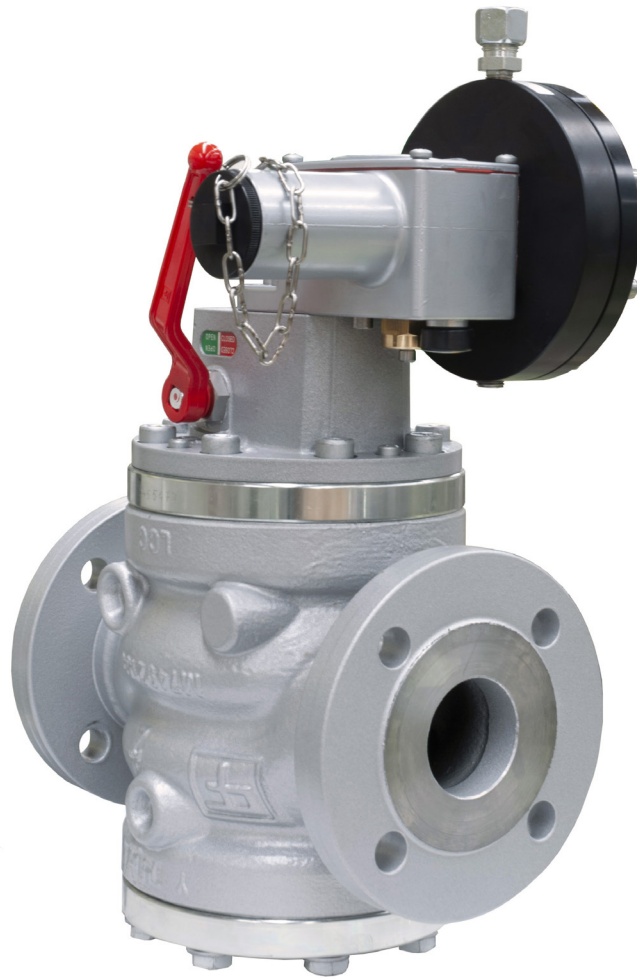


SCN

Slam-shut valve



Revision A - Edition 02/2023

**USE, MAINTENANCE
AND WARNING
MANUAL**

1 - INTRODUCTION

FOREWORD

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

GENERAL REMARKS

All operating, maintenance instructions and recommendations described in this manual must be observed. In order to obtain the best performance and to keep the equipment in efficient condition, the manufacturer recommends that maintenance operations be carried out regularly.

It is of particular importance that the personnel responsible for the equipment be trained in its use, maintenance and application of the safety instructions and procedures indicated in this manual.

Revision: A

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1.1 - REVISION HISTORY

Revision index	Date	Revision contents
A	02/2023	First issue

Tab. 1.1

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2 - GENERAL INFORMATION

2.1 - MANUFACTURER IDENTIFICATION

Manufacturer	PIETRO FIORENTINI S.P.A.
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Tab. 2.2

2.2 - IDENTIFICATION OF THE PRODUCT

Equipment	SLAM-SHUT VALVE
Model	SCN

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 in the SCN series, which is the subject of this manual, is designed, manufactured, tested and controlled in accordance with the requirements of standard EN 14382.

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

NOTICE!

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

2.4 - WARRANTY

PIETRO FIORENTINI S.P.A. guarantees that the equipment was manufactured using the best materials, with high quality workmanship, and complies with the quality requirements, specifications and performance set out in the order.




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

- due to 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 approval of the latter;
- in the event of failure by the purchaser to comply with the instructions contained in this manual, as provided by PIETRO FIORENTINI S.P.A.

NOTICE!

The warranty conditions are specified in the commercial contract.

2.5 - SYMBOLS USED IN THE MANUAL

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

Tab. 2.4

HAZARD!

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

WARNING!

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

ATTENTION!

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

NOTICE!

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

2.6 - ADDRESSEES, SUPPLY AND STORAGE OF THE MANUAL

The instruction manual is intended for qualified technicians responsible for operating and managing the equipment throughout its service life.

It contains the necessary information to properly use the equipment and keep its functional and qualitative characteristics unchanged over time. All information and warnings for safe, correct use are also provided.

The instruction manual, as well as the declaration of conformity and/or test certificate, is an integral part of the equipment and must always accompany it whenever it is moved or resold. It is up to the user to keep this documentation intact for reference throughout the lifespan of the equipment.

WARNING!

Removing, rewriting or editing the pages of the manual and their contents is not allowed.

Keep the instruction manual near the equipment, in an accessible place known by all qualified technicians involved in using and running it.

PIETRO FIORENTINI S.p.A. shall not be held liable for any damage to people, animals and property caused by failure to adhere to the warnings and operating procedures described in this manual.

2.7 - LANGUAGE

The original instruction manual was drawn up in Italian.

Any translations into additional languages are to be made from the original instruction manual.

HAZARD!

The Manufacturer is not responsible for any incomplete translations. If any inconsistency is found, please refer to the text of the original manual.

If inconsistencies are found or the text does not make sense:

- stop any actions;
- immediately contact the relevant offices of PIETRO FIORENTINI S.p.A.

WARNING!

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

2.8 - APPLIED RATING PLATES




WARNING!

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

The equipment and its accessories are provided with nameplates (from Id.1 to Id.3).

The rating plates specify identification details of the equipment and its accessories to be provided, if necessary, to PIETRO FIORENTINI S.p.A.

“Tab. 2.5” shows the nameplates applied:

Id.	Type	Image
1	NAMEPLATE EQUIPMENT (CE version)	
2	NAMEPLATE SLAM-SHUT VALVE	
3	NAMEPLATE PRESSURE SWITCH	

Tab. 2.5

2.8.1 - GLOSSARY FOR RATING PLATES

The terms and abbreviations used on nameplates are described in "Tab. 2.6":

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

Term	Description
Wdu	Full setpoint range with regard to tripping caused by decreased pressure in the pressure switch incorporated in the slam-shut valve. This range can be obtained by adjusting and/or replacing the components (for example, spring or sensitive element).
Wdsu	Full setpoint range with regard to tripping caused by decreased pressure in the pressure switch incorporated in the slam-shut valve. This range can be obtained by adjusting but not replacing the components.

Tab. 2.6

2.9 - GLOSSARY OF MEASUREMENT UNITS

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

Tab. 2.7

2.10 - QUALIFIED PROFESSIONAL FIGURES

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

Professional figure	Definition
Mechanical maintenance technician	<p>Qualified technician able to:</p> <ul style="list-style-type: none"> perform preventive/corrective maintenance operations on all mechanical parts of the equipment subject to maintenance or repair; access all device parts for visual inspection, equipment checks, adjustments and calibrations. <p>The maintenance mechanical technician is not authorised to operate on live electrical systems (if any).</p>
Electrical maintenance technician	<p>Qualified technician able to:</p> <ul style="list-style-type: none"> perform preventive/corrective maintenance operations on all electrical parts of the device subject to maintenance or repair; read wiring diagrams and check the correct functional cycle; perform adjustments and operate on electrical systems for maintenance, repair and replacement of worn parts. <p>The electrical maintenance technician can operate in the presence of voltage inside electrical panels, junction boxes, control equipment etc. only if he/she is deemed to be suitable (S.P.).</p> <p>For general requirements, refer to the IEC EN 50110-1:2014 standard.</p>
Worker in charge of transport, handling, unloading and placement on site	<p>Operator qualified to:</p> <ul style="list-style-type: none"> use lifting equipment; handle materials and equipment. <p>The equipment must be lifted and handled strictly in accordance with the instructions provided by the manufacturer as well as the regulations in force at the place where the equipment is installed.</p>
Installer	<p>Qualified operator able to:</p> <ul style="list-style-type: none"> carry out all the operations necessary to properly install the equipment; perform all the operations necessary for the proper functioning of the equipment and the system in safety.
User's technician	<p>Technician trained and authorized to use and manage the equipment for the activities for which it was supplied. They must:</p> <ul style="list-style-type: none"> be able to perform all operations required to properly run the equipment and the system, ensuring their own safety and that of any personnel on site; have proven experience in properly using the equipment similar to that described in this manual, and be trained, informed and instructed in this regard. <p>The technician may carry out maintenance only if authorised/qualified to do so.</p>

Tab. 2.8

3 - SAFETY

3.1 - GENERAL SAFETY WARNINGS

WARNING!

The equipment described in this instruction manual is:

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

WARNING!

If the gas used is a combustible gas, the installation area of the equipment is defined as a “danger zone” as there are residual risks that potentially explosive atmospheres may be generated.

In “danger zones” and in close proximity thereto:

- there must not be any effective sources of ignition;
- no smoking.

ATTENTION!

Authorised operators must not carry out operations or services on their own initiative that do not fall within their competence.

Never operate the equipment:

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

NOTICE!

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

Before installation, commissioning or maintenance, operators must:









- take note of the safety regulations applicable to the place of installation they are working in;
- obtain the necessary permits to operate when required;
- wear the personal protective equipment required by the procedures described in this instruction manual;
- ensure that the required collective protective equipment and safety information are available in the area they are operating in.

3.2 - PERSONAL PROTECTIVE EQUIPMENT

"Tab. 3.9" shows the personal protective equipment (PPE) and its description. An obligation is associated with each symbol.

Personal protective equipment means any equipment intended to be worn by the worker in order to protect them against one or several risks that are likely to threaten their safety or health during work.

For the operators in charge, depending on the type of work requested, the most appropriate PPE of the following will be reported and must be used:

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

Tab. 3.9

WARNING!

Each licensed operator is obliged to:

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

3.3 - RESIDUAL RISKS

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

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

3.3.1 - TABLE SHOWING RESIDUAL RISKS DUE TO PRESSURE

Risk and hazard	Event and Cause	Effect and consequence	Solution and prevention
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Violent impact; Impact (also due to falling, improper handling, etc.). 	<ul style="list-style-type: none"> Deformation; Broken connections and, if pressurised, even burst. 	<p>a. Handling and installation with appropriate devices to avoid localised stress.</p> <p>b. Installation in suitable places and spaces with appropriate guards and packaging.</p> <p>c. Information in the instructions for use and warning.</p>
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Use of inappropriate fluids. 	<ul style="list-style-type: none"> Corrosion; Embrittlement; Explosion. 	<p>a. The user must check compliance of the used fluid with the specifications on the data plate.</p>
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Operation at temperatures below the minimum permissible temperature. 	<ul style="list-style-type: none"> Embrittlement; Breakage; Explosion. 	<p>a. Install in places where the temperature is not below the minimum permissible temperature and/or insulate the equipment adequately.</p> <p>b. The minimum temperature allowed is indicated on the data plate.</p>
Pressurised gas leak. Projection of metallic and non-pressurised parts. Explosion.	<ul style="list-style-type: none"> Overpressure or exceedance of the rated limit values (maximum pressure allowed) 	<ul style="list-style-type: none"> Explosion; Breaks; Cracks; Permanent deformations. 	<p>a. The device has appropriate design safety margins.</p> <p>b. The user must check the maximum pressure applicable to the equipment.</p> <p>c. The maximum allowable pressure is highlighted on the appropriate plate on the equipment.</p>
Falling of the equipment.	<ul style="list-style-type: none"> Dangerous handling. 	<ul style="list-style-type: none"> Deformation; Cracking; Breakage. 	<p>b. The user must have suitably sized lifting equipment.</p> <p>c. The above requirements are referred to in the equipment use and warning manual.</p>
Pressurised fluid leakage. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Incorrect fixing of the equipment. 	<ul style="list-style-type: none"> Deformation; Breakage. 	<p>a. The device is equipped with unified type process connections and compression fittings.</p> <p>b. The user must ensure correct fixing to the line.</p> <p>c. Directions in the instructions for use and warning.</p>
Explosion of the device. Pressurised fluid leakage. Projection of metallic parts.	<ul style="list-style-type: none"> Operation at temperatures above the maximum permissible temperature. 	<ul style="list-style-type: none"> Reduction of mechanical resistance and breakage of the device; Explosion. 	<p>a. The user must equip the system with suitable safety and control devices.</p> <p>b. The maximum temperature allowed is indicated on the data plate.</p>
Pressurised gas leak.	<ul style="list-style-type: none"> Device maintenance with the system running. 	<ul style="list-style-type: none"> Inappropriate opening of pressurised chambers. 	<p>a. The user must perform any maintenance with the equipment not in operation.</p> <p>b. The above requirements are referred to in the use and warning manual.</p>

Risk and hazard	Event and Cause	Effect and consequence	Solution and prevention
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> External loads bearing on the device. 	<ul style="list-style-type: none"> Deformation; Cracking and slot formation; If under pressure, burst also. 	a. With the exclusion of what is set out in the project, the user must verify that no additional concentrated load bears on the device.
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Electrostatic potential, differential stray currents. 	<ul style="list-style-type: none"> Corrosion localised in the device. 	b. The user must equip the device with the necessary protection and earthing devices. c. The above requirements are referred to in the use and warning manual.
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Humidity; Environments with aggressive atmosphere. 	<ul style="list-style-type: none"> Deterioration of external surfaces; Corrosion. 	a. The user must periodically check the state of conservation of the external surfaces. b. The above requirements are referred to in the use and warning manual.

Tab. 3.10

3.3.2 - TABLE OF RESIDUAL RISKS FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

“Tab. 3.11” shows the conditions that can lead to the generation of a potentially explosive atmosphere by the slam-shut valve SCN

Considering that the silencer does not have active functional parts, in this analysis it is considered an integral part of the SCN regulator.

The table is valid for use with natural gas with a density of no more than 0.8; for different densities, the installation and environmental conditions must also be evaluated.

! WARNING!

If the gas used is a combustible gas, the installation area of the equipment is defined as a “danger zone” as there are residual risks that potentially explosive atmospheres may be generated.

There must be no effective sources of ignition in “danger zones” and in close proximity thereto.

Operating conditions	Potentially explosive atmosphere	Normative references	Management measures included in the instructions for use and warning
First start-up	No	<ul style="list-style-type: none"> During the production cycle and before the CE marking according to Directive 2014/68/EU, the external tightness of the equipment is checked at a value of 1.1 PS, in accordance with Standard EN 14382. Before commissioning, the external sealing of the system portion on which the equipment is installed is checked at a suitable pressure (in accordance with the provisions of standards EN 12186 and EN 12279). 	The instructions for use indicate the need to meet the requirements in Standards EN 12186 and EN 12279.
Operation in normal conditions	No	<p>The indications in the previous point apply, in addition:</p> <ul style="list-style-type: none"> the equipment is installed outdoors or in an environment with natural ventilation (in accordance with Standards EN 12186 and EN 12279); the installation is subject to surveillance according to current national rules/good practice/the equipment manufacturer’s instructions (in accordance with the provisions of Standard EN 12186 and Standard EN 12279). 	<p>The instructions for use indicate that:</p> <ul style="list-style-type: none"> any environment in which the equipment is installed must meet the requirement of Standards EN 12186 and EN 12279; periodic checks and maintenance must be carried out during surveillance in accordance with the national rules in force (if any), and with the specific manufacturer’s recommendations.
Breakage of the control head diaphragm (malfunction)	No	<p>This event must be considered a rare malfunction.</p> <p>All atmospheric pressure chambers delimited on at least one side by a diaphragm must be channelled to a safe area (in accordance with the provisions of Standard EN 12186 and Standard EN 12279).</p>	The instructions for use indicate the need to meet the requirements of Standards EN 12186 and EN 12279.

Operating conditions	Potentially explosive atmosphere	Normative references	Management measures included in the instructions for use and warning
Breakage of other non-metallic parts (malfunction)	No	This type of malfunction is not reasonably expected as it involves static sealing (to the outside).	-
Decommissioning	No	<ul style="list-style-type: none"> The pressure of the system section in which the equipment is installed must be reduced with appropriate vent lines channelled to a safe area (in accordance with the provisions of Standard EN 12186 and Standard EN 12279). The residual gas must be discharged as indicated above. 	The instructions for use indicate the need to meet the requirements of Standards EN 12186 and EN 12279
Reboot	No	<ul style="list-style-type: none"> After reassembling the regulator, carry out an external leakage test at a convenient pressure value as specified by the manufacturer. Before commissioning, the external sealing of the system portion on which the equipment is installed is checked at a suitable pressure (in accordance with the provisions of standards EN 12186 and EN 12279). 	The instructions for use indicate: <ul style="list-style-type: none"> the minimum conditions for testing internal leakage; the need to meet the requirements of Standards EN 12186 and EN 12279.

Tab. 3.11

3.4 - OBLIGATIONS AND PROHIBITIONS

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

It is mandatory to:



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

It is forbidden to:

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

3.5 - SAFETY PICTOGRAMS

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

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

Tab. 3.12

HAZARD!

It is absolutely forbidden to remove the safety pictograms on the equipment.

The user is required to replace the safety pictograms which, following wear, removal or tampering, are illegible.

3.6 - NOISE LEVEL

Depending on the operating conditions, use and configuration required, the equipment may generate noise beyond the limits allowed by current legislation in the country of installation.

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

ATTENTION!

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

4 - DESCRIPTION AND OPERATION

4.1 - GENERAL DESCRIPTION

The slam-shut valve SCN is a safety device that shuts off gas if the controlled pressure reaches the calibration value set for its tripping.

The slam-shut valve SCN can be installed individually or upstream of a regulator.

If the slam-shut valve is mounted individually, the pressure switch takes the pressure downstream of the slam-shut valve.

If the slam-shut valve is mounted upstream of the regulator, the control pressure reaching the pressure switch is taken downstream of the regulator.

The slam-shut valve SCN can be operated:

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

The main features are:

- tripping due to downstream pressure increase and/or decrease;
- design pressure: 16 bar for all accessory components;
- local shut-off button;
- manual reset only with internal bypass activated by the reset lever.

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

Pos.	Description	Pos.	Description
1	Plug	6	Sensor
2	Valve seat	7	Control shaft
3	Coupling device	8	Tripping spring due to pressure increase
4	Control pressure switch	9	Tripping spring due to pressure decrease
5	Pressure switch diaphragm	10	Reset lever

Tab. 4.13

4.2 - OPERATION

The downstream pressure (P_d) in the control head (C) acts on the diaphragm (5) of the control pressure switch (4), which, joined to the control shaft (7), receives an opposite force from the spring (8, 9), which determines the release of the plug (1) on the valve seat (2).

In the event of tripping due to a pressure surge:

- the downstream pressure (P_d) exceeds the calibration value
- the load on the diaphragm (5) increases until it overcomes the resistance of the spring (8)
- The translation of the drive shaft (7) moves the touch probe (6) by means of the cam, disengaging the coupling device (3).

In the event of a tripping due to pressure drop:

- the downstream pressure (P_d) drops below the calibration value
- the spring holder (9) slides and moves the drive shaft (7)
- The translation of the drive shaft (7) moves the touch probe (6) by means of the cam, disengaging the coupling device (3).

To reset the SN slam-shut valve, act on the lever (10) which:

- opens an internal bypass in the first section of the stroke allowing the upstream pressure (P_u) to be transferred from the inlet chamber to the outlet chamber of the regulator body thereby rebalancing the pressure on the plug (1);
- in the second section of the stroke, re-couples the coupling device (3) of the mobile system.

