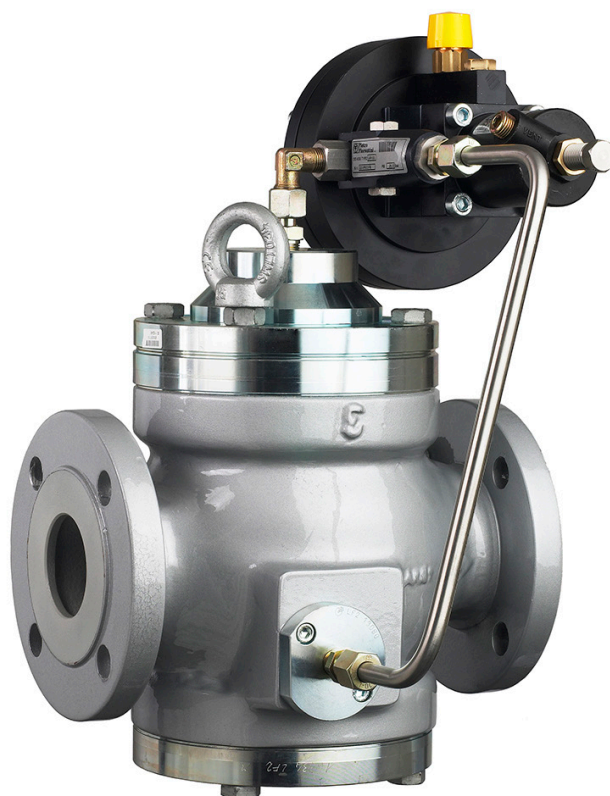


Aperval

Medium-low pressure gas regulator



Revision D - Edition 11/2024

**USE, MAINTENANCE
AND WARNING
MANUAL**

1 - INTRODUCTION

FOREWORD

All rights reserved. No part of this publication may be reproduced, distributed, translated into other languages or transmitted by any electronic or mechanical media, including photocopies, recording or any other storage and retrieval system, for any other purposes that are not exclusively the personal use of the buyer, without the express written permission of the Manufacturer.

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.

1.1 - REVISION HISTORY

Revision index	Date
A	02/2023
B	06/2023
C	01/2024
D	11/2024

Tab. 1.1.

INDEX

1 - INTRODUCTION	3
1.1 - REVISION HISTORY.....	5
2 - GENERAL INFORMATION	11
2.1 - MANUFACTURER IDENTIFICATION	11
2.2 - IDENTIFICATION OF THE PRODUCT	11
2.3 - REGULATORY FRAMEWORK.....	11
2.4 - WARRANTY	11
2.5 - SYMBOLS USED IN THE MANUAL.....	12
2.6 - ADDRESSEES, SUPPLY AND STORAGE OF THE INSTRUCTION MANUAL	13
2.7 - LANGUAGE	13
2.8 - APPLIED RATING PLATES	14
2.8.1 - GLOSSARY FOR NAMEPLATES	16
2.9 - GLOSSARY OF MEASUREMENT UNITS.....	18
2.10 - QUALIFIED PROFESSIONAL FIGURES.....	19
3 - SAFETY	21
3.1 - GENERAL SAFETY WARNINGS.....	21
3.2 - PERSONAL PROTECTIVE EQUIPMENT.....	22
3.3 - RESIDUAL RISKS	23
3.3.1 - TABLE SHOWING RESIDUAL RISKS DUE TO PRESSURE	24
3.3.2 - TABLE OF RESIDUAL RISKS FOR POTENTIALLY EXPLOSIVE ATMOSPHERES	26
3.4 - OBLIGATIONS AND PROHIBITIONS	28
3.5 - SAFETY PICTOGRAMS	29
3.6 - RISK LEVEL	29

4 - DESCRIPTION AND OPERATION 31

4.1 - GENERAL DESCRIPTION	31
4.1.1 - REGULATOR REACTION MODES.....	32
4.2 - OPERATION.....	32
4.3 - INTENDED USE	34
4.3.1 - ENVISAGED USE	34
4.3.2 - REASONABLY FORESEEABLE MISUSE	34
4.3.3 - TYPES OF FLUIDS	34
4.4 - TECHNICAL FEATURES/PERFORMANCE	35
4.5 - POSSIBLE CONFIGURATIONS	36
4.5.1 - BUILT-IN SILENCER.....	37
4.5.2 - MONITOR	38
4.5.2.1 - V/25 AND M/A ACCELERATOR VALVES	42
4.5.3 - SLAM-SHUT VALVE	44
4.5.3.1 - BUILT-IN SLAM-SHUT VALVE SA.....	44

5 - TRANSPORT AND HANDLING 47

5.1 - SPECIFIC WARNINGS FOR TRANSPORT AND HANDLING	47
5.1.1 - PACKAGING AND FASTENERS USED FOR TRANSPORT	48
5.2 - PHYSICAL CHARACTERISTICS OF THE EQUIPMENT	49
5.2.1 - APERVAL	49
5.2.2 - APERVAL + DB	50
5.2.3 - APERVAL + PM/182.....	51
5.2.4 - APERVAL + SA	52
5.2.5 - APERVAL + DB + PM/182	54
5.2.6 - APERVAL + DB + SA	56
5.3 - EQUIPMENT ANCHORING AND LIFTING METHOD.....	58
5.3.1 - FORKLIFT HANDLING METHOD.....	59
5.3.2 - CRANE HANDLING METHOD.....	61
5.4 - PACKAGING REMOVAL.....	62
5.4.1 - PACKAGING DISPOSAL	62
5.5 - STORAGE AND ENVIRONMENTAL CONDITIONS	63
5.5.1 - PRE-INSTALLATION WARNINGS AFTER PROLONGED STORAGE	63

6 - INSTALLATION 65

6.1 - INSTALLATION PRE-REQUISITES.....	65
6.1.1 - ALLOWED ENVIRONMENTAL CONDITIONS.....	65
6.1.2 - CHECKS BEFORE INSTALLATION.....	66
6.2 - SPECIFIC SAFETY INSTRUCTIONS FOR THE INSTALLATION STEP	67
6.3 - GENERAL INFORMATION ON CONNECTIONS	68
6.4 - REGULATOR INSTALLATION POSITIONS.....	69
6.5 - INSTALLATION PROCEDURES	70
6.5.1 - EQUIPMENT INSTALLATION PROCEDURE	70
6.5.2 - CONNECTION OF THE SENSING LINES TO THE DOWNSTREAM PIPING.....	70
6.6 - POST-INSTALLATION AND PRE-COMMISSIONING CHECKS	72

7 - COMMISSIONING/MAINTENANCE EQUIPMENT..... 73

7.1 - LIST OF EQUIPMENT.....	73
7.2 - EQUIPMENT NEEDED FOR THE DIFFERENT CONFIGURATIONS.....	75

8 - COMMISSIONING 77

8.1 - GENERAL WARNINGS	77
8.1.1 - SAFETY REQUIREMENTS FOR COMMISSIONING	77
8.2 - PRELIMINARY PROCEDURES FOR COMMISSIONING	78
8.3 - PROPER COMMISSIONING CHECK	79
8.4 - CALIBRATION OF ANY ACCESSORIES.....	79
8.5 - REGULATOR COMMISSIONING PROCEDURE	80
8.6 - PROCEDURE FOR COMMISSIONING THE APERVAL REGULATOR WITH PM/182 BUILT-IN MONITOR	82
8.7 - START-UP PROCEDURE FOR APERVAL REGULATOR WITH INCORPORATED MONITOR PM/182 AND ACCELERATOR VALVE V/25.....	84
8.8 - START-UP PROCEDURE FOR APERVAL REGULATOR WITH INCORPORATED MONITOR PM/182 AND ACCELERATOR VALVE M/A.....	88
8.9 - COMMISSIONING PROCEDURE FOR THE APERVAL REGULATOR WITH INTEGRATED SA BLOCK VALVE	92
8.9.1 - CHECKING THE CLOSING TIGHTNESS OF THE SA BUILT-IN SLAM-SHUT VALVE	92
8.9.2 - COMMISSIONING OF THE REGULATOR APERVAL WITH SA SLAM-SHUT VALVE	93
8.9.3 - DEVICE CALIBRATION.....	100
8.9.3.1 - V/25 ACCELERATOR VALVE CALIBRATION.....	100
8.9.3.2 - CALIBRATION OF 300, 200 SERIES PILOTS AND M/A ACCELERATOR VALVE.....	100
8.9.3.3 - CALIBRATION OF PRESSURE SWITCHES MOD. SA	101

9 - MAINTENANCE AND FUNCTIONAL CHECKS..... 103

9.1 - GENERAL WARNINGS	103
9.2 - PERIODICALLY CHECKING AND INSPECTING THE EQUIPMENT FOR PROPER OPERATION.....	105
9.3 - ROUTINE MAINTENANCE	106
9.3.1 - GENERAL SAFETY WARNINGS.....	106
9.3.2 - REPLACEMENT FREQUENCY FOR COMPONENTS SUBJECT TO WEAR	107
9.4 - ROUTINE MAINTENANCE PROCEDURES.....	109
9.4.1 - TIGHTENING TORQUES APERVAL.....	110
9.4.2 - REPLACING ELEMENTS SUBJECT TO WEAR AND ABRASION.....	131
9.4.3 - REGULATOR MAINTENANCE PROCEDURE APERVAL	132
9.4.4 - MAINTENANCE OF THE 300/A SERIES PILOT + AR100 LAMINATION VALVE.....	144
9.4.5 - DB APERVAL SILENCER MAINTENANCE.....	164
9.4.6 - PM/182 BUILT-IN MONITOR MAINTENANCE.....	172
9.4.7 - 200/A SERIES PILOT + PRE-REGULATORS R31/A AND R14/A MAINTENANCE	192
9.4.8 - V/25 ACCELERATOR VALVE MAINTENANCE	214
9.4.9 - M/A ACCELERATOR VALVE MAINTENANCE	218
9.4.10 - SEALING OF THE SA BUILT-IN SLAM-SHUT VALVE	222
9.4.11 - MAINTENANCE OF PRESSURE SWITCH MOD. SA	226
9.4.12 - PROCEDURE FOR RECOMMISSIONING AFTER MAINTENANCE	237

10 - TROUBLESHOOTING..... 239

10.1 -GENERAL WARNINGS	239
10.2 -OPERATOR QUALIFICATION SPECIFICATION	240
10.3 -TROUBLESHOOTING PROCEDURES	240
10.4 -TROUBLESHOOTING TABLES	241
10.4.1 - TROUBLESHOOTING APERVAL REGULATOR	241
10.4.2 - DB SILENCER TROUBLESHOOTING.....	243
10.4.3 - PM/182 BUILT-IN MONITOR TROUBLESHOOTING	244
10.4.4 - TROUBLESHOOTING OF THE SA SLAM-SHUT VALVE	248

11 - UNINSTALLATION AND DISPOSAL 249

11.1 -GENERAL SAFETY WARNINGS.....	249
11.2 -QUALIFICATION OF THE OPERATORS IN CHARGE.....	249
11.3 -UNINSTALLATION.....	249
11.4 -INFORMATION REQUIRED IN CASE OF RE-INSTALLATION.....	249
11.5 -DISPOSAL INFORMATION.....	250

12 - RECOMMENDED SPARE PARTS 251

12.1 -GENERAL WARNINGS	251
12.2 -HOW TO REQUEST SPARE PARTS.....	251

13 - CALIBRATION TABLES 253

13.1 -300 SERIES PILOT CALIBRATION TABLES	253
13.2 -200 SERIES PILOT CALIBRATION TABLES	254
13.3 -PRESSURE SWITCH CALIBRATION TABLES MOD. SA.....	255
13.4 -M/A ACCELERATOR VALVE CALIBRATION TABLE	257
13.5 -V/25 ACCELERATOR VALVE CALIBRATION TABLE.....	257

2 - GENERAL INFORMATION

2.1 - MANUFACTURER IDENTIFICATION

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

Tab. 2.2.

2.2 - IDENTIFICATION OF THE PRODUCT

Equipment	REGOLATORE PER MEDIA PRESSIONE
Model	APERVAL

Tab. 2.3.

2.3 - REGULATORY FRAMEWORK

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

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 INSTRUCTION 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 instruction 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

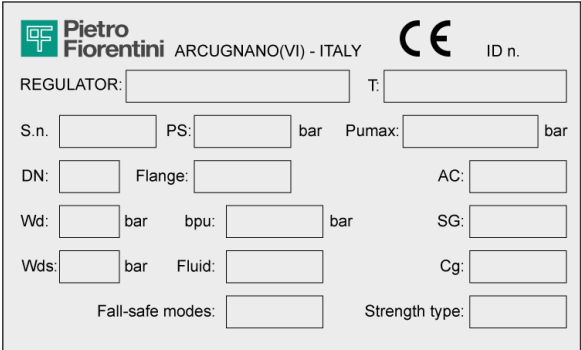

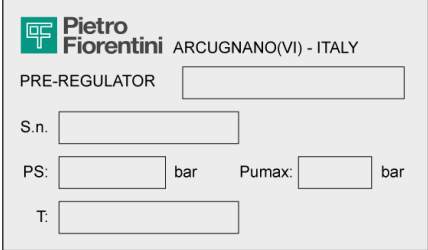

WARNING!

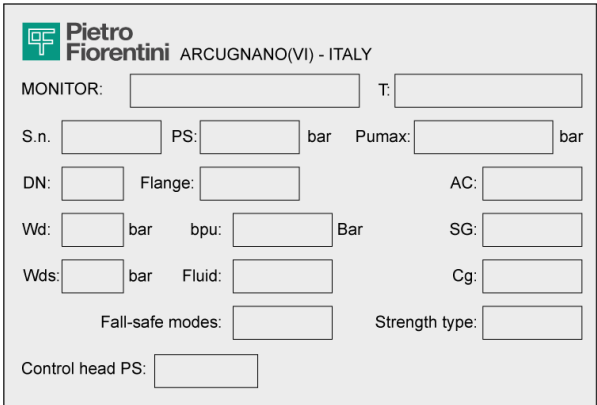


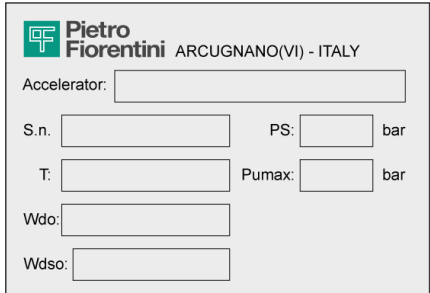
**Removing nameplates and/or replacing them with other plates is strictly not allowed.
Should the plates be unintentionally damaged or removed, the customer must notify
PIETRO FIORENTINI S.p.A.**

The equipment and its accessories are provided with nameplates (from Id.1 to Id.8).

The nameplates specify identification details of the equipment and its accessories to be mentioned in case of need to PIETRO FIORENTINI S.p.A.

Tab. 1.5 shows the nameplates applied:

Id.	Type	Image
1	NAMEPLATE REGULATOR (EC version)	
2	NAMEPLATE PILOT	
3	NAMEPLATE PRE-REGULATOR	
4	NAMEPLATE SILENCER	

Id.	Type	Image
5	NAMEPLATE MONITOR	 <p>Pietro Fiorentini ARCUGNANO(VI) - ITALY</p> <p>MONITOR: <input type="text"/> T: <input type="text"/></p> <p>S.n. <input type="text"/> PS: <input type="text"/> bar Pumax: <input type="text"/> bar</p> <p>DN: <input type="text"/> Flange: <input type="text"/> AC: <input type="text"/></p> <p>Wd: <input type="text"/> bar bpu: <input type="text"/> Bar SG: <input type="text"/></p> <p>Wds: <input type="text"/> bar Fluid: <input type="text"/> Cg: <input type="text"/></p> <p>Fall-safe modes: <input type="text"/> Strength type: <input type="text"/></p> <p>Control head PS: <input type="text"/></p>
6	NAMEPLATE SLAM-SHUT VALVE	 <p>Pietro Fiorentini ARCUGNANO(VI) - ITALY</p> <p>SLAM SHUT DEVICE <input type="text"/></p> <p>S.n. <input type="text"/> Class: <input type="text"/></p> <p>DN: <input type="text"/> T: <input type="text"/></p>
7	NAMEPLATE PRESSURE SWITCH	 <p>Pietro Fiorentini ARCUGNANO(VI) - ITALY</p> <p>TRIPPING UNIT: <input type="text"/></p> <p>S.n. <input type="text"/> Wdo: <input type="text"/> Bar</p> <p>T: <input type="text"/> Wdso: <input type="text"/> Bar</p> <p>AG max: <input type="text"/> Wdu: <input type="text"/> Bar</p> <p>AG min: <input type="text"/> Wdsu: <input type="text"/> Bar</p>
8	NAMEPLATE ACCELERATOR VALVE	 <p>Pietro Fiorentini ARCUGNANO(VI) - ITALY</p> <p>Accelerator: <input type="text"/></p> <p>S.n. <input type="text"/> PS: <input type="text"/> bar</p> <p>T: <input type="text"/> Pumax: <input type="text"/> bar</p> <p>Wdo: <input type="text"/></p> <p>Wdso: <input type="text"/></p>

Tab. 2.5.

2.8.1 - GLOSSARY FOR NAMEPLATES

The terms and abbreviations used on nameplates are described in Tab. 1.6:

Term	Description
AC	Accuracy class.
AG max	Accuracy class of pressure boosting slam-shut valves. "OPSO" (Over pressure shut off).
AG min	Accuracy class of safety devices for pressure drop. "UPSO"(Under pressure shut off).
bpu	Range of inlet pressure for which the regulator ensures a given accuracy class.
CE	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	inch of water column
	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 instruction 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;
- smoking is not allowed.

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 slow 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. 1.9 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 leakage. 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; breakage of 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 leakage. Projection of metallic and non-metallic 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 leakage. Projection of metallic and non-metallic pressurised parts.	<ul style="list-style-type: none"> operation at temperatures below the minimum permissible temperature. 	<ul style="list-style-type: none"> embrittlement; breaking; 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 leakage. Projection of metallic and non-pressurised parts. Explosion.	<ul style="list-style-type: none"> overpressure or exceeding of the rated limit values (maximum pressure allowed) 	<ul style="list-style-type: none"> explosion; breaks; cracks; permanent deformation. 	<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; breaking. 	<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-metallic pressurised parts.	<ul style="list-style-type: none"> incorrect fixing of the equipment. 	<ul style="list-style-type: none"> deformation; breaking. 	<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>

Risk and Hazard	Event and Cause	Effect and Consequence	Solution and Prevention
Pressurised gas leakage.	<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>
Pressurised gas leakage. Projection of metallic and non-metallic 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 pressurised, also bursting. 	<p>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.</p>
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	<ul style="list-style-type: none"> electrostatic potential, differential stray currents. 	<ul style="list-style-type: none"> corrosion localised in the device. 	<p>b. The user must equip the device with the necessary protection and earthing devices.</p> <p>c. The above requirements are referred to in the use and warning manual.</p>
Pressurised gas leakage. Projection of metallic and non-metallic pressurised parts.	<ul style="list-style-type: none"> humidity; environments with aggressive atmosphere. 	<ul style="list-style-type: none"> deterioration of external surfaces; corrosion. 	<p>a. The user must periodically check the state of conservation of the external surfaces.</p> <p>b. The above requirements are referred to in the use and warning manual.</p>

Tab. 3.10.

3.3.2 - TABLE OF RESIDUAL RISKS FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

Tab. 1.11 shows the conditions that can lead to the generation of a potentially explosive atmosphere respectively for:

- APERVAL pressure regulator;
- the PM/182 monitor;
- slam-shut valves SA.

Considering that the silencer does not have active functional parts, in this analysis it is considered an integral part of the APERVAL 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	Regulatory 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 334). • 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.

Operating conditions	Potentially explosive atmosphere	Regulatory references	Management measures included in the instructions for use and warning
Breakage of the control head diaphragm (malfunction)	No	<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.
Breakage of other non-metallic parts (malfunction)	No	<p>This type of malfunction is not reasonably expected as it involves static seals (to the outside) that cannot generate any external leakage.</p>	-
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). 	<p>The instructions for use indicate:</p> <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	Definition
	Symbol used to identify an ELECTRICAL HAZARD.
	Symbol used to identify a GENERIC HAZARD.

Tab. 3.12.

HAZARD!

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

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

3.6 - RISK LEVEL

Depending on the operating conditions, use and configuration required, the equipment may generate noise other than that permitted by current legislation in the country of installation.

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

ATTENTION!

The obligation to use 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 equipment APERVAL is a piloted pressure regulator for low and medium pressure which reduces the inlet gas pressure, keeping the downstream value stable even when the following varies:

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

The main elements of the equipment are:

Pos.	Description	Pos.	Description
1	Main regulator	5	Valve seat
2	Piloting unit	6	Pressure control element
3	AR100 lamination valve	7	Control head
4	300 series pilot	8	Spring

Tab. 4.13.

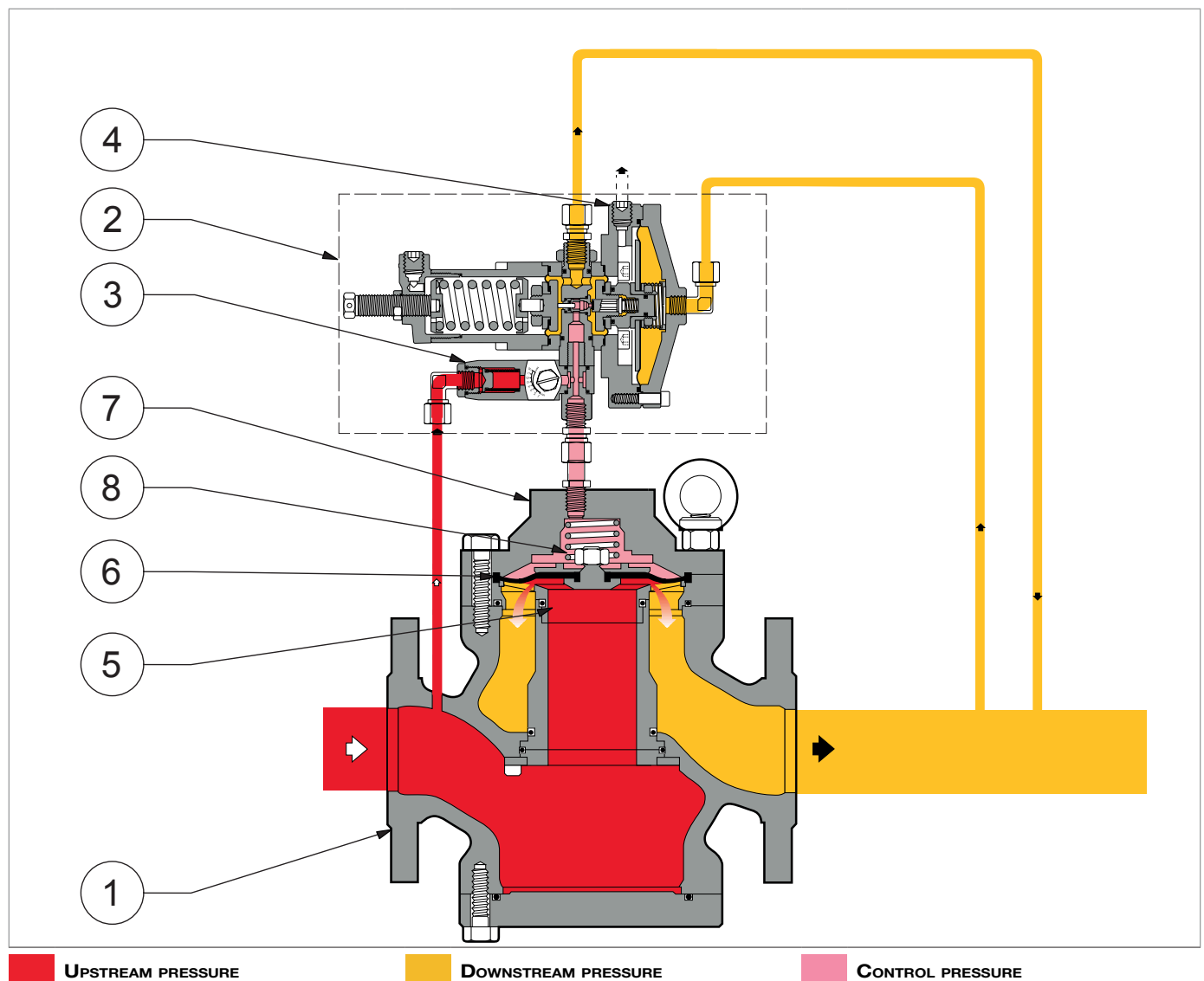


Fig. 4.1. General description APERVAL

4.1.1 - REGULATOR REACTION MODES

The APERVAL equipment is a regulator piloted with a “fail open” reaction (on-opening reaction), that is, it opens in the event of:

- breakage of the pilot diaphragm(s);
- breakage of the pilot plug;
- no power supply in the pilot circuit.

4.2 - OPERATION

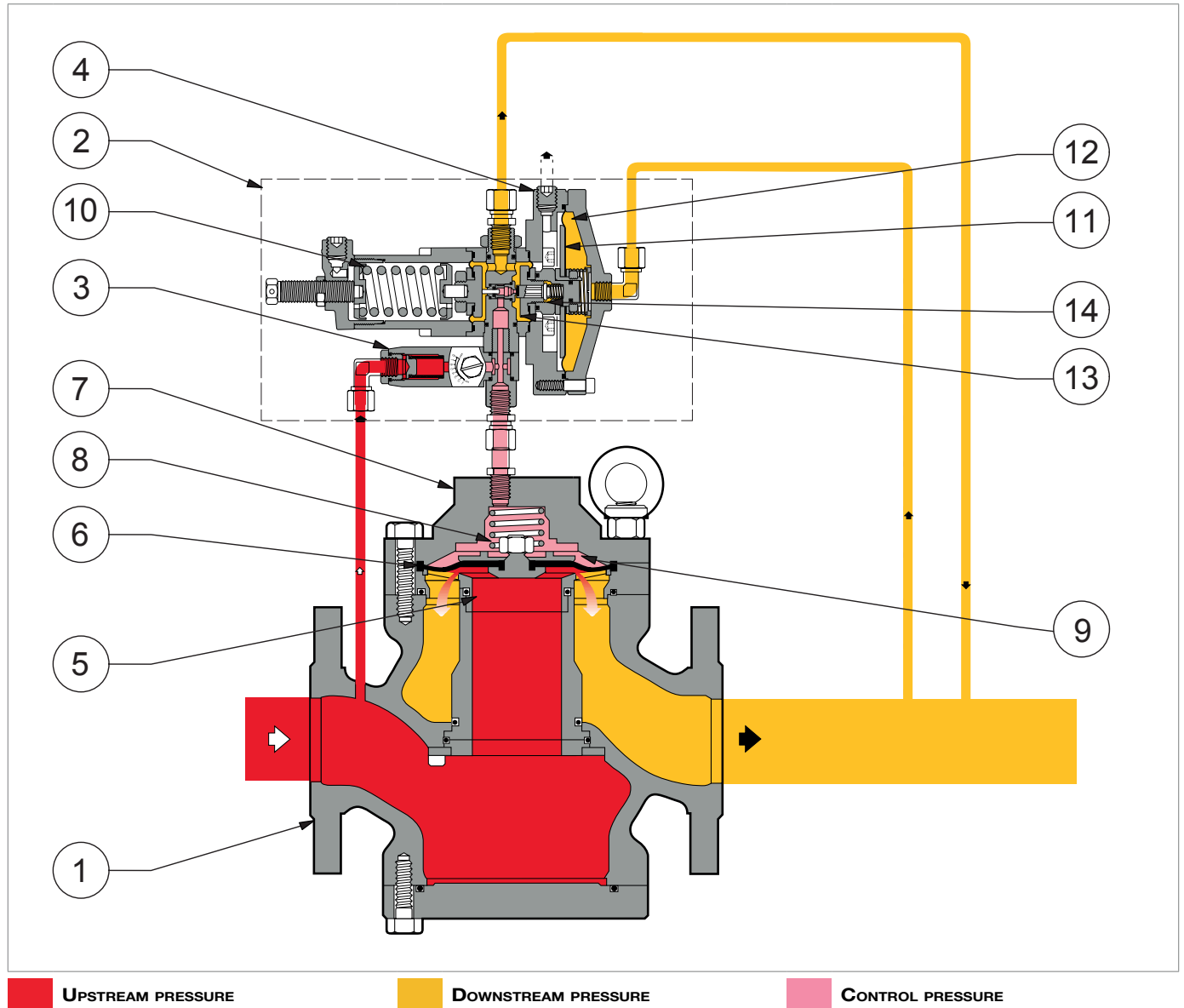


Fig. 4.2. Operation APERVAL

In the control head (7), the pressure control element (6), if not pressurised, is kept in the closed position by the spring (8).

In normal operating conditions, the following forces act on the control element (6):

- on the upper side: spring load (8), thrust resulting from the control pressure (C_p) in the control chamber (9) and weight of the mobile unit;
- on the lower side: thrusts deriving from the upstream (P_u) and downstream (P_d) pressure as well as residual dynamic components.

The gas used to feed the pilot (4) and the control chamber (9) is drawn upstream of the control element (6) at the upstream pressure (P_u) and cleaned of solid contaminants by the filter incorporated in the AR100 lamination valve (3).

The control pressure (C_p) value is adjusted by the pilot (4) by comparing:

- the load of the setting spring (10) of the pilot;
- the action of the downstream pressure (P_d) on the diaphragm (11) in the upper chamber (12).

During normal plug operation (14), the plug is positioned so that the control pressure (C_p) value above the control element (6) is such as to keep the downstream pressure (P_d) at approximately the selected value. If, during operation, the following should occur:

Operating conditions	Operating consequences	Concluding outcome
<p>Decrease in downstream pressure (P_d) below the calibration value (D_{ps}) for:</p> <ul style="list-style-type: none"> • increase in the requested flow rate • decrease in upstream pressure (P_u). 	<p>Imbalance of the mobile unit (13) which causes:</p> <ul style="list-style-type: none"> • an increase in plug opening (14); • a decrease in control pressure (C_p). 	<p>The pressure control element (6) goes into the open position and causes an increase in gas flow until the downstream pressure (P_d) is restored to the set value (D_{ps}).</p>
<p>Increase in upstream pressure (P_u) above the calibration value (D_{ps}) for:</p> <ul style="list-style-type: none"> • decrease in required flow rate • increase in upstream pressure (P_u). 	<p>Imbalance of the mobile unit (13) which causes:</p> <ul style="list-style-type: none"> • partial closure of the plug (14) and flow of a lower quantity of gas; • the increase in the control pressure (C_p) due to the decrease in the pressure loss generated by the lamination valve AR100 (3). 	<p>The pressure control element (6) goes into the closed position and causes a decrease in gas flow until the pressure is restored to the calibration value (D_{ps}).</p>

Tab. 4.14.

4.3 - INTENDED USE

4.3.1 - ENVISAGED USE

The equipment in question is intended for:

Operation	Permitted	Unpermitted	Work environment
Adjustment of the downstream pressure for:	Gaseous, and non-corrosive, fluids that have been filtered beforehand.	<ul style="list-style-type: none"> Liquids. Any product other than those permitted. 	Installations to carry and convey natural gas to supply networks for: <ul style="list-style-type: none"> civil use; industrial use.

Tab. 4.15.

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

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

Safe work parameters are:

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

4.3.2 - REASONABLY FORESEEABLE MISUSE

Incorrect and reasonably foreseeable use means the use of the equipment in a way not foreseen in the phase but which can derive from easily predictable human behaviour:

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

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

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

4.3.3 - TYPES OF FLUIDS

The equipment works with 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

The APERVAL equipment is a medium pressure regulator.

APERVAL is a “top entry” type regulator that can be easily serviced and equipped with on-site accessories. The regulation system is balanced and guarantees a stable outlet pressure even when the inlet pressure varies.

The main specifications for this regulator are:

Technical features	
Maximum allowable pressure	Up to 25 bar
Ambient temperature range	-20 °C + 60 °C
Inlet gas temperature range	-20 °C + 60 °C (class 2)
Inlet pressure range (bpu)	0.5 - 25 bar
Possible regulation range (Wd)	0.005 - 9.5 bar
Minimum differential pressure	0.45 bar
Maximum differential pressure	19 bar
Accuracy class (AC)	up to 5 (depending on operating conditions)
Lock up pressure class (SG)	up to 10 (depending on operating conditions)

Tab. 4.16.

Cg, Kg and K1 coefficients					
Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1”	2”	2” 1/2	3”	4”
Coefficient Cg	584	1978	3530	4525	6719
Coefficient K1	90	101	101	101	101

Tab. 4.17.

4.5 - POSSIBLE CONFIGURATIONS

The APERVAL equipment can have different configurations through the installation of the following accessories:

- DB Aperial silencer
- Monitor PM/182
- Built-in slam-shut valve SA

The possible configurations are listed in Tab. 1.18:

APERVAL	Silencer DB Aperial	Monitor PM/182	Built-in slam-shut valve SA
DB Aperial silencer	-	Yes	Yes
Monitor PM/182	Yes	-	No
Slam-shut valve SA	Yes	No	-

Tab. 4.18.

The accessories can be installed directly at the factory or, at a later time, directly on site.

 **NOTICE!**

The installation of accessories is described in the relevant chapter of this manual.

4.5.1 - BUILT-IN SILENCER

The DB Aperval silencer (1) is incorporated between the control head (2) and the main body of the equipment (3).

The DB Aperval silencer (1) reduces the noise generated by the equipment during the lamination process. Noise is absorbed precisely where it is generated, which prevents it from propagating.

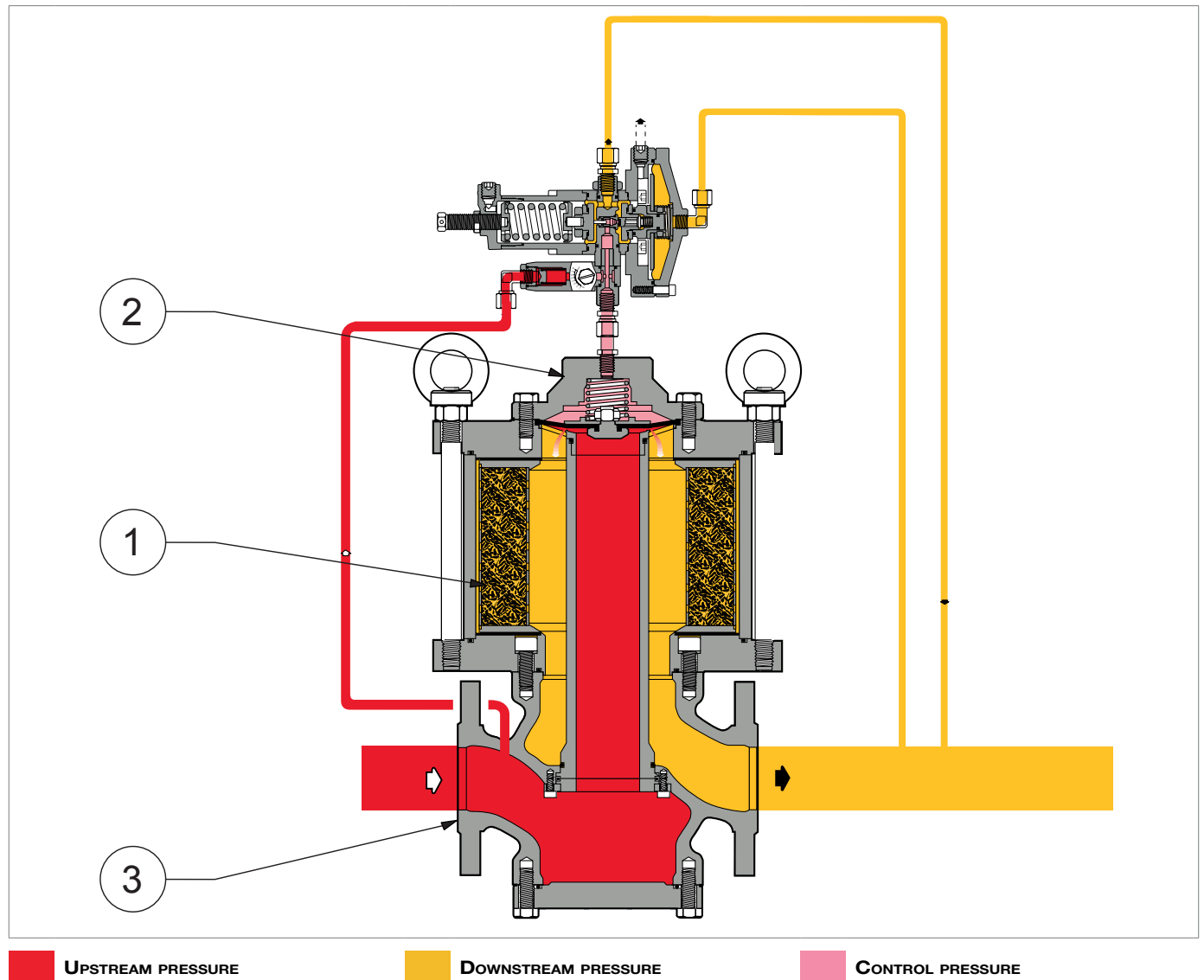


Fig. 4.3. Built-in DB Aperval silencer

4.5.2 - MONITOR

The PM/182 monitor (1) is installed upstream of the main pressure regulator (2) in a fully open position during normal operation.

The PM/182 (1) monitor is used to keep the pressure value downstream of the main regulator within the pre-set limits in case of failure.

The PM/182 monitor (1) is mounted in series directly on the service regulator body (2), converting the equipment into two pressure regulators with a common valve body. The two regulators have the following characteristics:

- are governed by two separate pilots;
- they work on independent valve seats.

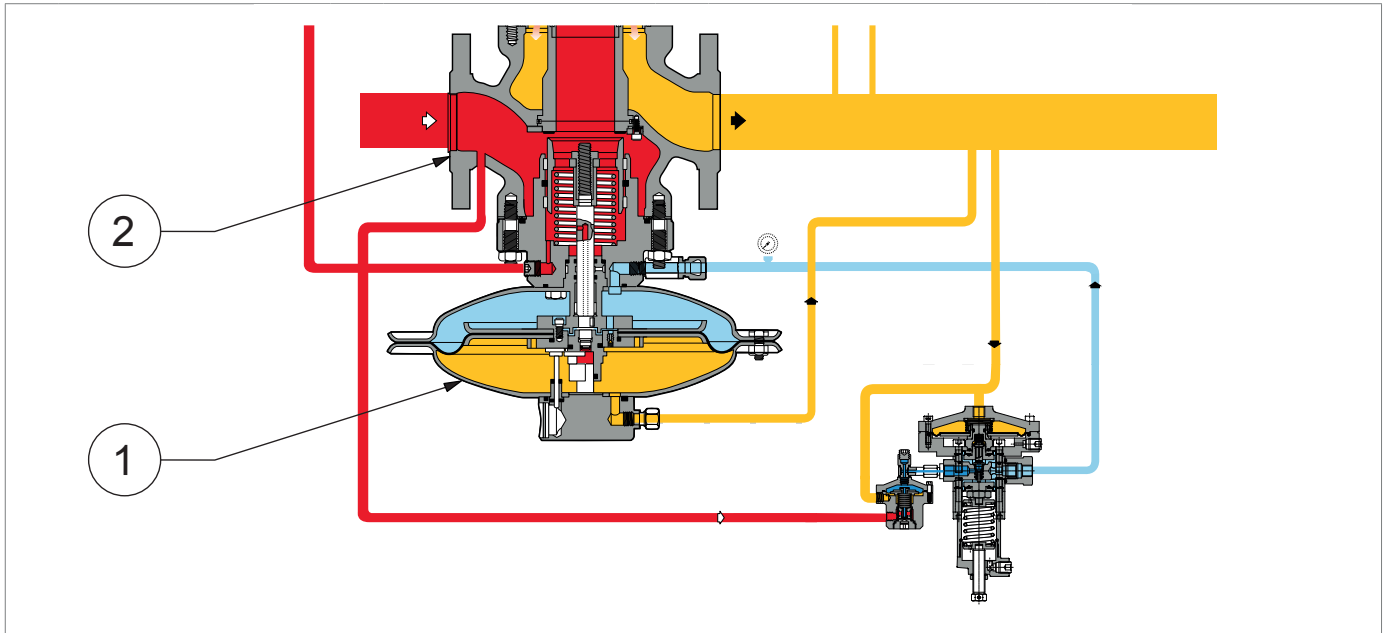


Fig. 4.4. APERVAL with PM/182 monitor

BUILT-IN MONITOR OPERATION

! NOTICE!

To check the position of the plug (3), look at the position of the stroke indicator rod (9) referring to the glass cover (10) on the flange of the monitor:

- open 100%;
- closed 0%.

In depressurised conditions, the plug (3) is kept in a closed position by the spring (4) and rests on the reinforced gasket (5).

The upstream pressure (P_u), even if variable, does not change this position as the plug (3) is completely balanced, just like the stem (6), as a result of the upstream pressure (P_u), through the hole (A), in the chamber (B).

The position of the plug (3) is controlled by the movements of the diaphragm (7) that the following act on:

- towards the closed position: the load of the spring (4) and the thrust resulting from the downstream pressure (P_d) in the chamber (C),
- towards the open position: the thrust resulting from the loading pressure (P_m) in the chamber (D), supplied by the pilot (8).

The weight of the mobile equipment acts towards the closed or open position depending on the installation position of the regulator (2) (see “Regulator installation positions”).

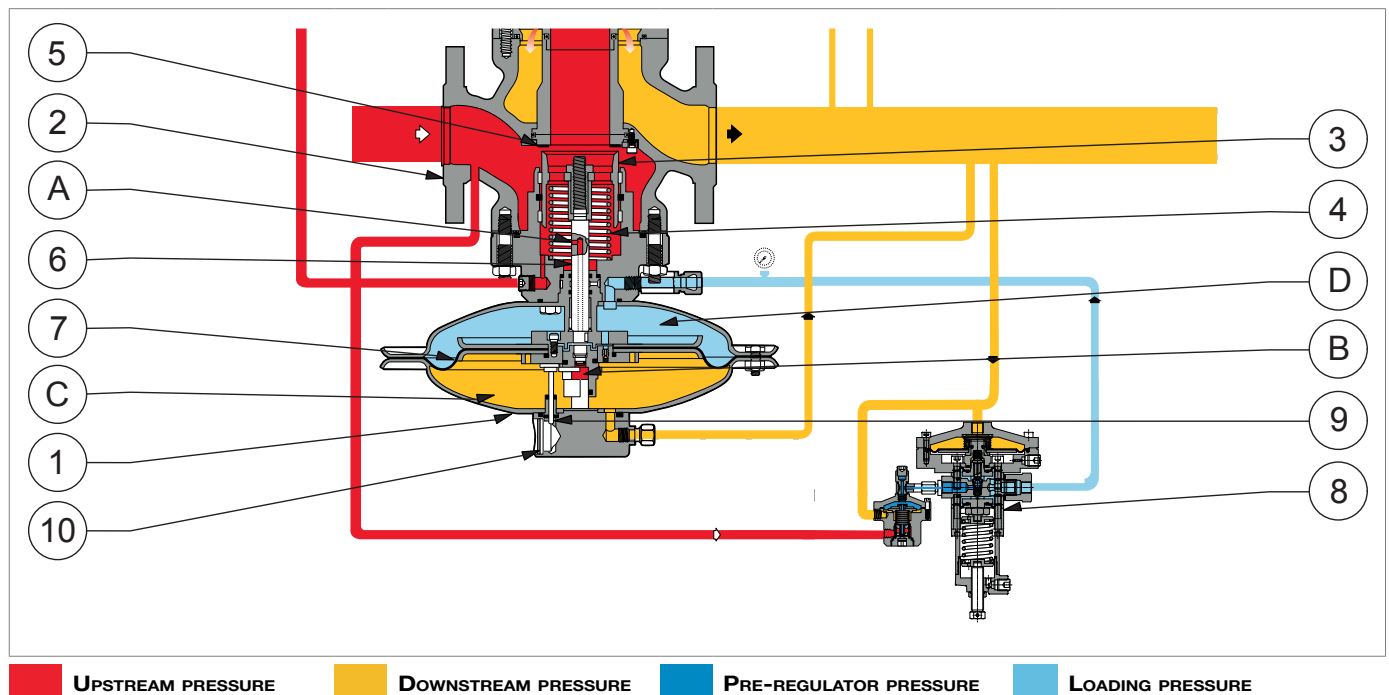


Fig. 4.5. Incorporated monitor operation

OPERATION OF THE BUILT-IN MONITOR IN STAND-BY CONDITIONS:

The PM/182 built-in monitor (1) is normally open during standard operation as pilot (3) calibration is higher than that of the main regulator's (4) pilot.

The passage of the pre-regulator pressure (P_{ep}) generated by the pre-regulator R31/A (4) through the fully open pilot (3) keeps the built-in monitor PM/182 (1) fully open.

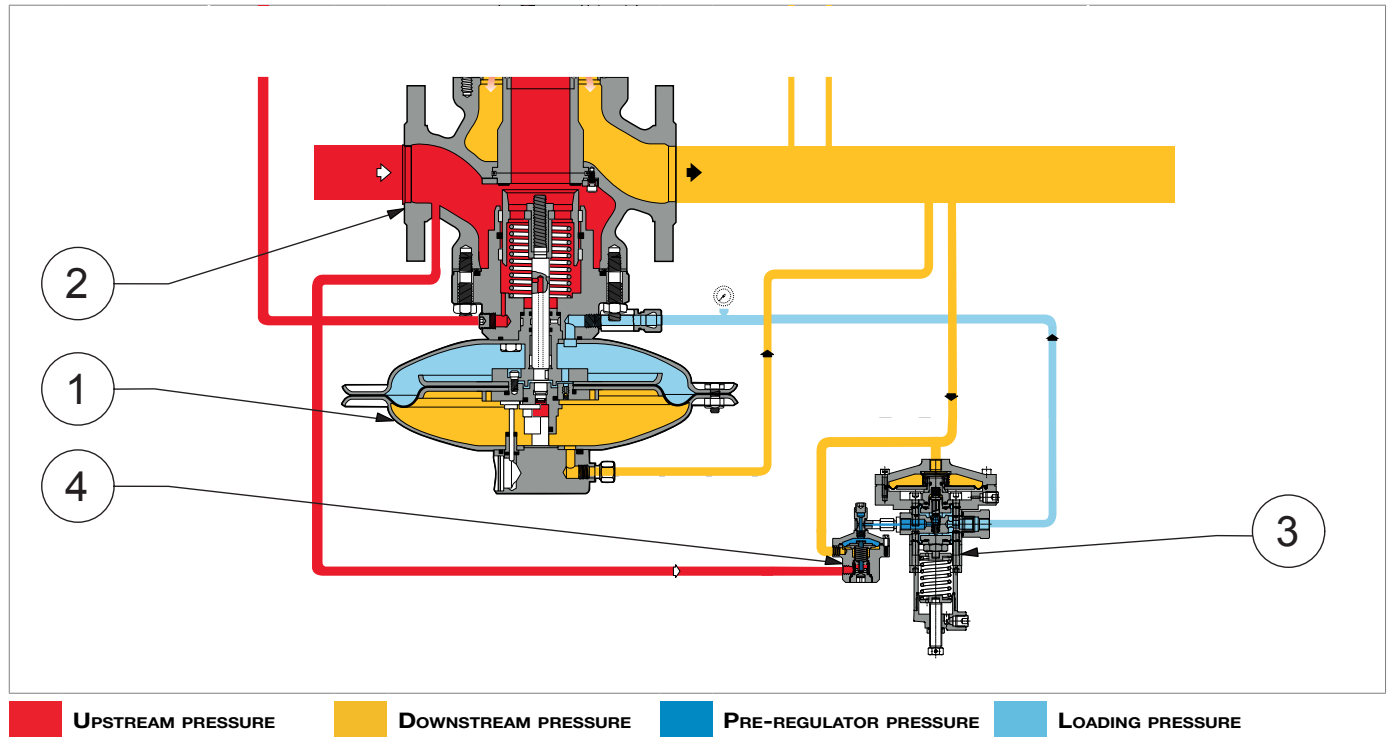


Fig. 4.6. Operation of the built-in monitor in stand-by conditions

BUILT-IN MONITOR OPERATION IN THE EVENT OF FAILURE OF THE MAIN REGULATOR:

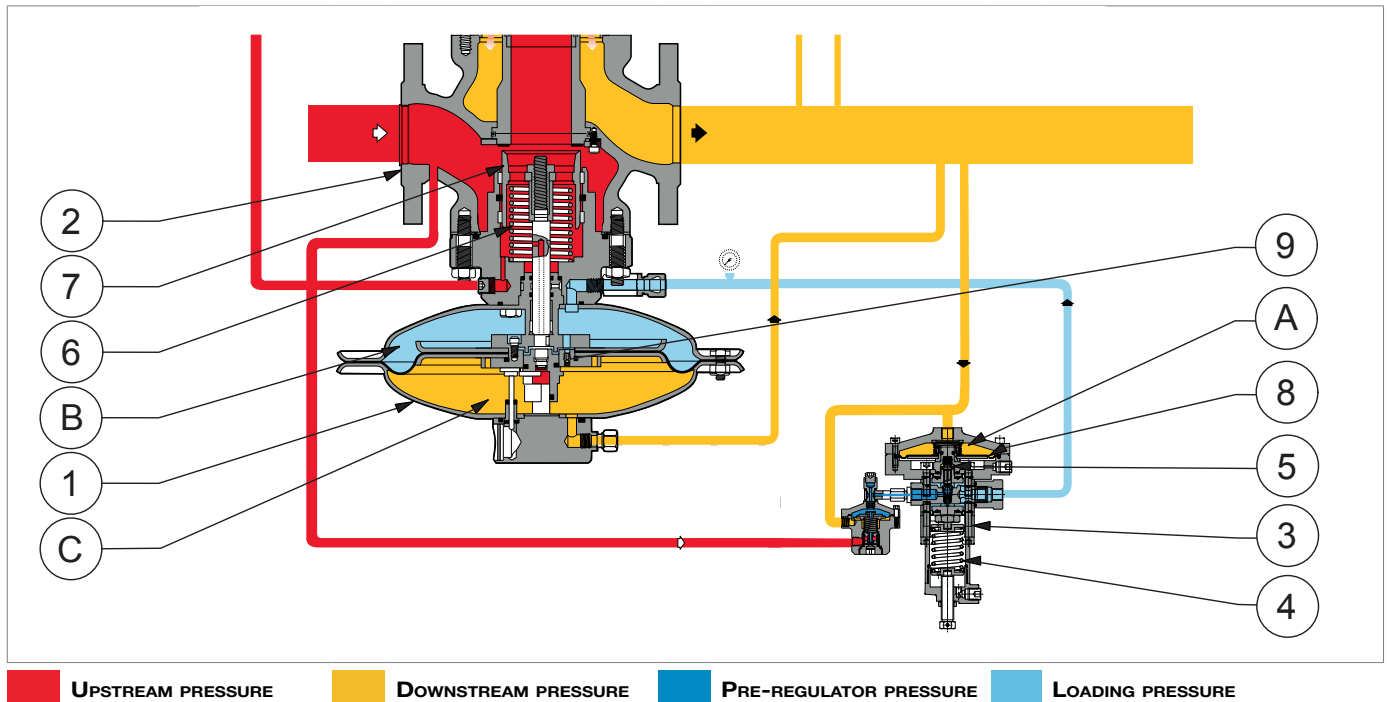


Fig. 4.7. Built-in monitor operation in the event of failure of the main regulator

Should the main regulator (2) fail, the PM/182 monitor (1) will trip until balanced adjustment is achieved.

If, during operation, the following should occur:

Operating conditions	Operating consequences	Concluding outcome
<p>Decrease in downstream pressure (P_d) due to:</p> <ul style="list-style-type: none"> • increase in the requested flow rate; • decrease in upstream pressure (P_u). 	<p>Imbalance between the pressure force in the chamber (A) and the calibration spring (3) of the pilot (4) which causes:</p> <ul style="list-style-type: none"> • increased opening of the pilot (4) plug (5); • consequent increase in the value of the loading pressure (P_m), inside the chamber (B). 	<p>Opening of the plug (7) of the PM/182 monitor (1) until the equilibrium of forces between the downstream pressure (P_d) in the chamber (A) and the calibration spring (3) of the pilot (4) has been restored.</p>
<p>Increased downstream pressure (P_d)</p>	<p>Move the plug (7) of the PM/182 monitor (1) to the shut-off position for:</p> <ul style="list-style-type: none"> • force applied by the spring (6); • the decrease in loading pressure (P_m) due to the transfer of this pressure between the chambers (B) and (C) of the PM/182 monitor (1) through the hole (9) 	<p>Close the plug (7) of the main regulator until the downstream pressure (P_d) has been restored to the pre-set value and the forces between the downstream pressure (P_d) in the chamber (A) and the setting spring (3) of the pilot (4) are balanced.</p>

Tab. 4.19.

4.5.2.1 - V/25 AND M/A ACCELERATOR VALVES

! NOTICE!

To use the monitor as a safety accessory according to Directive 2014/68/EU 'PED', installing V/25 or M/A accelerator valves is recommended.

In the event of malfunctions of the main regulator (2), to speed up tripping of built-in monitor PM/182 (1), accelerator valves will be installed

- V/25 (Fig. 1.8, ref. 3), in case of downstream pressure (Pd) up to 0.6 bar;
- M/A (Fig. 1.9, ref. 3), in case of downstream pressure (Pd) from 0.55 bar.

The accelerator valve, based on a downstream pressure signal (Pd), discharges the gas contained in the loading chamber of the monitor into the atmosphere, thus enabling more rapid tripping.

The setting of the accelerator valves must be higher than the monitor's cut-off pressure (1) with reference to the specific cut-off pressure value (refer to the identification plates in par. 1.8).

