated on the identification plate and according to the instructions and limits of use given in this manual.

The indications to work safely are:

- use within the limits stated on the identification plate and on this manual;
- compliance with the procedures of the user manual;
- execution of routine maintenance in the times and in the manner indicated;
- execution of extraordinary maintenance in case of need;
- do not tamper with and/or bypass the safety devices.

4.3.2 - REASONABLY FORESEEABLE MISUSE

Reasonably foreseeable misuse means the use of the equipment in a way not foreseen at the design stage but which may result from readily predictable human behavior:

- corrosive fluids;
- fluids not properly treated upstream;
- liquids;
- instinctive reaction of an operator in the event of a malfunction, accident or failure during the use of the equipment;
- behavior resulting from pressure to keep the equipment in operation in all circumstances;
- behavior resulting from carelessness;
- behavior resulting from the use of the equipment by unqualified and unsuitable persons;
- use of the equipment differently than envisaged in the paragraph "Intended use".

Any other use of the equipment than that envisaged must be authorized in advance in writing by PIETRO FIORENTINI S.p.A. In the absence of written permission, the use is considered improper.

In the presence of "improper use", PIETRO FIORENTINI S.p.A. disclaims all responsibility in relation to any damage caused to things or people and considers any type of warranty on the equipment lapsed.

4.3.3 - TYPES OF FLUIDS

The equipment works with combustible gases used:

- in pressure monitoring stations according to EN 12186 or EN 12279;
- in transmission and distribution networks.
- in commercial and industrial plants (after verification by contacting the Manufacturer).

NOTICE

The equipment, after verification, by contacting the Manufacturer, can also be used with inert gases.

4.4 - TECHNICAL CHARACTERISTICS/PERFORMANCE

The NORFLUX equipment is a regulator for medium and low pressure. The control system is balanced and guarantees a stable outlet pressure even when the inlet pressure and required flow rate varies.

The main specifications of this regulator are:

Technical features	
Maximum allowable pressure	Up to 1450 psig
Inlet gas temperature range	-4 °F - +140 °F
Ambient temperature range	-40 °F - +140 °F
Inlet pressure range (bpu)	14.5 to 1378 psig
Possible adjustment range (Wd)	10 to 58 psig
Minimum differential pressure	7 psig
Accuracy class (AC)	up to 10 (depending on operating conditions)
Shut-off pressure class (SG)	up to 10 (depending on operating conditions)

Tab. 4.16.

Coefficients Cg, Kg and K1	
Nominal diameter [mm]	50
Size [inches]	2"
Coefficient Cg	1861
Coefficient K1	106.78

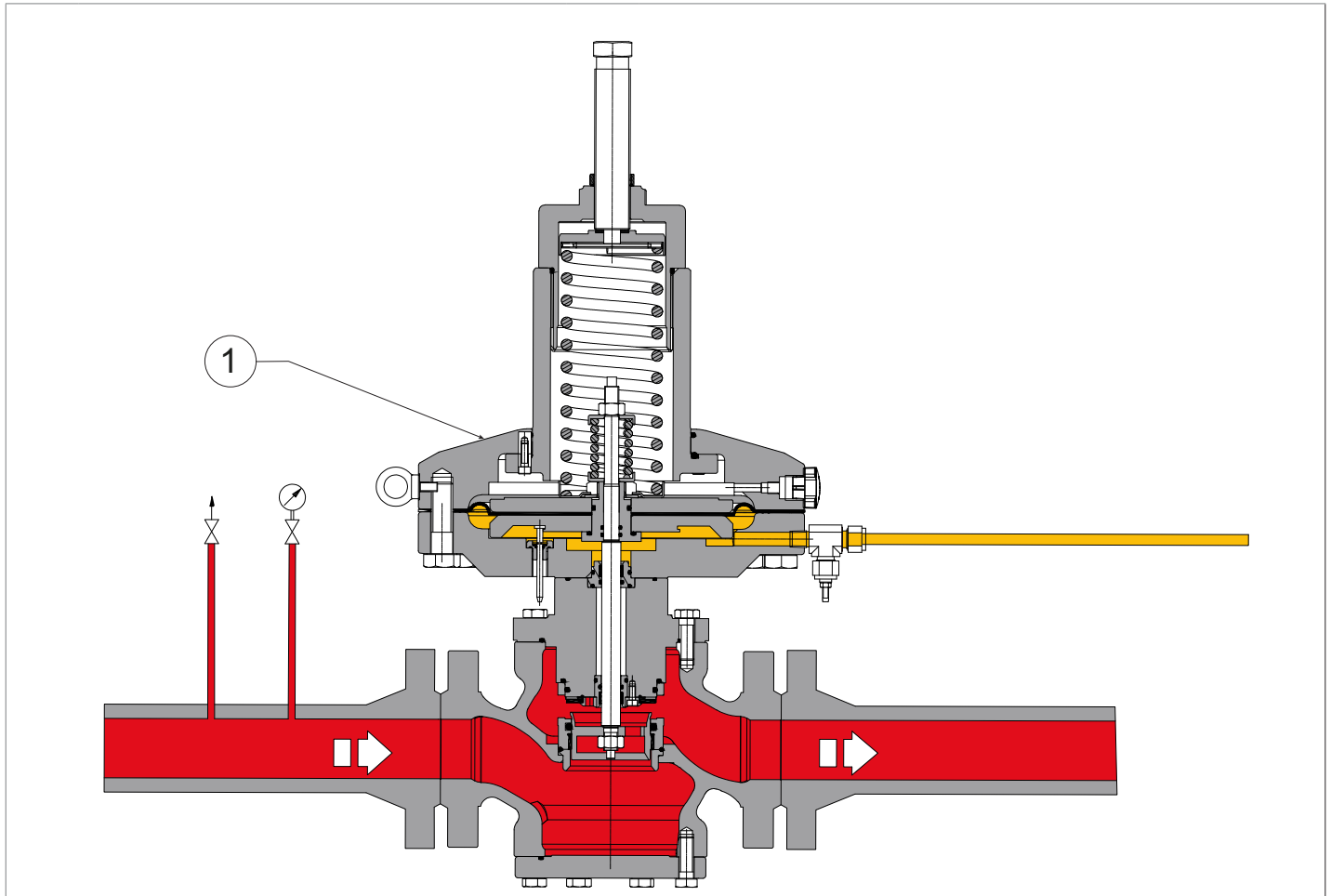
Tab. 4.17.

4.5 - POSSIBLE CONFIGURATIONS

4.5.1 - REGULATOR WITH MONITOR FUNCTION

The regulator with monitor function (1) has the task of keeping the value of the downstream pressure (P_d) within the predetermined limits in case of failure of the main regulator.

The regulator with monitor function (1) is installed upstream of the main pressure regulator.



 UPSTREAM PRESSURE

Fig. 4.3. Regulator with monitor function

4.5.1.1 - REGULATOR WITH IN-LINE MONITOR FUNCTION

The regulator with monitor function (1) is mounted in series on the same line as the main regulator (2). The two regulators are functionally independent and are controlled by independent sensing lines.

STANDBY OPERATION

The regulator with monitor function (1), during normal operation, is open due to its higher calibration of the main regulator calibration (2).

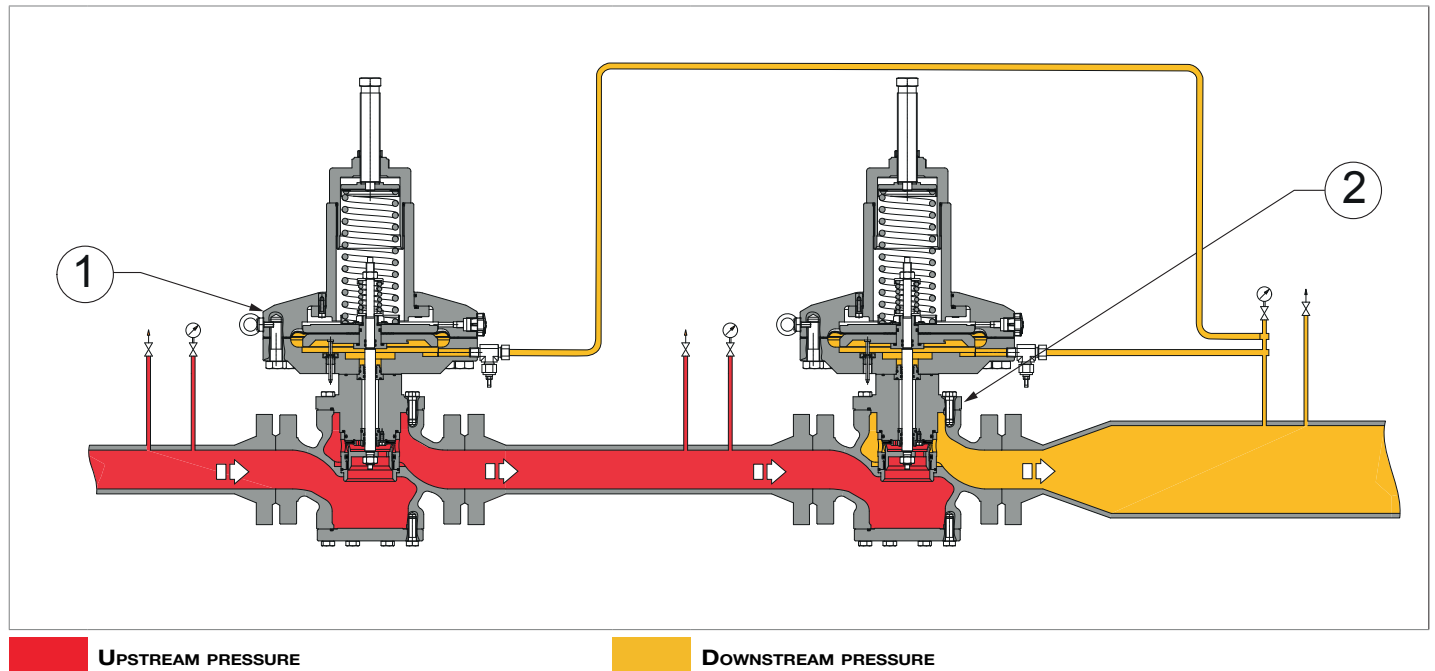


Fig. 4.4. In-line regulator-monitor operation in standby conditions

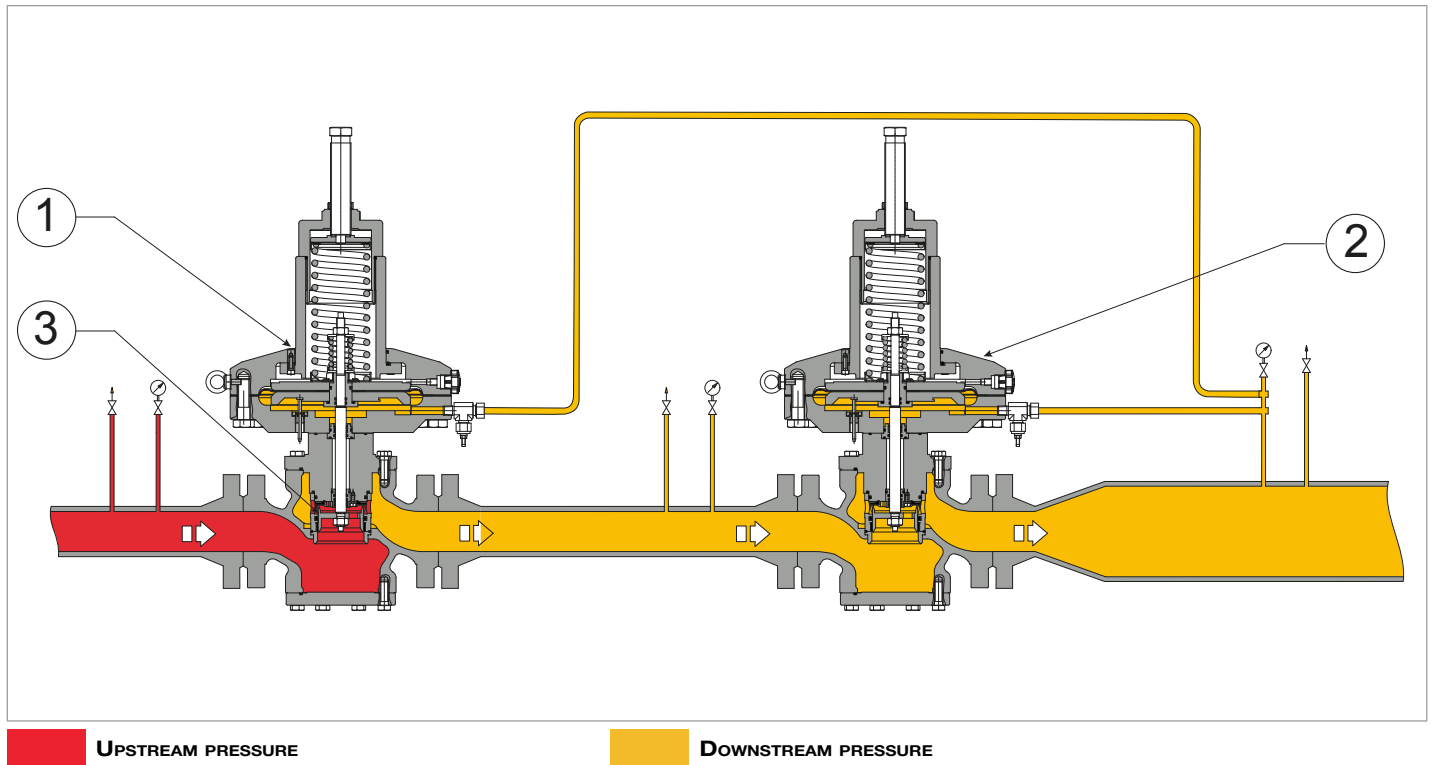
FAULT OPERATION OF THE MAIN REGULATOR


Fig. 4.5. Regulator-monitor operation in main regulator failure conditions

In case of failure of the main regulator (2), the regulator with monitor function (1) will trip keeping the downstream pressure value (P_d) within the value established for the calibration of the latter.

If, during operation, the following should occur:

Operating conditions	Operational consequences	Final outcome
Decrease in downstream pressure (P_d) due to: <ul style="list-style-type: none"> • increase in the required flow rate; • drop in upstream pressure (P_u). 	Imbalance that causes the plug to open (3).	Increase in flow rate until the predetermined value of the downstream pressure (P_d) is restored.
Increased downstream pressure (P_d) due to: <ul style="list-style-type: none"> • drop in the required flow rate; • increase in upstream pressure (P_u). 	Imbalance that causes the plug to close (3).	Decrease of the flow rate until the predetermined value of the downstream pressure (P_d) is restored.

Tab. 4.18.

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4.5.2 - SLAM-SHUT VALVE

The slam-shut valve is a safety device that has the task of intercepting the gas flow if the pressure value at the control point exceeds the calibration value of the valve itself.

The slam-shut valve incorporated into the main regulator consists of:

- a control system;
- the slam-shut mechanism.

4.5.2.1 - BUILT-IN SB SLAM-SHUT VALVE

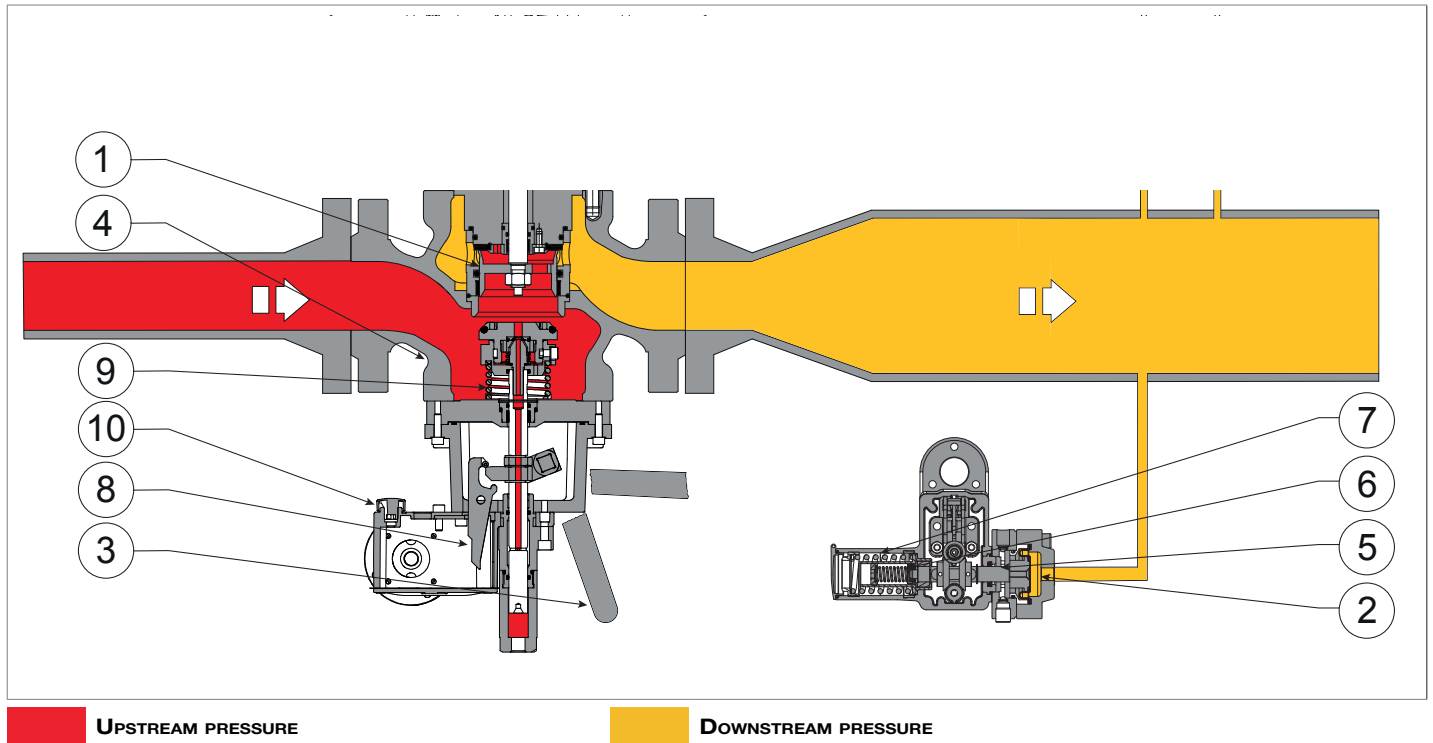


Fig. 4.6. NORFLUX with SB slam-shut valve

OPERATION

The built-in SB slam-shut valve can be operated:

- from the pressure switch;
- manually;
- with remote control (optional).

The main features of the built-in SB slam-shut valve are:

- tripping due to increase and / or decrease of the downstream pressure;
- design pressure: 1450.38 psi for all components of the accessory;
- local shut-off button;
- manual reset only with internal bypass operated by the reset lever.

Pressure switch type	Set	Tripping range (psi)	AG
Mod. 103M	max	29.00 - 319.07	5
Mod. 104M	max	217.56 - 652.65	2,5
Mod. 105M	max	435.10 - 1305.30	2,5

Tab. 4.19.

* Refer to chapter 13 "Calibration tables" for the minimum spring calibration values.

The built-in SB slam-shut valve consists of (see Fig. 4.6):

Pos.	Description
1	Plug
2	Control pressure switch
3	Reset system (manually operated via lever)

Tab. 4.20.

The operating pressure acts on the control element of the control pressure switch (2), which, integral with the stem (5), receives an opposite force through the springs for maximum (7) and minimum (6) pressure intervention, calibrated at the preset values. The translation of the stem (5) causes the release of the control device (8) of the mobile system and, by means of the spring (9), the closing of the plug (1).

To reset the device, operate the lever (3) which:

- in the first section of the stroke opens an internal bypass allowing the upstream pressure to be transferred from the inlet chamber to the outlet chamber of the regulator body (4), re-balancing the pressure on the plug (1);
- in the second section of the stroke, it reconnects the control device (8) of the mobile system.

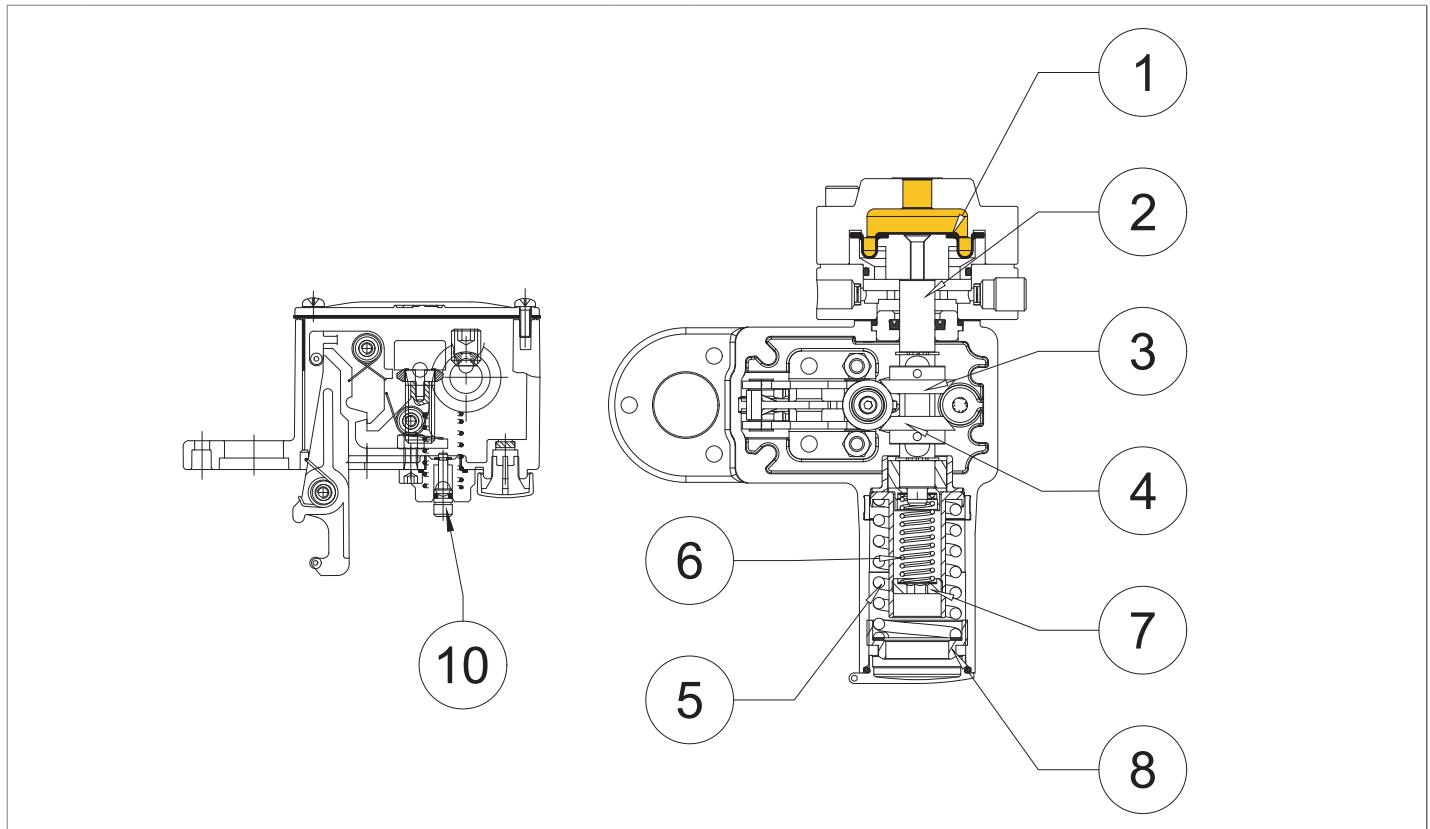
The release of the control device (8) of the mobile system can also be controlled manually via button (10).

4.5.3 - SLAM-SHUT VALVE PRESSURE SWITCHES

The pressure switch is a control device consisting of (see Fig. 4.7):

Pos.	Description
1	Control element. NOTICE The control element can be a diaphragm or a piston.
2	Stem.
3-4	Adjusting probes.
5	Spring for maximum pressure intervention.
6	Spring for minimum pressure intervention.
7	OPSO maximum spring adjustment ring nuts (5).
8	UPSO minimum spring adjustment ring nuts (6).
10	Manual release button.

Tab. 4.21.



DOWNSTREAM PRESSURE

Fig. 4.7. NORFLUX with SB slam-shut valve

Models of possible pressure switches for this regulator are listed in Tab. 4.22:

Pressure switch model	Max [psi]	Min [psi]
103M	29.01 - 319.09	2.90 - 116.03
103MH	29.01 - 319.09	116.03 - 275.58
104M	217.56 - 652.68	23.21 - 261.07
104MH	217.56 - 652.68	261.07 - 594.66
105M	435.12 - 1305.36	43.51 - 638.18
105MH	435.12 - 1305.36	638.18 - 1305.36

Tab. 4.22.

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5 - TRANSPORT AND HANDLING


5.1 - SPECIFIC WARNINGS FOR TRANSPORT AND HANDLING

NOTICE

The transport and handling activities, in compliance with the regulations in force in the country of destination of the equipment, must be carried out by personnel:

- qualified (specially trained);
- aware of the rules of accident prevention and safety in the workplace;
- authorized to use the lifting equipment and vehicles.

Transportation by forklift or crane

Operator qualification	In charge of transport, handling, unloading and placement on site
PPE required	<div style="display: flex; align-items: center;">  </div> <div style="background-color: #ff8c00; color: white; padding: 2px; margin: 5px 0;">⚠ WARNING</div> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any indications provided by the Safety Manager at the installation facility.
Lifting vehicle	Hoist crane, forklift or suitable similar means.
Weights and dimensions of the equipment	Refer to paragraph “5.2 - Physical characteristics of the equipment” for dimensions and weights.

Tab. 5.23.

5.1.1 - PACKAGING AND FASTENING SYSTEMS USED FOR TRANSPORT

The transport packaging has been designed and manufactured in order to avoid damage during normal transport, storage and handling.

The equipment and spare parts must be kept in their respective packaging until they are installed.




Upon receipt of the equipment:

- check that the packaging is intact and that no part has been damaged during transport and/or handling;
- immediately report to PIETRO FIORENTINI S.p.A. any damage found.

NOTICE

PIETRO FIORENTINI S.p.A. is not liable for damage to property or persons caused by accidents due to failure to comply with the instructions given in this manual.

Table “Tab. 5.24.” shows the types of packaging used:

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

Tab. 5.24.