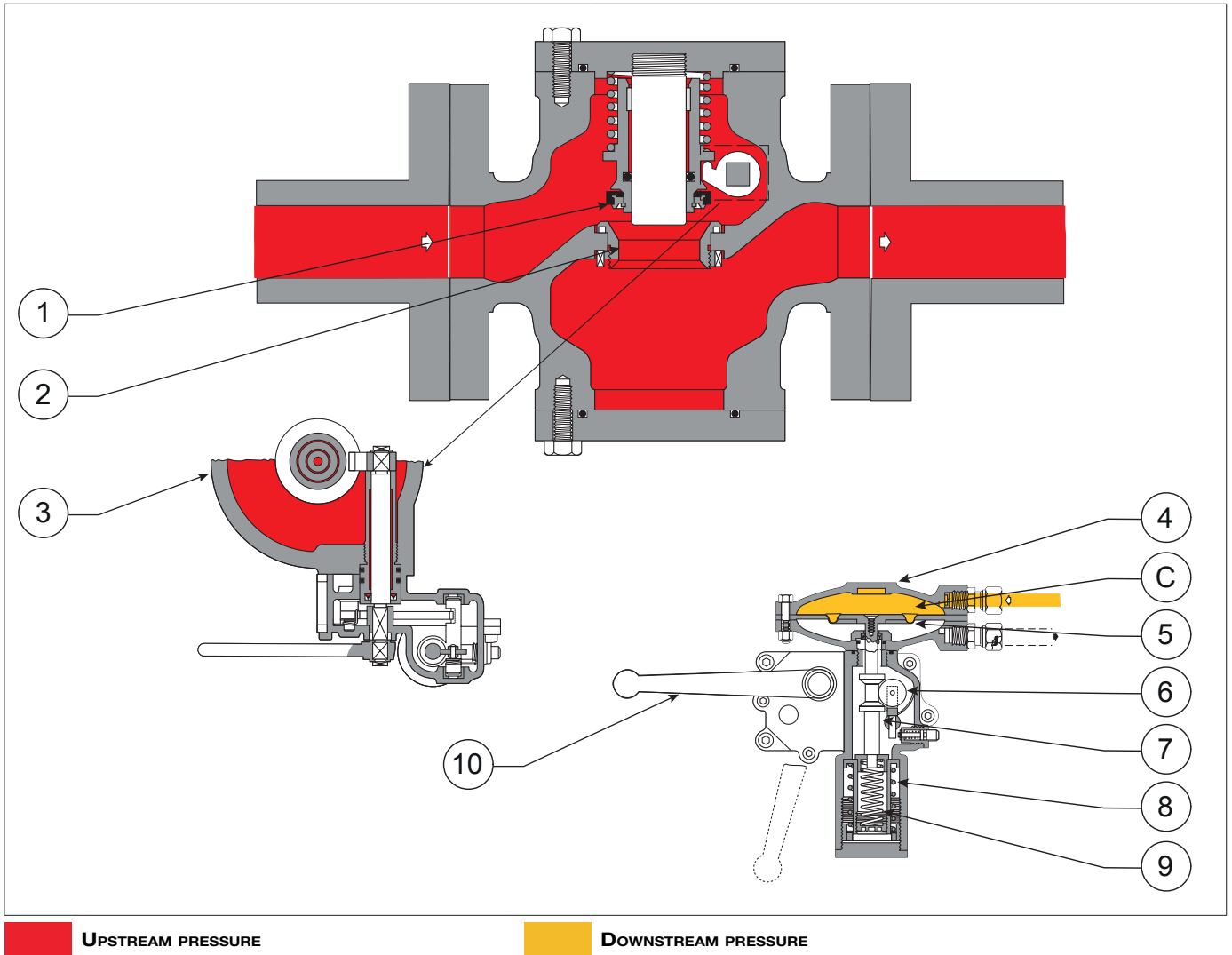


Fig. 4.1. Description and operation SCN

4.3 - INTENDED USE

4.3.1 - ENVISAGED USE

The equipment in question is intended for:

Operation	Permitted	Not permitted	Work environment
Pressure value monitoring:	Gaseous, and non-corrosive, fluids that have been filtered beforehand.	<ul style="list-style-type: none"> Liquids. Any product other than those permitted. 	Installations for the transport and distribution of gas fuel to supply networks for: <ul style="list-style-type: none"> civil use; industrial use.

Tab. 4.14

It was designed to be used exclusively within the limits specified on the nameplate and according to the instructions and limits of use referred to in this manual.

Safe work conditions are as follows:

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

4.3.2 - REASONABLY FORESEEABLE MISUSE

Reasonably foreseeable misuse means the use of the equipment in a way not foreseen in the phase but which can result from readily foreseeable human behaviour:

- corrosive fluids;
- fluids not properly treated upstream;
- liquids;
- instinctive reaction of an operator in the event of a malfunction, accident or breakdown while using the equipment;
- behaviour resulting from pressure to keep the equipment running under all circumstances;
- behaviour resulting from carelessness;
- behaviour resulting from the use of the equipment by unauthorised and unsuitable people;
- using the equipment in a manner other than that referred to under “4.3.1 - Envisaged use”.

Any use of the equipment other than the intended use must be previously approved in writing by PIETRO FIORENTINI S.p.A. If no written approval is provided, use shall be considered improper.

In the event of “improper use”, PIETRO FIORENTINI S.p.A. shall not be held liable for any damage caused to people or property, and any type of warranty on the equipment shall be deemed void.

4.3.3 - TYPES OF FLUIDS

The equipment works with combustible gases used:

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

NOTICE!

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

4.4 - TECHNICAL FEATURES/PERFORMANCE

Slam-shut valve SCN is suitable for medium and high pressure.

SCN is a “top entry” valve, therefore it allows easy maintenance without removing it from the line.

It is also equipped with a button for local closing.

The main specifications of this slam-shut valve are:

Technical features	
Maximum allowable pressure	Up to 16 bar
Inlet gas temperature range	-20 °C + 60 °C
Ambient temperature range	-20 °C + 60 °C
Inlet pressure range (bpu)	1 - 16 bar
Accuracy class (AG)	up to 2.5 for OPSO (depending on working conditions) up to 5 for UPSO (depending on working conditions)
Max. pressure tripping range (Wdso)	OPSO 0.025 - 5 bar
Min. pressure tripping range (Wdsu)	UPSO 0.01 - 3,01 bar

Tab. 4.15.

Cg and K1 coefficients								
Nominal diameter [mm]	25	40	50	65	80	100	150	200
Size [inches]	1”	1” ½	2”	2” ½	3”	4”	6”	8”
Coefficient Cg	331	848	1360	2240	3395	5100	10600	16600
Coefficient K1	106.78	106.78	106.78	106.78	106.78	106.78	106.78	106.78

Tab. 4.16.

5 - TRANSPORT AND HANDLING



5.1 - SPECIFIC WARNINGS FOR TRANSPORT AND HANDLING

NOTICE!

Transport and handling must be carried out by personnel:

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

Transport with forklift or crane

Operator qualification	Person in charge of transport, handling, unloading and placing on site
PPE required	 <p> WARNING!</p> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any information provided by the Safety Manager at the installation facility.</u>
Lifting equipment	Hoist crane, forklift truck or other suitable equipment.
Weights and dimensions of the equipment	For dimensions and weights please refer to “5.2 - Physical characteristics of the equipment”.

Tab. 5.17

5.1.1 - PACKAGING AND FASTENERS USED FOR TRANSPORT

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




Upon receiving the equipment:

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

! NOTICE!

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

“Tab. 5.18” shows the types of packaging used:

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

Tab. 5.18

5.2 - PHYSICAL CHARACTERISTICS OF THE EQUIPMENT

5.2.1 - SCN

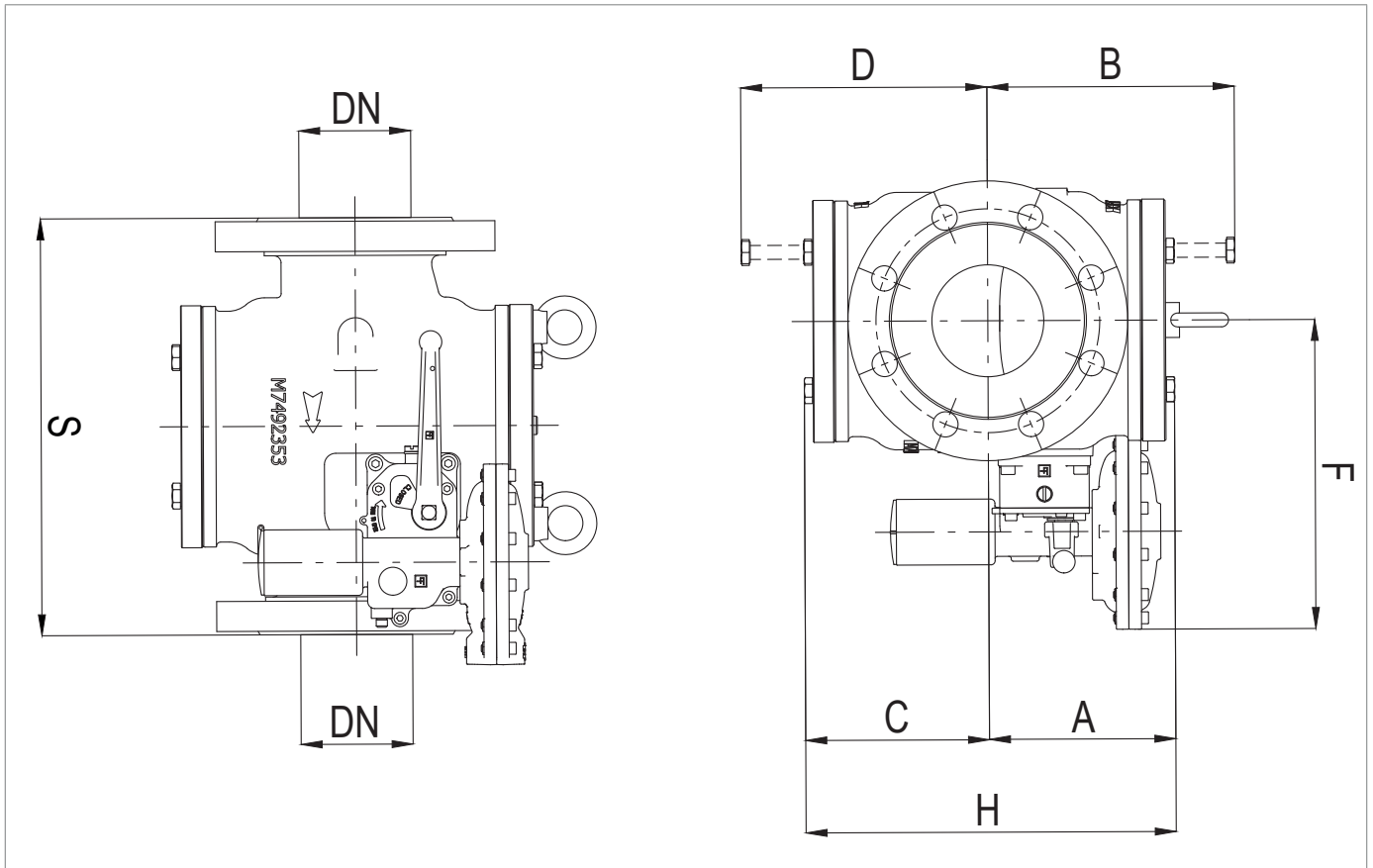


Fig. 5.2. SCN physical characteristics

SCN overall dimensions								
Size [inches]	1"	1" ½	2"	2" ½	3"	4"	6"	8"
Nominal diameter [mm]	25	40	50	65	80	100	150	200
S	183	223	254	277	298	352	451	543
A	120	135	135	165	165	200	210	250
B	140	160	160	180	180	220	260	300
C	120	135	135	165	165	200	210	250
D	140	160	160	180	180	220	260	300
F	160	170	170	195	195	160	175	180
H	240	270	270	330	330	400	420	500
Connecting pneumatic connections	Øe 10mm x Øi 8mm							

Tab. 5.19

Weight SCN								
	25	33	42	46	51	92	160	270

Tab. 5.20

5.3 - EQUIPMENT ANCHORING AND LIFTING METHOD

 **HAZARD!**

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

 **WARNING!**

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

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

 **ATTENTION!**

Before moving the equipment:

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

5.3.1 - FORKLIFT HANDLING METHOD

HAZARD!

It is forbidden to:

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

WARNING!

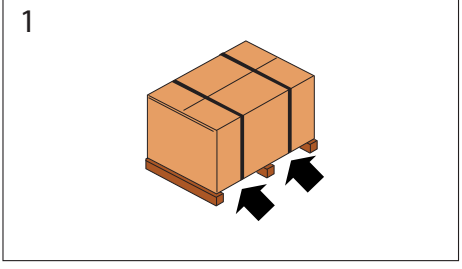




The following is not allowed on forklifts:

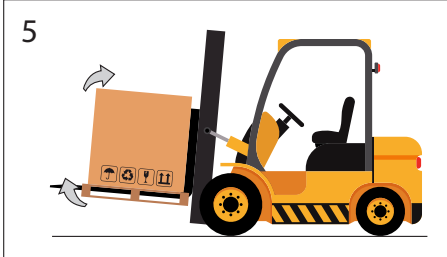
- carrying passengers;
- lifting people.

NOTICE!

Packaging must always be handled in a vertical position

Proceed as described at "Tab. 5.21":

Step	Action	Image
1	Place the forks of the forklift under the load surface.	
2	Make sure that the forks protrude from the front of the load (by at least 5 cm), far enough to eliminate any risk of the transported load tipping.	
3	Raise the forks until they are touching the load. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  NOTICE! Fasten the load to the forks with clamps or similar devices if required. </div>	
4	Slowly lift the load by a few dozen centimetres and check its stability, making sure that the centre of gravity of the load is positioned at the centre of the lifting forks.	

Step	Action	Image
5	Tilt the mast backwards (towards the driver's seat) to help the over-turning moment and to ensure greater load stability during transport.	
6	Adjust transport speed according to the type of floor and load, avoiding sudden manoeuvres. ⚠ WARNING! In case of: <ul style="list-style-type: none"> • obstacles along the path; • particular operating situations; hinder operator visibility, the assistance of a ground operator is required, standing outside the range of action of the lifting equipment, with the task of signalling.	-
7	Place the load in the chosen installation area.	-

Tab. 5.21

5.3.2 - CRANE HANDLING METHOD

WARNING!

It is mandatory to use CE marked chains, ropes and eyebolts or marked with conformity marks/markings in accordance with the regulations 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 the initial position;
- the ropes are in excellent condition and have adequate sections.


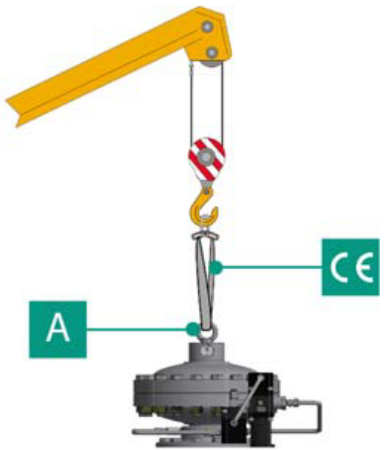

It is forbidden to:

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

NOTICE!


Packaging must be always handled in a vertical position.

The equipment must be handled using the lifting points provided on the equipment itself. For proper transport, follow the procedure in "Tab. 5.22":

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

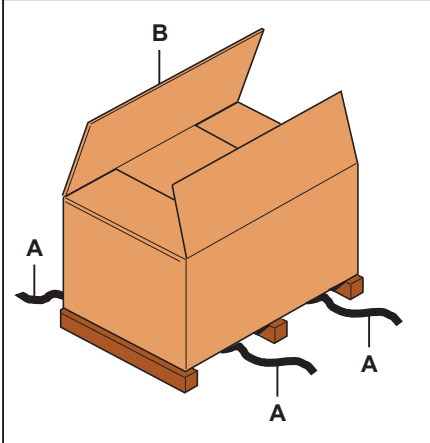
Tab. 5.22

5.4 - PACKAGING REMOVAL

Packaging removal	
Operator qualification	<ul style="list-style-type: none"> Person in charge of transport, handling, unloading and placing on site; Installer.
PPE required	 <p>WARNING!</p> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE necessary to protect against risks associated with the workplace or operating conditions, please refer to:</p> <ul style="list-style-type: none"> the regulations in force in the country of installation; any information provided by the Safety Manager at the installation facility.

Tab. 5.23

To unpack the equipment in a cardboard box, proceed as described in “Tab. 5.24”:

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

Tab. 5.24

NOTICE!

After removing all packaging materials, check for any anomalies.

If there are anomalies:

- do not install the equipment;
- contact PIETRO FIORENTINI S.p.A. and specify the details provided on the equipment nameplate.


5.4.1 - PACKAGING DISPOSAL

NOTICE!

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

5.5 - STORAGE AND ENVIRONMENTAL CONDITIONS

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

Conditions	Data
Maximum storage period	Maximum 3 years. <div style="border: 1px solid blue; padding: 5px;">  NOTICE! For installations in later periods, see paragraph “5.5.1 - Pre-installation warnings after prolonged storage”. </div>
Temperature	Not above 40°C
Humidity	Not above 70%
Radiation	Away from radiation sources according to UNI ISO 2230:2009

Tab. 5.25

5.5.1 - PRE-INSTALLATION WARNINGS AFTER PROLONGED STORAGE

For installations that have been stored for longer than 3 years, the condition of all rubber parts must be checked and, if found to be damaged, they must be replaced in order to ensure the correct functioning of the equipment.

For the replacement of the rubber parts of the equipment, please refer to “9 - Maintenance and functional checks”.

 **NOTICE!**

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

6 - INSTALLATION

6.1 - INSTALLATION PRE-REQUISITES

6.1.1 - ALLOWED ENVIRONMENTAL CONDITIONS

WARNING!

To safely use the equipment, in full respect of the allowed environmental conditions, follow the data shown on the regulator plate and on any accessories (refer to paragraph “2.8 - Applied rating plates”).

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

The installation area of the equipment must be properly lit to ensure proper operator visibility during working on the equipment.

NOTICE!

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

- use all the light sources of the installation plant;
- be equipped with a handheld lighting system or connected to the power mains, compliant with Directive 2014/34/EU (ATEX) for use in environments at risk of explosion.

6.1.2 - CHECKS BEFORE INSTALLATION

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

$$\text{MIPd} \leq 1.1 \text{ PS}$$

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

ATTENTION!

If the installation of the equipment requires the application of compression fittings, these must be installed in accordance with the instructions of the Manufacturer of the fittings themselves.



The choice of fittings must be compatible with:

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

Before installation, it must be ensured that:

- the expected dimensions of the installation site are compatible with those of the equipment;
- there is a space around the equipment that facilitates maintenance operations for employees;
- the upstream and downstream pipes are at the same level and can bear the weight of the equipment;
- the inlet and outlet connections of the pipes are aligned on the flanges;
- the inlet and outlet connections of the equipment are clean and flawless;
- 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	 <p> WARNING!</p> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any information provided by the Safety Manager at the installation facility.
Equipment required	Please refer to the chapter "7 - Commissioning/maintenance equipment".

Tab. 6.26

6.2 - SPECIFIC SAFETY INSTRUCTIONS FOR THE INSTALLATION STEP

 **WARNING!**

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

 **WARNING!**

Installation may also take place in areas where there is a risk of explosion, which implies that all necessary prevention and protection measures have to be taken.

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

6.3 - GENERAL INFORMATION ON CONNECTIONS

The equipment must be installed in-line with an arrow on the body pointing to the gas flow direction. They must be present in the online installation (see Fig. 6.5):

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

Tab. 6.27

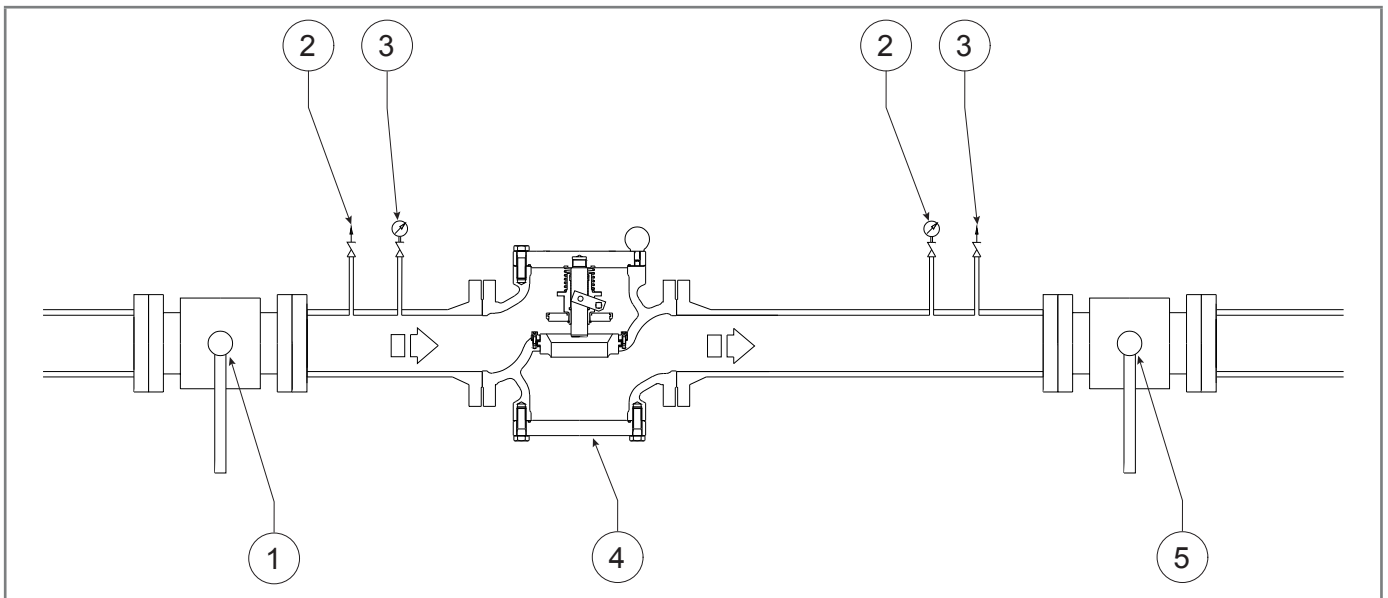


Fig. 6.3. In-line installation

NOTICE!