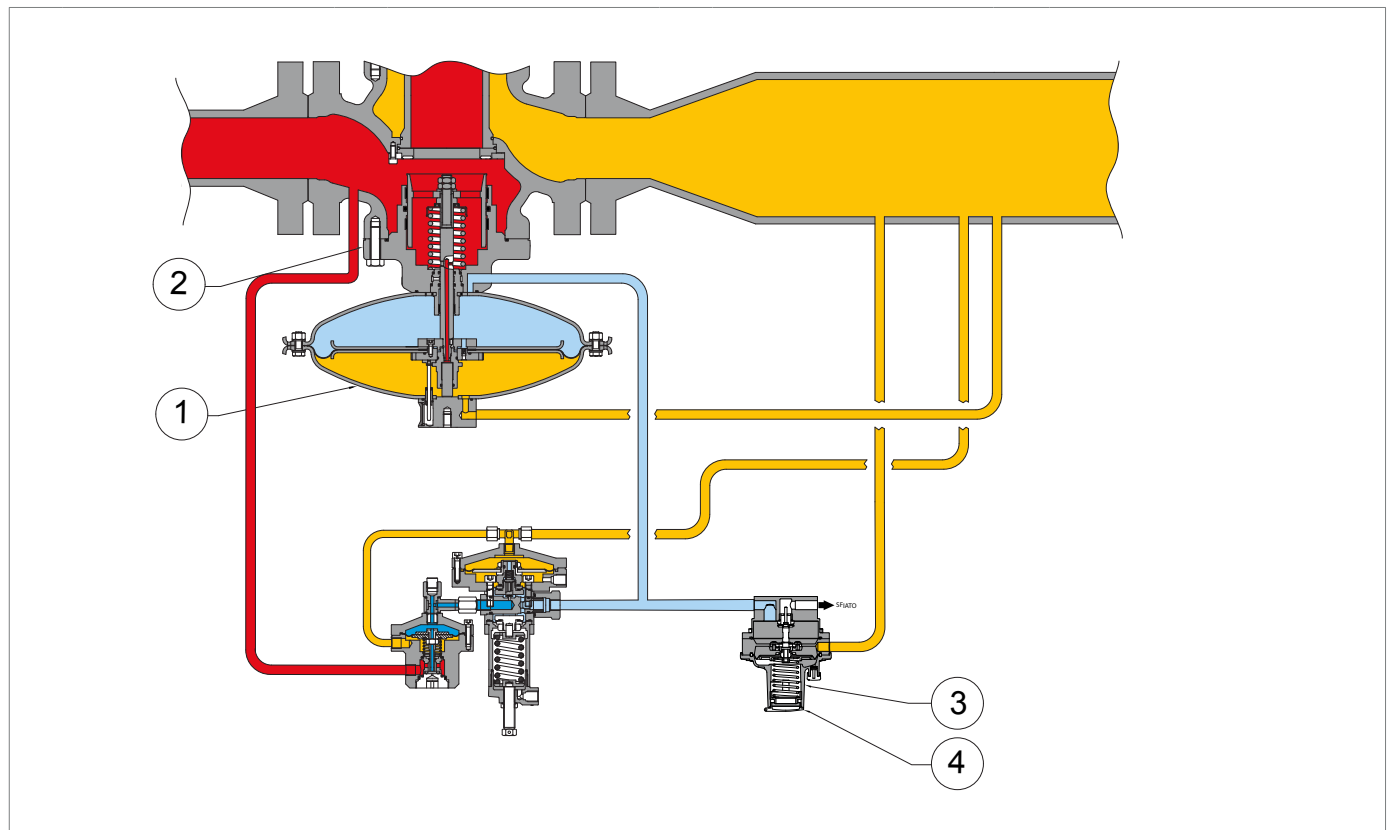
Calibration is performed by turning:

- the adjustment ring nut (Fig. 1.8, ref. 4) for valve V/25
- the adjusting screw (Fig. 1.9, ref. 4) for valve M/A

clockwise or anticlockwise to increase or decrease its value.

Accelerator valve	Set	Operating range (bar)
V/25	max	0.015 - 0.6
M/A	max	> 0.55

Tab. 4.20.



■ UPSTREAM PRESSURE
 ■ DOWNSTREAM PRESSURE
 ■ PRE-REGULATOR PRESSURE
 ■ LOADING PRESSURE

Fig. 4.8. V/25 accelerator valve

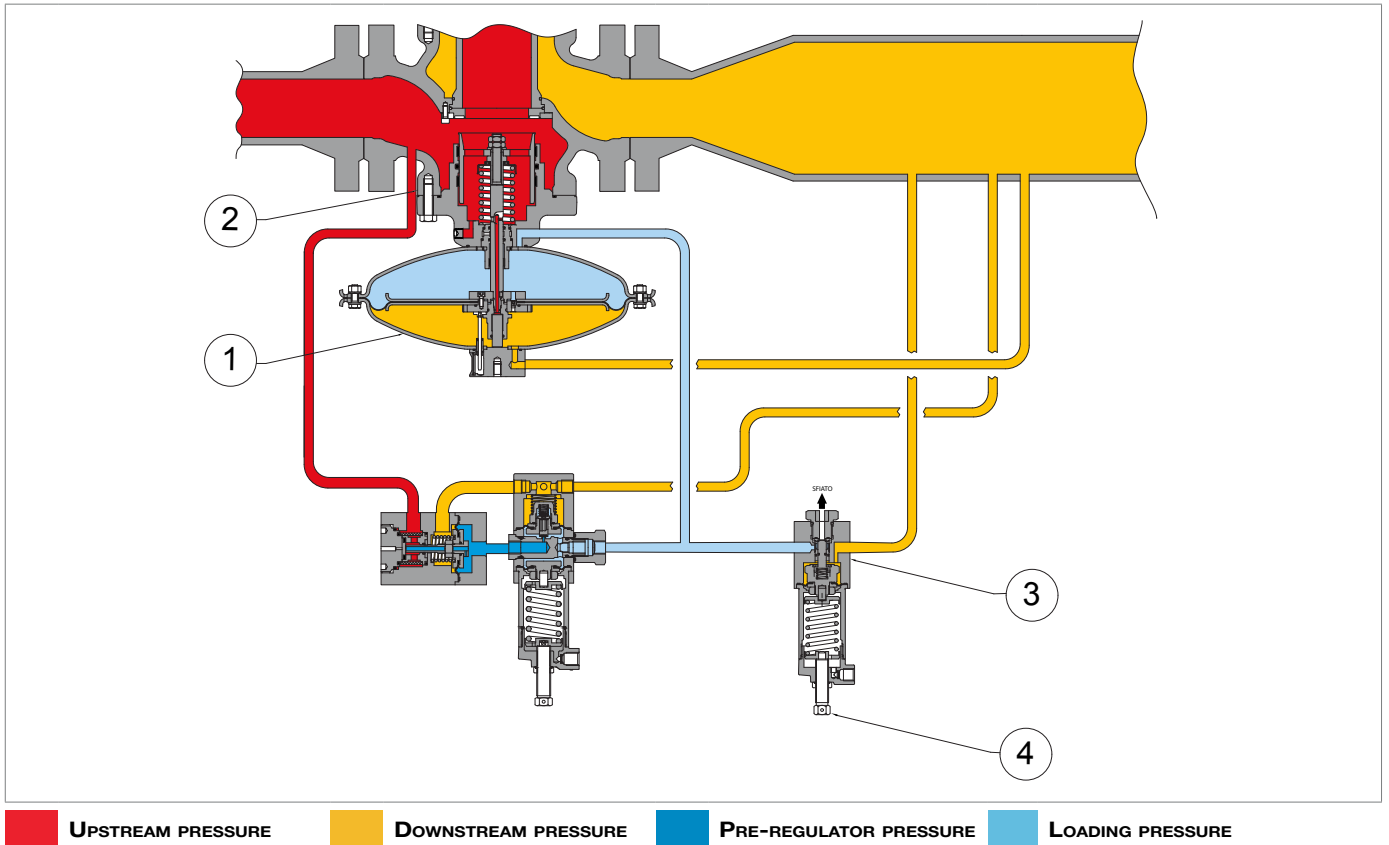


Fig. 4.9. M/A accelerator valve

4.5.3 - SLAM-SHUT VALVE

The slam-shut valve is a safety device is used to shut off the gas flow if the pressure value at the control point exceeds the calibration value of the valve itself.

The slam-shut valve is incorporated into the main body of the equipment and consists of:

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

In the event of triggering, the slam-shut valve shuts off power supply to the regulator and its control pilot.

4.5.3.1 - BUILT-IN SLAM-SHUT VALVE SA

The SA built-in slam-shut valve is controlled by pressure switch mod. SA-91, SA-92, SA-93 and can be operated:

- by the pressure switch;
- manually;
- with remote control.

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

- tripping due to downstream pressure increase and/or decrease;
- design pressure: 18.9 bar for all accessory components;
- local shut-off button;
- rearming without the need for a bypass thanks to the balanced plug.

Pressure switch type	Set	Operating range (bar)	AG
SA/91	max	0.025 - 1.1	10
SA/92	max	0.7 - 2	10
	max	2 - 5	5
SA-93	max	3 - 4	10
	max	4 - 13.3	5

Tab. 4.21.

* For the calibration values of the minimum spring, please refer to chapter 13 'Calibration tables'

The incorporated slam-shut valve SA consists of (see Fig. 1.4):

Pos.	Description
1	Plug
2	Control pressure switch
3	Reset system (manually operated through a lever)
4	Tripping spring due to pressure increase
5	Tripping spring due to pressure decrease
6	Diaphragm
7	Coupling device
8	Control shaft
9	Sensor

Tab. 4.22.

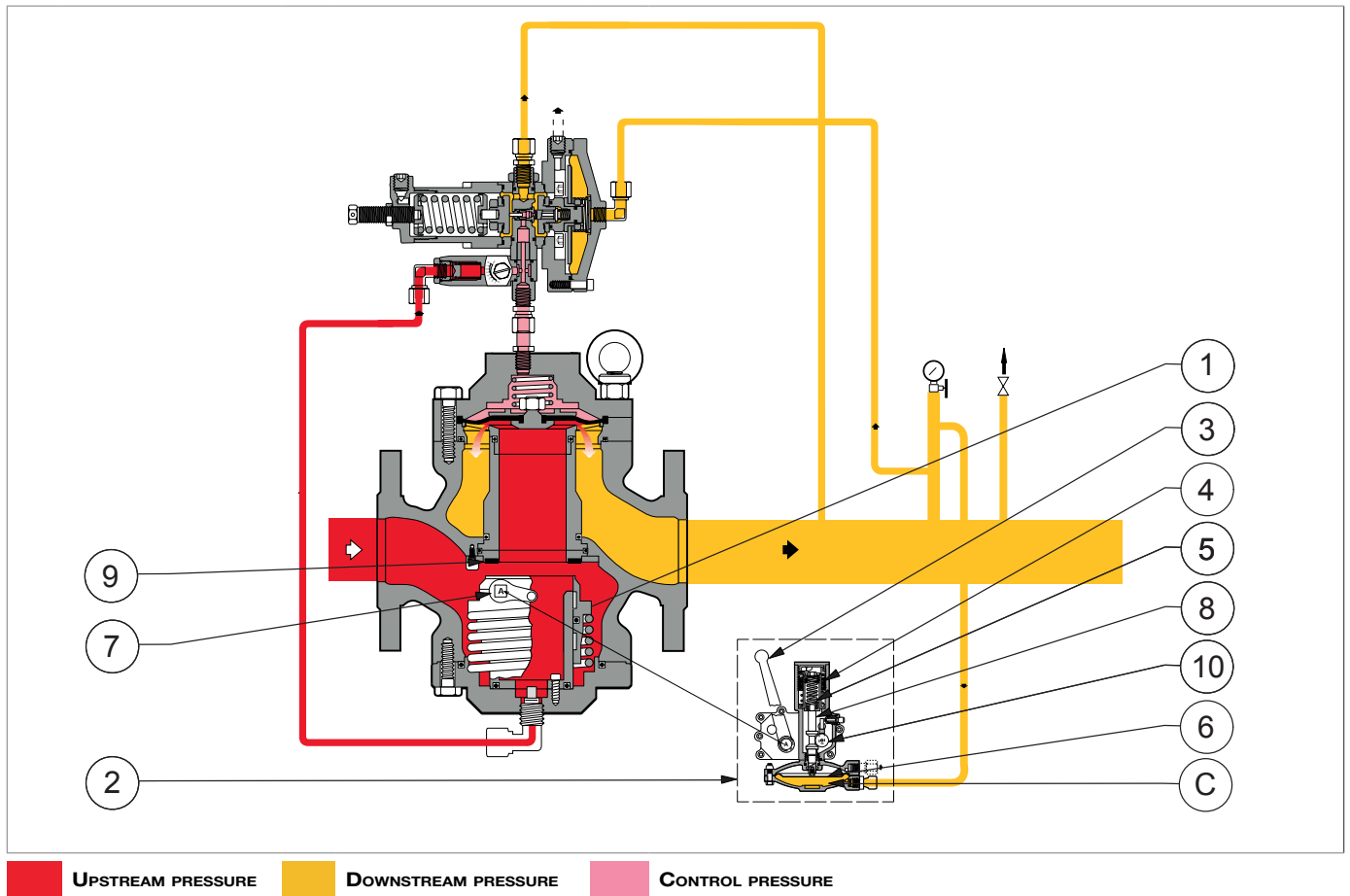


Fig. 4.10. Built-in slam-shut valve SA

OPERATION

In the control head (C), the downstream pressure (P_d) acts on the diaphragm (6) of the control pressure switch (2), which, integral with the control shaft (8), receives an antagonistic force through the springs (4, 5), which causes the plug (1) on the reinforced gasket (9) to disengage.

In the event of tripping due to a pressure surge:

- the downstream pressure (P_d) exceeds the calibration value;
- the load on the diaphragm (6) increases until the resistance of the spring (4) is overcome;
- movement to the open position of the drive shaft (8) moves the touch probe (10) via the cam, disengaging the lever mechanism.

In the event of a tripping due to pressure drop:

- the downstream pressure (P_d) decreases below the calibration value;
- the spring support (5) stops the stroke on the body stop;
- movement to the closed position of the drive shaft (8) moves the touch probe (10) via the cam, disengaging the lever mechanism.

In order to reset the built-in slam-shut valve, the lever (3) that engages the control device (7) of the mobile system must be operated.

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, refer to paragraph 5.2 "Physical characteristics of the equipment".

Tab. 5.23.

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. 1.24 shows the types of packaging used:

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

Tab. 5.24.

5.2 - PHYSICAL CHARACTERISTICS OF THE EQUIPMENT

5.2.1 - APERVAL

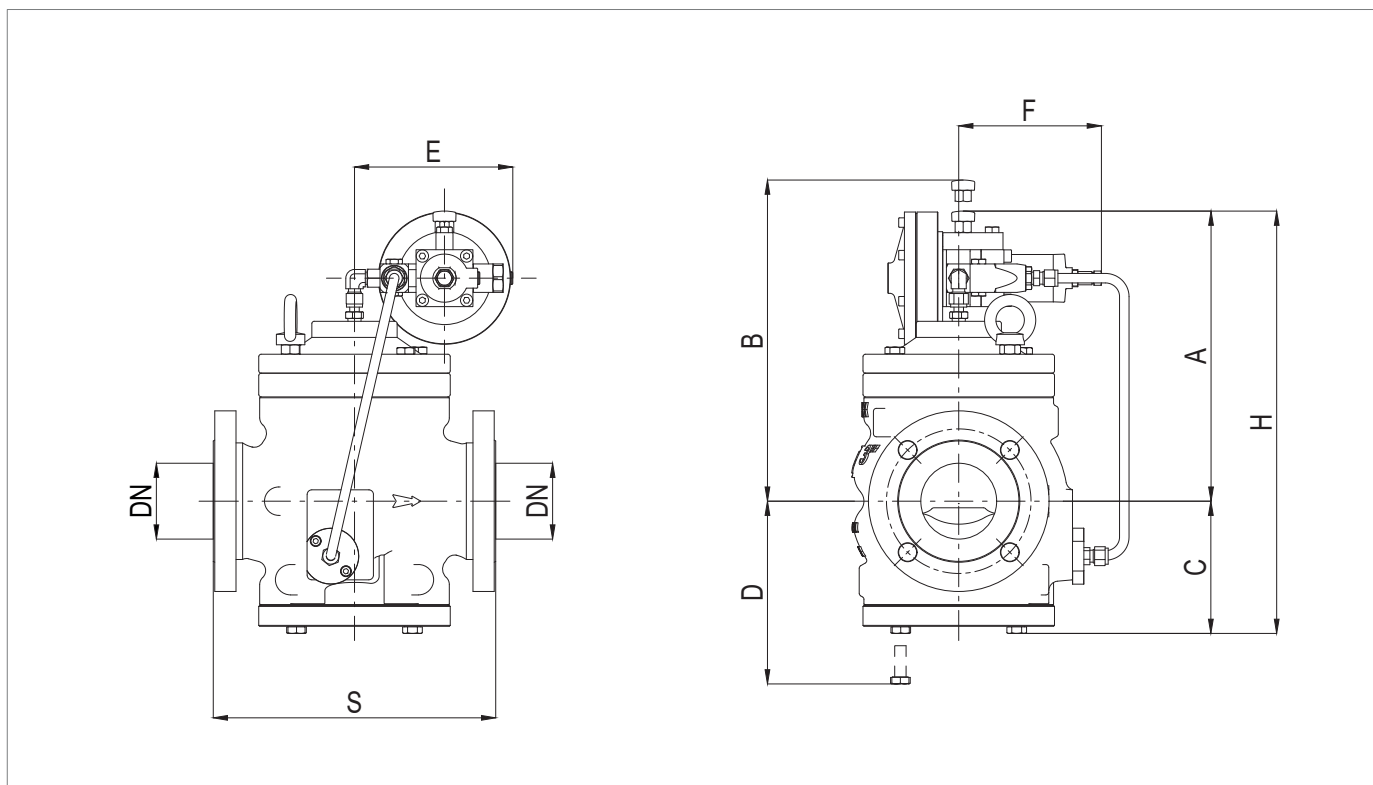


Fig. 5.11. APERVAL physical characteristics

APERVAL overall dimensions					
Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1"	2"	2" 1/2	3"	4"
S - Ansi 150/PN 16	184	254	276	298	352
A	282	313	341	346	429
B	292	323	351	356	439
C	88	120	133	142	180
D	118	155	168	182	230
E	178	178	178	178	178
F	160	160	160	160	160
G	115	115	115	115	115
H	370	433	474	488	950
Connecting pneumatic pipes	Øe 10mm x Øi 8mm				

Tab. 5.25.

Weight [kgf]					
Ansi 150/PN 16	20	34	45	57	110

Tab. 5.26.

5.2.2 - APERVAL + DB

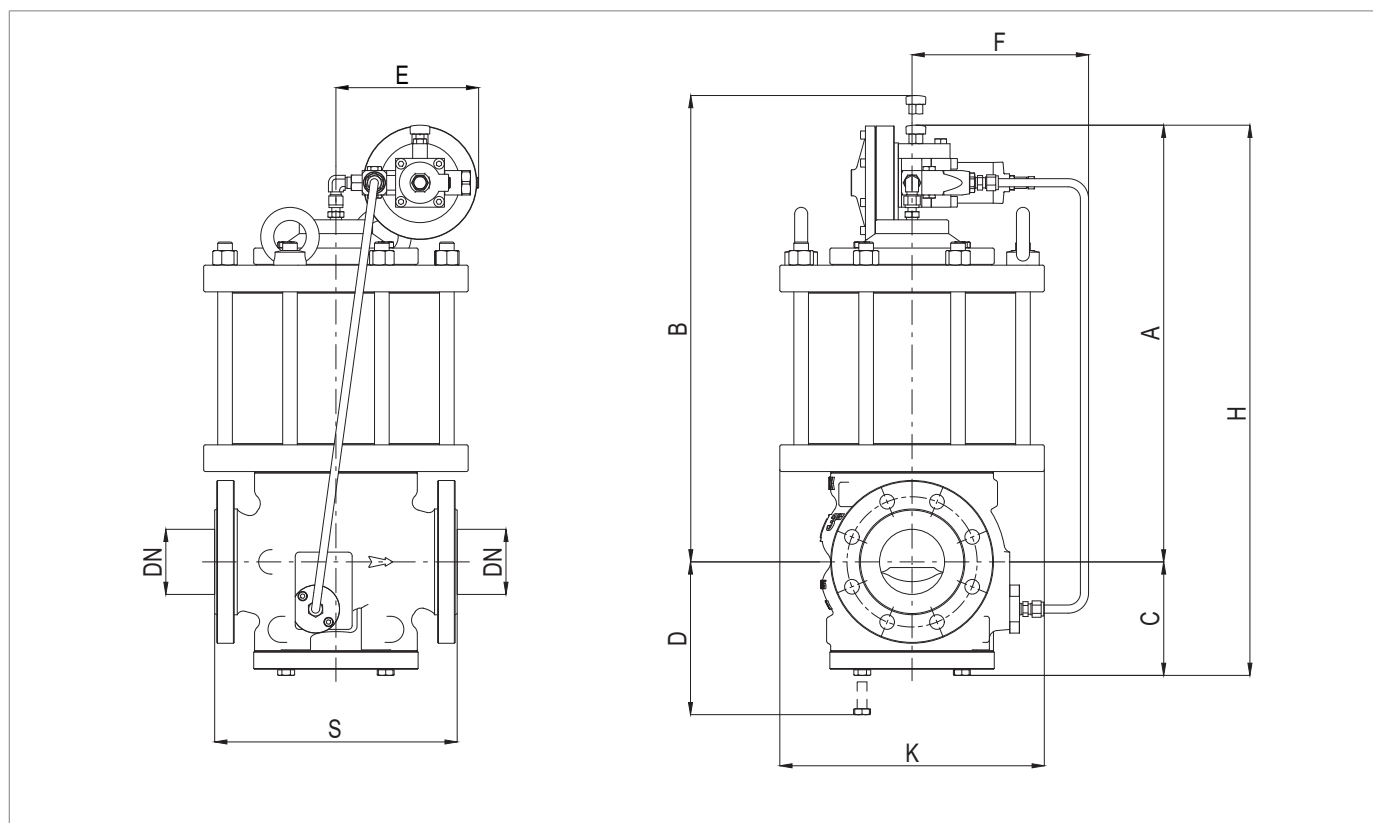


Fig. 5.12. Physical characteristics APERVAL + DB Aperval

Overall dimensions APERVAL + DB					
Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1"	2"	2" 1/2	3"	4"
S - Ansi 150/PN 16	183	254	276	298	352
A	449	507	577	601	760
B	459	517	587	611	688
C	88	120	133	142	180
D	118	155	168	182	230
E	178	178	178	178	178
F	120	158	173	175	205
H	537	627	710	743	940
K	220	295	325	330	390
Connecting pneumatic pipes	Øe 10mm x Øi 8mm				

Tab. 5.27.

Weight [kgf]					
Ansi 150/PN 16	44	84	88	112	178

Tab. 5.28.

5.2.3 - APERVAL + PM/182

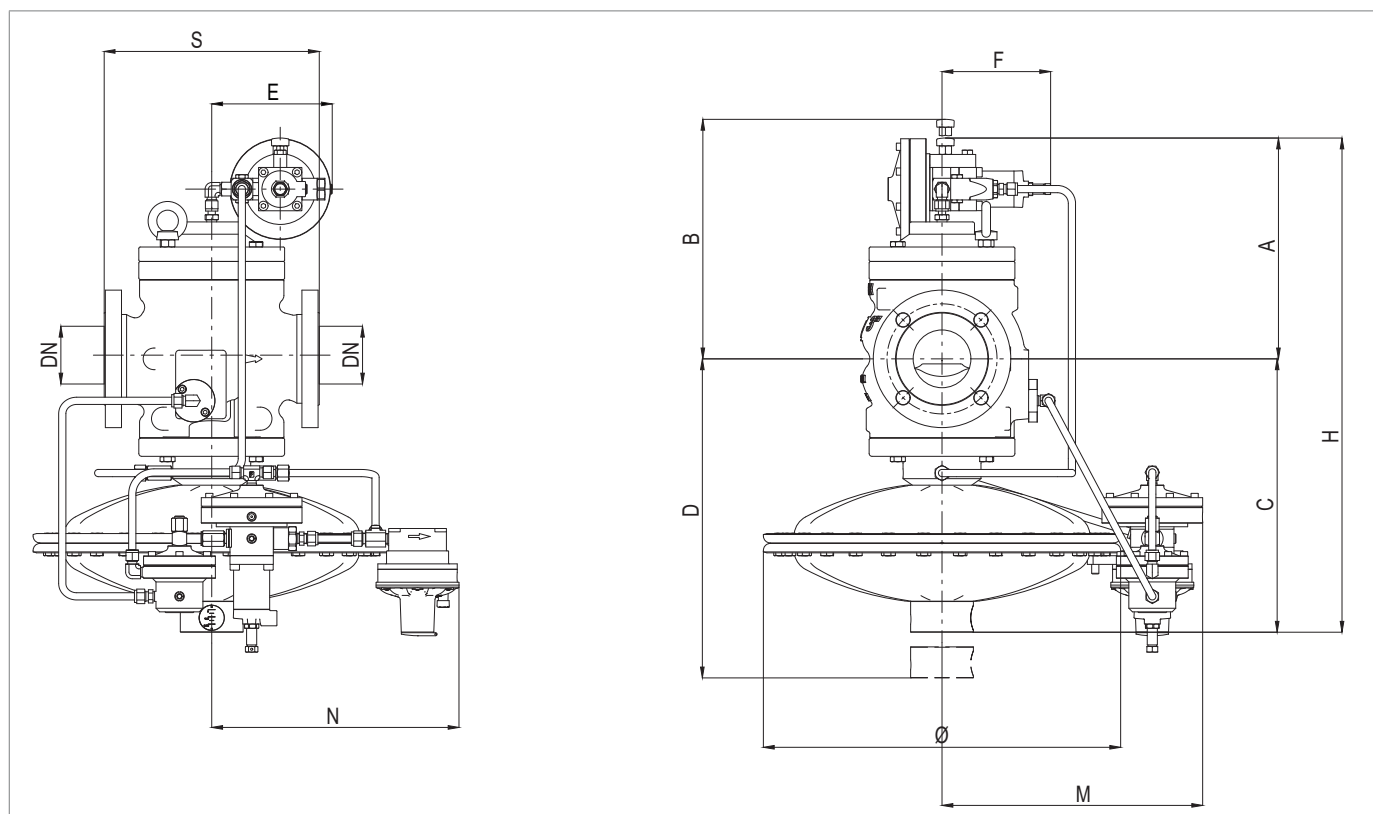


Fig. 5.13. APERVAL + PM/182 physical characteristics

APERVAL + PM/182 overall dimensions					
Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1"	2"	2" 1/2	3"	4"
S - Ansi 150/PN 16	183	254	276	298	352
Ø	375	375	495	495	495
A	282	313	341	346	429
B	292	323	351	356	439
C	269	300	374	379	414
D	329	385	474	484	537
E	178	178	178	178	178
F	160	160	160	160	160
H	551	613	715	725	843
M	300	300	350	350	350
N	306	306	310	310	310
Connecting pneumatic pipes	Øe 10mm x Øi 8mm				

Tab. 5.29.

Weight [kgf]					
Ansi 150/PN 16	41	69	72	87	110

Tab. 5.30.

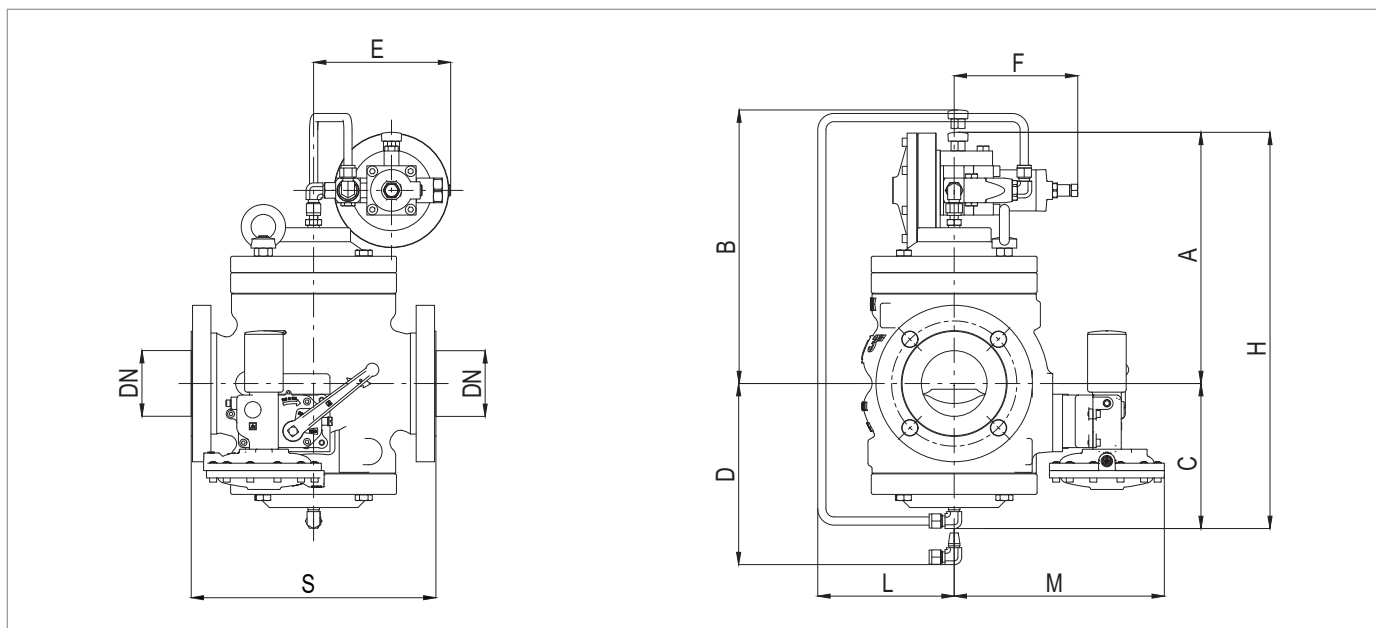
5.2.4 - APERVAL + SA


Fig. 5.14. Physical characteristics APERVAL + SA

Overall dimensions APERVAL + SA					
Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1"	2"	2" 1/2	3"	4"
S - Ansi 150/PN 16	183	254	276	298	352
A	292	323	351	356	439
B	292	323	351	356	439
C	145	161	178	185	205
D	212	255	292	322	330
E	178	178	178	178	178
F	160	160	160	160	160
H	427	474	519	531	833
L	98	146	146	146	146
M	194	219	322	246	263
N	125	125	125	130	130
Connecting pneumatic pipes	Øe 10mm x Øi 8mm				

Tab. 5.31.

Weight [kgf]					
Ansi 150/PN 16	22	35	46	59	113

Tab. 5.32.

5.2.5 - APERVAL + DB + PM/182

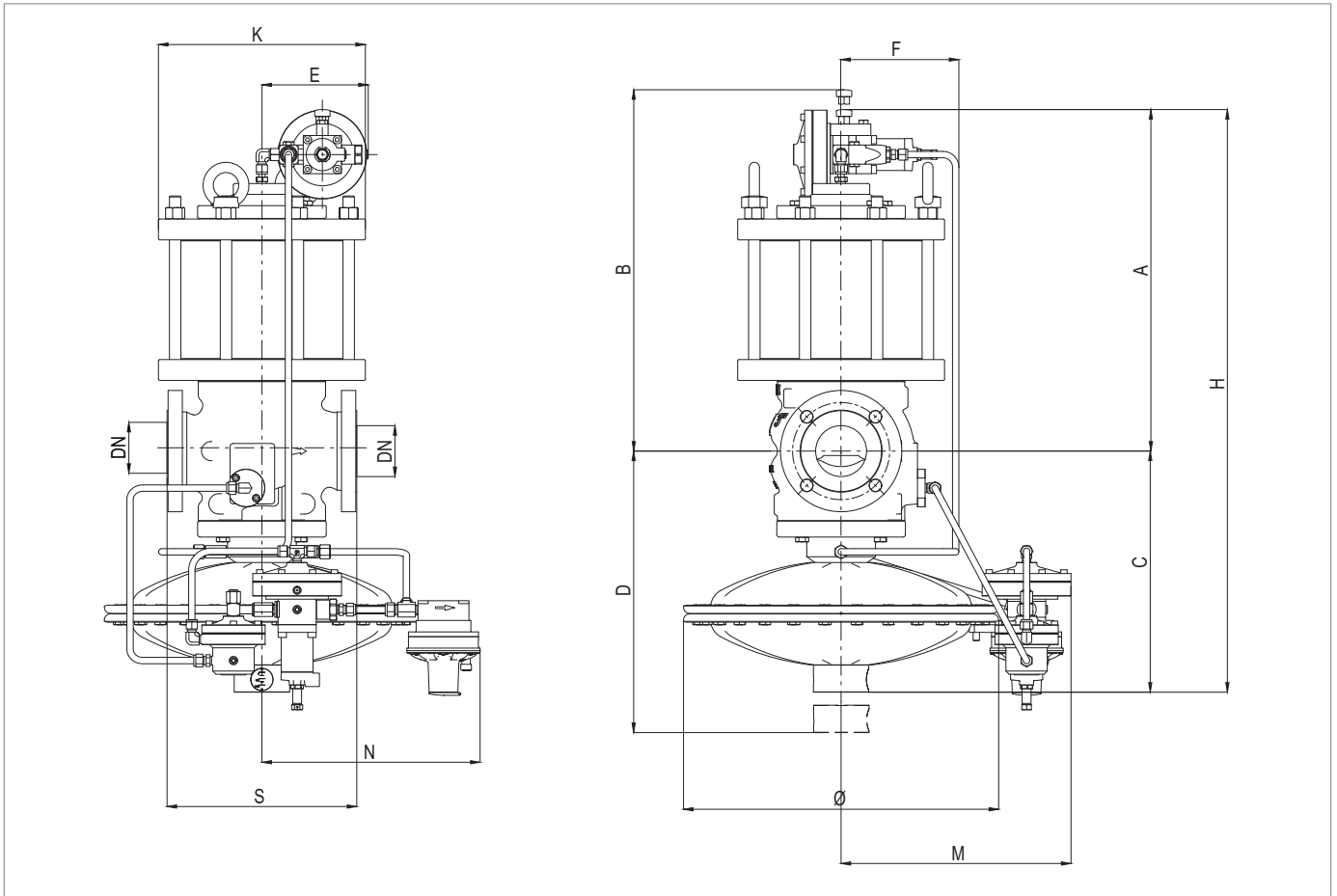


Fig. 5.15. Physical characteristics APERVAL + DB + PM/182

Overall dimensions APERVAL + DB + PM/182

Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1"	2"	2" 1/2	3"	4"
S - Ansi 150/PN 16	183	254	276	298	352
Ø	375	375	495	495	495
A	449	507	577	601	760
B	459	517	587	611	688
C	269	300	374	379	414
D	329	385	474	484	537
E	178	178	178	178	178
F	120	158	173	175	205
H	718	807	951	980	1174
M	300	300	350	350	350
N	306	306	310	310	310
K	220	295	325	330	390
Connecting pneumatic pipes	Øe 10mm x Øi 8mm				

Tab. 5.33.

Weight [kgf]

Ansi 150/PN 16	85	153	160	199	288
-----------------------	----	-----	-----	-----	-----

Tab. 5.34.

5.2.6 - APERVAL + DB + SA

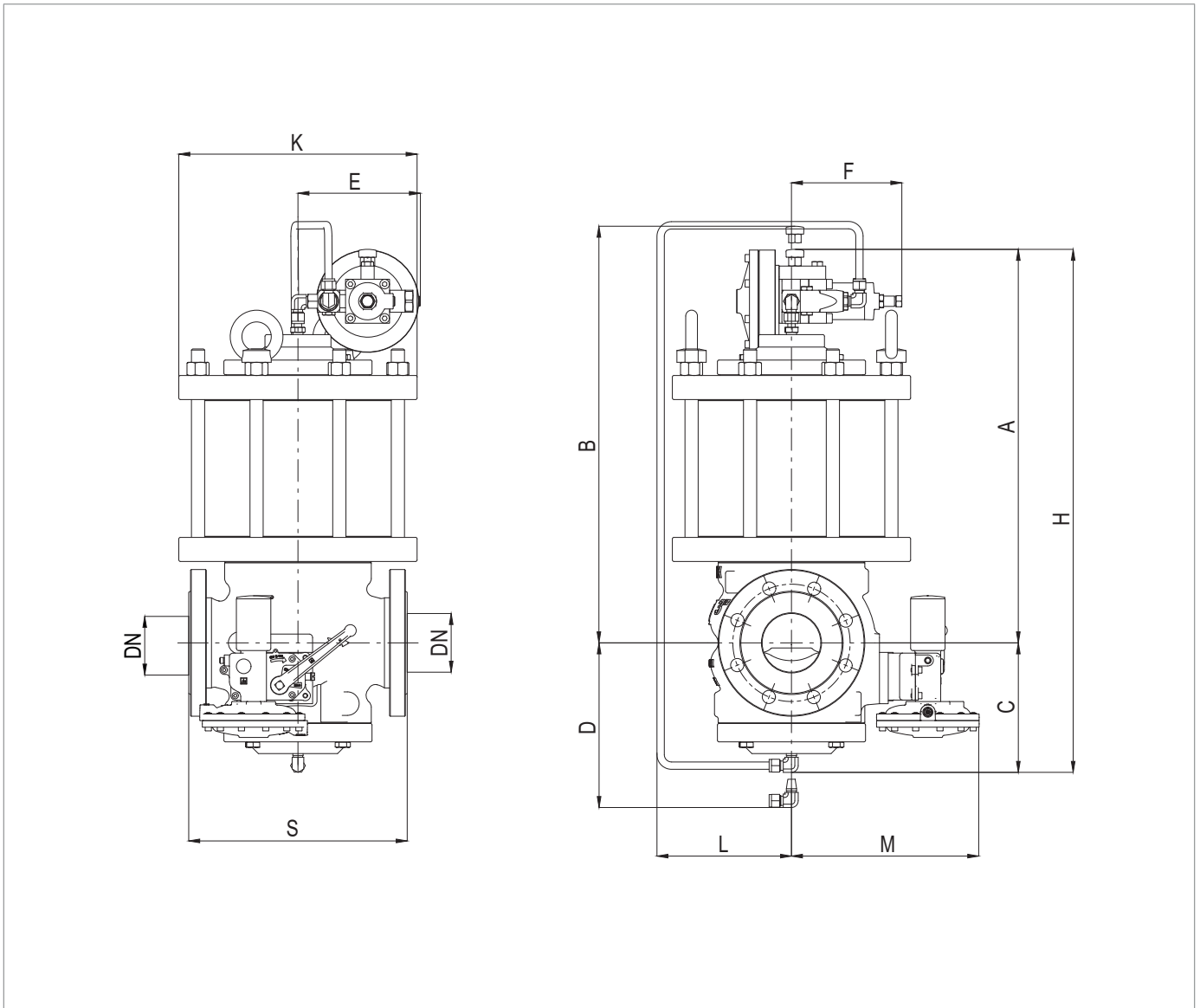


Fig. 5.16. Physical characteristics APERVAL + DB + SA

Overall dimensions APERVAL + DB + SA					
Nominal diameter [mm]	25	50	65	80	100
Size [inches]	1"	2"	2" 1/2	3"	4"
S - Ansi 150/PN 16	183	254	276	298	352
A	449	507	577	601	760
B	459	517	587	611	688
C	145	161	178	185	205
D	212	255	292	322	330
E	178	178	178	178	178
F	160	160	160	160	160
H	594	668	755	786	1164
L	98	146	146	146	146
M	194	219	322	246	263
K	220	295	325	330	390
Connecting pneumatic pipes	Øe 10mm x Øi 8mm				

Tab. 5.35.

Weight [kgf]					
Ansi 150/PN 16	66	119	134	171	291

Tab. 5.36.

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!

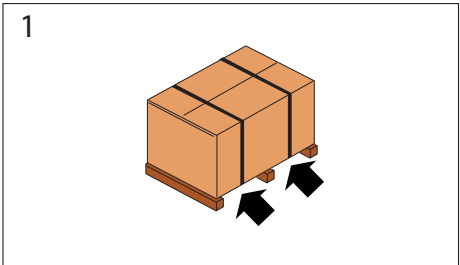
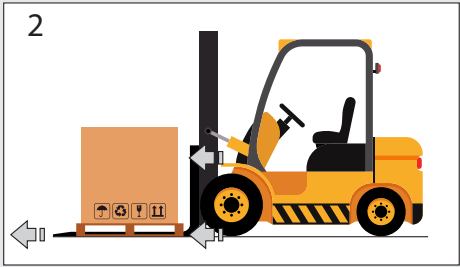


The following is not allowed on forklifts:


- carrying passengers;
- lifting people.

NOTICE!

Packaging must always be handled in a vertical position

Proceed as described at Tab. 1.37:

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. NOTICE! Fasten the load to the forks with clamps or similar devices if required.	
4	Slowly lift the load by a few dozen centimetres and check its stability, making sure that the centre of gravity of the load is positioned at the centre of the lifting forks.	

Step	Action	Image
5	Tilt the mast backwards (towards the driver's seat) to help the 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. 5.37.

5.3.2 - CRANE HANDLING METHOD

⚠ WARNING!

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

Always check that:

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

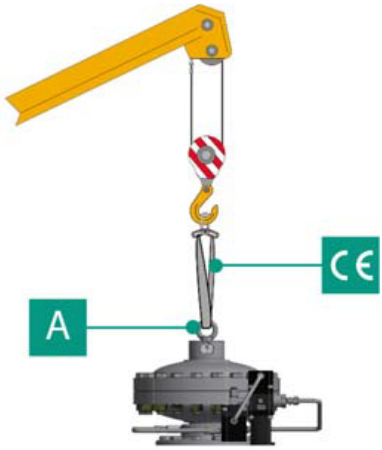
It is forbidden to:

- 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. 1.38:

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

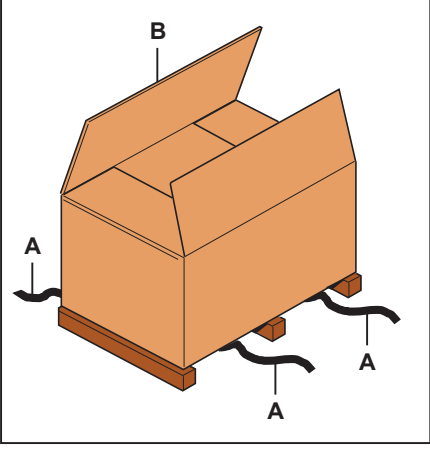
Tab. 5.38.

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	<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 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; <u>any information provided by the Safety Manager at the installation facility.</u>

Tab. 5.39.

To unpack the equipment in a cardboard box, proceed as described in Tab. 1.40:

Step	Action	Image
1	Remove the straps (A).	
2	Remove the packaging cardboard (B).	
3	Remove the fasteners that secure the equipment to the base (if any).	
4	Move the equipment from the base to the place intended for it. <div style="border: 1px solid blue; padding: 5px; margin-top: 5px;"> ⚠ NOTICE! Have at least 2 operators manually move the equipment, if required due to its dimensions/weight. </div>	

Tab. 5.40.

⚠ 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.
	 NOTICE! For installations in later periods, see paragraph “pre-installation warnings after prolonged storage.”
Temperature	Not above 25°C
Humidity	Not above 70%
Radiation	Away from radiation sources according to UNI ISO 2230:2009

Tab. 5.41.

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 “Cross diagram for tightening screws”.

 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 “1.8 - 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 lighting system handheld or connected to the power supply network, compliant with Directive 2014/34/EU (ATEX) for use in environments at risk of explosion;
- adhere to the temperature specified on the equipment nameplate.

6.1.2 - CHECKS BEFORE INSTALLATION

The equipment does not require any further 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 are no impediments for the workers in charge of maintenance;
- the upstream and downstream pipes are at the same level and can bear the weight of the equipment;
- the inlet and outlet connections of the pipes are aligned on the flanges;
- the inlet and outlet connections of the equipment are clean and 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	<div style="display: flex; align-items: center;">      </div> <div style="background-color: #ff8c00; 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 “1 - Commissioning/maintenance equipment”.

Tab. 6.42.

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. In line installation as well as in square installation, they must be present (see Fig. 1.17 and Fig. 1.18):

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 pressure regulator .
5	1 downstream shut-off valve .

Tab. 6.43.

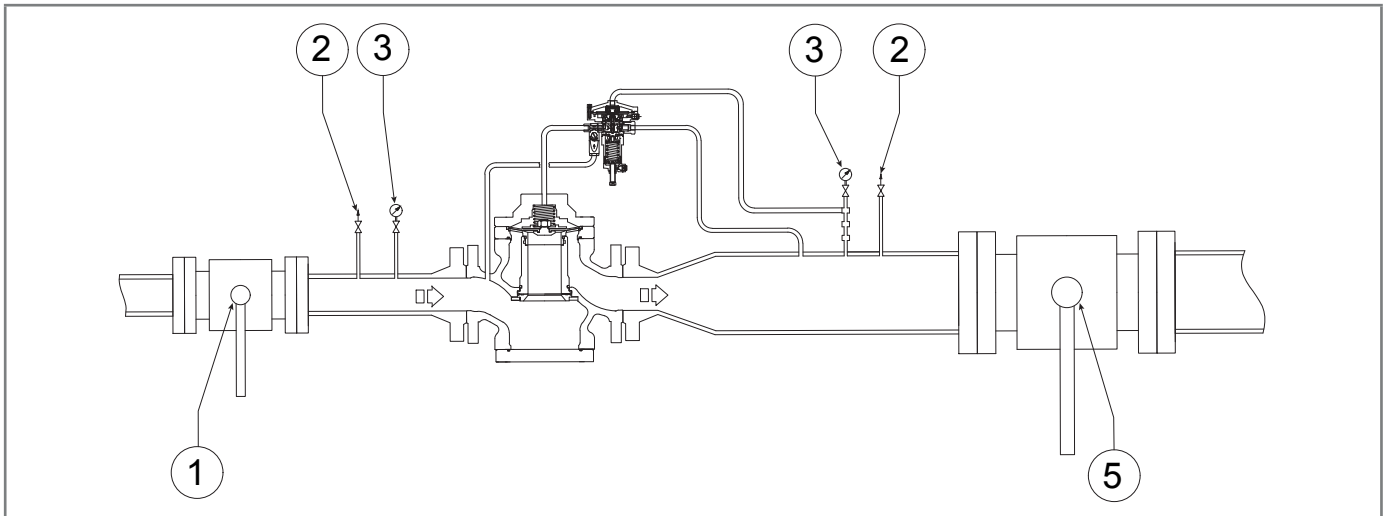


Fig. 6.17. In-line installation

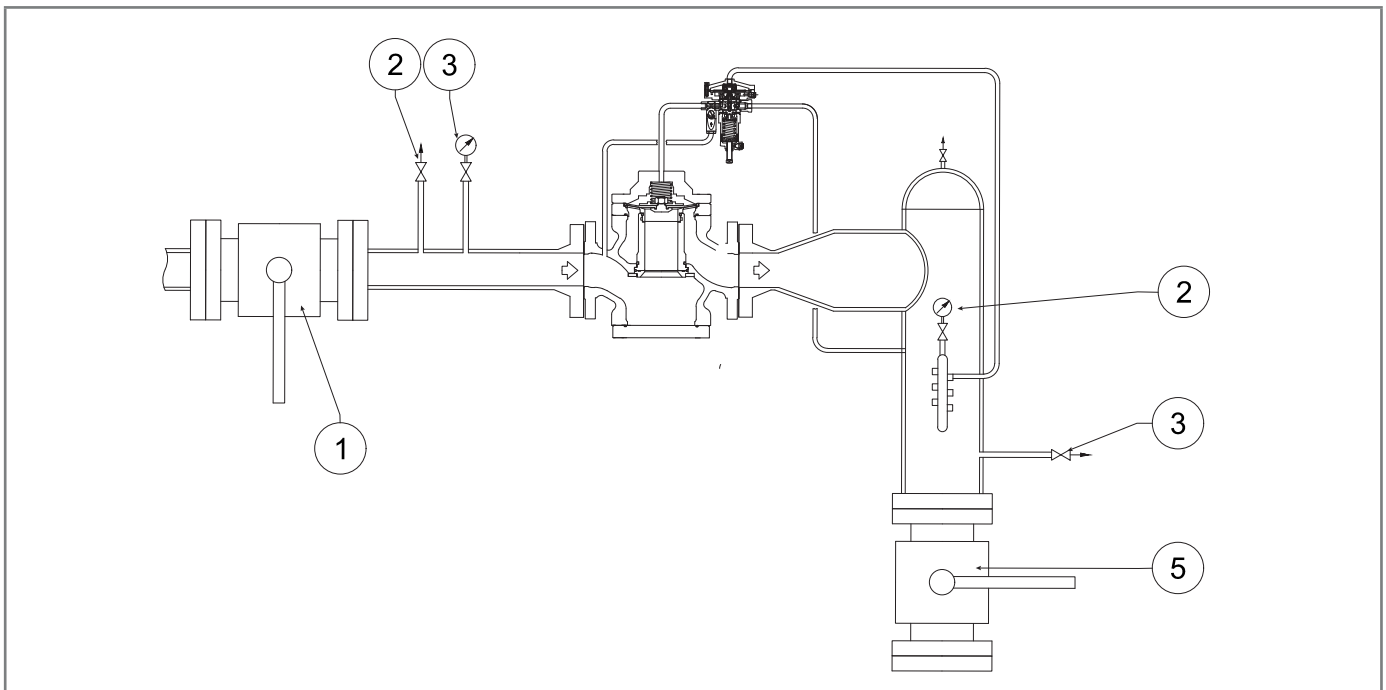


Fig. 6.18. Installation in a square pattern

! 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. 1.19 and Fig. 1.20 illustrate typical regulator arrangements:

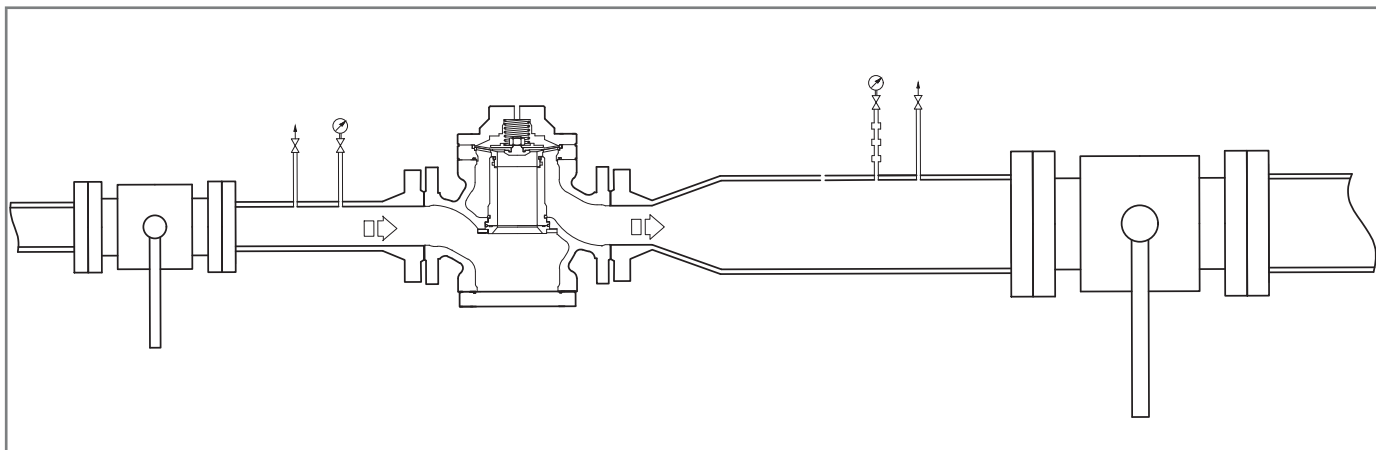


Fig. 6.19. Standard position

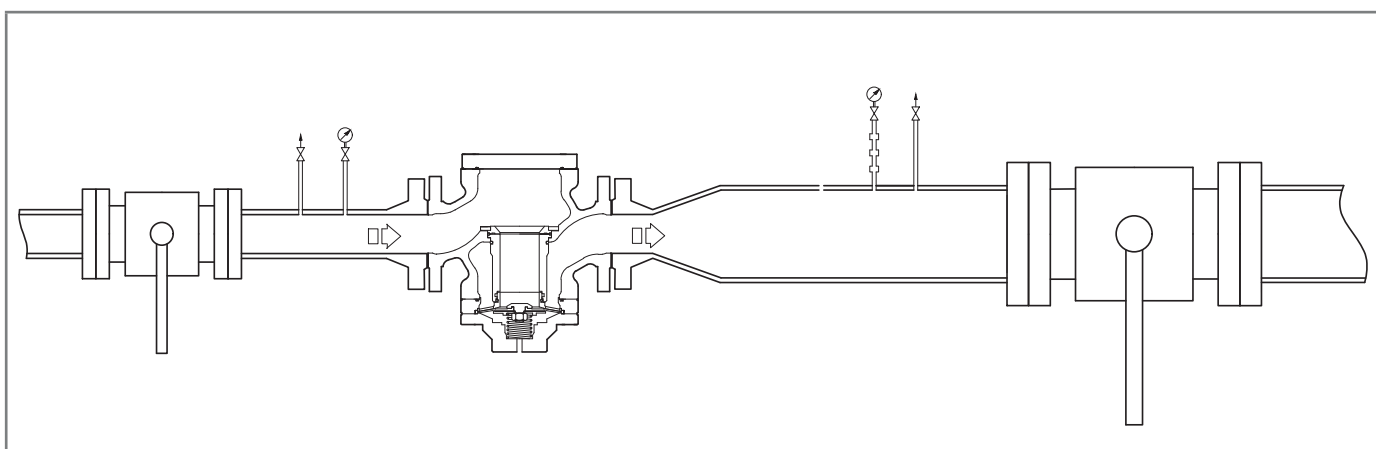


Fig. 6.20. Inverted position

6.5 - INSTALLATION PROCEDURES

6.5.1 - EQUIPMENT INSTALLATION PROCEDURE

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

Tab. 6.44.

NOTICE!

For installation after maintenance, replace the seals.

6.5.2 - CONNECTION OF THE SENSING LINES TO THE DOWNSTREAM PIPING

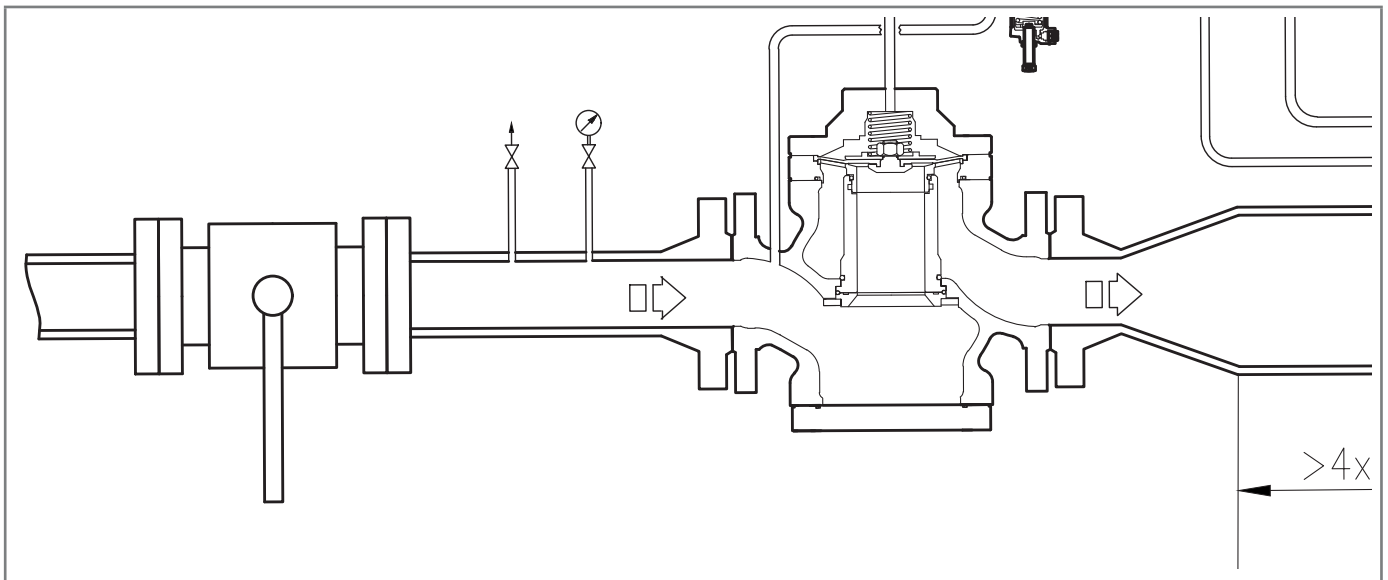


Fig. 6.21. Connection of sensing lines to the downstream piping

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;

ATTENTION!

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

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 diameter of the regulator 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 sensing line pipes from collecting impurities and condensation, it is necessary that:

- the pipe connections are always welded on the upper part or at maximum 90 degrees on the axis of the pipe (refer to Fig. 1.22);
- the hole in the piping has no burrs or internal protrusions;
- the slope of the pipe is always 5-10% towards the downstream pipe connection.