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5.2 - PHYSICAL CHARACTERISTICS OF THE EQUIPMENT

5.2.1 - NORFLUX

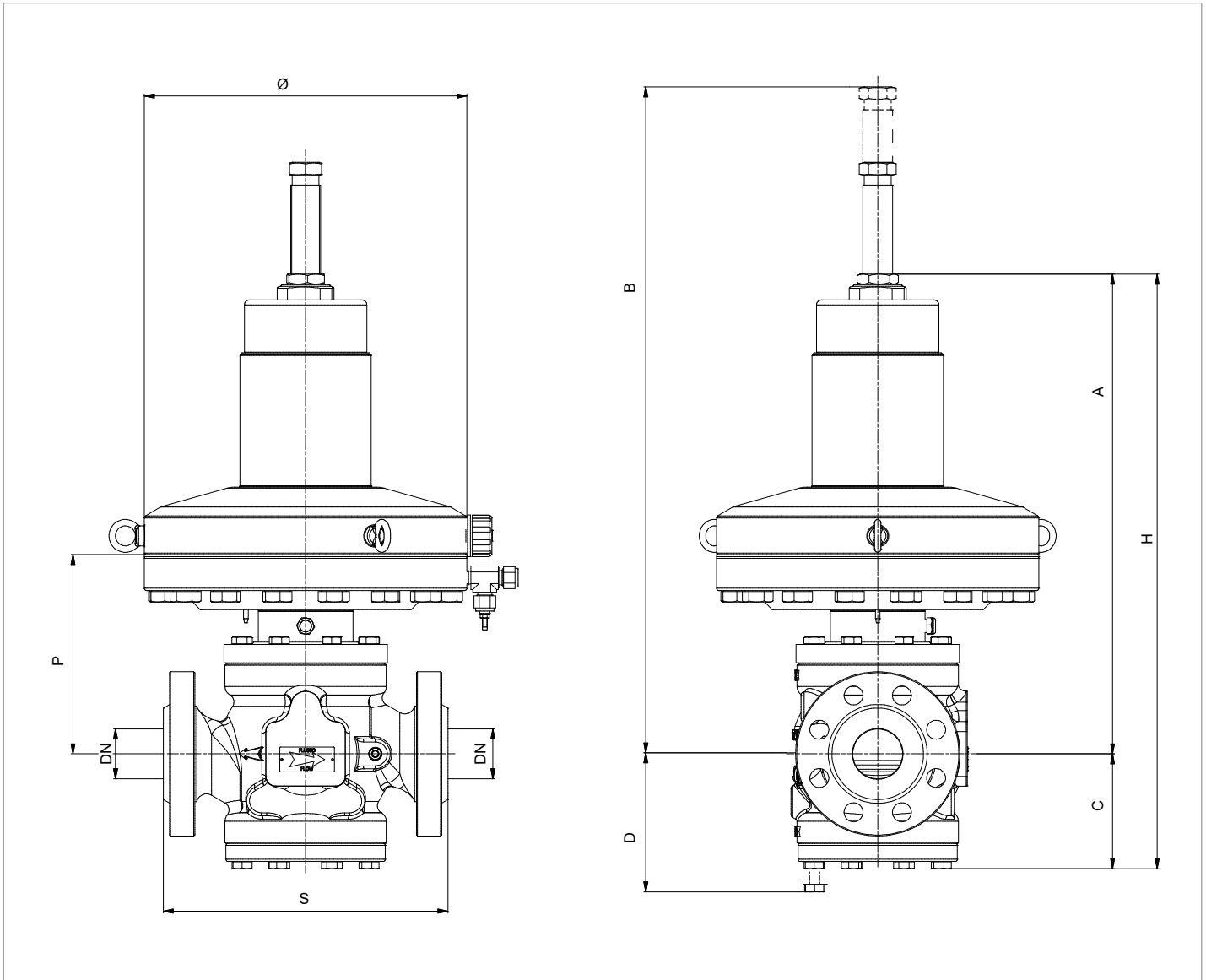


Fig. 5.8. Physical characteristics NORFLUX

Clearances and dimensions NORFLUX [inches]	
Nominal diameter [mm]	50
Size [inches]	2"
S - Class 300	267
S - Class 600	286
Ø	324
A	482
B	602
C	116
D	151
H	598
P	200
Pipe 3/8 connection pneumatic piping	

Tab. 5.25.

Weights [kg]	
S - Class 300	76
S - Class 600	78.4

Tab. 5.26.

5.2.2 - NORFLUX + SB

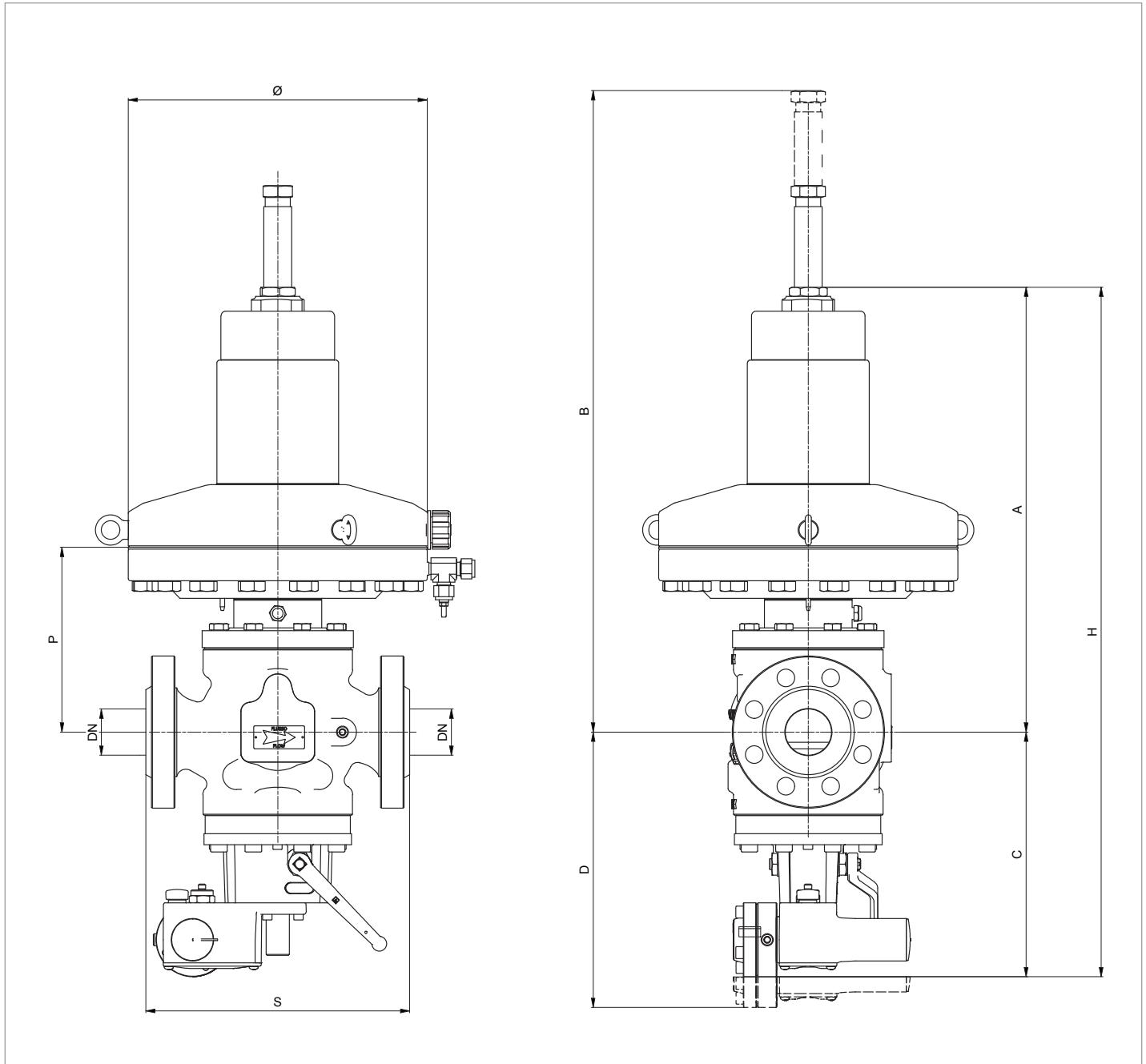


Fig. 5.9. Physical characteristics NORFLUX + SB

Clearances and dimensions NORFLUX + SB [inches]	
Nominal diameter [mm]	50
Size [inches]	2"
S - Class 300	267
S - Class 600	286
Ø	324
A	482
B	602
C	265
D	355
H	747
P	200
Pipe 3/8 connection pneumatic piping	

Tab. 5.27.

Weights [kg]	
S - Class 300	84
S - Class 600	86

Tab. 5.28.

5.3 - METHOD FOR ANCHORING AND LIFTING THE EQUIPMENT

⚠ DANGER

Before moving a load, make sure that its weight does not exceed the load capacity of the lifting means (and any other equipment) indicated on the specific plate.

⚠ WARNING

The unloading, transport and handling activities must be carried out by operators qualified for such operations and specially trained:

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

⚠ CAUTION

Before moving the equipment:

- remove or firmly secure any moving or hanging component to the load;
 - protect the most delicate equipment;
 - check that the load is stable;
 - make sure you have perfect visibility along the route.
-

5.3.1 - FORKLIFT HANDLING METHOD

⚠ DANGER

It is forbidden to:

- pass under suspended loads;
- move the load over the personnel working in the site/plant area.

⚠ WARNING

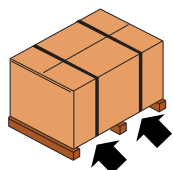
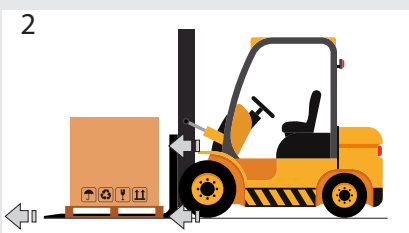


On forklift trucks it is forbidden to:


- transport passengers;
- lift people.

NOTICE

The packaging must always be handled in an upright position.

Proceed as follows:

Step	Operation	Image
1	Place the forklift forks under the loading surface.	
2	Make sure that the forks protrude from the front of the load (at least 5 cm), for a sufficient length to eliminate any risk of the transported load tipping over.	
3	Raise the forks until contact with the load. NOTICE If necessary, secure the load to the forks with clamps or similar devices.	
4	Slowly lift the load by a few dozens of centimeters and check its stability making sure that the center of gravity of the load is in the middle of the lifting forks.	

Step	Operation	Image
5	Tilt the mast backwards (toward the driver's seat) to take advantage of the tipping moment and ensure greater stability of the load during transport.	<p>5</p> 
6	<p>Adjust the transport speed according to the flooring and the type of load, avoiding sudden maneuvers.</p> <p>⚠ WARNING</p> <p>If:</p> <ul style="list-style-type: none"> • encumbrances along the route; • particular operating situations; <p>do not allow the operator to have a perfect view, the assistance of an operator on the ground is required, standing outside the range of action of the lifting means, with the task of signaling.</p>	-
7	Place the load in the chosen installation area.	-

Tab. 5.29.

5.3.2 - CRANE HANDLING METHOD

⚠ WARNING

It is compulsory to use chains, cables and eyebolts marked CE or marked with marks/conformity markings in accordance with the provisions in force in the place of installation. Do not use chains connected to each other by bolts.

Always check that:

- the safety catch of the hook returns to its initial position;
- the cables are in excellent condition with adequate cross-section.

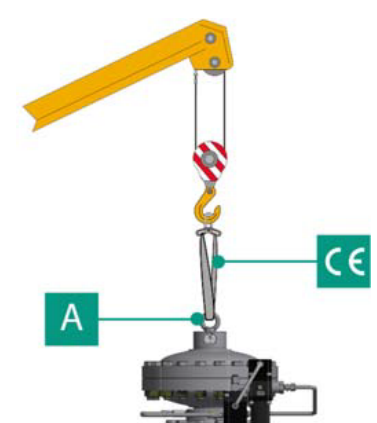
It is forbidden to:

- scrape the load on the ground;
- operate near power lines;
- stand within the range of action of the crane.

NOTICE


The packaging must always be handled in an upright position.

The handling of the equipment must be performed using the lifting points provided on the equipment itself. To carry out the transport correctly, proceed as follows:

Step	Operation	Image
1	Hook the lifting cable or chain to the appropriate supports. ⚠ WARNING The lifting point is sized to lift only the equipment and not other parts of the plant connected to it.	
2	Slightly lift the load making sure that the cables or chains are tight. NOTICE Verify that the load is properly balanced.	
3	Move the load avoiding sudden maneuvers.	
4	Place the load in the chosen installation area.	

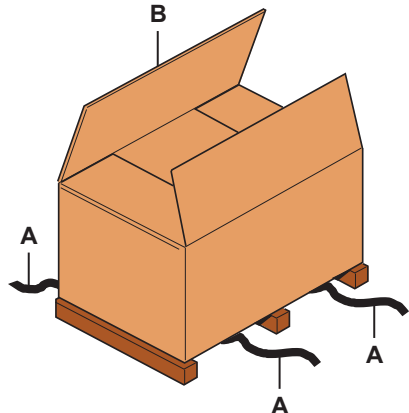
Tab. 5.30.

5.4 - UNPACKING

Packing removal	
Operator qualification	<ul style="list-style-type: none"> Worker in charge of transport, handling, unloading and placement on site. Installer.
PPE required	<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> the regulations in force in the country of installation; any indications provided by the Safety Manager at the installation facility. </div> </div>

Tab. 5.31.

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

Step	Operation	Image
1	Remove the straps (A).	
2	Remove the packing box (B).	
3	Remove the clips that secure the equipment to the base (when present).	
4	<p>Move the equipment from the base to the place intended for it.</p> <p>NOTICE</p> <p>To manually handle the packages, if their size/weight requires it, employ at least 2 operators.</p>	

Tab. 5.32.

NOTICE

After removing all packing materials, check for any anomalies.

In the presence of anomalies:

- do not perform the installation operations;
- contact PIETRO FIORENTINI S.p.A. communicating the data shown on the identification plate of the equipment.

5.4.1 - PACKAGING DISPOSAL

NOTICE

Separate 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 is to be stored for a long period, the minimum envisaged environmental conditions are shown. Only compliance with these requirements can guarantee the declared performance:

Conditions	Data
Maximum storage period	Maximum 3 years. NOTICE For installations in subsequent periods, consult the paragraph “pre-installation warnings after prolonged storage.”
Temperature	Not higher than 40°C
Humidity	Not more than 70%
Radiation	Far from radiation sources as per UNI ISO 2230:2009 standard

Tab. 5.33.

5.5.1 - PRE-INSTALLATION WARNINGS AFTER PROLONGED STORAGE

For installations following storage periods exceeding 3 years, it is necessary to check the conditions of all rubber parts and, if these are deteriorated, replace them so as to be able to guarantee correct operation of the equipment. To replace the rubber parts of the equipment, refer to chapter “9 - Maintenance and functional testing”.

NOTICE

PIETRO FIORENTINI S.p.A. recommends checking the state of conservation of the rubber parts for periods of inactivity or storage exceeding 3 years.

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6 - INSTALLATION

6.1 - INSTALLATION PRE-REQUISITES

6.1.1 - ENVIRONMENTAL CONDITIONS

⚠ WARNING

For the safe use of the equipment, respecting the permitted environmental conditions, follow the data on the plate of the regulator and any accessories (refer to paragraph “2.8 - Identification plates applied”).

The place of installation must be suitable for safe use of the equipment.

The installation area of the equipment must have lighting that guarantees the operator good visibility during the work phases on the equipment.

NOTICE

The equipment must work in correctly lit places using artificial lighting suitable for the protection of the operator (in compliance with UNI EN 12464-1: 2011 and UNI EN 12464-2: 2014). It is mandatory to make use of all light sources of the installation site in the event of maintenance operations to be performed in areas and/or parts that are poorly lit.

6.1.2 - CHECKS BEFORE INSTALLATION

In relation to its **permissible pressure PS**, the equipment does not require any additional upstream safety device to protect against possible overpressure when, for the upstream reduction station, the maximum downstream incidental pressure is:

$$MIPd \leq 1,1 PS$$

MIPd = maximum value of downstream incidental pressure (for more information see UNI EN 12186:2014).

⚠ CAUTION


Where the installation of the equipment requires the application of compression fittings in the field, these must be installed according to the instructions of the manufacturer of the fittings.

The choice of fittings must be compatible with:

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

Before proceeding with the installation you must make sure that:

- the intended dimensions of the installation site are compatible with the dimensions of the equipment;
- there are no impediments to the maintenance operations of the employees;
- upstream and downstream pipes are at the same level and capable of bearing the weight of the equipment;
- the inlet and outlet connections of the pipes are aligned on the flanges;
- the input and output 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	<div style="display: flex; align-items: center;">  </div> <p style="background-color: #ff8c00; color: white; padding: 2px; margin-top: 5px;">⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any indications provided by the Safety Manager at the installation facility.
Equipment required	Refer to chapter "7 - Commissioning/maintenance equipment".

Tab. 6.34.

6.2 - INSTALLATION-SPECIFIC SAFETY WARNINGS

⚠ WARNING

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

⚠ WARNING

The installation could also take place in environments at risk of explosion and this implies the adoption of all the necessary prevention and protection measures.

For these measures, please refer to the regulations in force at the place of installation.

6.3 - GENERAL INFORMATION ABOUT CONNECTIONS

The equipment must be installed in the line with the arrow on the body facing in the direction of gas flow.
The online installation must include:

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

Tab. 6.35.

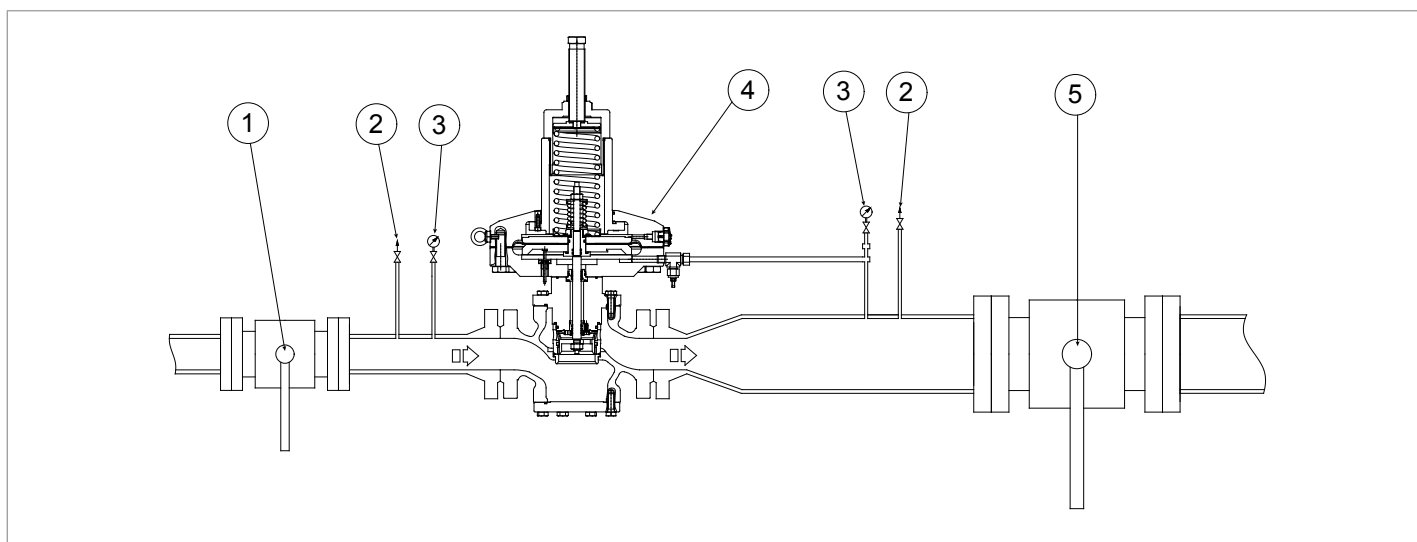


Fig. 6.10. In-line Installation

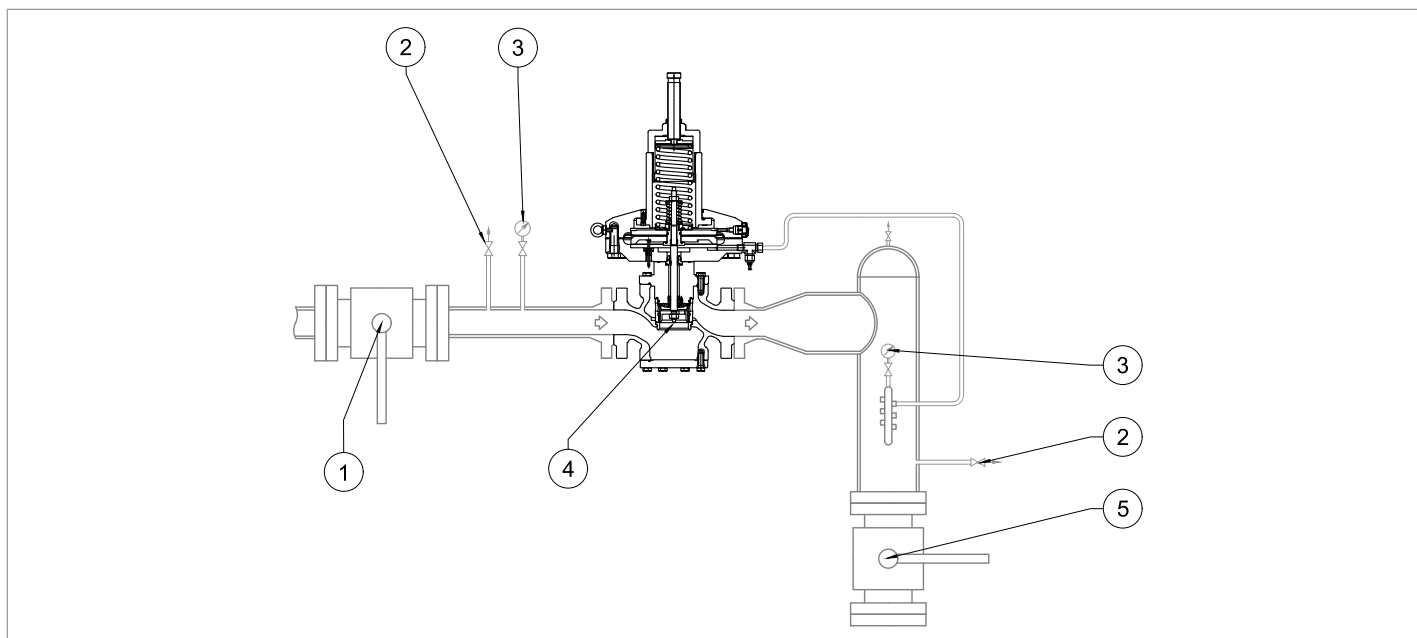


Fig. 6.11. Square installation

NOTICE

When the device is used in gas pressure reduction stations, it must be installed at least according to the requirements of UNI EN 12186:2014 or UNI EN 12279:2007.

The vents of the equipment must be channeled according to UNI EN 12186: 2014 or UNI EN 12279: 2007 or the standards in force at the place of installation of the equipment.

6.4 - INSTALLATION LOCATIONS OF THE REGULATOR

Figures Fig. 6.12 and Fig. 6.13 illustrate the typical regulator positions:

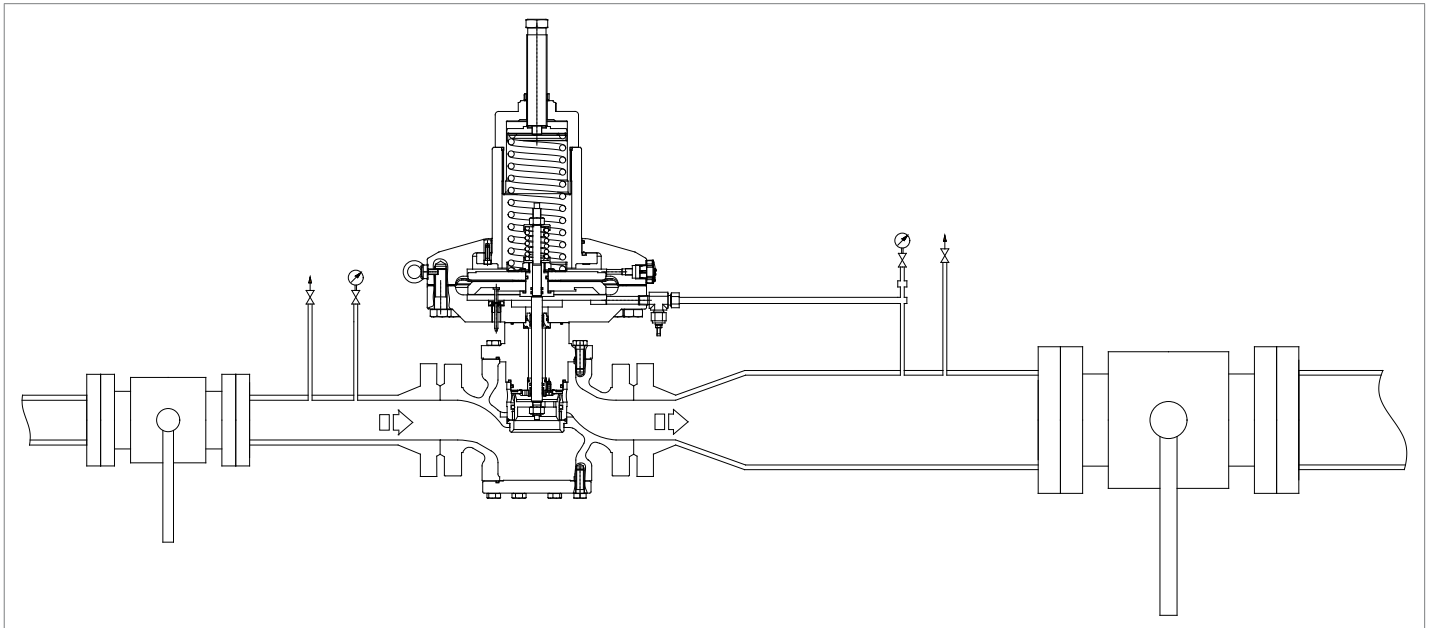


Fig. 6.12. Standard location

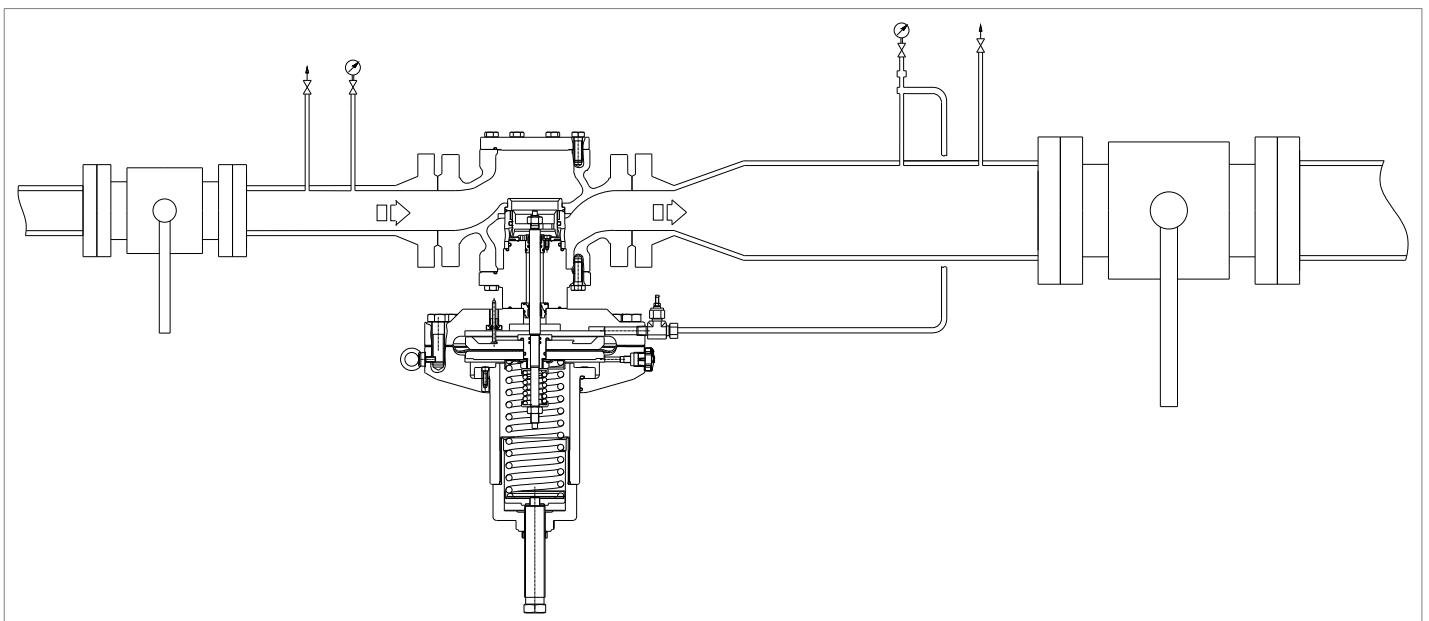


Fig. 6.13. Inverted position

6.5 - INSTALLATION PROCEDURES

6.5.1 - INSTALLATION PROCEDURES OF EQUIPMENT

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

Tab. 6.36.

NOTICE

For installation carried out after maintenance, replace the gaskets.