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

Equipment vents must be ducted in accordance with UNI EN 12186:2014 or UNI EN 12279:2007 or the standards in force at the place of installation of the equipment.

6.4 - REGULATOR INSTALLATION POSITIONS

Fig. 6.6 and Fig. 6.7 illustrate typical regulator arrangements:

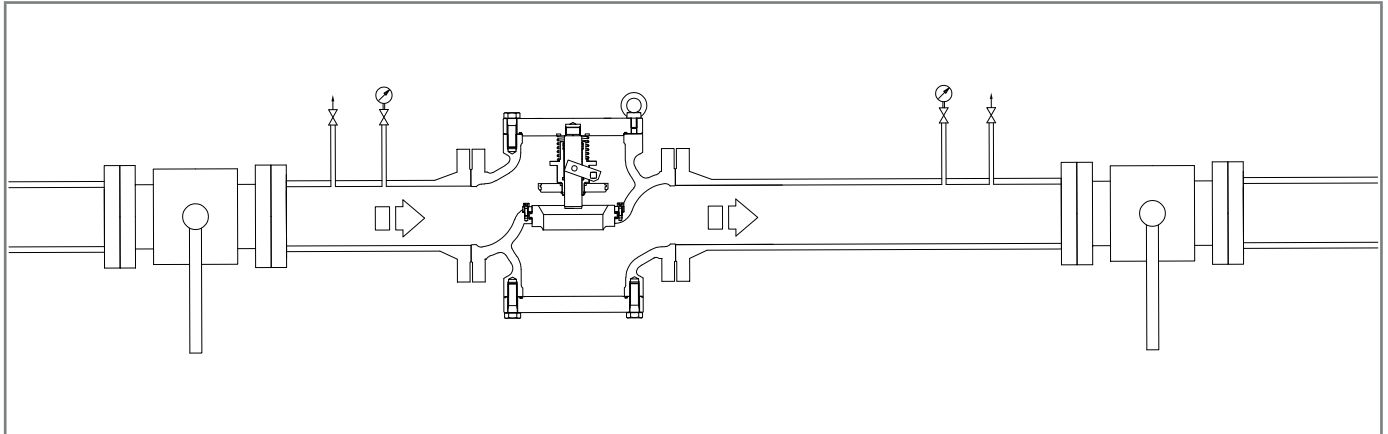


Fig. 6.4. Standard position

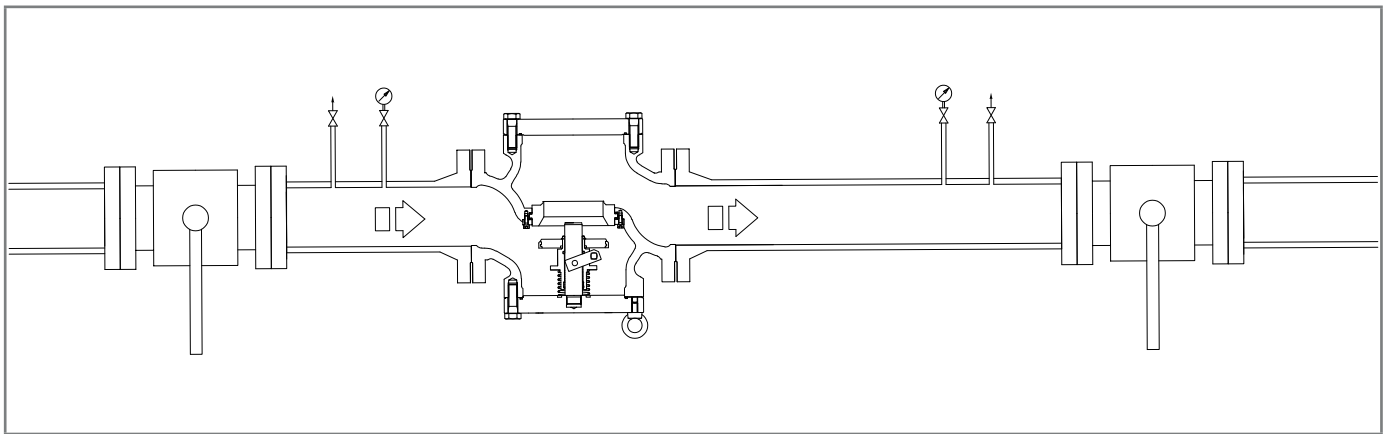


Fig. 6.5. Inverted position

6.5 - INSTALLATION PROCEDURES

6.5.1 - EQUIPMENT INSTALLATION PROCEDURES

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

Tab. 6.28

NOTICE!

For installation after maintenance, replace the seals.

6.5.2 - CONNECTION OF THE SENSING LINES TO THE DOWNSTREAM PIPING

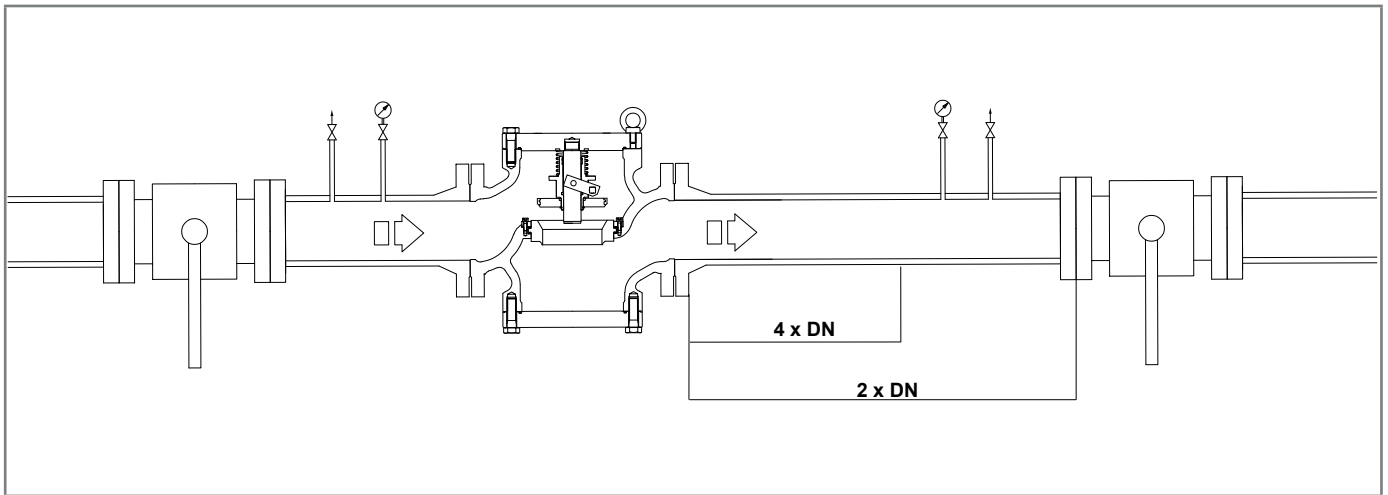


Fig. 6.6. Connection of sensing lines to the downstream piping

For proper adjustment, it is essential that:

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

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

$$V_{\max} = 30 \text{ m/s for } P_a > 5 \text{ bar}$$

$$V_{\max} = 25 \text{ m/s for } P_a < 5 \text{ bar}$$

As a limitation of use, the velocity of the pressurised fluid at the intake point does not exceed the following values:

$$V_{\max} = 40 \text{ m/s for } P_a > 5 \text{ bar}$$

To calculate the flow rate, use the following formula:

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

V = gas velocity in m/sec

Q = gas flow rate Sm³/h

DN = nominal pipe diameter in mm

Dp = regulator outlet pressure in barg

! NOTICE!

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

To prevent the pneumatic connections of the sensing lines from collecting impurities and condensation, 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. 6.9);
- the hole in the piping has no burrs or internal protrusions;
- the slope of the pneumatic connection is always 5-10% towards the downstream pipe connection.

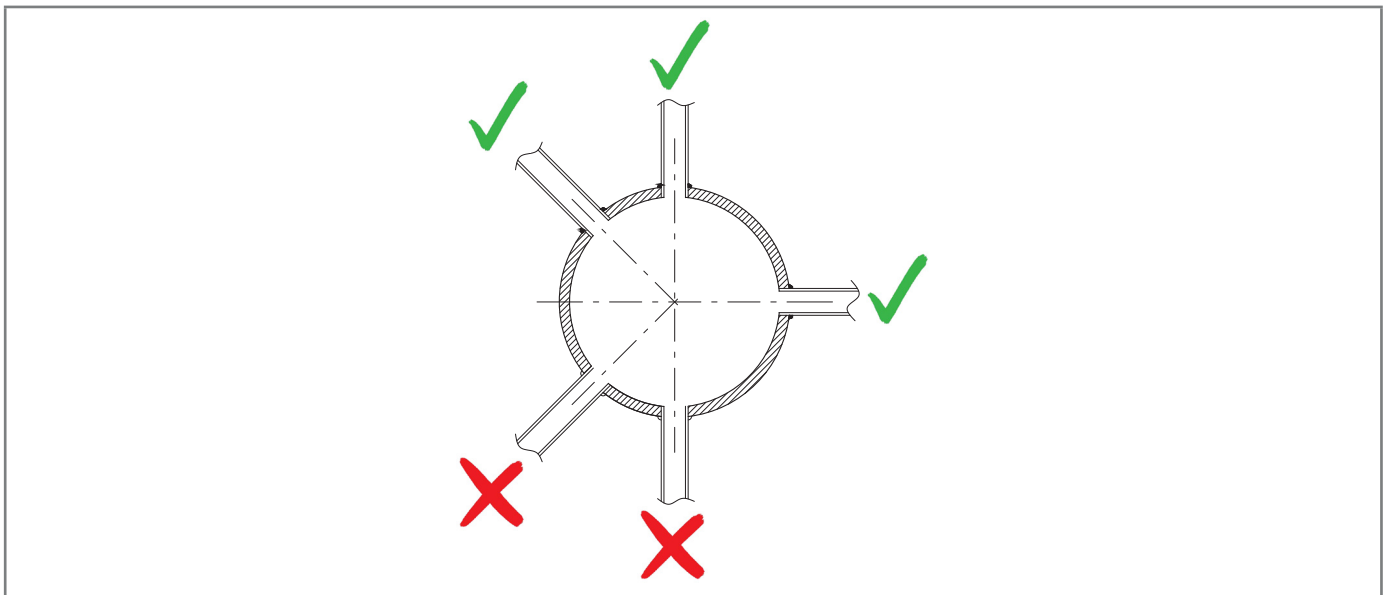


Fig. 6.7. Welded pipe connections

If there is a multiple sensing line, connect the equipment connections as shown below:

- 1 and 2 free sensing lines
- 3 and 4 regulator sensing lines (if applicable)
- 5 and 6 pressure switch sensing lines.

! NOTICE!

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

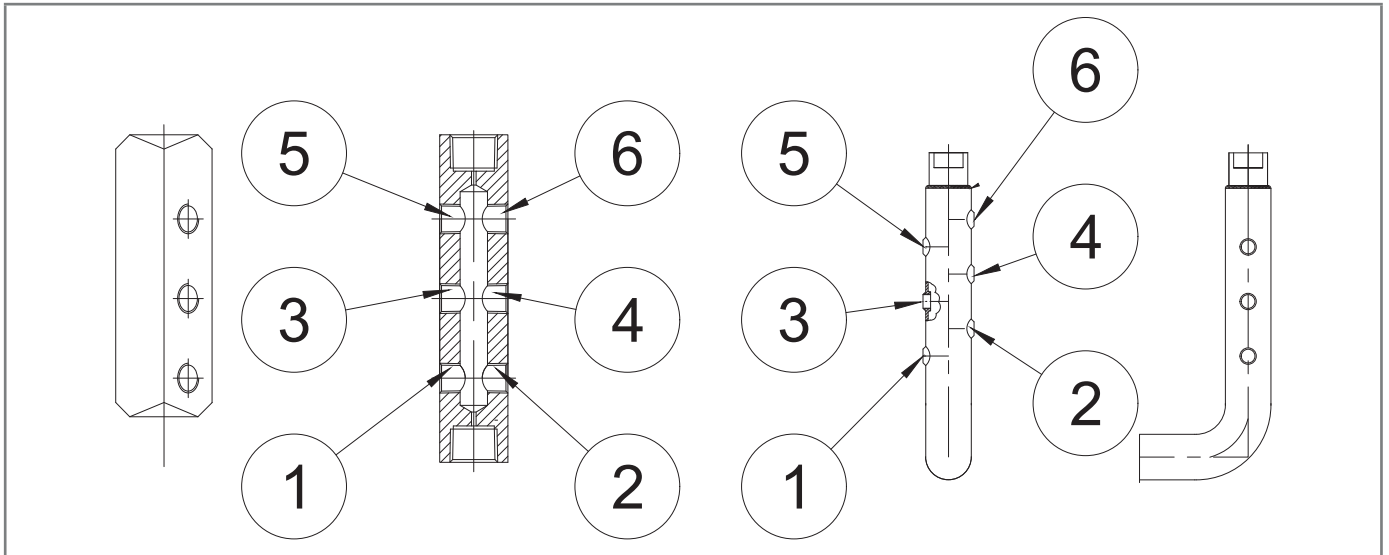


Fig. 6.8. Equipment connections


6.6 - POST-INSTALLATION AND PRE-COMMISSIONING CHECKS

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

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







7 - COMMISSIONING/MAINTENANCE EQUIPMENT




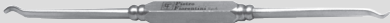

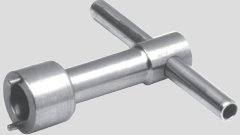


7.1 - LIST OF EQUIPMENT

Use of commissioning/maintenance equipment	
Operator qualification	<ul style="list-style-type: none"> • Mechanical maintenance technician; • Electrical maintenance technician; • Installer; • Name of the user.
PPE required	<div style="display: flex; align-items: center;">  </div> <div style="background-color: #f4a460; padding: 5px; margin-top: 5px;"> <p>⚠ WARNING!</p> </div> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any information provided by the Safety Manager at the installation facility.

Tab. 7.29

The types of equipment required to commission and service the equipment are described in “Tab. 7.30”:

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

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

Tab. 7.30

7.2 - EQUIPMENT NEEDED FOR THE DIFFERENT CONFIGURATIONS

Tab. 7.32 is distinguished by:

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

Tab. 7.31

SCN									
Equipment		Size [inches]							
Ref.	Type	1"	1" ½	2"	2" ½	3"	4"	6"	8"
A	Ch.	8-13-19-23	8-17-19-23	8-17-19-23	8-17-19-23	8-17-19-23	8-19-24	8-19-22	8-19-22
B	L.	300							
D	Ch.	10-27							
E	Ch.	4-5							
L	Code	7999099							
M	DN	19 - 60							
O	Code	7999045	7999047	7999047	-	-	-	-	-

Tab. 7.32

8 - COMMISSIONING

8.1 - GENERAL WARNINGS

8.1.1 - SAFETY REQUIREMENTS FOR COMMISSIONING

HAZARD!

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

HAZARD!

In case of installation on distribution networks for natural gas, consider the risk associated with explosive mixtures (gas/air) being formed inside the piping, if the line is not subjected to inerting.

WARNING!

During commissioning, any unauthorised personnel must keep away.
The no entry area has to be marked with signs and/or boundaries.

NOTICE!

Commissioning has to be carried out by authorised and qualified personnel.

The equipment is supplied with the pressure switch / control device already calibrated.



NOTICE!

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

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

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

Commissioning

Operator qualification	<ul style="list-style-type: none"> • Installer; • Qualified technician.
PPE required	<div style="display: flex; align-items: center;">  </div> <div style="background-color: #f96; padding: 5px; margin-top: 5px;">  WARNING! </div> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any information provided by the Safety Manager at the installation facility.
Equipment required	Please refer to the chapter "7 - Commissioning/maintenance equipment".

Tab. 8.33

8.2 - PRELIMINARY PROCEDURES FOR COMMISSIONING

HAZARD!

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

WARNING!

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


ATTENTION!

To protect the equipment from damage, never:

- pressurise the equipment through a valve located downstream of it;
- depressurise the equipment through a valve located upstream of it.

Commissioning can be carried out using two different procedures:

Commissioning types

Injection of an inert fluid	Pressurising the equipment by injecting an inert fluid (e.g. nitrogen) to avoid potentially explosive mixtures for services with combustible gases. <div style="background-color: #f4a460; padding: 5px;"> WARNING!</div> During pressurisation, always check that the equipment has no leaks.
Direct injection	Direct injection of gas into pipes, keeping the gas velocity in the pipes as low as possible (maximum permitted value of 5 m/s).

Tab. 8.34

8.3 - PROPER COMMISSIONING CHECK

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

8.4 - CALIBRATION OF EQUIPMENT AND ACCESSORIES INSTALLED

 **NOTICE!**

To properly calibrate the equipment and accessories present, refer to the accuracy class indicated on the nameplates (see section “2.8 - Applied rating plates”).

8.5 - SLAM-SHUT VALVE COMMISSIONING PROCEDURE SCN

8.5.1 - CHECKING THE TIGHTNESS OF THE SLAM-SHUT VALVE SCN

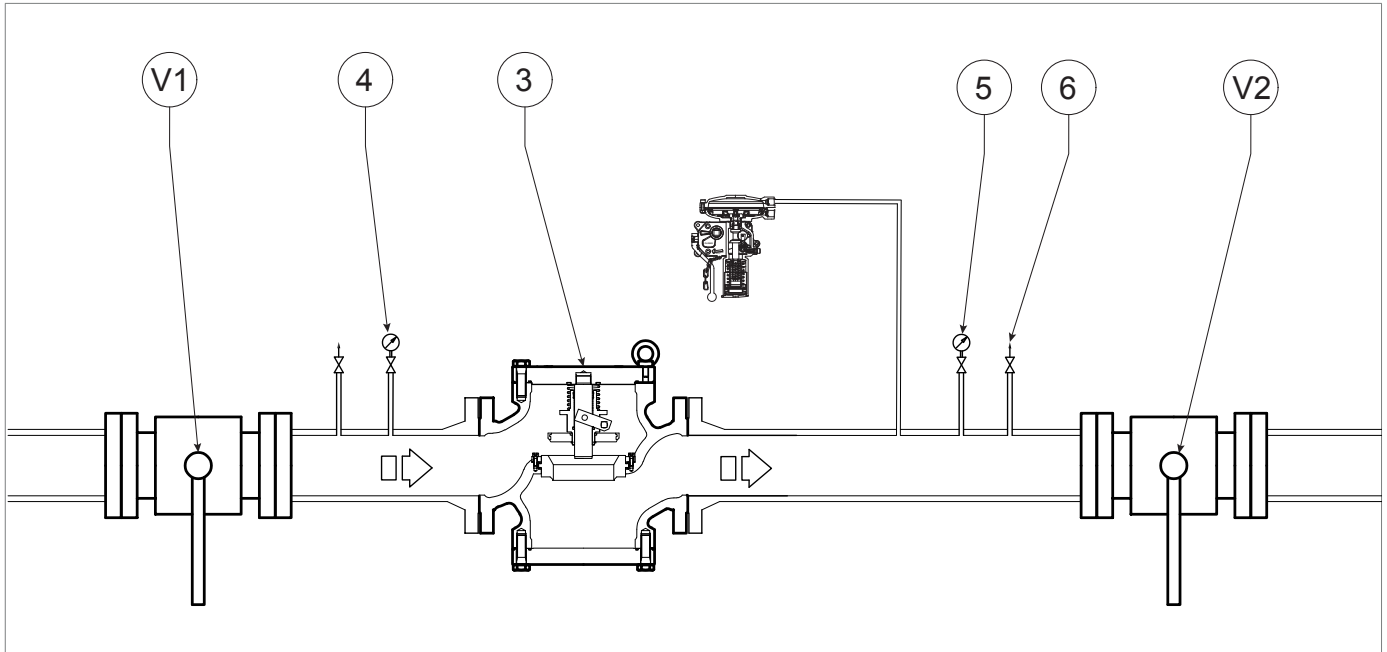


Fig. 8.9. Checking the tightness of the slam-shut valve SCN

Step	Action
1	Check that the slam-shut valve is in the shut-off position.
2	Open the bleed cock (6) to fully discharge the downstream section.
3	Slowly open the upstream shut-off valve (V1).
4	Check the internal tightness of the slam-shut valve by means of the bleed cock (6). <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • Check the seal with a foaming substance; • In case of leaks, please refer to the chapter “10 - Troubleshooting” to clear the causes of malfunctions. </div>