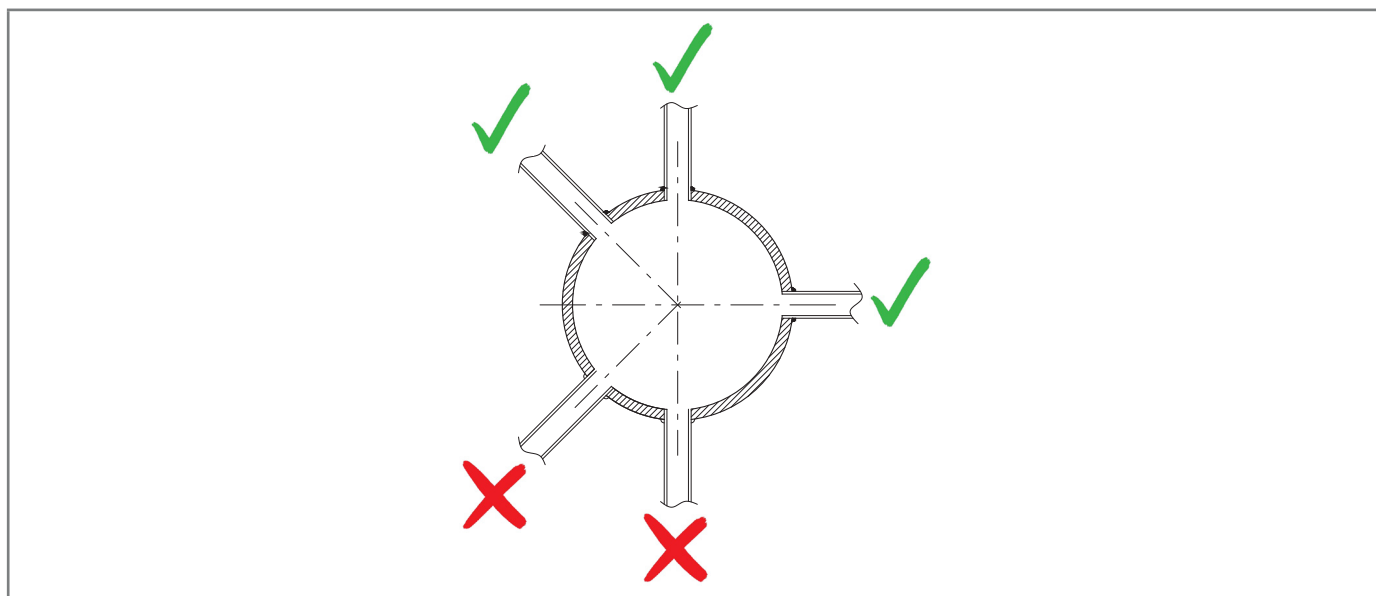


Fig. 6.22. Welded pipe connections

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

- 1 and 2 to the discharge outlet of the control head of the PM/182 monitor, if any;
- 3 and 4 to the pilot sensing lines;
- 5 and 6 to the sensing lines of the accelerator of the slam-shut device, if any.

! 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.**

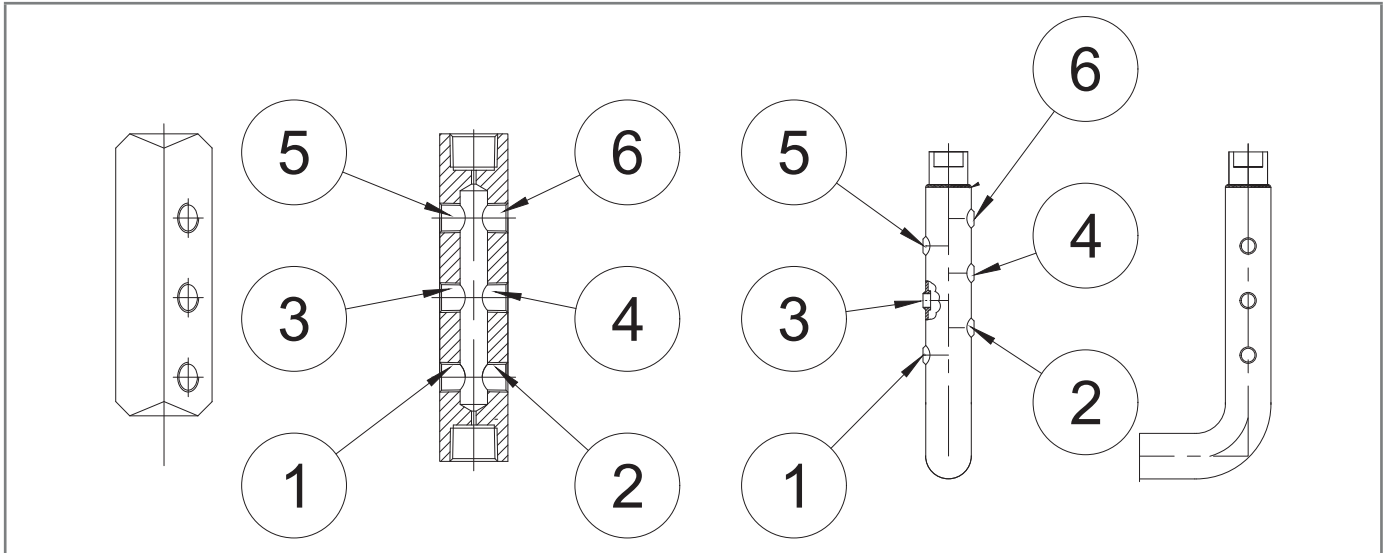


Fig. 6.23. Equipment connections


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.



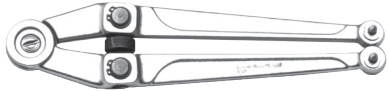



7 - COMMISSIONING/MAINTENANCE EQUIPMENT






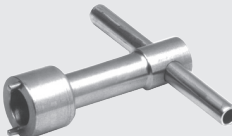


7.1 - LIST OF EQUIPMENT

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; • <u>any information provided by the Safety Manager at the installation facility.</u>

Tab. 7.45.

The types of equipment required to commission and service the equipment are described in :

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. 7.46.

7.2 - EQUIPMENT NEEDED FOR THE DIFFERENT CONFIGURATIONS

Each table is distinguished by:

Term	Description
K./Wr.	Key, with reference to the equipment indicated in
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. 7.47.

APERVAL						
Equipment		DN				
Ref.	Type	1"	2" 1/2	2"	3"	4"
A	K./Wr.	10-16-17-18-19- 22-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-41
B	L.	300				
C	Ø	4				
E	K./Wr.	2.5-8	2.5-8	2.5-8	2.5-8	2.5-8
F	K./Wr.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	K./Wr.	8-10-17-20	8-10-17-20		10-17-19-22	10-17-19-22
I	L.	65 x 100				
L	Code	7999099				

Tab. 7.48.

APERVAL + DB						
Equipment		DN				
Ref.	Type	1"	2"	2" 1/2	3"	4"
A	K./Wr.	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-41
B	L.	300				
C	Ø	4				
E	K./Wr.	2.5-8	2.5-8	2.5-8	2.5-8	2.5-8
F	K./Wr.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	K./Wr.	8-10- 17-20	8-10- 17-20	10-17-19-20	10-17-19-20	10-17-19-20
I	L.	65 x 100				
L	Code	7999099				
O	Code	7999031	7999033	7999034	7999035	7999036

Tab. 7.49.

APERVAL + PM/182						
Equipment		DN				
Ref.	Type	1"	2"	2" 1/2	3"	4"
A	K./Wr.	10-16-17-18-19- 22-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-30	10-16-17-18-19- 22-24-27-41
B	L.	300				
C	Ø	4				
E	K./Wr.	2.5-8	2.5-8	2.5-8	2.5-8	2.5-8
F	K./Wr.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
G	K./Wr.	8-10-17-20	8-10-17-20	8-10-19-22	8-10-19-22	8-10-19-22
I	L.	65 x 100				
L	Code	7999099				

Tab. 7.50.

APERVAL + SA						
Equipment		DN				
Ref.	Type	1"	2"	2" 1/2	3"	4"
B	L.	300				
C	Ø	4				
D	K./Wr.	24	24	24	24	24
E	K./Wr.	2.5-8	2.5-8	2.5-8	2.5-8	2.5-8
F	K./Wr.	4-5-8	4-5-8	4-5-8	4-5-8	4-5-8
I	L.	65x100				
L	Code	7999099				

Tab. 7.51.

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 pilot unit already calibrated.

Even if the built-in monitor PM/182 or the built-in blocking valve SA are fitted to the equipment, any pilots or pressure switches present will already be 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	 <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 "1 - Commissioning/maintenance equipment".

Tab. 8.52.

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; margin-top: 5px;">  WARNING! During pressurisation, always check that the equipment has no leaks. </div>
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. 8.53.

8.3 - PROPER COMMISSIONING CHECK

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

8.4 - CALIBRATION OF ANY ACCESSORIES

 **NOTICE!**

To properly calibrate the equipment and accessories present, refer to the accuracy class indicated on the nameplates (see section 2.8).

8.5 - REGULATOR COMMISSIONING PROCEDURE

In the application consisting of two pressure adjusting lines, it is advisable to commission one line at a time, starting with the line with the lowest set point.

The set point value is mentioned on the test certificate enclosed with each piece of equipment.

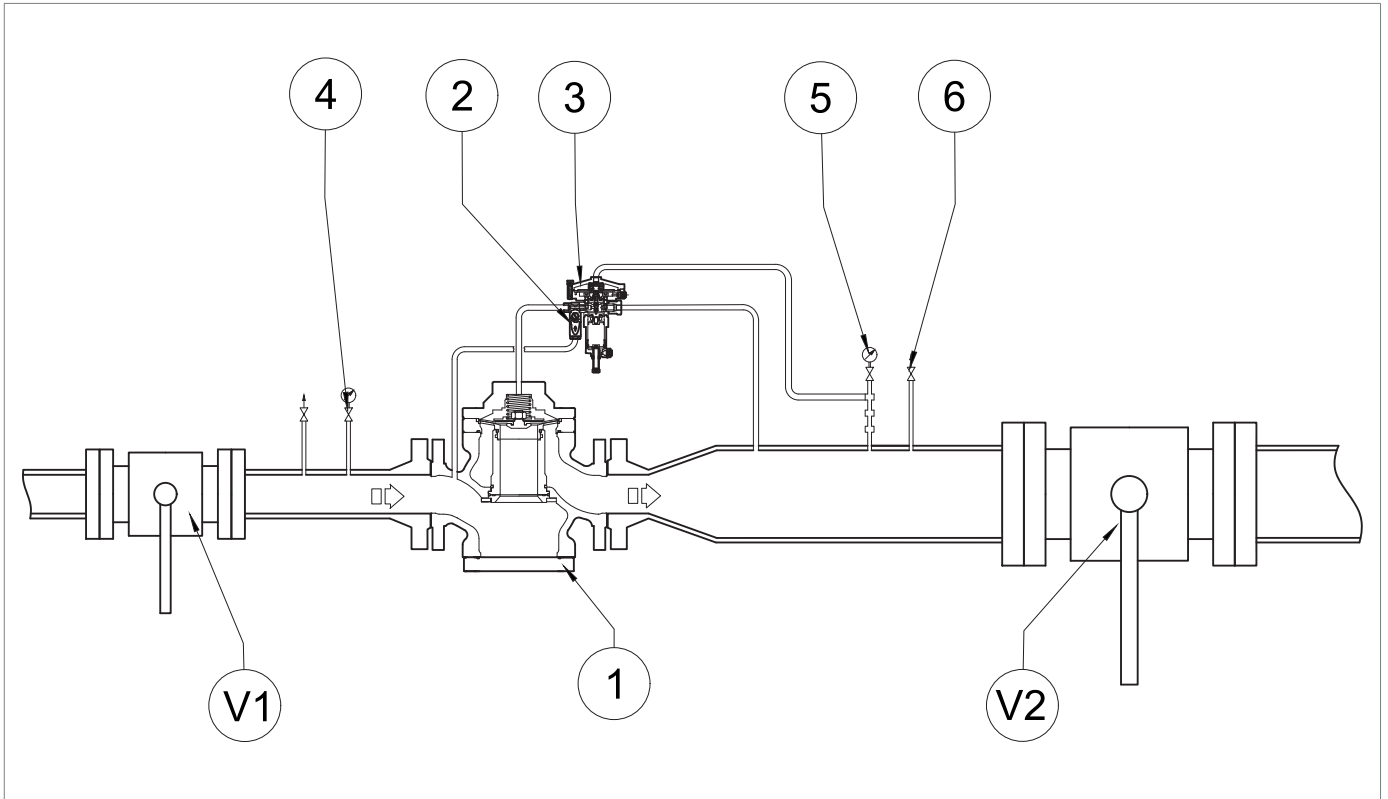


Fig. 8.24. Commissioning the regulator

Step	Action
1	Partially open the bleed cock (6).
2	Completely unscrew the fixing nut and adjusting screw (Fig. 1.32, ref. 10) of the pilot (3) to relieve the spring.
3	<p>Check that the value of the AR100 lamination valve (2) is between 3 and 5.</p> <p>! NOTICE!</p> <p>If necessary, turn the screw of the AR100 lamination valve (2) to the required value.</p>
4	<p>Open the inlet shut-off valve (V1) very slowly.</p> <p>! NOTICE!</p> <p>Check the pressure by referring to the pressure gauge (4) located upstream.</p>
5	<p>Turn the pilot adjustment screw (3) clockwise to load the calibration spring to the requested regulator value (1).</p> <p>! NOTICE!</p> <p>Check the pressure referring to the pressure gauge (5) located upstream.</p>
6	Close the bleed cock (6).
7	<p>Check that the downstream pressure, after an increase phase, does not exceed the shut-off pressure value (refer to the SG value on the nameplate, see par. 2.8).</p> <p>! NOTICE!</p> <p>If the downstream pressure exceeds the closing pressure value, refer to chapter 10 "Troubleshooting" to clear the causes of the malfunctions.</p>
8	<p>Check the tightness of all the fittings between the shut-off valves (V1, V2).</p> <p>! NOTICE!</p> <p>Check for sealing with a foaming substance.</p>
9	<p>Open the downstream shut-off valve (V2) very slowly until the piping has been filled completely.</p> <p>! NOTICE!</p> <p>If at the beginning of this operation, the pressure in the downstream pipeline is much lower than the calibration pressure, shutter the opening of this valve so as not to exceed the maximum flow rate of the system.</p>
10	<p>! NOTICE!</p> <p>Should pumping phenomena or an excessive decrease in downstream pressure (Pd) occur, please refer to Chapter 10 'Troubleshooting' to remove the cause of the malfunction.</p>
11	Tighten the adjusting screw and fixing nut (Fig. 1.32, ref. 10) of the pilot (3).

Tab. 8.54.

8.6 - PROCEDURE FOR COMMISSIONING THE APERVAL REGULATOR WITH PM/182 BUILT-IN MONITOR

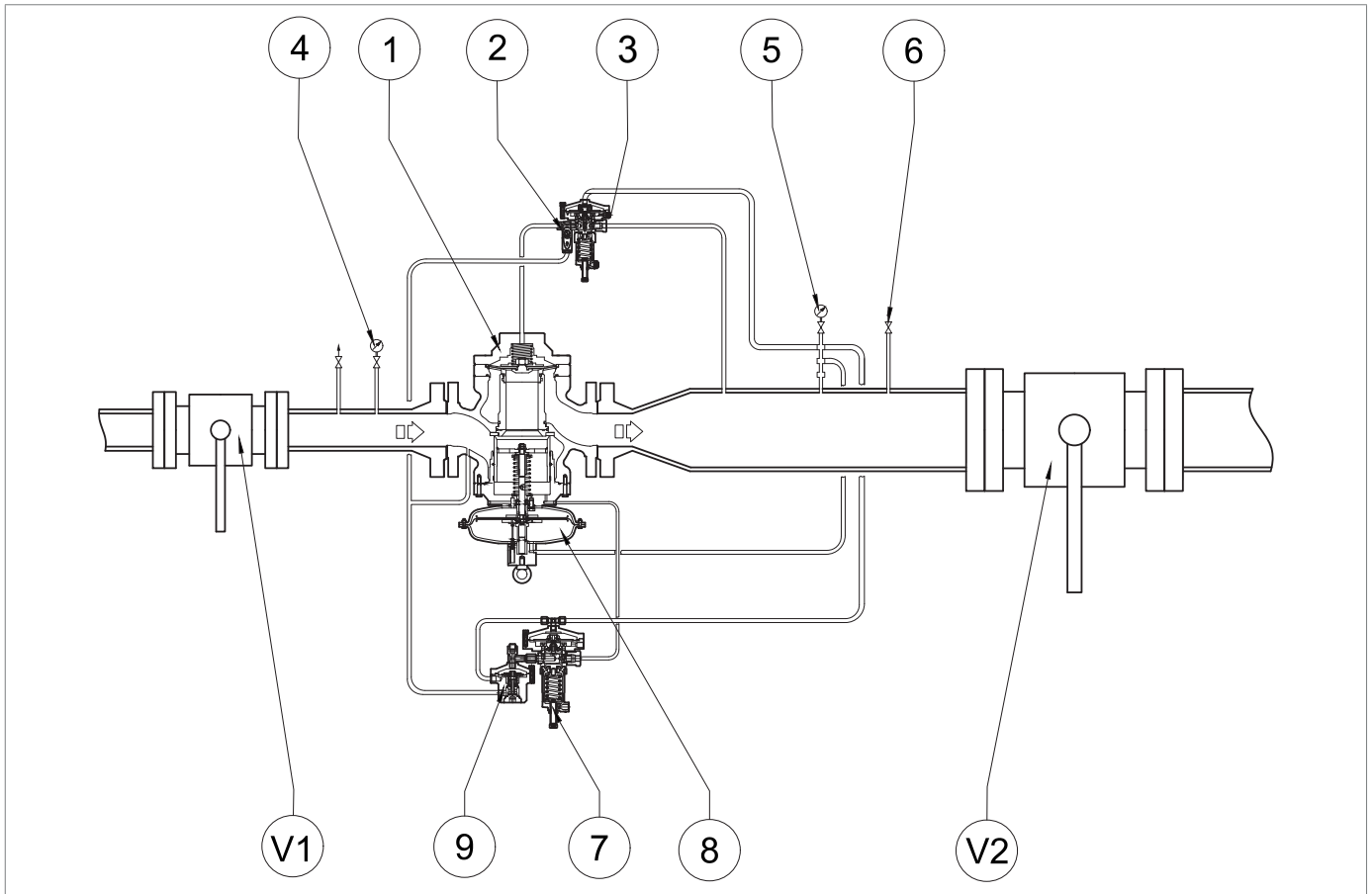


Fig. 8.25. Procedure for commissioning the regulator with PM/182 built-in monitor

Step	Action
1	Partially open the bleed cock (6).
2	Completely unscrew the nut securing the adjusting screws (Fig. 1.32, ref. 10) of the pilots (3, 7).
3	Completely compress the pilot spring (3) by turning the adjusting screw (Fig. 1.32, ref. 10) clockwise.
4	Completely relieve the pilot spring (7) by turning the adjusting screw (Fig. 1.32, ref. 10) anti-clockwise.
5	Turn the screw of the AR100 lamination valve (2) to position 1.
6	Open the inlet shut-off valve (V1) very slowly. <div style="border: 1px solid blue; padding: 5px; margin-top: 5px;"> <p>! NOTICE! Check the pressure by referring to the pressure gauge (4) located upstream.</p> </div>
7	Turn the adjustment screw (Fig. 1.32, ref. 10) on the monitor pilot (7) clockwise to increase the downstream pressure value to the selected monitor operating value. <div style="border: 1px solid blue; padding: 5px; margin-top: 5px;"> <p>! NOTICE! Check the pressure referring to the pressure gauge (5) located upstream.</p> </div>

Step	Action
8	<p>Check that the calibration pressure is at the set value by referring to the downstream pressure gauge (5).</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • To reduce the pressure (to the required value): turn the pilot adjustment screw (7) anti-clockwise; • To increase the pressure (to the required value): turn the pilot adjustment screw (7) clockwise. </div>
9	Turn the screw of the AR100 lamination valve (2) to a value between 3 and 5.
10	Turn the adjusting screw (Fig. 1.32, ref. 10) on the pilot (3) anti-clockwise to relieve the calibration spring until the regulator trips.
11	Make sure that the PM/182 monitor (8) is fully open (100%) by checking the position of the stroke indicator rod (fig. 4.6).
12	<p>Check that the calibration pressure is at the set value by referring to the downstream pressure gauge (5).</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • To reduce the pressure (to the required value): turn the pilot adjustment screw (3) anti-clockwise; • To increase the pressure (to the required value): turn the pilot adjustment screw (3) clockwise. </div>
13	Slowly close the bleed cock (6).
14	<p>Check that the downstream pressure, after an increase phase, does not exceed the closing pressure value (refer to the SG value of the built-in monitor on the rating plate, see 2.8).</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shut-off pressure value, refer to chapter 10 “Fault search and troubleshooting” to remove the causes of the malfunction. • Check the pressure referring to the pressure gauge (5) located upstream. </div>
15	<p>Check all joints between the shut-off valves (V1, V2) for sealing.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Check for sealing with a foaming substance.</p> </div>
16	<p>Slowly open the downstream shut-off valve V2 until the piping has been completely filled.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • If at the beginning of this operation the pressure in the pipeline is much lower than the calibration pressure, it will be advisable to shutter the opening of this valve so as not to exceed the maximum flow rate of the system. • Check the pressure referring to the pressure gauge (5) located upstream. </div>
17	<div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Should pumping phenomena or an excessive decrease in downstream pressure (Pd) occur, please refer to Chapter 10 'Troubleshooting' to remove the cause of the malfunction.</p> </div>
18	Tighten the adjusting screws (Fig. 1.32, ref. 10) and the pilot fastening nuts (3, 7).

Tab. 8.55.

8.7 - START-UP PROCEDURE FOR APERVAL REGULATOR WITH INCORPORATED MONITOR PM/182 AND ACCELERATOR VALVE V/25

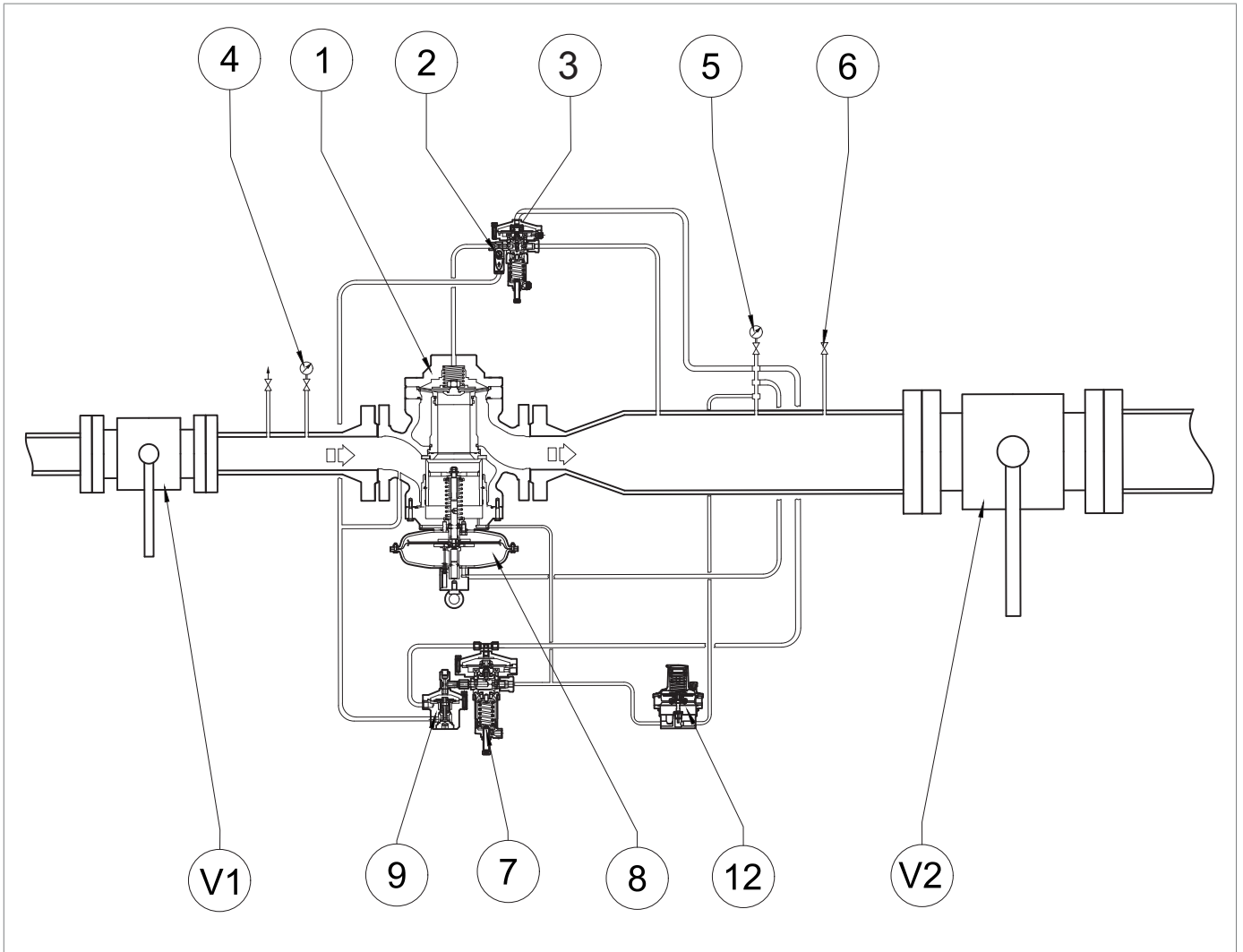
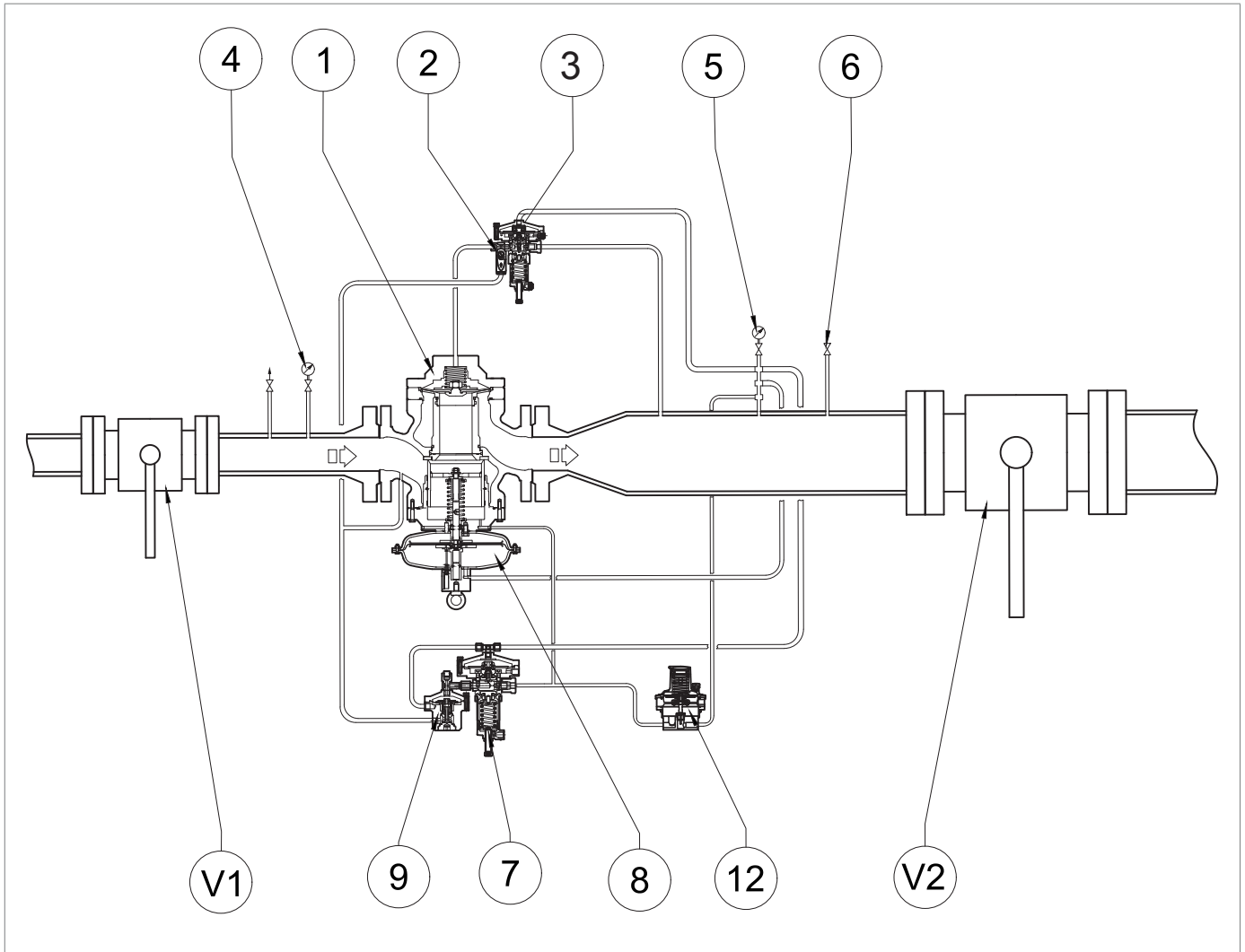


Fig. 8.26. Procedure for commissioning the regulator with PM/182 built-in monitor and V/25 accelerator

Step	Action
1	Partially open the bleed cock (6).
2	Completely unscrew the fixing nut of the pilot adjustment screw (3, 7).
3	Unscrew and remove the cap of the V/25 accelerator valve (12).
4	Completely compress the pilot spring (3) by turning the adjusting screw (Fig. 1.32, ref. 10) clockwise.
5	Completely relieve the pilot spring (7) by turning the adjusting screw (Fig. 1.32, ref. 10) anti-clockwise.
6	Completely compress the spring of the V/25 accelerator valve (12) by turning the adjustment ring nut clockwise (Fig. 1.32, ref. 10).
7	Turn the screw of the AR100 lamination valve (2) to position 1.
8	Open the inlet shut-off valve (V1) very slowly. ! NOTICE! Check the pressure by referring to the pressure gauge (4) located upstream.
9	Slowly increase the downstream pressure by turning the adjusting screw (Fig. 1.32, ref. 10) of the monitor pilot (10) clockwise until the setpoint pressure of the V/25 accelerator valve (12) is reached. ! NOTICE! Check the pressure referring to the pressure gauge (5) located upstream.
10	Turn the adjusting ring (Fig. 1.31, ref. 23) of the V/25 accelerator valve (12) anti-clockwise to decrease the setting of the tripping pressure value until gas is escapes from the gas outlet. ! NOTICE! Check for sealing with a foaming substance.
11	Turn the adjusting screw (Fig. 1.32 ref. 10) on the monitor pilot (7) anti-clockwise to decrease the downstream pressure value to the selected monitor operating value. ! NOTICE! <ul style="list-style-type: none"> • Ensure that the accelerator valve (12) has cut off the gas discharge; • Check the pressure referring to the pressure gauge (5) located upstream.
12	Turn the screw of the AR100 lamination valve (2) to a value between 3 and 5.
13	Turn the adjusting screw (Fig. 1.32, ref. 10) on the pilot (3) anti-clockwise to relieve the calibration spring until the regulator trips. ! NOTICE! Check the pressure referring to the pressure gauge (5) located upstream.
14	Make sure that the PM/182 monitor (8) is fully open (100%) by checking the position of the stroke indicator rod (fig. 4.6).
15	Check that the calibration pressure is at the set value by referring to the downstream pressure gauge (5). ! NOTICE! <ul style="list-style-type: none"> • To reduce the pressure (down to the pre-set value): turn the pilot adjustment screw (3) anti-clockwise; • To increase the pressure (up to the pre-set value): turn the pilot adjustment screw (3) clockwise.
16	Slowly close the bleed cock (6).



Procedure for commissioning the regulator with PM/182 built-in monitor and V/25 accelerator

Step	Action
17	<p>Check that the downstream pressure, after an increase phase, does not exceed the closing pressure value (refer to the SG value of the built-in monitor on the rating plate, see 2.8).</p> <p>! NOTICE!</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shut-off pressure value, refer to chapter 10 “Fault search and troubleshooting” to remove the causes of the malfunction • Ensure that the accelerator valve (12) has cut off the gas discharge • Check the pressure referring to the pressure gauge (5) located upstream.
18	<p>Check all joints between the shut-off valves (V1, V2) for sealing.</p> <p>! NOTICE!</p> <p>Check for sealing with a foaming substance.</p>
19	<p>Open the downstream shut-off valve (V2) very slowly until the piping has been filled completely.</p> <p>! NOTICE!</p> <ul style="list-style-type: none"> • If at the beginning of this operation, the pressure in the piping is much lower than the calibration pressure, shutter the opening of this valve so as not to exceed the maximum flow rate of the system • Check the pressure referring to the pressure gauge located upstream.
20	<p>! NOTICE!</p> <p>Should pumping phenomena or an excessive decrease in downstream pressure (Pd) occur, please refer to Chapter 10 'Troubleshooting' to remove the cause of the malfunction.</p>
21	Position and secure the V/25 accelerator valve cap (12).
22	Tighten the adjusting screws (Fig. 1.32, ref. 10) and the pilot fastening nuts (3, 7).

Tab. 8.56.

8.8 - START-UP PROCEDURE FOR APERVAL REGULATOR WITH INCORPORATED MONITOR PM/182 AND ACCELERATOR VALVE M/A

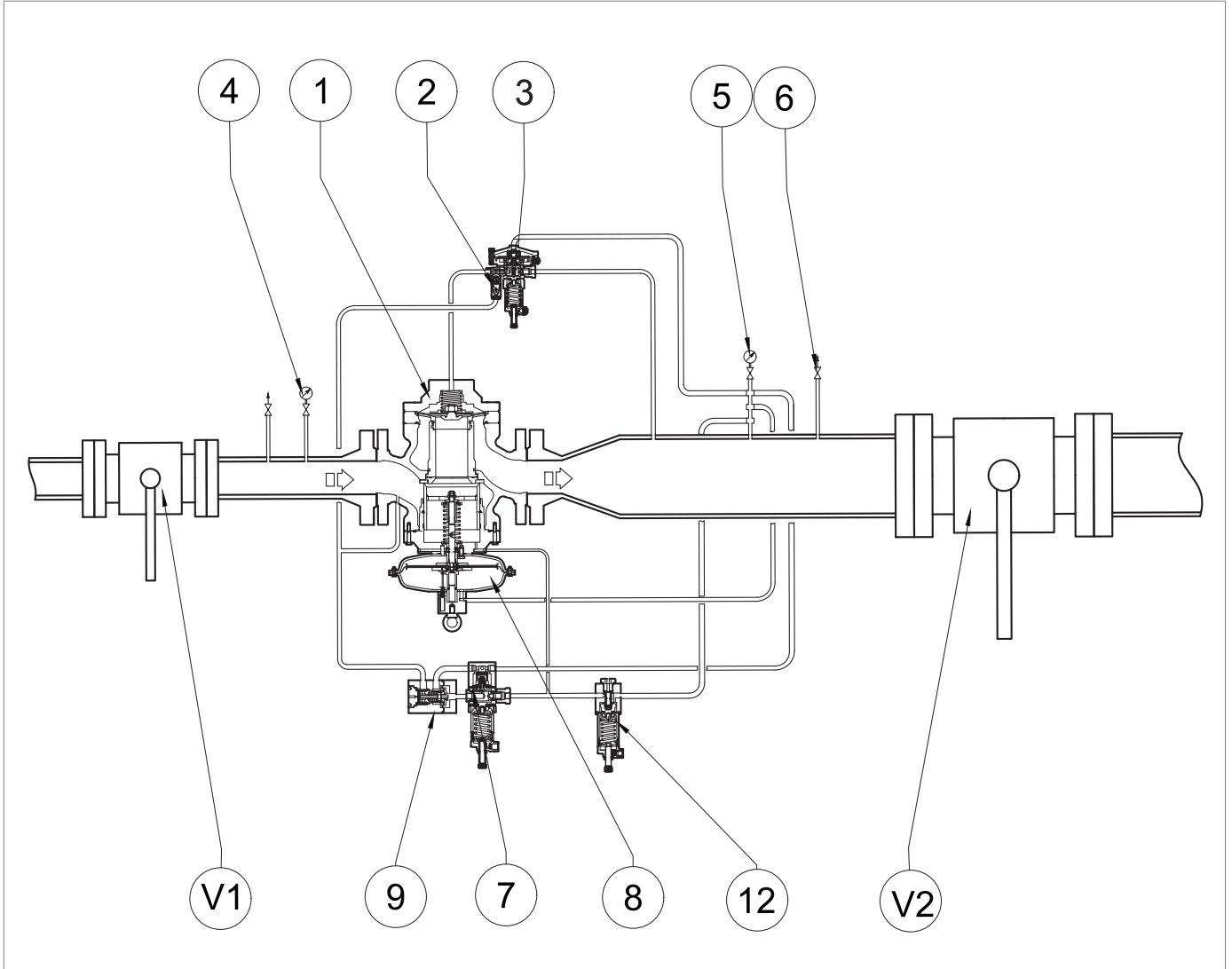






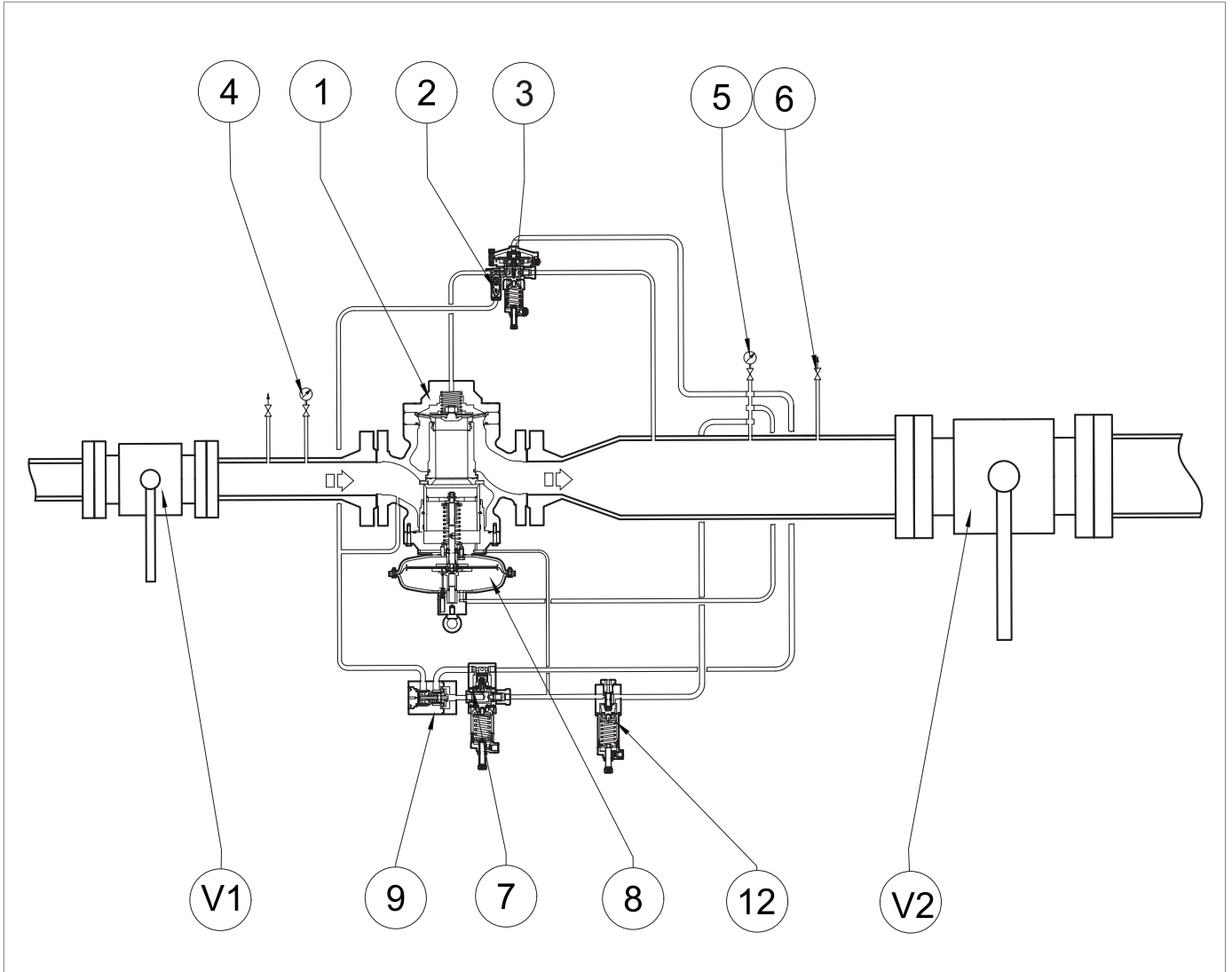


Fig. 8.27. Procedure for commissioning the regulator with PM/182 built-in monitor and M/A accelerator

Step	Action
1	Partially open the bleed cock (6).
2	Completely unscrew the fixing nut of the adjusting screw (Fig. 1.32, ref. 10) of the pilots (3, 7) and the M/A accelerator valve (12).
3	Completely compress the pilot spring (3) by turning the adjusting screw (Fig. 1.32, ref. 10) clockwise.
4	Completely relieve the pilot spring (7) by turning the adjusting screw (Fig. 1.32, ref. 10) anti-clockwise.
5	Fully compress the M/A accelerator valve spring (12) by turning the adjusting screw clockwise.
	Open the inlet shut-off valve (V1) very slowly.
6	 NOTICE! Check the pressure by referring to the pressure gauge (4) located upstream.
	Slowly increase the downstream pressure by turning the adjusting screw (Fig. 1.32, ref. 10) of the monitor pilot (7) clockwise until the value of the M/A accelerator valve's starting pressure (12) is reached.
7	 NOTICE! Check the pressure referring to the pressure gauge (5) located upstream.
	Turn the adjusting screw of the M/A accelerator valve (12) anti-clockwise to decrease the calibration of the cut-in pressure value until gas is released from the gas outlet.
8	 NOTICE! Check for sealing with a foaming substance.
	Turn the adjusting screw (Fig. 8.32 ref. 10) on the monitor pilot (7) anti-clockwise to decrease the downstream pressure value to the selected monitor operating value.
9	 NOTICE! <ul style="list-style-type: none"> • Ensure that the accelerator valve (12) has cut off the gas discharge; • Check the pressure referring to the pressure gauge (5) located upstream.
	Turn the adjusting screw (Fig. 1.32, ref. 10) on the pilot (3) anti-clockwise to relieve the calibration spring until the regulator trips.
10	 NOTICE! Check the pressure referring to the pressure gauge (5) located upstream.
11	Make sure that the PM/182 monitor (8) is fully open (100%) by checking the position of the stroke indicator rod (fig. 4.6).
	Check that the calibration pressure is at the set value by referring to the downstream pressure gauge (5).
12	 NOTICE! <ul style="list-style-type: none"> • To reduce the pressure (down to the pre-set value): turn the pilot adjustment screw (3) anti-clockwise; • To increase the pressure (up to the pre-set value): turn the pilot adjustment screw (3) clockwise.
13	Slowly close the bleed cock (6).



Procedure for commissioning the regulator with PM/182 built-in monitor and M/A accelerator

Step	Action
14	<p>Check that the downstream pressure, after an increase phase, does not exceed the closing pressure value (refer to the SG value of the built-in monitor on the rating plate, see 2.8).</p> <p>! NOTICE!</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shut-off pressure value, refer to chapter 10 “Fault search and troubleshooting” to remove the causes of the malfunction; • Check the pressure on the pressure gauge (5) located upstream
15	<p>Check all joints between the shut-off valves (V1, V2) for sealing.</p> <p>! NOTICE!</p> <p>Check for sealing with a foaming substance.</p>
16	<p>Slowly open the downstream shut-off valve V2 until the piping has been completely filled.</p> <p>! NOTICE!</p> <ul style="list-style-type: none"> • If at the beginning of this operation, the pressure in the piping is much lower than the calibration pressure, shutter the opening of this valve so as not to exceed the maximum flow rate of the system; • Check the pressure referring to the pressure gauge (5) located upstream.
17	<p>Tighten the adjusting screws (Fig. 1.32, ref. 10) and the fixing nuts of the pilots (3, 7) and the M/A accelerator valve (12).</p>

Tab. 8.57.

8.9 - COMMISSIONING PROCEDURE FOR THE APERVAL REGULATOR WITH INTEGRATED SA BLOCK VALVE

8.9.1 - CHECKING THE CLOSING TIGHTNESS OF THE SA BUILT-IN SLAM-SHUT VALVE

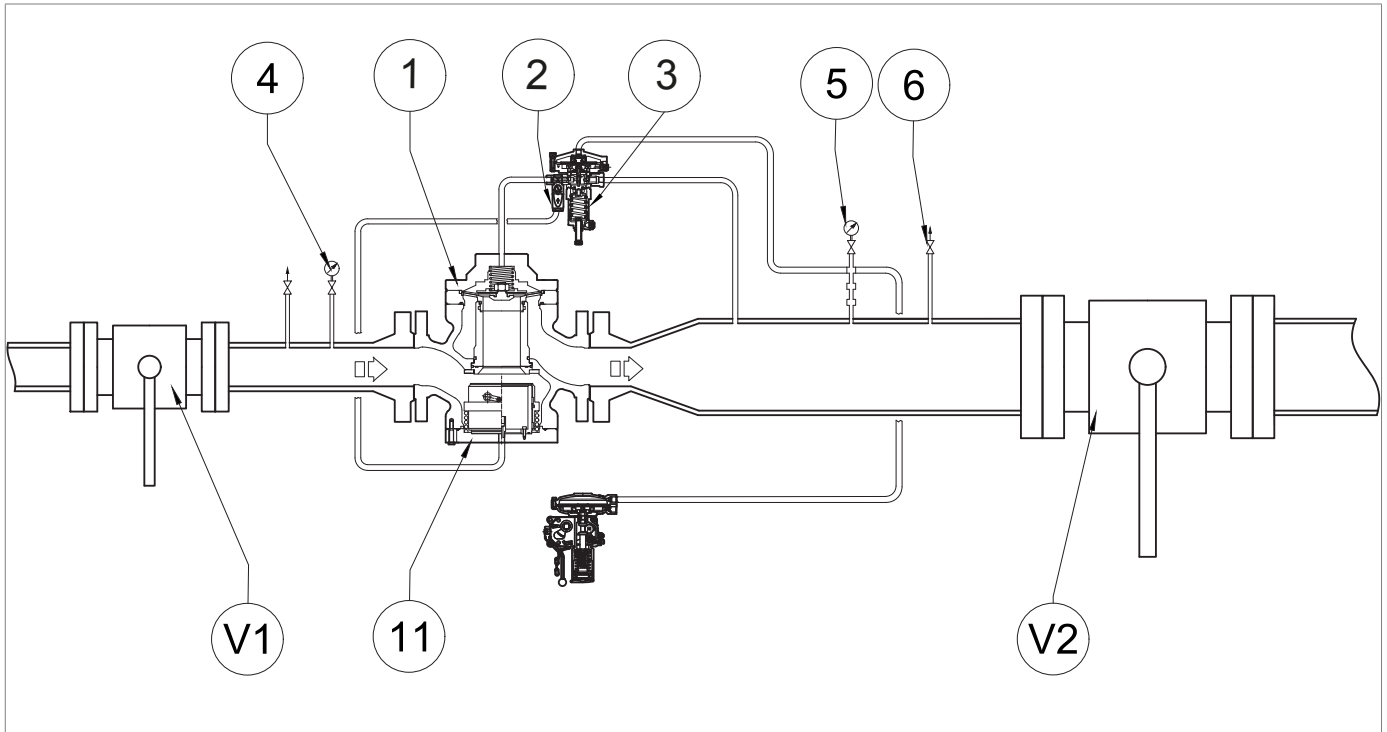


Fig. 8.28. Sealing of the SA slam-shut valve when closing

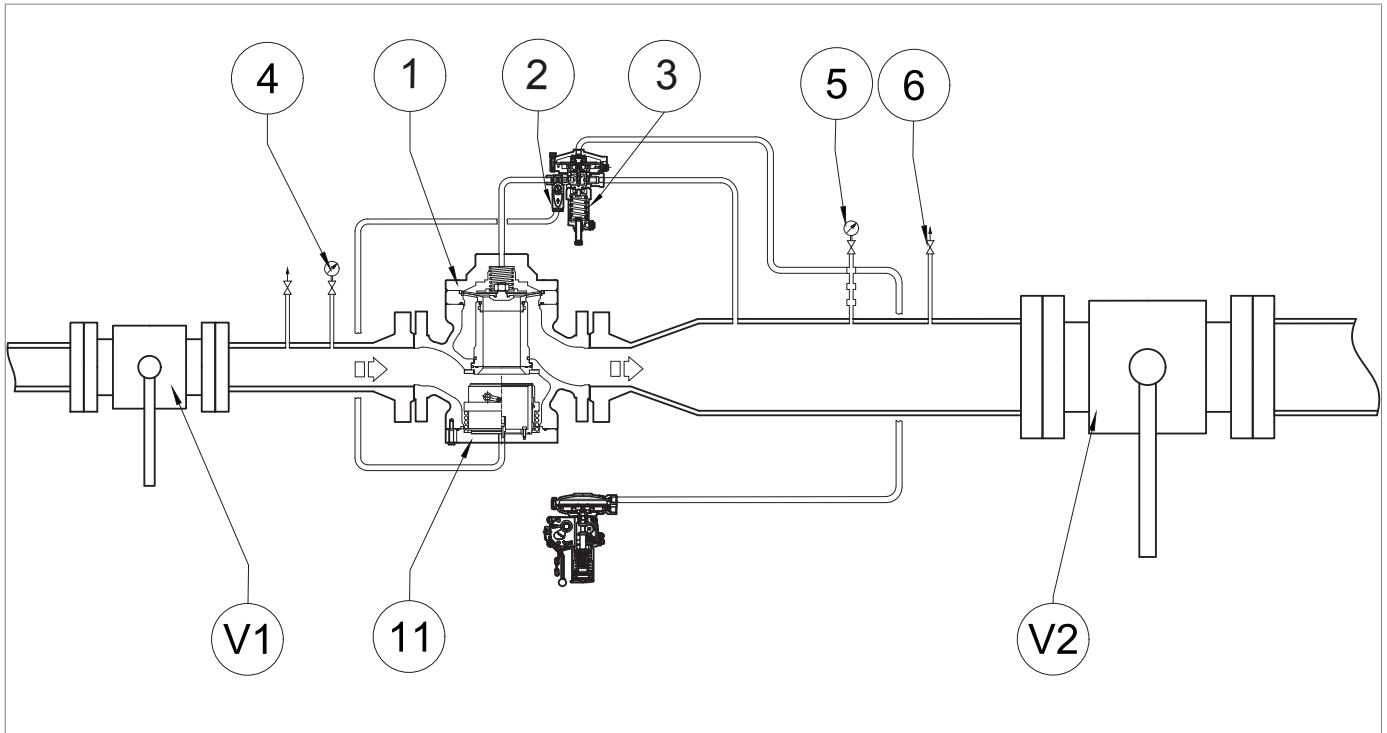
Step	Action
1	<p>Check that the slam-shut valve (11) is in the closed position.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>If the built-in slam-shut valve is in the open position, close it using a manual button (Fig. 1.29, ref. 10).</p> </div>
2	Open the drain cock (6) and drain the downstream section completely.
3	Open the upstream valve (V1) very slowly.
4	<p>To check the tightness of the slam-shut valve (11), disconnect the power connection of the pilot unit (3) located on the flange of the slam-shut valve (11).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • Check the seal with a foaming substance; • In the event of leaks from the connection, please refer to Chapter 10 'Troubleshooting' to clear the causes of malfunctions. </div>
5	<p>Reconnect the power connection of the drive unit (3) to the flange of the slam-shut valve (11).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Check whether to replace the fitting by referring to the fitting manufacturer's instructions.</p> </div>

Tab. 8.58.

8.9.2 - COMMISSIONING OF THE REGULATOR APERVAL WITH SA SLAM-SHUT VALVE

For the following procedure, please refer to paragraph "1.9.1 - Checking the closing tightness of the SA built-in slam-shut valve":

Step	Action
1	Make sure that the bleed cock (6) is partially open.
2	Check that the slam-shut valve (11) is in the closed position. NOTICE! If the built-in slam-shut valve is in the open position, close it using a manual button (Fig. 1.29, ref. 10).
3	Partially open the upstream shut-off valve (V1), checking the pressure indicated by the upstream pressure gauge (4).
4	Perform the internal tightness check of the LA slam-shut valve, referring to chapter 1.9.1. NOTICE! In case of leaks, please refer to the chapter "10 - Ricerca guasti e troubleshooting" to clear the causes of malfunctions.
5	Slowly pressurise the regulating line, acting on the reset lever (16) of the slam-shut valve (refer to the "Operation" section of 4.5.3.1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required setting value by more than 50%.
6	When the regulator is put into service, the pressure on the downstream pressure gauge (5) will be equal to the calibration value of the main regulator. NOTICE! In the first line pressurisation phase, the pressure on the downstream pressure gauge (5) could exceed the required calibration value, depending on the response time of the regulator.
7	Open the upstream shut-off valve (V1) completely.
8	Check calibrations of the pressure switch of the slam-shut valve by referring to par. 8.9.3.
9	a - FOR INITIAL COMMISSIONING OF THE REGULATION LINE If the pressure downstream (Pd) is not at the required calibration value, proceed as follows: <ul style="list-style-type: none"> value of the downstream pressure (Pd) is lower than the required calibration value: load the pilot calibration spring (2) by turning the adjustment screw (Fig. 1.32, ref. 10) clockwise value of the downstream pressure (Pd) is higher than the required calibration value: unload the pilot calibration spring (2) by turning the adjustment screw (Fig. 1.32, ref. 10) clockwise b - AFTER MAINTENANCE OF THE REGULATION LINE <ul style="list-style-type: none"> load the pilot setting spring (2) by turning the adjustment screw (10) clockwise to increase the regulator pressure value (1)
10	Check the downstream pressure (Pd) referring to the downstream pressure gauge (5).
11	Close the bleed cock (6).