6.5.2 - CONNECTING THE SENSING LINES TO THE DOWNSTREAM PIPELINE

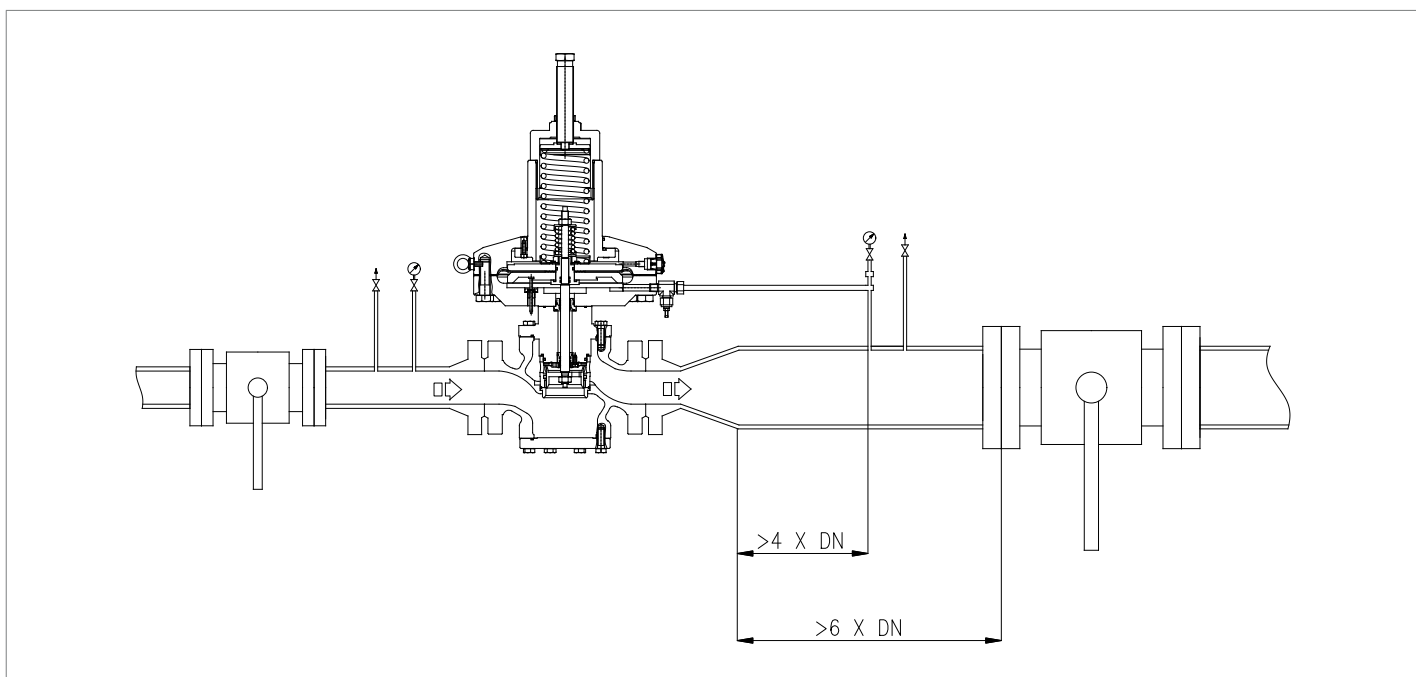


Fig. 6.14. Connecting sensing lines to the downstream pipeline

To obtain a good regulation it is essential that:

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

For optimal performance, the velocity of the fluid under pressure at the setting point does not exceed the following values:

$V_{max} = 30 \text{ m/s}$ for $P_a > 72.52 \text{ psi}$

$V_{max} = 25 \text{ m/s}$ for $P_a < 72.52 \text{ psi}$

As limit of use, the velocity of the fluid under pressure at the setting point does not exceed the following values:

$V_{max} = 40 \text{ m/s}$ for $P_a > 72.52 \text{ psi}$

To calculate the flow rate use the following formula:

$$V = 0.0498 \times \frac{Q}{DN^2} \times \frac{14.504 - 0.002 \times Pd}{14.504 + Pd}$$

V = gas speed in ft/sec

Q = Scfh gas flow rate

DN = nominal pipe diameter in inches

Pd = outlet pressure of the regulator in psi

NOTICE

All pneumatic connections to be made in the field must have pipes with a minimum internal diameter of 8 mm.

To avoid the collection of impurities and condensation in the pneumatic connections of the sensing lines it is necessary that:

- the connections of the pneumatic connection are always welded to the top or horizontal axis of the pipe itself (refer to Fig. 6.15);
- the hole on the pipe has no burrs or internal protrusions;
- the slope of the pneumatic connection is always 5-10% towards the connection of the downstream pipe.

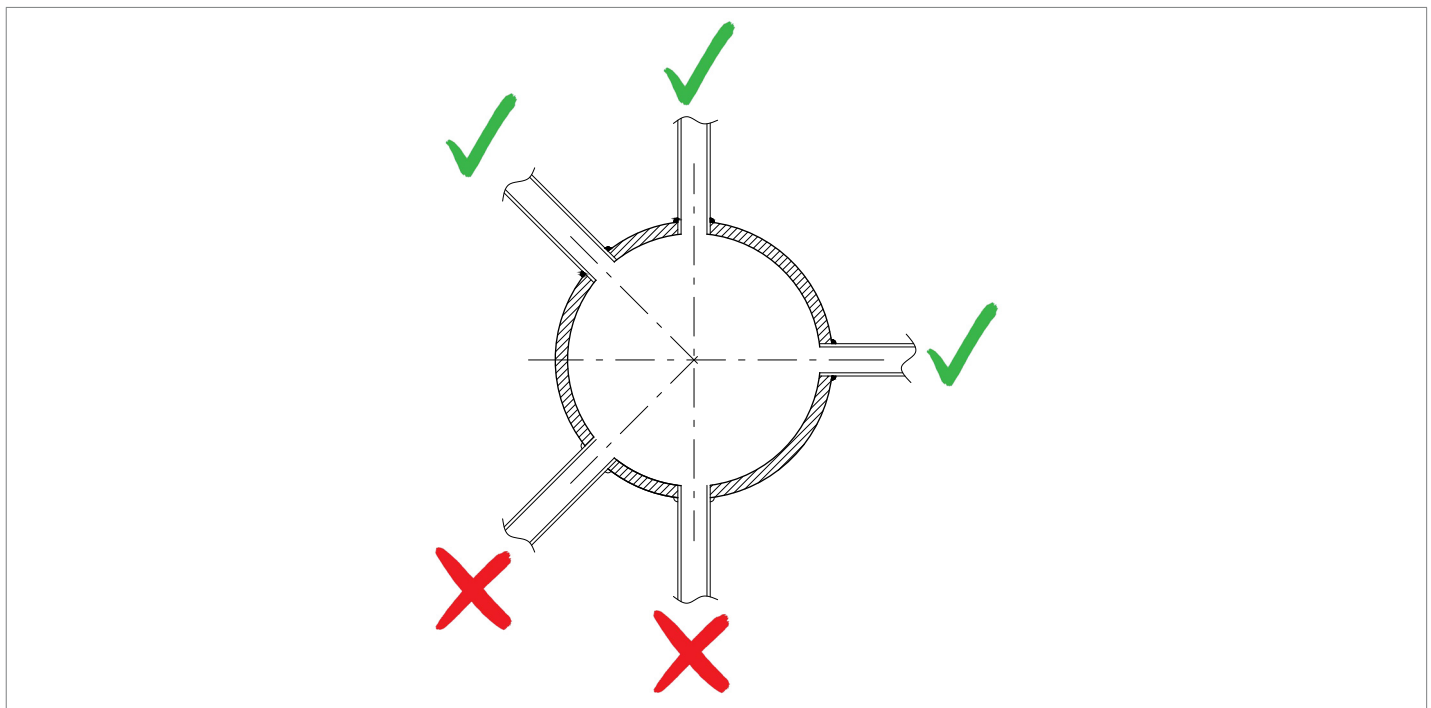


Fig. 6.15. Welded pipe connections

In case there is a multiple sensing line, connect the connections of the equipment as follows:

- 1 and 2 to the sensing line of the control head of the main regulator and the regulator with built-in monitor or monitor function;
- 3 and 4 free;
- 5 and 6 to the sensing line of the slam-shut valve when present.

NOTICE

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

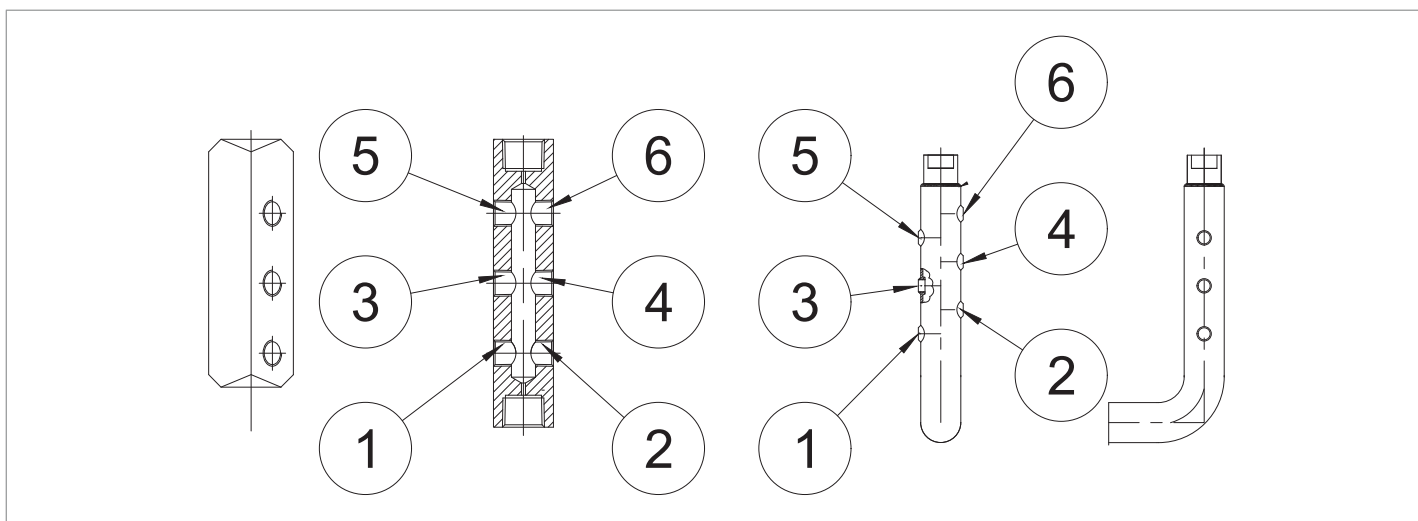


Fig. 6.16. Equipment connections


6.6 - POST-INSTALLATION AND PRE-COMMISSIONING VERIFICATION

In service you need to make sure that all connections are:

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



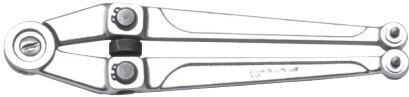


7 - COMMISSIONING/MAINTENANCE EQUIPMENT





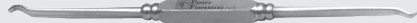

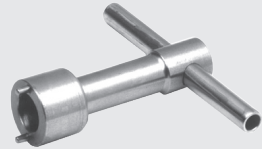

7.1 - EQUIPMENT LIST

Commissioning/maintenance equipment use	
Operator qualification	<ul style="list-style-type: none"> • Mechanical maintenance technician; • Electrical maintenance technician; • Installer; • User technician.
PPE required	<div style="display: flex; align-items: center;">  </div> <p style="background-color: orange; color: black; padding: 2px; margin-top: 5px;">⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any indications provided by the Safety Manager at the installation facility.

Tab. 7.37.

Table “Tab. 7.38” shows the types of equipment needed to commission and service the equipment:

Ref.	Type of equipment	Image
A	Combination wrench	
B	Adjustable roller wrench	
C	Needle roller compass wrench	
D	Double polygonal socket wrench	
E	Hexagonal male bent wrench	

Ref.	Type of equipment	Image
F	Hexagonal male "T" wrench	
G	Hexagonal socket "T" wrench	
H	Phillips screwdriver	
I	Slotted screwdriver	
L	O-ring extraction tool	
M	Ring pliers	
N	Fiorentini special key	
O	Fiorentini special key	

Tab. 7.38.

7.2 - EQUIPMENT NEEDED FOR THE DIFFERENT CONFIGURATIONS

Each table is distinguished by:

Term	Description
Ch.	Key, referring to the equipment shown in "Tab. 7.38".
Code	Code, referring to equipment.
DN	Nominal diameter of the reference configuration.
L.	Length, referring to equipment.
Ref.	Equipment reference.
Type	Type (size) or code of equipment.

Tab. 7.39.

NORFLUX		
Equipment		Size [inches]
Ref.	Type	2"
A	Ch.	7 - 17 - 18 - 19 - 21 - 27 - 32 - 36 - 46 - 55
B	L.	300
F	Ch.	4 - 5 - 8
I	L.	65 x 100
L	L.	7999099
M	DN	19 - 60

Tab. 7.40.

NORFLUX + SB		
Equipment		Size [inches]
Ref.	Type	2"
A	Ch.	7 - 8 - 14 - 17 - 18 - 19 - 21 - 27 - 32 - 36 - 46 - 55
B	L.	300
E	DN	2 - 4 - 10
F	Ch.	4 - 5 - 8
I	Ch.	65 x 100
L	Ch.	7999099
M	Ch.	19 - 60
N	Code	7999019

Tab. 7.41.

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8 - COMMISSIONING

8.1 - GENERAL WARNINGS

8.1.1 - SAFETY REQUIREMENTS FOR COMMISSIONING

⚠ DANGER

During commissioning, the risks posed by possible discharges of flammable or noxious gases into the atmosphere must be assessed.

⚠ DANGER

In the case of installation on distribution networks for natural gas, the risk of explosive mixture (gas/air) formation inside the pipes should be considered if an inerting procedure of the line is not adopted.

⚠ WARNING

During commissioning operations, unauthorized personnel must stay out.
The interdiction area must be marked with signs and/or boundaries.

NOTICE

Commissioning must be carried out by authorized and licensed personnel.

The equipment and accessories present (the regulator with in-line monitor function, built-in SB slam-shut valve and pressure switches) are supplied already calibrated.

NOTICE

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

Before commissioning the equipment, it is necessary to verify that:

- all shut-off valves (inlet, outlet, bypass if any) are closed;
- the gas is at a temperature within the limits indicated on the rating plate.

Commissioning

Operator qualification	<ul style="list-style-type: none"> • Installer; • Licensed technician.
PPE required	 <p>⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any indications provided by the Safety Manager at the installation facility.
Equipment required	Refer to chapter “7 - Commissioning/maintenance equipment”.

Tab. 8.42.

8.2 - PRELIMINARY PROCEDURES FOR COMMISSIONING

⚠ DANGER

Before commissioning the equipment, it is mandatory to ensure that any explosion hazard or source of ignition has been eliminated.

⚠ WARNING

Before commissioning, it is necessary to ensure that the conditions of use are in accordance with the characteristics of the equipment.

⚠ CAUTION

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

- pressurization through a valve located downstream of the equipment itself;
- depressurization through a valve located upstream of the equipment itself.

Commissioning can be performed by following two different procedures:

Types of commissioning

Insertion of an inert fluid	<p>Pressurizing the equipment by inserting an inert fluid (e.g., nitrogen) to avoid potentially explosive mixtures for services with combustible gases.</p> <p>⚠ WARNING</p> <p>During the pressurization phase, always check the equipment for leaks.</p>
Direct insertion	<p>Direct insertion of the gas into the pipes by keeping the gas velocity within the pipes as limited as possible (maximum allowable value of 5 m/s).</p>

Tab. 8.43.

8.3 - VERIFICATION OF EXTERNAL TIGHTNESS

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

8.4 - CALIBRATION OF THE EQUIPMENT AND ACCESSORIES PRESENT

NOTICE

To perform proper calibration of the equipment and the accessories present, refer to the accuracy class shown on the identification plates (see section “2.8 - Identification plates applied”).

8.5 - REGULATOR COMMISSIONING PROCEDURE

In the application consisting of several pressure control lines, it is recommended to commission one line at a time starting with the one with the lowest set-point.

The set-point value is recalled on the test certificate attached to each piece of equipment.

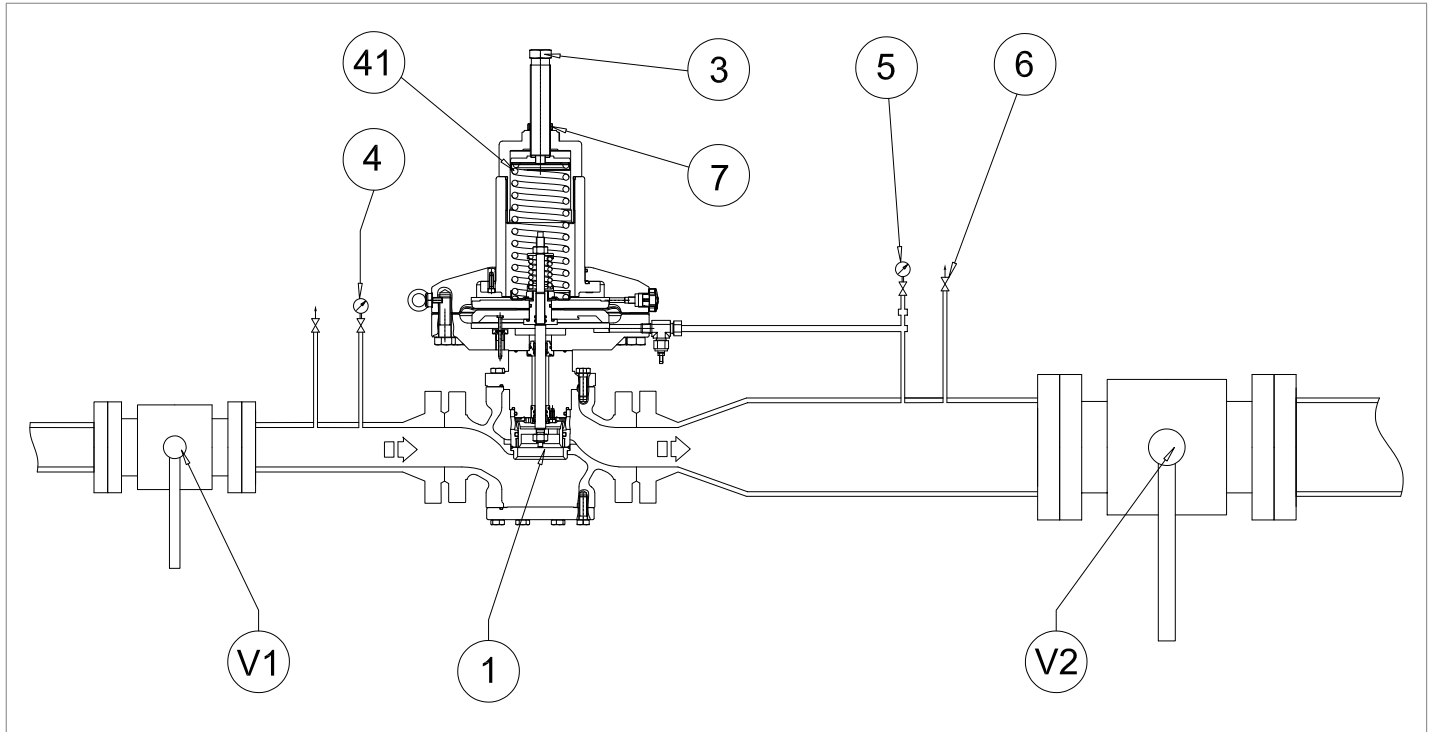


Fig. 8.17. Commissioning of the regulator NORFLUX

Step	Operation
1	Partially open the drain cock (6).
2	<p>Slowly open the upstream shut-off valve (V1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required setting value by more than 50%.</p> <p>NOTICE In the first pressurization phase of the line, the downstream pressure (Pd) of the downstream pressure gauge (5) may exceed the required calibration value, depending on the response time of the regulator.</p>
3	At the time the regulator enters into service, the downstream pressure (Pd) indicated by the downstream pressure gauge (5) will be equal to the calibration value of the regulator.
4	<p>4a- FOR FIRST COMMISSIONING OF THE CONTROL LINE If the downstream pressure (Pd) is not at the required calibration value, act as follows:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the set screw (3) clockwise • value of downstream pressure (Pd) higher than the required calibration value: unload the calibration spring by turning the adjustment screw (3) counterclockwise <p>4b- FOLLOWING MAINTENANCE OF THE CONTROL LINE</p> <ul style="list-style-type: none"> • load the calibration spring (41) and increase the pressure value of the main regulator (1) by turning the set screw (3) clockwise
5	Check the downstream pressure (Pd) by referring to the downstream pressure gauge (5).
6	Close the drain cock (6).
7	<p>Check that the downstream pressure (Pd), after an increment phase, does not exceed the shut-off pressure value (refer to the rating plate SG value, see par. 2.8).</p> <p>NOTICE If the pressure in the section of pipeline between the regulator and the downstream shut-off valve (V2) exceeds the shut-off pressure value, refer to chapter “10 - Fault finding and troubleshooting” to remove the causes of malfunctions.</p>
8	<p>Check the tightness of all connections between the shut-off valves (V1, V2).</p> <p>NOTICE Check the seal with a foaming substance;</p>
9	In case external leaks, eliminate the leakage points and repeat the procedure from step 7.
10	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system.</p>
11	Lock the set screw (3) via the fixing nut (7) of the regulator (1).

Tab. 8.44.

8.6 - REGULATION LINE COMMISSIONING PROCEDURE: REGULATOR AND REGULATOR WITH IN-LINE MONITOR FUNCTION

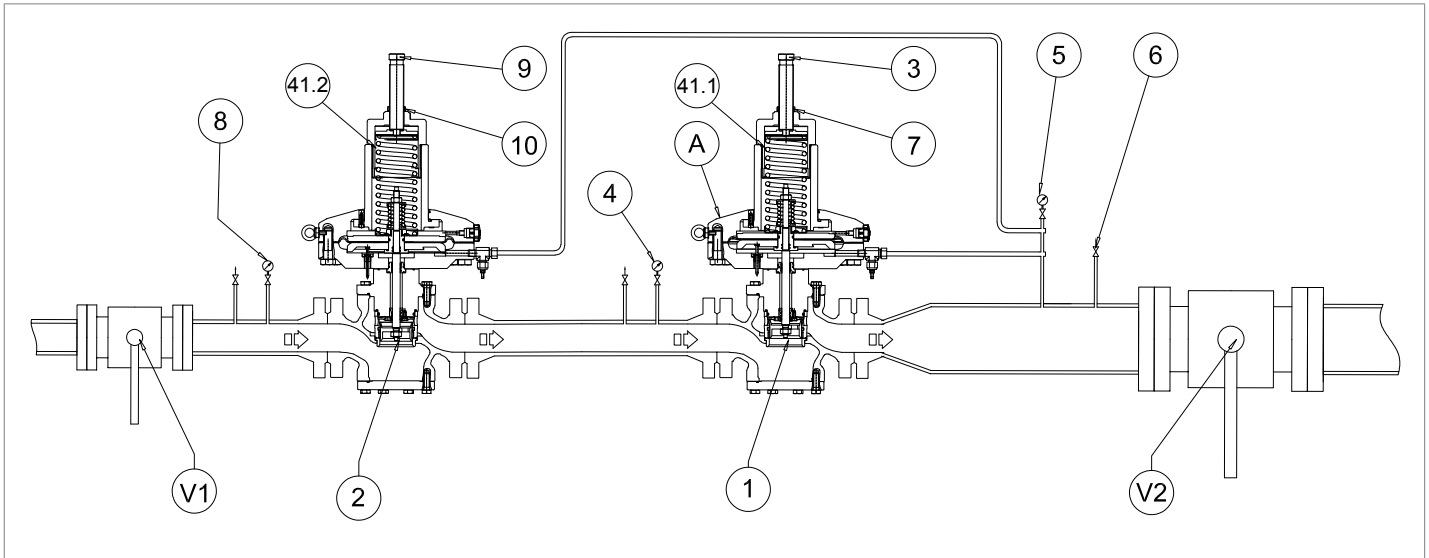
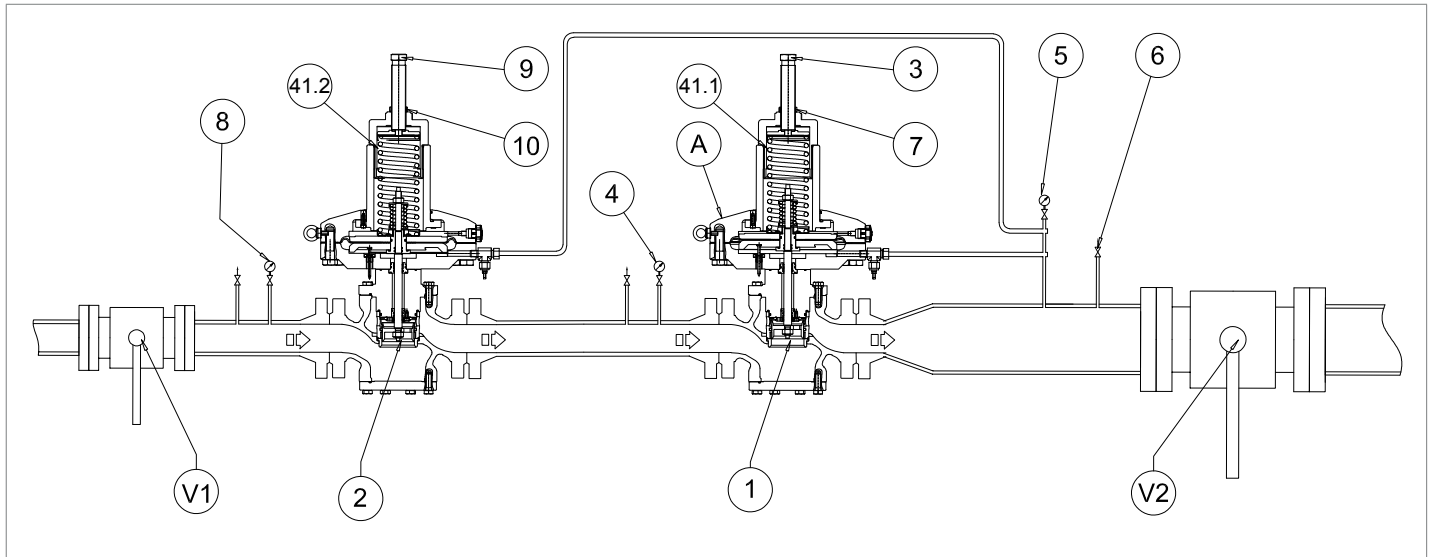


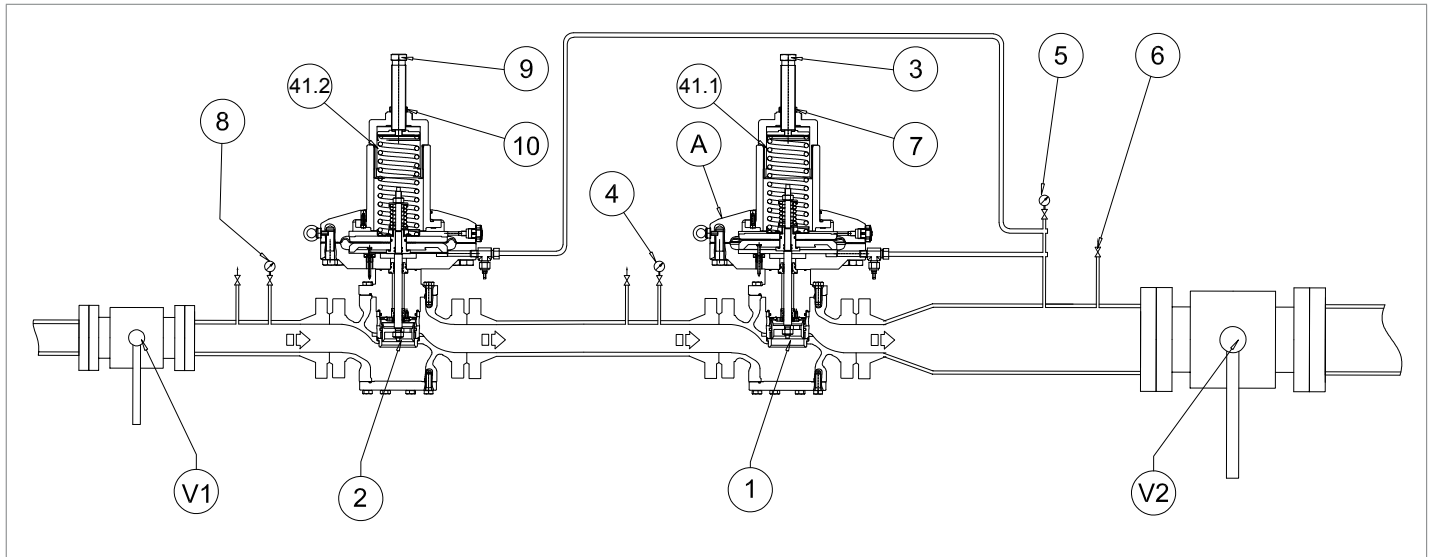
Fig. 8.18. Commissioning of regulator + regulator with in-line monitor function

Step	Operation
1	Partially open the drain cock (6).
2	<p>Slowly open the upstream shut-off valve (V1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required setting value by more than 50%.</p> <p>NOTICE</p> <p>In the first pressurization phase of the line, the downstream pressure (Pd) of the downstream pressure gauge (5) may exceed the required calibration value, depending on the response time of the main regulator (1).</p>
3	At the time the main regulator (1) enters into service, the downstream pressure (Pd) indicated on the downstream pressure gauge (5) will be equal to the calibration value of the main regulator (1).
4	<p>Verify that the regulator with in-line monitor function (2) is fully open (100%).</p> <p>NOTICE</p> <p>The regulator with monitor function (2) is fully open, when the pressure indicated on the intermediate pressure gauge (4) is the same as the upstream pressure gauge (8). If not fully open, refer to chapter “10 - Fault finding and troubleshooting” in order to remove the causes of the malfunctions.</p>
5	Fully open the upstream shut-off valve (V1).
6	Increase the value of the downstream pressure (Pd) beyond the calibration value of the regulator with monitor function (2) by turning the set screw (3) of the main regulator (1) clockwise.
7	Verify that the regulator with in-line monitor function (2) is operating by checking that the pressure indicated on the intermediate pressure gauge (4) is equal to the calibration value of the regulator with in-line monitor function (2).
8	<p>8a- FOR FIRST COMMISSIONING OF THE CONTROL LINE</p> <p>If the downstream pressure (Pd) is not at the required calibration value for the regulator with in-line monitor function (2), proceed as follows:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the set screw (9) clockwise • value of downstream pressure (Pd) higher than the required calibration value: unload the calibration spring by turning the set screw (9) counterclockwise <p>8b- FOLLOWING MAINTENANCE OF THE CONTROL LINE</p> <ul style="list-style-type: none"> • increase the value of the downstream pressure (Pd) beyond the calibration value of the regulator with monitor function (2) by turning the set screw (3) of the main regulator (1) clockwise. • load the calibration spring (41.2) and increase the pressure value of the regulator with monitor function (2) by turning the set screw (9) clockwise
9	<p>Check the calibration value of the regulator with in-line monitor function (2), referring to the downstream pressure gauge (5).</p> <p>NOTICE</p> <p>If the calibration pressure is not at the set value, repeat steps 8a (first commissioning) or 8b (following maintenance).</p>
10	Slowly close the drain cock (6).