Tab. 8.35

8.5.2 - START-UP OF THE SLAM-SHUT VALVE SCN

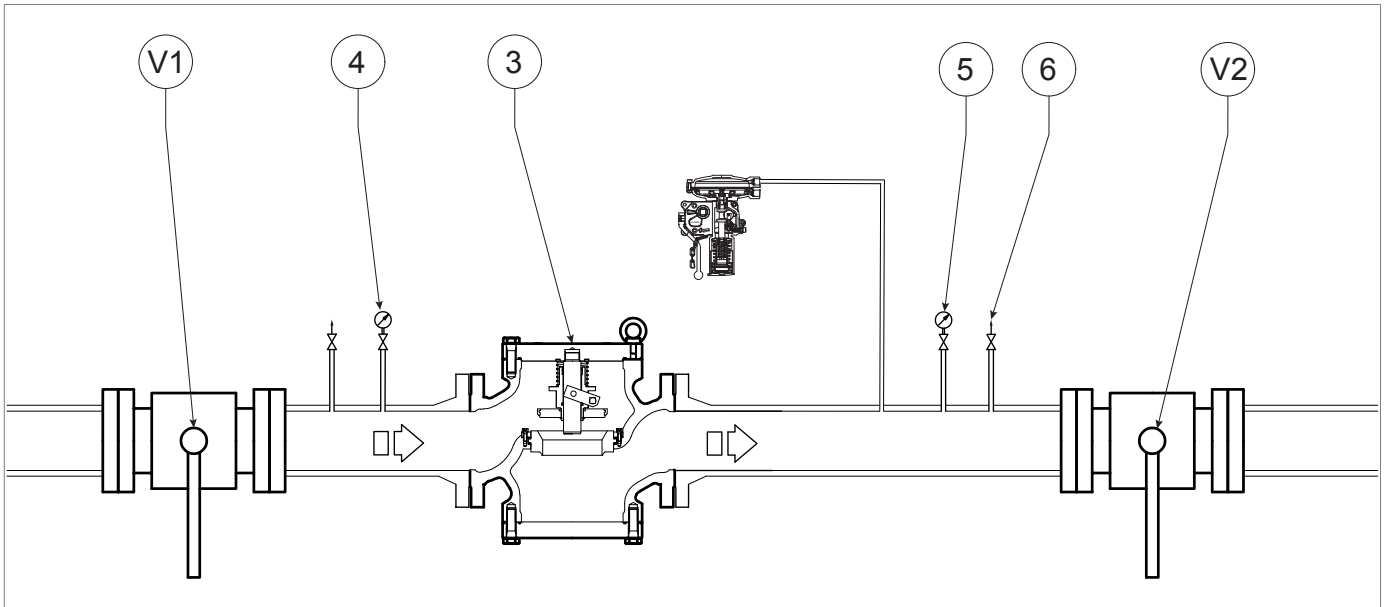


Fig. 8.10. Start-up of the slam-shut valve SCN

Step	Action
1	<p>a- VALID FOR VALVE MOUNTED INDIVIDUALLY Check that the drain cock (6) is closed.</p> <p>b- VALID FOR VALVE MOUNTED UPSTREAM OF THE REGULATOR Make sure that the bleed cock (6) is partially open.</p>
2	<p>Check that the slam-shut valve (3) is in the closed position.</p> <p>! NOTICE! If the slam-shut valve (3) is in the open position, close it using the manual button (Fig. 8.12,ref. 10).</p>
3	Partially open the upstream shut-off valve (V1), checking the pressure indicated by the upstream pressure gauge (4).
4	<p>Perform the internal tightness check of the LA slam-shut valve, referring to paragraph 8.5.1.</p> <p>! NOTICE! In case of leaks, please refer to the chapter "10 - Troubleshooting" to clear the causes of malfunctions.</p>
5	Slowly pressurise the conveying or control line, acting on the reset lever (Fig. 8.14, ref. 16) of the slam-shut valve (refer to the "Operation" section of par. 4.2), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) is 20% lower than the pressure switch intervention value.
6	Open the upstream shut-off valve (V1) completely.
7	Check calibrations of the pressure switch of the slam-shut valve by referring to paragraph 8.5.4.
8	Check the downstream pressure (Pd) referring to the downstream pressure gauge (5).
9	<p>VALID FOR VALVE MOUNTED UPSTREAM OF THE REGULATOR Close the bleed cock (6).</p>
10	<p>Check the tightness of all the fittings between the shut-off valves (V1, V2).</p> <p>! NOTICE! Check for sealing with a foaming substance.</p>
11	If external leaks are noticed, eliminate the leak points and repeat the procedure from step 6.
12	Open downstream shut-off valve (V2) very slowly until the pipeline fills completely.

Tab. 8.36.

8.5.3 - PRESSURISING WITH EXTERNAL SOURCE

It is possible to pressurise the chamber (A) of the pressure switch control head (1) using an external source. The introduced pressure is controlled by using pressure gauges or transducers.

To correctly discharge the introduced pressure, make sure there is an additional bleed cock (2).

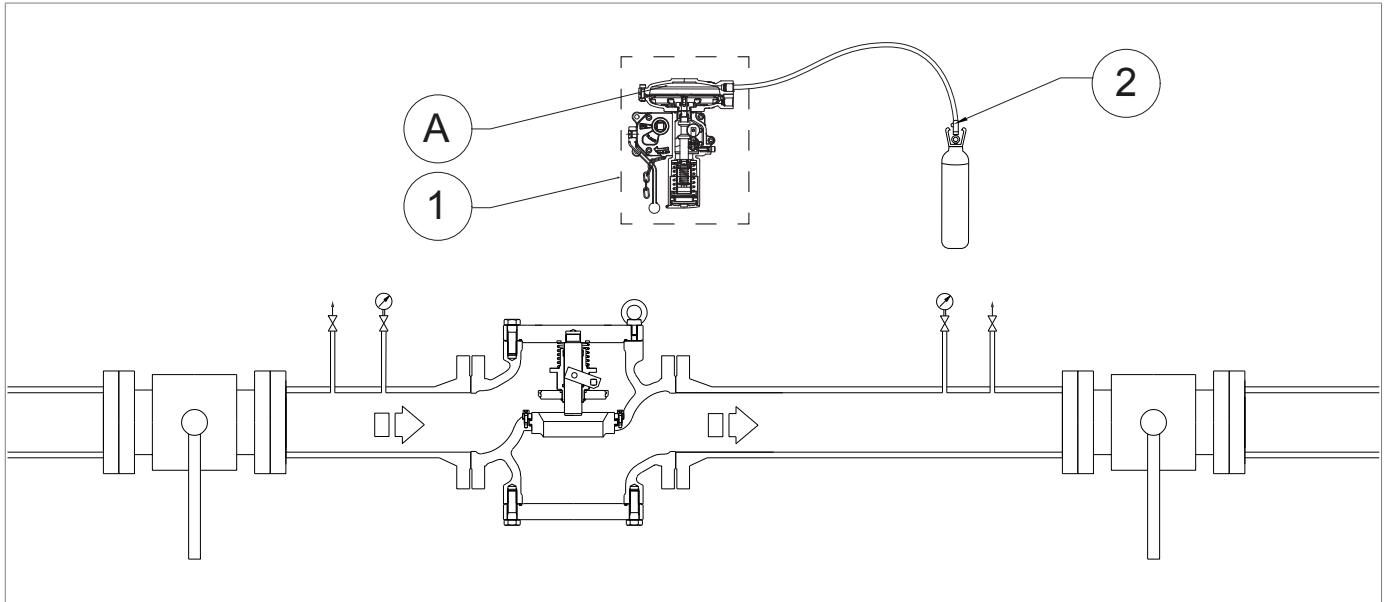


Fig. 8.11. *Pressurisation with external pressure source*

8.5.4 - CALIBRATION PROCEDURE FOR SN PRESSURE SWITCHES

8.5.4.1 - CALIBRATION PROCEDURE WITHOUT REGULATOR

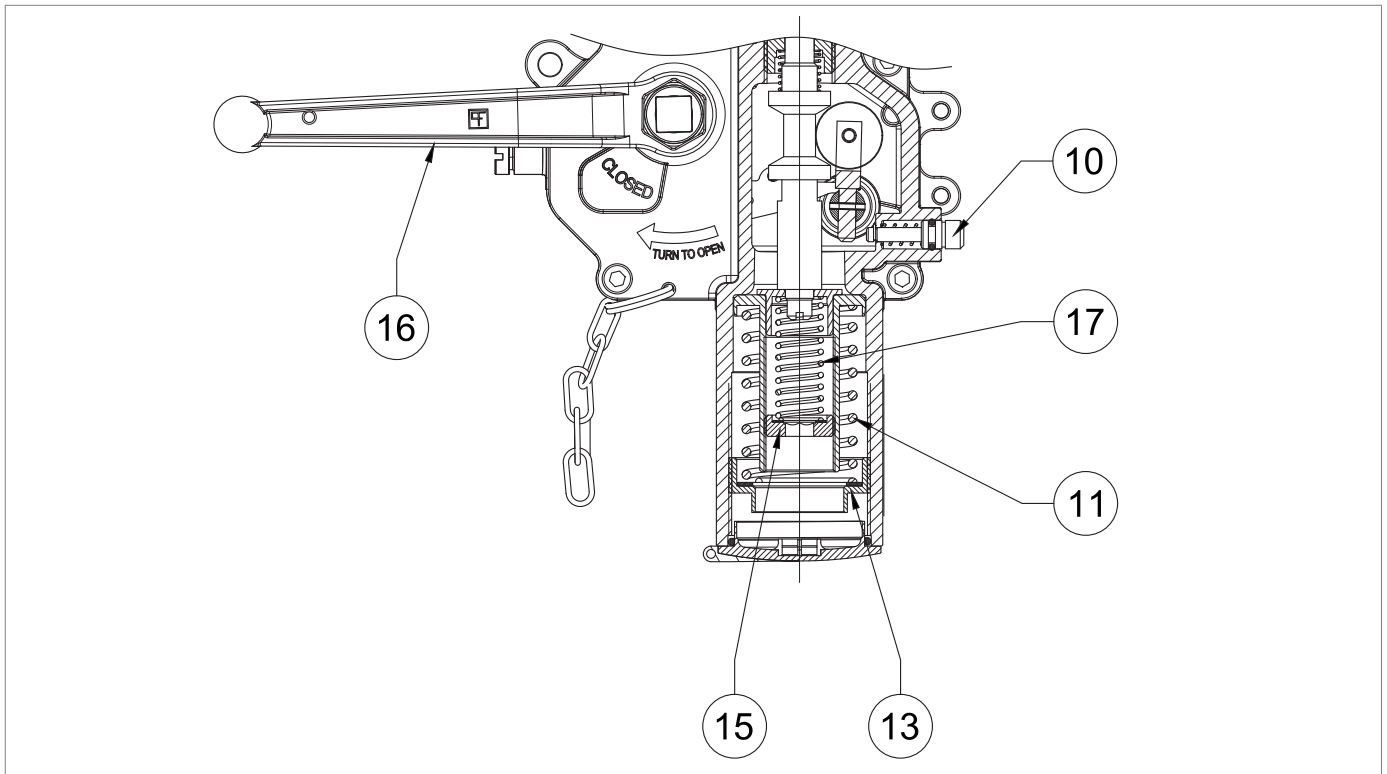


Fig. 8.12. Calibration of SN pressure switches

SPRING CALIBRATION FOR MAXIMUM PRESSURE TRIP

Step	Action
	<p>Increase the downstream pressure (P_d) to check correct calibration:</p> <ul style="list-style-type: none"> of the line, using an external pressure source of the pressure switch head, referring to "8.5.3 - Pressurising with external source".
1	<p>! NOTICE!</p> <p>Check the pressure referring to the downstream pressure gauge (Fig. 8.9, ref. 5).</p> <p>If the slam-shut valve:</p> <ul style="list-style-type: none"> trips before the expected pressure value: screw in (clockwise) the adjustment ring nut (13) so as to further compress the spring (11); does not trip at the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (13) so as to relieve the spring (11).
2	Decrease the pressure in the pressure switch head using the drain cock (3) of the external source or the drain cock (Fig. 8.9, ref. 6)
3	Reset the slam-shut valve by acting on the reset lever (16).
4	<p>Repeat steps 1-2-3 at least three times.</p> <p>! NOTICE!</p> <p>The calibration value must comply with the operating limits specified on the plate.</p>
5	If present, disconnect the external pressure source from the pressure switch sensing line and reconnect the sensing line between pressure switch and line.

Tab. 8.37.

SPRING CALIBRATION FOR MINIMUM PRESSURE TRIP (IF ANY)

Step	Action
1	Partially open the bleed cock (Fig. 8.9, ref. 6) and keep it open for the next steps.
2	<p>Decrease the downstream pressure to the minimum required slam-shut valve pressure.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Check the pressure referring to the downstream pressure gauge (Fig. 8.9, ref. 5).</p> <p>If the slam-shut valve:</p> <ul style="list-style-type: none"> • trips before the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (15) so as to relieve the spring (17); • does not trip before the expected pressure value, screw in (clockwise) the adjustment ring nut (15) so as to further compress the spring (17). </div>
3	Close the bleed cock (Fig. 8.9, ref. 6).
4	Move the slam-shut valve to open by acting on the reset lever (16) and keep it open manually.
5	<p>Increase the downstream pressure (Pd) to reset the slam-shut valve:</p> <ul style="list-style-type: none"> • of the line, using an external pressure source • of the pressure switch head, referring to “8.5.3 - Pressurising with external source”.
6	Reset the slam-shut valve by acting on the reset lever (16).
7	Check the minimum pressure spring for proper calibration by repeating steps 1-2-3-4 at least three times.
8	If present, disconnect the external pressure source from the pressure switch sensing line and reconnect the sensing line between pressure switch and line.

Tab. 8.38.

8.5.4.2 - CALIBRATION PROCEDURE WITH REGULATOR

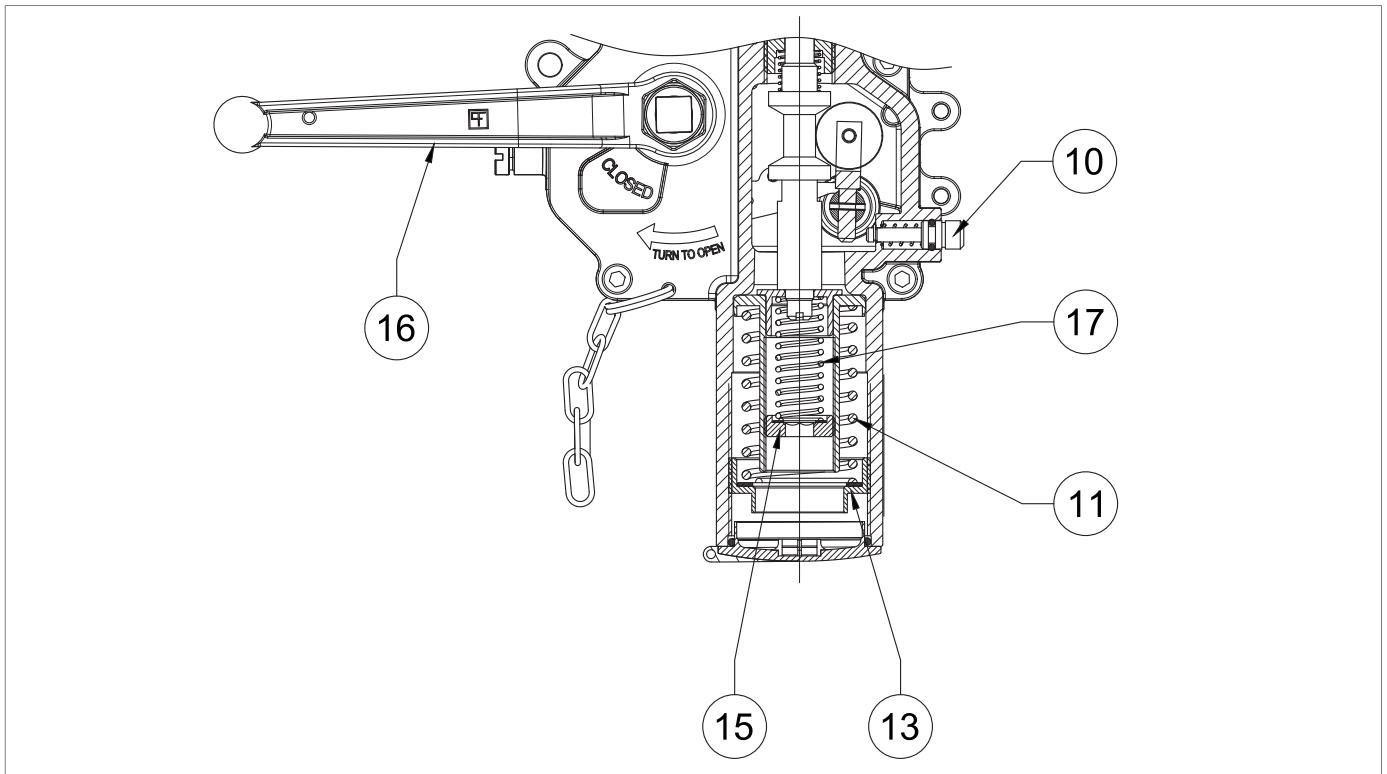


Fig. 8.13. Calibration of SN pressure switches

SPRING CALIBRATION FOR MAXIMUM PRESSURE TRIP

Step	Action
	<p>Increase the downstream pressure (P_d) to the slam-shut valve's tripping value to check the correct setting:</p> <ul style="list-style-type: none"> • of the line, using an external pressure source • of the pressure switch head, referring to "8.5.3 - Pressurising with external source".
1	<p>NOTICE!</p> <p>Check the pressure referring to the pressure gauge (Fig. 8.9, ref. 5) 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: screw in (clockwise) the adjustment ring nut (13) so as to further compress the spring (11); • does not trip at the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (13) so as to relieve the spring (11).
2	By opening the vent (Fig. 8.9, ref. 6), decrease the pressure in the downstream section to the calibration value of the main regulator.
3	Close the air vent valve (Fig. 8.9, ref. 6).
4	Reset the slam-shut valve by acting on the reset lever (16).
5	<p>Repeat steps 1-2-3-4 at least three times.</p> <p>NOTICE!</p> <p>The calibration value must comply with the operating limits specified on the plate.</p>

Tab. 8.39.

SPRING CALIBRATION FOR MINIMUM PRESSURE TRIP (IF ANY)

Step	Action
1	Partially open the bleed cock (Fig. 8.9, ref. 6) and keep it open for the next steps.
2	<p>Decrease the downstream pressure to the minimum required slam-shut valve pressure.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Check the pressure referring to the downstream pressure gauge (Fig. 8.9, ref. 5).</p> <p>If the slam-shut valve:</p> <ul style="list-style-type: none"> • trips before the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (15) so as to relieve the spring (17); • does not trip before the expected pressure value, screw in (clockwise) the adjustment ring nut (15) so as to further compress the spring (17). </div>
3	Close the bleed cock (Fig. 8.9, ref. 6).
4	Move the slam-shut valve to open by acting on the reset lever (16) and keep it open manually.
5	<p>Increase the downstream pressure (Pd) to reset the slam-shut valve:</p> <ul style="list-style-type: none"> • of the line, using an external pressure source • of the pressure switch head, referring to “8.5.3 - Pressurising with external source”.
6	Reset the slam-shut valve by acting on the reset lever (16).
7	Check the minimum pressure spring for proper calibration by repeating steps 1-2-3-4 at least three times.
8	If present, disconnect the external pressure source from the pressure switch sensing line and reconnect the sensing line between pressure switch and line.

Tab. 8.40.

9 - MAINTENANCE AND FUNCTIONAL CHECKS

9.1 - GENERAL WARNINGS

HAZARD!

- **Maintenance work must be carried out by qualified personnel trained on safety in the workplace and authorised to carry out equipment-related activities.**
- **Each maintenance operation requires in-depth and specialised knowledge of the equipment, the necessary operations, the associated risks and the correct procedures to operate safely.**
- **Repair or maintenance work not provided for in this manual may be carried out only if approved by PIETRO FIORENTINI S.p.A.. PIETRO FIORENTINI S.p.A. shall not be held liable for damage to persons or property resulting from operations other than those described herein or carried out in ways other than as indicated.**

WARNING!