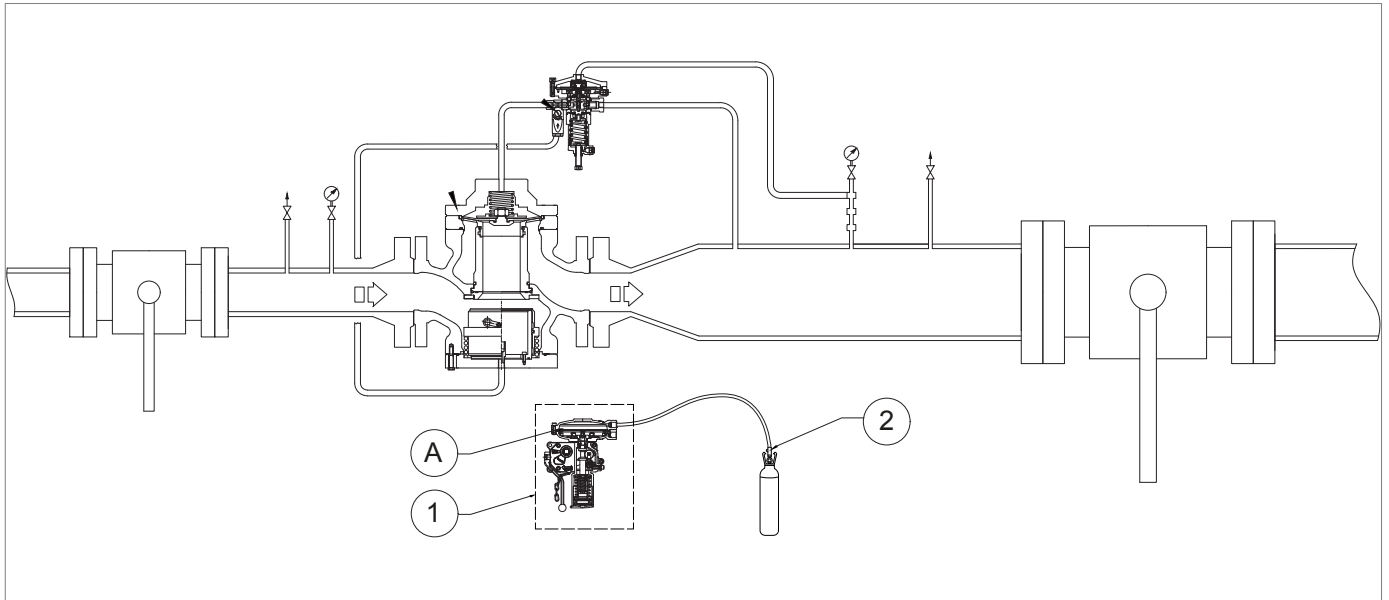
Sealing of the SA slam-shut valve when closing

12	<p>Check that the downstream pressure (P_d), after an increment phase, does not exceed the closing pressure value (refer to the SG value displayed on the plate, see par. 2.8).</p> <p>! NOTICE!</p> <p>If the pressure in the pipe section between the regulator and the downstream shut-off valve (V2) exceeds the closing pressure value, consult chapter 10 “Troubleshooting” to clear the causes of the malfunctions.</p>
13	<p>Check the tightness of all the fittings between the shut-off valves (V1, V2).</p> <p>! NOTICE!</p> <p>Check for sealing with a foaming substance.</p>
14	<p>If external leaks are noticed, eliminate the leak points and repeat the procedure from step 7.</p>
15	<p>Open downstream shut-off valve (V2) very slowly until the pipeline fills completely.</p> <p>! NOTICE!</p> <p>If the pressure of the downstream pipeline is lower than the calibration pressure, partially open the downstream shut-off valve (V2) so as to not to exceed the maximum flow rate value of the installation.</p>

Tab. 8.59.

8.8 - PRESSURISING WITH EXTERNAL SOURCE

It is possible to pressurise the chamber (A) of the pressure switch control head (1) using an external source. Pressurisation can take place via an external pressure source and is controlled using pressure gauges or transducers. To correctly discharge the introduced pressure, make sure there is an additional bleed cock (2).



Pressurisation with external pressure source

8.7 - CALIBRATION PROCEDURE FOR PRESSURE SWITCHES MOD. SA

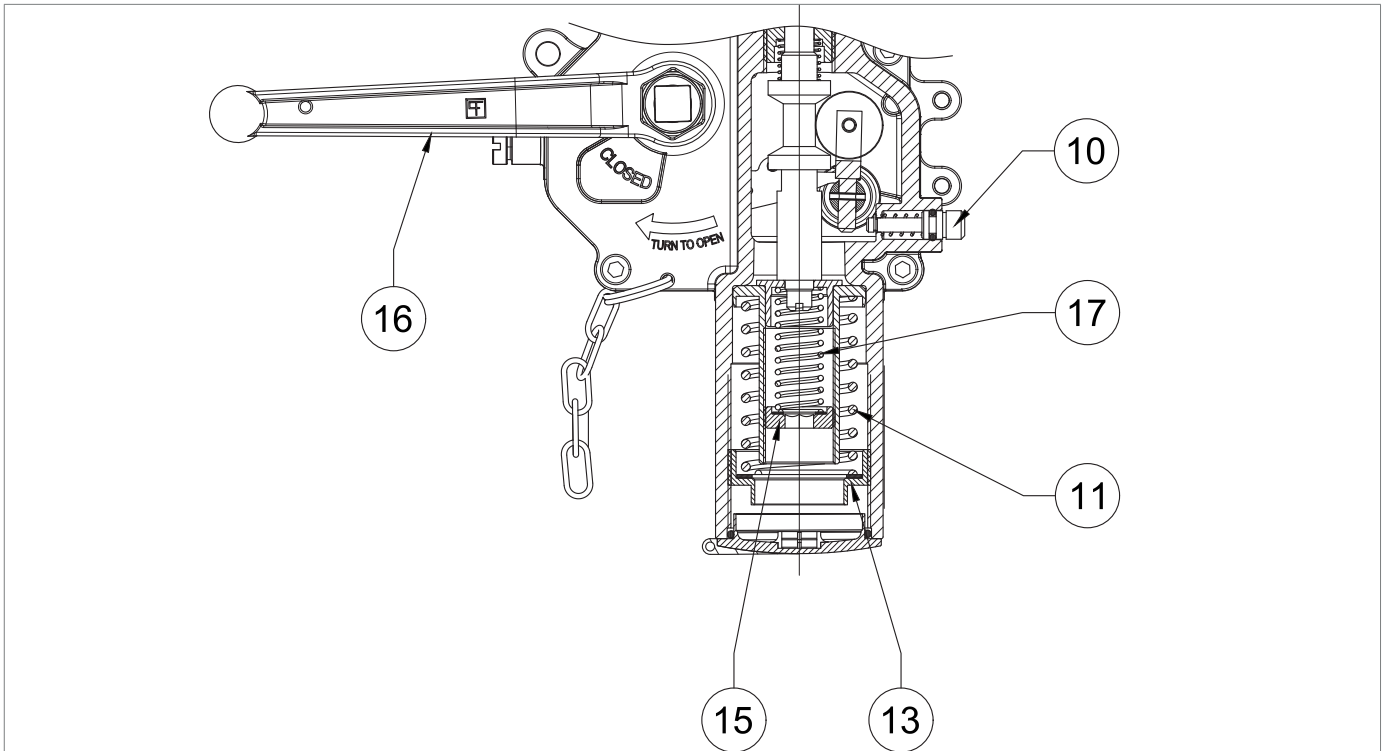


Fig. 8.29. Calibration of pressure switches models SA-91, SA-92, SA-93

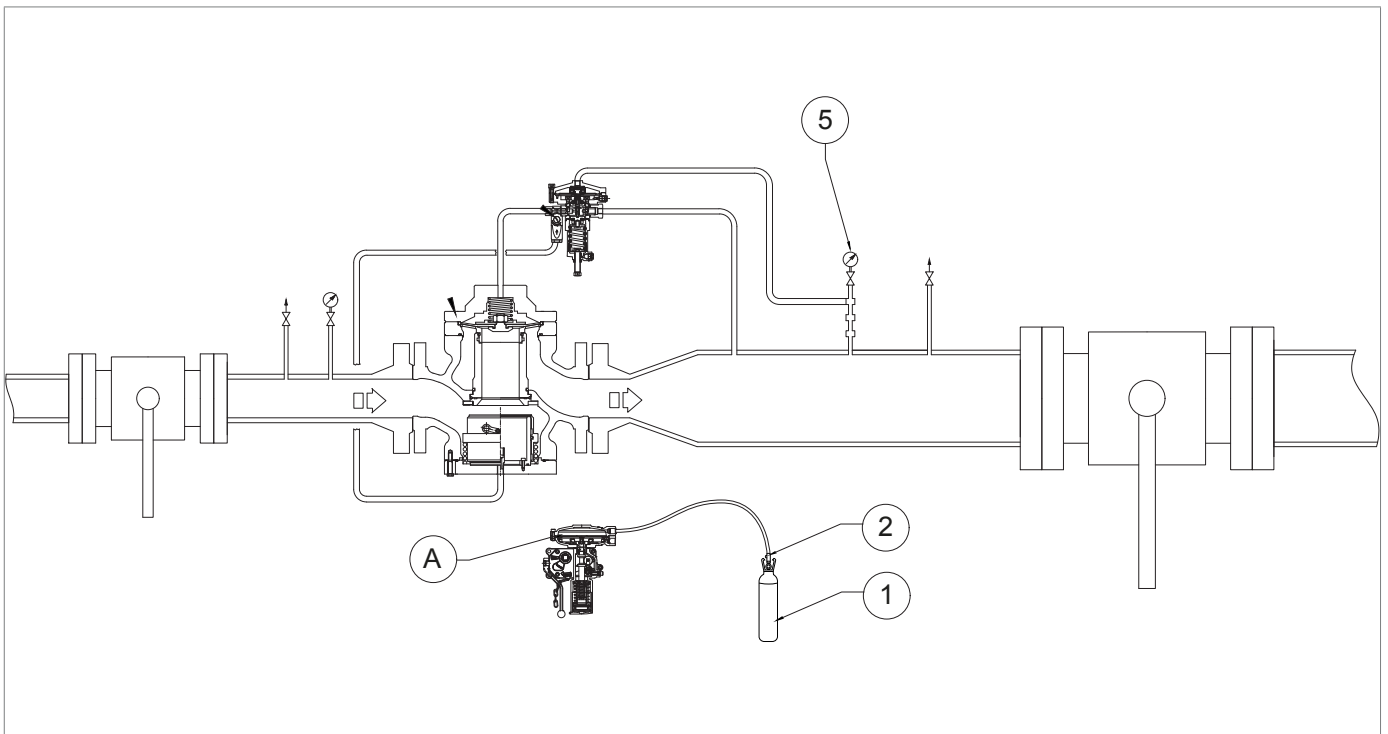




Fig. 8.30. APERVAL with built-in SA shut-off valve and external pressure source

SPRING CALIBRATION FOR MAXIMUM PRESSURE TRIP

Step	Action
1	<p>Increase the downstream pressure to the start value by turning the adjustment screw (Fig. 1.32, ref. 10) on the pilot clockwise.</p> <div style="border: 1px solid black; padding: 5px;"> <p> NOTICE!</p> <p>Check the tripping pressure value of the slam-shut valve indicated on the downstream pressure gauge (Fig. 1.30, ref. 5).</p> </div>
2	<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 (Fig. 1.29, ref. 13) so as to further compress the spring (Fig. 1.29, ref. 11); does not trip at the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (Fig. 1.29, ref. 13) so as to relieve the spring (Fig. 1.29, ref. 11).
3	Decrease the pressure in the downstream section by opening the air vent valve (Fig. 1.24, ref. 6) to bring it down to the regulator's setpoint.
4	Close the air vent valve (Fig. 1.24, ref. 6).
5	Open the slam-shut valve by acting on the reset lever (Fig. 1.29, 16).
6	Check the maximum pressure spring for proper calibration by repeating steps 1-2-3-4 at least three times.
7	Close the bleed cock (Fig. 1.24, ref. 6).

Tab. 8.60.

SPRING SETTING FOR MAXIMUM PRESSURE TRIP WITH EXTERNAL PRESSURE SOURCE

Step	Action
1	<p>Increase the downstream pressure to the threshold value by connecting an external pressure source (Fig. 1.30, ref. 1) to the pressure switch sensing line.</p> <div style="border: 1px solid black; padding: 5px;"> <p> NOTICE!</p> <p>Check the tripping pressure value of the slam-shut valve indicated on the downstream pressure gauge (5).</p> </div>
2	<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 (Fig. 1.29, ref. 13) so as to further compress the spring (Fig. 1.29, ref. 11); does not trip at the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (Fig. 1.29, ref. 13) so as to relieve the spring (Fig. 1.29, ref. 11).
3	Decrease the pressure in the downstream section by opening the additional drain cock (2) to bring it up to the regulator setting.
4	Close the additional drain cock (Fig. 1.30, ref. 2).
5	Open the slam-shut valve from the reset lever (Fig. 1.29, ref. 16).
6	Check the maximum pressure spring for proper calibration by repeating steps 1-2-3-4 at least three times.
7	Close the additional drain cock (Fig. 1.30, ref. 2) and disconnect the external pressure source (Fig. 1.30, ref. 1).

Tab. 8.61.

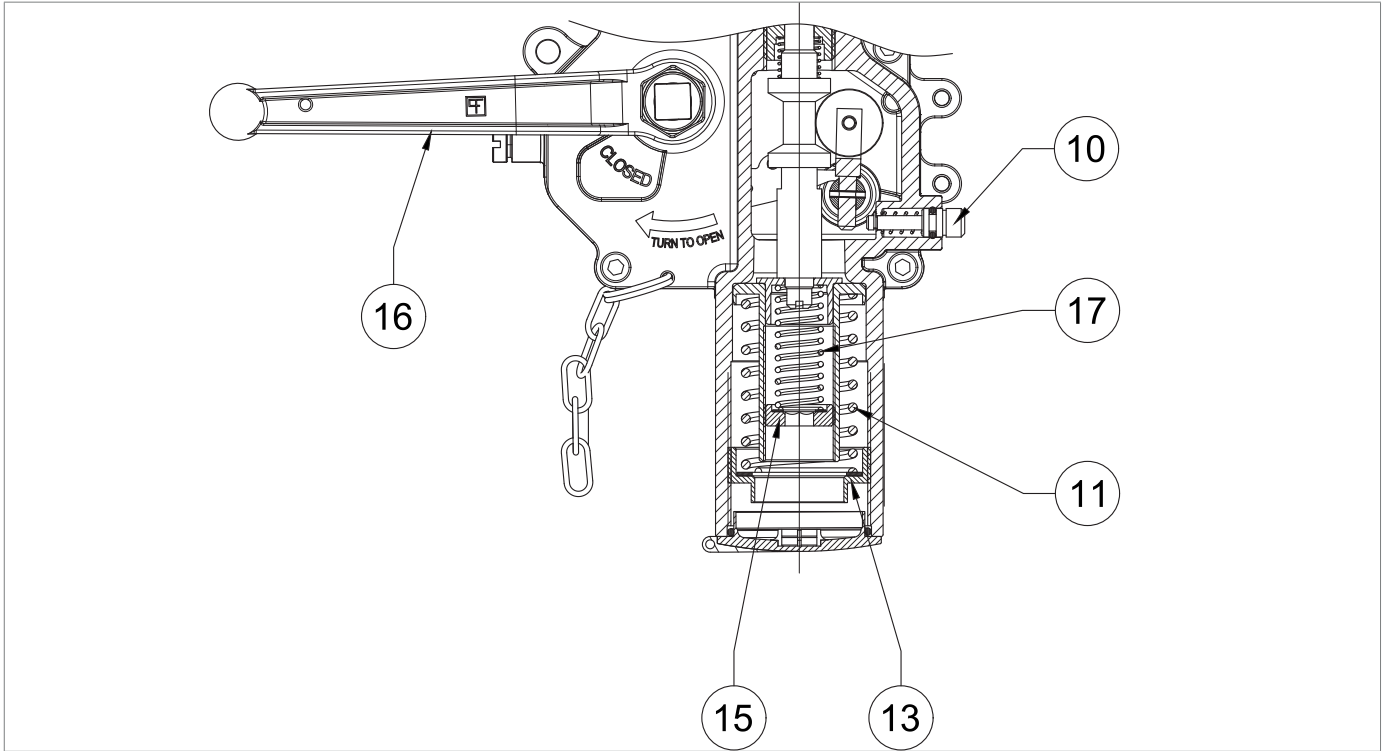


Fig. 8.29 Calibration of pressure switches models SA-91, SA-92, SA-93

SPRING CALIBRATION FOR MINIMUM PRESSURE TRIP (IF APPLICABLE)

Step	Action
1	Partially open the drain cock (Fig. 1.24, ref. 6) to the atmosphere and keep it open for the next steps.
2	Turn the adjustment screw (Fig. 1.32, ref. 10) of the pilot anti-clockwise to decrease the downstream pressure (Dp) to the minimum pressure required for the slam-shut valve to operate.
4	<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 (Fig. 1.29, ref. 15) so as to further compress the spring (Fig. 1.29, ref. 17); does not trip at the expected pressure value: unscrew (anti-clockwise) the adjustment ring nut (Fig. 1.29, ref. 15) so as to relieve the spring (Fig. 1.29, ref. 17).
5	<p>After checking that the slam-shut valve operates at the preset value, act as follows:</p> <ol style="list-style-type: none"> Close the air vent valve (Fig. 1.24, ref. 6) Slowly open the upstream shut-off valve (V1) until the downstream pressure value (Dp) reaches the calibration value of the regulator, referring to the downstream pressure gauge (Fig. 1.24, ref. 5) Close the upstream shut-off valve (V1) Slowly and partially open the air vent valve (Fig. 1.24, ref. 6) to decrease the downstream pressure by referring to the downstream pressure gauge (Fig. 1.24, ref. 5) until the minimum pressure trip value is reached Check the minimum pressure spring for proper calibration by repeating steps 2-3-4 at least three times Calibrate the main regulator referring to par. 8.5
6	Open the slam-shut valve by acting on the reset lever (Fig. 1.29, ref. 16) and hold it open manually.
7	Turn the adjustment screw (Fig. 1.29, ref. 10) clockwise to increase the downstream pressure to the pilot setting value.
8	Arming the slam-shut valve by acting on the reset lever (Fig. 1.29, ref. 16).
9	Close the bleed cock (Fig. 1.24, ref. 6).

Tab. 8.62.

COMMISSIONING THE REGULATOR

NOTICE!

Refer to paragraph 8.5 “Regulator commissioning procedure” in this chapter.

8.9.3 - DEVICE CALIBRATION

8.9.3.1 - V/25 ACCELERATOR VALVE CALIBRATION

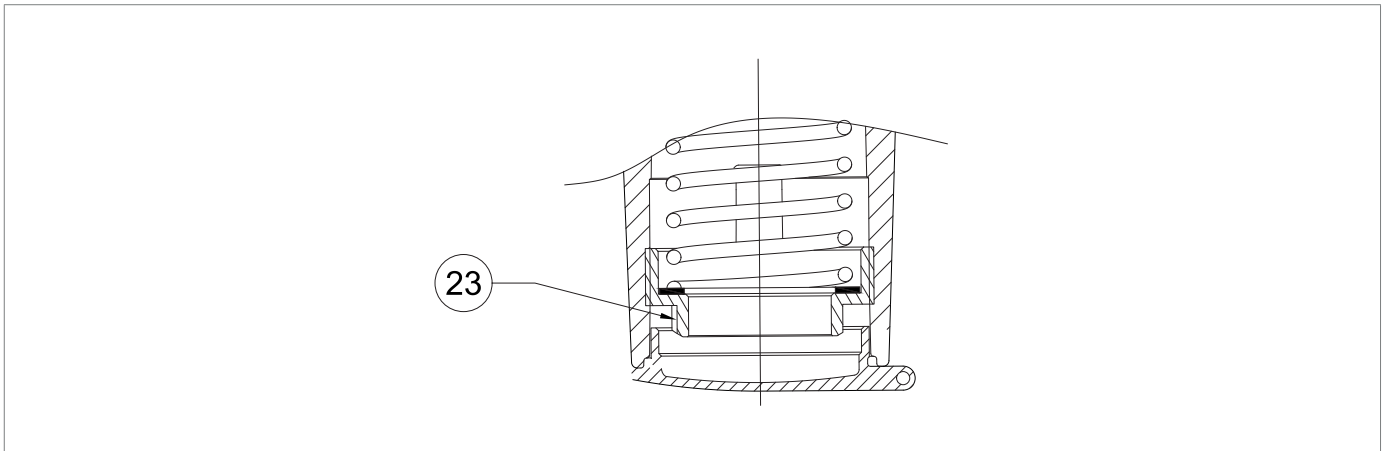


Fig. 8.31. V/25 Accelerator valve calibration

Adjust the adjustment ring nut (23):

- anticlockwise to decrease the adjusted pressure;
- clockwise to increase the adjusted pressure.

8.9.3.2 - CALIBRATION OF 300, 200 SERIES PILOTS AND M/A ACCELERATOR VALVE

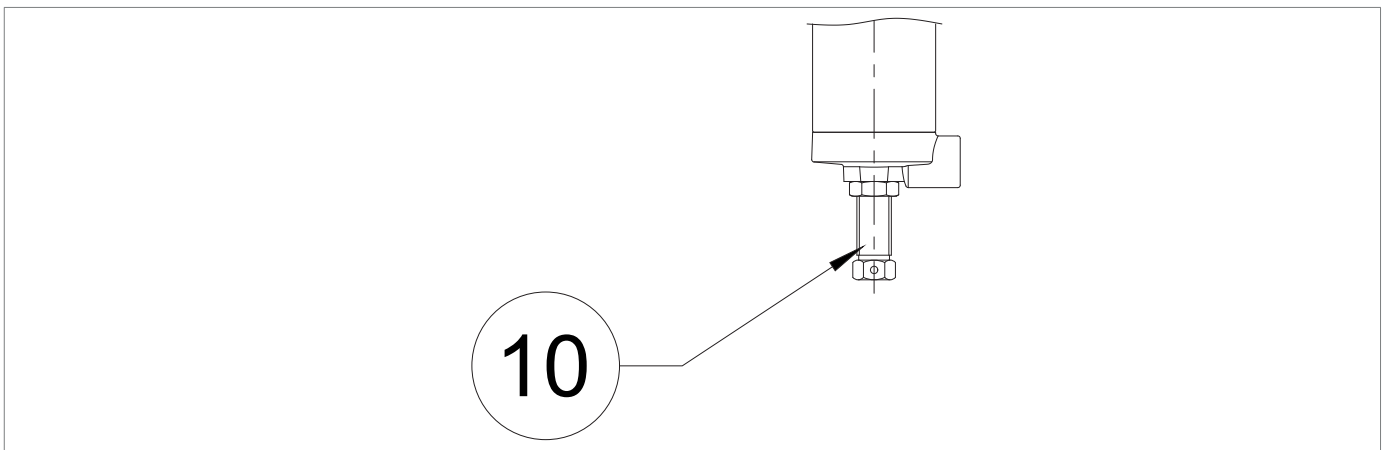


Fig. 8.32. Calibration of 300, 200 series pilots and M/A accelerator valve

Turn the adjusting screw (10):

- anti-clockwise to decrease the adjusted pressure;
- clockwise to increase the adjusted pressure.

8.9.3.3 - CALIBRATION OF PRESSURE SWITCHES MOD. SA

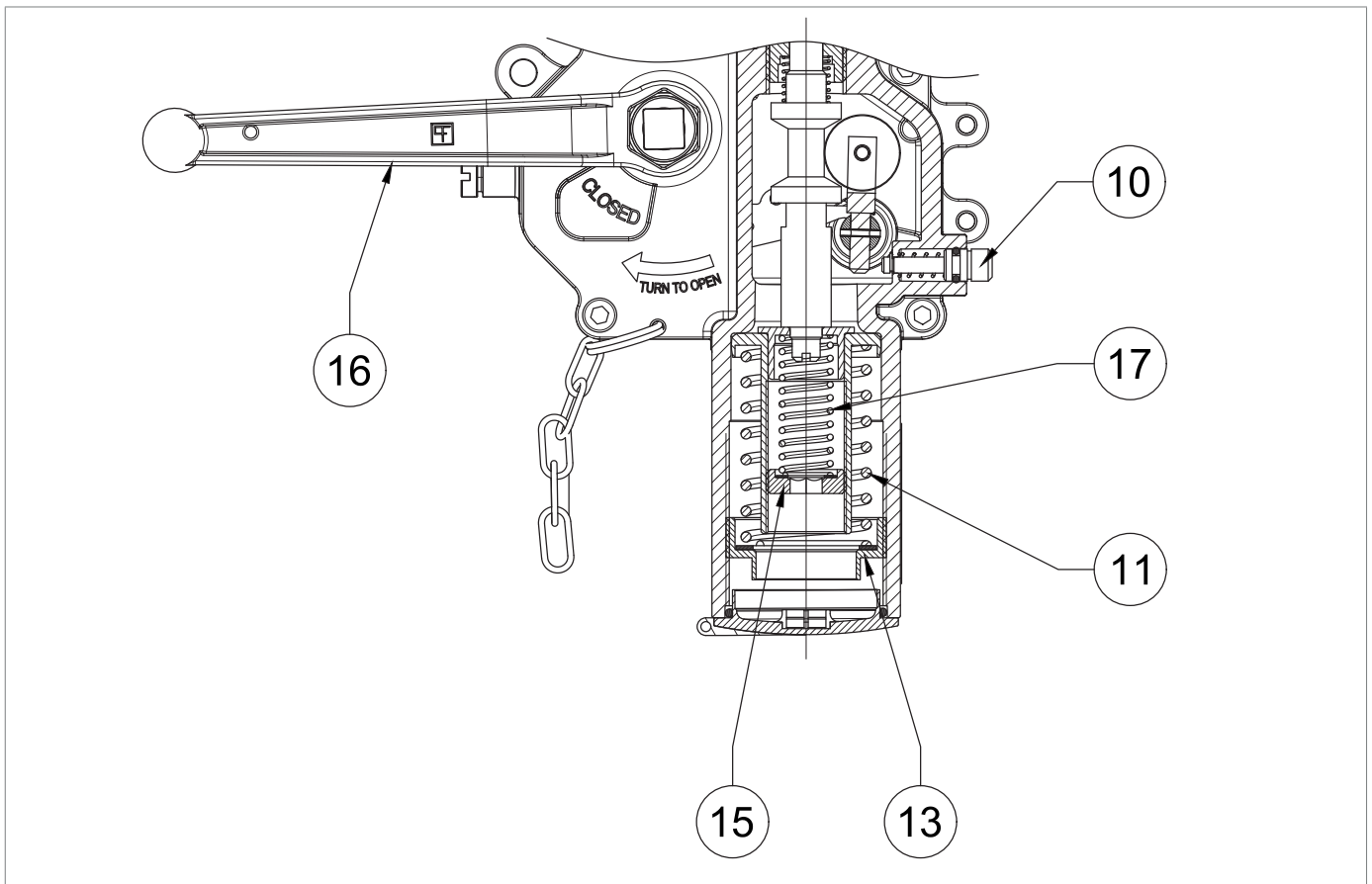


Fig. 8.33. Calibration of pressure switches mod. SA-91, SA-92, SA-93

Adjust the maximum pressure (11) ring nut (13):

- anti-clockwise to decrease the slim-shut device tripping pressure;
- clockwise to increase the slim-shut device tripping pressure.

Turn the minimum pressure (17) ring nut (15):

- anti-clockwise to decrease the slim-shut device tripping pressure;
- clockwise to increase the slim-shut device tripping pressure.

NOTICE!

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

ATTENTION!

After calibration of the pressure switch, remove the lever to avoid interference with other objects on the system.

9 - MAINTENANCE AND FUNCTIONAL CHECKS

9.1 - GENERAL WARNINGS

HAZARD!

- Maintenance work must be carried out by qualified personnel trained on safety in the workplace and authorised to carry out equipment-related activities.
- Repair or maintenance work not provided for in this manual may be carried out only if approved by 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.

After discharging the pressure from the line, trigger the slam-shut valve.

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 recommended original spare parts;
- the operator must have the necessary equipment (see chapter “1 - 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 “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	<p>All those operations that the operator must preventively carry out to ensure proper operation of the device over time. Routine maintenance includes:</p> <ul style="list-style-type: none"> • inspection; • control; • adjustment; • cleaning; • lubrication; • replacement; <p>of all spare parts.</p>
Special maintenance	<p>All those operations to be carried out by the operator when the equipment requires them.</p> <div style="background-color: #c00000; color: white; padding: 5px; display: flex; align-items: center;">  HAZARD! </div> <p>Special maintenance:</p> <ul style="list-style-type: none"> • requires extensive and specialised knowledge of the machines, operations required, risks involved and correct procedures to operate safely; • must be provided by qualified, trained and authorised technicians.

Tab. 9.66

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;"> <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. </div>

Tab. 9.67

Tab. 1.68 lists the checks and inspections, i.e. the operations that do not require any manual service on the equipment. Some items thereof can be replaced remotely using suitable remote control tools:

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. 9.68

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

9.3 - ROUTINE MAINTENANCE

9.3.1 - GENERAL SAFETY WARNINGS

HAZARD!

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

WARNING!

After discharging the pressure from the line, trigger the slam-shut valve.

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	Covers 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	takes into account parts subject to aging only, including parts that also require lubrication and/or cleaning.

Tab. 9.69

NOTICE!







Check, within the minimum frequency specified in “Tab. 1.73.”, 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

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

Tab. 9.70

9.4 - ROUTINE MAINTENANCE PROCEDURES

Routine maintenance	
Operator qualification	Mechanical maintenance technician
PPE required	<div style="display: flex; justify-content: space-around; align-items: center;">      </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 “1 - Commissioning/maintenance equipment”.

Tab. 9.71

9.4.1 - TIGHTENING TORQUES APERVAL

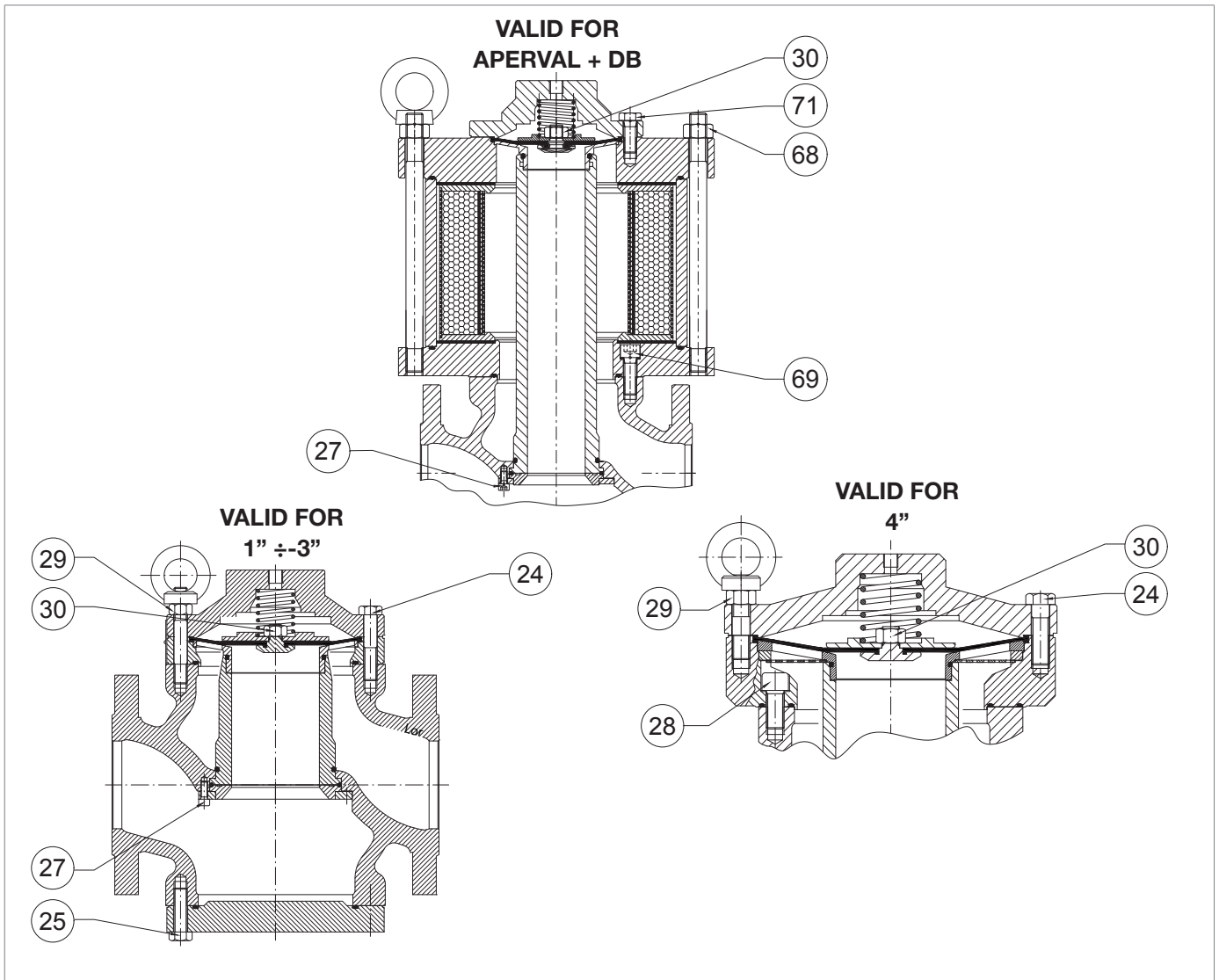


Fig. 9.34. Tightening torques APERVAL

APERVAL 1" (+DB APERVAL)

Pos.	Description	Torque (nm)	Torque (ft - lb)
24	Screw M10X45 UNI 5737	25	18
25	Screw M10X30 UNI 5739	25	18
27	Screw M6X12 UNI 5931	10	7
29	Nut M10 UNI 5588	45	33
30	Nut M10X2.5 UNI 5588	45	33
68	Nut M14 UNI 5587	115	84
69	Screw M10X30 UNI 5931	45	33
71	Screw M10X25 UNI 5739	25	18

Tab. 9.72.
APERVAL 2" (+DB APERVAL)

Pos.	Description	Torque (nm)	Torque (ft - lb)
24	Screw M12X45 UNI 5737	25	18
25	Screw M12X35 UNI 5739	25	18
27	Screw M6X12 UNI 5931	10	7
29	Nut M12 UNI 5588	80	59
30	Nut M12X2.5 UNI 5588	50	36
68	Nut M16 UNI 5588	150	110
69	Screw M12X35 UNI 5931	80	59
71	Screw M12X35 UNI 5739	25	18

Tab. 9.73.
APERVAL 2" ½ (+DB APERVAL)

Pos.	Description	Torque (nm)	Torque (ft - lb)
24	Screw M12X50 UNI 5737	25	18
25	Screw M12X35 UNI 5739	25	18
27	Screw M6X14 UNI 5931	10	7
29	Nut M12 UNI 5588	80	59
30	Nut M12X2.5 UNI 5588	50	36
68	Nut M18 UNI 5588	200	147
69	Screw M12X35 UNI 5931	80	59
71	Screw M12X35 UNI 5739	25	18

Tab. 9.74.

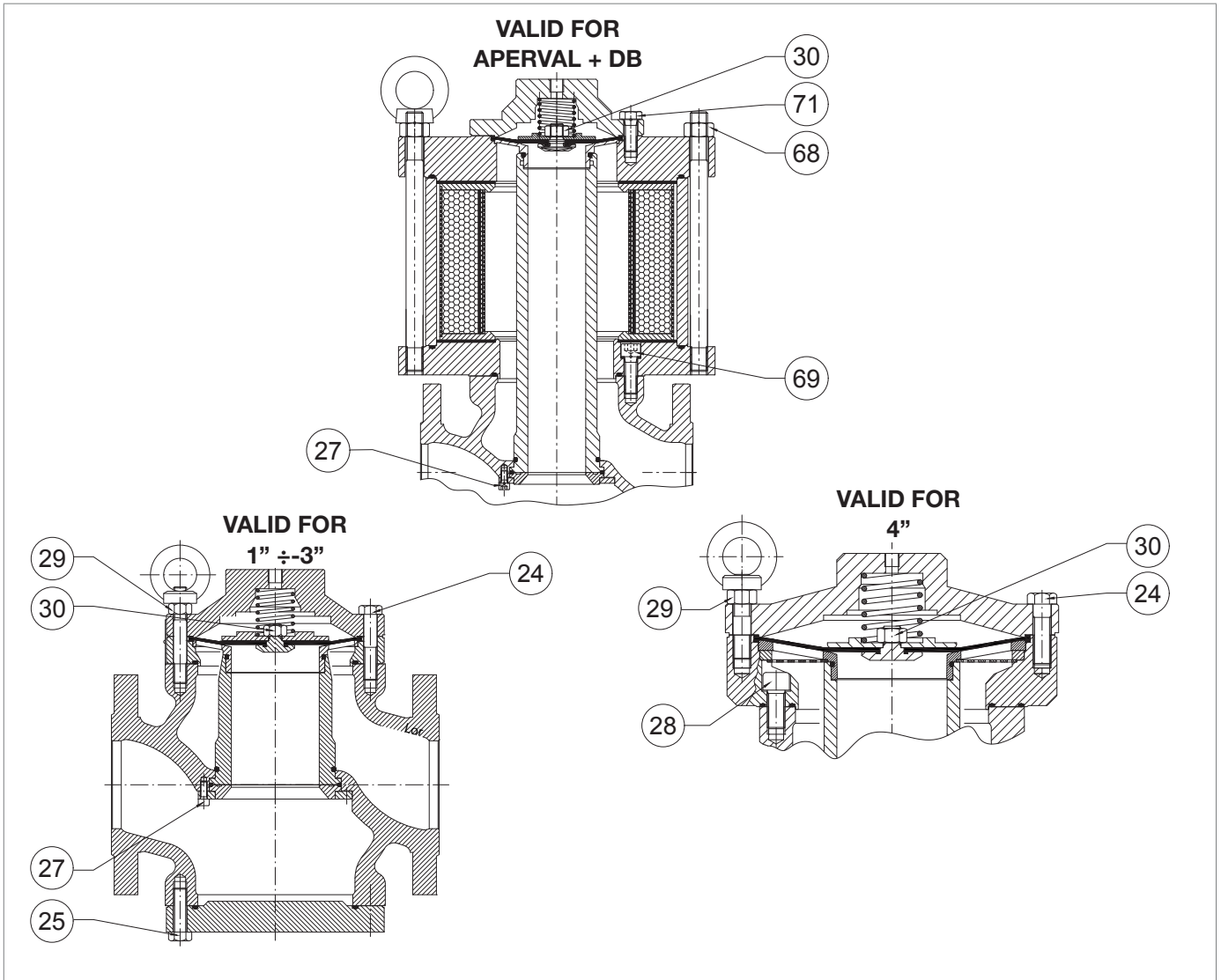


Fig. 9.35. Tightening torques APERVAL

APERVAL 3" (+DB APERVAL)

Pos.	Description	Torque (nm)	Torque (ft - lb)
24	Screw M12X60 UNI 5737	25	18
25	Screw M12X40 UNI 5739	25	18
27	Screw M6X16 UNI 5931	10	7
29	Nut M12 UNI 5588	80	59
30	Nut M12X2.5 UNI 5588	50	36
68	Nut M18 UNI 5587	200	147
69	Screw M12X40 UNI 5931	80	59
71	Screw M12X35 UNI 5739	25	18

Tab. 9.75.
APERVAL 4" (+DB APERVAL)

Pos.	Description	Torque (nm)	Torque (ft - lb)
24	Screw M12X55 UNI 5737	25	18
25	Screw M12X50 UNI 5739	25	18
27	Screw M6X14 UNI 5931	10	7
28	Screw M16X35 UNI 5931	45	33
29	Nut M16 UNI 5588	200	147
30	Nut M16 UNI 5588	80	59
68	Nut M20 UNI 5587	250	184
69	Screw M16X45 UNI 5931	200	147
71	Screw M16X55 UNI 5739	25	18

Tab. 9.76.

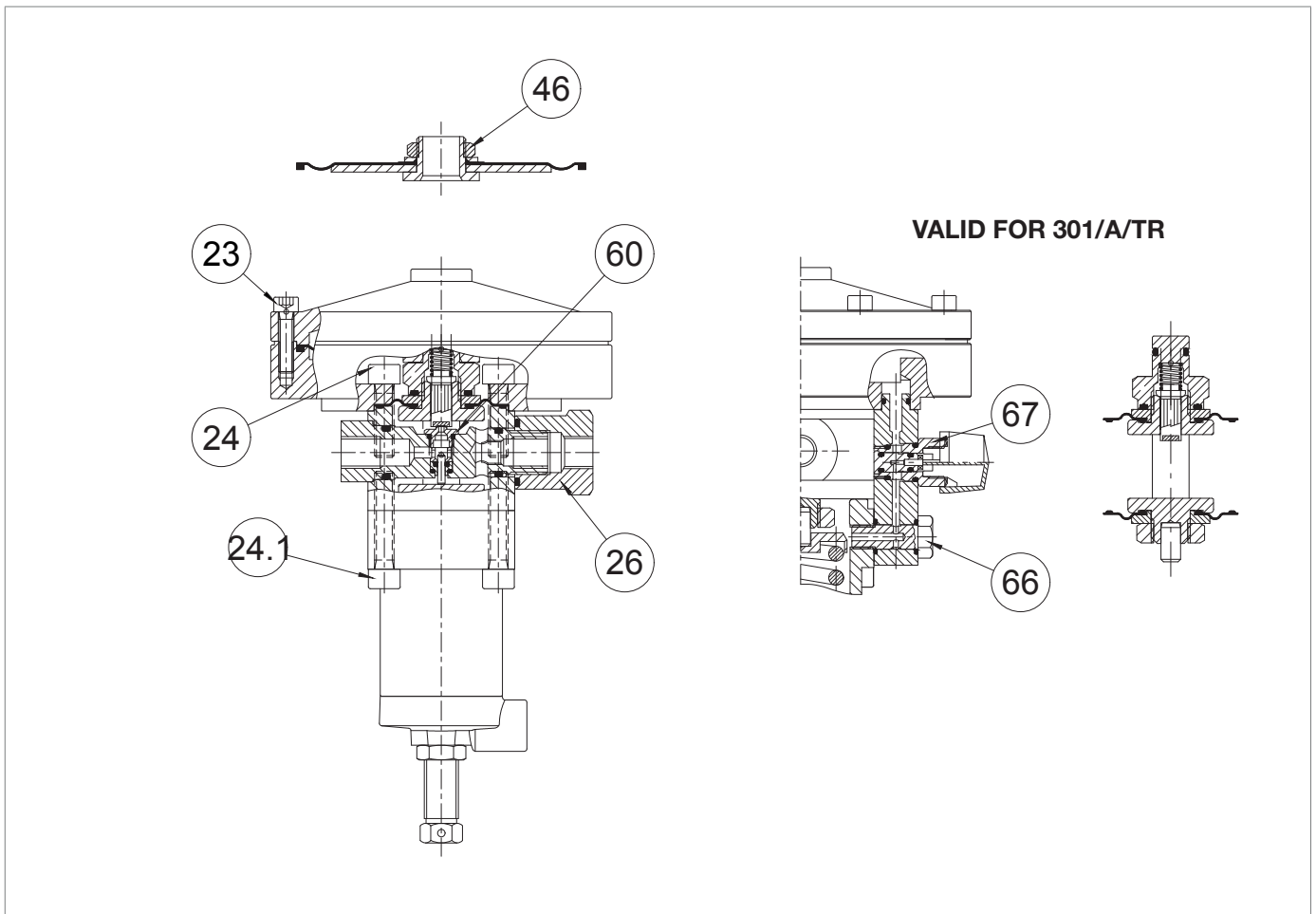
9.4.1.1 - TIGHTENING TORQUES FOR PILOTS SERIES 300


Fig. 9.36. Tightening torques for pilot 301/A and 301/A/TR

PILOT 301/A; 301/A/TR			
Pos.	Description	Torque (nm)	Torque (ft - lb)
2	Nut M16X1	20	14
23	Screw M6X25 UNI 5931 AISI	7	5
24	Screw M8X30 UNI 5931 AISI	20	14
24.1	Screw M8X40 UNI 5931 AISI	20	14
25	Nut M16X1.5	20	14
26	Nut M18X1.5	20	14
46	Nut M20X1	8	5
66	Screw G 1/8	20	14

Tab. 9.77

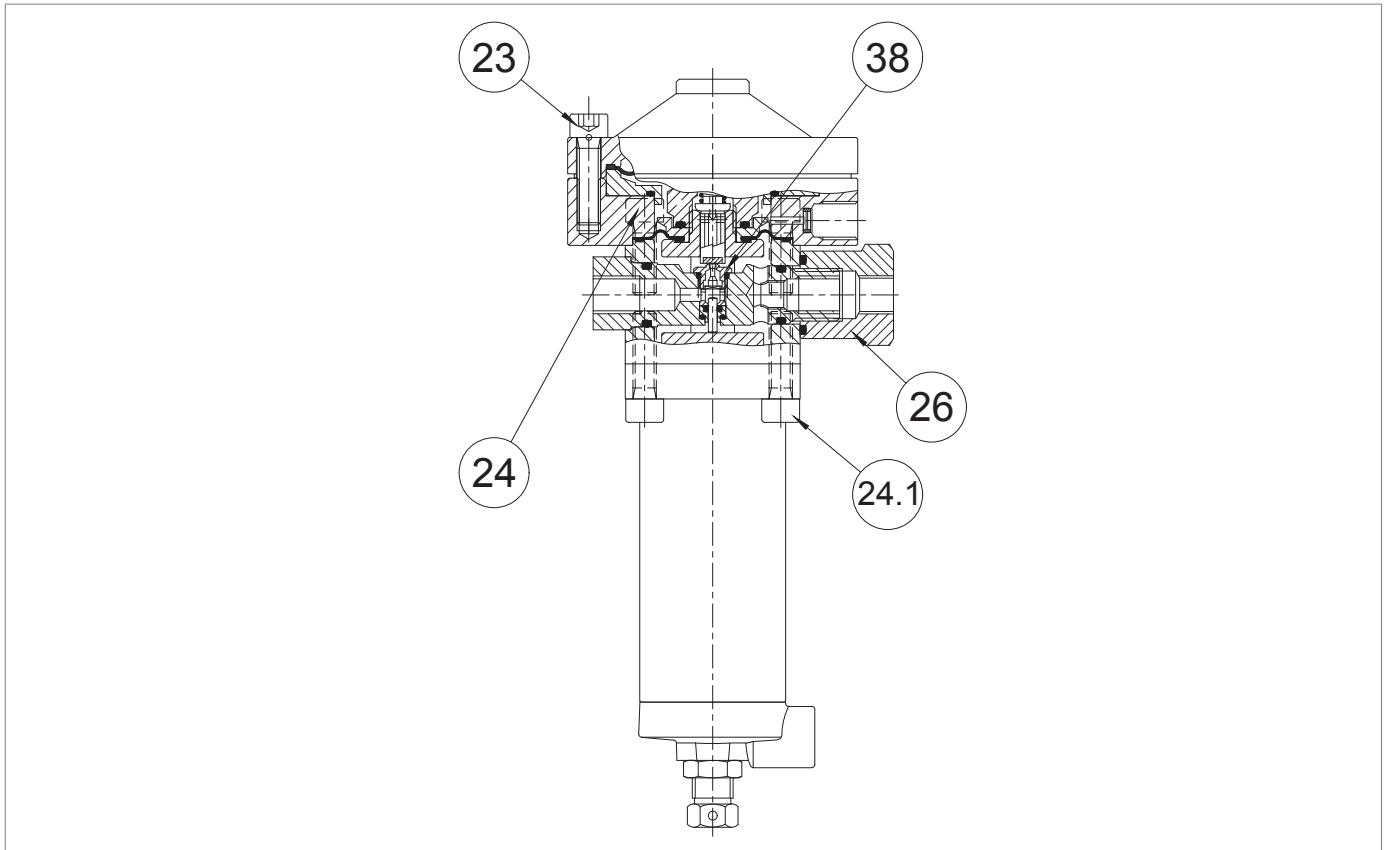


Fig. 9.37. Tightening torques for pilots 302/A

PILOT 302/A			
Pos.	Description	Torque (nm)	Torque (ft - lb)
2	Nut M16X1	20	14
23	Screw M8X30 UNI 5931 AISI	20	14
24	Screw M8X25 UNI 5931 AISI	20	14
24.1	Screw M8X30 UNI 5931 AISI	20	14
25	Nut M16X1.5	20	14
26	Nut M18X1.5	20	14
44	Nut M20X1	8	5

Tab. 9.78

9.4.1.2 - TIGHTENING TORQUES FOR LAMINATION VALVE AR100

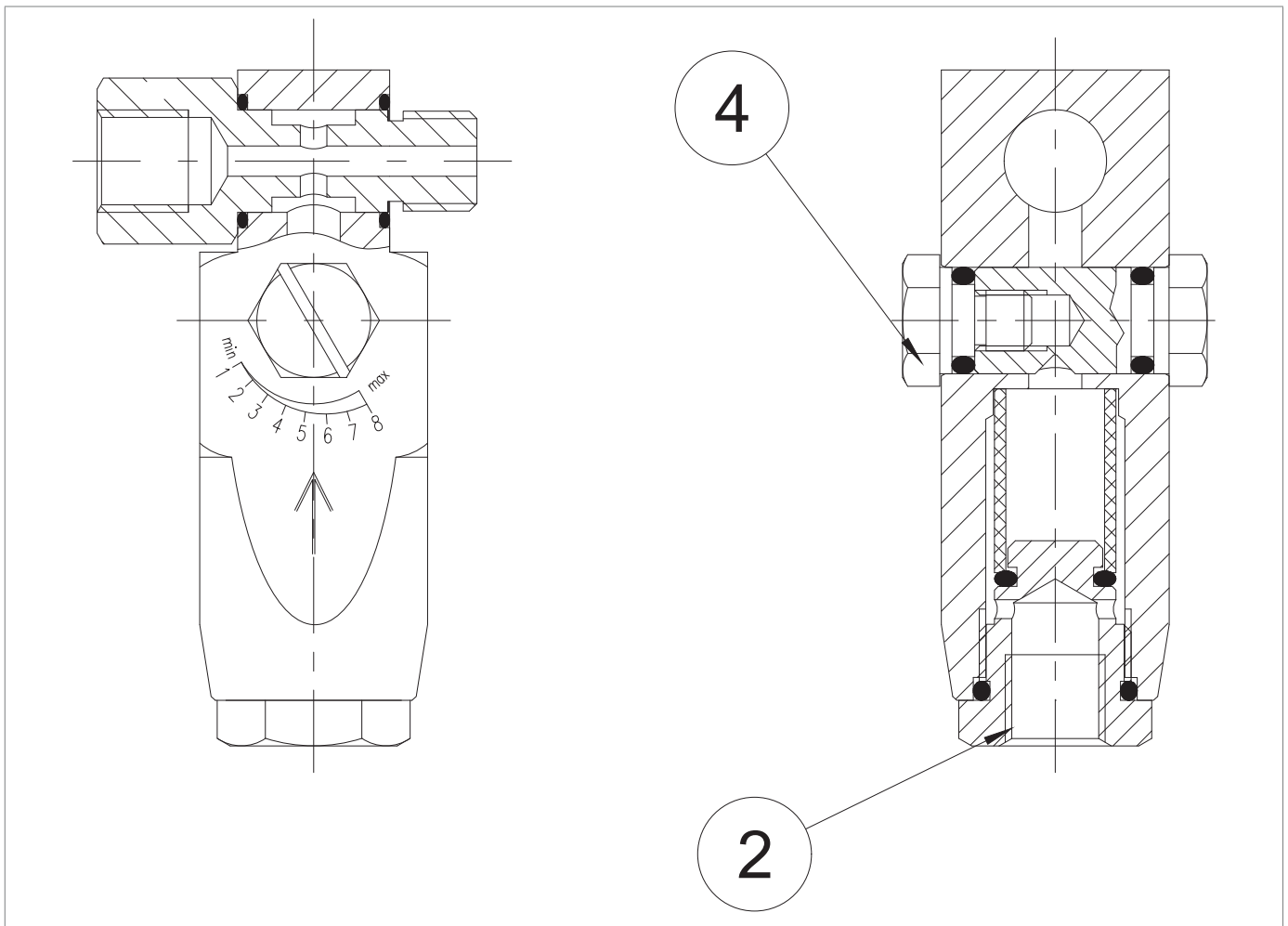


Fig. 9.38. Tightening torques for lamination valve AR100

LAMINATION VALVE AR100			
Pos.	Description	Torque (nm)	Torque (ft - lb)
2	Cap M20X1.5	20	14
4	Screw M8 AISI	4	2

Tab. 9.79

9.4.1.3 - TIGHTENING TORQUES FOR PM/182 BUILT-IN MONITOR

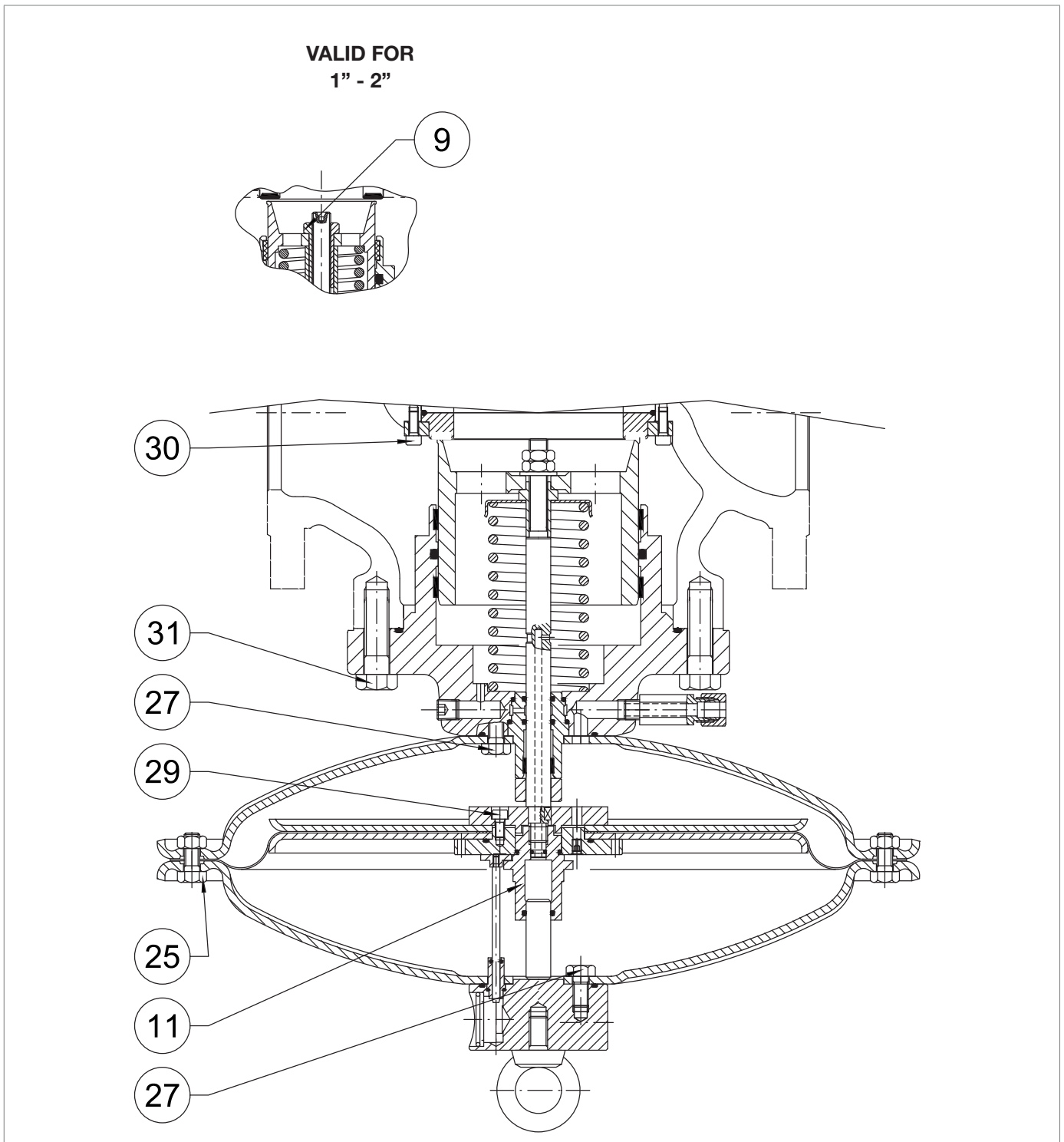


Fig. 9.39. Tightening torques for PM/182 built-in monitor

PM/182 DN 1"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
9	Nut M12	35	25
11	M12 piston guide	35	25
25	Screw M10X25 UNI 5739	30	22
27	Screw M10X20 UNI 5739	45	33
29	Screw M6X14 UNI 5931	10	7
30	Screw M6X12 UNI 5931	10	7
31	Screw M10X30 UNI 5739	45	33

Tab. 9.80.
PM/182 DN 2"

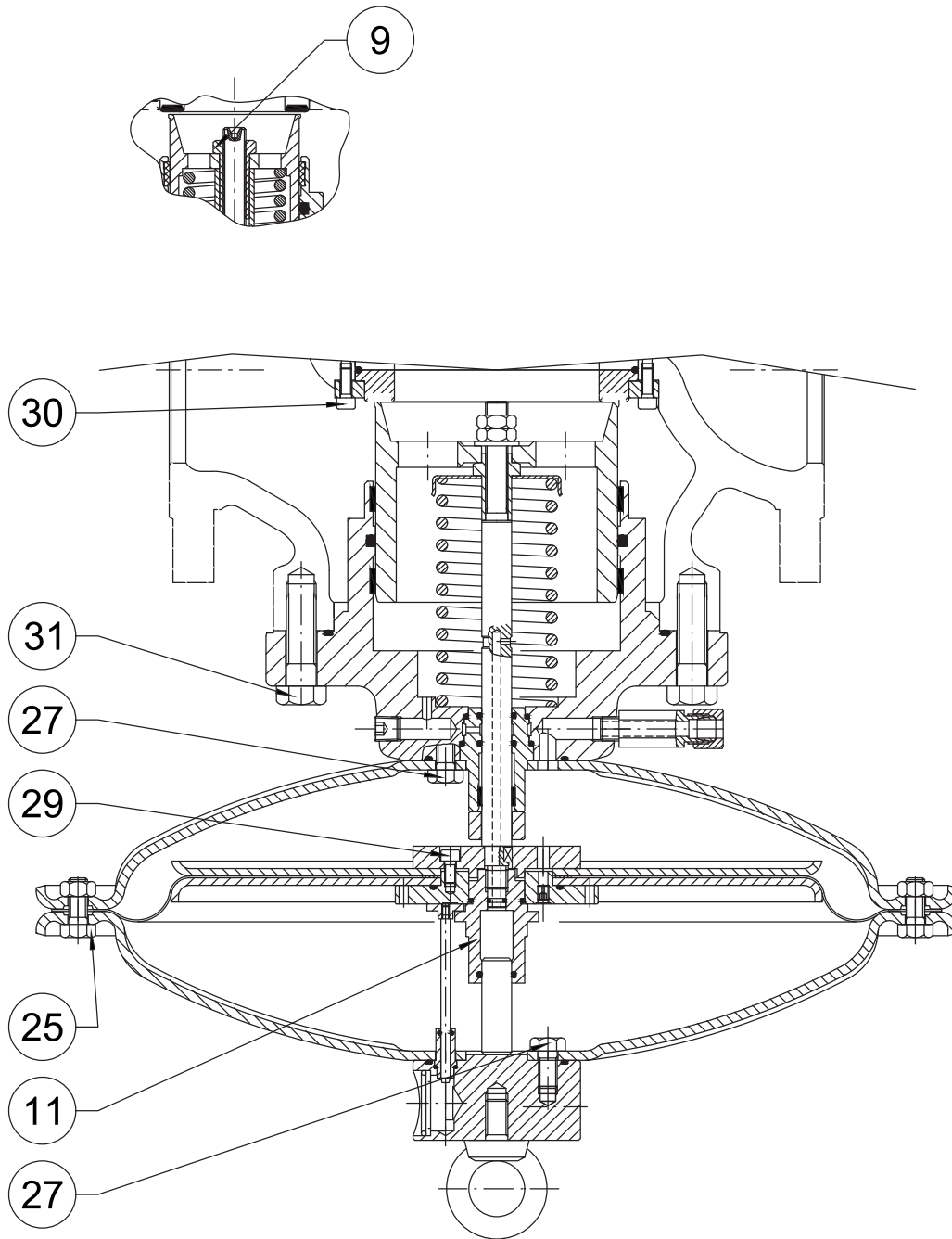
Pos.	Description	Torque (Nm)	Torque (ft - lb)
9	Nut M12	35	25
11	M12 piston guide	35	25
25	Screw M10X25 UNI 5739	30	22
27	Screw M10X20 UNI 5739	45	33
29	Screw M6X14 UNI 5931	10	7
30	Screw M6X12 UNI 5931	10	7
31	Screw M12X35 UNI 5739	80	59

Tab. 9.81.
PM/182 DN 2" ½

Pos.	Description	Torque (Nm)	Torque (ft - lb)
11	M12 piston guide	35	25
25	Screw M10X25 UNI 5739	30	22
27	Screw M10X20 UNI 5739	45	33
29	Screw M6X14 UNI 5931	10	7
30	Screw M6X12 UNI 5931	10	7
31	Screw M12X40 UNI 5739	80	59

Tab. 9.82.