Commissioning of regulator + regulator with in-line monitor function

Step	Operation
11	<p>Check that the downstream pressure, after an increment phase, does not exceed the closing pressure value of the regulator with in-line monitor function (2) (refer to the rating plate SG value, see paragraph “2.8 - Identification plates applied”).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shut-off pressure value, refer to chapter “10 - Fault finding and troubleshooting” to remove the causes of malfunctions. • Check the pressure by referring to the downstream pressure gauge (5).
12	Partially open the drain cock (6).
13	Unload the main regulator adjustment spring (1).
14	<p>Verify that the regulator with in-line monitor function (2) is fully open (100%).</p> <p>NOTICE</p> <p>The regulator with in-line monitor function (2) is fully open, when the pressure indicated on the intermediate pressure gauge (4) is the same as the upstream pressure gauge (8).</p>
15	Check that the calibration pressure of the main regulator (1) is at the set value by referring to the pressure value indicated by the downstream pressure gauge (5).
16	<p>16a- FOR FIRST COMMISSIONING OF THE CONTROL LINE If the downstream pressure (Pd) is not at the required calibration value, act as follows:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the set screw (3) clockwise • value of downstream pressure (Pd) higher than the required calibration value: unload the calibration spring by turning the adjustment screw (3) counterclockwise <p>16b- FOLLOWING MAINTENANCE OF THE CONTROL LINE.</p> <ul style="list-style-type: none"> • load the calibration spring (41.1) and increase the pressure value of the main regulator (1) by turning the set screw (3) clockwise
17	Slowly close the drain cock (6).
18	<p>Check that the downstream pressure, after an increment phase, does not exceed the closing pressure value of the main regulator (1) (refer to the rating plate SG value, see paragraph “2.8 - Identification plates applied”).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shut-off pressure value, refer to chapter “10 - Fault finding and troubleshooting” to remove the causes of malfunctions. • Check the pressure by referring to the downstream pressure gauge (5).
19	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
20	In case external leaks, eliminate the leakage points and repeat the procedure from step 1.



Commissioning of regulator + regulator with in-line monitor function

Step	Operation
21	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • <u>Check the pressure by referring to the downstream pressure gauge (5).</u>
22	Lock the set screw (9) via the fixing nut (10) of the regulator with in-line monitor function (2).
23	Lock the set screw (3) via the fixing nut (7) of the main regulator (1).

Tab. 8.45.

8.7 - COMMISSIONING PROCEDURE OF THE NORFLUX REGULATOR WITH SLAM-SHUT VALVE

8.7.1 - CHECK FOR LEAKAGE OF THE SLAM-SHUT VALVE

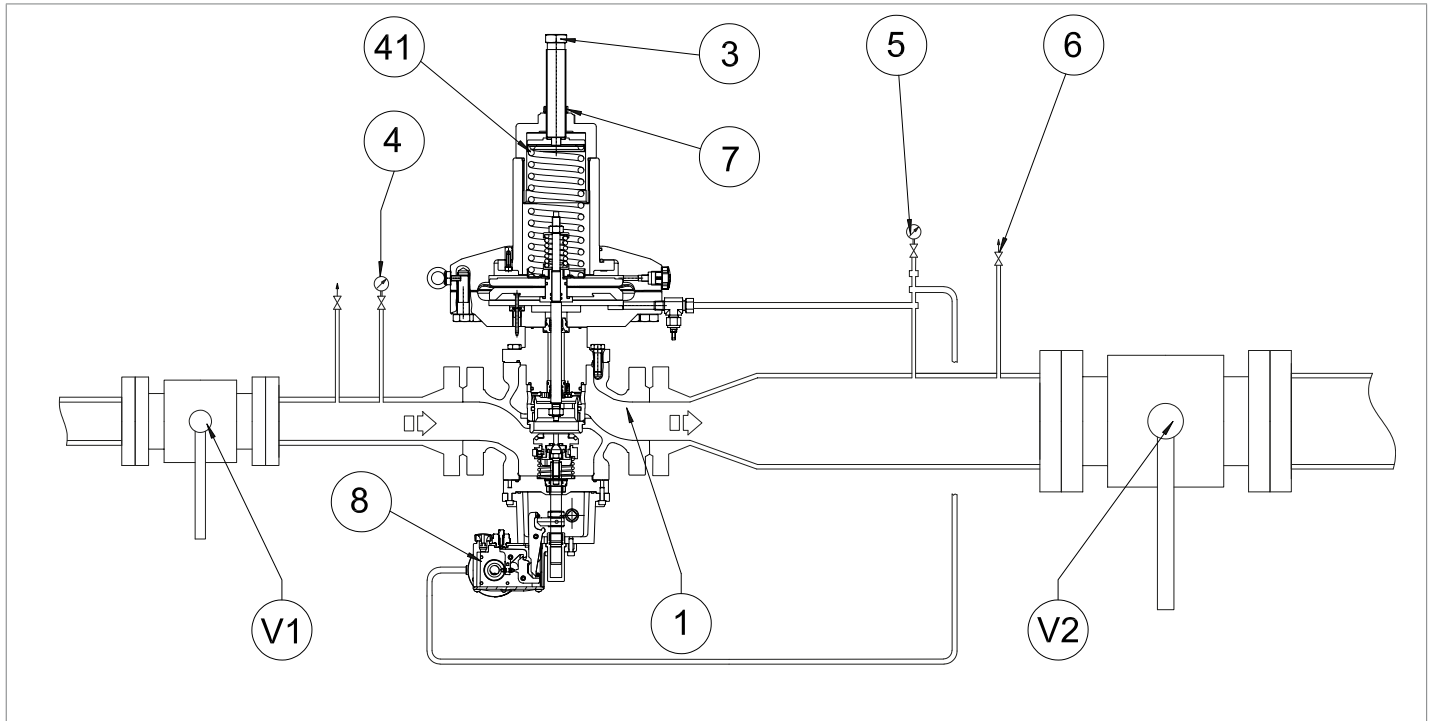


Fig. 8.19. Commissioning of the regulator NORFLUX with slam-shut valve

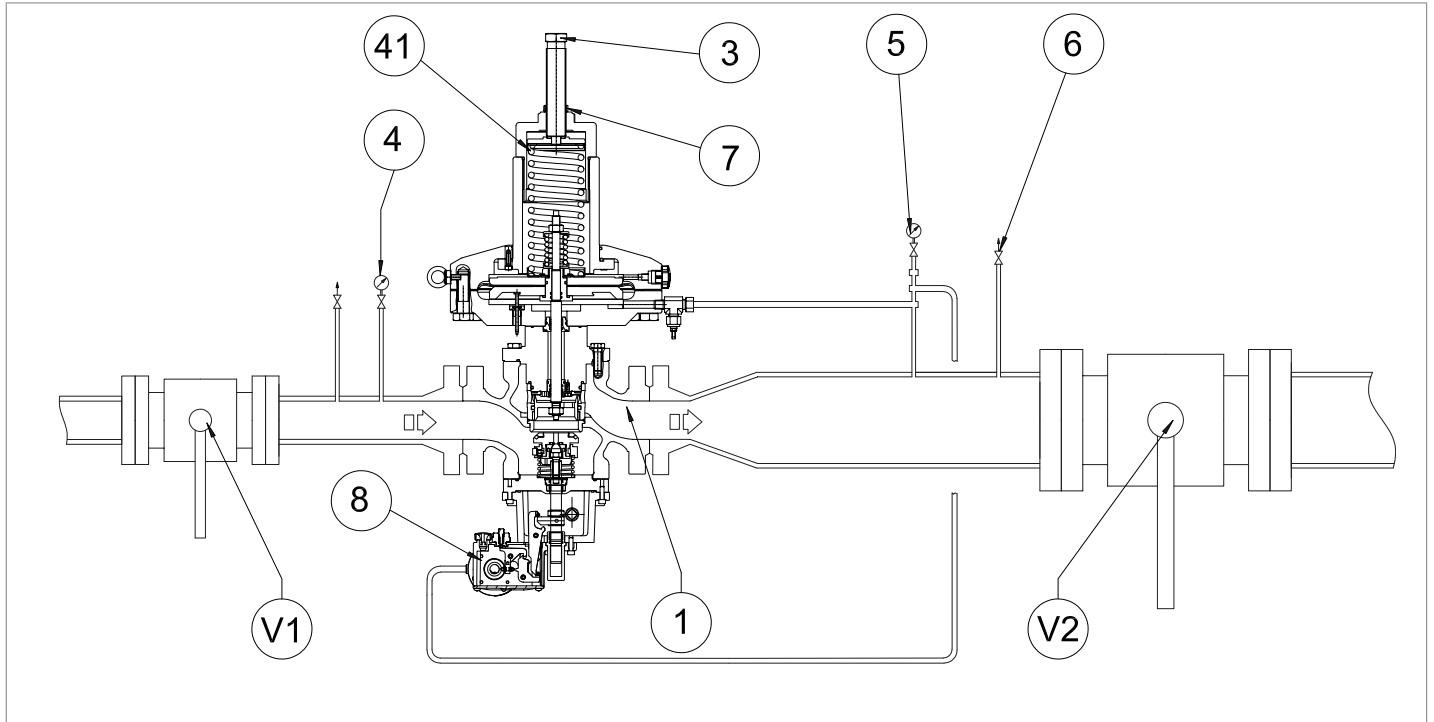
Step	Operation
1	Check that the slam-shut valve is in the closed position.
2	Open the drain cock (6) to completely drain the downstream section.
3	Slowly open the upstream shut-off valve (V1).
4	Check the internal seal of the slam-shut valve through the drain valve (6). <div style="background-color: #0070c0; color: white; padding: 2px; display: inline-block; font-weight: bold;">NOTICE</div> <ul style="list-style-type: none"> Check the seal with a foaming substance; In case of leaks, refer to chapter "10 - Fault finding and troubleshooting" to remove the causes of the malfunctions.

Tab. 8.46.

8.7.2 - COMMISSIONING OF THE REGULATOR NORFLUX WITH SLAM-SHUT VALVE

For the following procedure, refer to Fig. 8.19 of paragraph “8.7.1 - Check for leakage of the slam-shut valve”:

Step	Operation
1	Check that the drain cock (6) is partially open.
2	Check that the slam-shut valve is in the closed position. NOTICE If the slam-shut valve is in open position, close it via the manual button (Fig. 8.20, ref. 10).
3	Slowly open the upstream shut-off valve (V1), checking the pressure value indicated by the upstream pressure gauge (4).
4	Perform the internal leakage test of the SB slam-shut valve, referring to paragraph “8.7.1 - Check for leakage of the slam-shut valve”. NOTICE In case of leakage, refer to chapter 10 "Fault finding and troubleshooting" to remove the causes of malfunctions.
5	Slowly pressurize the control line, acting on the slam-shut valve lever (refer to the "Operation" section of paragraph “4.5.2.1 - Built-in SB slam-shut valve”), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required calibration value by more than 50%.
6	When the regulator is put into service, the pressure of the downstream pressure gauge (5) will be equal to the setting value of the main regulator. NOTICE In the first pressurization phase of the line, the pressure of the downstream pressure gauge (5) may exceed the required calibration value, depending on the response time of the regulator.
7	Fully open the upstream shut-off valve (V1).
8	Check the pressure switch settings of the slam-shut valve by referring to paragraph “8.7.3 - Calibration procedure of pressure switches mod. 100”.
9	9a- FOR FIRST COMMISSIONING OF THE CONTROL LINE If the downstream pressure (Pd) is not at the required calibration value, act as follows: <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the set screw (3) clockwise • value of downstream pressure (Pd) higher than the required calibration value: unload the calibration spring by turning the adjustment screw (3) counterclockwise 9b- FOLLOWING MAINTENANCE OF THE CONTROL LINE <ul style="list-style-type: none"> • load the calibration spring (41) and increase the pressure value of the regulator (1) by turning the set screw (3) clockwise
10	Check the downstream pressure (Pd) by referring to the downstream pressure gauge (5).
11	Close the drain cock (6).



Commissioning of the regulator NORFLUX with SB slam-shut valve

Step	Operation
12	<p>Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value (refer to the rating plate SG value, see “2.8 - Identification plates applied”).</p> <p>NOTICE If the pressure in the section of pipeline between the regulator and the downstream shut-off valve (V2) exceeds the shut-off pressure value, refer to chapter “10 - Fault finding and troubleshooting” to remove the causes of malfunctions.</p>
13	<p>Check the tightness of all connections between the shut-off valves (V1, V2).</p> <p>NOTICE Check the seal with a foaming substance;</p>
14	<p>In case external leakage is found, eliminate the leakage points and repeat the procedure from step 7.</p>
15	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system.</p>
16	<p>Lock the set screw (3) via the fixing nut (7) of the regulator (1).</p>

Tab. 8.47.

8.7.3 - CALIBRATION PROCEDURE OF PRESSURE SWITCHES MOD. 100

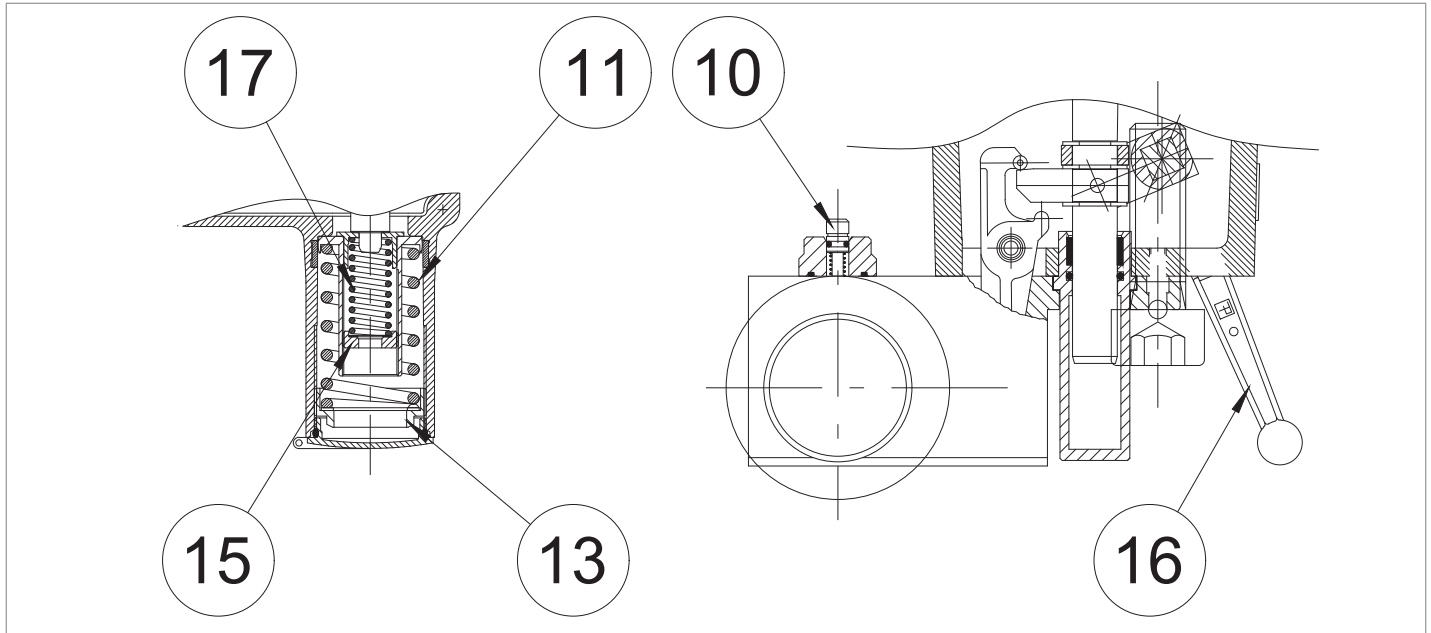


Fig. 8.20. Calibration of model 100 pressure switches

Calibration of spring for maximum pressure trip

Step	Operation
1	<p>Increase the downstream pressure to the slam-shut valve trip value by turning the set screw (10) of the pilot (2) of the main regulator (1) to check the correct setting.</p> <p>NOTICE</p> <p>Check the pressure by referring to the pressure gauge (Fig. 8.17, ref. 5) placed downstream of the main regulator.</p> <p>If the slam-shut valve:</p> <ul style="list-style-type: none"> trips before the expected pressure value: tighten (clockwise) the adjustment ring nut (13) so as to compress the spring (11) more; does not trip at the expected pressure value: unscrew (counterclockwise) the adjustment ring nut (13), so as to relieve the spring (11).
2	Decrease the pressure of the downstream section by opening the drain cock (Fig. 8.17, ref. 6) to bring it up to the calibration value of the main regulator.
3	Close the drain cock (Fig. 8.17, ref. 6).
4	<p>Arm the slam-shut valve by acting on the reset lever (16).</p> <p>NOTICE</p> <p>To reset the slam-shut valve, decrease the downstream pressure (Pd) to the normal operating pressure of the line and below the pressure switch calibration value.</p>
5	<p>Repeat steps 2-3-4 at least three times.</p> <p>NOTICE</p> <p>The calibration value must comply with the operating limits indicated on the rating plate.</p>

Tab. 8.48.

CALIBRATION OF SPRING FOR TRIPPING BY MINIMUM PRESSURE (IF ANY)

Step	Operation
1	Partially open the drain cock (Fig. 8.17, ref. 6) in the atmosphere and keep it open for the next steps.
2	<p>Decrease the downstream pressure to the minimum required slam-shut trip pressure by acting on the set screw of the pilot of the main regulator.</p> <p>NOTICE</p> <p>Check the pressure by referring to the downstream pressure gauge (Fig. 8.17, ref. 5).</p> <p>If the slam-shut valve:</p> <ul style="list-style-type: none"> • does not trip before the expected pressure value: unscrew (counterclockwise) the adjustment ring nut (15), so as to relieve the spring (17); • does not trip before the expected pressure value: tighten (clockwise) the adjusting screw (15) so as to compress the spring (17) more;
3	Open the block by acting on the reset lever (16) and keep it open manually.
4	Increase the downstream pressure to the calibration value of the regulator by acting on the set screw (10) of the pilot (2) of the main regulator (1).
5	Arm the slam-shut valve.
6	Verify the correct calibration of the minimum spring by repeating steps 1-2-3-4 at least three times.
7	Close the drain cock (Fig. 8.17, ref. 6).

Tab. 8.49.

8.8 - REGULATION LINE COMMISSIONING PROCEDURE: REGULATOR, REGULATOR WITH IN-LINE MONITOR FUNCTION AND SLAM-SHUT VALVE

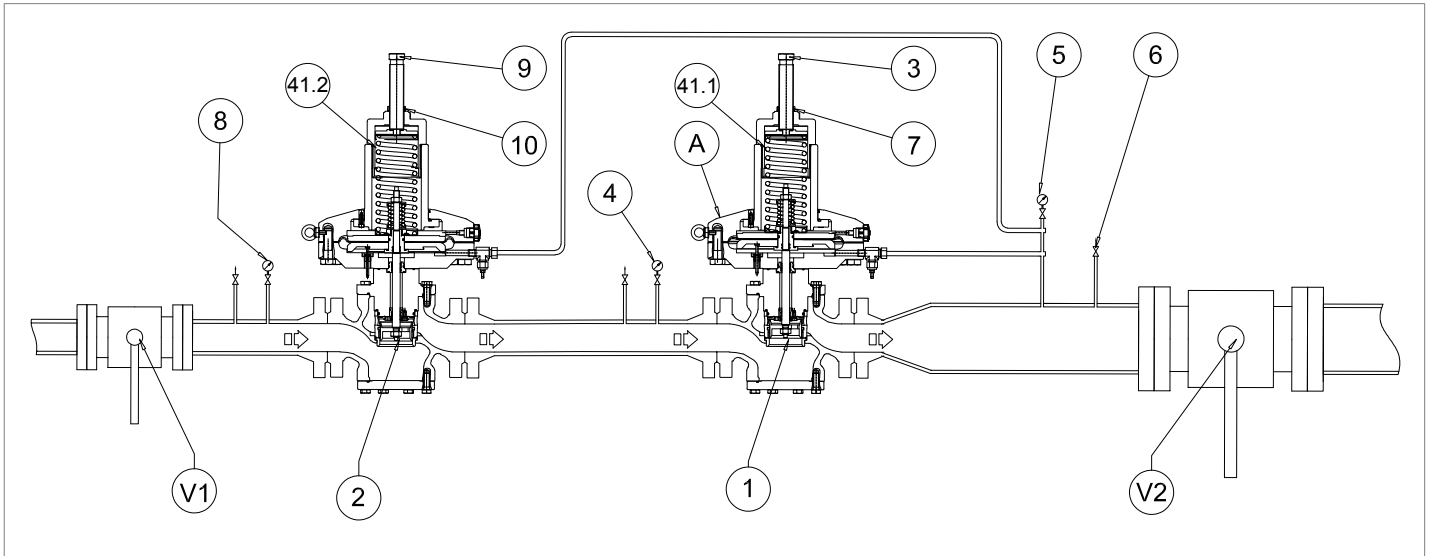
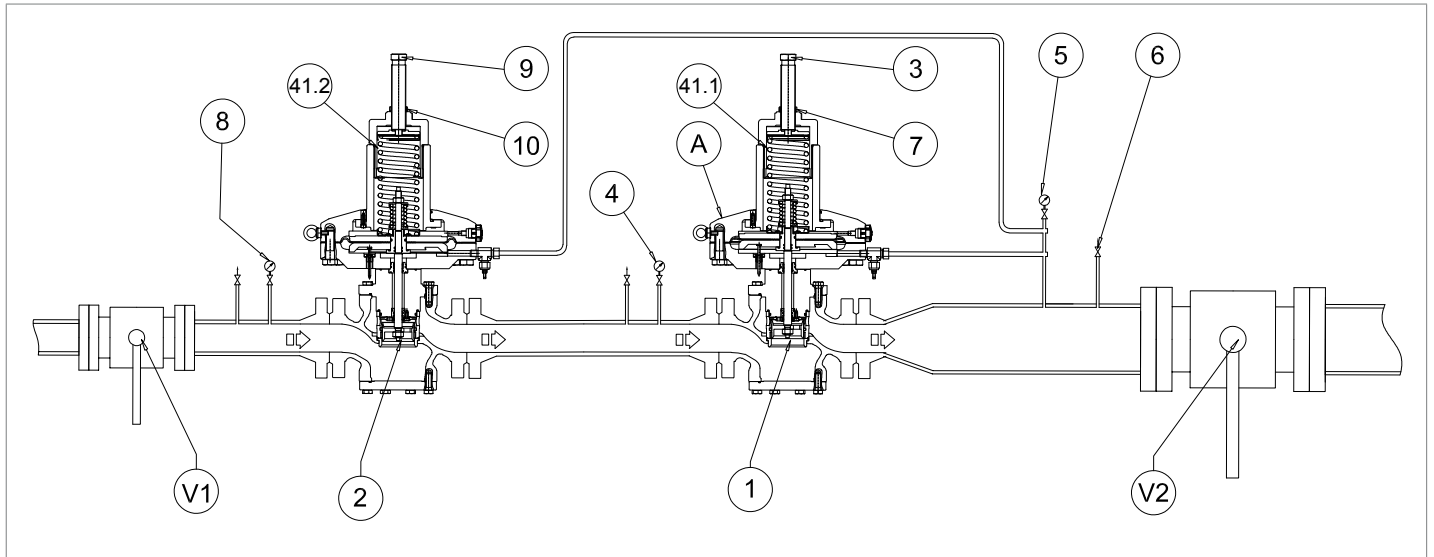


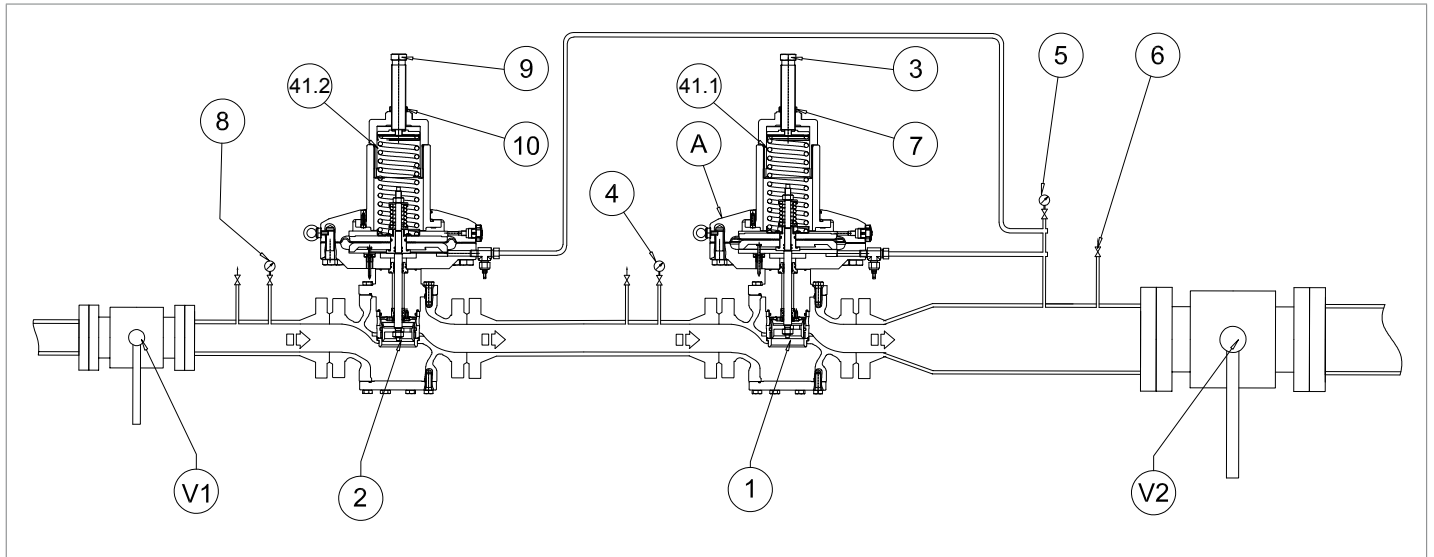
Fig. 8.21. Commissioning of the regulator, regulator with in-line monitor function and slam-shut valve

Step	Operation
1	Check that the drain cock (6) is partially open.
2	<p>Check that the slam-shut valve is in the closed position.</p> <p>NOTICE</p> <p>If the slam-shut valve is in open position, close it via the manual button (Fig. 8.20, ref. 10).</p>
3	Slowly open the upstream shut-off valve (V1), checking the pressure value indicated by the upstream pressure gauge (4).
4	<p>Perform the internal leakage test of the LA slam-shut valve, referring to paragraph “8.7.1 - Check for leakage of the slam-shut valve”.</p> <p>NOTICE</p> <p>In case of leaks, refer to chapter “10 - Fault finding and troubleshooting” to remove the causes of the malfunctions.</p>
5	Check that the drain cock (6) is partially open.
6	Slowly pressurize the control line, acting on the slam-shut valve lever (refer to the "Operation" section of paragraph “4.5.2.1 - Built-in SB slam-shut valve”), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required calibration value by more than 50%.
7	<p>When the regulator is put into service, the pressure of the downstream pressure gauge (5) will be equal to the setting value of the main regulator.</p> <p>NOTICE</p> <p>In the first pressurization phase of the line, the pressure of the downstream pressure gauge (5) may exceed the required calibration value, depending on the response time of the regulator.</p>
8	Check the pressure switch settings of the slam-shut valve by referring to paragraph “8.7.3 - Calibration procedure of pressure switches mod. 100”.
9	<p>Verify that the regulator with in-line monitor function (2) is fully open (100%).</p> <p>NOTICE</p> <p>The regulator with monitor function (2) is fully open, when the pressure indicated on the intermediate pressure gauge (4) is the same as the upstream pressure gauge (8).</p>
10	Fully open the upstream shut-off valve (V1).
11	<p>Increase the value of the downstream pressure (Pd) beyond the calibration value of the regulator with monitor function (2) by turning the set screw (3) of the main regulator (1) clockwise.</p> <p>NOTICE</p> <p>The value of the pressure input from the external source can be up to 50% higher than the calibration value of the regulator with in-line monitor function (2).</p>
12	Verify that the regulator with in-line monitor function (2) is operating by checking that the pressure indicated on the intermediate pressure gauge (4) is equal to the calibration value of the regulator with in-line monitor function (2).