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

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

WARNING!

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

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

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

NOTICE!

Maintenance work is strictly related to:

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

To properly run the equipment, one should:

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

Before beginning disassembly of the equipment, make sure that:

- the spare parts and parts used in replacements have adequate requirements to ensure the original performance of the equipment. Use original, compliant spare parts;
- the operator must have the necessary equipment (see chapter “7 - Commissioning/maintenance equipment”).

! NOTICE!

The recommended spare parts are unambiguously identified with tags indicating:


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

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

Commissioning and maintenance operations	
Periodic checks and inspections	All those checks that the operator must carry out on a regular basis to ensure that the equipment is in proper working order.
Routine maintenance	All those operations that the operator must preventively carry out to ensure proper operation of the device over time. Routine maintenance includes: <ul style="list-style-type: none"> • inspection; • control; • adjustment; • cleaning; • lubrication; • replacement; of all spare parts.
Special maintenance	All those operations to be carried out by the operator when the equipment requires them.

Tab. 9.41

9.2 - PERIODICALLY CHECKING AND INSPECTING THE EQUIPMENT FOR PROPER OPERATION

Periodic checks and inspections	
Operator qualification	Mechanical maintenance technician
PPE required	 <div style="background-color: orange; padding: 5px; margin-top: 10px;"> ⚠ WARNING! </div> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any information provided by the Safety Manager at the installation facility.</u>

Tab. 9.42

“Tab. 9.43” lists checks and verifications, i.e. operations that do not require any manual intervention on the individual equipment.

Some items thereof can be replaced remotely using suitable remote control tools. The following is listed below:

Activity description	Equipment/accessories involved	Evaluation criterion	Minimum frequency
Significant performance check*	Pressure regulators	<ul style="list-style-type: none"> • No fluctuations in the adjusted pressure. • Significant pressure values within pre-set limits. 	Monthly
	Gas flow slam-shut type safety devices (external position indicator)	<ul style="list-style-type: none"> • Fully open position. 	
	Stand-by monitor (external position indicator)	<ul style="list-style-type: none"> • Fully open position. 	
Visual inspection of the equipment outside condition	All	<ul style="list-style-type: none"> • No visible damage. • External surface protection as per UNI 9571-1:2012. 	Half-yearly

Tab. 9.43

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

9.3 - ROUTINE MAINTENANCE

9.3.1 - GENERAL SAFETY WARNINGS

 **HAZARD!**

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

 **NOTICE!**

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

9.3.2 - REPLACEMENT FREQUENCY FOR COMPONENTS SUBJECT TO WEAR

NOTICE!

The following provisions shall apply to equipment components only.

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

Preventive maintenance work

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

Tab. 9.44

NOTICE!


Check, within the minimum frequency specified in “Tab. 9.45”, the available components for wear/abrasion/aging.

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

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

Tab. 9.45

9.4 - ROUTINE MAINTENANCE PROCEDURES

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

Tab. 9.46

9.4.1 - TIGHTENING TORQUES

9.4.1.1 - SLAM-SHUT VALVE TIGHTENING TORQUES SCN

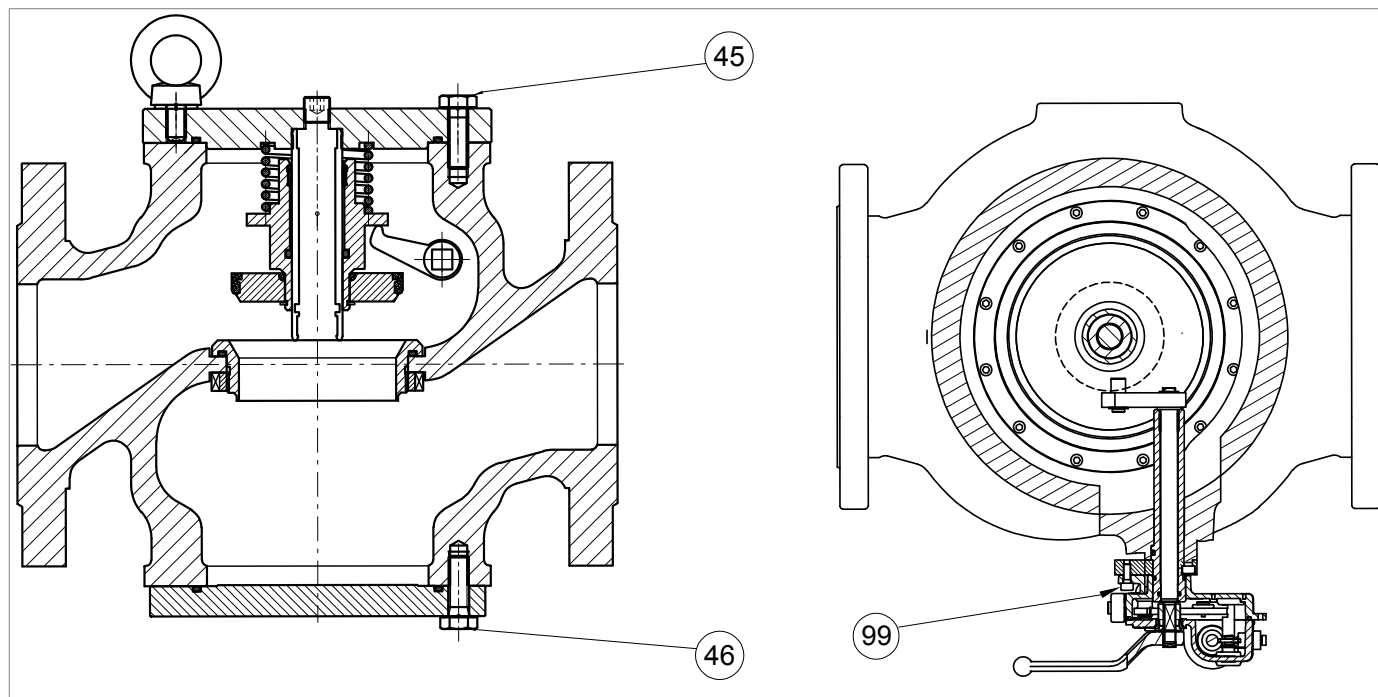


Fig. 9.14. Tightening torques SCN

SCN 1"			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
45	Screw M8X25 UNI 5739	30	22
46	Screw M8X30 UNI 5737	30	22
99	Screw M6X16 UNI 5931	10	7

Tab. 9.47

SCN 1" ½			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
45	Screw M10X25 UNI 5739	50	36
46	Screw M10X30 UNI 5737	50	36
99	Screw M6X16 UNI 5931	10	7

Tab. 9.48

SCN 2"			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
45	Screw M10X25 UNI 5739	50	36
46	Screw M10X30 UNI 5737	50	36
99	Screw M6X16 UNI 5931	10	7

Tab. 9.49

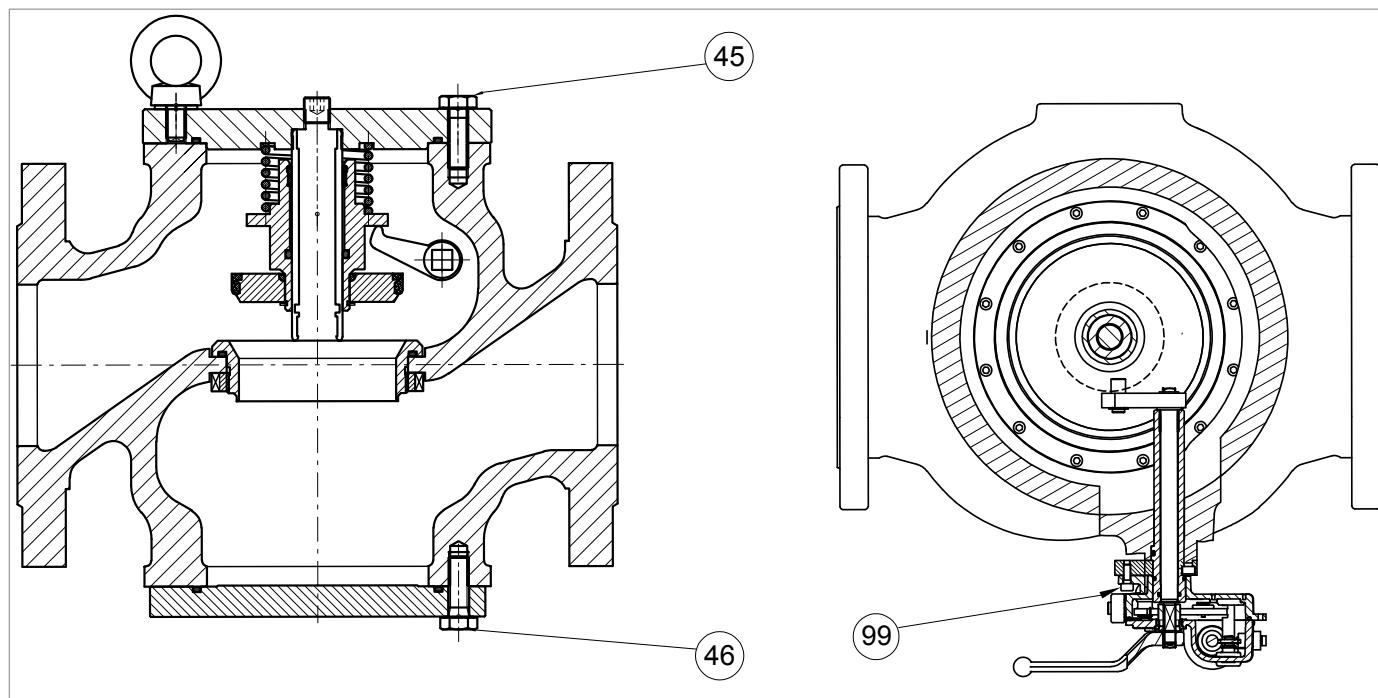


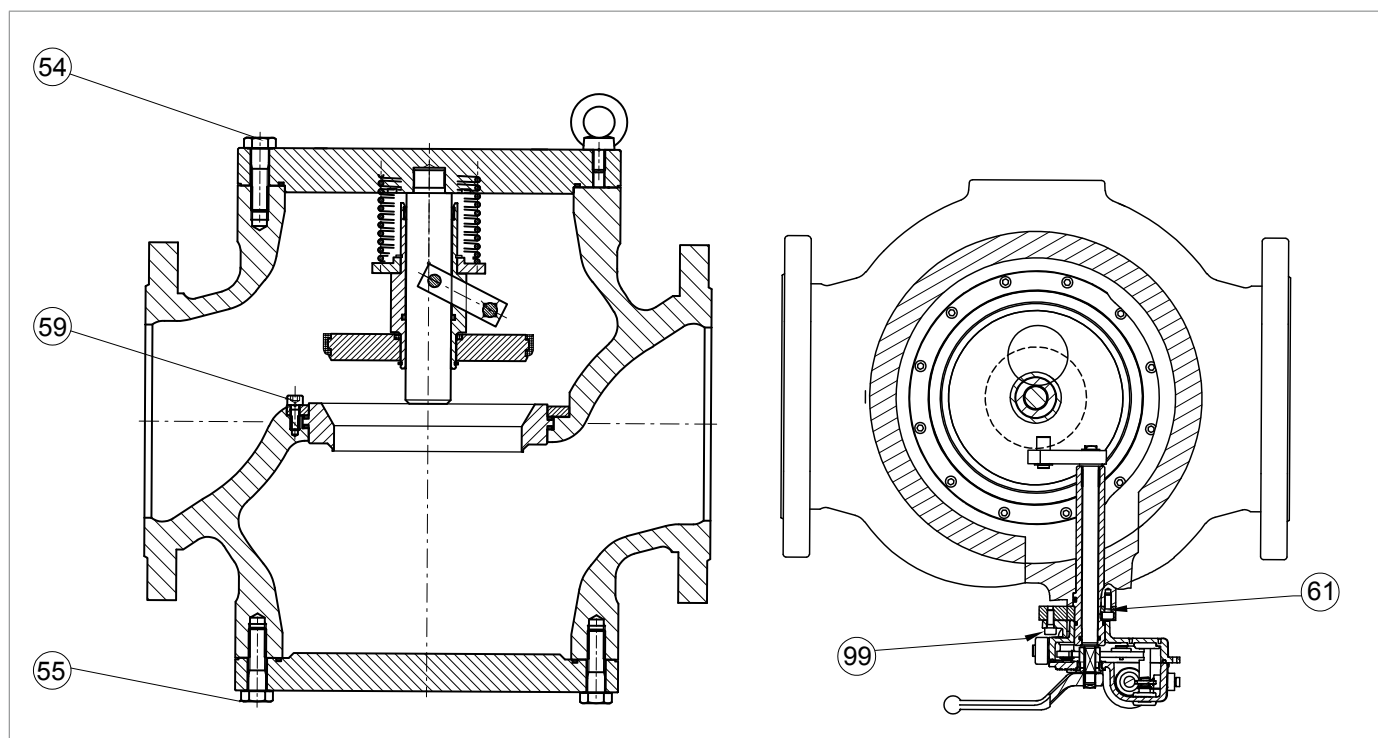
Fig. 9.15. Tightening torques SCN

SCN 2" ½			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
45	Screw M10X30 UNI 5739	50	36
46	Screw M10X30 UNI 5737	50	36
99	Screw M6X16 UNI 5931	10	7

Tab. 9.50

SCN 3"			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
45	Screw M10X30 UNI 5739	50	36
46	Screw M10X30 UNI 5737	50	36
99	Screw M6X16 UNI 5931	10	7

Tab. 9.51



Tightening torques SCN

SCN 4"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
54	Screw M16X50 UNI 5737	150	110
55	Screw M16X50 UNI 5737	150	110
59	Screw M6X16 UNI 5931	10	7
99	Screw M6X16 UNI 5931	10	7

Tab. 9.52

SCN 6"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
54	Screw M16X50 UNI 5737	115	84
55	Screw M16X50 UNI 5737	115	84
59	Screw M6X16 / M6X20 UNI 5931	10	7
61	Screw M6X16 UNI 5931	10	7
99	Screw M6X16 UNI 5931	10	7

Tab. 9.53

SCN 8"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
54	Screw M16X50 UNI 5737	115	84
55	Screw M16X50 UNI 5737	115	84
59	Screw M6X16 / M6X20 UNI 5931	10	7
61	Screw M6X16 UNI 5931	10	7
99	Screw M6X16 UNI 5931	10	7

Tab. 9.54

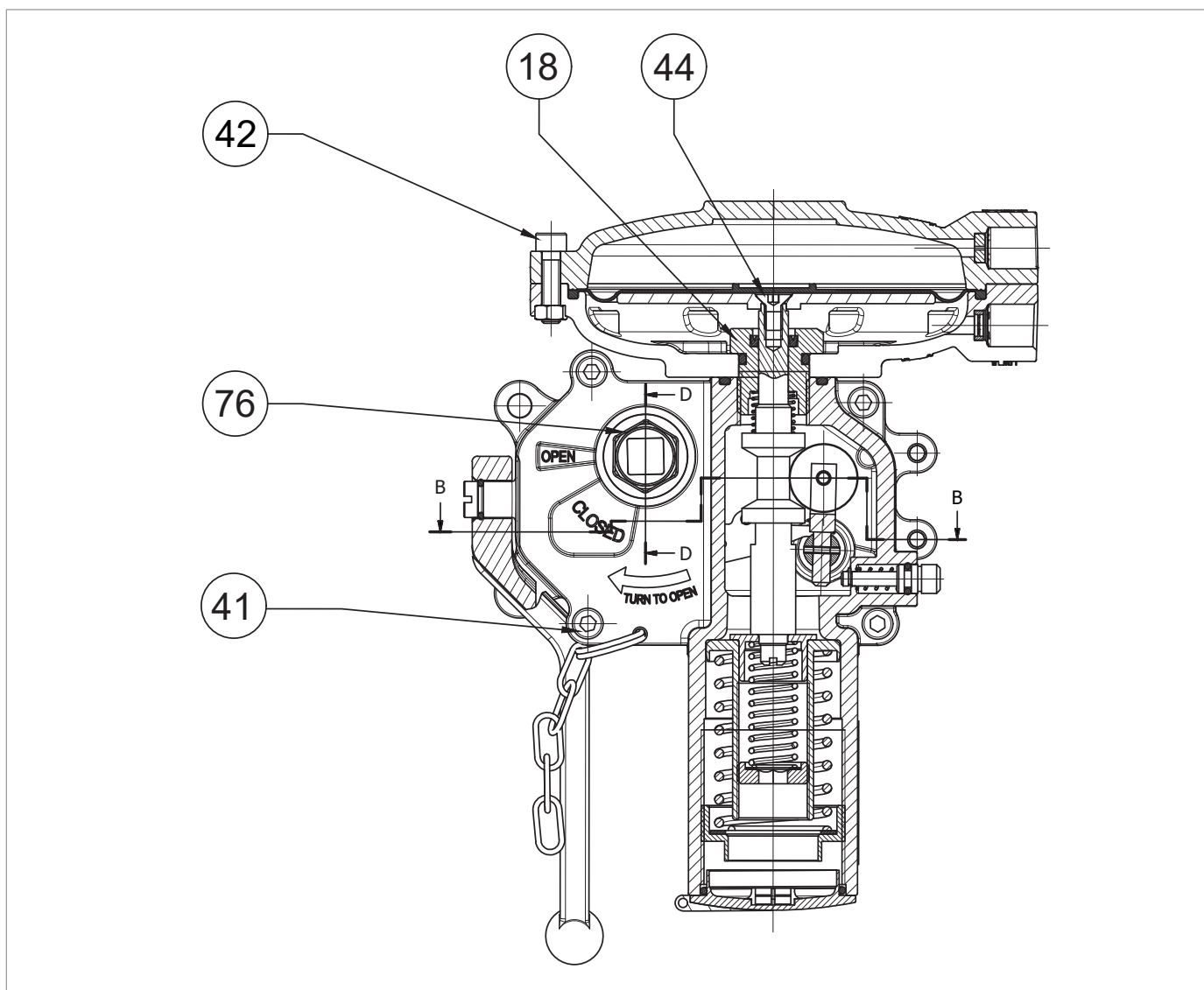
9.4.1.2 - PRESSURE SWITCH TIGHTENING TORQUE MOD. SN-91, SN-92


Fig. 9.16. Pressure switch tightening torques mod. SN-91, SN-92

SN-91, SN-92			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
18	Slam-shut device guide	45	33
41	Screw M5X10 UNI 5931	4	2
42	Screw M5X20 UNI 5931	5	3
44	Screw M5X10 UNI 5933	5	3
76	Locking nut	12	8

Tab. 9.55.

9.4.2 - REPLACING ELEMENTS SUBJECT TO WEAR AND ABRASION

9.4.2.1 - INITIAL OPERATIONS

ATTENTION!

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

ATTENTION!