VALID FOR
VALID FOR REV. 182 1" - 2"



Tightening torques for PM/182 built-in monitor

PM/182 DN 3"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
11	M12 piston guide	35	25
25	Screw M10X25 UNI 5739	30	22
27	Screw M10X20 UNI 5739	45	33
29	Screw M6X14 UNI 5931	10	7
30	Screw M6X12 UNI 5931	10	7
31	Screw M12X40 UNI 5739	80	59

Tab. 9.83.
PM/182 DN 4"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
11	M12 piston guide	35	25
25	Screw M10X25 UNI 5739	30	22
27	Screw M10X20 UNI 5739	45	33
29	Screw M6X14 UNI 5931	10	7
30	Screw M6X16 UNI 5931	10	7
31	Screw M16X50 UNI 5739	150	110

Tab. 9.84.

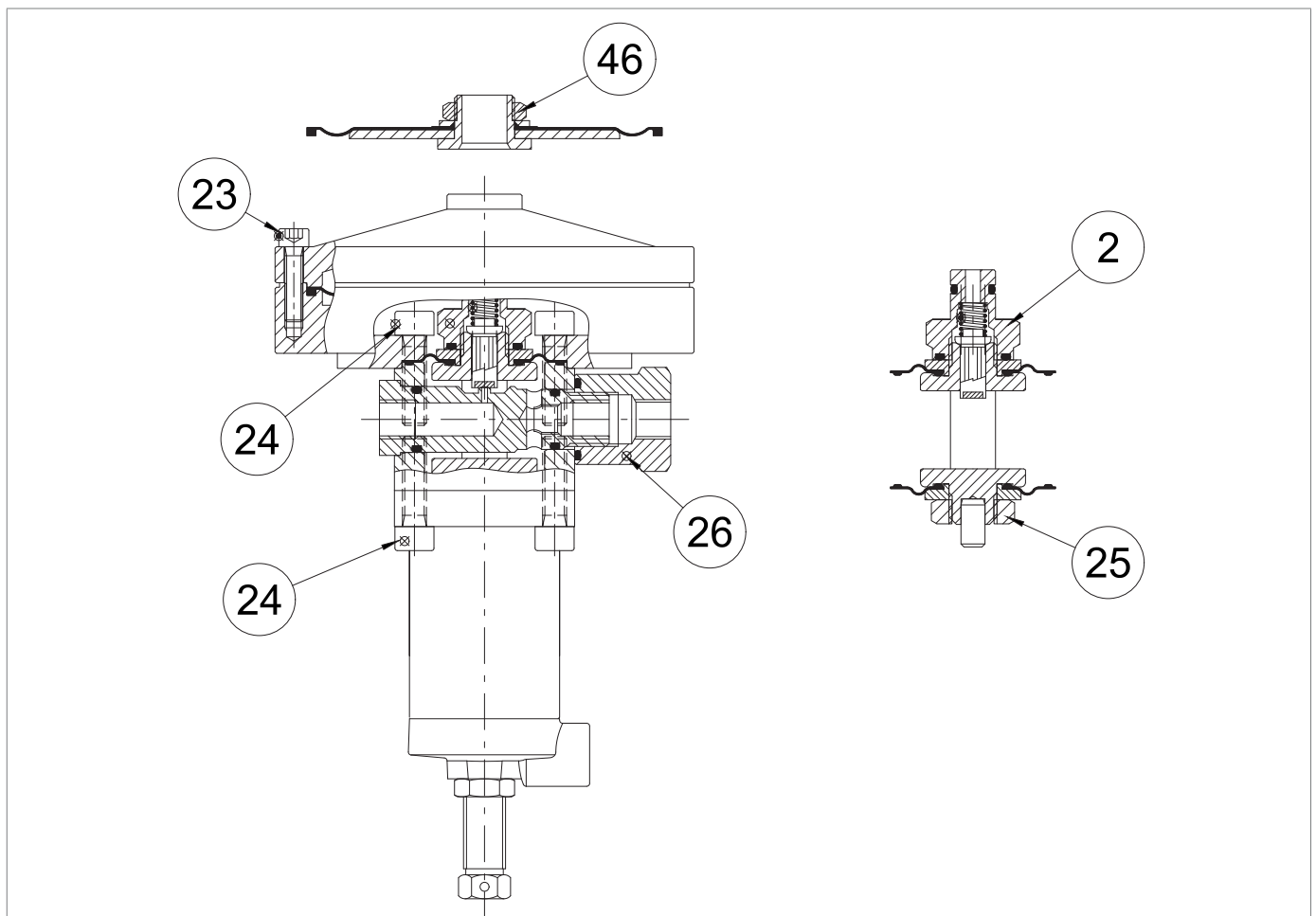
9.4.1.4 - TIGHTENING TORQUES FOR PILOTS SERIES 200


Fig. 9.40. Tightening torques for 201/A pilot

PILOTS 201/A			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
2	Nut M16X1	25	18
23	Screw M6X25 UNI 5931	7	5
24	Screw M8X30 UNI 5931	20	14
25	Nut M16x1.5	25	18
26	Nut M16x1.5	20	14
46	Nut M20x1	8	5

Tab. 9.85.

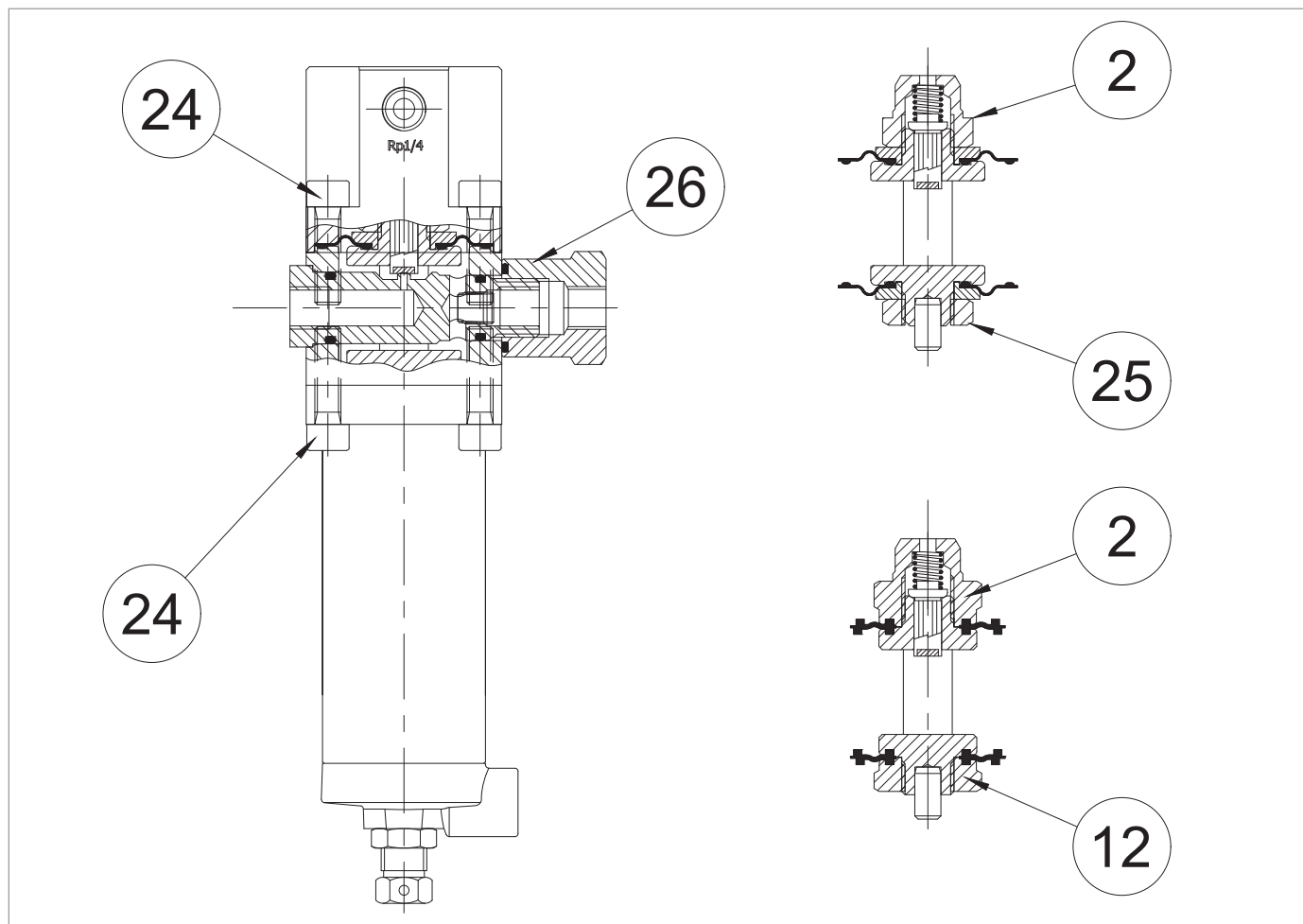


Fig. 9.41. Tightening torques for pilots 204

PILOTS 204/A			
Pos.	Description	Torque (nm)	Torque (ft - lb)
2	Nut M16X1	25	18
24	Screw M8X30 UNI 5931 AISI	20	14
25	Nut M16X1.5	25	18
26	Nut M18X1.5	20	14

Tab. 9.86

9.4.1.5 - TIGHTENING TORQUES FOR PRE-REGULATORS

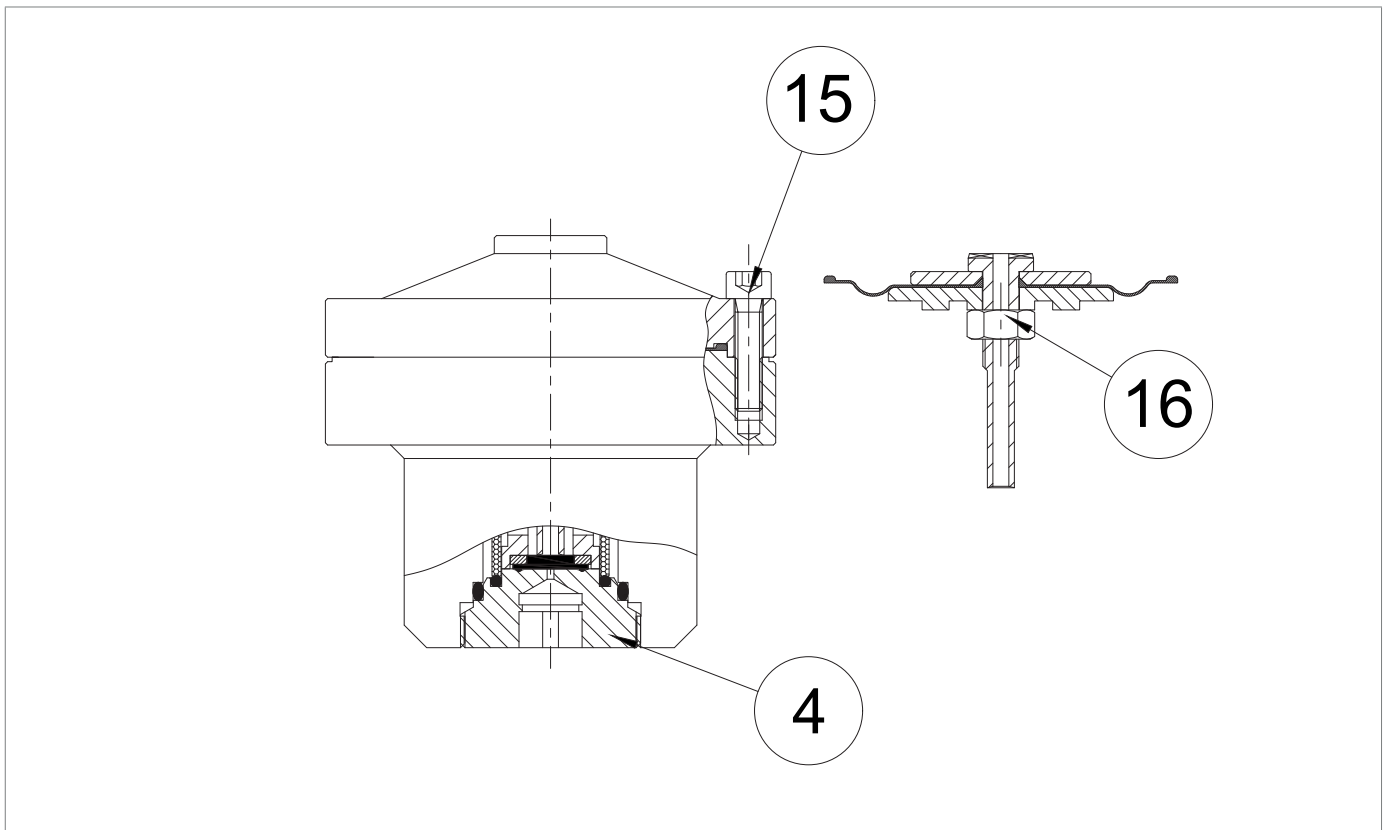


Fig. 9.42. Pre-regulator R31/A tightening torques

PRE-REGULATOR R31/A			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
4	Cap	35	25
30	Nut M6x25 UNI 5931	8	5
32	Nut M8 UNI 5588	7	5

Tab. 9.87.

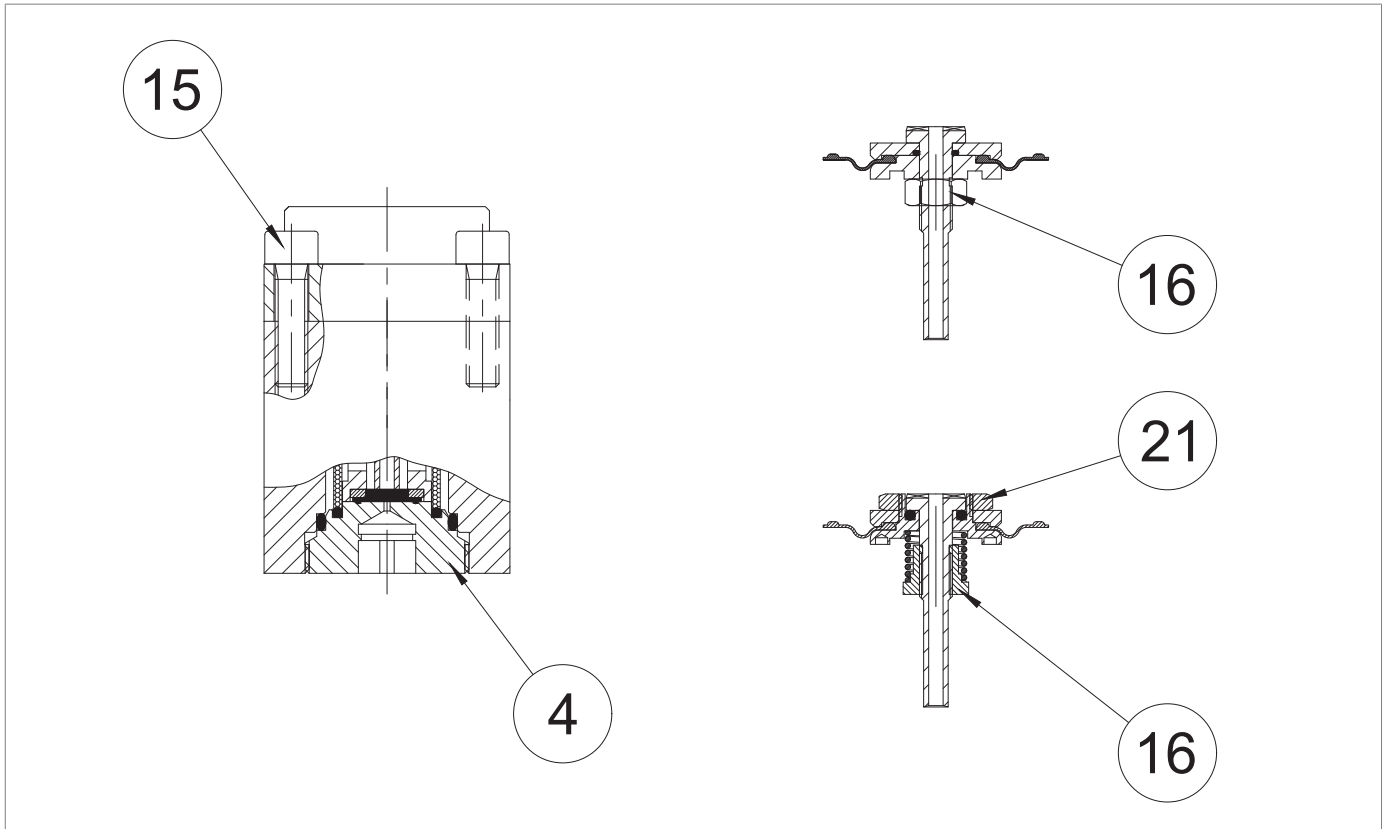


Fig. 9.43. Pre-regulator R14/A tightening torques

PRE-REGULATOR R14/A			
Pos.	Description	Torque (Nm)	Torque (ft - lb)
4	Cap	35	25
15	Nut M8x30 UNI 5931	20	14
16	Nut M8 UNI 5588	8	5

Tab. 9.88.

9.4.1.6 - TIGHTENING TORQUE SA SLAM-SHUT VALVE

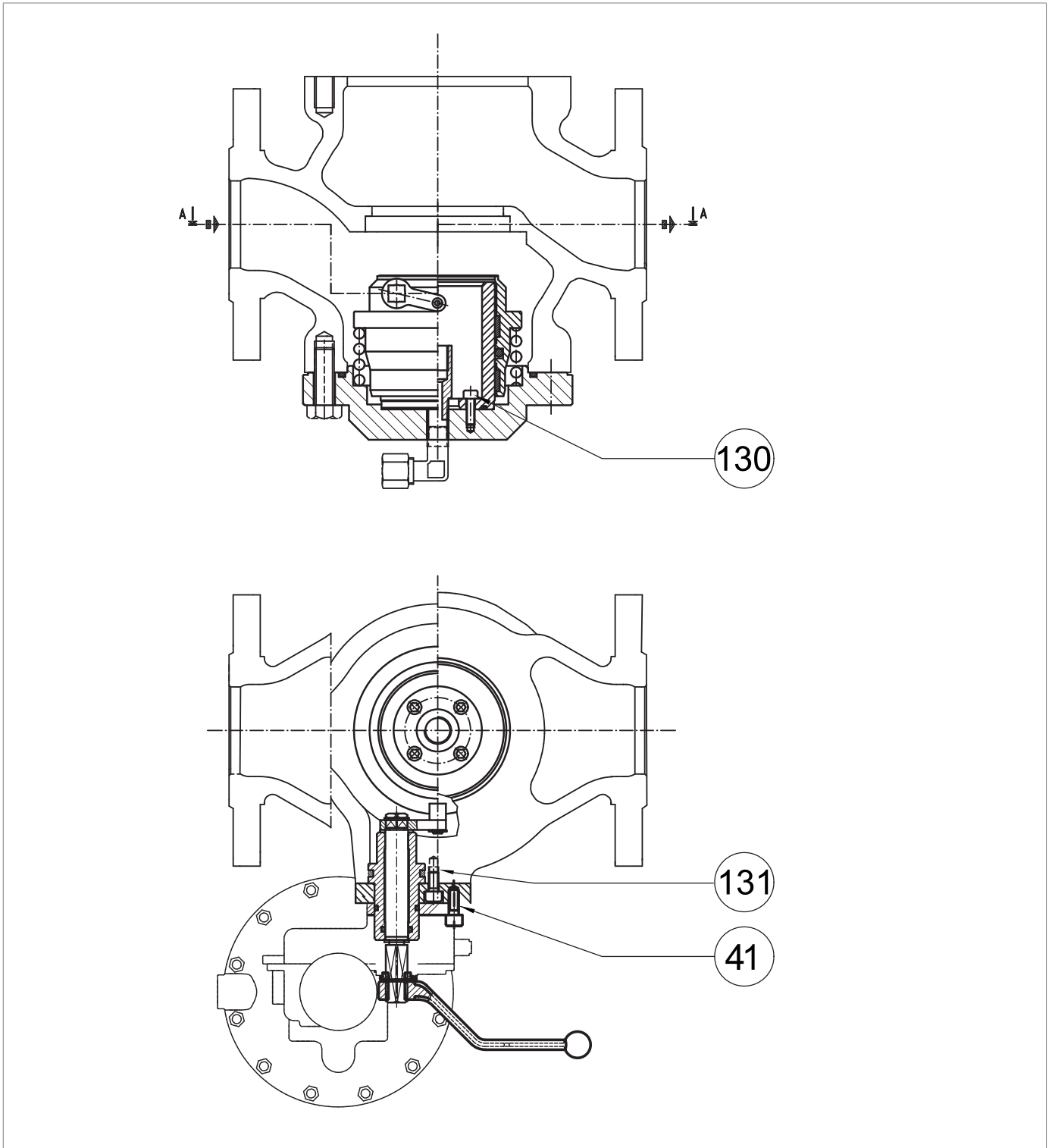


Fig. 9.44. SA slam-shut valve tightening torques

SA 1"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
41	Screw M6X12 UNI 5931	10	7
130	Screw M5X16 UNI 5931	10	7
131	Screw M6X12 UNI 5931	10	7

Tab. 9.89.
SA 2"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
41	Screw M6X12 UNI 5931	10	7
130	Screw M5X16 UNI 5931	10	7
131	Screw M6X12 UNI 5931	10	7

Tab. 9.90.
SA 2" ½

Pos.	Description	Torque (Nm)	Torque (ft - lb)
41	Screw M6X12 UNI 5931	10	7
130	Screw M5X16 UNI 5931	10	7
131	Screw M6X12 UNI 5931	10	7

Tab. 9.91.
SA 3"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
41	Screw M6X12 UNI 5931	10	7
130	Screw M5X16 UNI 5931	10	7
131	Screw M6X12 UNI 5931	10	7

Tab. 9.92.
SA 4"

Pos.	Description	Torque (Nm)	Torque (ft - lb)
41	Screw M6X12 UNI 5931	10	7
130	Screw M5X16 UNI 5931	10	7
131	Screw M6X12 UNI 5931	10	7

Tab. 9.93.

9.4.1.7 - TIGHTENING TORQUE CONTROL PRESSURE SWITCH SA-91, SA-92, SA-93

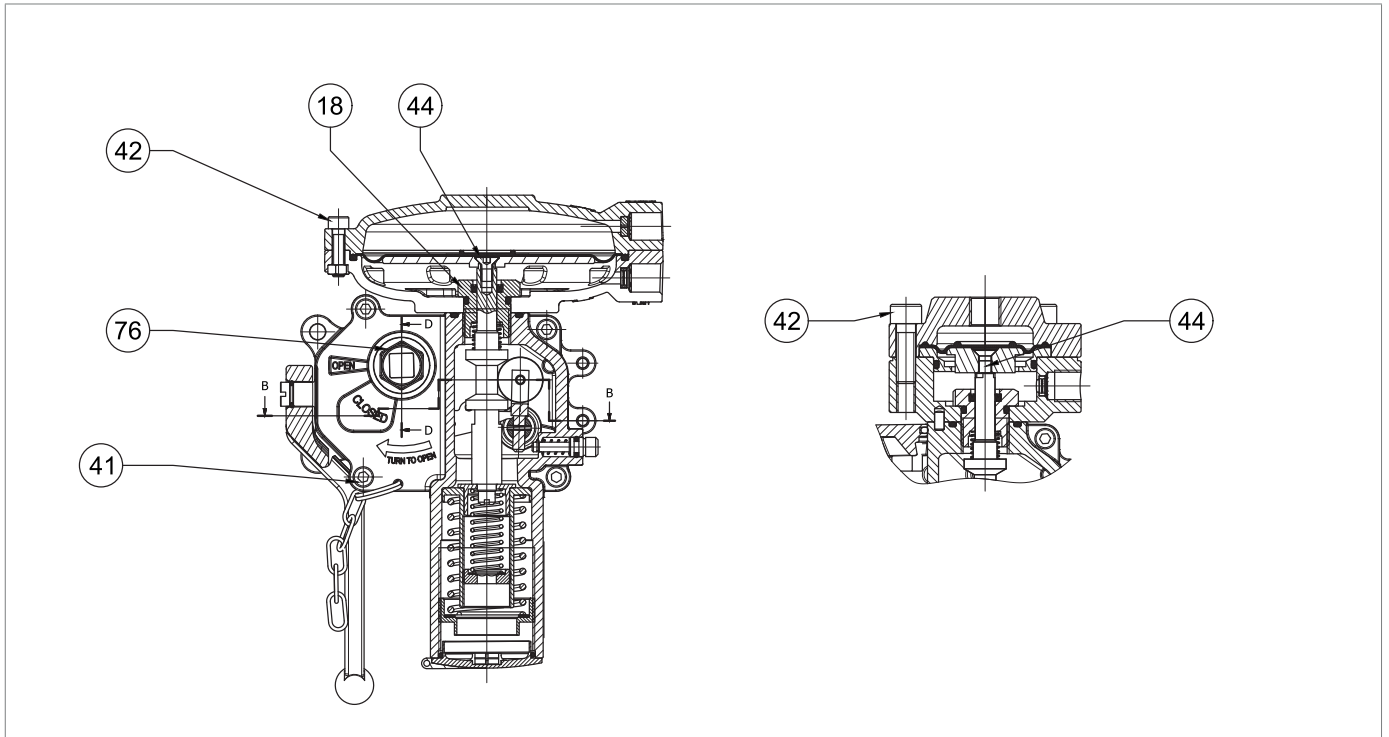


Fig. 9.45. Tightening torques locking mechanism SA-91, SA-92, SA-93

SA/91

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

Tab. 9.94.
SA/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

Tab. 9.95.
SA-93

Pos.	Description	Torque (Nm)	Torque (ft - lb)
18	Slam-shut device guide	45	33
41	Screw M5X10 UNI 5931	4	2
42	Screw M8X25 UNI 5931	16	11
44	Screw M5X16 UNI 5933	5	3

Tab. 9.96.

9.4.2 - REPLACING ELEMENTS SUBJECT TO WEAR AND ABRASION

9.4.2.1 - INITIAL OPERATIONS

WARNING!

After discharging the pressure from the line, trigger the slam-shut valve.


ATTENTION!

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

ATTENTION!

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

Proceed as follows:

Step	Action
1	Unscrew the conical seal fittings to disconnect all power outlets and sensing lines for the pilot and regulator.
2	Loosen the nut securing the pilot support bracket to the regulator.
3	Remove the following from the regulator: <ul style="list-style-type: none"> the installed series 300 pilot; the AR100 lamination valve. <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <p> NOTICE!</p> <p>To replace the components of the piloting unit, refer to paragraphs “1.4.3 - Regulator Maintenance Procedure APERVAL” and “1.4.6 - PM/182 built-in monitor maintenance”.</p> </div>

Tab. 9.97

9.4.2.2 - CROSS DIAGRAM FOR TIGHTENING SCREWS

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

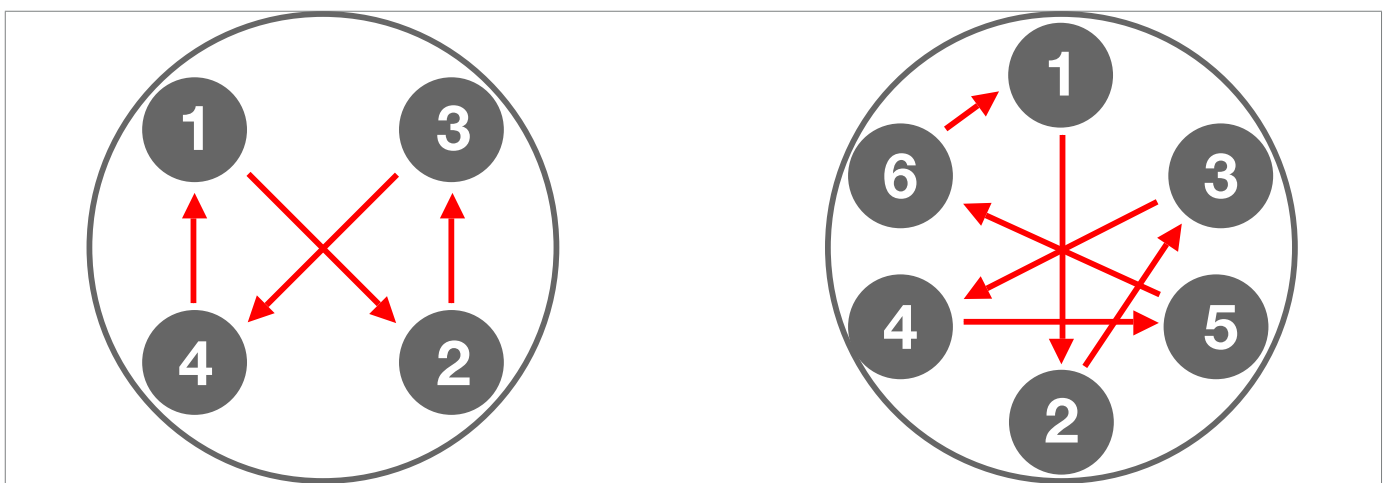


Fig. 9.46. Cross diagram

9.4.3 - REGULATOR MAINTENANCE PROCEDURE APERVAL

9.4.3.1 - APERVAL 1" - 3"

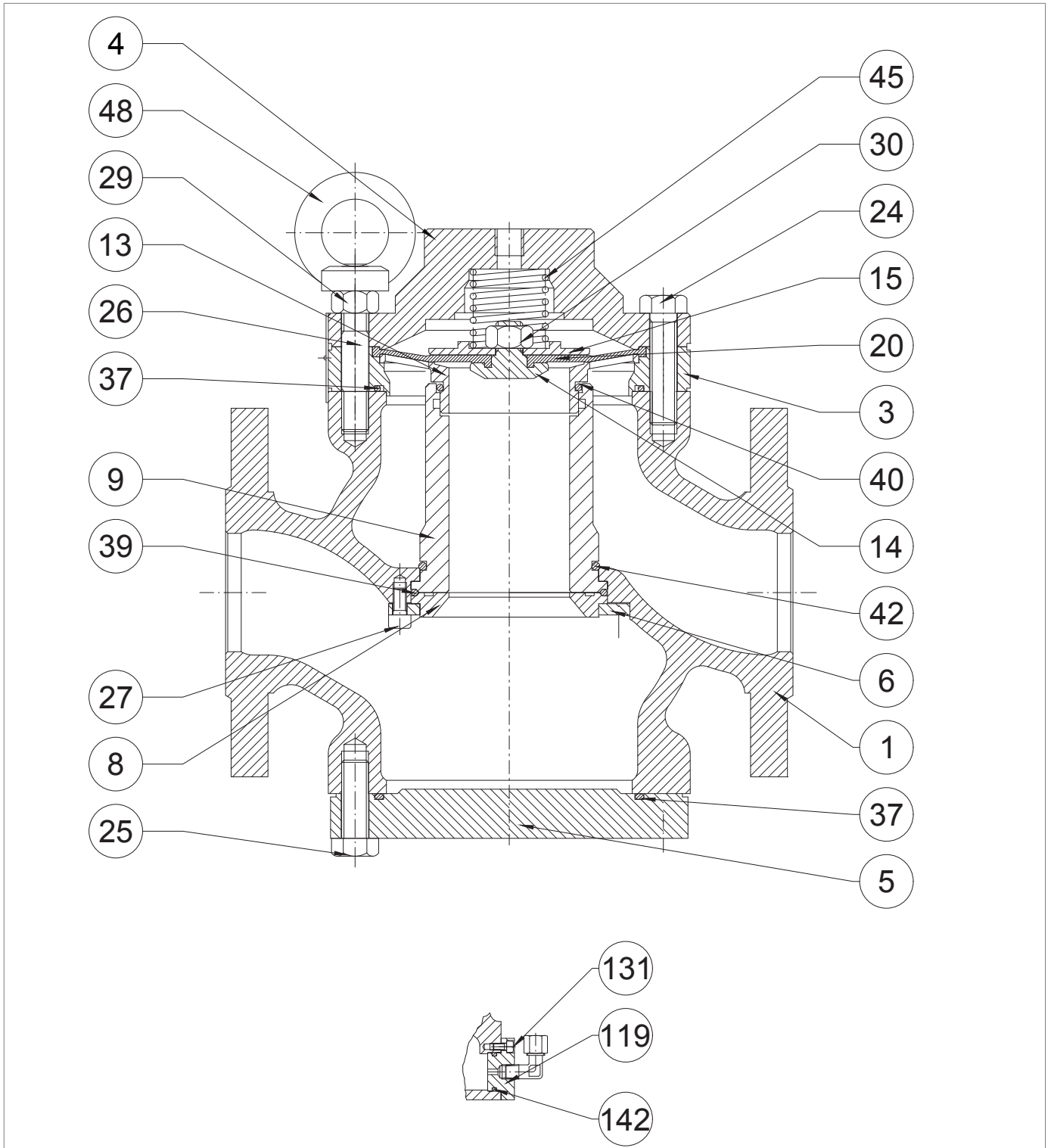
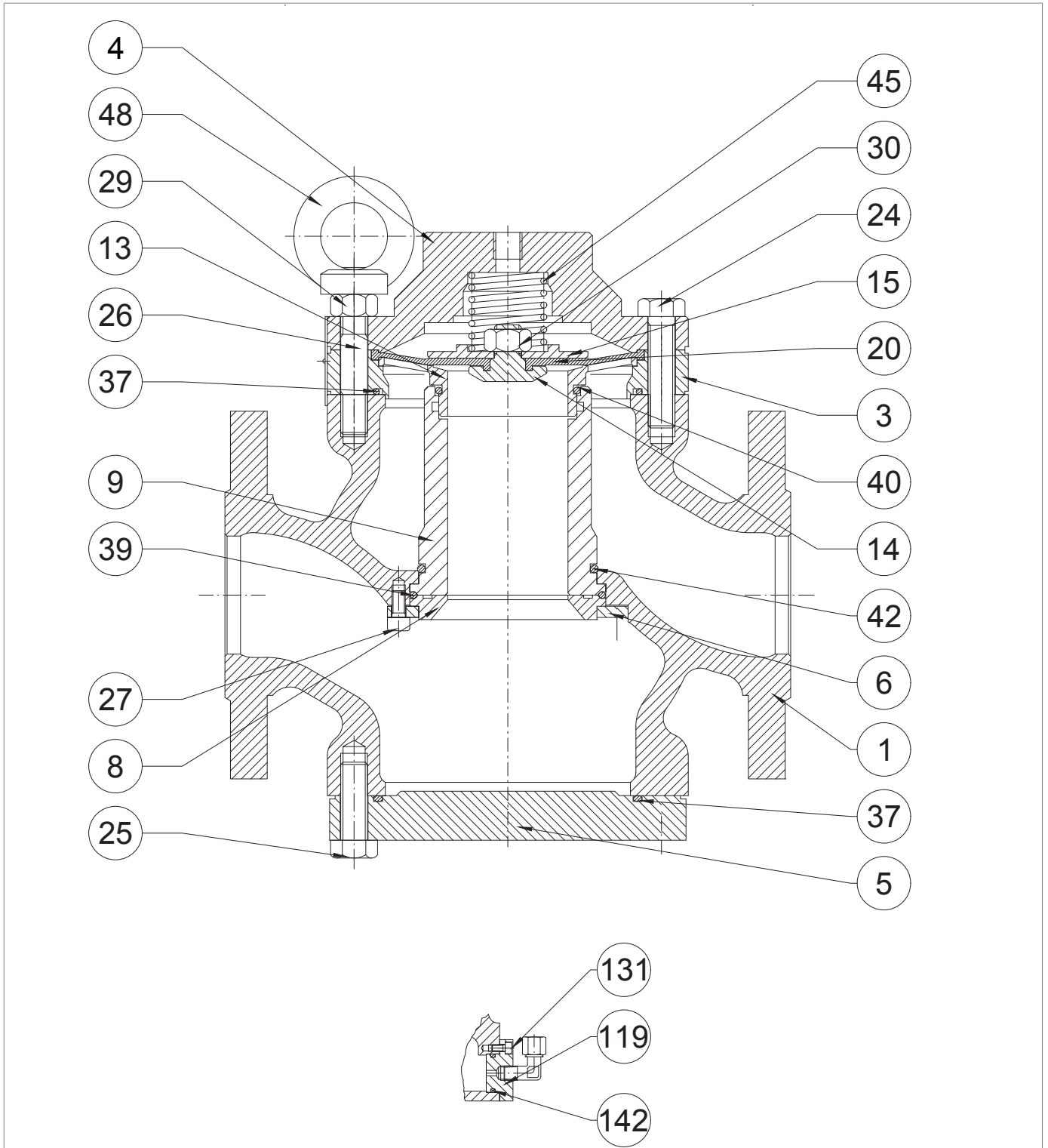


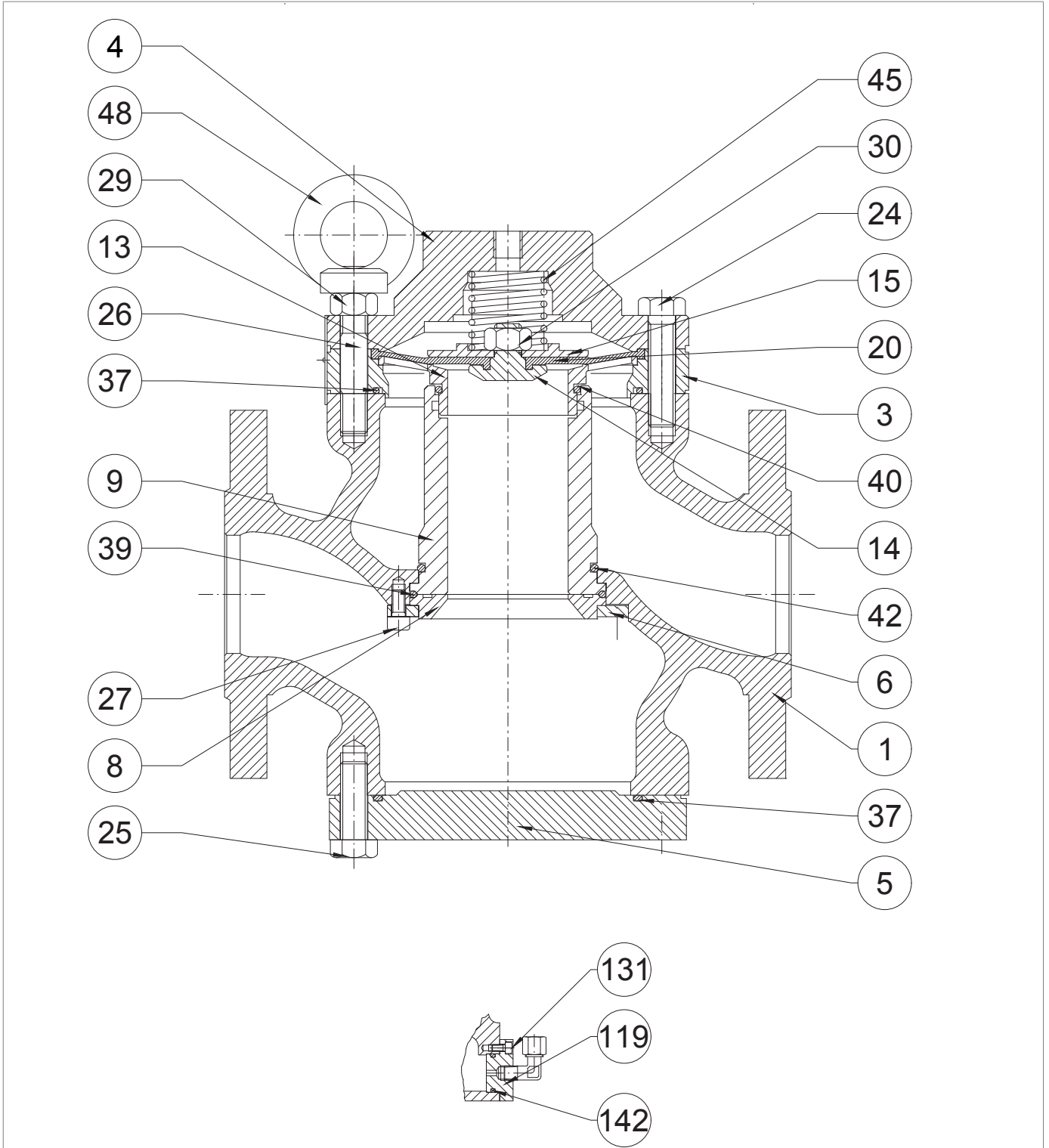
Fig. 9.47. Regulator APERVAL 1" - 3"

Step	Action
1	Unscrew and remove the fixing screws (24).
2	Unscrew and remove the nuts (48).
3	Unscrew and remove the nuts (29).
4	Remove the upper lid (4).
5	Remove the spring (45).
6	Take out the diaphragm unit (14, 15, 20, 30).
7	Unscrew and remove the nut (30). NOTICE! During this phase, keep the screw (14) still.
8	Remove the diaphragm protection disc (15).
9	Remove and replace the diaphragm (20) from the screw (14), taking care to lubricate the lanyard with synthetic grease.
10	Assemble the diaphragm unit, placing the diaphragm (20) in the screw (14). NOTICE! Carefully place the diaphragm O-ring (20) into the screw slot (14).
11	Fit the diaphragm protection disc (15).
12	Insert and fix the nut (30) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 NOTICE! During this phase, keep the screw (14) still.
13	Remove the grid (13). NOTICE! Take care not to damage the grid seat profile (13).
14	Remove the O-ring (40) from the grid (13) 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
15	Remove the intermediate flange (3).
16	Remove the O-ring (37) from the intermediate flange (3) 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
17	Undo and remove the screws (25). NOTICE! Support the flange to prevent it from falling.
18	Remove the blind flange (5) or any built-in accessory (SA slam-shut valve or PM/182 monitor).







Regulator APERVAL 1" - 3"

Step	Action
19	Remove the O-ring (37) from the blind flange (5) 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>
20	! WARNING! Support the sleeve (9) during the next steps to prevent it from falling.
21	Undo and remove the screws (27).
22	Remove the locking ring (6), the conical seat (8) and the O-ring (39). <div style="border: 1px solid black; padding: 5px;">! NOTICE! If the SA slam-shut valve or the built-in monitor PM/182 is fitted, the reinforced gasket (63) replaces the conical seat (8).</div>
23	Remove the sleeve (9) from the top downwards, exerting slight pressure.
24	Remove the O-ring (42) from the sleeve (9) 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>
25	Clean the upper and lower bearing surfaces of the body (1), the flanges, the contact surfaces between the sleeve (9), conical seat (8) and the body (1).
26	Place the sleeve (9) in the body (1) from top to bottom, exerting slight pressure. <div style="border: 1px solid black; padding: 5px;">! NOTICE! Take care not to damage the O-ring (42).</div>
27	Replace the O-ring (39) from the sleeve (9), 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>
28	Put the conical seat (8) back in place together with the O-ring (39), the locking ring (6). <div style="border: 1px solid black; padding: 5px;">! NOTICE! If the SA slam-shut valve or the built-in monitor PM/182 is fitted, the reinforced gasket (63) replaces the conical seat (8).</div>
29	Insert and fix the screws (27) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 <div style="border: 1px solid black; padding: 5px;">! NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws".</div>
30	Position the blind flange (5) or any built-in accessory (SA slam-shut valve or PM/182 monitor). <div style="border: 1px solid black; padding: 5px;">! NOTICE! Support the flange to prevent it from falling.</div>



Regulator APERVAL 1" - 3"

Step	Action
31	Insert and fix the screws (25) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
32	Fit the intermediate flange (3).
33	Fit the grid (13).
34	Put the diaphragm unit (14, 15, 20, 30) in place. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">  NOTICE! Take care to lubricate the retaining slots with synthetic grease. </div>
35	Fit the spring (45).
36	Fit the upper cover (4).
37	Insert and fix the screws (24) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
38	Insert and fix the nuts (29).
39	Insert the eyebolts (48).
40	Unscrew and remove the screws (131).
41	Remove the cap (119).
42	Remove the O-ring (142) from the cap (119) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
43	Clean and lubricate the hole on the body (1).
44	Insert the cap (119).
45	Insert and fix the screws (131) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75

Tab. 9.98

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.3.2 - REGULATOR APERVAL 4"

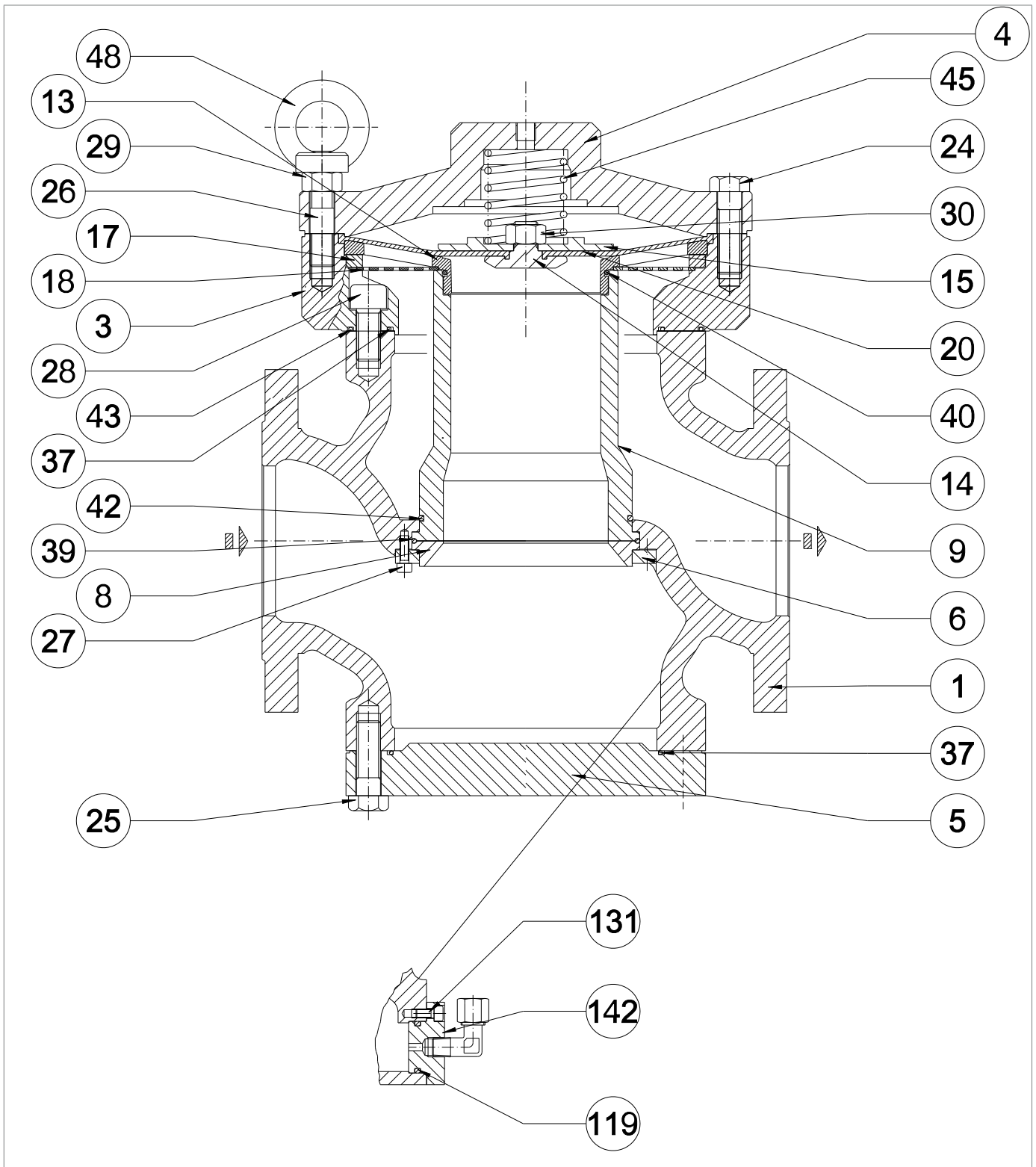
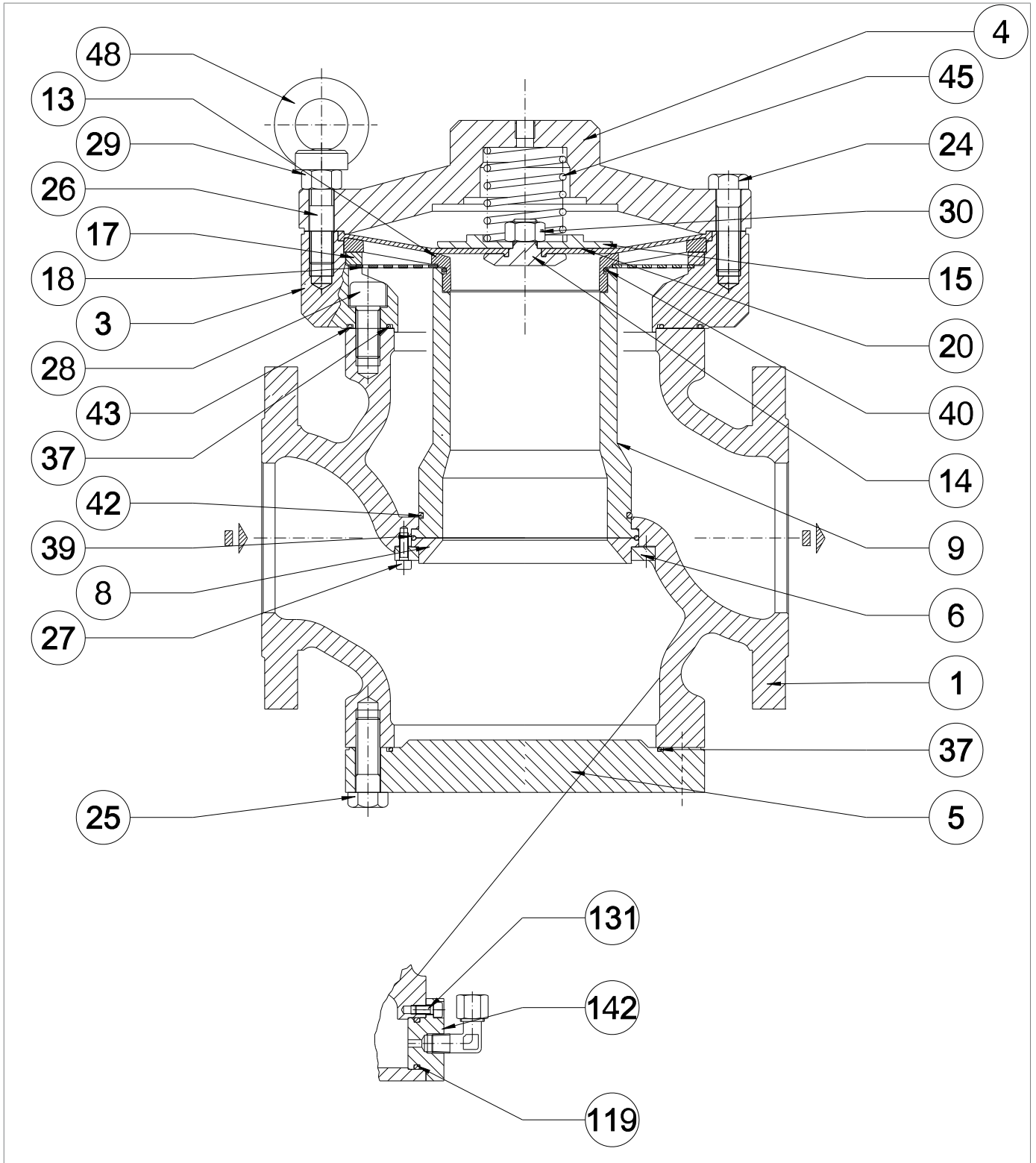


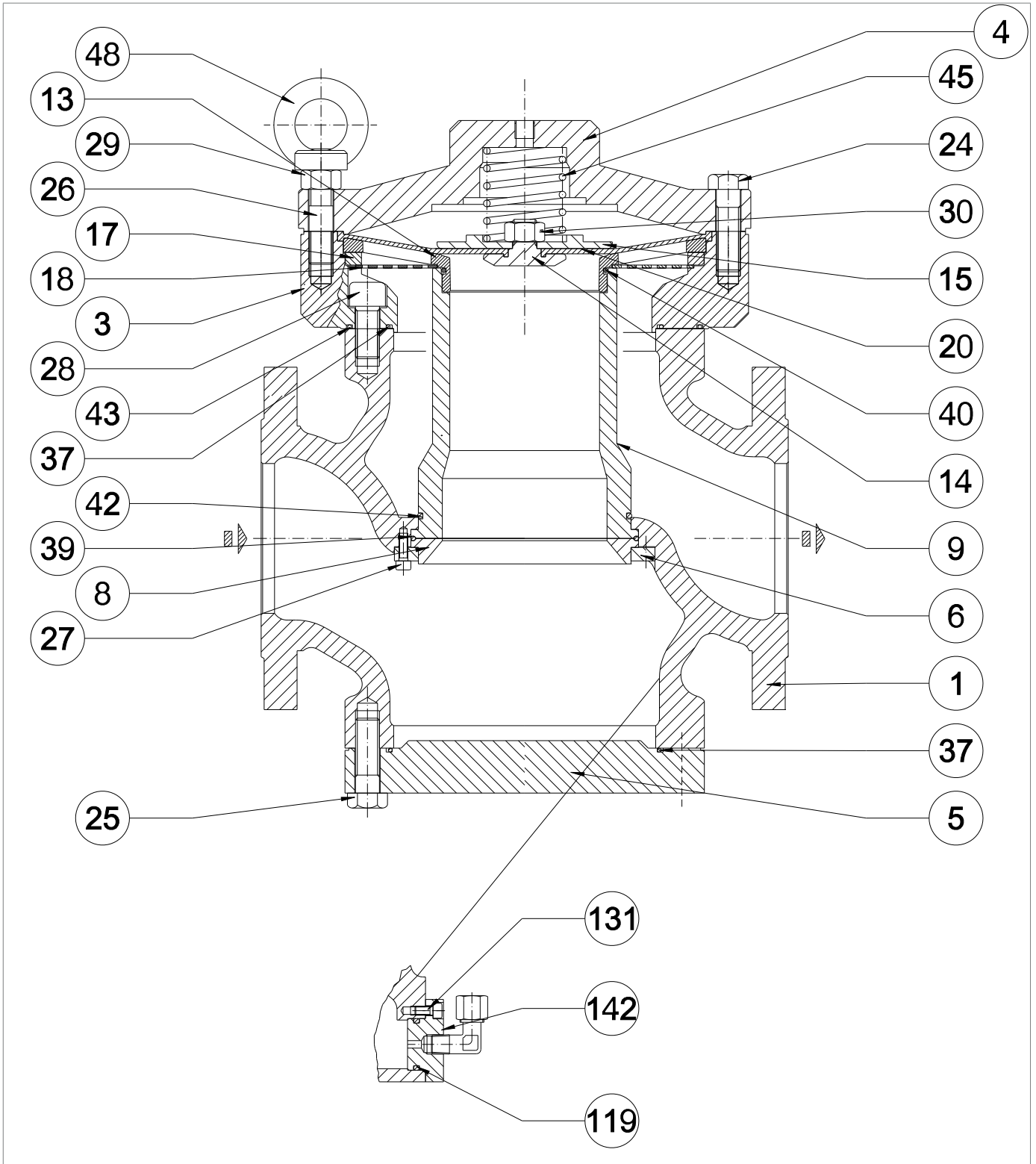
Fig. 9.48. Regulator APERVAL 4"

Step	Action
1	Unscrew and remove the nuts (29).
2	Unscrew and remove the nuts (48).
3	Undo and remove the screws (24).
4	Remove the upper lid (4).
5	Remove the spring (45).
6	Take out the diaphragm unit (14, 15, 20, 30).
7	Unscrew and remove the nut (30).
8	Remove the diaphragm protection disc (15).
9	Remove the diaphragm (20) and remove it from the screw (14). NOTICE! Lubricate the lanyard with synthetic grease.
10	Fit the diaphragm protection disc (15).
11	Fix the nut (30) according to the following tightening torques: • 4": Tab. 1.76
12	Remove the grid (13).
13	Remove the O-ring (40) from the grid (13) 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	Remove the support ring (17).
15	Remove the flow-filter grid (18)
16	Unscrew and remove the screws (28) from the intermediate flange (3).
17	Remove the intermediate flange (3).
18	Remove the O-rings (37, 43) from the intermediate flange (3) and replace them, taking care to lubricate them with synthetic grease. NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
19	Undo the screws (25). NOTICE! Support the blind flange (5) during the phase to prevent it from falling off.
20	Remove the blind flange (5) or any built-in accessory (SA slam-shut valve or PM/182 monitor).
21	Remove the O-ring (37) from the blind flange (5) 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.
22	WARNING! Support the sleeve (9) during the next steps to prevent it from falling.
23	Undo and remove the screws (27).
24	Remove ring (6), conical seat (8) and O-ring (39). NOTICE! If the SA slam-shut valve or the built-in monitor PM/182 is fitted, the reinforced gasket (63) replaces the conical seat (8).