Commissioning of NORFLUX regulator + regulator with in-line monitor function

Step	Operation
13	<p>FOR INITIAL COMMISSIONING OF THE CONTROL LINE</p> <p>If the downstream pressure (Pd) is not at the required calibration value for the regulator with in-line monitor function (2), proceed as follows:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the set screw (9) clockwise • value of downstream pressure (Pd) higher than the required calibration value: unload the calibration spring by turning the set screw (9) counterclockwise <p>FOLLOWING MAINTENANCE OF THE CONTROL LINE</p> <ul style="list-style-type: none"> • load the calibration spring (41.2) and increase the pressure value of the regulator with in-line monitor function (2) by turning the set screw (9) clockwise
14	<p>Check the calibration value of the regulator with in-line monitor function (2), referring to the downstream pressure gauge (5).</p> <p>NOTICE</p> <p>If the calibration pressure is not at the set value, repeat steps 15a (first commissioning) or 15b (following maintenance).</p>
15	<p>Slowly close the drain cock (6).</p>
16	<p>Check that the downstream pressure, after an increment phase, does not exceed the closing pressure value of the regulator with in-line monitor function (2) (refer to the rating plate SG value, see paragraph 2.8).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shutdown pressure value, refer to chapter 10 "Troubleshooting" to remove the causes of malfunctions. • Check the pressure by referring to the downstream pressure gauge (5).
17	<p>Partially open the drain cock (6).</p>
18	<p>Unload the main regulator (1) adjustment spring (41.1).</p>
19	<p>Verify that the regulator with in-line monitor function (2) is fully open (100%).</p> <p>NOTICE</p> <p>The regulator with monitor function (2) is fully open, when the pressure indicated on the intermediate pressure gauge (4) is the same as the upstream pressure gauge (8).</p>
20	<p>Check that the calibration pressure of the main regulator (1) is at the set value by referring to the pressure value indicated by the downstream pressure gauge (5).</p>
21	<p>FOR INITIAL COMMISSIONING OF THE CONTROL LINE</p> <p>If the downstream pressure (Pd) is not at the required calibration value, act as follows:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the set screw (3) clockwise • value of downstream pressure (Pd) higher than the required calibration value: unload the calibration spring by turning the adjustment screw (3) counterclockwise <p>FOLLOWING MAINTENANCE OF THE CONTROL LINE</p> <ul style="list-style-type: none"> • load the calibration spring (41.1) and increase the pressure value of the main regulator (1) by turning the set screw (3) clockwise
22	<p>Slowly close the drain cock (6).</p>



Commissioning of NORFLUX regulator + regulator with in-line monitor function

Step	Operation
23	<p>Check that the downstream pressure, after an increment phase, does not exceed the closing pressure value of the main regulator (1) (refer to the rating plate SG value, see paragraph “2.8 - Identification plates applied”).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shutdown pressure value, refer to chapter “10 - Fault finding and troubleshooting” to remove the causes of malfunctions. • Check the pressure by referring to the downstream pressure gauge (5).
24	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
25	In case external leakage is found, eliminate the leakage points and repeat the procedure from step 10.
26	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the downstream pressure gauge (5).
27	Lock the set screw (9) via the fixing nut (10) of the regulator with in-line monitor function (2).
28	Lock the set screw (3) via the fixing nut (7) of the main regulator (1).

Tab. 8.50.

COMMISSIONING THE SLAM-SHUT VALVE

NOTICE

Refer to paragraph “8.7.3 - Calibration procedure of pressure switches mod. 100”.

8.9 - ANTIPUMPING VALVE

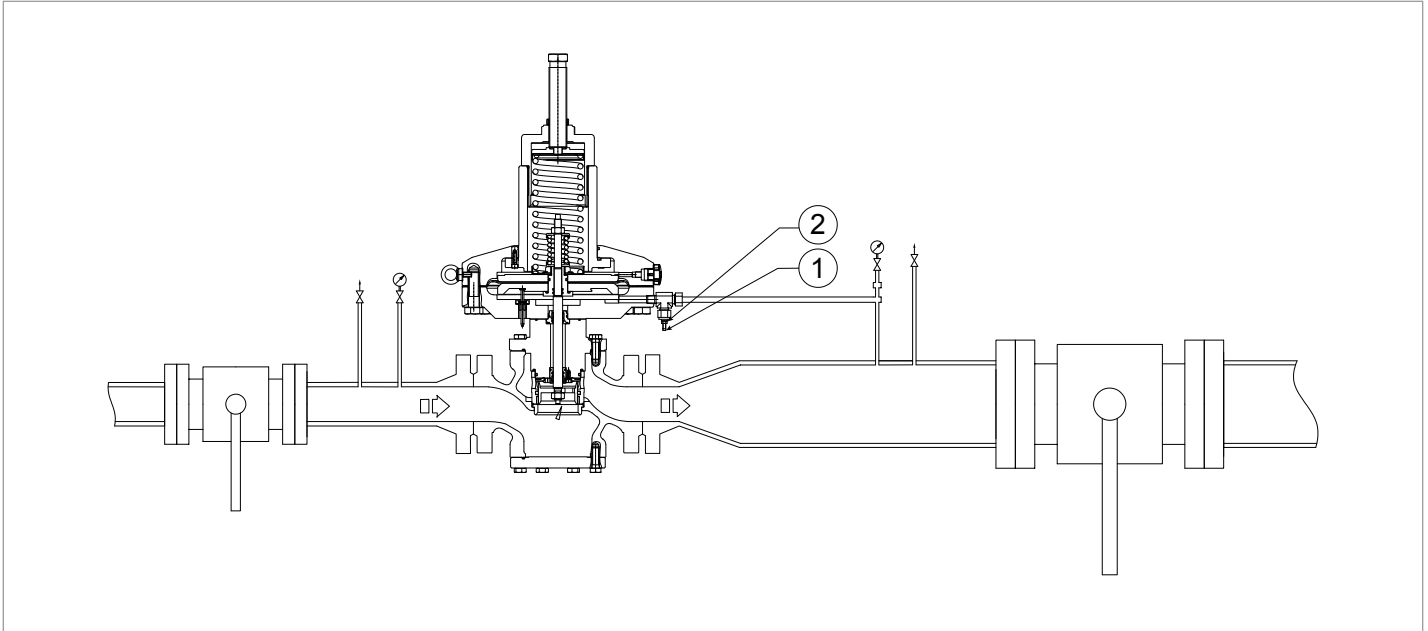


Fig. 8.22. Antipumping valve

In case of light pumping of the regulator, due to small volumes or low flow rates, adjust the flow rate of the downstream sensing line with the anti-pumping valve. Proceed as described:

1. Loosen the nut (2)
2. Partially tighten the screw (1) until the pumping stopped.
3. Tighten the nut (2).

8.10 - CALIBRATION OF DEVICES

8.10.1 - CALIBRATION OF PRESSURE SWITCH MOD. 100

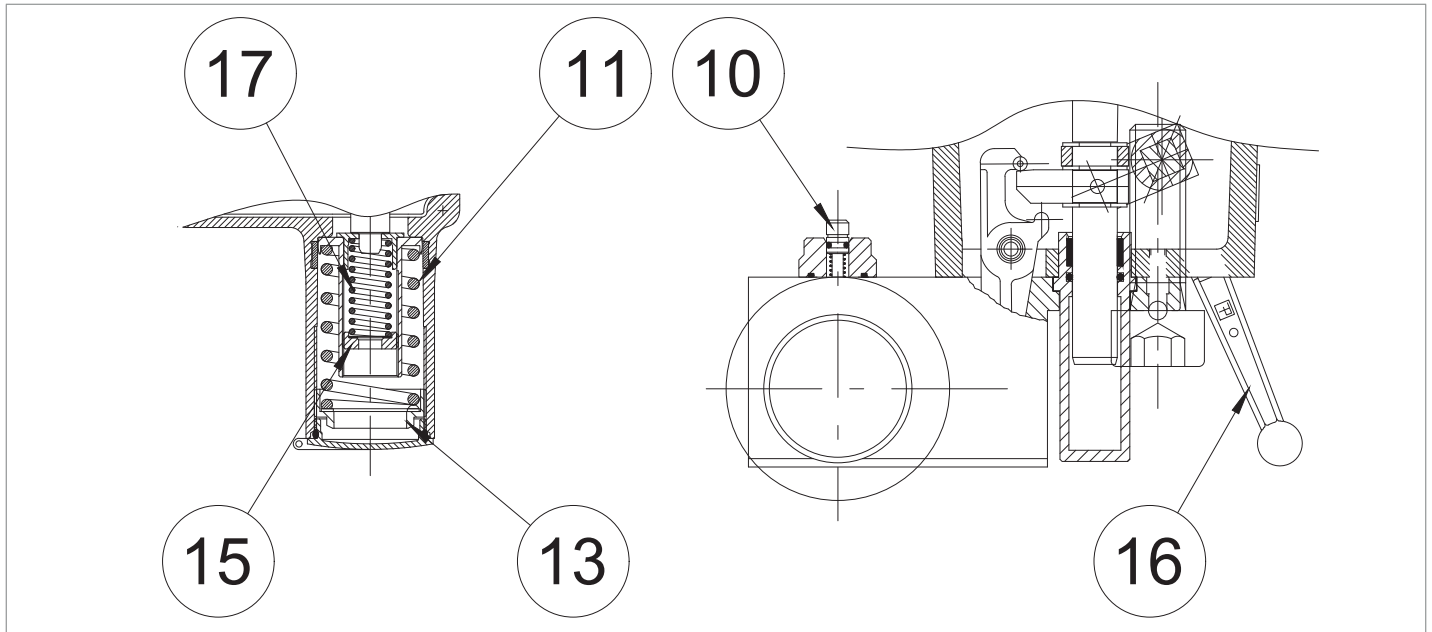


Fig. 8.23. Calibration of model 100 pressure switches

Act on the ring nut (13) for maximum tripping (spring ref. 11):

- counterclockwise to decrease the slam-shut trip pressure;
- clockwise to increase the slam-shut trip pressure.

Act on the ring nut (15) for minimum tripping (spring ref. 17):

- counterclockwise to decrease the slam-shut trip pressure;
- clockwise to increase the slam-shut trip pressure.

NOTICE

For calibration ranges, refer to the chapter “13 - Calibration tables”.

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9 - MAINTENANCE AND FUNCTIONAL TESTING

9.1 - GENERAL WARNINGS

⚠ DANGER

- Maintenance operations must be performed by personnel trained in workplace safety, qualified and authorized for the activities inherent in the equipment.
- Each maintenance operation requires a thorough and specialized knowledge of the equipment, the operations required, the risks involved, and the proper procedures for operating it safely.
- Repair or maintenance work not provided for in this manual may be carried out only with prior approval from PIETRO FIORENTINI S.p.A.. No liability related to damage to persons or property can be attributed to PIETRO FIORENTINI S.p.A. for interventions other than those described or performed in a manner other than those indicated.

⚠ WARNING

Before carrying out any work, it is important to make sure that the line on which the equipment is installed:

- Has been intercepted upstream and downstream;
- Has been discharged.

After releasing pressure from the line, trip the slam-shut valve.

⚠ WARNING

When in doubt, it is forbidden to operate. Contact PIETRO FIORENTINI S.p.A. for necessary clarification.

Operation and/or use of the equipment includes interventions that become necessary as a result of normal use such as:

- inspections and monitoring;
- functional verifications;
- routine maintenance;
- extraordinary maintenance.

NOTICE

Maintenance interventions are closely related:

- to the quality of the transported gas (impurities, moisture, gasoline, corrosive substances);
- to the efficiency of filtration;
- to the conditions under which the equipment is used.

Good management of the equipment requires to:

- comply with the intervals specified in the manual for functional checks and routine maintenance.
- not exceeding the time interval between interventions. The time interval is intended to be the maximum acceptable; it can be shortened instead;
- promptly check the cause of any abnormalities such as excessive noise, fluid leakage or the like and remedy them. removing any causes of anomalies and/or malfunctions in a timely manner prevents further damage to equipment and ensures the safety of operators;

Before beginning equipment disassembly operations, it should be ensured that:

- spare parts and parts used in replacements have appropriate requirements in order to ensure the original performance of the equipment. Use genuine compliant spare parts;
- the operator has the necessary equipment (refer to chapter "7 - Commissioning/maintenance equipment").

NOTICE

Recommended replacement parts are unambiguously identified with tags indicating:

- **the assembly drawing number of the equipment in which they can be used (see chapter "12 - Recommended spare parts");**
- **the location shown on the equipment assembly drawing.**


Equipment maintenance operations are operationally divided into three main categories:

Commissioning maintenance operations

Periodic checks and inspections	All those checks that the operator must perform on a periodic basis for the proper maintenance and operation of the equipment.
Routine maintenance	All those operations that the operator needs to carry out in a preventive manner to ensure proper operation of the equipment over time. Routine maintenance includes: <ul style="list-style-type: none"> • inspection; • control; • adjustment; • cleaning; • lubrication; • replacement; of all spare parts.
Extraordinary maintenance	All those operations that the operator has to perform when the equipment needs it.

Tab. 9.51.

9.2 - PERIODIC CHECKS AND VERIFICATIONS OF PROPER OPERATION

Periodic checks and inspections	
Operator qualification	Mechanical maintenance technician
PPE required	 <p>⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any indications provided by the Safety Manager at the installation facility.</u>

Tab. 9.52.

Table "Tab. 9.53." lists the checks and tests, i.e., operations that do not require any manual intervention on the individual equipment.

Some can be replaced by monitoring carried out from a remote point by means of appropriate remote control devices.

Activity Description	Equipment/Accessories Involved	Evaluation criterion	Minimum frequency
Significant performance check*	Pressure regulators	<ul style="list-style-type: none"> • Absence of fluctuations in regulated pressure. • Values of significant pressures within established limits. 	Monthly
	Gas flow lock type safety devices (external position indicator)	<ul style="list-style-type: none"> • Completely open position. 	
	Standby monitor (external position indicator)	<ul style="list-style-type: none"> • Completely open position. 	
Equipment external state visual inspection	All	<ul style="list-style-type: none"> • Absence of visible damage. • External surface protection as UNI 9571-1:2012. 	Semiannual

Tab. 9.53.

* These checks can be performed remotely in the presence of a remote control system capable of analyzing significant performance related to the equipment and sending alerts/alarms when predetermined thresholds are reached.

9.3 - ROUTINE MAINTENANCE

9.3.1 - GENERAL SAFETY WARNINGS

⚠ DANGER

Put the equipment in a safe condition (close the downstream and then upstream shut-off valve, drain the line completely);

Make sure the pressure upstream and downstream of the equipment is "0".

⚠ WARNING

After releasing pressure from the line, trip the slam-shut valve.

NOTICE

Before installing new sealing elements (O-ring, diaphragm, etc.), their integrity should be checked.

9.3.2 - FREQUENCY OF REPLACEMENT OF COMPONENTS SUBJECT TO WEAR AND TEAR

NOTICE

The following directions apply only to the components of the equipment.

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

Preventive maintenance operations

Category 1	Parts subject to wear and/or abrasion where by: <ul style="list-style-type: none"> Wear and tear means the normal degradation of a part after prolonged use under ordinary operating conditions; abrasion means the mechanical action on the surface of the involved part resulting from the passage of gas under ordinary operating conditions.
Category 2	Parts subject to aging only including parts that also require lubrication and/or cleaning activities.

Tab. 9.54.

NOTICE


Check the state of wear/abrasion/aging of the components present within the minimum frequency specified in "Tab. 9.55."

Category	Part description	Evaluation criterion	Minimum replacement frequency
1	Sealing rings of non-metal valve seats and plugs	Pressure regulators	6 years
		Safety devices	
		Pressure safety system equipment	
1	Nonmetallic parts with internal sealing function of valve seats and accessories of individual equipment	Pilots	6 years
		Pre-reducers	
		Accelerators	
		Miscellaneous	

Category	Part description	Evaluation criterion	Minimum replacement frequency
1	Nonmetallic parts with a sealing function between parts of which, at least one, is in motion under ordinary working conditions/operation	Pressure regulators	6 years
		Gas flow block type safety devices	
		Relief devices with discharge to atmosphere	
1	Nonmetallic parts with sealing function involved in disassembly operations during maintenance	Equipment subject to maintenance	6 years
2	Non-metallic parts that provide "feedback" (sensitive elements) of the controlled pressure of safety equipment	Safety equipment and/or related accessories	6 years
2	Nonmetallic parts with sealing and performance functions (diaphragms) of a piece of equipment	Pressure regulators and related accessories	6 years
		Gas flow block type safety devices	6 years
		Relief device with discharge to atmosphere	6 years
2	Nonmetallic parts of equipment with internal sealing function: under ordinary operating conditions during maintenance	Relief valves	6 years
		Control line disconnection equipment	In the presence of ascertained leaks
2	Non-metallic parts with only static sealing function	Miscellaneous equipment	In the presence of ascertained leaks
2	Lubricating parts subject to lubrication	Shut-off valves	Yearly
		Other equipment	Yearly
2	Filter elements	Filters	As needed

Tab. 9.55.

9.4 - ROUTINE MAINTENANCE PROCEDURES

Routine maintenance	
Operator qualification	Mechanical maintenance technician
PPE required	 <p>⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> the regulations in force in the country of installation; <u>any indications provided by the Safety Manager at the installation facility.</u>
Equipment required	Refer to chapter "7 - Commissioning/maintenance equipment".

Tab. 9.56.

9.4.1 - TIGHTENING TORQUES

9.4.1.1 - TIGHTENING TORQUES NORFLUX

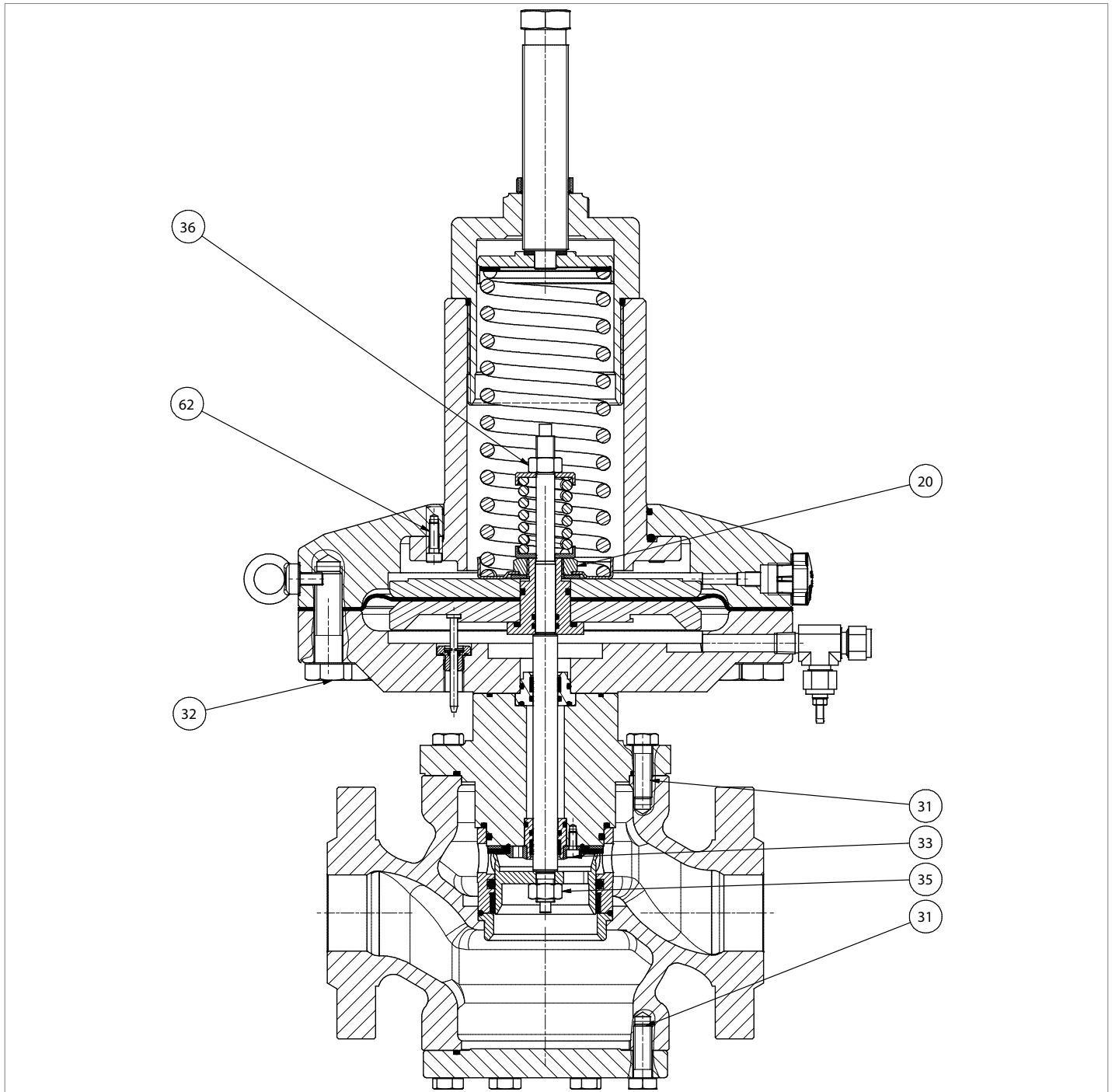


Fig. 9.24. Tightening torques NORFLUX

NORFLUX 2"			
Pos.	Description	Torque (Nm)	Torque (ft-lb)
20	Nut M24X2	40	29
31	Screw M12X 35 UNI 5739	45	33
32	Screw M18X60 UNI 5737	70	44
33	Screw M5X12 UNI 5931	10	7
35	Nut M12X1, 25 UNI 5588	35	25
36	Nut M12X1, 25 UNI 5588	35	25
62	Screw M6X20 UNI 5931	10	7

Tab. 9.57.

9.4.1.2 - SB SLAM-SHUT VALVE TIGHTENING TORQUES

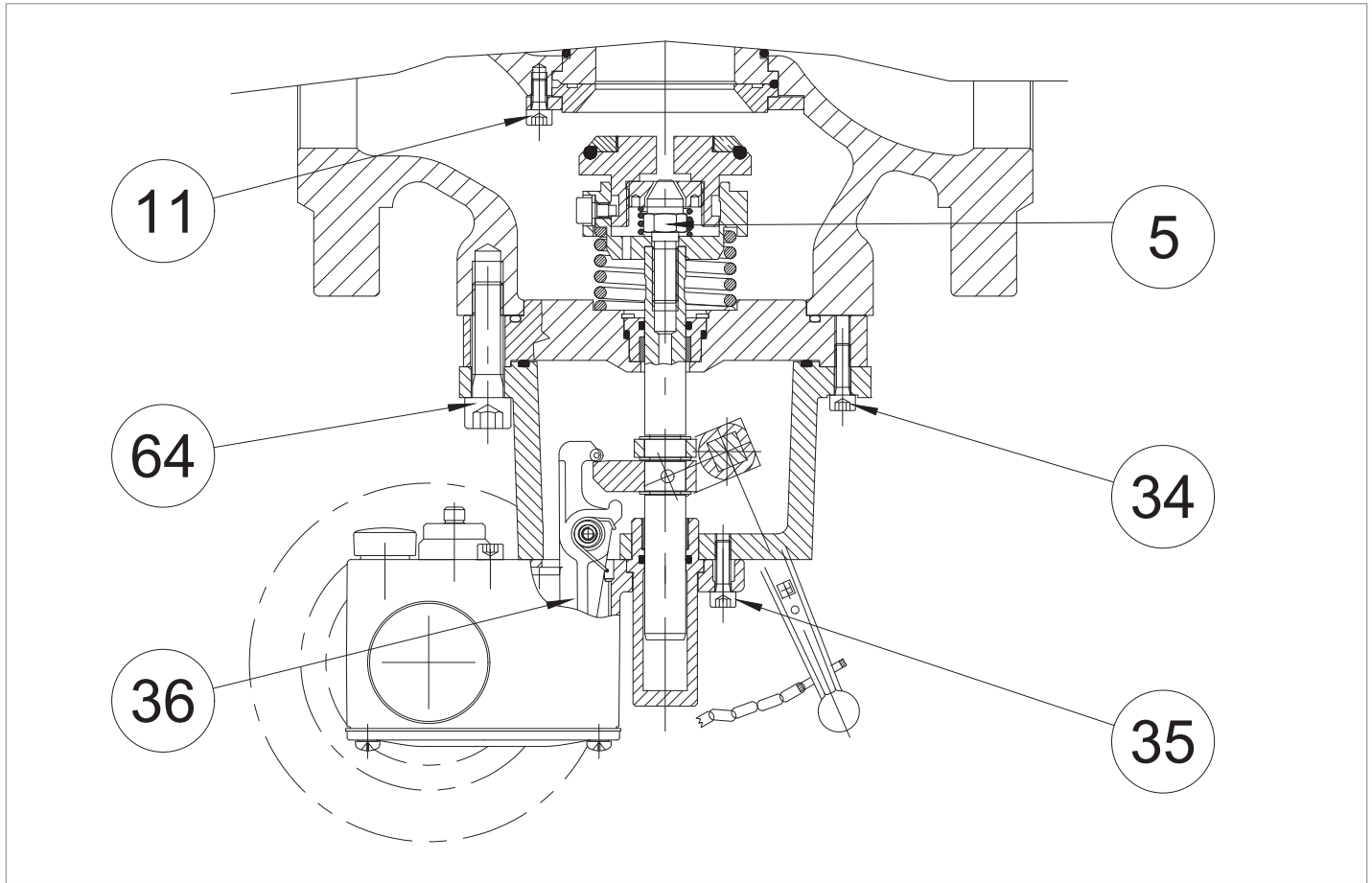


Fig. 9.25. SB slam-shut valve tightening torques

SB 2"			
Pos.	Description	Torque (nm)	Torque (ft - lb)
5	M10 safety valve screw	40	29
11	Screw M6X12 UNI 5931	10	5
34	Screw M6X20 UNI 5931	10	5
35	Screw M6X20 UNI 5931	10	5
36	Screw M6X20 UNI 5931	10	5
64	Screw M12X45 UNI 5931	80	59

Tab. 9.58.