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

9.4.2.2 - CROSS DIAGRAM FOR TIGHTENING SCREWS

To tighten the screws, when required by the maintenance procedure, refer to the following diagram:

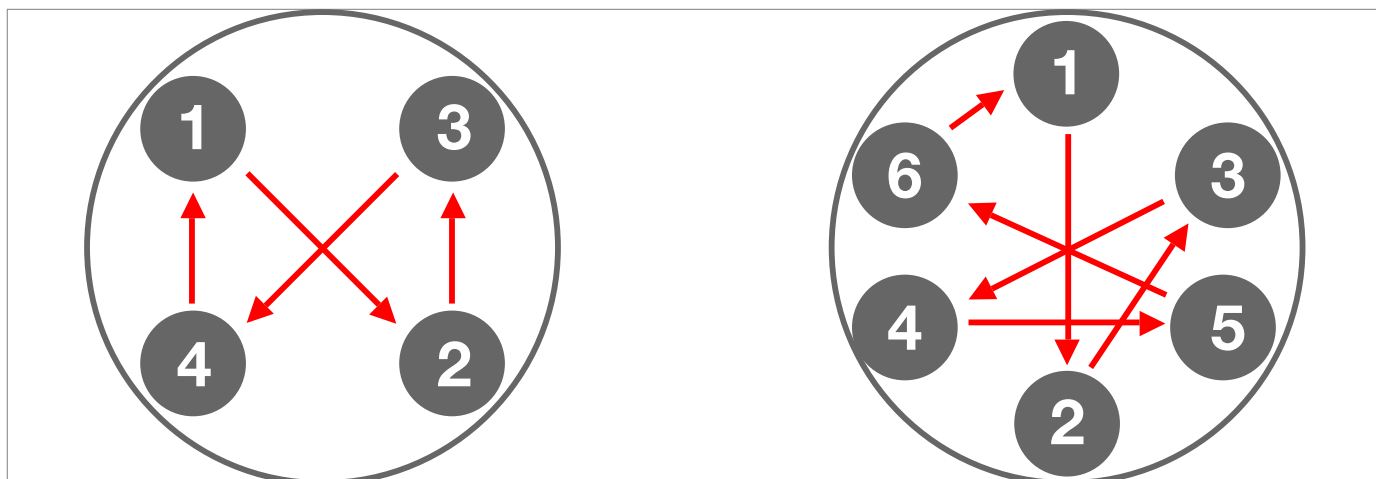


Fig. 9.17. Cross diagram

9.4.3 - SLAM-SHUT VALVE MAINTENANCE PROCEDURE SCN

9.4.3.1 - SCN 1" - 3"

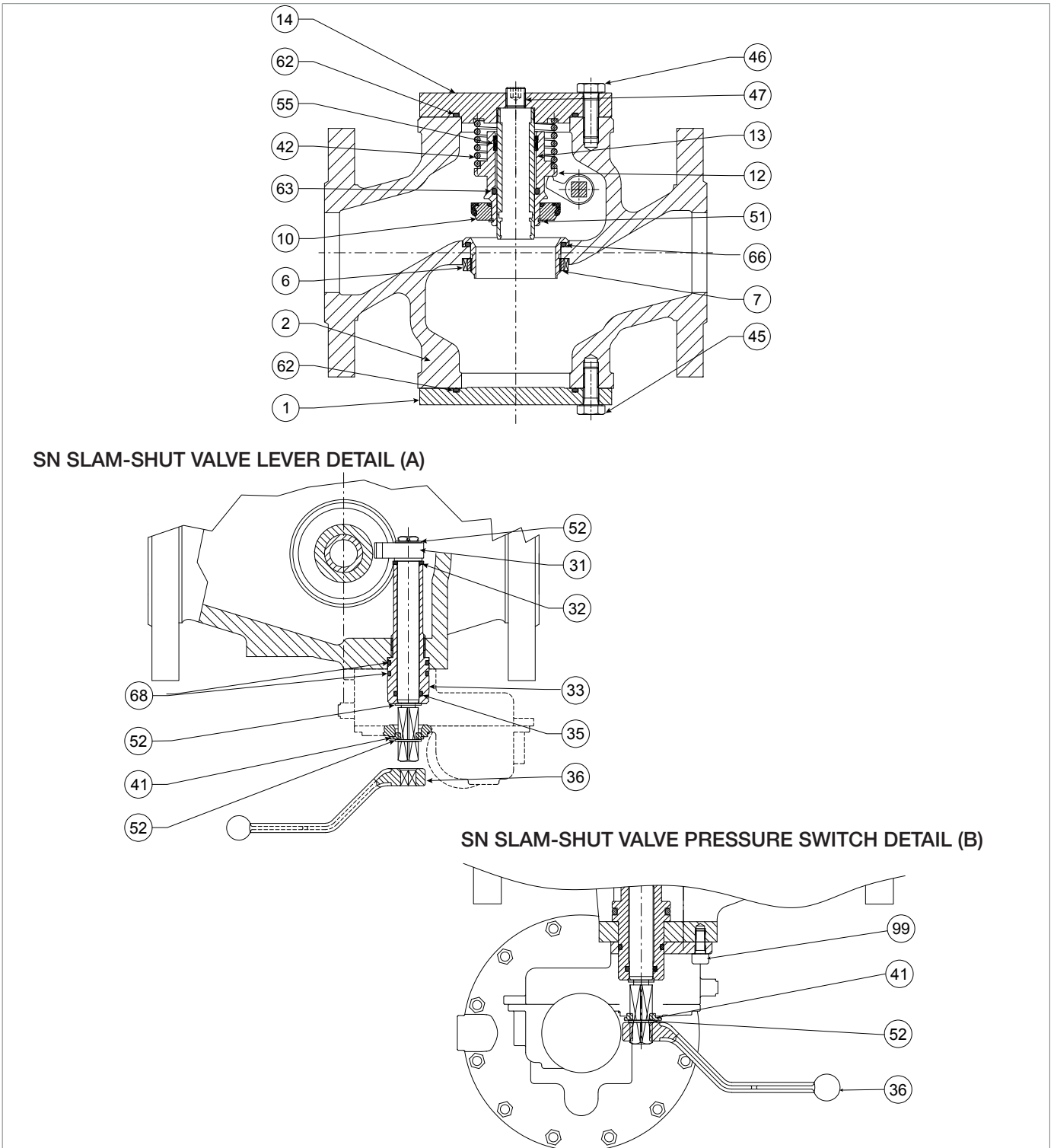
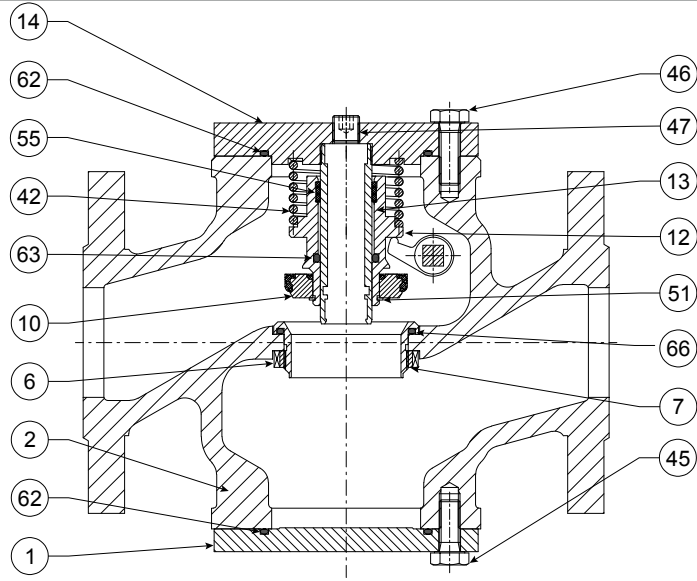
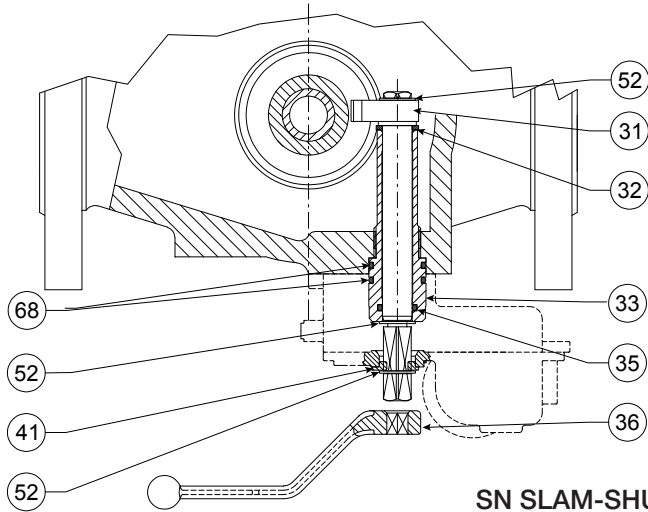


Fig. 9.18. SCN 1" - 3"

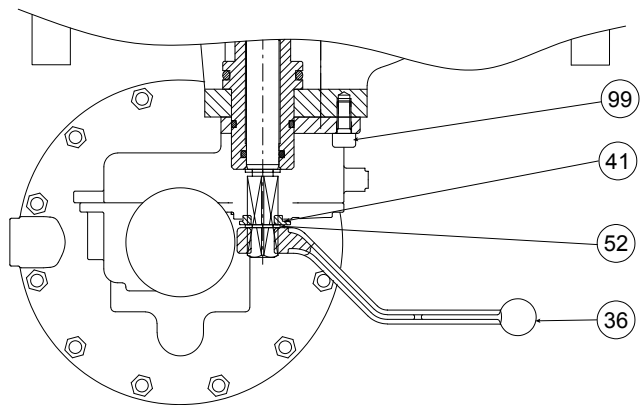
Step	Action
1	Undo and remove the screws (46).
2	Remove the flange (14).
3	Remove the O-ring (62) from the flange (14) and replace it, taking care to lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
4	Remove the spring (42).
5	Remove the plug support (12) together with the I/DWR ring (55), the O-ring (63), the plug (10) and the shaft collar (51).
6	Remove the shaft collar (51).
7	Remove and replace the plug (10).
8	Fit the shaft collar (51).
9	Replace the O-ring (63) and lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
10	Replace the I/DWR ring (55), taking care to lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement I/DWR, clean the retaining slots with a cleaning solution.
11	Unscrew and remove the screws (45) from the flange (1).
12	Remove the flange (1).
13	Remove the O-ring (62) and replace it, taking care to lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
14	Unscrew and remove the shaft collar (6).
15	Remove the coupling lever (36).
16	Remove the outer Seeger ring (52).
17	Remove the position indicator (41).
18	Remove the inner Seeger ring (52).
19	Remove the screws (99).
20	Pull out the SN pressure switch (detail B) from the bush (33).
21	Pull out the bush (33), together with the O-rings (35, 68) from the body (2).
22	Remove the O-ring (35) and replace it, taking care to lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.








SN SLAM-SHUT VALVE LEVER DETAIL (A)

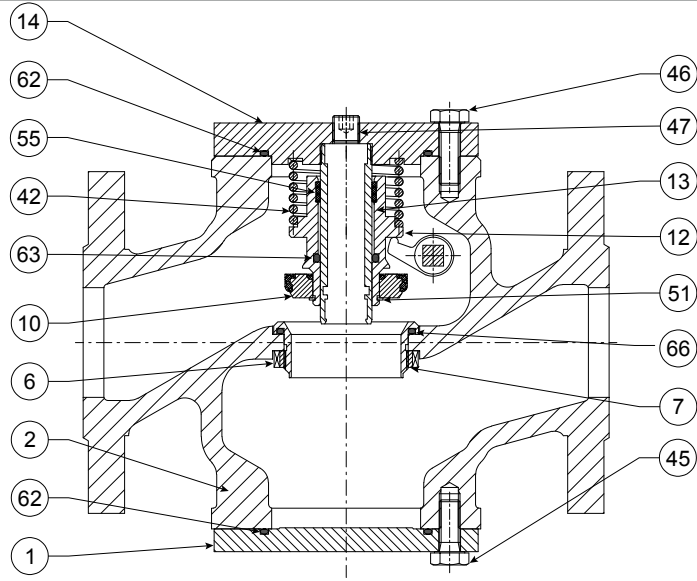


SN SLAM-SHUT VALVE PRESSURE SWITCH DETAIL (B)

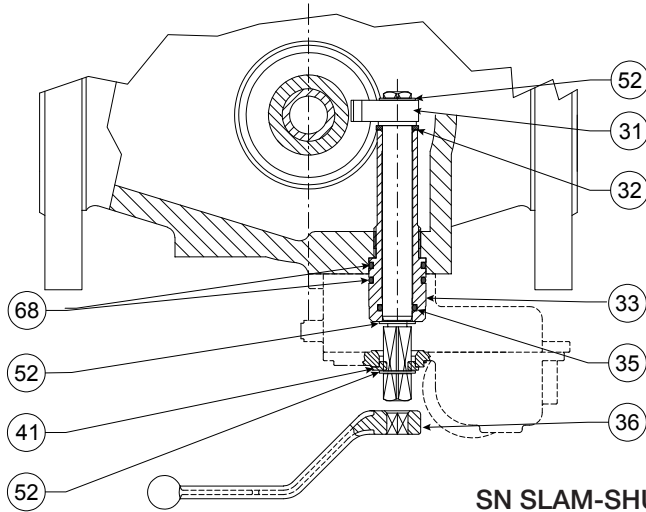


SCN 1" - 3"

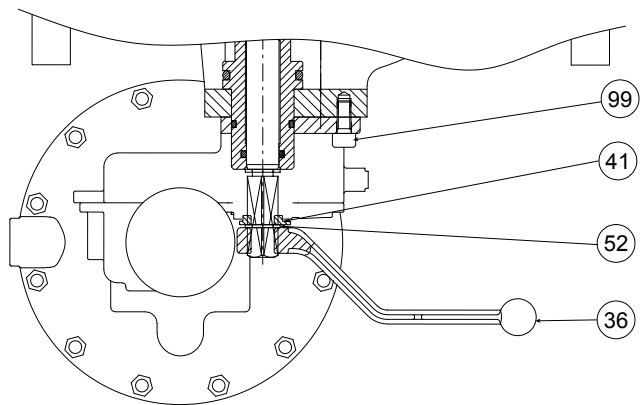
Step	Action
23	Remove and replace the O-rings (68), taking care to lubricate them with synthetic grease. <div style="border: 1px solid black; padding: 5px;">  NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution. </div>
24	Position the bush (33), together with the O-rings (35, 68) in the body (2).
25	Insert the inner Seeger ring (52).
26	Position the SN pressure switch (detail B) in the bush (33).
27	Insert and fix the screws (99) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 9.47 • 1" 1/2: Tab. 9.48 • 2": Tab. 9.49 • 2" 1/2: Tab. 9.50 • 3": Tab. 9.51 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws" </div>
28	Fit the position indicator (41).
29	Fit the outer Seeger ring (52).
30	Fit the coupling lever (36).
31	Pull out the valve seat (7) together with the O-ring (66) from the body (2) from the bottom upwards.
32	Replace the O-ring (66) and lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
33	Insert the valve seat (7) together with the O-ring (66) into the body (2) from the top downwards.
34	Insert and secure the shaft collar (6).
35	Position the bush (12) together with the I/DWR ring (55), the O-ring (63), the plug (10) and the shaft collar (51). <div style="border: 1px solid black; padding: 5px;">  NOTICE! During this phase, hold the coupling lever (36) between the bush (12) and the plug (10). </div>
36	Fit the spring (42).
37	Insert the flange (14) together with the O-ring (62).
38	Insert and fasten the screws (46) in the flange (14) according to the tightening torques: <ul style="list-style-type: none"> • 1": Tab. 9.47 • 1" 1/2: Tab. 9.48 • 2": Tab. 9.49 • 2" 1/2: Tab. 9.50 • 3": Tab. 9.51 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws" </div>
39	Fit the flange (1).




SN SLAM-SHUT VALVE LEVER DETAIL (A)



SN SLAM-SHUT VALVE PRESSURE SWITCH DETAIL (B)



SCN 1" - 3"

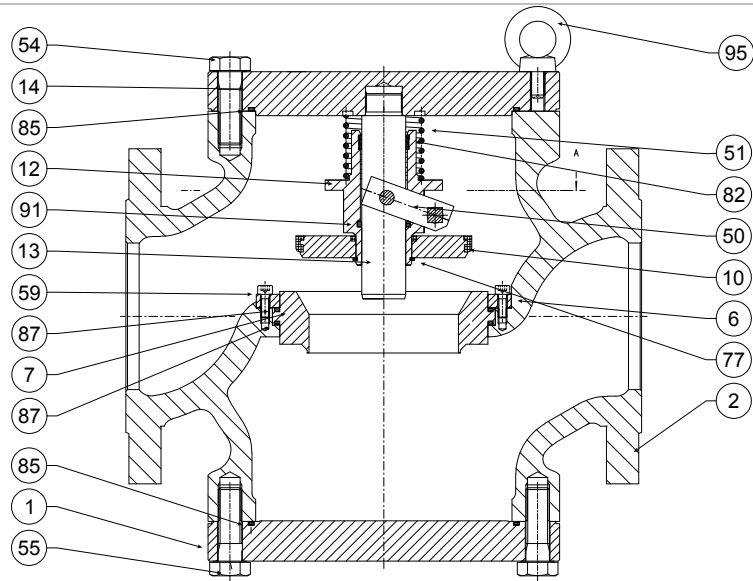
Step	Action
40	<p>Insert and fix the screws (45) according to the following tightening torques:</p> <ul style="list-style-type: none">• 1": Tab. 9.47• 1" 1/2: Tab. 9.48• 2": Tab. 9.49• 2" 1/2: Tab. 9.50• 3": Tab. 9.51 <div style="border: 1px solid blue; padding: 5px;"><p> NOTICE!</p><p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p></div>

Tab. 9.58.

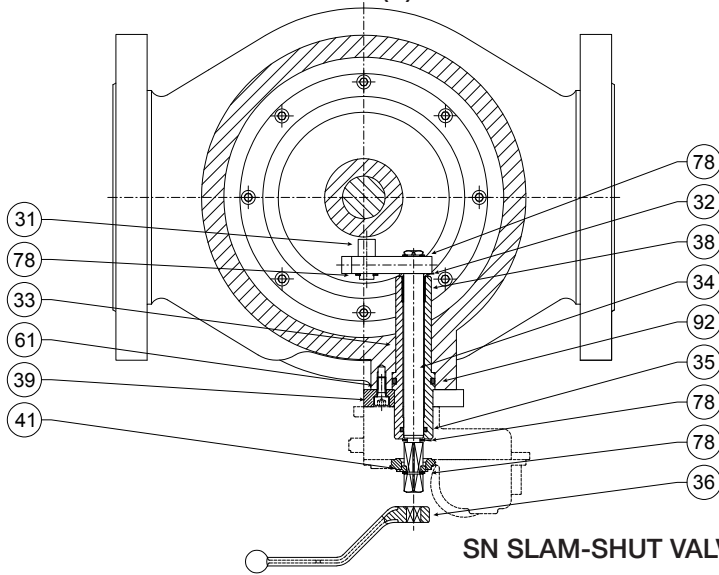
 **WARNING!**

Ensure that all parts have been fitted correctly.

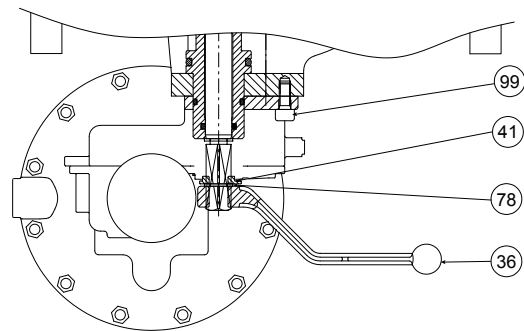
9.4.3.2 - SCN 4"



SN SLAM-SHUT VALVE LEVER DETAIL (A)

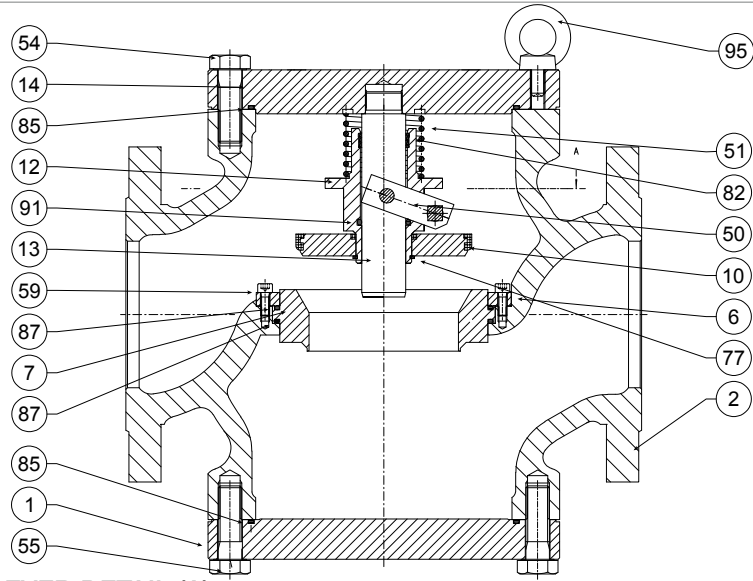


SN SLAM-SHUT VALVE PRESSURE SWITCH DETAIL (B)