Regulator APERVAL 4''

Step	Action
25	Remove the sleeve (9) from the top downwards.
26	Remove the O-ring (42) from the sleeve (9) 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.
27	Clean the upper and lower bearing surfaces of the body (1) and the flanges (2, 5), the contact surfaces between the sleeve (9), conical seat (8) and the body (1).
28	Insert the sleeve (9) of the body from the bottom upwards.
29	Replace the O-ring (39) and lubricate it with synthetic grease.
30	Position the conical seat (8), ring (6) and O-ring (39). NOTICE! If the SA slam-shut valve or the built-in monitor PM/182 is fitted, the reinforced gasket (63) replaces the conical seat (8).
31	Insert and fix the screws (27) according to the following tightening torques: • 4": Tab. 1.76 NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws".
32	Position the blind flange (5) or any built-in accessory (SA slam-shut valve or PM/182 monitor). NOTICE! Support the flange to prevent it from falling.
33	Insert and fix the screws (25) according to the following tightening torques: • 4": Tab. 1.76 NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws".
34	Fit the intermediate flange (3). NOTICE! Make sure that the supply hole of the AR100 lamination valve faces upstream.
35	Insert and fix the screws (28) according to the following tightening torques: • 4": Tab. 1.76 NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws".
36	Place the flow-filter grid (18).
37	Position the support ring (17).
38	Fit the grid (13).
39	Put the diaphragm unit (14, 15, 20, 30) in place and lubricate the retaining slots with synthetic grease.
40	Fit the spring (45).
41	Fit the upper cover (4).



Regulator APERVAL 4''

Step	Action
42	Insert and fix the screws (24) according to the following tightening torques: <ul style="list-style-type: none"> • 4": Tab. 1.76 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
43	Insert and fix the nuts (29).
44	Insert the eyebolts (48).
45	Unscrew and remove the screws (131).
46	Remove the cap (119).
47	Remove the O-ring (142) from the cap (119) 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>
48	Clean and lubricate the hole on the body (1).
49	Insert the cap (119).
50	Insert and fix the screws (131) according to the following tightening torques: <ul style="list-style-type: none"> • 4": Tab. 1.76

Tab. 9.99

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.4 - MAINTENANCE OF THE 300/A SERIES PILOT + AR100 LAMINATION VALVE

9.4.4.1 - 300/A SERIES PILOT DISCONNECTION

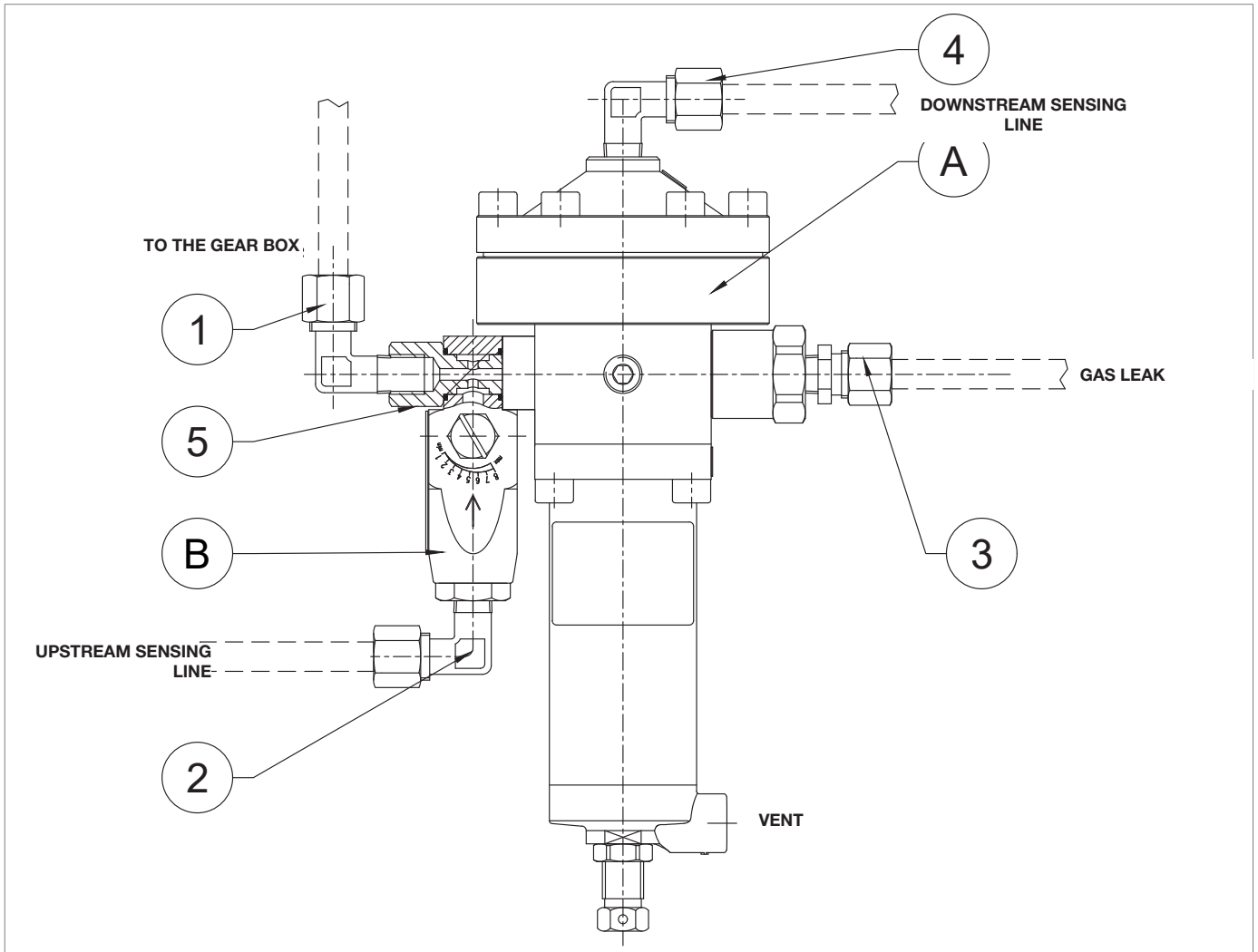


Fig. 9.49. 300/A series pilot

To disconnect the pilot, proceed as in Tab. 1.100 (Fig. 1.49):

Step	Action
1	Disconnect the sensing lines between the 300/A pilot and the regulator by adjusting the fittings (2, 3, 4).
2	Unscrew and remove the union (1) to remove the pilot from the regulator.
3	Unscrew and remove the screw (5) to separate the AR100 lamination valve from the pilot.

Tab. 9.100

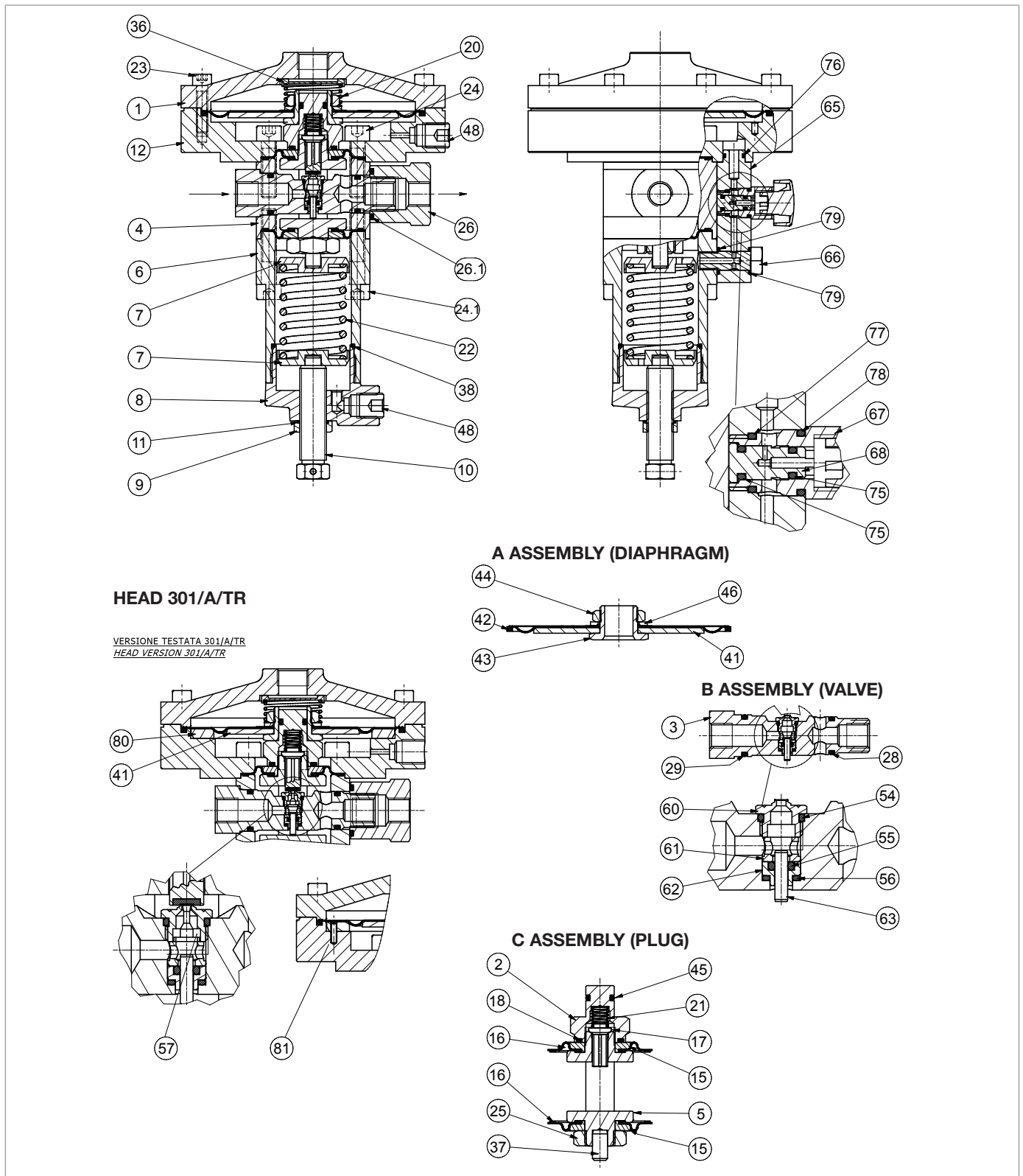





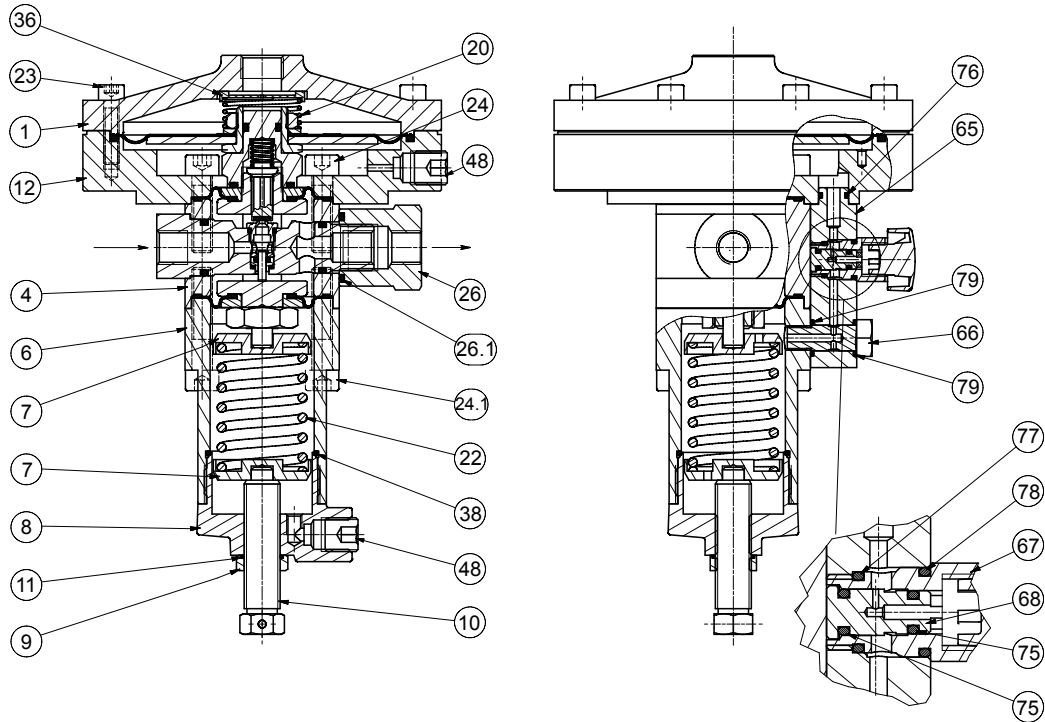
9.4.4.2 - PILOT 301/A AND 301/A/TR


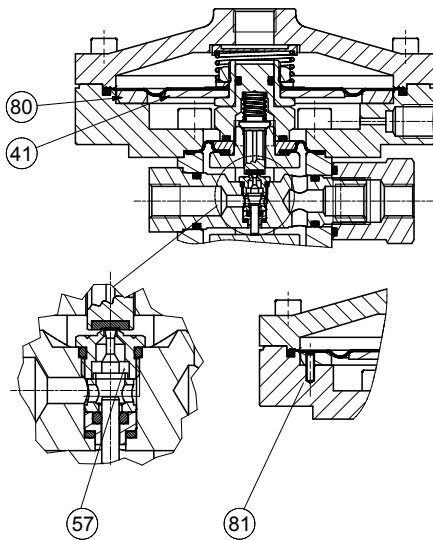
Fig. 9.50. Pilot 301/A and 301/A/TR

Step	Action
1	Unscrew the nut (9).
2	Completely relieve the spring (22) by turning the adjusting screw (10) anticlockwise.
3	Remove the adjusting screw (10) together with the cap (9).
4	Remove the cap (8).
	Remove the O-ring (38) from the cap (8) and replace it, taking care to lubricate it with synthetic grease.
5	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
6	Remove the spring (22) and the spring supports (7).
7	Undo and remove the screws of the lower section (24.1).
8	Remove the sleeve (6).
9	Undo and remove the screws of the upper section (23).
10	Remove the pilot cover (1).
11	Remove the spring (20) together with the shock absorber nozzle (36).
12	Remove assembly "A" (diaphragm).
13	Unscrew the nut (44).
14	Remove the ring (46).
15	Remove and replace the diaphragm (42) from its support (43), taking care to lubricate the lanyards with synthetic grease.
16	Fit the ring (46).
17	Tighten assembly 'A' (diaphragm) with nut (44).
18	Unscrew and remove the nut (26).
	Remove the O-ring (26.1) from the nut (26) and replace it, taking care to lubricate it with synthetic grease.
19	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
20	Remove assembly "B" (valve).
	Unscrew the valve seat (60).
21	 NOTICE! Take care not to damage the surfaces
	Remove the O-ring (54) from the valve seat (38) and replace it, taking care to lubricate it with synthetic grease.
22	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
23	VALID FOR 301/A/TR Remove the piston (57).
24	Remove the bushing (61).
25	Remove the balancing piston (63).
26	Take out the piston guide (62).
	Remove the O-ring (55) from the piston guide (62) and replace it, taking care to lubricate it with synthetic grease.
27	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.

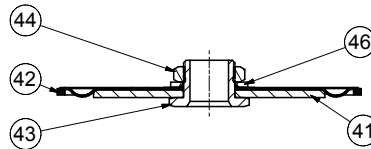


HEAD 301/A/TR

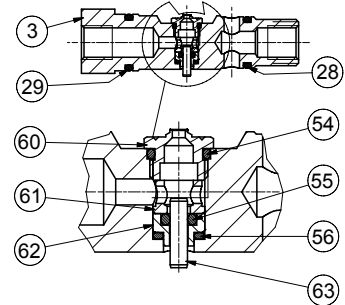
*VERSIONE TESTATA 301/A/TR
HEAD VERSION 301/A/TR*



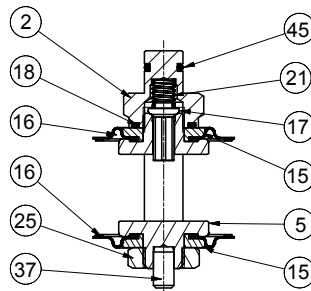
A ASSEMBLY (DIAPHRAGM)



B ASSEMBLY (VALVE)

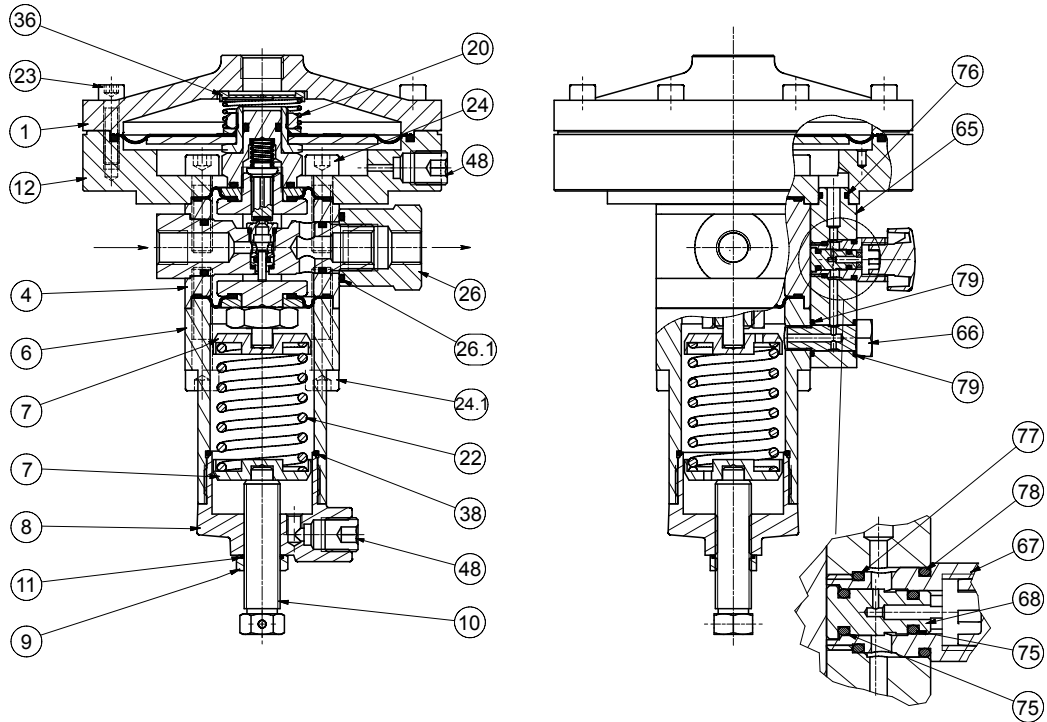


C ASSEMBLY (PLUG)

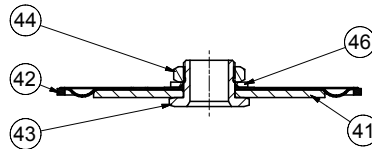


Pilot 301/A and 301/A/TR

Step	Action
28	Remove the O-ring (56) from the valve seat (3) 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.
29	Remove the O-rings (28, 29) from the valve seat (3) and replace them, taking care to lubricate them with synthetic grease. NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
30	Fit the piston guide (62) and balancing piston (63).
31	Insert the bush (61) into the pilot seat (3) so that the wider stop rests on the O-ring (55).
32	VALID FOR 301/A/TR Insert piston (57).
33	Insert and fix the valve seat (60). NOTICE! Take care not to damage the valve seat profile (60) and the O-ring (54).
34	Unscrew and remove the screws (24)
35	a- VALID FOR 301/A Remove the flange (12). b- VALID FOR 301/A/TR Remove the flange (12) together with the ring (80).
36	Remove assembly "C" (plug) from the valve body (4).
37	Remove the O-ring (45) from the pilot nut (2) 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.
38	Unscrew and remove the pilot nut (2).
39	Remove the O-rings (18) from the pilot nut (2) and replace them, taking care to lubricate them with synthetic grease. NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
40	Remove the spring (21).
41	Remove and replace the plug (17).
42	Remove the upper protection disc (15).
43	Remove and replace the upper diaphragm (16), taking care to lubricate the lanyards with synthetic grease. NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
44	Unscrew and remove the nut (25).
45	Remove the lower protection disc (15).
46	Remove and replace the lower diaphragm (16), taking care to lubricate the lanyards with synthetic grease. NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
47	Fit the lower protection disc (15).

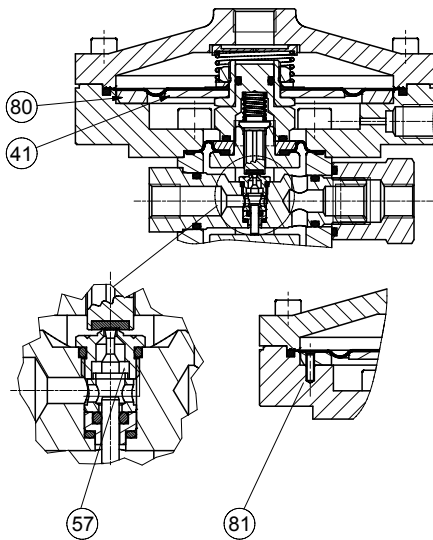


A ASSEMBLY (DIAPHRAGM)

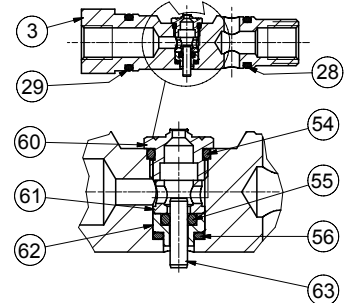


HEAD 301/A/TR

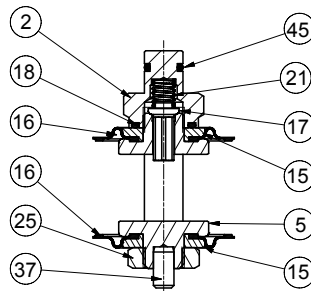
*VERSIONE TESTATA 301/A/TR
HEAD VERSION 301/A/TR*



B ASSEMBLY (VALVE)

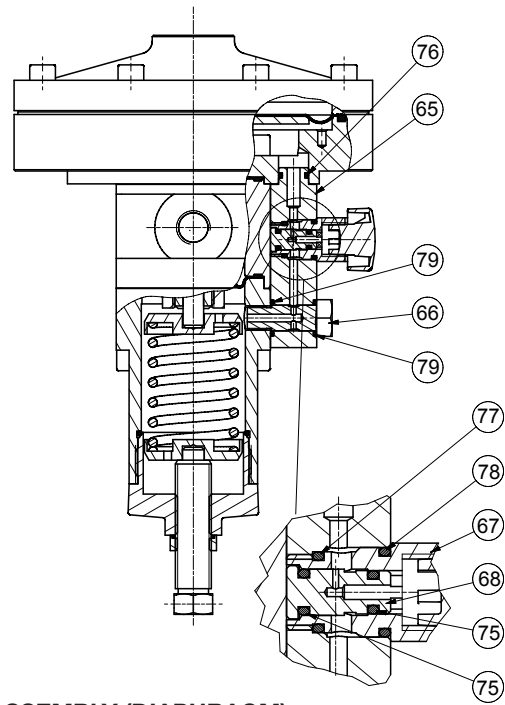
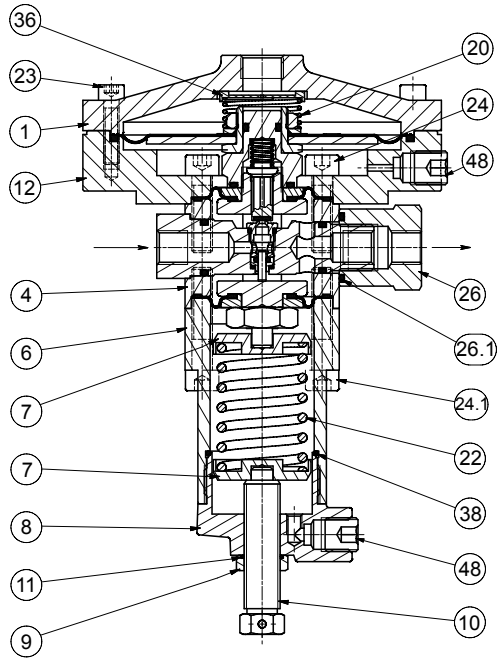


C ASSEMBLY (PLUG)



Pilot 301/A and 301/A/TR

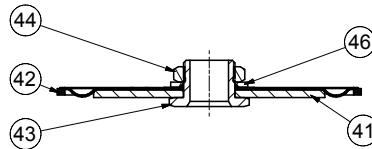
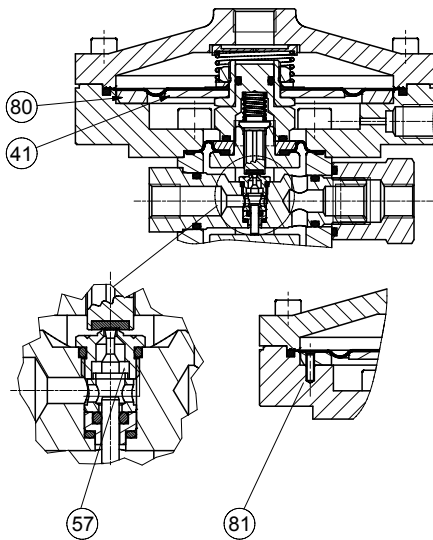
Step	Action
48	Fix the nut (25) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 301 and 301/A/TR: Tab. 1.77
49	Fit the plug (17) and the spring (21).
50	Fit the upper protection disc (15).
51	Fix the nut (2) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 301 and 301/A/TR: Tab. 1.77
52	Insert assembly "C" (plug) from the top downwards into the valve body (4). <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <ul style="list-style-type: none"> Take care not to damage the diaphragms (16) during this step The marking on the lower section of the headframe must be parallel to the axis of the hole for inserting the seat (3) into the valve body (4). </div>
53	Undo and remove the screw (66)
54	Remove the damping device (65).
55	Remove and replace the O-rings (76, 79) from the damping device (65), lubricating them with synthetic grease. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p> </div>
56	Unscrew and remove the screw (67) together with the piston (68).
57	Pull the piston (68) out of the screw (67).
58	Remove the O-rings (75) from the piston (68) and replace them, taking care to lubricate them with synthetic grease. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p> </div>
59	Remove the O-rings (77, 78) from the screw (67) and replace them, taking care to lubricate them with synthetic grease. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p> </div>
60	Insert the piston (68) into the screw (67).
61	Insert and secure the screw (67) in the damping device (65).
62	Insert assembly "B" (valve) into the valve body (4). <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>Take care not to damage the O-rings (28, 29) and the valve seat (3).</p> </div>
63	Insert and fix the nut (26) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 301 and 301/A/TR: Tab. 1.77
64	<p>a- VALID FOR 301/A Insert the flange (12).</p> <p>b- VALID FOR 301/A/TR Insert the flange (12) together with the ring (80).</p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>The bore of the damping device (65) must be perpendicular to the valve seat (3).</p> </div>
65	Insert and fix the screws (24) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 301 and 301/A/TR: Tab. 1.77
66	Fit assembly "A" (diaphragm).



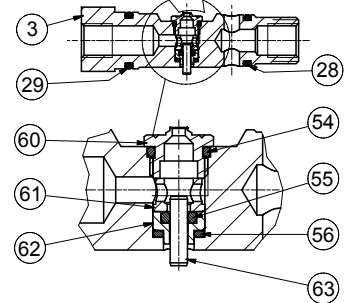
A ASSEMBLY (DIAPHRAGM)

HEAD 301/A/TR

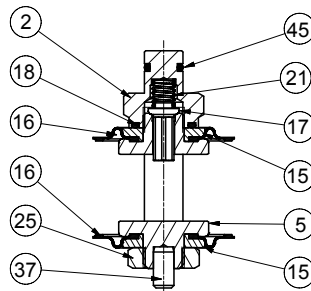
*VERSIONE TESTATA 301/A/TR
HEAD VERSION 301/A/TR*






B ASSEMBLY (VALVE)



C ASSEMBLY (PLUG)



Pilot 301/A and 301/A/TR

Step	Action
67	Position the spring (20) together with the shock absorber nozzle (36). <div style="border: 1px solid black; padding: 2px;">  NOTICE! The smallest bore of the shock absorber nozzle (36) must point upwards. </div>
68	Fit the lid (1).
69	Insert and fix the screws (23) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 301 and 301/A/TR: Tab. 1.77
70	Fit the sleeve (6). <div style="border: 1px solid black; padding: 2px;">  NOTICE! The bore of the damping device (65) must be perpendicular to the valve seat (3). </div>
71	Insert and fix the screws (24.1) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 301 and 301/A/TR: Tab. 1.77
72	Position the damping device (65) on the pilot.
73	Insert and fix the screw (66) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 301 and 301/A/TR: Tab. 1.77
74	Fit the spring (22) and the spring supports (7).
75	Insert and fix the cap (8).
76	Remove the O-ring (11) from the nut (9) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 2px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
77	Fit the adjusting screw (10) together with the cap (9).

Tab. 9.101

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.4.3 - PILOT 302/A

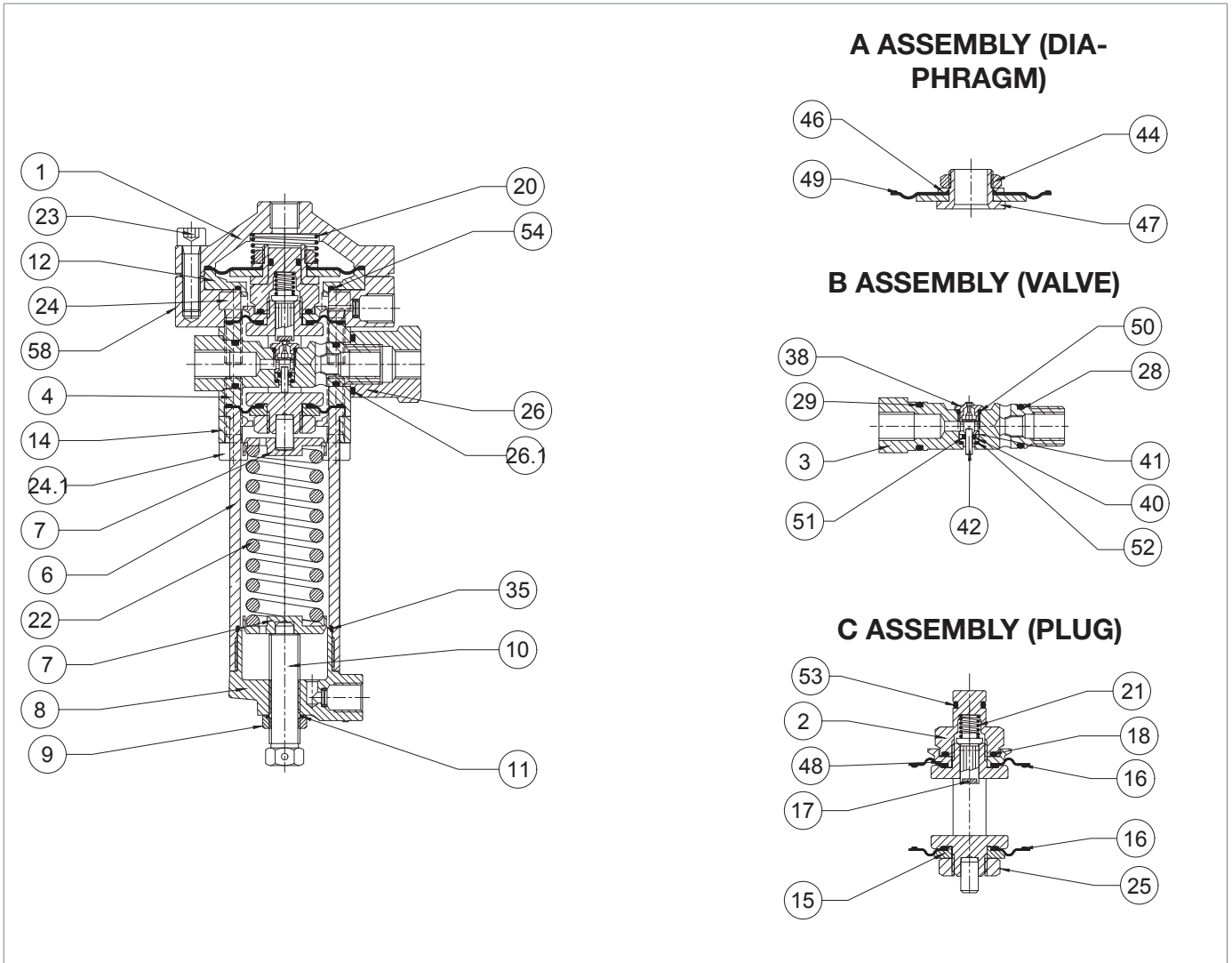





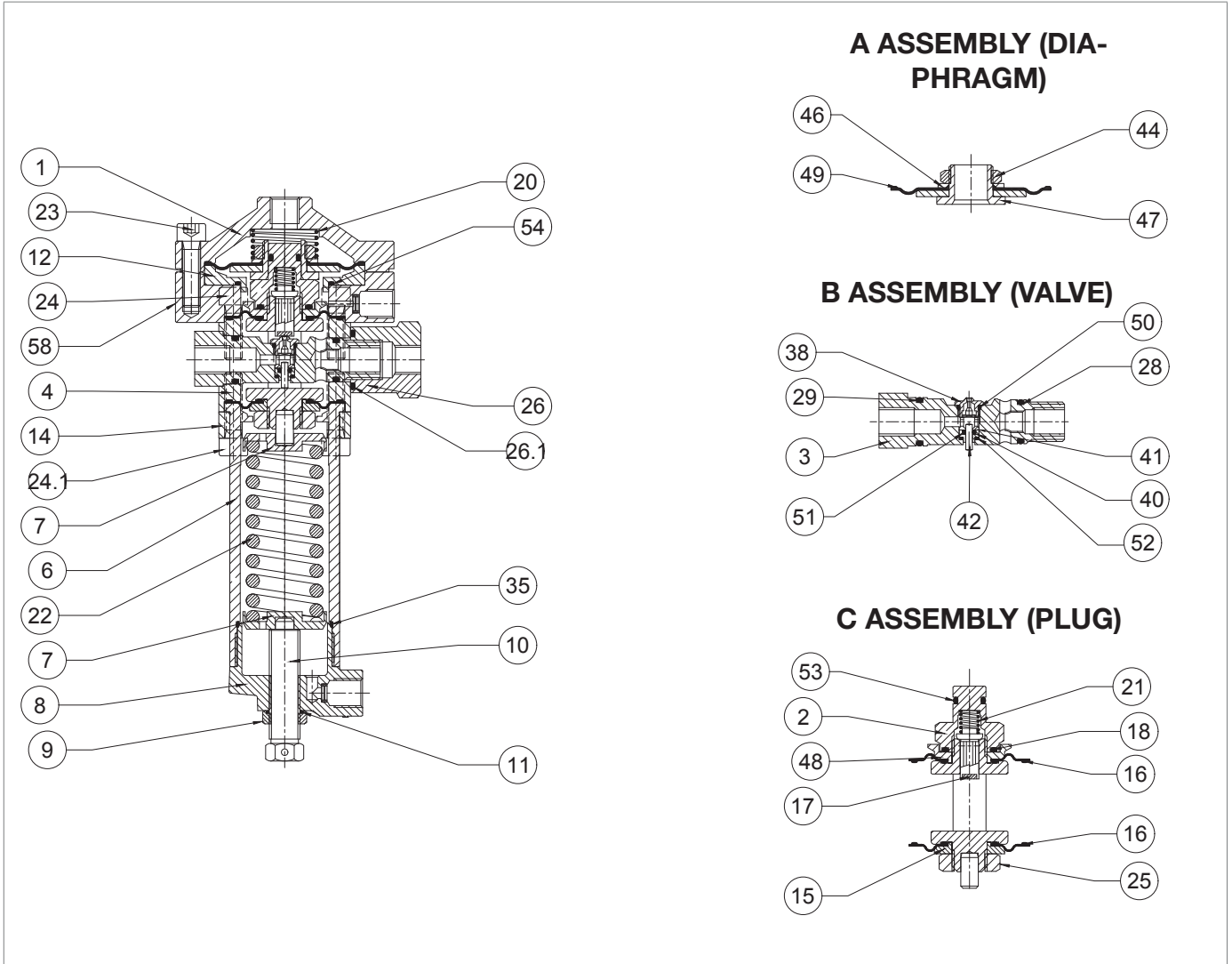


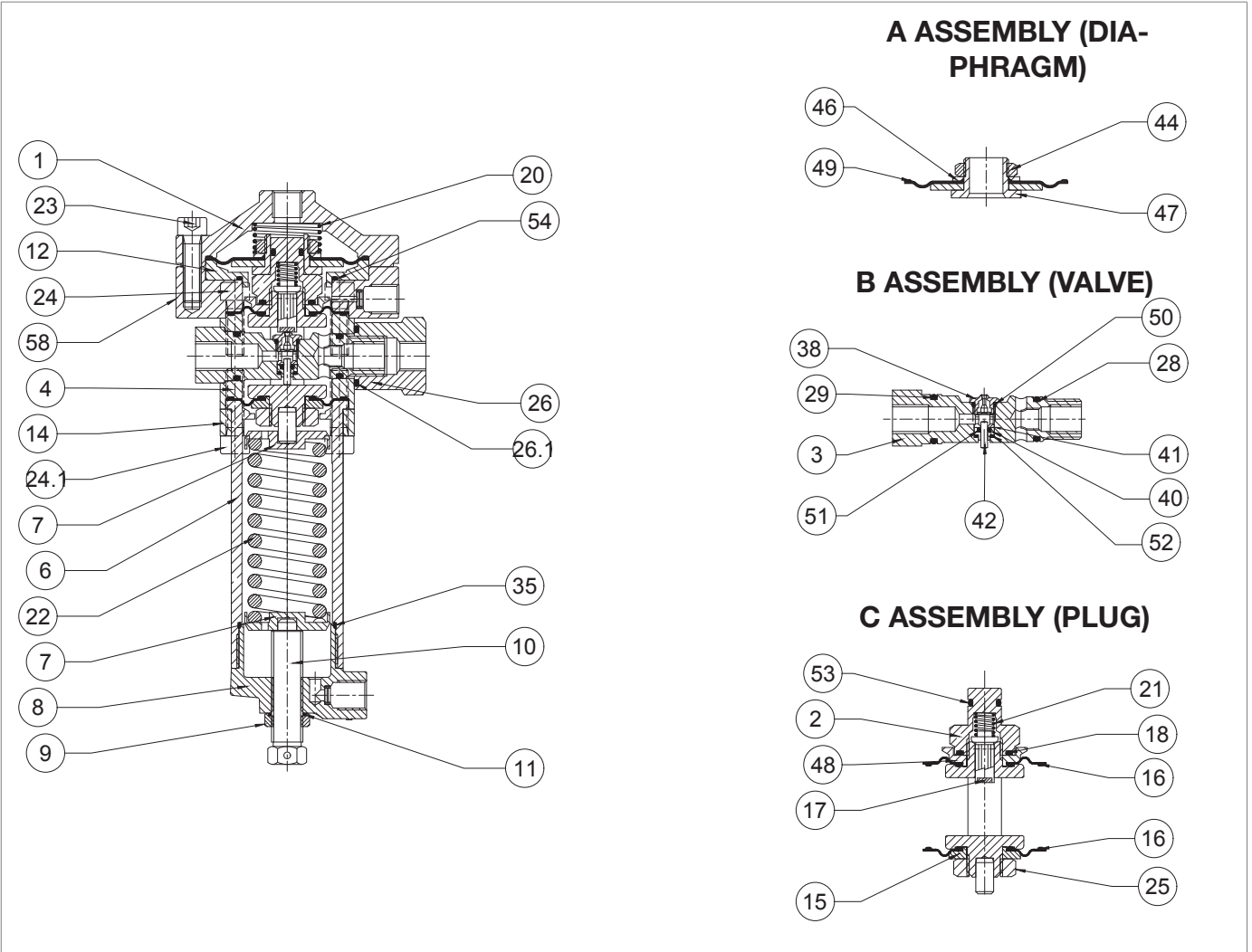
Fig. 9.51. Pilot 302/A

Step	Action
1	Loosen the nut (9).
2	Completely release the spring (22) by turning the adjusting screw (10).
3	Remove the adjusting screw (10) together with the cap (9).
4	Remove the cap (8).
	Remove the O-ring (35) from the cap (8) and replace it, taking care to lubricate it with synthetic grease.
5	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
6	Remove the spring (22) and the spring supports (7).
7	Undo and remove the screws of the lower section (24.1).
8	Remove the spacer (14) from the sleeve (6).
9	Remove the sleeve (6).
10	Undo and remove the screws of the upper section (23).
11	Remove the pilot cover (1).
12	Remove the spring (20).
13	Remove assembly "A" (diaphragm).
14	Unscrew the nut (44).
15	Remove the ring (46).
16	Remove and replace the diaphragm (49) from its support (47), taking care to lubricate the lanyards with synthetic grease.
17	Fit the ring (46).
18	Tighten assembly "A" (diaphragm) with the nut (44) according to the following tightening torque.
19	Unscrew and remove the nut (26).
	Remove the O-ring (26.1) from the nut (26) and replace it, taking care to lubricate it with synthetic grease.
20	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
21	Remove the ring (12).
	Remove the O-ring (54) from the nut (12) and replace it, taking care to lubricate it with synthetic grease.
22	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
23	Remove assembly "B" (valve).
	Unscrew the valve seat (38).
24	 NOTICE! Take care not to damage the surfaces
	Remove the O-ring (50) from the valve seat (38) and replace it, taking care to lubricate it with synthetic grease.
25	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
26	Remove the bush (41).
27	Remove the balancing piston (42).
28	Take out the piston guide (40).



Pilot 302/A

Step	Action
29	Remove the O-ring (51) from the piston guide (40) 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.
30	Remove the O-ring (52) from the valve seat (3) 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.
31	Remove the O-rings (28, 29) from the valve seat (3) and replace them, taking care to lubricate them with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
32	Fit the piston guide (40) and balancing piston (42).
33	Insert the bush (41) into the pilot seat (3) so that the wider stop rests on the O-ring (51).
34	Insert and fix the valve seat (38). ! NOTICE! Take care not to damage the valve seat profile (38) and the O-ring (50).
35	Remove the screws (24) together with the flange (58).
36	Remove assembly "C" (plug) from the valve body (4).
37	Remove the O-ring (53) from the pilot nut (2) 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.
38	Unscrew and remove the pilot nut (2).
39	Remove the O-rings (18) from the pilot nut (2) and replace them, taking care to lubricate them with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
40	Remove the spring (21).
41	Remove and replace the plug (17).
42	Remove the protective disc (48).
43	Remove and replace the upper diaphragm (16), taking care to lubricate the lanyards with synthetic grease. ! NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
44	Unscrew and remove the nut (25).
45	Remove the protective disc (15).
46	Remove and replace the lower diaphragm (16), taking care to lubricate the lanyards with synthetic grease. ! NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
47	Fit the protection disc (15).
48	Fix the nut (25) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 302: Tab. 1.78
49	Fit the plug (17) and the spring (21).



Pilot 302/A

Step	Action
50	Fit the protection disc (48).
51	Fix the nut (2) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 302: Tab. 1.78
52	Insert assembly “C” (plug) from the top downwards into the valve body (4). <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> Take care not to damage the diaphragms (16) during this step The marking on the lower section of the headframe must be parallel to the axis of the hole for inserting the seat (3) into the valve body (4). </div>
53	Insert assembly “B” (valve) into the valve body (4). <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>! NOTICE!</p> <p>Take care not to damage the O-rings (28, 29) and the valve seat (3).</p> </div>
54	Screw in the nut (26) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 302: Tab. 1.78
55	Insert the flange (58).
56	Insert and fix the screws (24) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 302: Tab. 1.78
57	Fit the ring (12).
58	Fit assembly “A” (diaphragm).
59	Fit the spring (20).
60	Fit the cover (1).
61	Insert and fix the screws (23) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 302: Tab. 1.78
62	Position the sleeve (6) and spacer (14).
63	Insert and fix the screws (24.1) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 302: Tab. 1.78
64	Fit the spring (22) and the spring supports (7).
65	Insert cap (8).
66	Remove the O-ring (11) from the nut (9) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>! NOTICE!</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
67	Fit the adjusting screw (10) together with the cap (9).

Tab. 9.102

! WARNING!

Ensure that all parts have been fitted correctly.

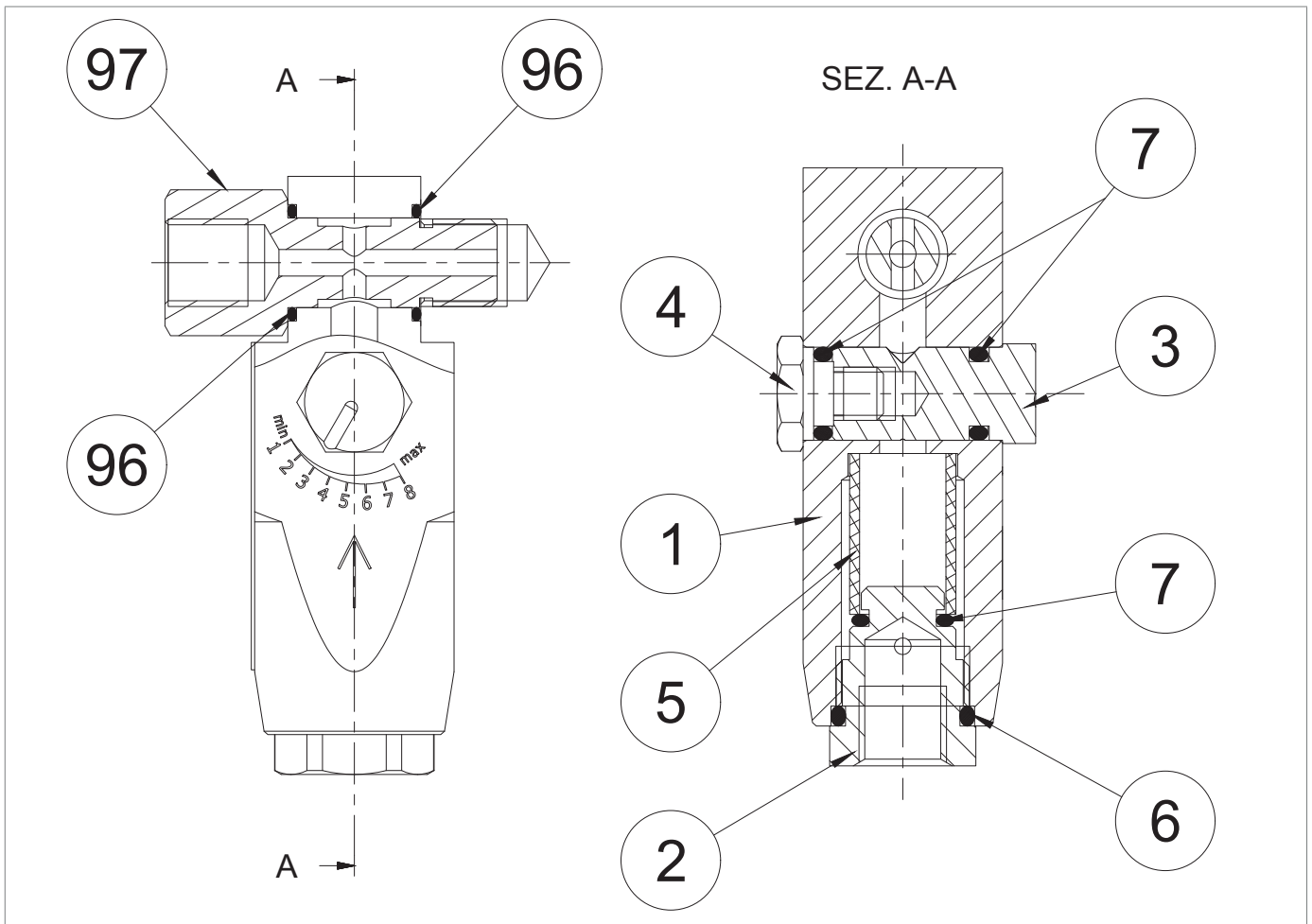
9.4.4.4 - AR100 LAMINATION VALVE





Fig. 9.52. AR100 lamination valve

Step	Action
1	Undo and remove the locking screw (97).
2	Remove the O-rings (96) from the AR100 lamination valve body (1) and replace them, taking care to lubricate them with synthetic grease.
3	Undo and remove the locking screw (4).
4	Remove the O-ring (7) from the shut-off screw (4) and replace it, taking care to lubricate it with synthetic grease.
5	Remove the adjusting screw (3).
6	Remove the O-ring (7) from the adjusting screw (3) and replace it, taking care to lubricate it with synthetic grease.
7	Unscrew and remove the cap (2).

NOTICE!
Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.

NOTICE!
Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.

NOTICE!
Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.

Step	Action
8	Remove the O-rings (6, 7) from the cap (2) and replace them, 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>
9	Remove and replace the filter (5).
10	Fit and fix the cap (2) according to the following tightening torque: <ul style="list-style-type: none"> AR100: Tab. 1.79 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Take care not to damage the O-rings (6, 7). </div>
11	Insert the adjusting screw (3), taking care not to damage the O-ring (7).
12	Fit and fix the shut-off screw (4) according to the following tightening torque: <ul style="list-style-type: none"> AR100: Tab. 1.79 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Take care not to damage the O-ring (7). </div>
13	Insert the locking screw (97) with the valve ports in line with the AR100 lamination valve (1) body.