9.4.1.3 - TIGHTENING TORQUES PRESSURE SWITCH MOD. 100

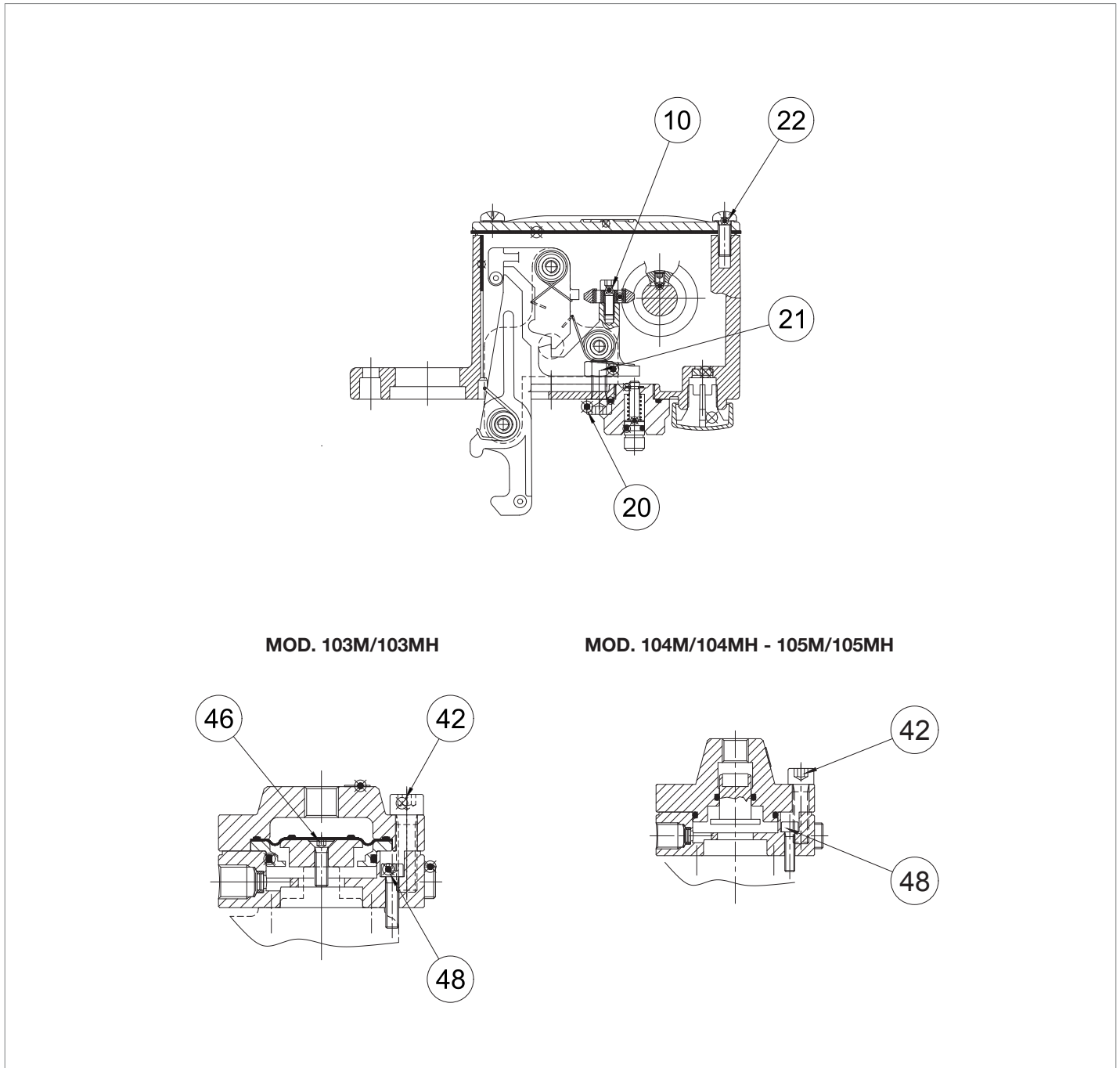


Fig. 9.26. Tightening torques pressure switch mod. 100

MOD. 103M/103MH

Pos.	Description	Torque (nm)	Torque (ft - lb)
10	Screw M4X10 UNI 5931	3	2.21
11	Screw M5X10 UNI 5933	5	3.68
20	Screw M6X16 UNI 5931	10	7.37
21	Nut M6 UNI 5588	10	7.37
22	Screw M5X15 UNI 8112	5	3.68
42	Screw M8X30 UNI 5931	16	11.80
46	Screw M5X18 UNI 5931	8	5.90
48	Screw M5X20 UNI 5931	5	3.68

Tab. 9.59.
MOD. 104M/104MH - 105M/105MH

Pos.	Description	Torque (nm)	Torque (ft - lb)
10	Screw M4X10 UNI 5931	3	2.21
11	Screw M5X10 UNI 5933	5	3.68
20	Screw M6X16 UNI 5931	10	7.37
21	Nut M6 UNI 5588	10	7.37
22	Screw M5X15 UNI 8112	5	3.68
42	Screw M8X30 UNI 5931	16	11.80
48	Screw M5X20 UNI 5931	5	3.68

Tab. 9.60.

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9.4.2 - REPLACEMENT OF ELEMENTS SUBJECT TO WEAR AND ABRASION

9.4.2.1 - INITIAL OPERATIONS

⚠ WARNING

After releasing pressure from the line, trip the slam-shut valve.

⚠ CAUTION

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

⚠ CAUTION

During assembly steps, be sure to tighten the screws following the tables (tightening torques) according to the size in which you are servicing.

Proceed as follows:

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

Tab. 9.61.

9.4.2.2 - CROSS PATTERN FOR TIGHTENING SCREWS

Refer to the following diagram for tightening screws when required by maintenance procedures:

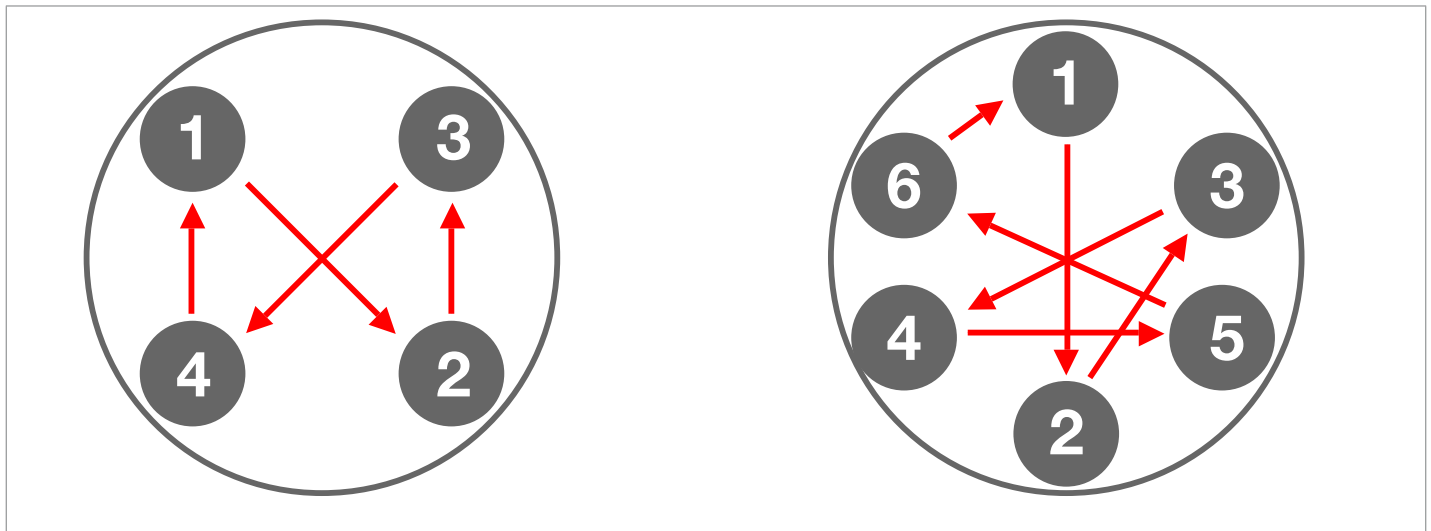


Fig. 9.27. Cross pattern

9.4.2.3 - NORFLUX REGULATOR

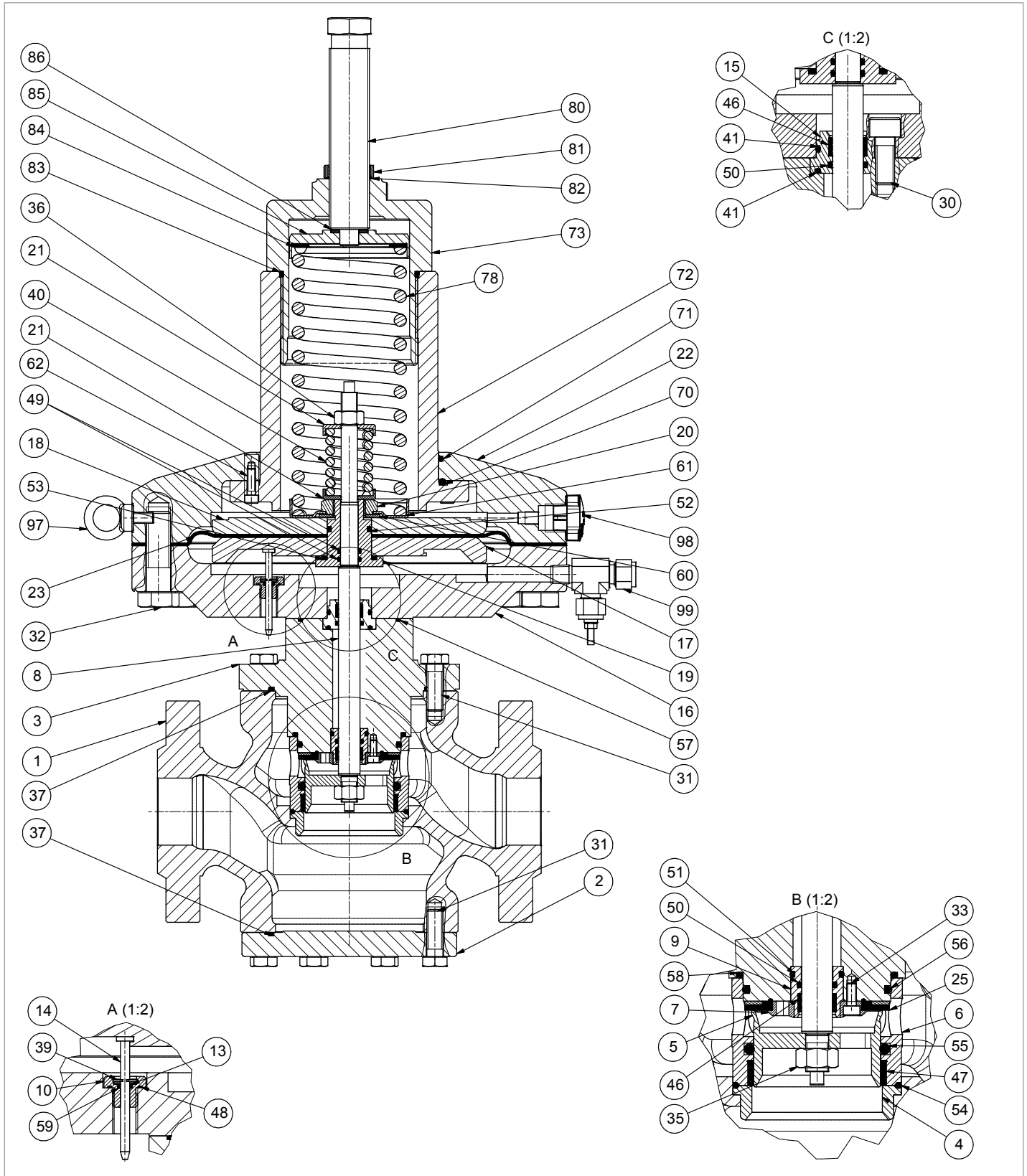
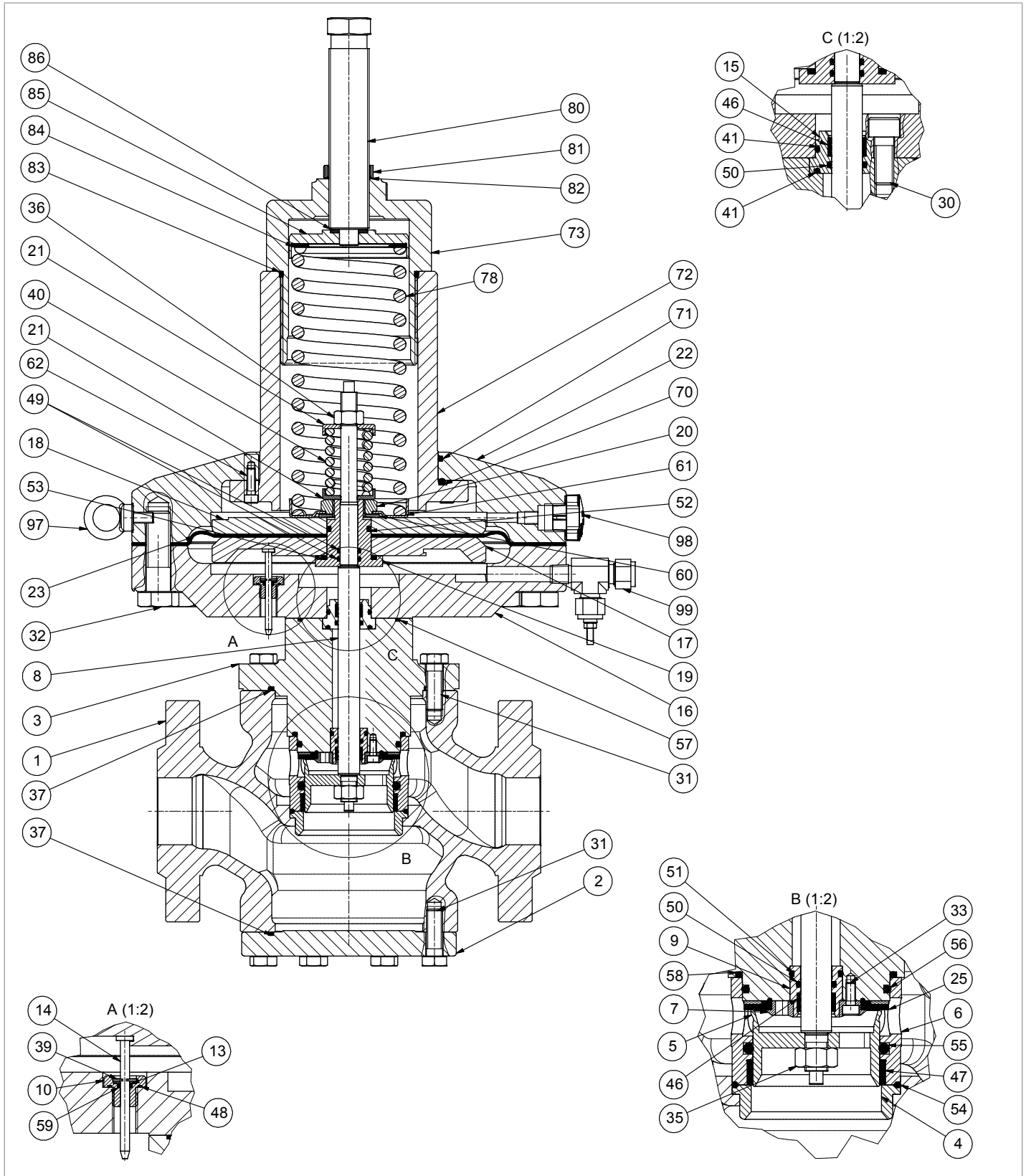


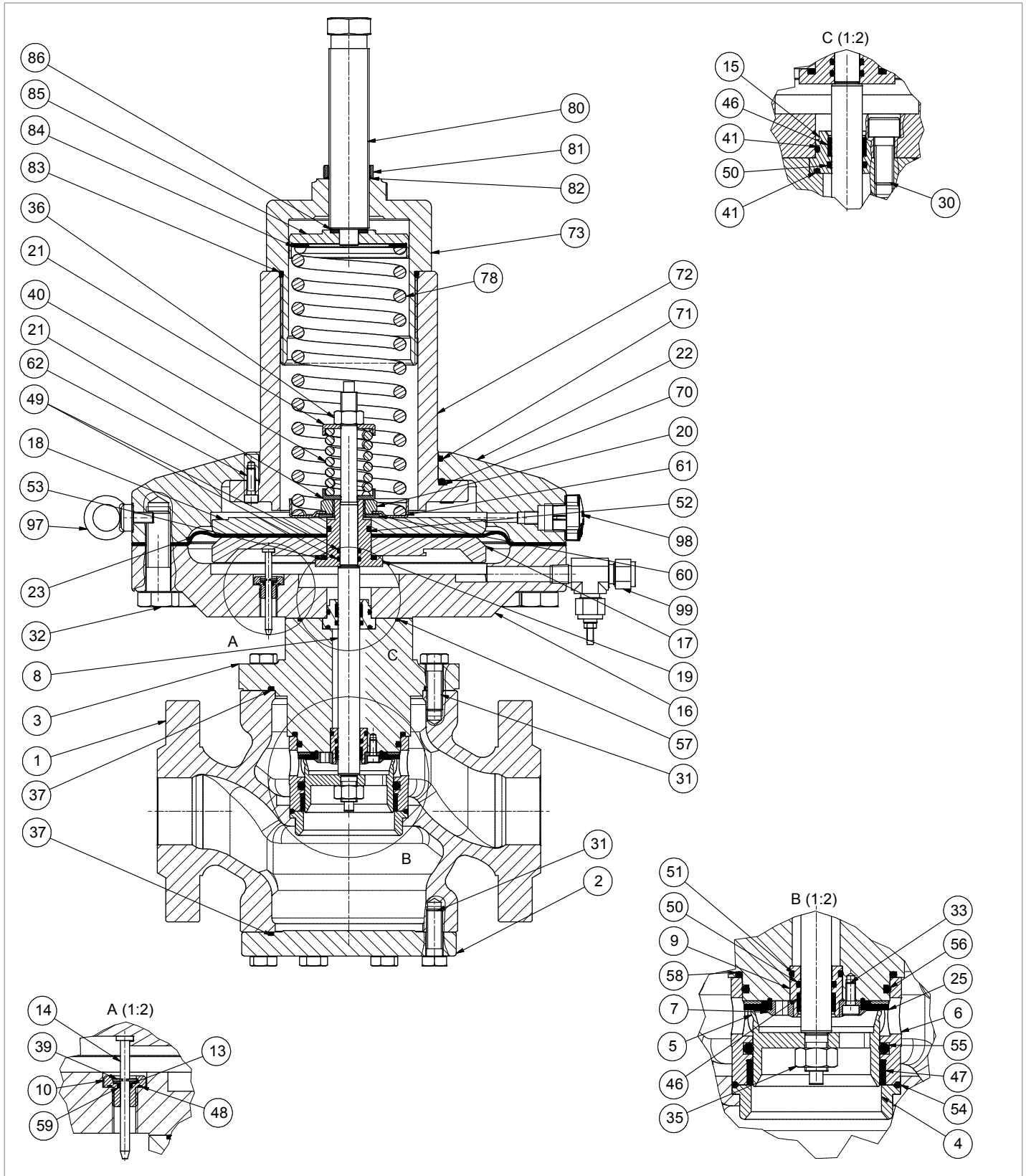
Fig. 9.28. NORFLUX Regulator

Step	Operation
1	Loosen the nut (81).
2	Unscrew and remove the set screw (80) together with the disk (86), nut (81) and O-ring (82).
3	Replace the O-ring (82), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
4	Unscrew and remove the plug (73) together with the O-ring (83).
5	Replace the O-ring (83), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
6	Remove the spring guide disk (85) together with the needle roller axial cage (84) and slewing rings (87).
7	Remove the spring (78).
8	Unscrew and remove the screws (32) from the lower cover (19).
9	Remove the upper cover (22) together with the sleeve (72) and the O-rings (71, 70). NOTICE <ul style="list-style-type: none"> • During lifting, use eyebolts (97) • Place the assembly on a shock-proof surface with the sleeve (72) resting on it
10	Unscrew and remove the screws (62). NOTICE During this step, support the top cover (22).
11	Slowly lower the top cover (22).
12	Slide the sleeve (72) off the top cover (22).
13	Remove the O-ring (70) from the sleeve (72), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
14	Remove the O-ring (71) from the cover (22), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
15	Place the sleeve (72) in the cover (22).
16	Insert and fasten the screws (62) according to the tightening torques: <ul style="list-style-type: none"> • "Tab. 9.57." NOTICE During this step, keep the cover (22) raised.
17	Unscrew and remove the nut (36). NOTICE During this step, hold the stem (8) stationary.
18	Remove the spring guides (21) together with the spring (40).



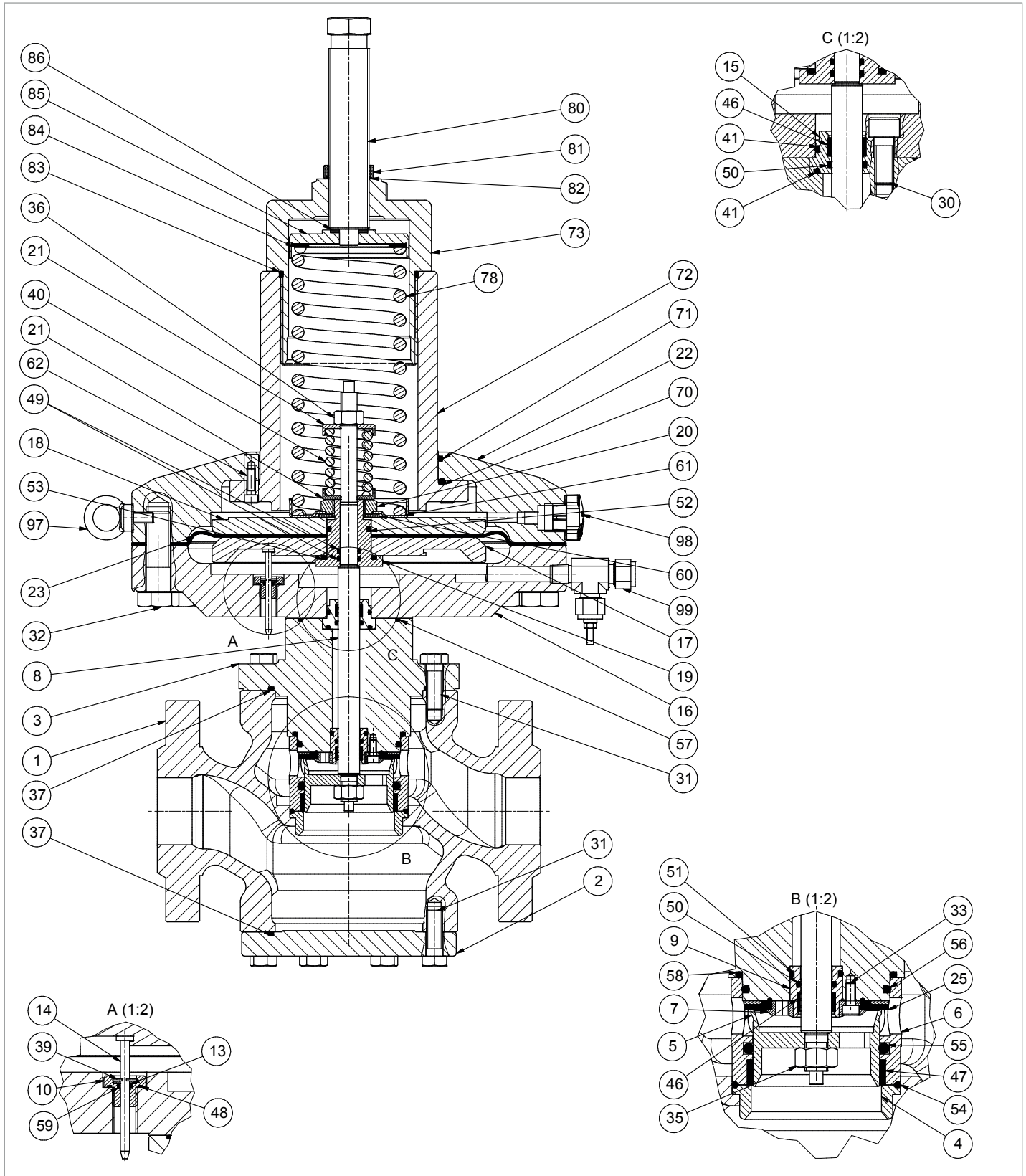
NORFLUX Regulator

Step	Operation
19	Remove the diaphragm assembly (A) [nut (20), spring guide (61), belleville washer (60), upper diaphragm protection disk (18), lower diaphragm protection disk (17), diaphragm (23), diaphragm support (19), O-rings (52, 49, 53), stroke indicator (14)] from the stem (8).
20	<p>Unscrew and remove the nut (20).</p> <p>NOTICE</p> <p>During this step, hold the diaphragm holder (19) in place.</p>
21	Remove the spring guide (61).
22	Remove the belleville washer (60).
23	Remove the upper diaphragm protection disk (18).
24	Remove the diaphragm (23).
25	Remove the lower diaphragm protection disk (17).
26	<p>Remove and replace the O-rings (53, 49, 52) from the diaphragm support (19), lubricating them with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
27	Place the lower diaphragm protection disk (17), diaphragm (23), upper diaphragm protection disk (18), belleville washer (60) and spring guide (61) in the diaphragm holder (19).
28	<p>Insert and fasten the nut (20), according to the tightening torque:</p> <ul style="list-style-type: none"> • "Tab. 9.57." <p>NOTICE</p> <p>During this step, hold the diaphragm holder (19) in place.</p>
29	Unscrew and remove the indicator rod guide (10) together with the Seeger ring (39), disk (13) and O-rings (48, 59) from the lower flange (16).
30	Remove the Seeger ring (39) from the indicator rod guide (10).
31	Remove the disk (13) on the indicator rod guide (10).
32	<p>Remove and replace the O-rings (48, 59) from the indicator rod guide (10), lubricating them with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
33	Place the disk (13).
34	Insert and secure the Seeger ring (39) on the indicator rod guide (10).
35	Insert and secure the indicator rod guide (10), together with the Seeger ring (39), disk (13) and O-rings (48, 59) on the lower flange (16).
36	Unscrew and remove the screws (30) from the lower flange (16).
37	Remove the lower flange (16) and place it on a surface.
38	Remove the rod guide assembly B (rod guide 15, upper I/DWR 46, O-ring 41, upper 50) from the reinforced gasket support (3).
39	<p>Remove and replace the O-rings (41, 50) from the stem guide (15), lubricating them with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>