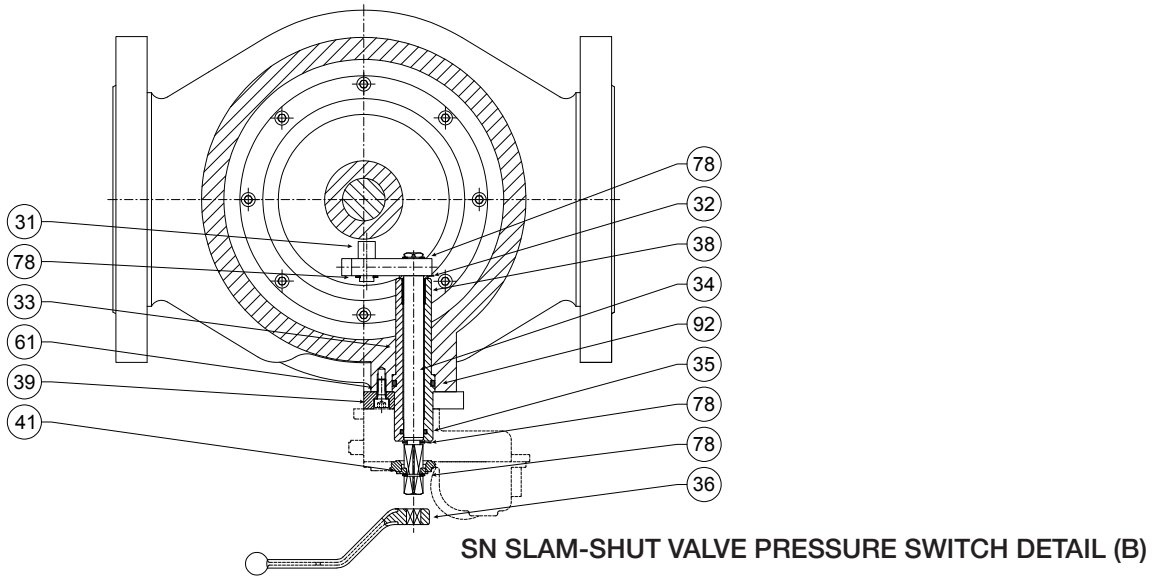


SCN 4"

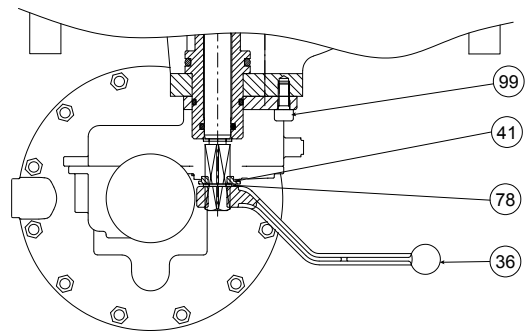
Step	Action
1	Undo and remove the screws (54).
2	Unscrew and remove the eyebolts (95).
3	Remove the flange (14).
4	Remove the O-ring (85) and replace it, taking care to lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
5	Remove the plug support (12) together with the I/DWR ring (82), the O-ring (91), the spring (51), the plug (10) and the shaft collar (77) from the rod guide sleeve (13).
6	Remove the shaft collar (77).
7	Remove and replace the plug (10).
8	Fit the shaft collar (77).
9	Replace the O-ring (91) and lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
10	Replace the I/DWR ring (82), taking care to lubricate it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
11	Insert the plug support (12) together with the I/DWR ring (82), the O-ring (91), the spring (51), the plug (10) and the shaft collar (77) into the rod guide sleeve (13).
12	Remove the coupling lever (36).
13	Remove the outer Seeger ring (78).
14	Remove the position indicator (41).
15	Remove the inner Seeger ring (78).
16	Remove the screws (99).
17	Pull out the SN pressure switch (detail B) from the bush (33).
18	Undo and remove the screws (61).
19	Remove the flange (39).
20	Pull out the bush (33), together with the O-rings (35, 92) from the body (2).
21	Remove and replace the O-rings (35, 92), taking care to lubricate them with synthetic grease. ! NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
22	Position the bush (33), together with the O-rings (35, 92) in the body (2).
23	Fit the flange (39).
24	Insert and fix the screws (61) according to the following tightening torques: • 4": Tab. 9.52 ! NOTICE! Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"
25	Insert the inner Seeger ring (78).



SN SLAM-SHUT VALVE LEVER DETAIL (A)



SN SLAM-SHUT VALVE PRESSURE SWITCH DETAIL (B)



SCN 4"

Step	Action
26	Position the SN pressure switch (detail B) in the bush (33)
27	<p>Insert and fix the screws (99) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 4": Tab. 9.52 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p> </div>
28	Fit the position indicator (41).
29	Fit the outer Seeger ring (78)
30	Fit the coupling lever (36).
31	Undo and remove the screws (59) from the shaft collar (6).
32	Remove the shaft collar (6).
33	Remove the valve seat (7) together with the O-rings (87).
34	<p>Remove and replace the O-rings (87), taking care to lubricate them with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p> </div>
35	Position the valve seat (7).
36	Fit the shaft collar (6).
37	<p>Insert and fix the screws (59) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 4": Tab. 9.52 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p> </div>
38	Insert the flange (14) together with the O-ring (85).
39	<p>Insert and fix the screws (54) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 4": Tab. 9.52 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p> </div>
40	Insert and secure eyebolts (95).
41	Undo and remove the screws (55).
42	Remove the flange (1).
43	<p>Remove the O-ring (85) and replace it, taking care to lubricate it with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
44	Fit the flange (1).
45	<p>Insert and fix the screws (55) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 4": Tab. 9.52 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p> </div>

Tab. 9.59

! WARNING!
Ensure that all parts have been fitted correctly.

9.4.3.3 - SCN 6" - 8"

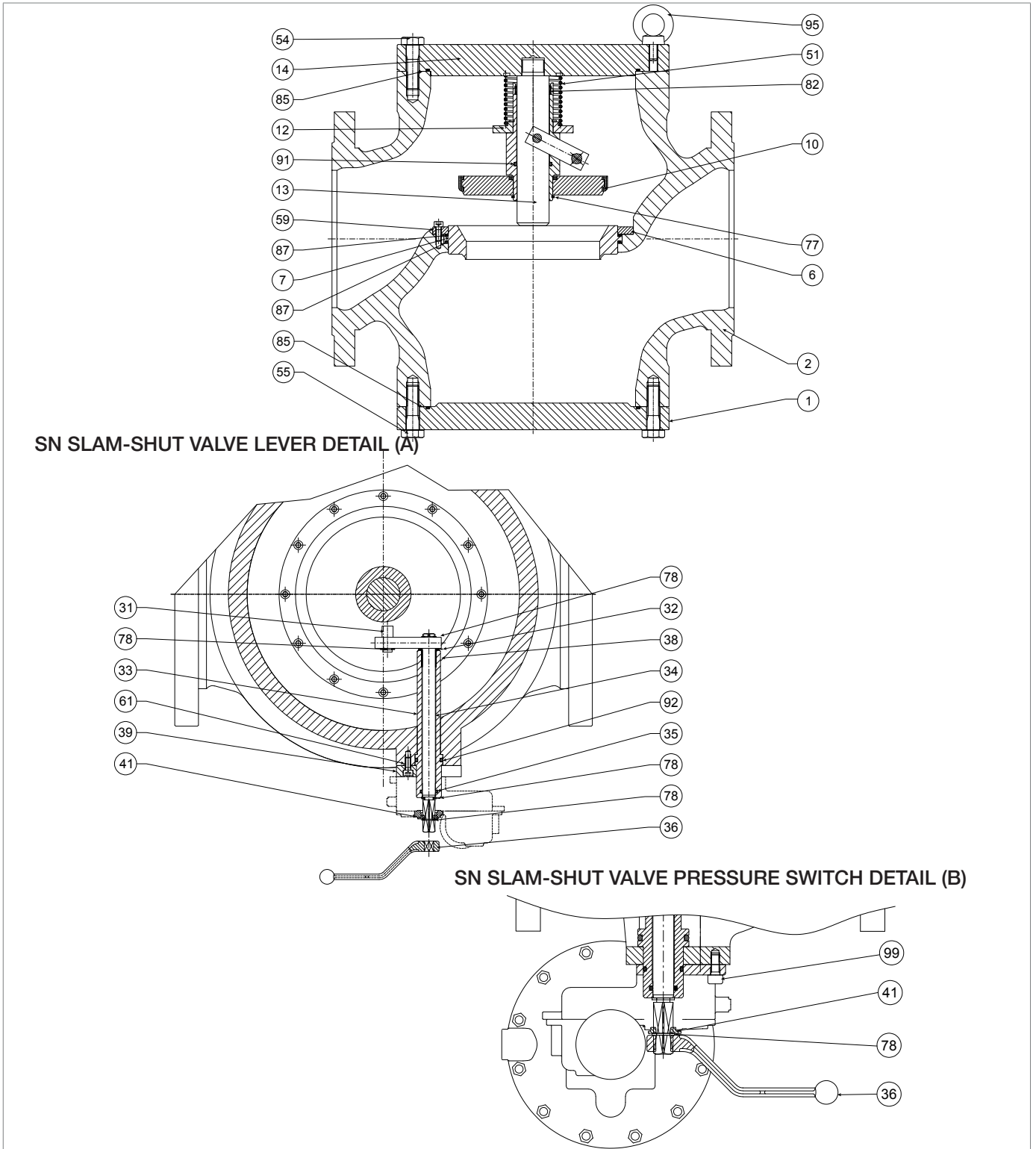




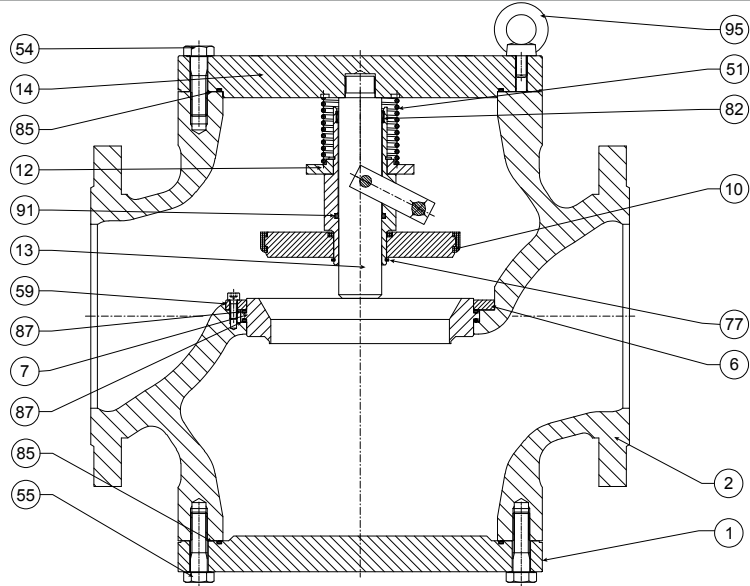
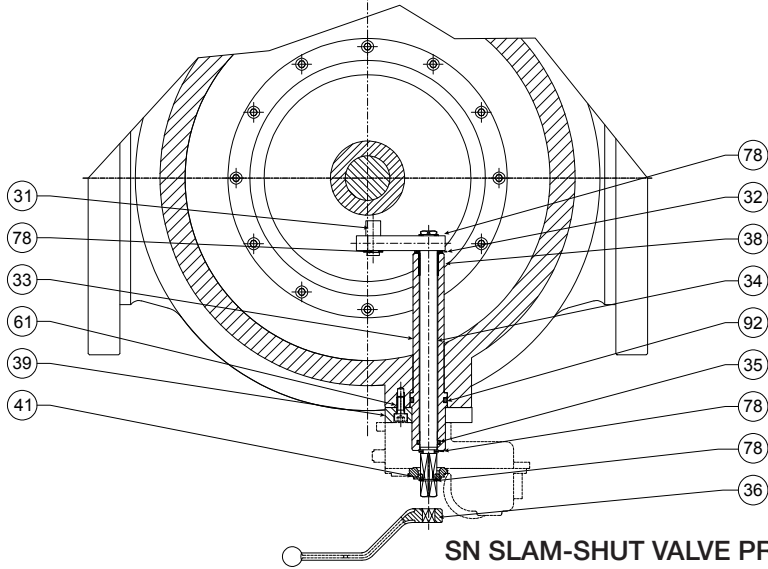


Fig. 9.19. SCN 6" - 8"

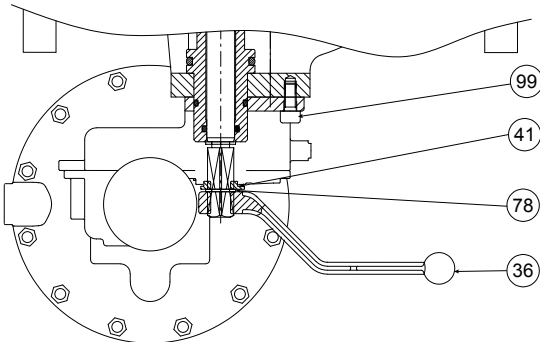
Step	Action
1	Undo and remove the screws (54).
2	Remove the flange (14).
3	Remove the O-ring (85) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
4	Remove the plug support (12) together with the I/DWR ring (82), the O-ring (91), the spring (51), the plug (10) and the shaft collar (77) from the rod guide sleeve (13).
5	Remove the shaft collar (77).
6	Remove and replace the plug (10).
7	Fit the shaft collar (77).
8	Remove the O-ring (91) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
9	Remove the I/DWR ring (82) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
10	Insert the plug support (12) together with the I/DWR ring (82), the O-ring (91), the spring (51), the plug (10) and the shaft collar (77) into the rod guide sleeve (13).
11	Remove the coupling lever (36).
12	Remove the outer Seeger ring (78).
13	Remove the position indicator (41).
14	Remove the inner Seeger ring (78).
15	Remove the screws (99).
16	Pull out the SN pressure switch (detail B) from the bush (33).
17	Undo and remove the screws (61).
18	Remove the flange (39).
19	Pull out the bush (33), together with the O-rings (35, 92) from the body (2).
20	Remove and replace the O-rings (35, 92), taking care to lubricate them with synthetic grease. <div style="border: 1px solid black; padding: 5px;">  NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution. </div>
21	Position the bush (33), together with the O-rings (35, 92) in the body (2).
22	Fit the flange (39).



SN SLAM-SHUT VALVE LEVER DETAIL (A)



SN SLAM-SHUT VALVE PRESSURE SWITCH DETAIL (B)



SCN 6" - 8"

Step	Action
23	<p>Insert and fix the screws (61) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 6": Tab. 9.53 • 8": Tab. 9.54 <p>NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p>
24	Insert the inner Seeger ring (78).
25	Position the SN pressure switch (detail B) in the bush (33)
26	<p>Insert and fix the screws (99) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 6": Tab. 9.53 • 8": Tab. 9.54 <p>NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p>
27	Fit the position indicator (41).
28	Fit the outer Seeger ring (78)
29	Fit the coupling lever (36).
30	Undo and remove the screws (59) from the shaft collar (6).
31	Remove the shaft collar (6).
32	Remove the valve seat (7) together with the O-rings (87) from the body (2).
33	<p>Remove and replace the O-rings (87), taking care to lubricate them with synthetic grease.</p> <p>NOTICE!</p> <p>Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p>
34	Fit the valve seat (7) in the body (2).
35	Fit the shaft collar (6).
36	<p>Insert and fix the screws (59) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 6": Tab. 9.53 • 8": Tab. 9.54 <p>NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p>
37	Insert the flange (14) together with the O-ring (85).
38	<p>Insert and fix the screws (54) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 6": Tab. 9.53 • 8": Tab. 9.54 <p>NOTICE!</p> <p>Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p>
39	Undo and remove the screws (55).
40	Remove the flange (1).

Step	Action
41	<p>Remove the O-ring (85) and replace it, taking care to lubricate it with synthetic grease.</p> <p>NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
42	Fit the flange (1).
43	<p>Insert and fix the screws (55) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 6": Tab. 9.53 • 8": Tab. 9.54 <p>NOTICE! Tighten the screws as shown in the diagram in section "9.4.2.2 - Cross diagram for tightening screws"</p>

Tab. 9.60

WARNING!
Ensure that all parts have been fitted correctly.

9.4.4 - MAINTENANCE OF PRESSURE SWITCH MOD. SN

9.4.4.1 - DISCONNECTION OF PRESSURE SWITCH MOD. SN

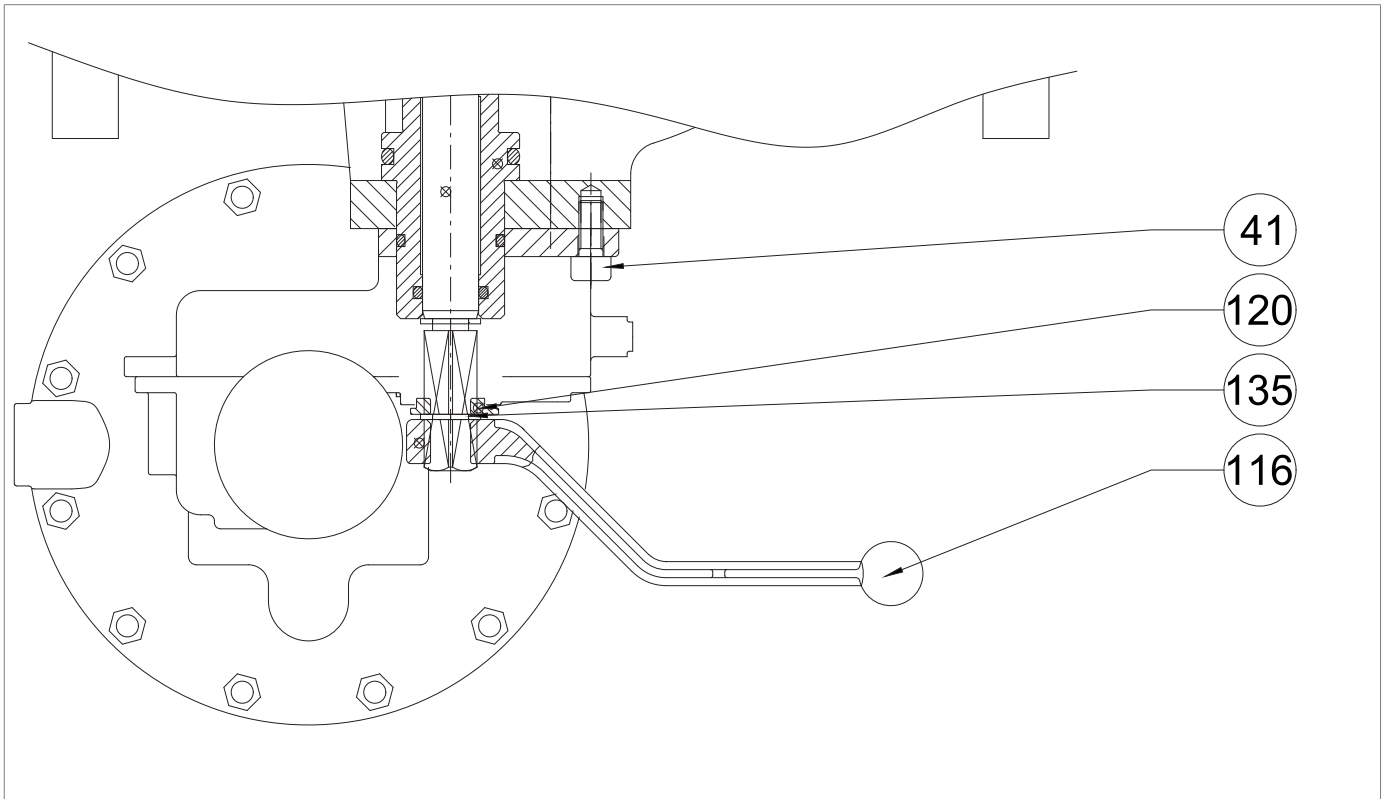


Fig. 9.20. Pressure switch mod. SN

To disconnect pressure switches mod. SN, proceed as at Tab. 9.56 (see Fig. 9.20):

Step	Action
1	Remove the lever (116).
2	Remove the Seeger ring (135).
3	Remove the position indicator (120).
4	Remove the screws (41).

Tab. 9.56.