Tab. 9.103

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.4.5 - 300/A SERIES PILOT DISCONNECTION

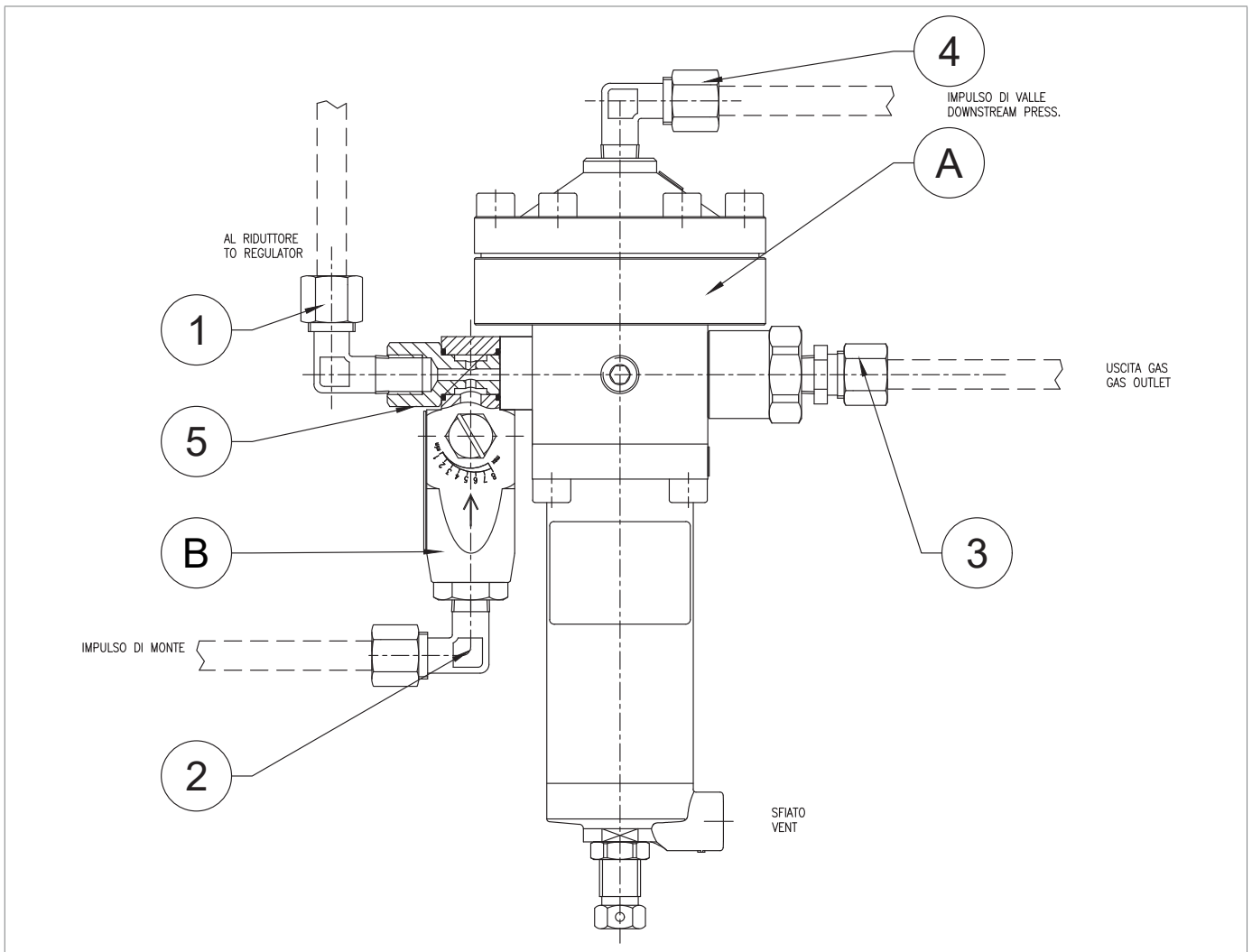


Fig. 9.53. 300/A series pilot

To reconnect the pilot, proceed as indicated in Tab. 1.104 (Fig. 1.53):

Step	Action
1	Insert and secure the screw (5) into the AR100 lamination valve to connect it to the pilot.
2	Attach the fitting (1) to connect the pilot to the regulator.
3	Connect the sensing lines between the 300/A pilot and the regulator by adjusting the fittings (2, 3, 4).

Tab. 9.104

9.4.5 - DB APERVAL SILENCER MAINTENANCE

9.4.5.1 - SILENCER DB APERVAL 1"- 4"

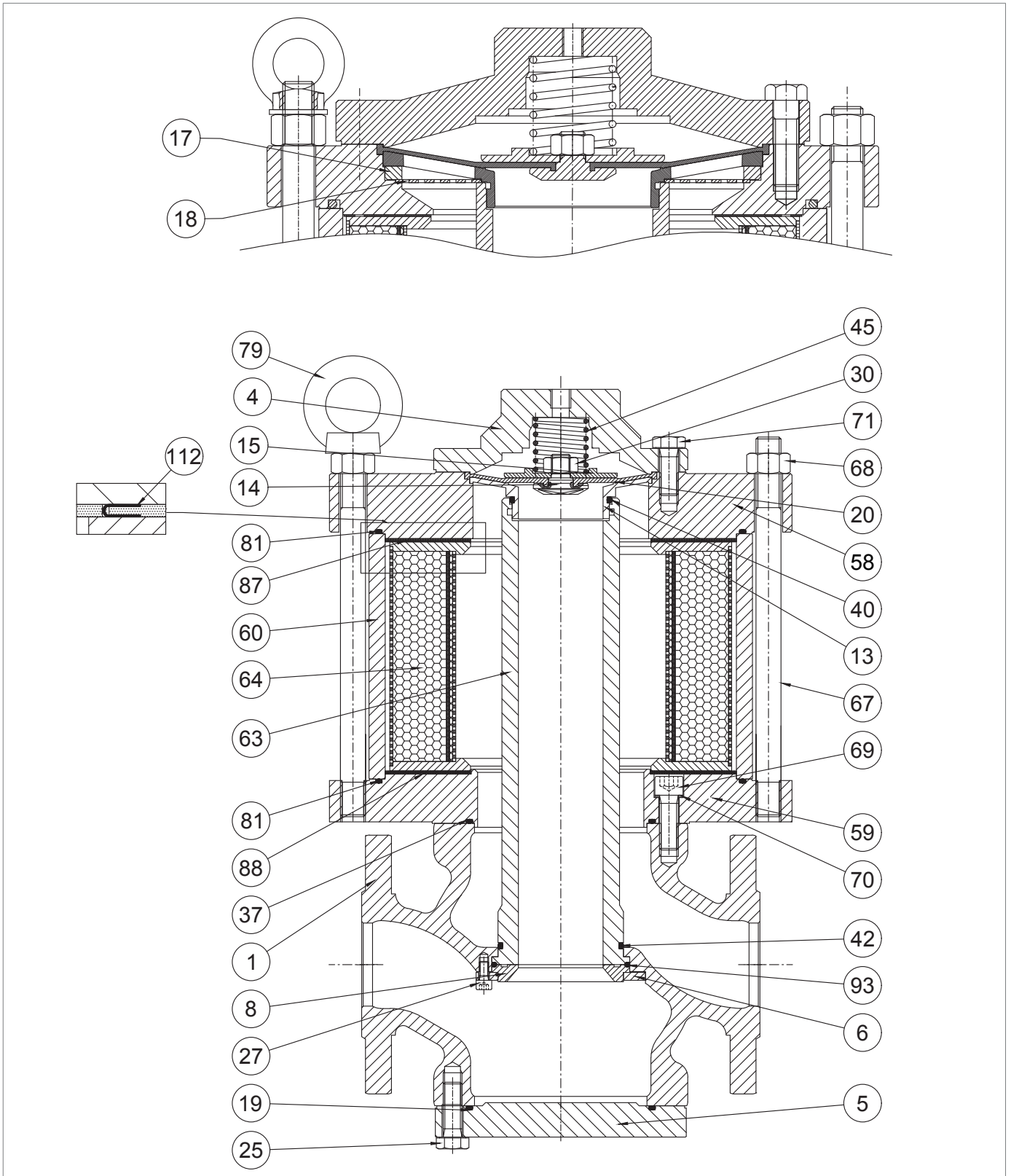
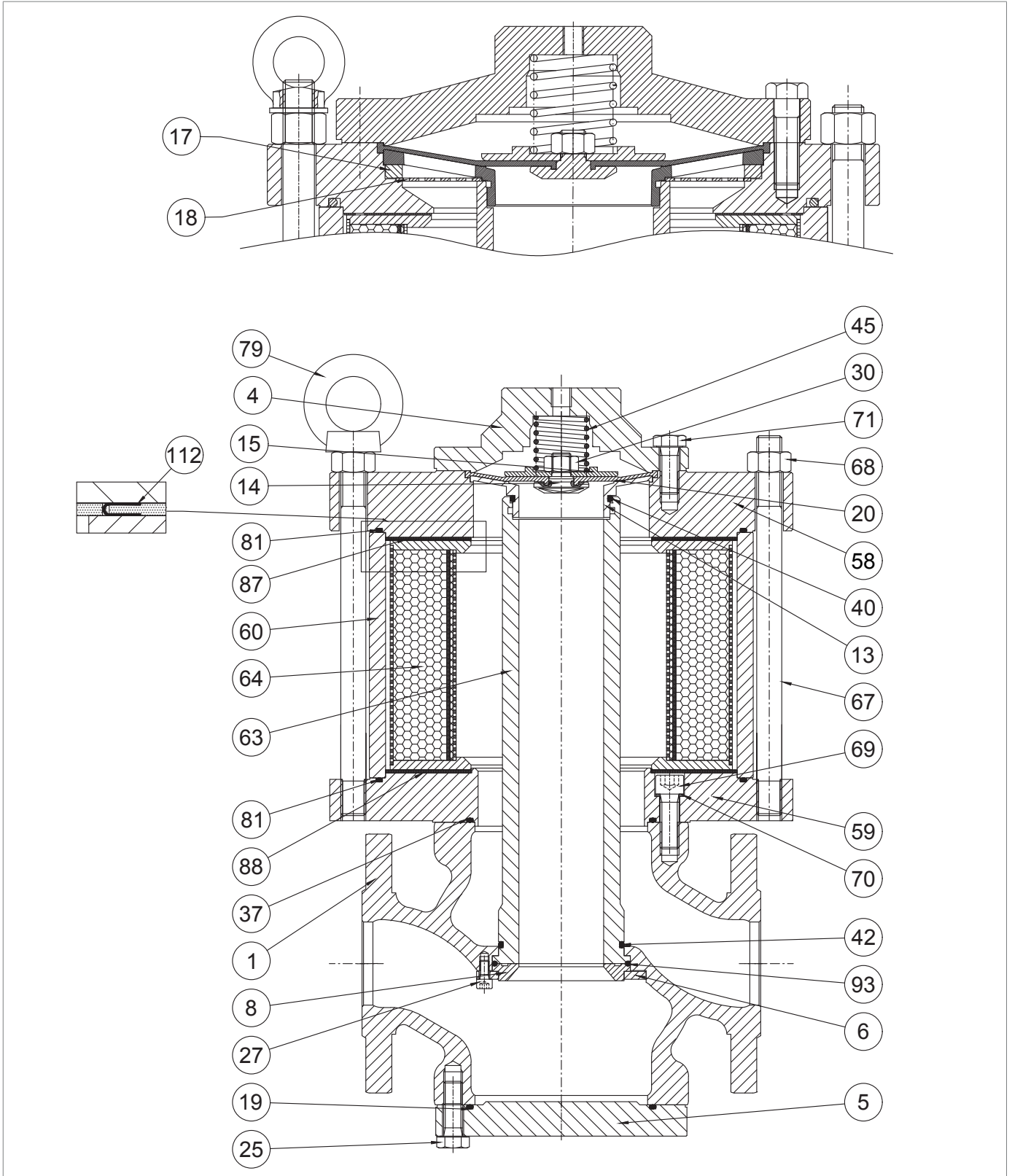










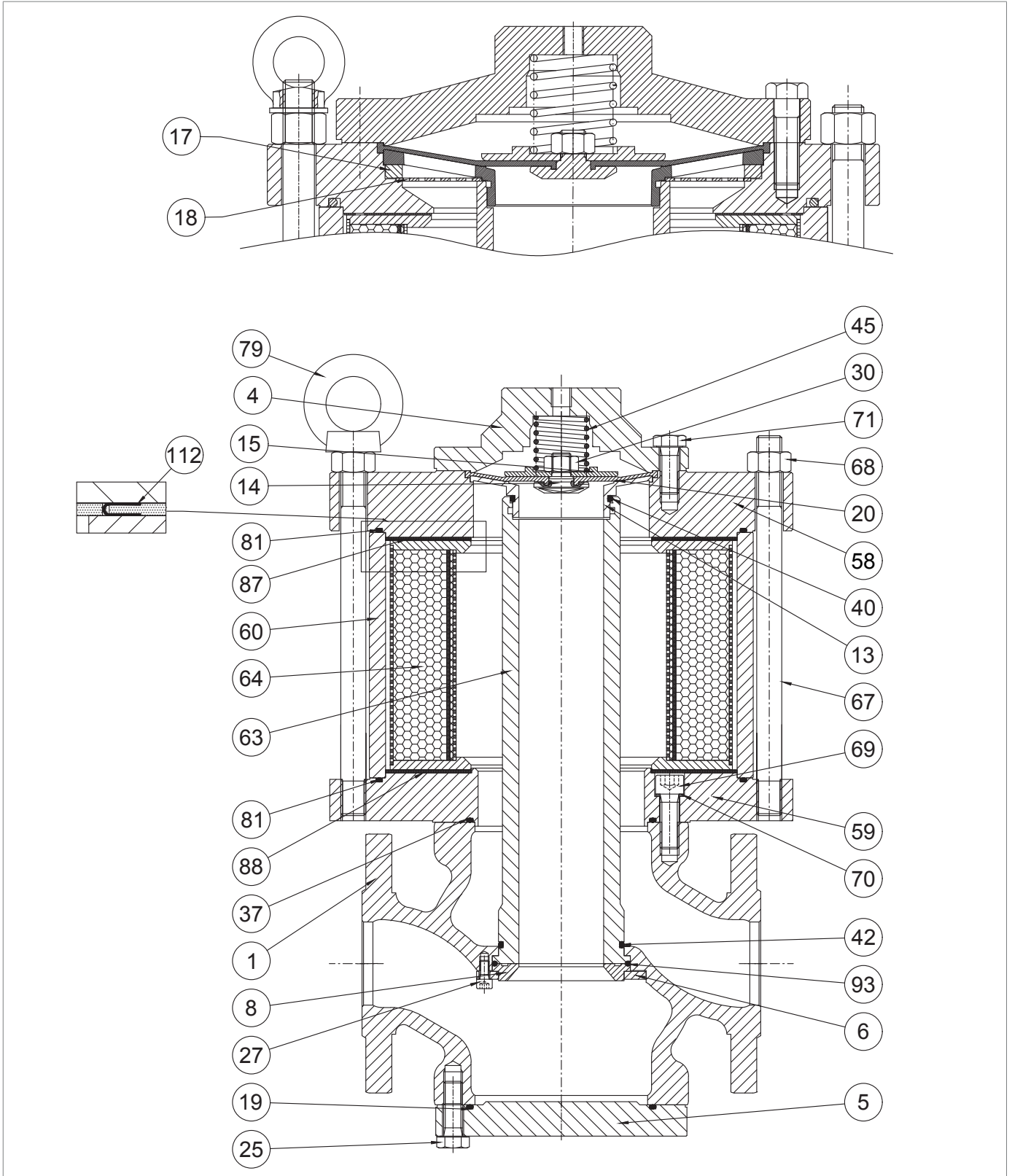
Fig. 9.54. Silencer DB Aperial 1"- 4"

Step	Action
1	Unscrew and remove the fixing screw (71).
2	Remove the upper lid (4).
3	Remove the spring (45).
4	Take out the diaphragm unit (14, 15, 20, 30).
5	Unscrew and remove the nut (30). NOTICE! During this phase, keep the screw (14) still.
6	Remove the diaphragm protection disc (15).
7	Remove and replace the diaphragm (20) from the screw (14), taking care to lubricate the lanyard with synthetic grease.
8	Assemble the diaphragm unit, placing the diaphragm (20) in the screw (14). NOTICE! Carefully place the diaphragm O-ring (20) into the screw slot (14).
9	Fit the diaphragm protection disc (15).
10	Insert and fix the nut (30) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 NOTICE! During this phase, keep the screw (14) still.
11	Remove the grid (13).
12	Remove the O-ring (40) from the grid (13) 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.
13	ONLY VALID FOR 4" Remove the ring (17).
14	ONLY VALID FOR 4" Remove the flow-filter grid (18).
15	Unscrew and remove eyebolt (79)
16	Unscrew and remove the nut (68).
17	Remove the upper flange (58).
18	Remove the O-ring (81) from the upper flange (58) 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.
19	Remove and replace the upper anti-oil gasket (87).
20	Remove the basket (64).
21	Remove the plating (60).
22	Remove the O-ring (81) from the lower flange (59) 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.







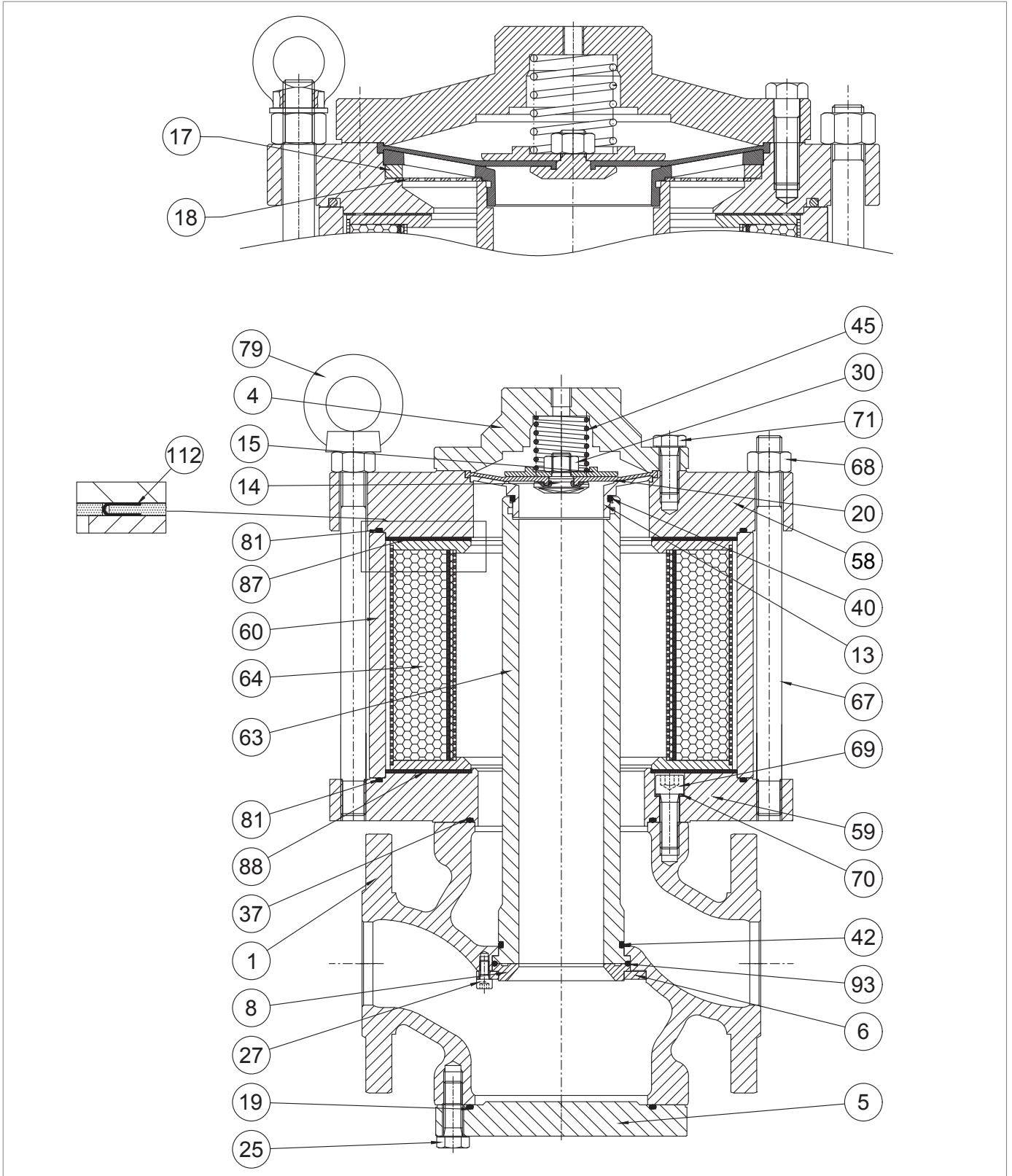
Silencer DB Aperval 1" - 4"

Step	Action
23	Remove and replace the lower anti-oil gasket (88).
24	Undo the screws (69) together with the washers (70).
25	Remove the lower flange (59) together with the tie rods (67).
26	Remove the O-ring (37) from the lower flange (59) 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>
27	Undo and remove the screws (25).
28	Remove the blind flange (5) or any built-in accessory (SA slam-shut valve or PM/182 monitor).
29	Remove and replace the O-ring (19) from the blind flange (5) or from any built-in accessory (SA slam-shut valve or PM/182 monitor), 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>
30	Undo and remove the screws (27). <div style="border: 1px solid black; padding: 5px;">  NOTICE! During this operation, be careful to support the sleeve (63). </div>
31	Remove the locking ring (6) together with the conical seat (8). <div style="border: 1px solid black; padding: 5px;">  NOTICE! If the SA slam-shut valve or the built-in monitor PM/182 is fitted, the reinforced gasket (63) replaces the conical seat (8). </div>
32	Remove the O-ring (93) from the valve seat (8) 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>
33	Remove the sleeve (63) from the top downwards.
34	Remove the O-ring (42) from the sleeve (63) 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>
35	Clean the upper and lower support surfaces of the body (1), the flanges, the contact surfaces between the sleeve (63), the conical seat (8) and the body (1).
36	Put the sleeve (63) back in place into the body from the bottom upwards. <div style="border: 1px solid black; padding: 5px;">  NOTICE! During this operation, be careful to support the sleeve (63). </div>
37	Put the conical seat (8) back in place together with the O-ring (93) and the locking ring (6). <div style="border: 1px solid black; padding: 5px;">  NOTICE! As an alternative to the conical seat (8), a reinforced gasket may be present, based on the built-in accessory. </div>





Silencer DB Aperval 1" - 4"

Step	Action
38	<p>Insert and fix the screws (27) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 • 4": Tab. 1.76 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
39	Fit the blind flange (5) or any accessory.
40	<p>Insert and fix the screws (25) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 • 4": Tab. 1.76 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
41	Fit the lower flange (59) together with the tie rods (67).
42	<div style="border: 1px solid black; padding: 5px;">  NOTICE! Replace the washers (70) before performing this operation. </div>
43	Insert the washers (70) and lubricate them with synthetic grease.
44	<p>Insert and fix the screws (69) according to the following tightening torques:</p> <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 • 4": Tab. 1.76 <div style="border: 1px solid black; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
45	Fit the lower anti-oil gasket (88).
46	Fit the plating (60).
47	Fit the basket (64).
48	Fit the upper anti-oil gasket (87).
49	Fit the upper flange (58).



Silencer DB Aperval 1" - 4"

Step	Action
50	Fit and fix the nuts (68) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 • 4": Tab. 1.76 <div style="border: 1px solid blue; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>
51	Put the eyebolt (79) back in place.
52	ONLY VALID FOR 4" Place the flow-filter grid (18).
53	ONLY VALID FOR 4" Fit the ring (17).
54	Fit the grid (13).
55	Put the diaphragm unit (14, 15, 20, 30) in place.
56	Fit the spring (45).
57	Fit the lid (4).
58	Fit and fix the screws (71) according to the following tightening torques: <ul style="list-style-type: none"> • 1": Tab. 1.72 • 2": Tab. 1.73 • 2" ½: Tab. 1.74 • 3": Tab. 1.75 • 4": Tab. 1.76 <div style="border: 1px solid blue; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws". </div>

Tab. 9.105

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.6 - PM/182 BUILT-IN MONITOR MAINTENANCE

9.4.6.1 - BUILT-IN MONITOR PM/182 1"- 2"

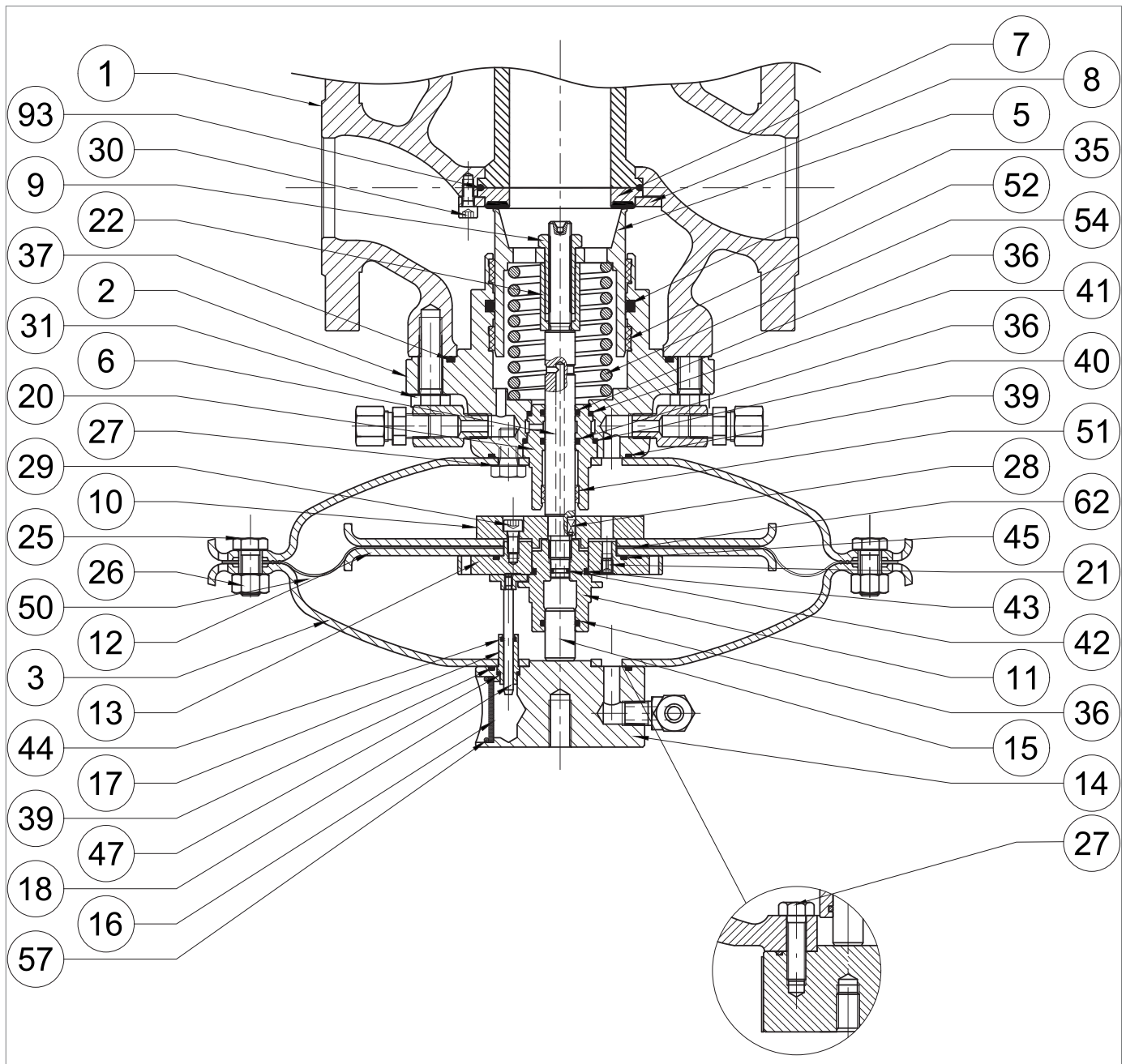
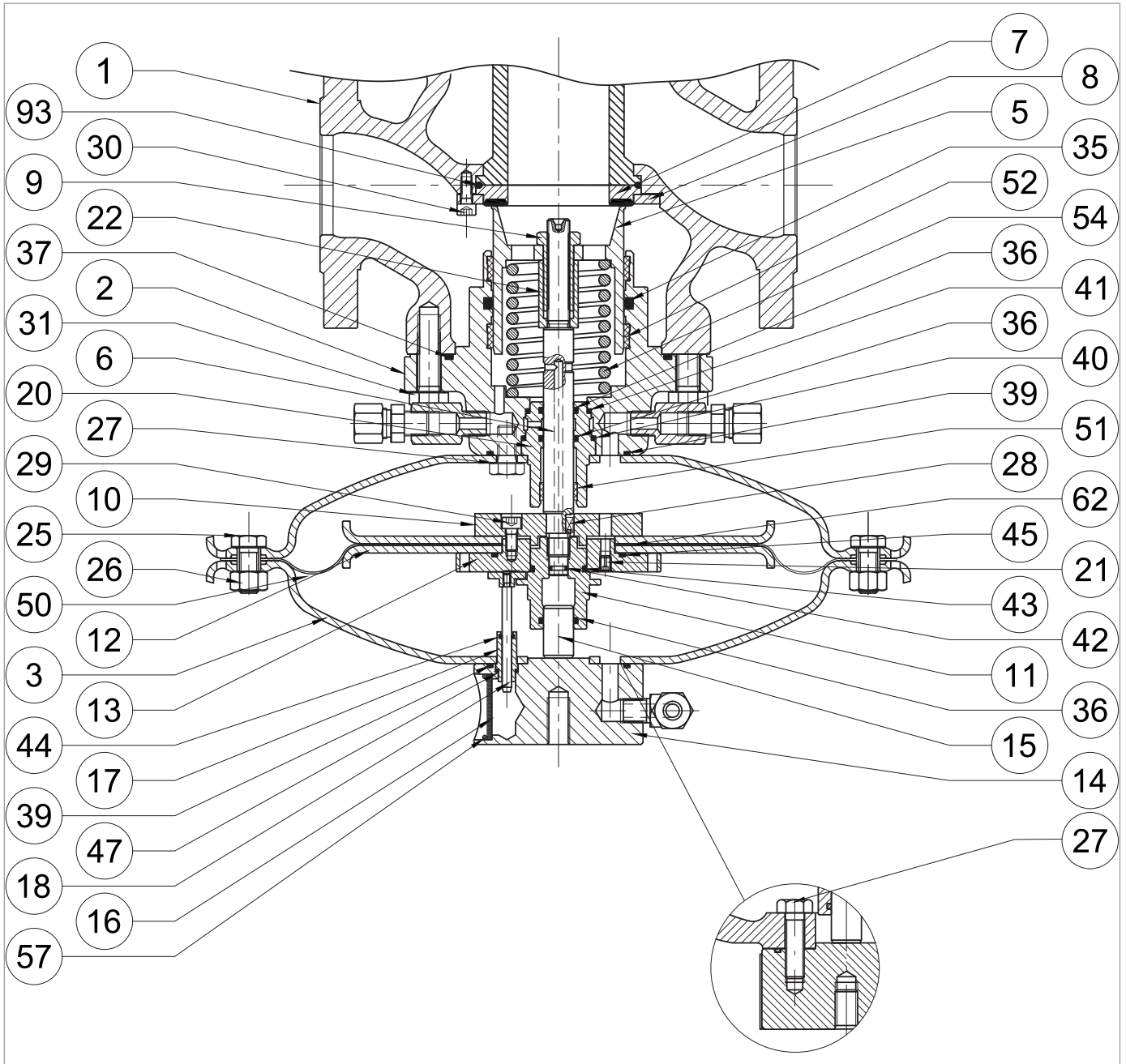


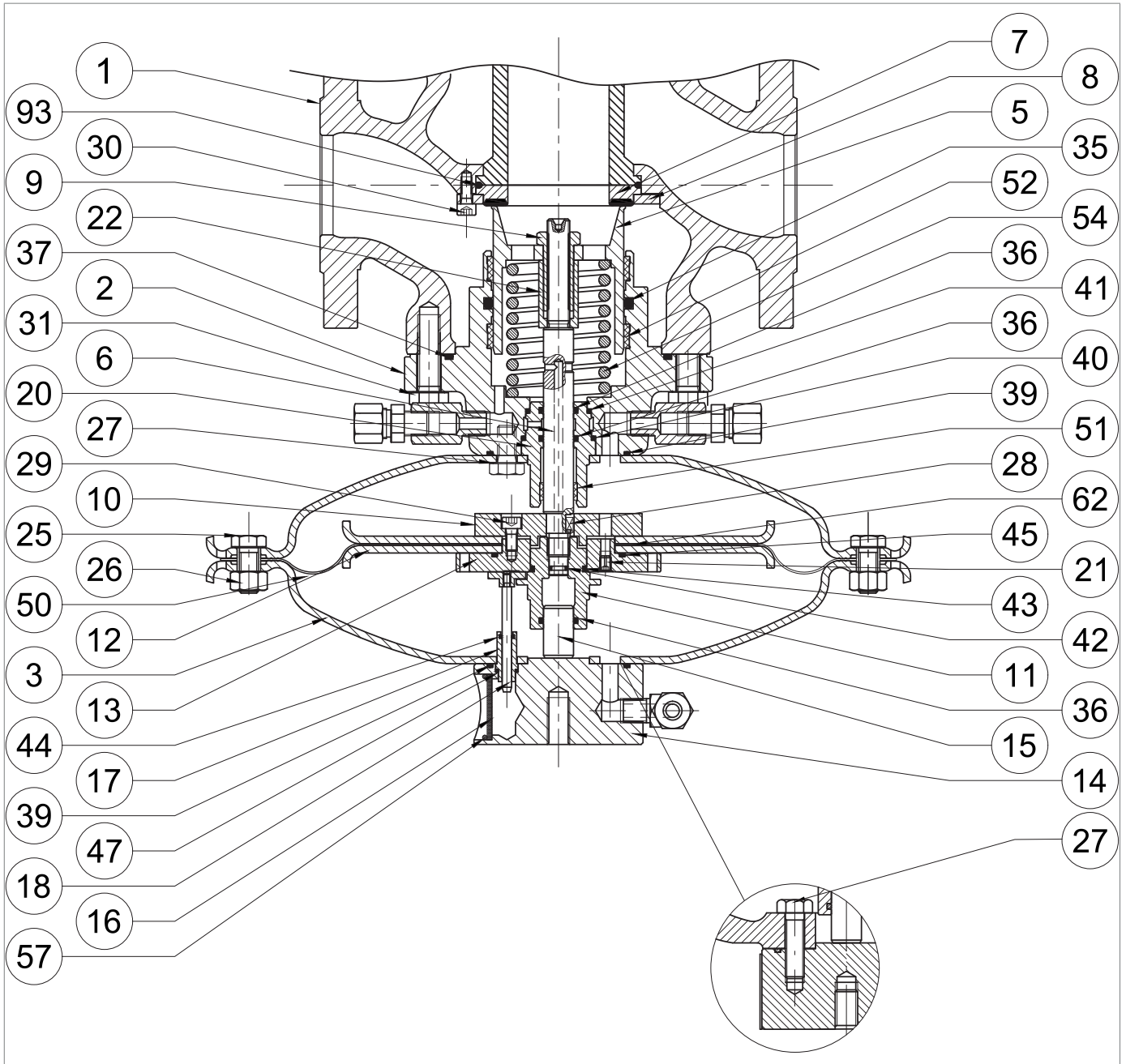
Fig. 9.55. Built-in monitor PM/182 1"- 2"

Step	Action
1	<p>Unscrew and remove the screws (31) securing the control head to the regulator body (1).</p> <p>! NOTICE! Support the head assembly during this step to avoid falls.</p>
2	<p>Remove the control head and place it on its side in a plane with an impact-resistant surface.</p> <p>! NOTICE! Take care not to damage the plug profile (5).</p>
3	<p>Remove the O-ring (37) from the plug guide (2) 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>
4	<p>Unscrew the lock nut (9).</p> <p>! NOTICE! Take care not to damage the plug profile (5).</p>
5	Remove the plug (5) and place it on a table with an impact-resistant surface.
6	Remove the spring (54) together with the spacer (22).
7	<p>Remove and replace the I/DWR rings (52) from the plug guide (2).</p> <p>! NOTICE! Before inserting the replacement I/DWR rings, clean the retaining slots with a cleaning solution.</p>
8	<p>Remove the O-ring (35) from the plug guide (2) 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>
9	Clean the plug (5) and the plug guide (2) lubricating with silicone grease.
10	Unscrew and remove the nuts (26) together with the screws (25).
11	Remove the upper lid (3).
12	Remove the indicator rod (18) from the rod guide (17).
13	Unscrew and remove the top screws (27) from the top cover (3).
14	Separate the upper cover (3) from the eyebolt flange (14).
15	Take out the rod guide (17).
16	<p>Remove the O-rings (39, 47) from the eyebolt flange (14) and replace them, taking care to lubricate them with synthetic grease.</p> <p>! NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p>
17	<p>Remove the O-ring (44) from the rod guide (17) 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>
18	Place the rod guide (17) in the eyebolt flange (14).
19	Assemble the eyebolt flange (14) with the cover (3).



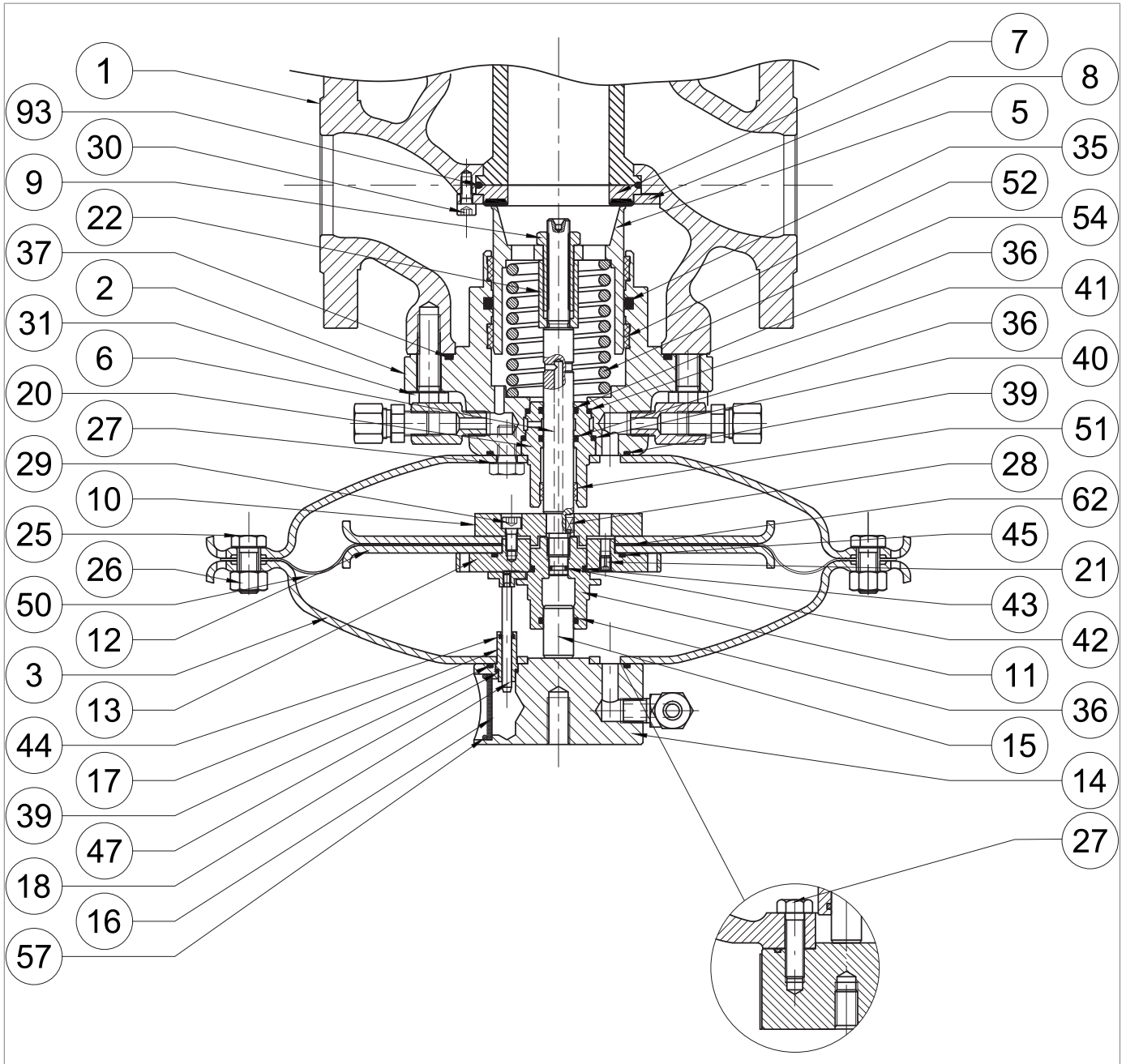
Built-in monitor PM/182 1"- 2"

Step	Action
20	<p>Insert and fix the screws of the upper section (27) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 1": Tab. 1.80 • 2": Tab. 1.81 <div style="border: 1px solid black; padding: 5px;"> <p>NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
21	Insert the indicator rod (18) into the rod guide (17).
22	<p>Unscrew and remove the balancing stem guide (11).</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTICE!</p> <p>Hold the diaphragm assembly in place by positioning the spanner in the holes in the upper diaphragm support (13).</p> </div>
23	Remove the balancing piston (15) from the balancing stem guide (11).
24	<p>Remove and replace the O-rings (36, 43) from the balancing stem guide (11), lubricating 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>
25	Place the balancing piston (15) in the piston guide (11).
26	Take out the diaphragm unit (10, 12, 13, 21, 29, 45, 50, 62)
27	Unscrew and remove the screws (29) from the lower diaphragm support (10).
28	Remove the diaphragm support (10) and the lower diaphragm protection disc (12).
29	Remove the diaphragm (50) together with the oil seal (62).
30	Remove the lower diaphragm protection disc (12) from the upper diaphragm holder (13).
31	<p>Remove and replace the O-ring (45) from the upper diaphragm support (13), lubricating 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>
32	<p>Place the upper diaphragm protection disc (12) in the upper diaphragm holder (13).</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTICE!</p> <p>Check that the hole on the nozzle (21) is free from dirt or foreign bodies.</p> </div>
33	Position the oil seal (62).
34	<p>Position the diaphragm (50).</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTICE!</p> <p>The convex side of the diaphragm must face the drive chamber (pos. D, fig. 4.6).</p> </div>
35	<p>Apply thread locking glue to insert and fix the screws (29) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 1": Tab. 1.80 • 2": Tab. 1.81 <div style="border: 1px solid black; padding: 5px;"> <p>NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
36	Unscrew and remove the lower part screws (27) from the lower cover (3).
37	Remove the lower cover (3).



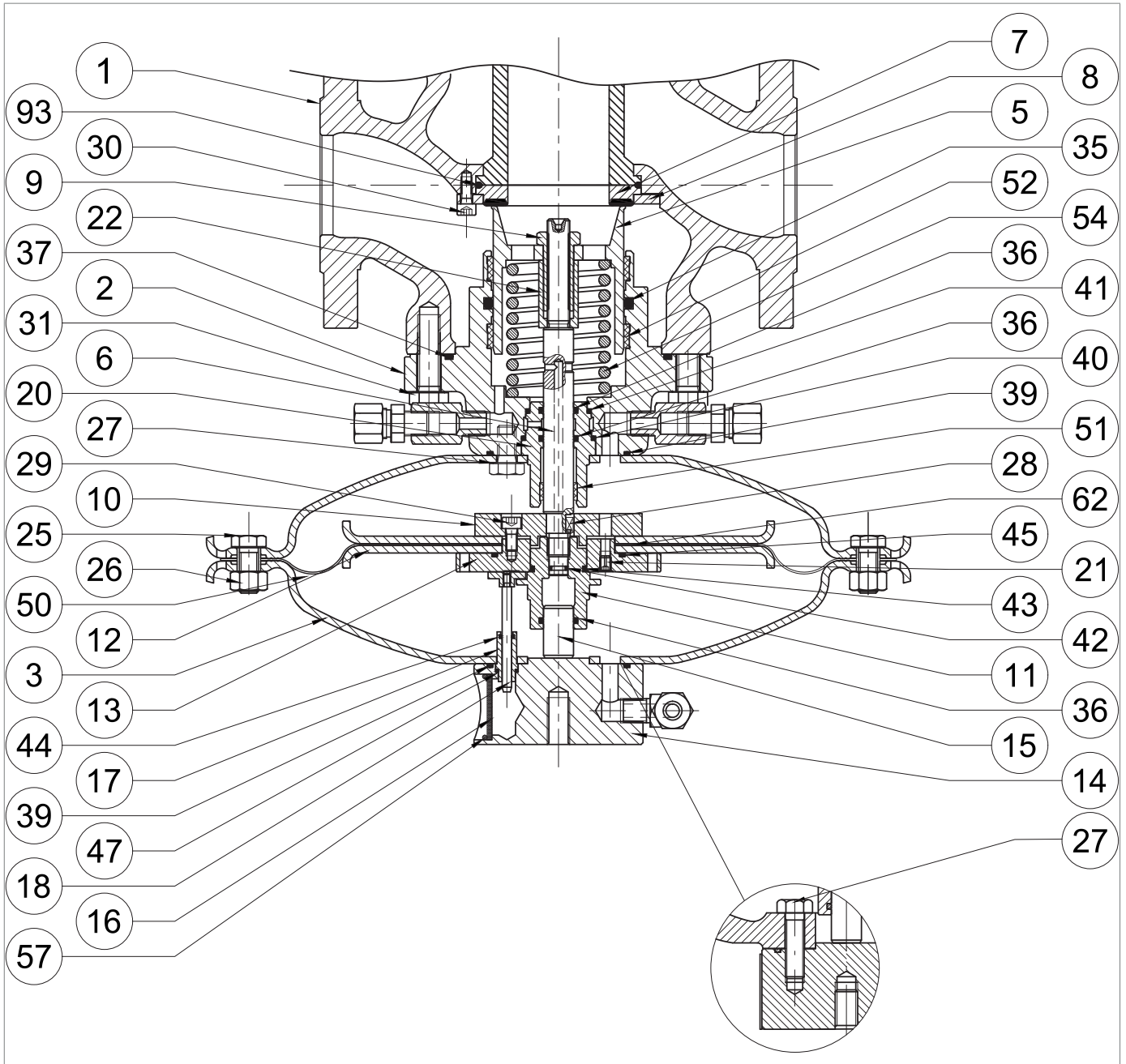
Built-in monitor PM/182 1"- 2"

Step	Action
38	<p>Remove the O-ring (93) from the plug guide (2) 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>
39	<p>Remove the stem guide (20), the stem (6) and the key (28).</p>
40	<p>Remove and replace the I/DWR ring (51) from the stem guide (20).</p> <p>NOTICE! Before inserting the replacement I/DWR ring, clean the retaining slots with a cleaning solution.</p>
41	<p>Remove the O-ring (36) from the stem guide (20) 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	<p>Remove the O-rings (40, 41) from the stem guide (20) and replace them, taking care to lubricate them with synthetic grease.</p> <p>NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p>
43	<p>Remove the O-ring (42) from the stem (6) 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>
44	<p>Remove the stem guide (20), the stem (6) and the key (28).</p> <p>NOTICE! Lubricate the stem surface with silicone grease; make sure that the key (28) is in the correct position in the stem (6).</p>
45	<p>Place the lower cover (3) on the plug guide (2).</p> <p>NOTICE! The hole for the passage of the loading pressure must match the similar one on the plug guide.</p>
46	<p>Insert and fasten the screws of the lower part (27) in the lower cover (3) according to the tightening torque:</p> <ul style="list-style-type: none"> 1": Tab. 1.80 2": Tab. 1.81 <p>NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p>
47	<p>Put the diaphragm unit in place (10, 12, 13, 21, 29, 45, 50, 62).</p>
48	<p>Make sure that the key (28) is in the correct position in the stem (6).</p>
49	<p>Insert and secure the balancing stem guide (11) according to the tightening torque:</p> <ul style="list-style-type: none"> 1": Tab. 1.80 2": Tab. 1.81 <p>NOTICE! During this phase:</p> <ul style="list-style-type: none"> hold the diaphragm assembly in place by positioning the spanner in the holes in the upper diaphragm support (13); The holes in the diaphragm must match the holes in the lower cover (3).




Built-in monitor PM/182 1"- 2"

Step	Action
50	<p>Position the upper cover (3), taking care to position the indicator stem (18) in the space between the upper diaphragm support (13) and the balance stem guide (11).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • The indicator rod (18) must not obstruct the pouring hole (21) on the upper diaphragm support (13); • The flange travel indicator must be visible and perpendicular to the gas flow. </div>
51	<p>Insert and fasten the screws (25) with the nuts (26) according to the tightening torque:</p> <ul style="list-style-type: none"> • 1": Tab. 1.80 • 2": Tab. 1.81 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
52	<p>Put the spacer (22) and the spring (54) in place.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Fit the spacer (34) so that the stop with the narrower hole rests on the surface of the stem (6).</p> </div>
53	<p>Insert the plug (5).</p>
54	<p>Insert the locking nut (9) according to the tightening torque:</p> <ul style="list-style-type: none"> • 1": Tab. 1.80 • 2": Tab. 1.81 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Before fixing the lock nut (9), check that the spring (80) is well seated in the appropriate centring stop on the plug guide (70).</p> </div>
55	<p>Unscrew and remove screws (30), locking ring (8), reinforced gasket (7) and O-ring (93).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Take care that the upper seal does not fall off.</p> </div>
56	<p>Remove the O-ring (39) from the reinforced gasket (7) 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>
57	<p>Position the reinforced gasket (7) and the locking ring (8).</p>
58	<p>Insert and fix the screws (30) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 1": Tab. 1.80 • 2": Tab. 1.81 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
59	<p>Position the control head inside the regulator body (1) with the indicator slide (16) visible and on axis with the gas flow direction.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Take care not to damage the plug profile (5).</p> </div>



Built-in monitor PM/182 1"- 2"

Step	Action
60	Insert and fix the screws (31) according to the following tightening torque: <ul style="list-style-type: none"> • 1": Tab. 1.80 • 2": Tab. 1.81 <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2. </div>
61	Connect the pneumatic connections between the regulator and the respective control unit, including downstream pressure ports.