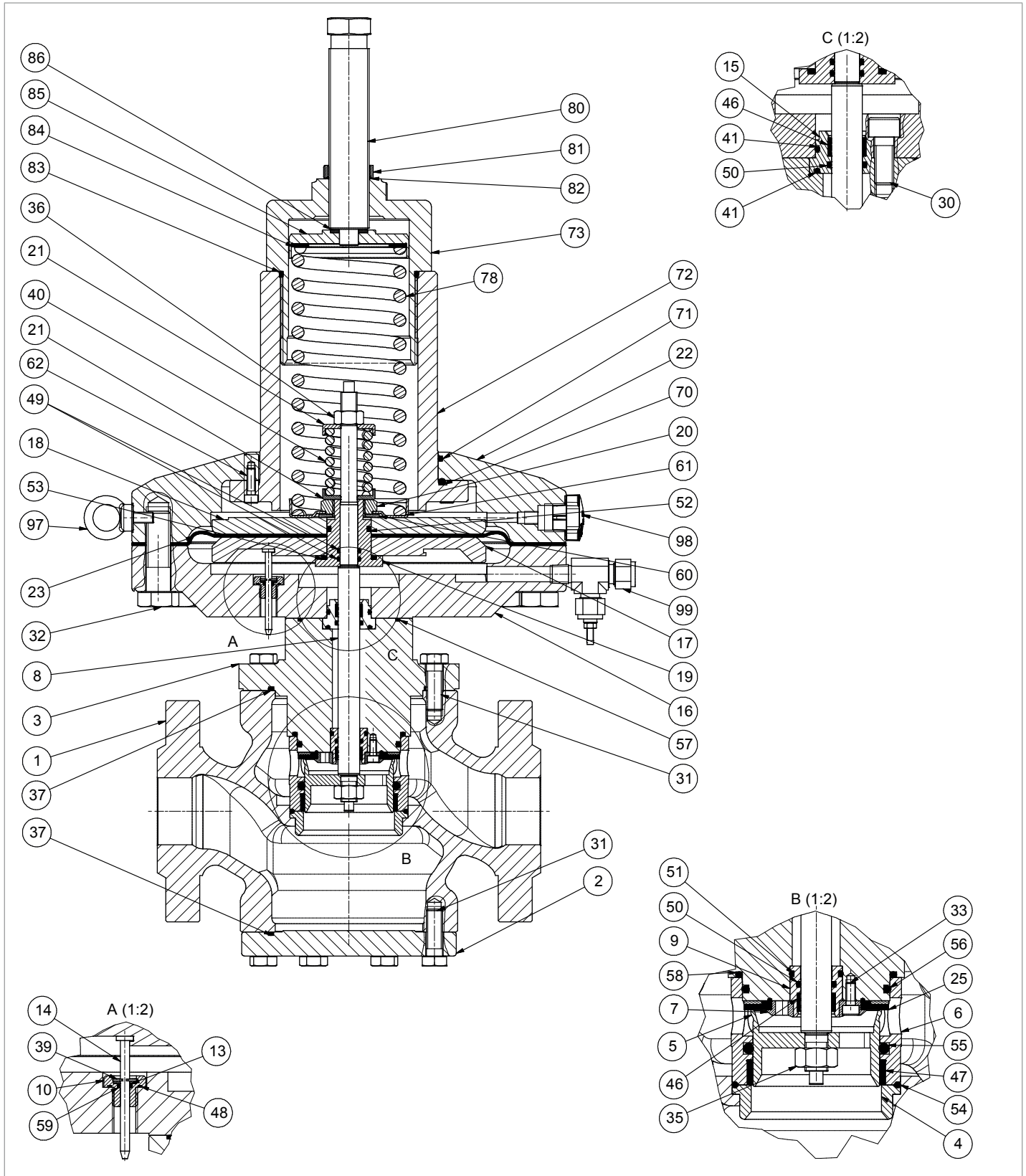
NORFLUX Regulator

Step	Operation
40	Remove and replace the I/DWR ring (46) from the stem guide (15), lubricating it with synthetic grease. NOTICE Before inserting the replacement I/DWR, clean the retaining slots with a cleaning solution.
41	Unscrew the screws (31) from the reinforced gasket support (3).
42	Lift the reinforced gasket support (3) together with the O-rings (58, 51, lower 50, 56, 37), screws (33), lower rod guide (9), lower I/DWR (46), reinforced gasket (25), locking ring (7). NOTICE Place the assembly upside down on a shock-proof surface. The reinforced gasket support (3) must rest on the surface with the reinforced gasket facing upward.
43	Replace the O-rings (56, 58) from the reinforced gasket support (3), lubricating them with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
44	Unscrew and remove the screws (33) from the reinforced gasket (25).
45	Replace the reinforced gasket (25).
46	Remove the stem guide (9) together with the O-ring (51, lower 50) and lower I/DWR (46) from the reinforced gasket support (3).
47	Replace the O-rings (51, lower 50) from the lower stem guide (9), lubricating them with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
48	Replace at the lower I/DWR ring (46) from the lower stem guide (9).
49	Place the lower rod guide (9), with O-rings (51, lower 50), lower I/DWR (46) in the reinforced gasket support (3).
50	Place the replacement reinforced gasket (25) in the reinforced gasket support (3).
51	Insert and fasten the screws (33) into the reinforced gasket (25) according to the tightening torques: • "Tab. 9.57." NOTICE Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".
52	Remove and replace the O-ring (37) from the reinforced gasket support (3), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
53	Remove the stem (8) together with the nut (35) and plug (5) from the plug guide (6). NOTICE Place the stem (8), nut (35), plug (5) unit on a shock-proof surface.
54	Remove the plug guide (6) together with the O-ring (55), I/DWR ring (47), O-ring (54) and valve seat (4) from the body (1).



NORFLUX Regulator

Step	Operation
55	<p>Remove and replace the O-ring (55) from the plug guide (6), lubricating it with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
56	<p>Remove and replace the I/DWR ring (47) from the plug guide (6), lubricating it with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement I/DWR, clean the retaining slots with a cleaning solution.</p>
57	<p>Insert the valve seat (4) into the body (1).</p>
58	<p>Remove and replace the O-ring (54) from the valve seat (4), lubricating it with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
59	<p>Insert the plug guide unit (6) together with the O-ring (55) and I/DWR ring (47) into the body (1).</p>
60	<p>Insert the stem (8) together with the nut (35) and plug (5) into the plug guide (6).</p>
61	<p>Insert the reinforced gasket support (3) and the lower rod guide assembly (9) into the body (1).</p>
62	<p>Insert and fasten the screws (31) on the reinforced gasket support (3).</p>
63	<p>Place the upper stem guide assembly (15) in the stem (8).</p> <p>NOTICE</p> <p>Bring the upper rod guide assembly (15) to a stop on the reinforced gasket support (3)</p>
64	<p>Place the lower flange (16) in the upper rod guide assembly (3).</p>
65	<p>Insert and fasten the screws (30) into the lower flange (16), according to the tightening torques:</p> <ul style="list-style-type: none"> • "Tab. 9.57." <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>
66	<p>Place the position indicator (14) in the lower diaphragm protection disk housing (17).</p>
67	<p>Insert the diaphragm unit (A) into the stem (8).</p> <p>NOTICE</p> <p>The position indicator (14) must enter the indicator guide (10) without detaching from the lower diaphragm protection disk (17).</p>
68	<p>Place the lower spring guide (21).</p>
69	<p>Place the spring (40).</p>
70	<p>Place the upper spring guide (21).</p>
71	<p>Insert and secure the nut (36).</p> <p>NOTICE</p> <p>Tighten the screws as per the diagram in paragraph "9.4.2.2 - Cross pattern for tightening screws" During this step, hold the stem (8) stationary</p>



NORFLUX Regulator

Step	Operation
72	Place the cover (22) on the lower flange (16).
73	<p>Insert and fasten the screws (32) in the cover (22) according to the tightening torques:</p> <ul style="list-style-type: none"> • "Tab. 9.57." <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>
74	Insert the calibration spring (78).
75	Insert the slewing rings (87) together with the needle roller axial cage (84).
76	Place the spring guide (85).
77	Place and secure the cap (73).
78	Insert and secure the adjusting screw (80) together with the nut (81) and O-ring (82) in the cap (73).
79	Unscrew and remove the screws (31) from the blind flange (2).
80	<p>Remove and replace the O-ring (37) from the blind flange (2), lubricating it with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
81	<p>Insert and fasten the screws (31) in the blind flange (2) according to the tightening torques:</p> <ul style="list-style-type: none"> • "Tab. 9.57." <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>

Tab. 9.62.

⚠ WARNING

Make sure that all parts have been assembled correctly.

9.4.3 - MAINTENANCE OF THE NORFLUX REGULATOR WITH SB SLAM-SHUT VALVE

9.4.3.1 - BUILT-IN SB 2" SLAM-SHUT VALVE

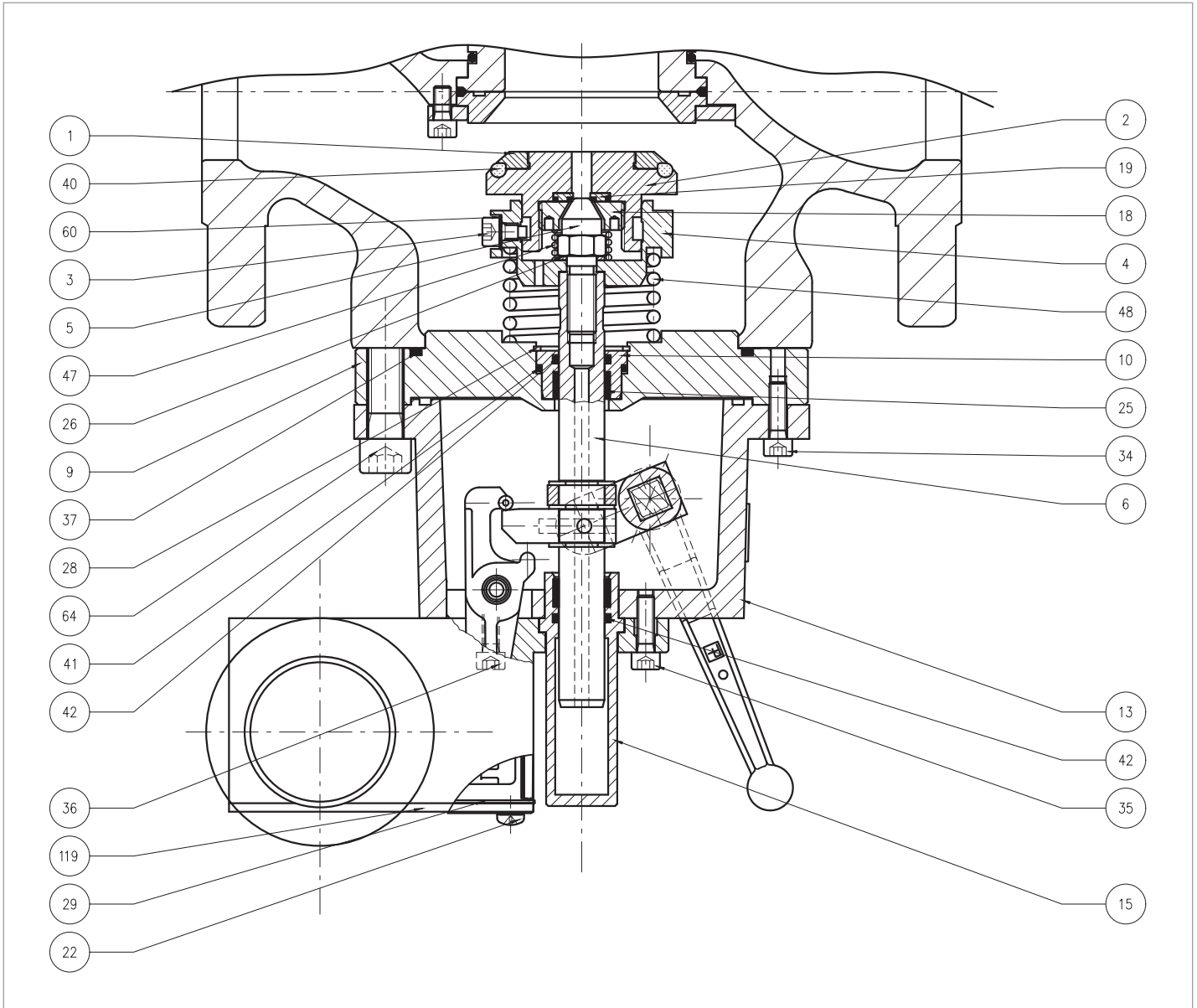
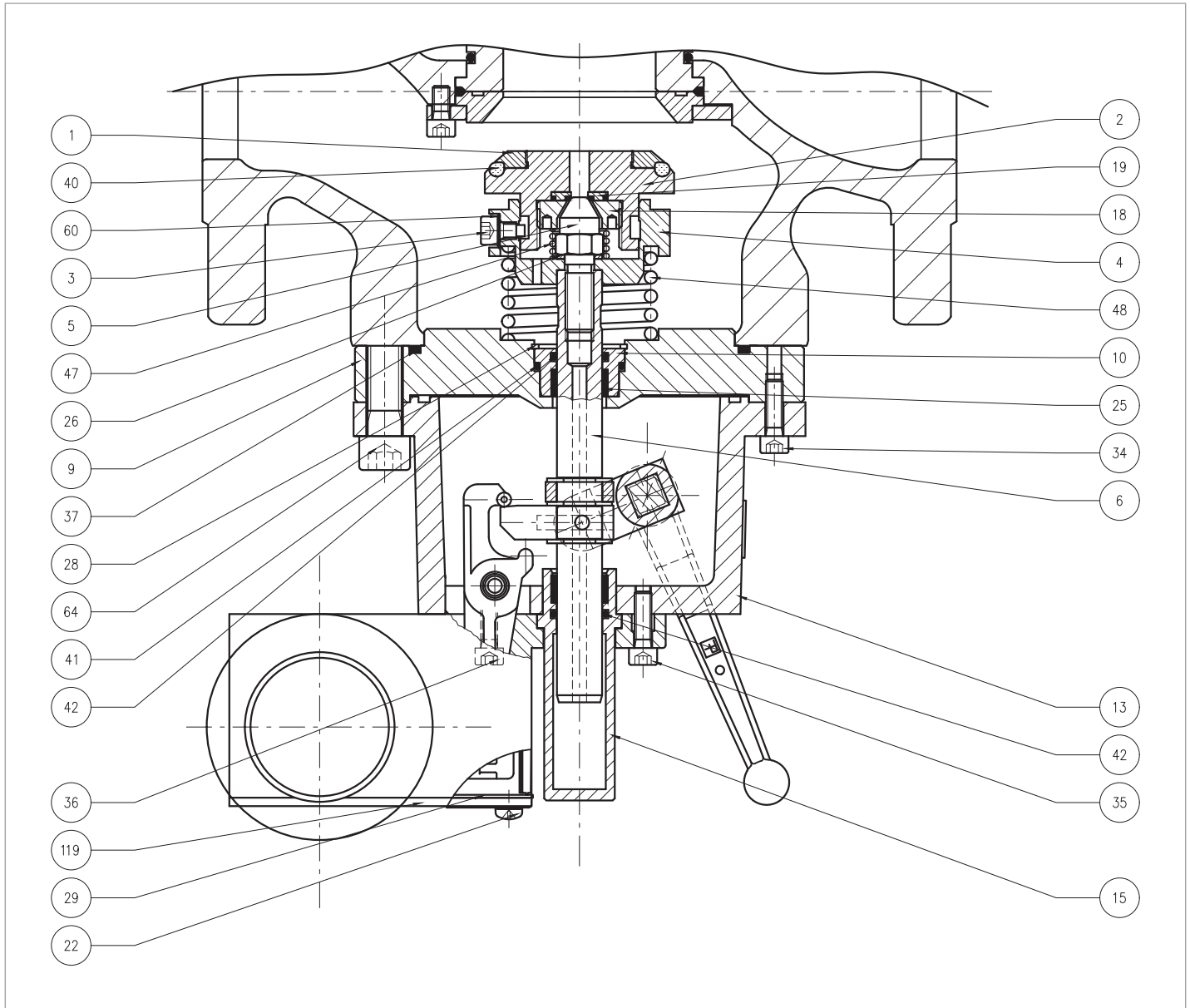


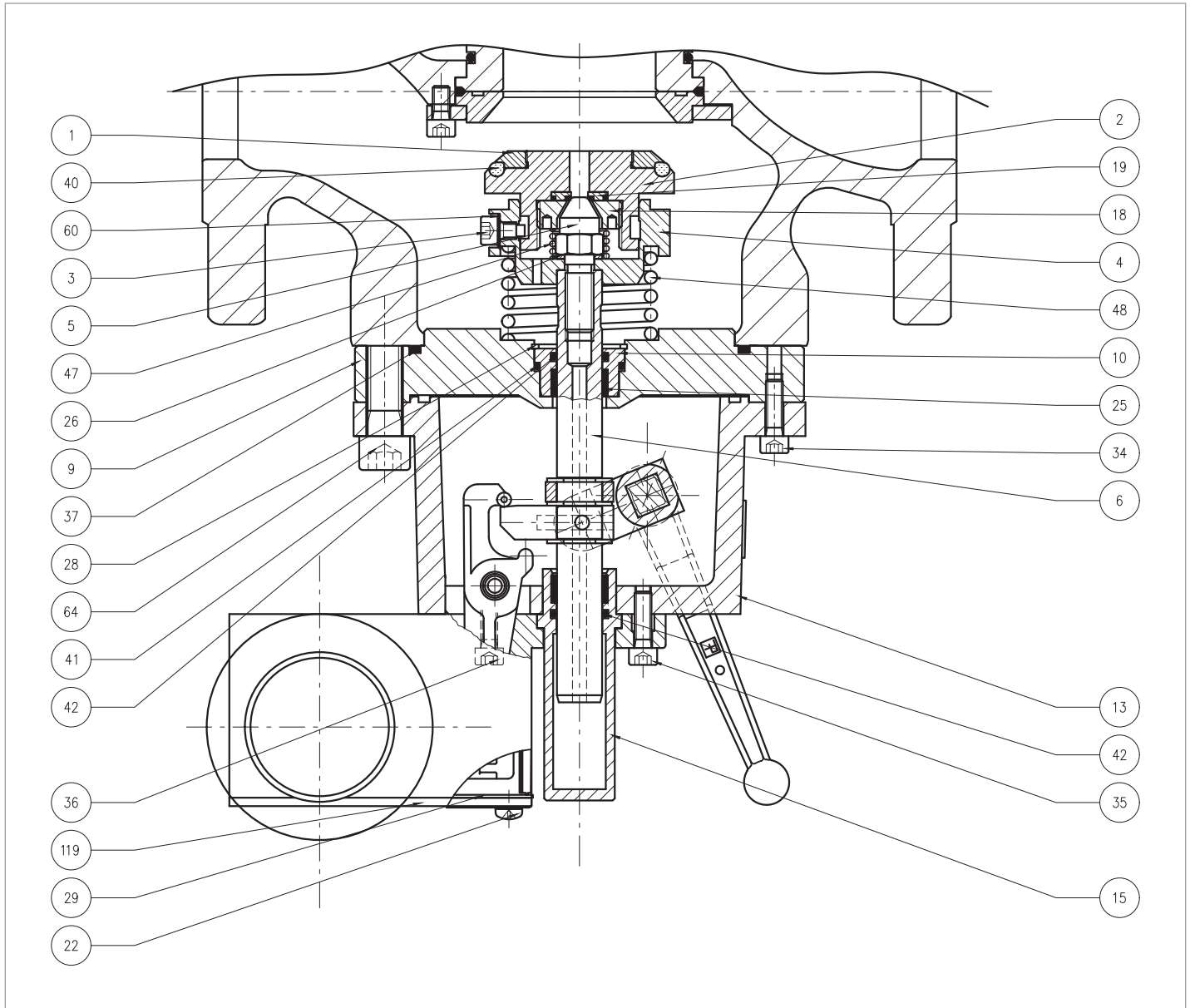
Fig. 9.29. Built-in SB 2" slam-shut valve

Step	Operation
1	<p>⚠ WARNING</p> <p>Check that the built-in slam-shut valve is in the closed position.</p>
2	<p>Unscrew the minimum spring (Fig. 8.20, ref. 17).</p> <p>NOTICE</p> <p>Check that the minimum spring is present.</p>
3	Arm the slam-shut valve by moving the reset lever (16) to the open position.
4	Hold the built-in slam-shut valve during the next steps.
5	<p>Partially unscrew the screws (64).</p> <p>⚠ WARNING</p> <p>This step is crucial to reduce the spring thrust (48).</p>
6	Remove the screws (64).
7	<p>Remove the slam-shut valve and lay it upside down on an shock-proof surface with the plug (2) facing downward.</p> <p>NOTICE</p> <p>Pay attention not to press the reset button.</p>
8	<p>Disarm the slam-shut valve by pressing the reset button.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • During this step, slowly move the reset lever (16) to the "CLOSED" position. • Pay attention not to damage the plug (2)
9	<p>Remove and replace the O-ring (37) from the flange (9), lubricating it with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
10	Unscrew and remove the screws (3) together with the toothed washers (60).
11	Remove the plug unit (47, 4, 18, 1, 19, 40, 5, 2).
12	Remove the spring (47).
13	<p>Unscrew and remove the ring nut (18), using the appropriate tool.</p> <p>NOTICE</p> <p>Refer to paragraph "7.1 - Equipment list".</p>
14	Remove and replace the pad (19).
15	<p>Place and secure the ring nut (18) with the appropriate tool.</p> <p>NOTICE</p> <p>Refer to paragraph "7.1 - Equipment list".</p>
16	Unscrew and remove the ring nut (1).
17	<p>Remove and replace the O-ring (40) from the plug (2), lubricating it with synthetic grease.</p> <p>NOTICE</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
18	Place and secure the ring nut (1).



Built-in SB 2" slam-shut valve

Step	Operation
19	Unscrew the plug screw (5).
20	Remove the washer (26).
21	Remove the spring holder (4) and spring (48).
22	Unscrew and remove the screws (22) of the pressure switch.
23	Remove the cover (119) together with the gasket (29).
24	Unscrew the side screws (36) located inside the control pressure switch.
25	Unscrew the outer screws (35).
26	Remove the pressure switch unit. NOTICE <u>Refer to the relevant sheet for the maintenance procedure of the pressure switch unit.</u>
27	Remove the cup (15).
28	Remove and replace the O-ring (42) from the cup (15), lubricating it with synthetic grease. NOTICE <u>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</u>
29	Unscrew and remove the screws (34).
30	Remove the intermediate body (13)
31	Remove the stem (6) taking care not to damage it.
32	Remove the Seeger ring (28) from the flange (9).
33	Remove the bushing (10).
34	Remove and replace the O-ring (41) from the flange (9), lubricating it with synthetic grease. NOTICE <u>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</u>
35	Remove and replace the O-ring (42) from the bushing (10), lubricating it with synthetic grease. NOTICE <u>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</u>
36	Remove and replace the I/DWR ring (25) from the bushing (10), lubricating it with synthetic grease. NOTICE <u>Before inserting the replacement I/DWR ring, clean the retaining slots with a cleaning solution.</u>
37	Place the bushing (10) taking care not to damage the O-ring (41).
38	Place the Seeger ring (28) in the flange (9).
39	Insert the stem (6) into the bushing (10). NOTICE <u>Lubricate the surface of the stem with silicone grease.</u>
40	Place the intermediate body (13).
41	Insert and fasten the screws (34).



Built-in SB 2" slam-shut valve

Step	Operation
42	Place the pressure switch unit.
43	<p>Insert and fasten the screws (35), according to the tightening torque:</p> <ul style="list-style-type: none"> • "Tab. 9.58." <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>
44	<p>Insert and fasten the side screws (36), according to the tightening torque:</p> <ul style="list-style-type: none"> • "Tab. 9.58." <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>
45	Place the gasket (29) together with the cover (119).
46	Insert and fasten the screws (22).
47	Place the spring (48) and spring holder (4).
48	Place the washer (26).
49	<p>Insert and fasten the plug (5), according to the tightening torque:</p> <ul style="list-style-type: none"> • "Tab. 9.58." <p>NOTICE</p> <ul style="list-style-type: none"> • Apply threadlock glue before inserting the screw (5); • Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".
50	Place the spring (47).
51	Place the plug unit.
52	<p>Insert the screws (3) together with the toothed washers (60).</p> <p>NOTICE</p> <p>Apply threadlock glue before inserting the screw (3).</p>
53	Fasten the screws (3), holding the plug unit to compress the spring (47) inside the plug guide (4).
54	Arm the slam-shut valve by moving the reset lever (16) to the "OPEN" position.
55	Turn the slam-shut valve upside down with the plug (2) facing downward on a shock-proof surface.
56	Arm the slam-shut valve by moving the reset lever (16) to the open position.
57	<p>Place the slam-shut valve.</p> <p>NOTICE</p> <p>Pay attention not to press the reset button.</p>
58	<p>Insert and fasten the screws (64), according to the tightening torque:</p> <ul style="list-style-type: none"> • "Tab. 9.58." <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>

Tab. 9.63

⚠ WARNING

Make sure that all parts have been assembled correctly.

9.4.4 - MAINTENANCE PROCEDURE FOR PRESSURE SWITCHES MOD. 100

9.4.4.1 - PRESSURE SWITCH MOD. 103M/103MH

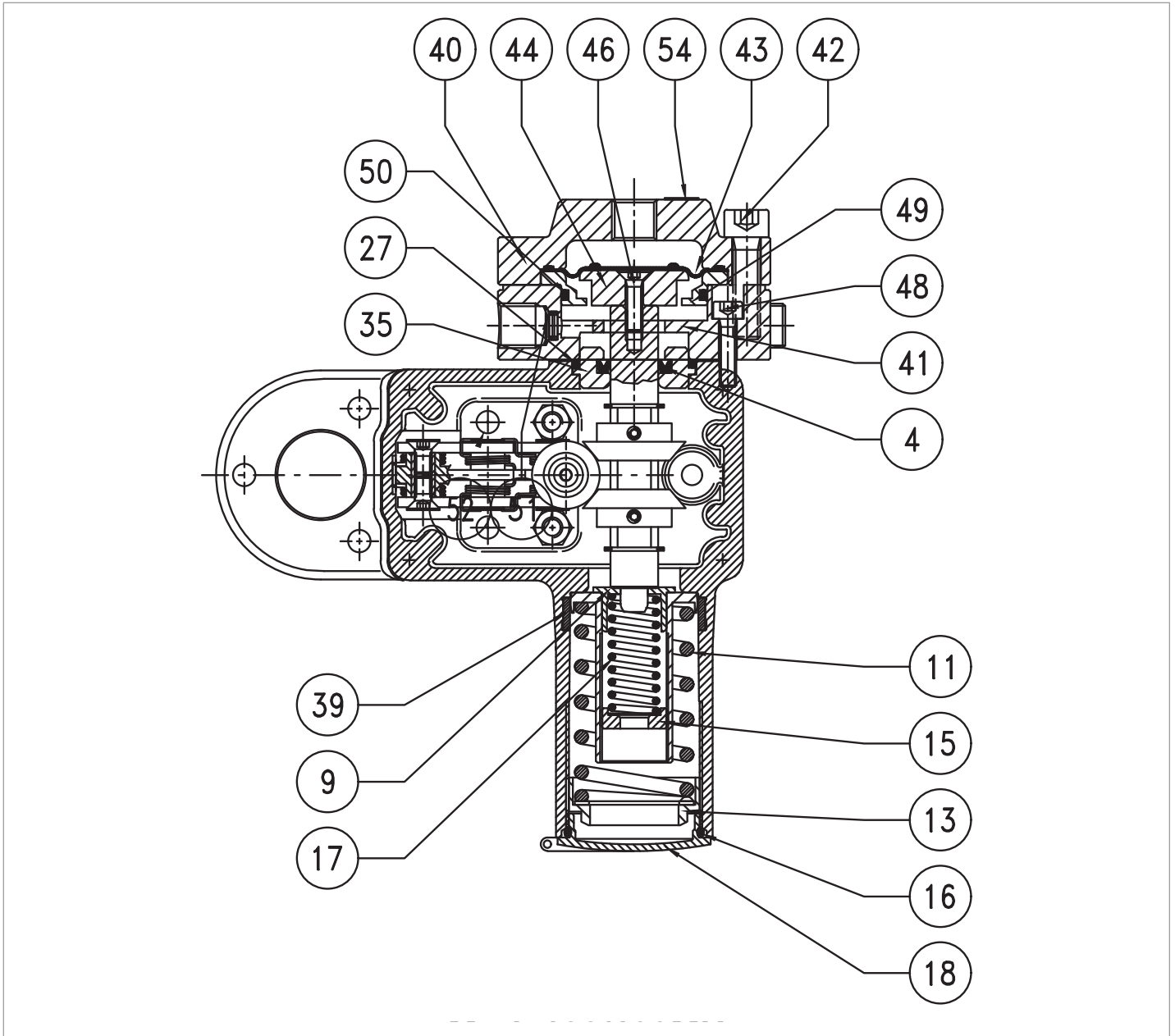
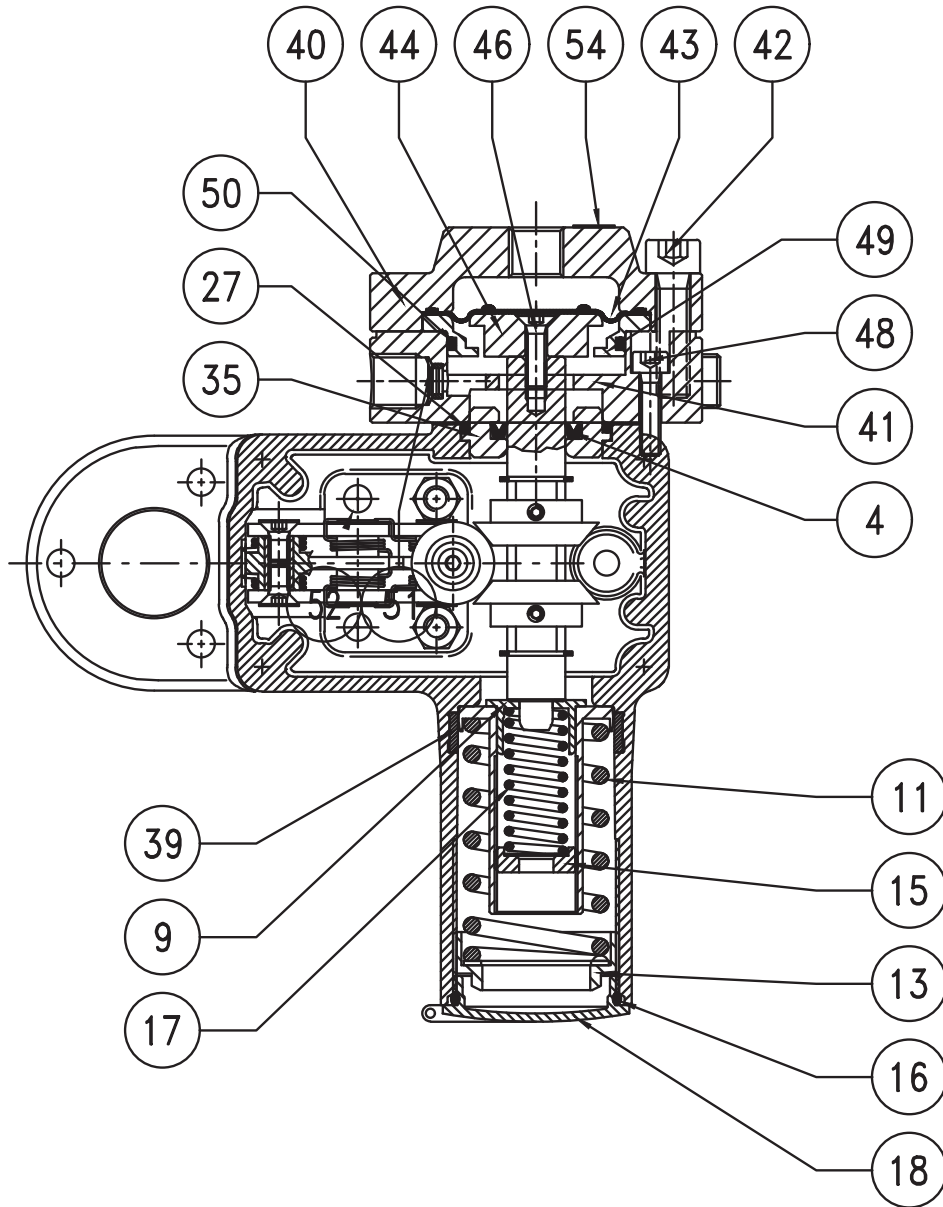