9.4.4.2 - PRESSURE SWITCH SN-91, SN-92

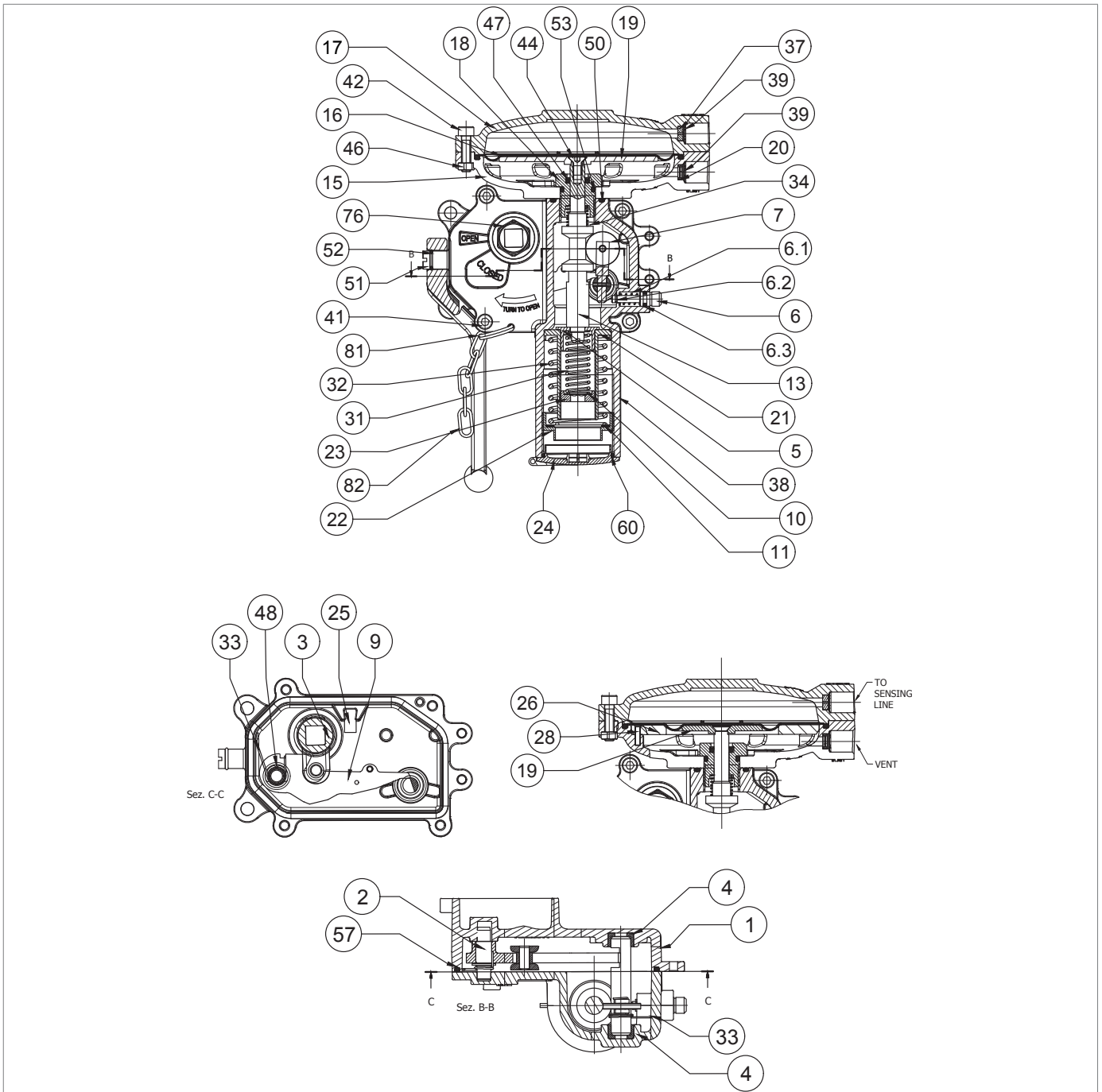
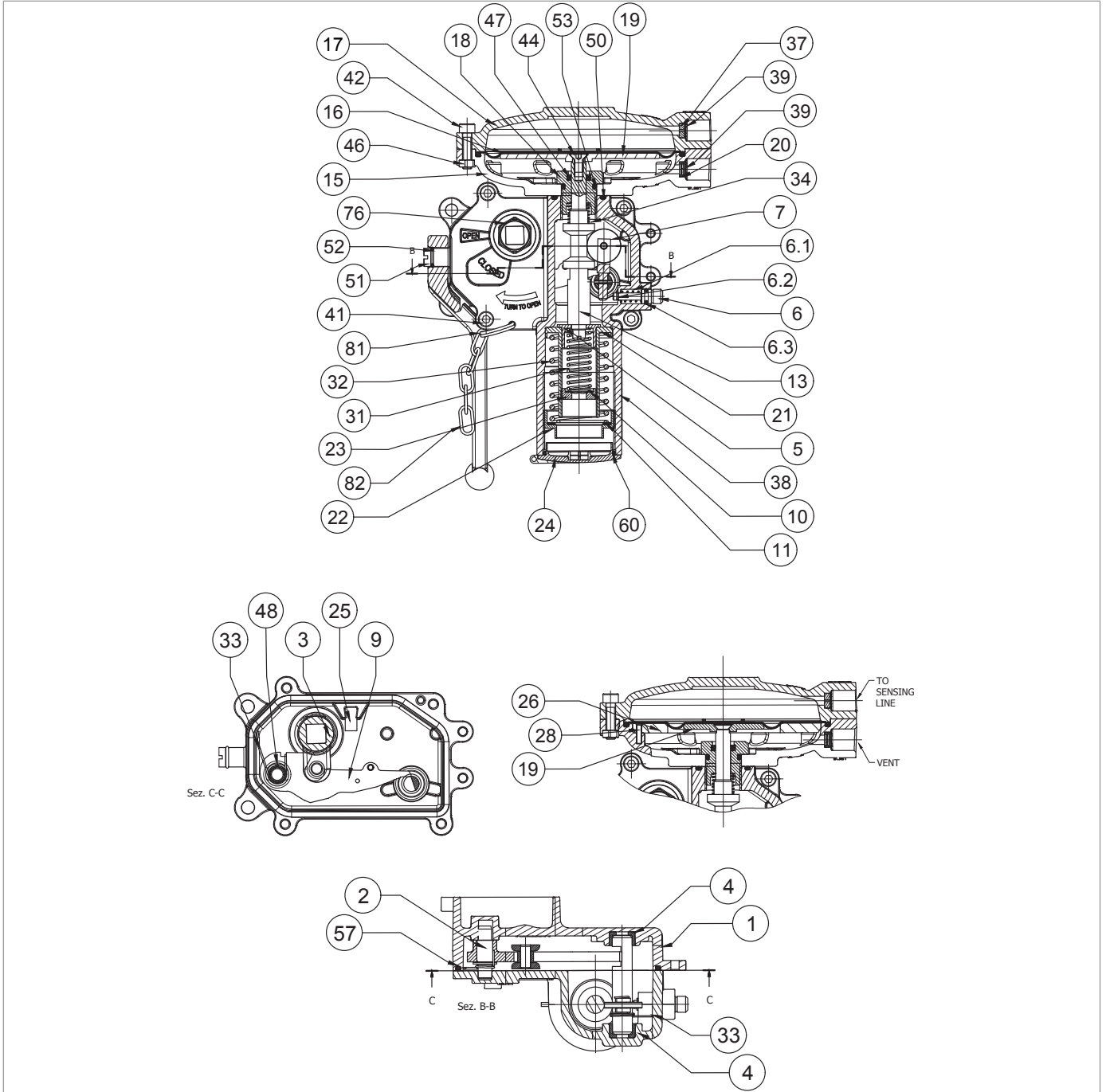



Fig. 9.21. Pressure switch SN-91, SN-92

Step	Action
1	Unscrew and remove the cap (24).
2	Remove the O-ring (60) from the cap (24) and replace it, taking care to lubricate it with synthetic grease. NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
3	Unscrew and remove the screws (42) together with the nuts (46).
4	Remove the cover (17).
5	Remove the diaphragm (16).
6	Undo and remove the screw (44) NOTICE! During this step, hold the diaphragm protection disc (19) in place.
7	Remove the diaphragm protection disc (19).
8	Unscrew and remove the slam-shut device guide (18).
9	Remove the flange (15).
10	Remove the O-ring (50) and replace it, taking care to lubricate it with synthetic grease. NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
11	Remove replace the O-ring (53) from the sleeve (18), lubricating it with synthetic grease. NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
12	Remove the U-shaped ring (47) from the bush (18) and replace it, taking care to lubricate it with synthetic grease. NOTICE! Before inserting the replacement ring, clean the retaining slots with a cleaning solution.
13	Fit the flange (15).
14	Insert and secure the slam-shut device guide (18) according to the tightening torque: <ul style="list-style-type: none"> Pressure switch SN-91, SN-92: Tab. 9.55
15	Put the diaphragm protection disc (19) back in place
16	Insert and fix the screw (44) according to the following tightening torque: <ul style="list-style-type: none"> Pressure switch SN-91, SN-92: Tab. 9.55 NOTICE! <ul style="list-style-type: none"> Tighten the screws according to the cross diagram in paragraph 9.4.2.2 During this step, hold the diaphragm protection disc (19) in place
17	Position the diaphragm (16).
18	Fit the cover (17).



Pressure switch SN-91, SN-92

Step	Action
19	Insert and fasten the screws (42) together with the nuts (46), according to the tightening torque: <ul style="list-style-type: none"> • Pressure switch SN-91, SN-92: Tab. 9.55 <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">  NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2. </div>
20	Insert and fix the cap (24).

Tab. 9.61.

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.4.3 - RECONNECTION OF PRESSURE SWITCH MOD. SN

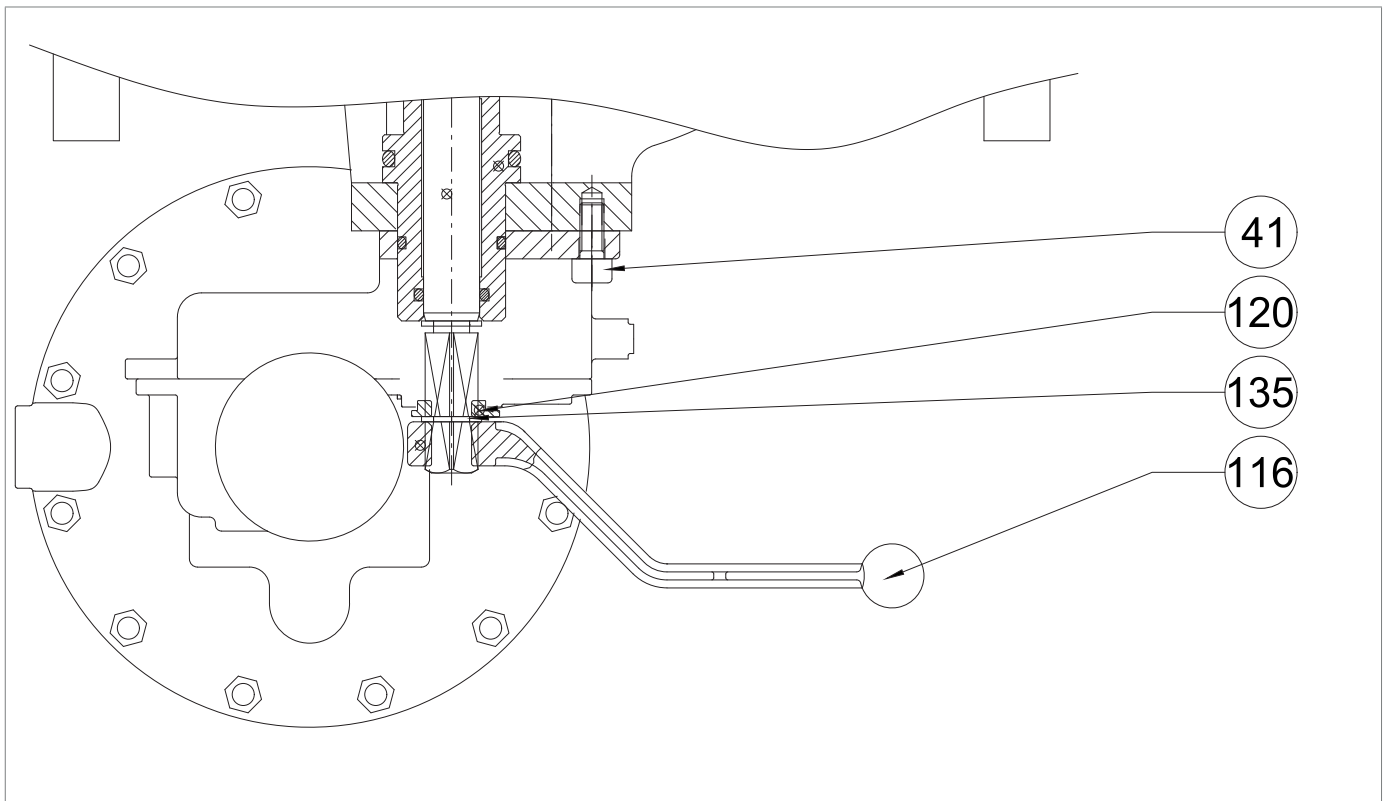


Fig. 9.22. Pressure switch mod. SN

To connect pressure switches mod. SN, proceed as at Tab. 9.57 (see Fig. 9.22):

Step	Action
1	Insert and fix the screws (41) according to the following tightening torques: <ul style="list-style-type: none"> • Pressure switch SN-91, SN-92: Tab. 9.55
2	Position the indicator (120).
3	Fit the Seeger ring (135).
4	Fit the lever (116).

Tab. 9.57.

9.4.5 - PROCEDURE FOR RECOMMISSIONING AFTER MAINTENANCE

NOTICE!

For the recommissioning procedure, refer to the relevant paragraph.

10 - TROUBLESHOOTING

Listed below are the cases (causes and tripping) that could occur in the form of malfunctions of various kinds over time. These situations depend on the conditions of the gas as well as on the natural ageing and wear of the materials.

10.1 - GENERAL WARNINGS

HAZARD!

Maintenance work must be carried out by qualified personnel:

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

WARNING!







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

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

NOTICE!

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

10.2 - OPERATOR QUALIFICATION SPECIFICATION

Commissioning	
Operator qualification	<ul style="list-style-type: none"> • Mechanical maintenance technician; • Electrical maintenance technician; • Installer; • Name of the user.
PPE required	<div style="display: flex; align-items: center; gap: 10px;">      </div> <div style="background-color: #f4a460; padding: 5px; margin-top: 5px;">  WARNING! </div> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any information provided by the Safety Manager at the installation facility.</u>
Equipment required	Please refer to the chapter “7 - Commissioning/maintenance equipment”.

Tab. 10.62

10.3 - TROUBLESHOOTING PROCEDURES

For proper troubleshooting, proceed as follows:

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

10.4 - TROUBLESHOOTING TABLES

NOTICE!

See chapter “9.4.2.2 - Cross diagram for tightening screws” for pictures of the regulator SCN and its accessories.

10.4.1 - TROUBLESHOOTING SCN REGULATOR

Failure	Device	Possible causes	Intervention
Incorrect tripping pressure	PRESSURE SWITCH MOD. SN	Wrong calibration: <ul style="list-style-type: none"> • maximum spring-load (32) • minimum spring-load (31) 	Repeat calibration by adjusting the ring nuts
		Lever mechanisms with friction	Clean and lubricate the levers and if needed replace the pressure switch
		Springs (31, 32) collapsed	Replace
		Springs (31, 32) out of level	Refit
Impossible to reset	PRESSURE SWITCH MOD. SN	Wrong calibration: <ul style="list-style-type: none"> • maximum spring-load (32) • minimum spring-load (31) 	Repeat calibration by adjusting the ring nuts
		Downstream pressure is not consistent with the minimum and/or maximum setting of the slam-shut device	Adjust the downstream pressure
		Lever mechanism broken or chipped	Replace pressure switch
		Diaphragm breakage (16) if there is a minimum spring-load	Replace the diaphragm (16)
		Manual release button (6) locked	Clean and lubricate
Failure to provide service	SN SLAM-SHUT VALVE	<ul style="list-style-type: none"> • 1" - 3": plug (12) • 4" - 8": plug (2) locked in opening position	Clean and lubricate if needed
		<ul style="list-style-type: none"> • 1" - 3": I/DWR (55) • 4" - 8": I/DWR (82) soiled or damaged	Clean and replace if needed
		<ul style="list-style-type: none"> • 1" - 3": spring (42) • 4" - 8": spring (51) collapsed	Replace
		Rod (34) blocked	Clean and lubricate
	PRESSURE SWITCH MOD. SN	Diaphragm breakage (16) if there is a minimum spring-load	Replace the diaphragm (16)
		Lever mechanism broken or chipped	Replace pressure switch

Failure	Device	Possible causes	Intervention
Downstream pressure increase with slam-shut device shutting off	SN SLAM-SHUT VALVE	Valve seat (7) with damaged profile	Replace
		Failed sealing: <ul style="list-style-type: none"> • 1" - 3": O-ring (63) • 4" - 8": O-ring (91) 	Clean and replace if needed
		Failed tightness of the reinforced gasket (10) on main outer surface	Clean and replace if needed
		Failed tightness of the reinforced gasket (10) on bypass inner surface	Clean and replace if needed
		Failed sealing: <ul style="list-style-type: none"> • 1" - 3": O-ring (66) • 4" - 8": O-ring (87) 	Clean and replace if needed

Tab. 10.63.

11 - UNINSTALLATION AND DISPOSAL

11.1 - GENERAL SAFETY WARNINGS

HAZARD!



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

WARNING!

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

11.2 - QUALIFICATION OF THE OPERATORS IN CHARGE

Commissioning

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

Tab. 11.64

11.3 - UNINSTALLATION

ATTENTION!

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

NOTICE!

For equipment uninstallation procedures, please refer to the installation procedures (see chapter “6 - installation”), proceeding in reverse order.

11.4 - INFORMATION REQUIRED IN CASE OF RE-INSTALLATION

NOTICE!

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

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

11.5 - DISPOSAL INFORMATION

NOTICE!

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

NOTICE!

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

The equipment was manufactured with materials that can be recycled by specialised companies. For proper disposal of the equipment, proceed as specified in “Tab. 11.66”:

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

Tab. 11.65

The equipment in any configuration consists of the following materials:

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

Tab. 11.66

NOTICE!

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

12 - RECOMMENDED SPARE PARTS

12.1 - GENERAL WARNINGS

NOTICE!

If non-original spare parts are used, PIETRO FIORENTINI S.p.A. their declared performance cannot be guaranteed.

It is recommended to use original spare parts PIETRO FIORENTINI S.p.A.

PIETRO FIORENTINI S.p.A. shall not be held liable for any damage caused by using non-original parts.

12.2 - HOW TO REQUEST SPARE PARTS

NOTICE!

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

13 - CALIBRATION TABLES

13.1 - CALIBRATION TABLES FOR PRESSURE SWITCHES MOD. SN-91, SN-92

Below are the calibration tables for the pressure switches that may be installed in the slam-shut valve:

Mod. SN-91 - Max pressure							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2700680	Brown	2.3	60	35	0.025	0.045
2	2700830	Red/Black	2.5			0.046	0.076
3	2700920	White/yellow	2.8			0.076	0.1
4	2701040	White/orange	3			0.101	0.165
5	2701260	White	3.5			0.166	0.3
6	2701530	Yellow	4			0.301	0.58
7	2701790	Yellow/Black	4.5			0.581	0.9
8	2702070	Orange	5			0.901	1.1

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **Min./Max.** = pressure (bar)

Tab. 13.67.

Mod. SN-91 - Min pressure							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2700338	White	1.3	40	15	0.01	0.025
2	2700377	Yellow	1.5			0.026	0.045
3	2700464	Orange	1.7			0.046	0.095
4	2700513	Red	2			0.096	0.125
5	2700713	Green	2.3			0.126	0.2
6	2700750	Black	2.5			0.201	0.5
7	2700985	Brown	3			0.501	0.9

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **Min./Max.** = pressure (bar)

Tab. 13.68.

Mod. SN-91 (Norval/SCN inverted) - Max pressure							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2700680	Brown	2.3	60	35	0.025	0.045
2	2700830	Red/Black	2.5			0.046	0.076
3	2700920	White/yellow	2.8			0.076	0.1
4	2701040	White/orange	3			0.101	0.165
5	2701260	White	3.5			0.166	0.3
6	2701530	Yellow	4			0.301	0.58
7	2701790	Yellow/Black	4.5			0.581	0.9
8	2702070	Orange	5			0.901	1.1

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **Min./Max.** = pressure (bar)

Tab. 13.69.

Mod. SN-91 (Norval/SCN inverted) - Min pressure

Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2700338	White	1.3	40	15	0.01	0.025
2	2700377	Yellow	1.5			0.026	0.045
3	2700464	Orange	1.7			0.046	0.095
4	2700513	Red	2			0.096	0.125
5	2700713	Green	2.3			0.126	0.2
6	2700750	Black	2.5			0.201	0.5
7	2700985	Brown	3			0.501	0.9

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **Min./Max.** = pressure (bar)

Tab. 13.70.

Mod. SN-92 - Max pressure

Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2701260	White	3.5	60	35	0.7	1.01
2	2701530	Yellow	4			1.011	1.96
3	2701790	Yellow/Black	4.5			1.961	3.2
4	2702070	Orange	5			3.201	3.75
5	2702280	White/Red	5.5			3.751	5

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **Min./Max.** = pressure (bar)

Tab. 13.71.

Mod. SN-92 - Min pressure

Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2700513	Red	2	40	15	0.25	0.4
2	2700713	Green	2.3			0.401	0.62
3	2700750	Black	2.5			0.621	1.55
4	2700985	Brown	3			1.551	3.01

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **Min./Max.** = pressure (bar)

Tab. 13.72.

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