Fig. 9.30. Pressure switch Mod. 103M/103MH

Step	Operation
1	Unscrew and remove the cap (18).
2	Remove and replace the O-ring (16) from the cover (18), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
3	Fully unload the maximum spring (11) via the ring nut (13).
4	Fully unload the minimum spring (17) via the ring nut (15). NOTICE The minimum spring may not be present.
5	Remove the ring nut (13), spring (11) and spring holder (17).
6	Remove and replace the I/DWR ring (39) from the pressure switch sleeve, lubricating it with synthetic grease. NOTICE Before inserting the replacement I/DWR ring, clean the retaining slots with a cleaning solution.
7	Unscrew and remove the screws (42).
8	Remove the top cover (40).
9	Remove and replace the diaphragm (43), lubricating the cord with synthetic grease. NOTICE Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
10	Unscrew and remove the screw (46).
11	Remove the ring (49).
12	Remove and replace the O-ring (50) from the ring (49). NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
13	Unscrew and remove the screws (48).
14	Remove the lower cover (41).
15	Remove the bushing (35).
16	Remove and replace the O-ring (27) from the bushing (35), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
17	Remove and replace the U-ring (4) from the bushing (35), lubricating it with synthetic grease. NOTICE Before inserting the replacement U-ring, clean the retaining slots with a cleaning solution.
18	Place the bushing (35) together with the O-ring (27). NOTICE Before inserting the bushing (35), lubricate the inner surface with silicone grease.



Pressure switch Mod. 103M/103MH

Step	Operation
19	Put the lower cover (41) in place.
20	Insert and fasten the screws (48), according to the tightening torque: <ul style="list-style-type: none"> • Mod. 103: Tab. 9.59. <p>NOTICE</p> <ul style="list-style-type: none"> • Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws"; • Ensure there is a gasket between the lower cover and the pressure switch body.
21	Place the diaphragm protection disk (44), then insert and fasten the screw (46). <p>NOTICE</p> <p>Apply threadlock glue before inserting the screw (46).</p>
22	Insert and fasten the screw (46), according to the tightening torque: <ul style="list-style-type: none"> • Mod. 103: Tab. 9.59. <p>NOTICE</p> <ul style="list-style-type: none"> • Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws"; • Apply threadlock glue before inserting the screw (46).
23	Place the diaphragm (43).
24	Place the cover (40).
25	Insert and fasten the screws (42), according to the tightening torque: <ul style="list-style-type: none"> • Mod. 103: Tab. 9.59. <p>NOTICE</p> <p>Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".</p>

Tab. 9.64.

⚠ WARNING

Make sure that all parts have been assembled correctly.

9.4.4.2 - PRESSURE SWITCH MOD. 104M/104MH, 105M/105MH

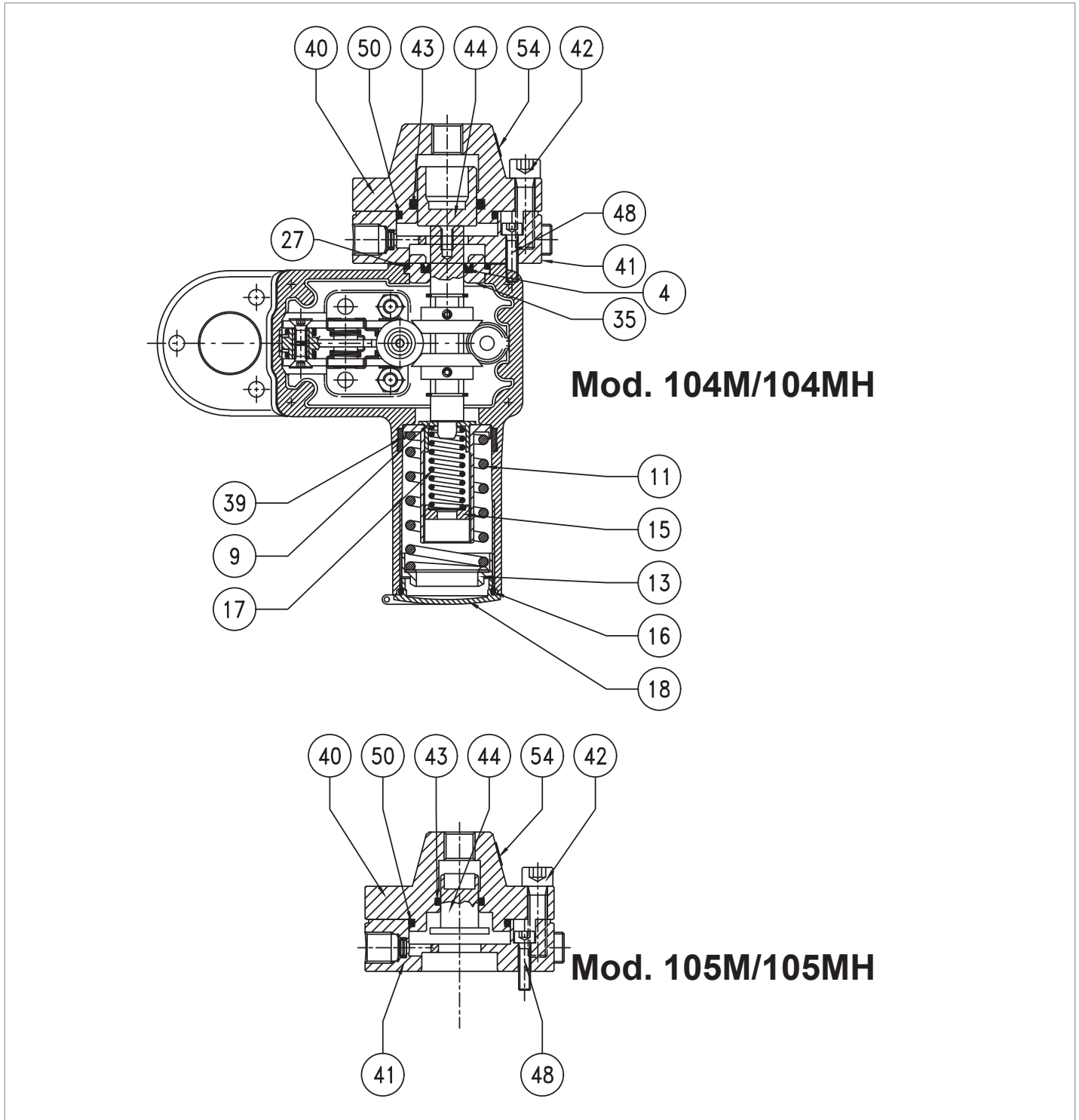
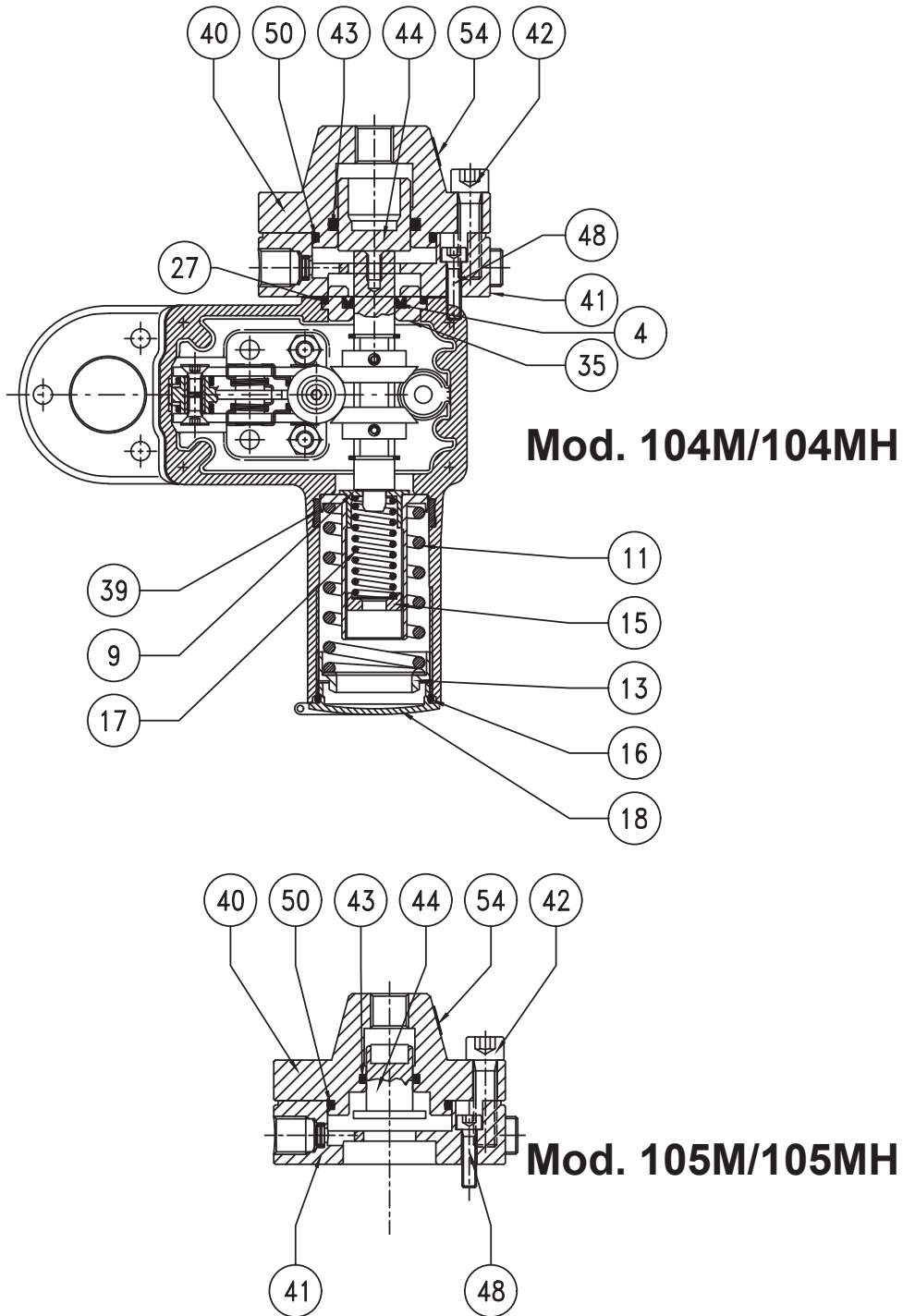


Fig. 9.31. Pressure switch Mod. 104M/104MH, 105M/105MH

Step	Operation
1	Unscrew and remove the cap (18).
2	Remove and replace the O-ring (16) from the cover (18), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
3	Fully unload the maximum spring (11) via the ring nut (13).
4	Fully unload the minimum spring (17) via the ring nut (15). NOTICE The minimum spring may not be present.
5	Remove the ring nut (13), spring (11) and spring holder (17).
6	Remove and replace the I/DWR ring (39) from the pressure switch sleeve, lubricating it with synthetic grease. NOTICE Before inserting the replacement I/DWR ring, clean the retaining slots with a cleaning solution.
7	Unscrew and remove the screws (42).
8	Remove the upper cover (40) together with the plunger (44).
9	Remove the plunger (44) from the upper cover (40).
10	Remove and replace the O-rings (43, 50) from the upper cover (40), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
11	Reinsert the plunger (44) into the upper cover (40).
12	Unscrew and remove the screws (48).
13	Remove the lower cover (41).
14	Remove the bushing (35).
15	Remove and replace the O-ring (27) from the bushing (35), lubricating it with synthetic grease. NOTICE Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
16	Remove and replace the U-ring (4) from the bushing (35), lubricating it with synthetic grease. NOTICE Before inserting the replacement U-ring, clean the retaining slots with a cleaning solution.
17	Place the bushing (35) together with the O-ring (27). NOTICE Before inserting the bushing (35), lubricate the inner surface with silicone grease.



Pressure switch Mod. 104M/104MH, 105M/105MH

Step	Operation
18	Put the lower cover (41) in place. NOTICE Ensure there is a gasket between the lower cover and the pressure switch body.
19	Insert and fasten the screws (48) according to the tightening torques: <ul style="list-style-type: none"> • Mod. 104-105: Tab. 9.60. NOTICE Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".
20	Place the upper cover (40).
21	Insert and fasten the screws (42) according to the tightening torques: <ul style="list-style-type: none"> • Mod. 104-105: Tab. 9.60. NOTICE Tighten the screws as shown in the diagram at paragraph "9.4.2.2 - Cross pattern for tightening screws".

Tab. 9.65.

⚠ WARNING

Make sure that all parts have been assembled correctly.

9.4.5 - RE-COMMISSIONING PROCEDURE FOLLOWING MAINTENANCE

NOTICE

For the re-commissioning procedure, follow the directions in the relevant paragraph.

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10 - FAULT FINDING AND TROUBLESHOOTING

Listed below are the situations (the causes and interventions) that could, over time, occur in the form of dysfunctions of various kinds.

These are phenomena related to gas conditions in addition to the natural aging and wear of materials.

10.1 - GENERAL WARNINGS

⚠ DANGER

Maintenance operations shall be carried out by qualified personnel:

- trained on safety in places also according to the regulations in force at the place of installation of the work equipment;
 - qualified and authorized for the activities inherent to the equipment.
-

⚠ WARNING






No liability related to personal injury or property damage can be attributed to PIETRO FIORENTINI S.p.A. for interventions:

- other than those described;
 - performed in ways other than those indicated;
 - performed by unsuitable personnel.
-

NOTICE

In the event of a malfunction since no qualified personnel are available for the specific task, contact the PIETRO FIORENTINI S.p.A. Authorized Service Center

10.2 - SPECIFIC QUALIFICATION OF THE OPERATOR

Commissioning	
Operator qualification	<ul style="list-style-type: none"> • Mechanical maintenance technician; • Electrical maintenance technician; • Installer; • User technician.
PPE required	<div style="display: flex; align-items: center; gap: 10px;">      </div> <p style="background-color: #ff8c00; color: white; padding: 2px; display: inline-block;">⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any indications provided by the Safety Manager at the installation facility.</u>
Equipment required	Refer to chapter “7 - Commissioning/maintenance equipment”.

Tab. 10.66.

10.3 - TROUBLESHOOTING PROCEDURES

The following steps should be taken for proper troubleshooting:

- close the downstream and upstream shut-off valves;
- refer to the troubleshooting tables listed below.

10.4 - TROUBLESHOOTING TABLES

NOTICE

Refer to chapter “9 - Maintenance and functional testing” for pictures of the regulator NORFLUX and its accessories.

10.4.1 - NORFLUX REGULATOR TROUBLESHOOTING

WARNING

If the built-in slam-shut valve has tripped, close the upstream and downstream shut-off valves (V1 and V2) of the line and relieve the pressure before any operation.

Fault	Equipment	Possible causes	Intervention
Operating faults	REGULATOR	Stem (8) dirty or blocked	Clean
		Adjusting diaphragm (23) worn out	Replace
		Lock nut (36) loose	Tighten correctly according to tightening torque
		Obstructed or misplaced sensing line	Clean and if necessary reposition
		I/DWR (46) dirty or worn out	Clean and if necessary replace
		Valve seat (5) with damaged profile	Replace
		Reinforced gasket (25) dirty or worn out	Clean and if necessary replace
		Screws (33) loose	Tighten correctly
		Spring (78) snared or out of plane	Reposition and replace if required
		Spring (78) not suitable	Replace
Pumping	REGULATOR	I/DWR (46) worn	Replace
		Sensing line dirty, obstructed or incorrectly positioned	Clean and reposition if required
		Valve seat (5) with damaged profile	Replace
		Reinforced gasket (25) dirty or worn out	Clean and if necessary replace
		Low flow rate	Antipumping valve (99): loosen the nut, partially tighten the screw and tighten the nut.
Lack of seal at zero flow rate	REGULATOR	O-ring (67) dirty or damaged	Clean and if necessary replace
		O-ring (60) dirty or damaged	Clean and if necessary replace
		No O-ring seal (66)	Clean and if necessary replace
		Valve seat (5) with damaged profile	Replace
		Reinforced gasket (4) dirty or worn out	Clean and if necessary replace

Fault	Equipment	Possible causes	Intervention
Downstream pressure increases during delivery	REGULATOR	Diaphragm (20) worn or damaged	Replace
		I/DWR (46) dirty or damaged	Clean and if necessary replace
		Stem (8) locked in opening	Clean
		Reinforced gasket (4) dirty or worn out	Clean and if necessary replace
		Valve seat (5) with damaged profile	Replace
		Sensing line dirty, obstructed or incorrectly positioned	Clean and reposition if required
Downstream pressure decreases during delivery	REGULATOR	Lack of upstream pressure (Pu)	Check the upstream pressure
		Stem (8) blocked	Clean
		I/DWR (46) dirty or damaged	Clean and if necessary replace
		Spring (78) not suitable	Replace

Tab. 10.67.

10.4.2 - BUILT-IN SLAM-SHUT VALVE TROUBLESHOOTING

⚠ WARNING

If the built-in slam-shut valve has tripped, close the inlet and outlet valves (V1 and V2) of the line and relieve the pressure before any operation.

Fault	Equipment	Possible causes	Intervention
Incorrect release pressure	BUILT-IN SLAM-SHUT VALVE	Incorrect max and/or min spring calibration.	Perform calibration again by acting on the ring nuts. If minimum calibration is also required, recalibrate the maximum and minimum springs several times in this sequence
		Levers with friction	Clean and lubricate the levers and replace the pressure switch if required
	PRESSURE SWITCHES MODELS 100	Springs (11,17) snared	Replace
		Springs (11.17) out of plane	Reposition
Failure to rearm	BUILT-IN SLAM-SHUT VALVE	Incorrect max and/or min spring calibration.	Re-calibrate by acting on the ring nuts
		The downstream pressure is not consistent with the min. and/or max. slam-shut setting	Adjust downstream pressure
		Broken or chipped levers	Change the standard box containing the entire assembly
	PRESSURE SWITCHES MODELS 100	Diaphragm rupture (43) when min spring is present.	Replace
Manual release button locked		Clean and lubricate. Verify that the reset pressure is consistent with the pressure switch calibrations	
Failed tripping	BUILT-IN SLAM-SHUT VALVE	Stem (6) blocked in opening	Clean and lubricate
		Levers locked	Clean and lubricate
	PRESSURE SWITCHES MODELS 100	Rupture of the diaphragm (43) if min spring is missing.	Replace

Fault	Equipment	Possible causes	Intervention
Downstream pressure increase with slam-shut in closure	BUILT-IN SLAM-SHUT VALVE	Lack of O-ring seal (40)	Clean and if necessary replace
		No plug pad seal (19)	Clean and if necessary replace
		Conical seat (8) damaged	Replace
		Lack of O-ring seal (39)	Clean and if necessary replace
	BYPASS DEVICE HP2/2	Lack of pad O-ring seal (5)	Clean and if necessary replace
		Lack of O-ring seal (15)	Clean and if necessary replace
		Damaged valve seat (6)	Replace
		Lack of O-ring seal (20)	Clean and if necessary replace

Tab. 10.68

11 - UNINSTALLATION AND DISPOSAL

11.1 - GENERAL SAFETY WARNINGS

⚠ DANGER


Ensure that there are no effective ignition sources in the work area set up for equipment de-installation and/or disposal.

⚠ WARNING

Before proceeding with uninstallation and disposal operations, ensure that the equipment is secured by disconnecting it from all power supplies.

11.2 - QUALIFICATION OF THE OPERATORS IN CHARGE

Commissioning

Operator qualification	Installer
PPE required	 <p>⚠ WARNING</p> <p>The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any indications provided by the Safety Manager at the installation facility.</u>
Equipment required	Refer to chapter “7 - Commissioning/maintenance equipment”.

Tab. 11.69.

11.3 - UNINSTALLING

⚠ CAUTION

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

NOTICE

Refer to the installation procedures for uninstalling the equipment (see chapter “6 - Installation”) by proceeding in reverse order.

11.4 - INFORMATION NEEDED IN CASE OF RE-INSTALLATION

NOTICE

In case the equipment after uninstallation is to be reused, refer to chapters:

- “6 - Installation”;
- “8 - Commissioning”.

11.5 - DISPOSAL INFORMATION

NOTICE

Please remember to comply with the laws in force in the country where the equipment is installed.

Illegal or improper disposal will result in the application of the penalties provided for in the regulations in force in the country of installation.

NOTICE

Proper disposal avoids harm to humans and the environment and promotes the reuse of valuable raw materials.

The equipment is made of materials that can be recycled by specialized companies.
For proper disposal of the equipment, proceed as shown in “Tab. 11.70.”:

Step	Operation
1	Prepare a large, clutter-free work area so that equipment dismantling operations can be carried out safely.
2	Separate the various components by material type in a way that facilitates recycling through separate collection.
3	Entrust the materials obtained in Step 2 to a specialized company.

Tab. 11.70.

The equipment in all possible configurations consists of the following materials:

Material	Disposal/recycling directions
Plastic	It must be disassembled and disposed of separately.
Lubricants/Oils	They must be collected and delivered to the appropriate specialized and authorized collection and disposal centers.
Steel/Cast-iron	Dismantle and collect separately. It must be recycled through the appropriate collection centers.
Stainless steel	Dismantle and collect separately. It must be recycled through the appropriate collection centers.
Aluminum	Dismantle and collect separately. It must be recycled through the appropriate collection centers.
Pneumatic/electrical components	They will have to be disassembled to be reused in case they are still in good condition or, if possible, overhauled and recycled.

Tab. 11.71.

12 - RECOMMENDED SPARE PARTS

12.1 - GENERAL WARNINGS

NOTICE

By using non-original replacement parts PIETRO FIORENTINI S.p.A. the stated performance cannot be guaranteed.

It is recommended to use the original PIETRO FIORENTINI S.p.A. replacement parts
PIETRO FIORENTINI S.p.A. is not responsible for damage caused by the use of non-original spare parts or components.

12.2 - HOW TO REQUEST SPARE PARTS

NOTICE

For specific information, consult the PIETRO FIORENTINI S.p.A. sales network

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13 - CALIBRATION TABLES

13.1 - REGULATOR CALIBRATION TABLES

NORFLUX							
Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2703735	White	9	260	85	10	12.5
2	2704390	Green	11			12.501	22
3	2704820	Purple	13			22.001	36
4	2705010	Light blue	15			36.201	58

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.72.

13.2 - PRESSURE SWITCH CALIBRATION TABLES MOD. 100

Calibration tables of possible pressure switches in built-in slam-shut valves are provided below:

Mod. 103M/103MH - Max Pressure							
Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2701530	Yellow	4	60	35	29.00	58.01
2	2701790	Yellow/Black	4.5			58.03	108.77
3	2702280	White/Red	5.5			108.79	217.55
4	2702450	Red	6			217.56	319.07

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.73.

Mod. 103M - Min Pressure							
Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2700464	Orange	1.7	40	15	2.901	7.25
2	2700513	Red	2			7.27	11.60
3	2700713	Green	2.3			11.62	24.65
4	2700750	Black	2,5			24.67	58.01
5	2700985	Brown	3			58.03	116.02

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.74.

Mod. 103MH - Min Pressure							
Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2700985	Brown	3	40	15	116.03	188.54
	2700980	Blue	3	35			
2	2700985	Brown	3	40		188.56	275.56
	2700985	Brown	3				

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.75.

Mod. 104M/104MH - Max Pressure

Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2702280	White/Red	5.5	60	35	217.56	435.10
2	2702450	Red	6			435.11	652.65

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.76.
Mod. 104M - Min Pressure

Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2700713	Green	2.3	40	15	23.20	43.51
2	2700750	Black	2,5			43.52	116.03
3	2700985	Brown	3			116.04	261.06

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.77.
Mod. 104MH - Min Pressure

Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2700985	Brown	3	40	15	261.06	435.10
	2700980	Blue	3	35			
2	2700985	Brown	3	40		435.11	594.63
	2700985	Brown	3				

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.78.
Mod. 105M/105MH - Max Pressure

Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2702280	White/Red	5.5	60	35	435.10	942.71
2	2702450	Red	6			942.72	1305.30

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.79.
Mod. 105M - Min Pressure

Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2700713	Green	2.3	40	15	43.51	101.52
2	2700750	Black	2,5			101.53	232.05
3	2700985	Brown	3			232.07	638.14

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.80.

Mod. 105MH - Min Pressure							
Pos.	Spring article code	Spring color	d	Lo	De	Min	Max
1	2700985	Brown	3	40	15	638.14	870.20
	2700980	Blue	3	35			
2	2700985	Brown	3	40		870.21	1305.30
	2700985	Brown	3				

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Tab. 13.81.

13.3 - REGULATOR FLOW RATE TABLES

NORFLUX 2" (maximum recommended flow rate for optimal performance)				
Inlet pressure	Outlet pressure			
	10 psi	20 psi	30 psi	58 psi
psi	Scfh	Scfh	Scfh	Scfh
20	54037	-	-	-
30	78996	76199	-	-
40	100213	96085	85022	-
50	118395	121578	114403	-
60	133154	143278	143368	113020
100	140829	194494	204288	183810
200	110605	231143	285020	362911
300	95369	231792	306676	419374
400	93424	231673	311079	423483
600	89931	231452	318955	430840
800	88981	229790	317238	428208
1000	88097	228287	315735	425878
1200	87266	226910	314401	423786

Cg = 1360 | **K1** = 106.78

Tab. 13.82

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