Tab. 9.106

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.6.2 - BUILT-IN MONITOR PM/182 2" 1/2- 4"

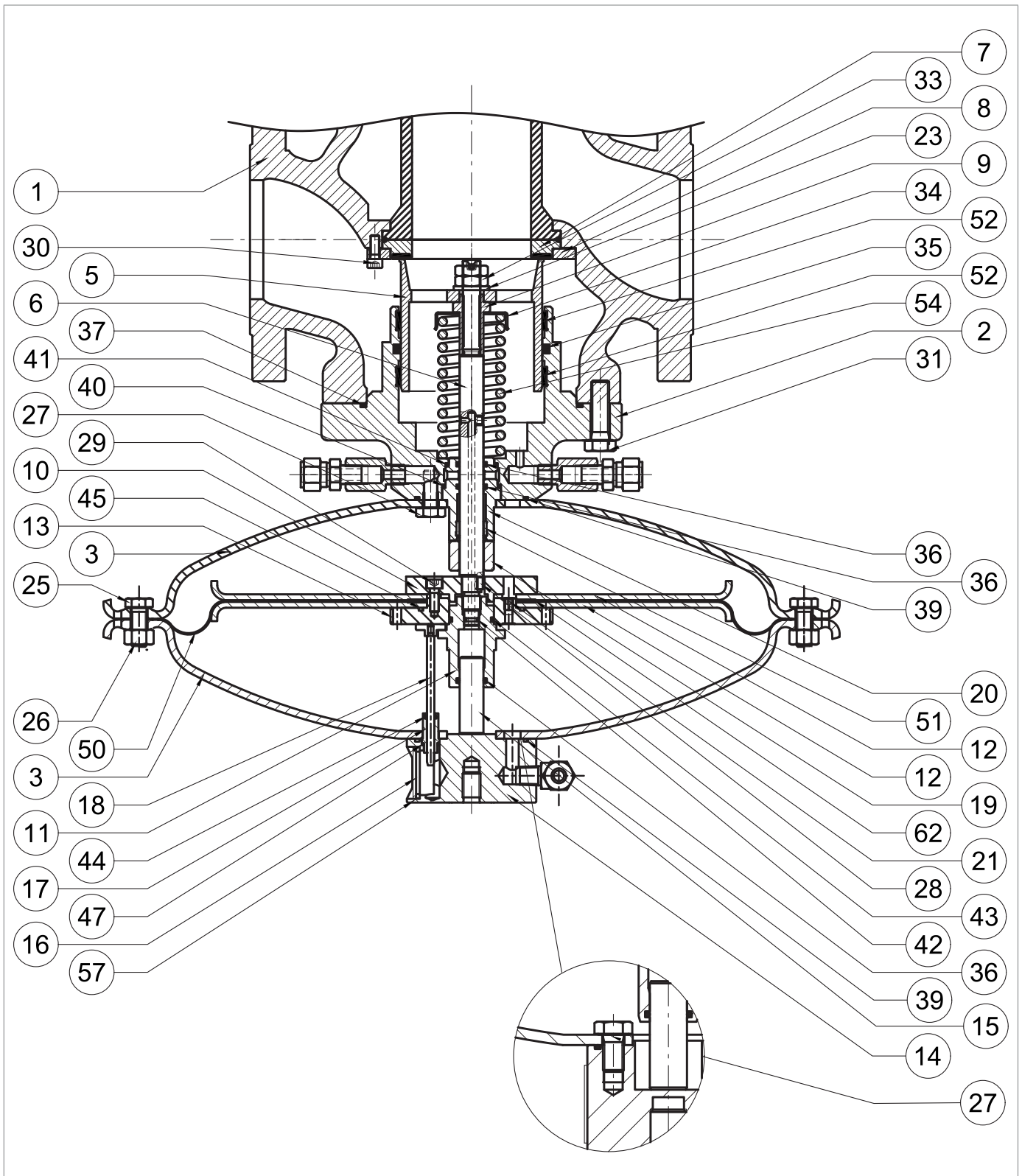
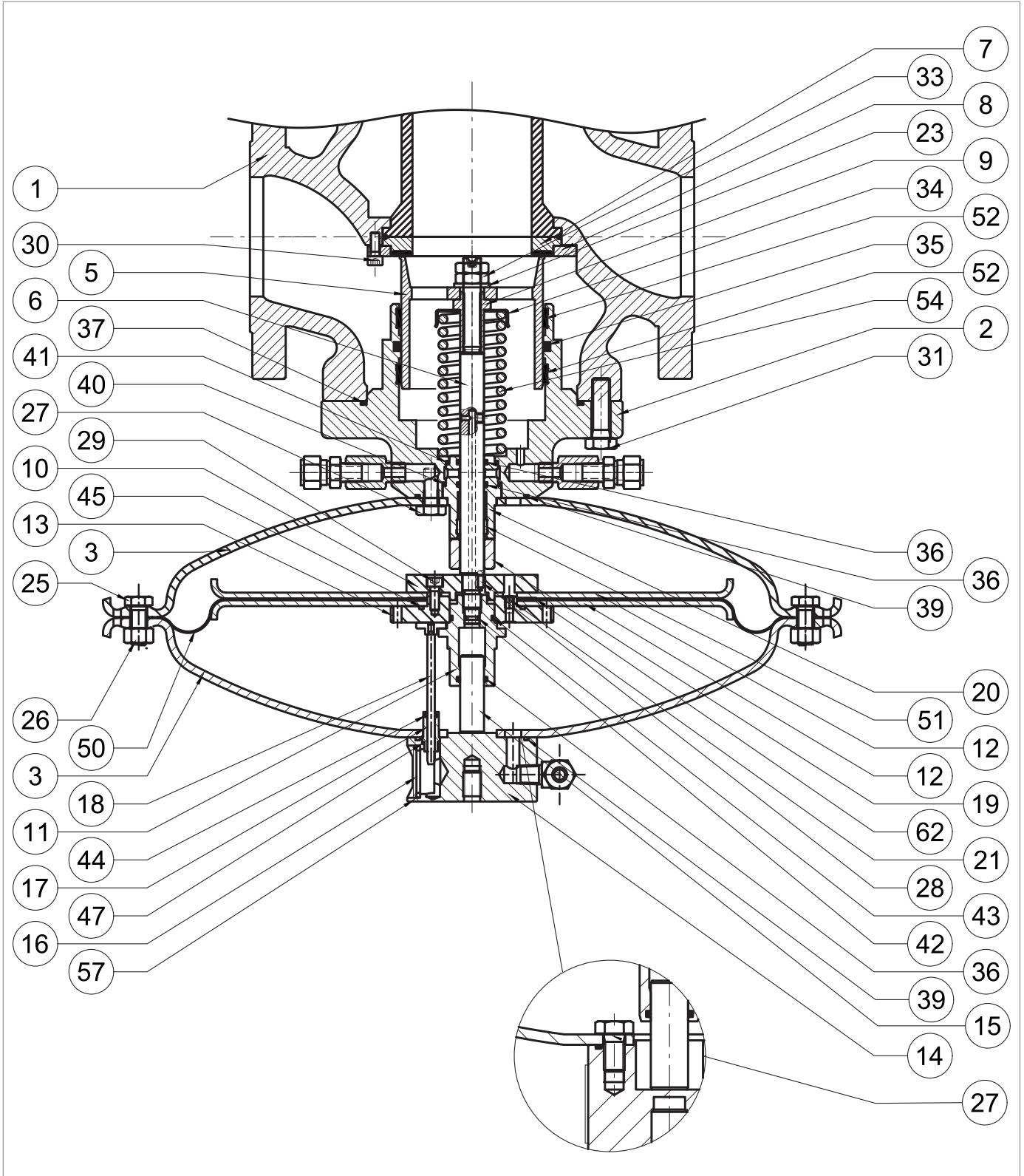


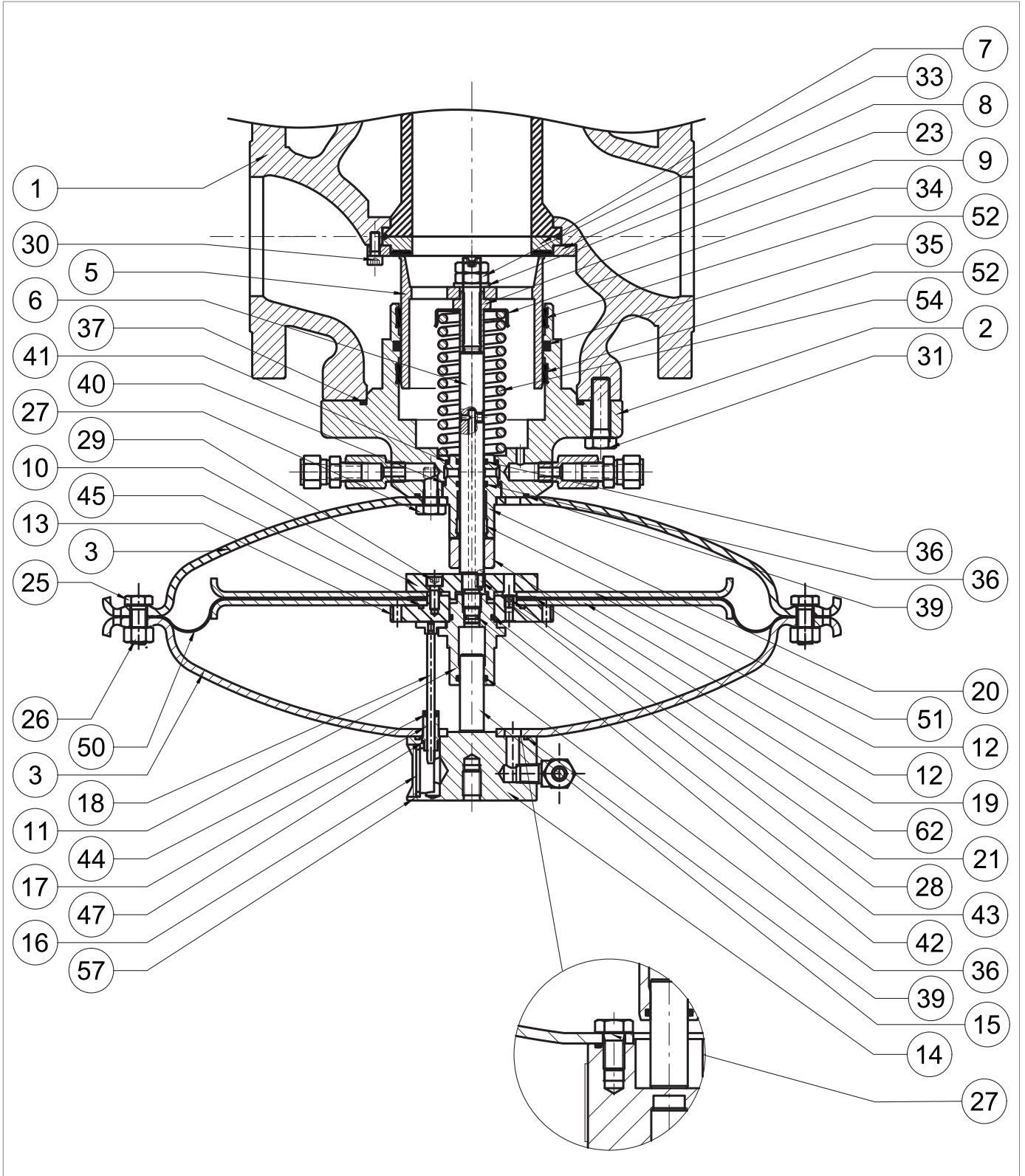
Fig. 9.56. Built-in monitor PM/182 2" 1/2- 4"

Step	Action
1	<p>Unscrew and remove the screws (31) securing the control head to the regulator body (1).</p> <p>NOTICE! Support the head assembly during this step to avoid falls.</p>
2	<p>Remove the control head and place it on its side in a plane with an impact-resistant surface.</p> <p>NOTICE! Take care not to damage the plug profile (5).</p>
3	<p>Remove the O-ring (37) from the plug guide (2) 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>
4	<p>Unscrew and remove the nuts (33) together with the washer (23).</p> <p>NOTICE! During this phase, the spring (54) decompresses and pushes the plug (5) outwards.</p>
5	Remove the plug (5) and place it on an anti-shock surface.
6	<p>Unscrew the locking nut (9) to release the spring.</p> <p>NOTICE! Take care not to damage the plug profile (5).</p>
7	Remove the spring support (34) and the spring (54).
8	<p>Remove and replace the I/DWR rings (52) from the plug guide (2).</p> <p>NOTICE! Before inserting the replacement I/DWR rings, clean the retaining slots with a cleaning solution.</p>
9	<p>Remove the O-ring (35) from the plug guide (2) 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>
10	Clean the plug (5) and the plug guide (2) lubricating with silicone grease.
11	Unscrew and remove the nuts (26, 97) together with the screws (25, 98).
12	Remove the upper lid (3).
13	Remove the indicator rod (18) from the rod guide (17).
14	Unscrew and remove the top screws (27) from the top cover (3).
15	Separate the upper cover (3) from the eyebolt flange (14).
16	Take out the rod guide (17).
17	<p>Remove the O-rings (39, 47) from the eyebolt flange (14) and replace them, taking care to lubricate them with synthetic grease.</p> <p>NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p>
18	<p>Remove the O-ring (44) from the rod guide (17) 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>
19	Place the rod guide (17) in the eyebolt flange (14).



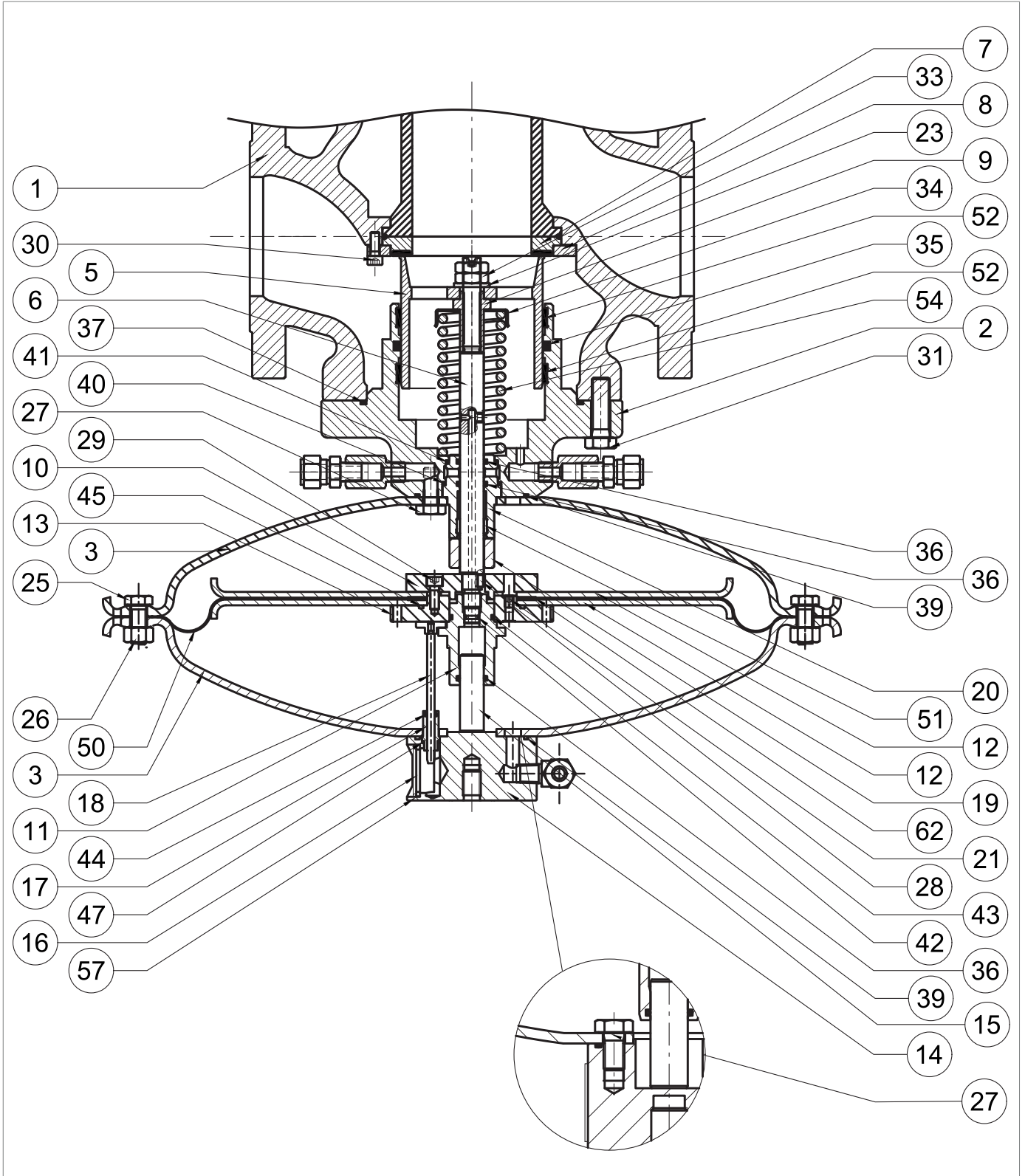
Built-in monitor PM/182 2" 1/2- 4"

Step	Action
20	Assemble the eyebolt flange (14) with the upper cover (3).
21	<p>Insert and fasten the screws of the upper part (27) in the upper cover (3) according to the tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
22	Insert the indicator rod (18) into the rod guide (17).
23	<p>Unscrew and remove the balancing stem guide (11).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Hold the diaphragm assembly in place by positioning the spanner in the holes in the upper diaphragm support (13).</p> </div>
24	Remove the balancing piston (15) from the balancing stem guide (11).
25	<p>Remove and replace the O-rings (36, 43) from the balancing stem guide (11), lubricating them with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p> </div>
26	Position the balancing piston (15) in the balancing stem guide (11).
27	Take out the diaphragm unit (10, 12, 13, 21, 29, 45, 50, 62)
28	Unscrew and remove the screws (29) from the lower diaphragm support (10).
29	Remove the diaphragm support (10) and the lower diaphragm protection disc (12).
30	Remove and replace the diaphragm (50) together with the oil seal (62).
31	Remove the lower diaphragm protection disc (12) from the upper diaphragm holder (13).
32	<p>Remove and replace the O-ring (45) from the upper diaphragm support (13), lubricating it with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
33	<p>Place the upper diaphragm protection disc (12) in the upper diaphragm holder (13).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Check that the hole on the nozzle (21) is free from dirt or foreign bodies.</p> </div>
34	<p>Position the diaphragm (50).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! The convex side of the diaphragm must face the drive chamber (pos. D, fig. 4.6).</p> </div>
35	Position the oil seal (62).
36	<p>Put the diaphragm protection disc (12) and the lower diaphragm support (10) in place.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Check that the nozzle hole on the upper diaphragm support (13) is aligned with the hole on the lower diaphragm support (10).</p> </div>



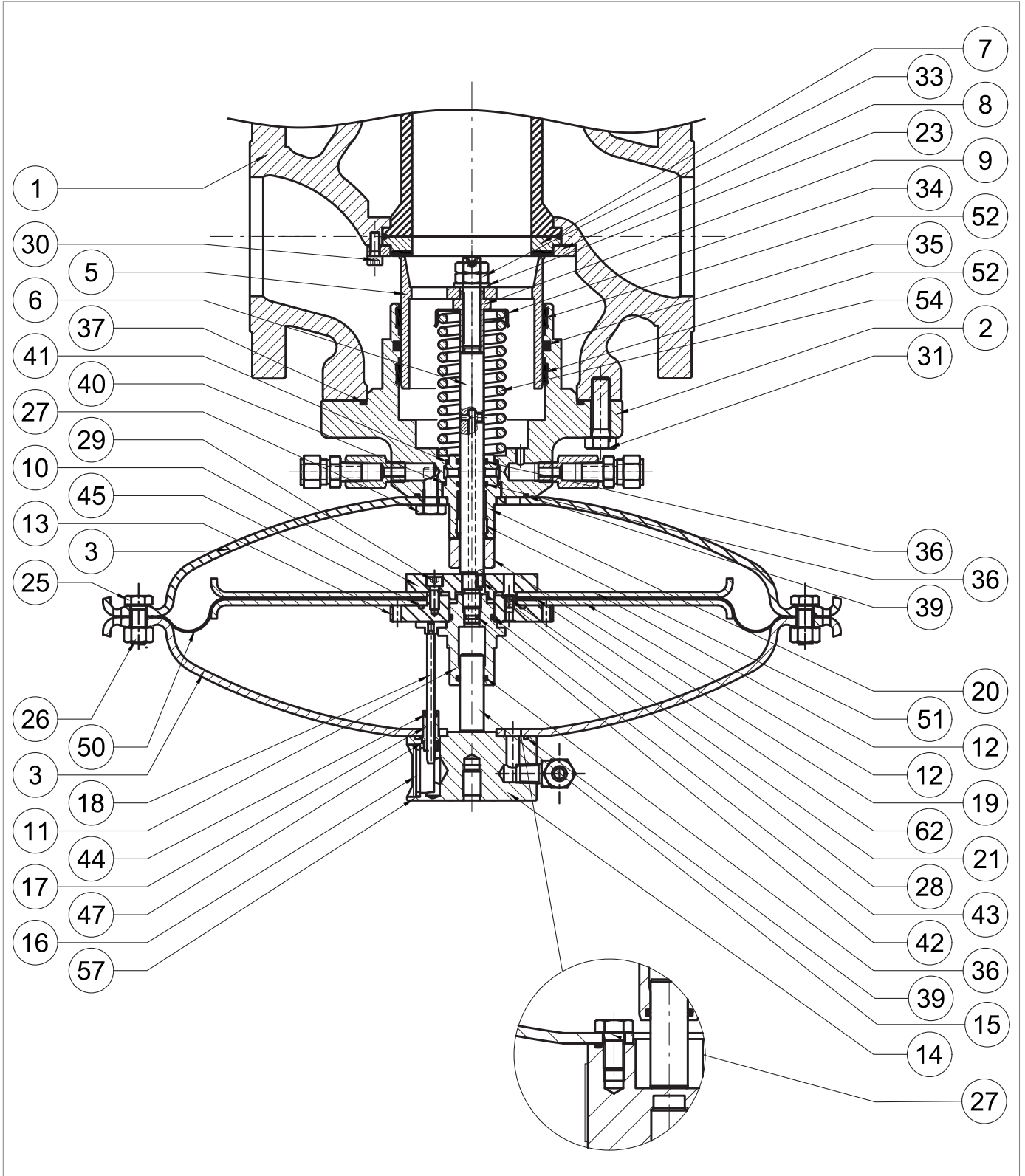
Built-in monitor PM/182 2" 1/2- 4"

Step	Action
37	<p>Apply thread locking glue to insert and fix the screws (29) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
38	Unscrew and remove the screws of the lower part (27) in the lower cover (3).
39	Remove the lower cover (3).
40	<p>Remove the O-ring (39) from the plug guide (2) and replace it, taking care to lubricate it with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
41	Remove the stem guide (20), the stem (6) and the key (28).
42	<p>Remove and replace the I/DWR ring (51) from the stem guide (20).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
43	<p>Remove the O-ring (36) from the stem guide (20) and replace it, taking care to lubricate it with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
44	<p>Remove the O-rings (40, 41) from the stem guide (20) and replace them, taking care to lubricate them with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</p> </div>
45	<p>Remove the O-ring (42) from the stem (6) and replace it, taking care to lubricate it with synthetic grease.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
46	<p>Remove the stem guide (20), the stem (6) and the key (28).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • Lubricate the stem surface with silicone grease • The key (28) must be in the correct position in the stem (6). </div>
47	<p>Put the lower cover (3) in place and fix it on the plug guide (2).</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Match the hole for the passage of the loading pressure to the similar one on the plug guide.</p> </div>
48	<p>Insert and fasten the screws of the lower part (27) in the lower cover (3) according to the tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
49	Put the diaphragm unit in place (10, 12, 13, 21, 29, 45, 50, 62).
50	Make sure that the key (28) is in the correct position in the stem (6).



Built-in monitor PM/182 2" 1/2- 4"

Step	Action
51	<p>Insert and secure the balancing stem guide (11) according to the tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Hold the diaphragm assembly in place by positioning the spanner in the holes in the upper diaphragm support (13).</p> </div>
52	<p>Position the upper cover (3), taking care to position the indicator stem (18) in the space between the upper diaphragm support (13) and the balance stem guide (11).</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • The indicator rod (18) must not obstruct the pouring hole (21) on the upper diaphragm support (13); • The flange travel indicator must be perpendicular to the gas flow and visible. </div>
53	Place the pilot support screw (98).
54	<p>Insert and fasten the screws (25) with the nuts (26) according to the tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84
55	<p>Position the spring holder (34) and spring (54).</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Check that the spring (54) is properly seated in the centring stop on the plug guide (2).</p> </div>
56	<p>Insert the locking nut (9) according to the tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
57	Insert the plug (5).
58	<p>Unscrew and remove screws (30), locking ring (8), reinforced gasket (7) and O-ring (93).</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Take care that the upper seal does not fall off.</p> </div>
59	<p>Remove the O-ring (93) from the reinforced gasket (7) and replace it, taking care to lubricate it with synthetic grease.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
60	Position the reinforced gasket (7) and the locking ring (8).
61	<p>Insert and fix the screws (30) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid blue; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>



Built-in monitor PM/182 2" 1/2- 4"

Step	Action
62	<p>Position the control head inside the regulator body (1) with the indicator slide (16) visible and on axis with the gas flow direction.</p> <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Take care not to damage the plug profile (5).</p> </div>
63	<p>Insert and fix the screws (31) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 2" ½: Tab. 1.82 • 3": Tab. 1.83 • 4": Tab. 1.84 <div style="border: 1px solid black; padding: 5px;"> <p>! NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
64	<p>Connect the pneumatic connections between the regulator and the respective control unit, including downstream pressure ports.</p>

! WARNING!

Ensure that all parts have been fitted correctly.

9.4.7 - 200/A SERIES PILOT + PRE-REGULATORS R31/A AND R14/A MAINTENANCE

9.4.7.1 - PILOT DISCONNECTION SERIES 201/A AND PRE-REGULATOR R31/A

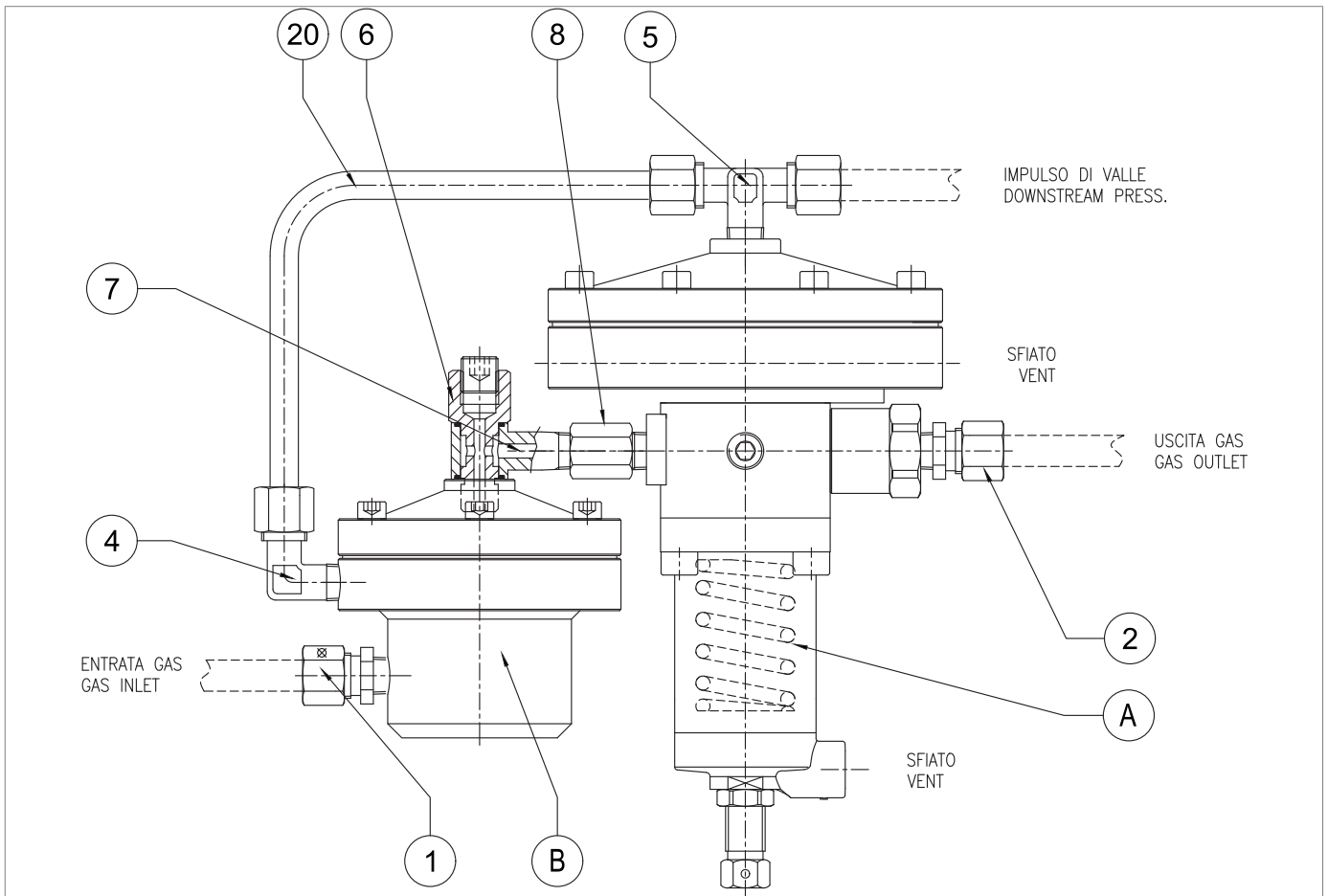


Fig. 9.57. 201/A + R31/A series pilot

To disconnect pilot 201/A, proceed as shown in Tab. 1.107 (Fig. 1.57):

Step	Action
1	Disconnect the sensing lines between the 201/A pilot and the regulator by adjusting the fittings (1, 2, 3).
2	Unscrew and remove the fixing screw to remove the 201/A pilot from the regulator.
3	Remove the pipe (20) by adjusting the fittings (4, 5).
4	Unscrew and remove screw (6) to separate pre-regulator R31/A from pilot 201/A.
5	Undo and remove the screw (7) from pilot 201/A.

Tab. 9.107.

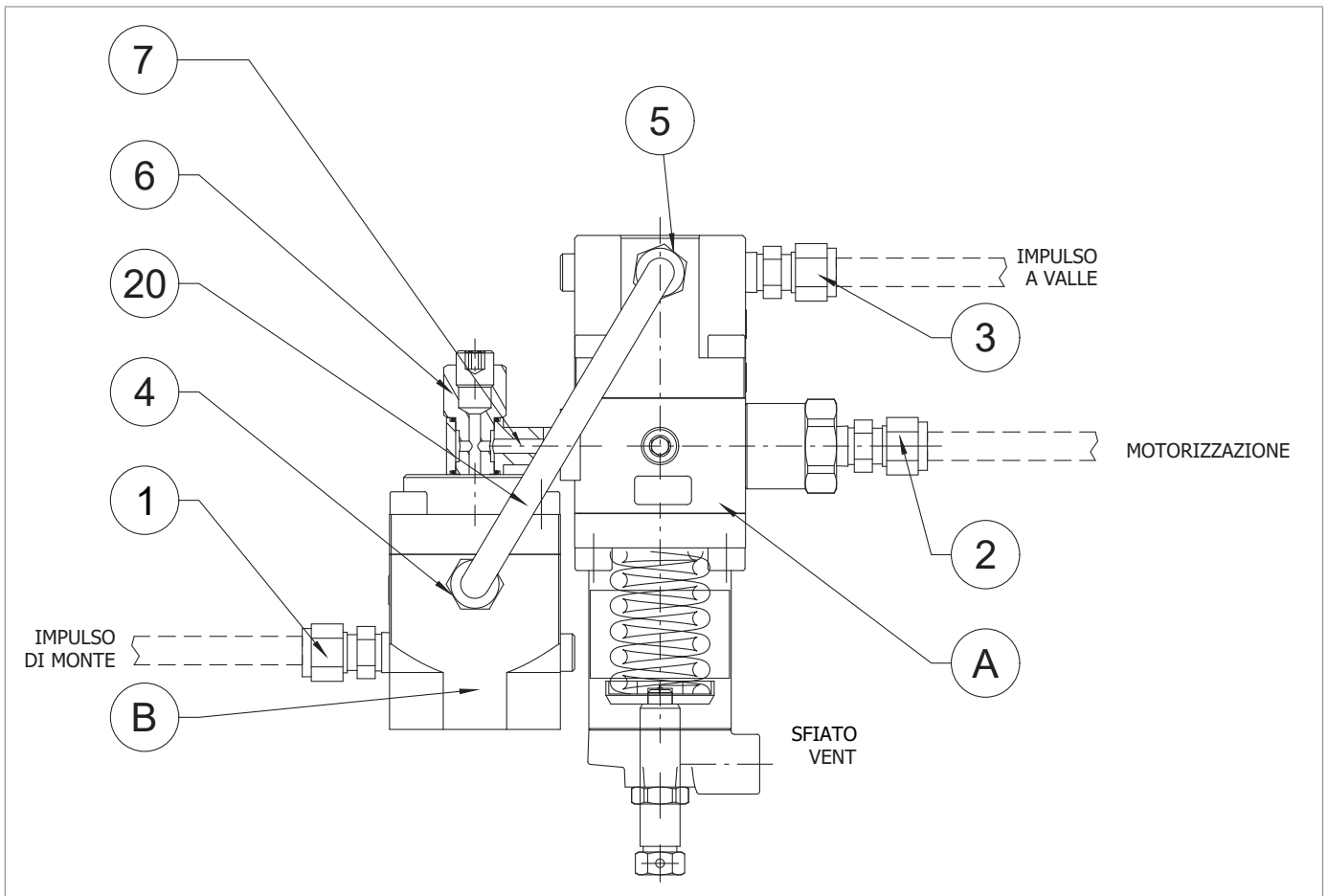
9.4.7.2 - 204/A SERIES PILOT DISCONNECTION AND R14/A PRE-REGULATOR


Fig. 9.58. 204/A + R14/A series pilot

To disconnect pilot 204/A, proceed as shown in Tab. 1.108 (Fig. 1.58):

Step	Action
1	Disconnect the sensing lines between the 204/A pilot and the regulator by adjusting the fittings (1, 2, 3).
2	Unscrew and remove the fixing screw to remove the pilot 204/A from the regulator.
3	Remove the pipe (20) by adjusting the fittings (4, 5).
4	Unscrew and remove the screw (6) to separate the R14/A pre-regulator from the pilot 204/A.
5	Undo and remove the screw (7) from pilot 204/A.

Tab. 9.108.

9.4.7.3 - PILOT 201/A

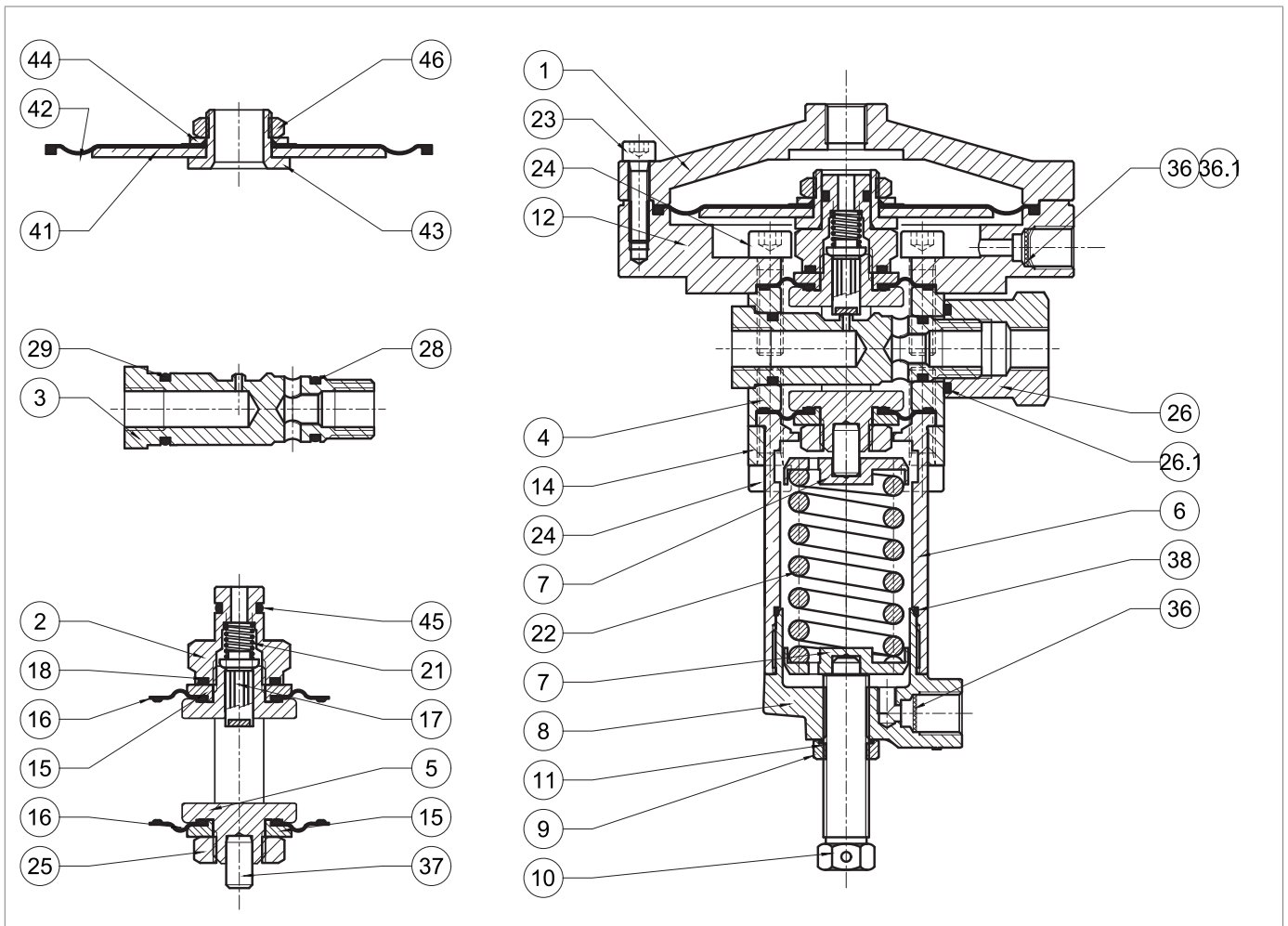





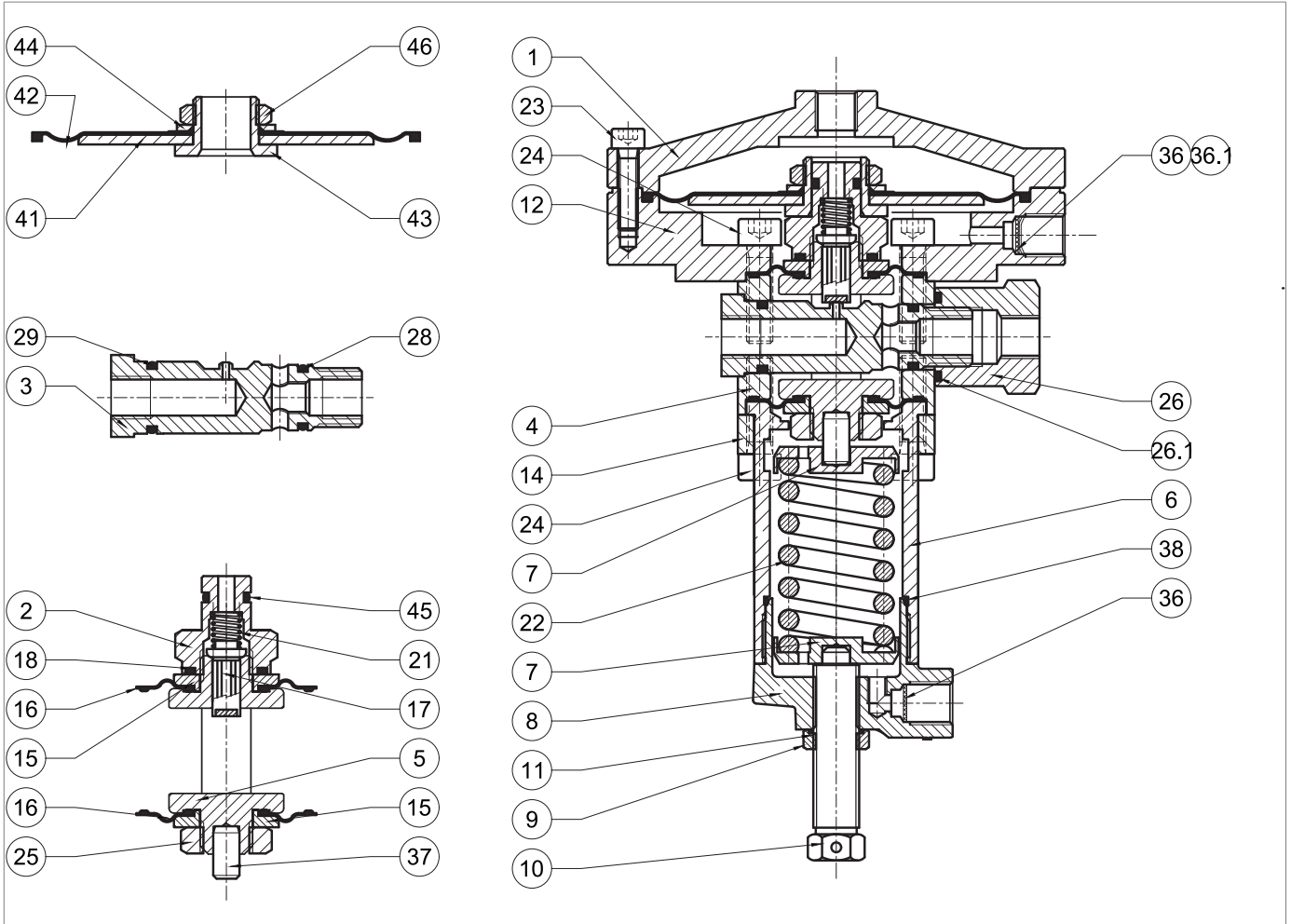


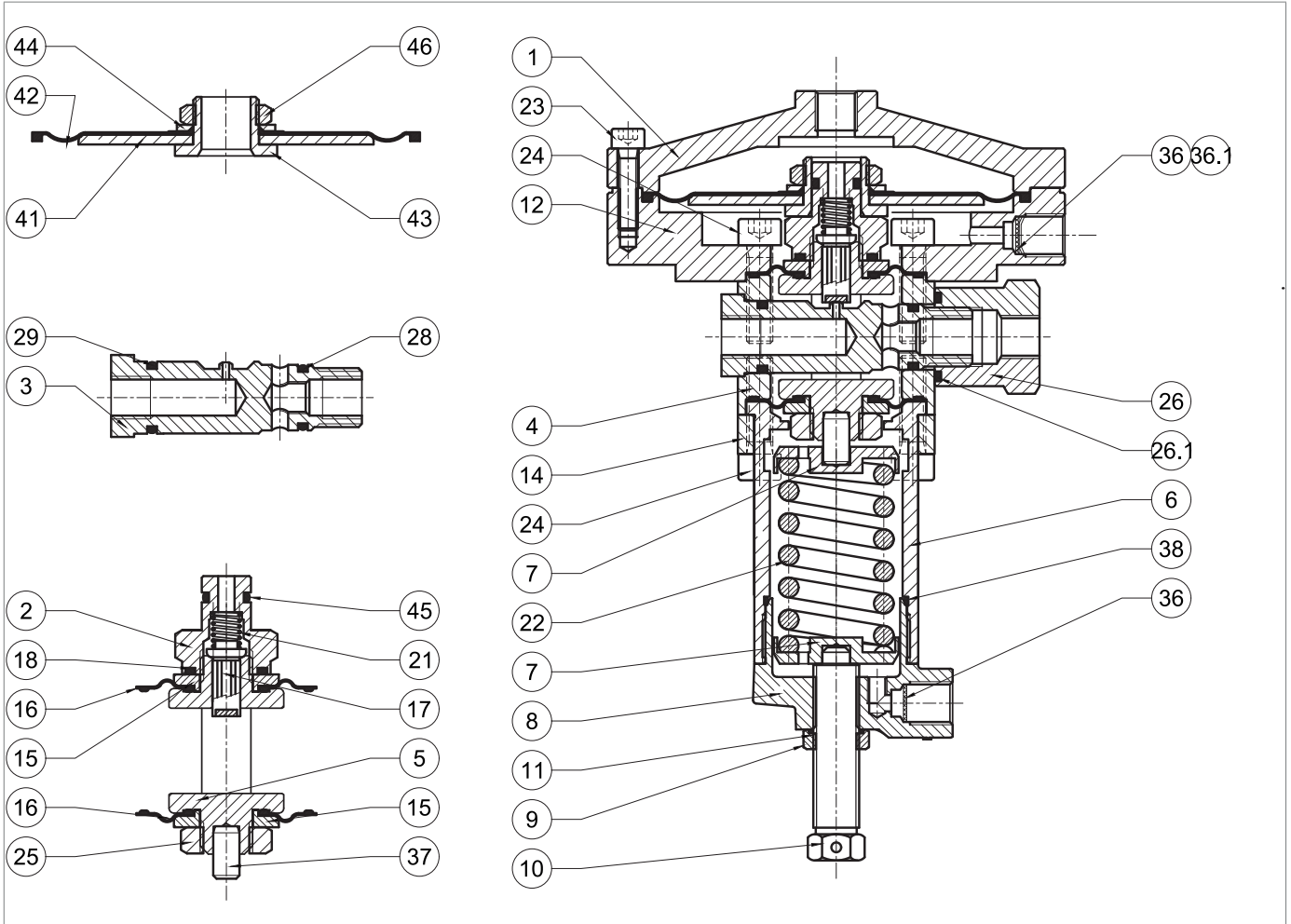
Fig. 9.59. Pilot 201/A

Step	Action
1	Loosen the nut (9).
2	Completely release the spring (22) by turning the adjusting screw (10).
3	Remove the adjusting screw (10) together with the cap (9).
4	Remove the cap (8).
	Remove the O-ring (38) from the cap (8) and replace it, taking care to lubricate it with synthetic grease.
5	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
6	Remove the spring (22) and the spring supports (7).
7	Undo and remove the screws of the lower section (24).
8	Remove the bracket (14) from the sleeve (6).
9	Remove the sleeve (6).
10	Undo and remove the screws (23).
11	Remove the pilot cover (1).
12	Remove assembly 'C' (diaphragm).
	Unscrew and remove the nut (46) together with the washer (44)
13	 NOTICE! During this operation, hold the diaphragm support (43) in place.
14	Remove and replace the diaphragm (42).
15	Position the washer (44) with the conical part facing the diaphragm.
	Insert and fix the nut (46).
16	 NOTICE! During this operation, hold the diaphragm support (43) in place.
17	Undo and remove the screws of the upper section (24).
18	Remove the flange (12).
19	Unscrew and remove the nut (26).
20	Remove and replace O-ring (26.1) from nut (26)
21	Remove assembly "B" (valve).
	Remove the O-rings (28, 29) from the valve seat (3) and replace them, taking care to lubricate them with synthetic grease.
22	 NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
23	Remove assembly "A" (plug) from the valve body (4) by pushing it from the bottom upwards.
24	Unscrew and remove the pilot nut (2).
	Remove the O-ring (18) of the pilot nut (2) and replace it, taking care to lubricate it with synthetic grease.
25	 NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
26	Remove the spring (21).
27	Remove and replace the plug (17).
28	Remove the upper protection disc (15).




Pilot 201/A

Step	Action
29	Remove and replace the upper diaphragm (16), taking care to lubricate the lanyards with synthetic grease. ! NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
30	Unscrew and remove the nut (25).
31	Remove the lower protection disc (15).
32	Remove and replace the lower diaphragm (16), taking care to lubricate the lanyards with synthetic grease. ! NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
33	Fit the lower protection disc (15).
34	Fix the nut (25) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A: Tab. 1.85
35	Fit the plug (17) and then the spring (21).
36	Fit the upper protection disc (15).
37	Fix the nut (2) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A: Tab. 1.85
38	Insert assembly "A" (plug) from top to bottom into the valve body (4). ! NOTICE! <ul style="list-style-type: none"> • Take care not to damage the diaphragms (16) during this step • Make sure the marking on the lower section of the headframe is parallel to the axis of the hole for inserting the seat (3) into the valve body (4).
39	Insert assembly "B" (valve) into the valve body (4). ! NOTICE! Take care not to damage the O-rings (28, 29) and the valve seat (3).
40	Insert and fix the nut (26) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A: Tab. 1.85
41	Position the upper diaphragm (16).
42	Position the upper disc (15).
43	Insert the plug (17).
44	Fit the spring (21).
45	Insert and fix the nut (2) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A: Tab. 1.85
46	Fit the flange (12).
47	Insert and fix the screws (24) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A > tab. 9.114
48	Position assembly 'C' (diaphragm).
49	Position cover (1).
50	Insert and fix the screws (23) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A: Tab. 1.85
51	Fit the sleeve (6).
52	Position the bracket (14) in the sleeve (6).
53	Insert and fix the screws of the lower section (24) according to the following tightening torque: <ul style="list-style-type: none"> • Pilot 201/A: Tab. 1.85
54	Insert the upper spring guide (7).



Pilot 201/A

Step	Action
55	Insert the spring (22).
56	Insert the lower spring guide (7).
57	Unscrew the cap (8).
58	Remove the O-ring (11) from the nut (9) 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>
59	Place the nut (9) in the adjusting screw (10).
60	Insert the adjusting screw (10) into the cap (8).

Tab. 9.109.

 **WARNING!**

Ensure that all parts have been fitted correctly.

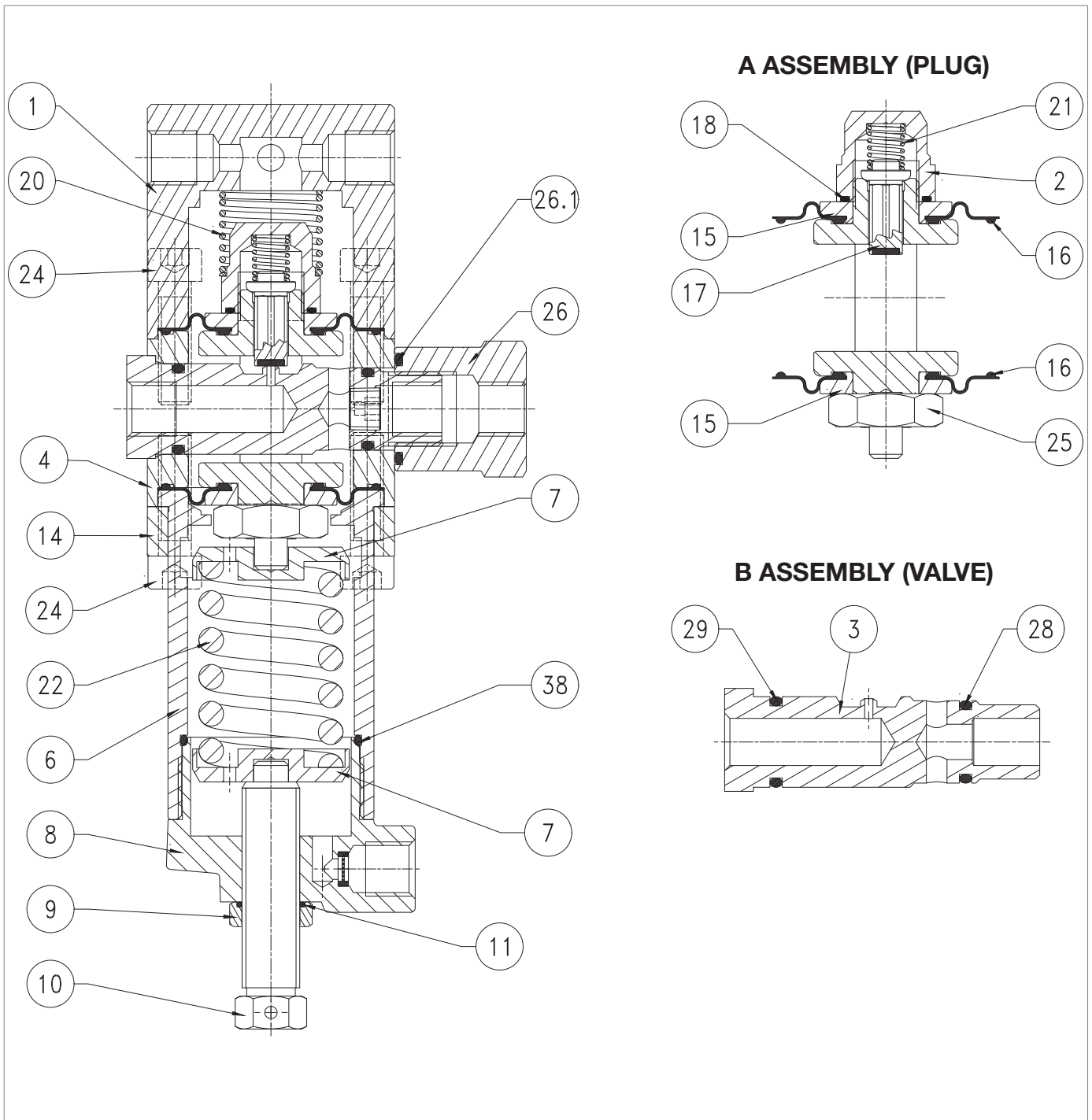






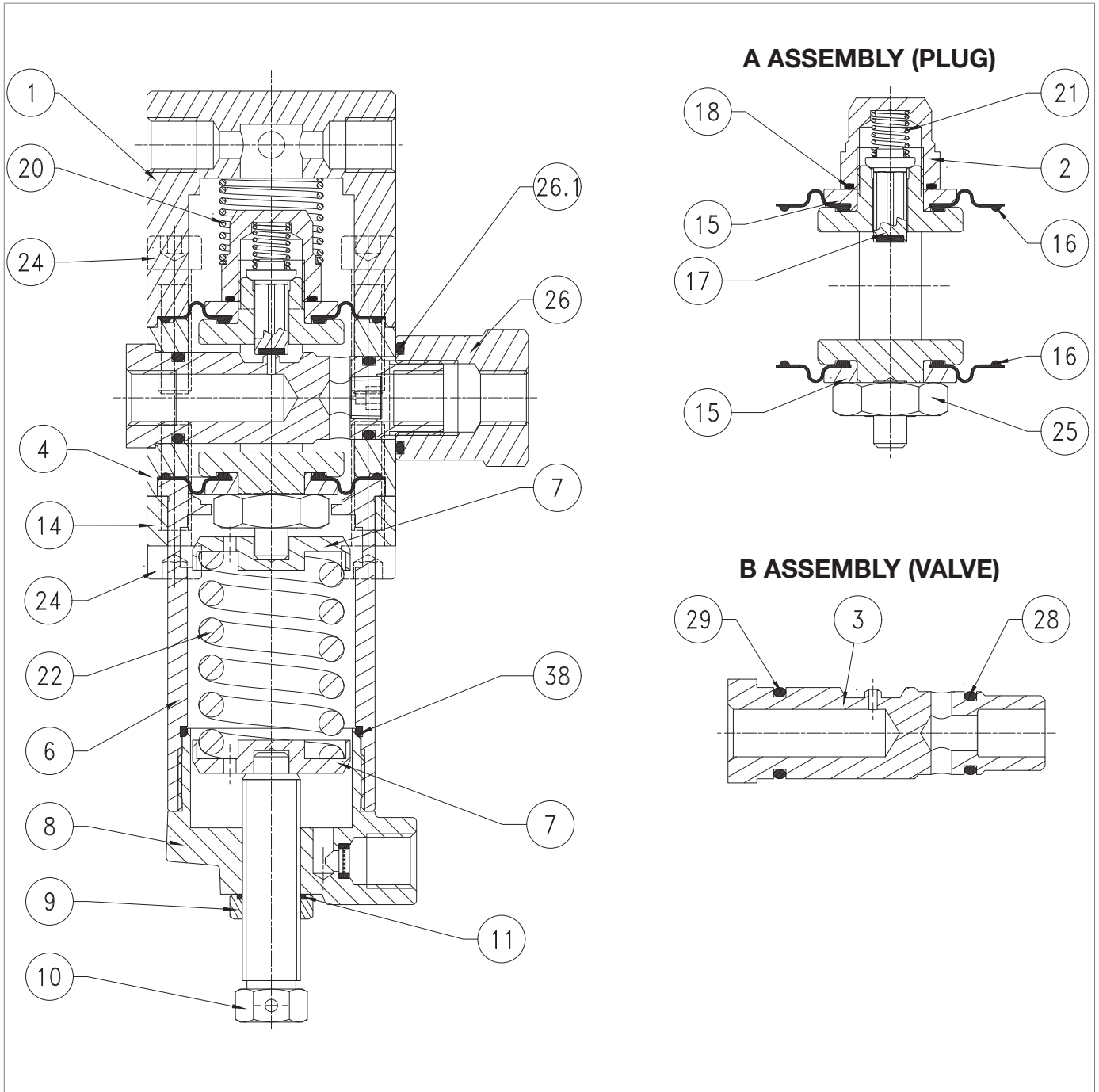


Fig. 9.60. Pilot 204/A

Step	Action
1	Loosen the nut (9).
2	Completely release the spring (22) by turning the adjusting screw (10).
3	Remove the adjusting screw (10) together with the cap (9).
4	Remove the cap (8).
	Remove the O-ring (38) from the cap (8) and replace it, taking care to lubricate it with synthetic grease.
5	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
6	Remove the spring (22) and the spring supports (7).
7	Undo and remove the screws of the lower section (24).
8	Remove the bracket (14) from the sleeve (6).
9	Remove the sleeve (6).
10	Undo and remove the screws of the upper section (24).
11	Remove the pilot cover (1).
12	Remove the spring (20).
13	Unscrew and remove the nut (26).
	Remove the O-ring (26.1) from the nut (26) and replace it, taking care to lubricate it with synthetic grease.
14	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
15	Remove assembly "B" (valve).
	Remove the O-rings (28, 29) from the valve seat (3) and replace them, taking care to lubricate them with synthetic grease.
16	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
17	Remove assembly "A" (plug) from the valve body (4) by pushing it from the bottom upwards.
18	Unscrew and remove the pilot nut (2).
	Remove the O-ring (18) of the pilot nut (2) and replace it, taking care to lubricate it with synthetic grease.
19	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
20	Remove the spring (21).
21	Remove and replace the plug (17).
22	Remove the upper protection disc (15).
	Remove and replace the upper diaphragm (16), taking care to lubricate the lanyards with synthetic grease.
23	 NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
24	Unscrew and remove the nut (25).
25	Remove the lower protection disc (15).
	Remove and replace the lower diaphragm (16), taking care to lubricate the lanyards with synthetic grease.
26	 NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
27	Fit the lower protection disc (15).



Pilot 204/A

Step	Action
28	Fix the nut (25) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 204/A: Tab. 1.86
29	Fit the plug (17) and then the spring (21).
30	Fit the upper protection disc (15).
31	Fix the pilot nut (2) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 204/A: Tab. 1.86
32	Insert assembly "A" (plug) from the top downwards into the valve body (4) <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <ul style="list-style-type: none"> Take care not to damage the diaphragms (16) during this step Make sure the marking on the lower section of the headframe is parallel to the axis of the hole for inserting the seat (3) into the valve body (4). </div>
33	Insert assembly "B" (valve) into the valve body (4). <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>Take care not to damage the O-rings (28, 29) and the valve seat (3).</p> </div>
34	Screw in the nut (26) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 204/A: Tab. 1.86
35	Fit the spring (20).
36	Fit the cover (1).
37	Insert and fix the screws of the upper section (24) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 204/A: Tab. 1.86
38	Fit the sleeve (6) and the bracket (14).
39	Insert and fix the screws of the lower section (24) according to the following tightening torque: <ul style="list-style-type: none"> Pilot 204/A: Tab. 1.86
40	Fit the spring (22) and the spring supports (7).
41	Unscrew the cap (8).
42	Remove and replace the O-ring (11) in the nut (9). <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>NOTICE!</p> <p>Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</p> </div>
43	Fit the adjusting screw (10) together with the cap (9).

Tab. 9.110

WARNING!

Ensure that all parts have been fitted correctly.

9.4.7.5 - PRE-REGULATOR R31/A

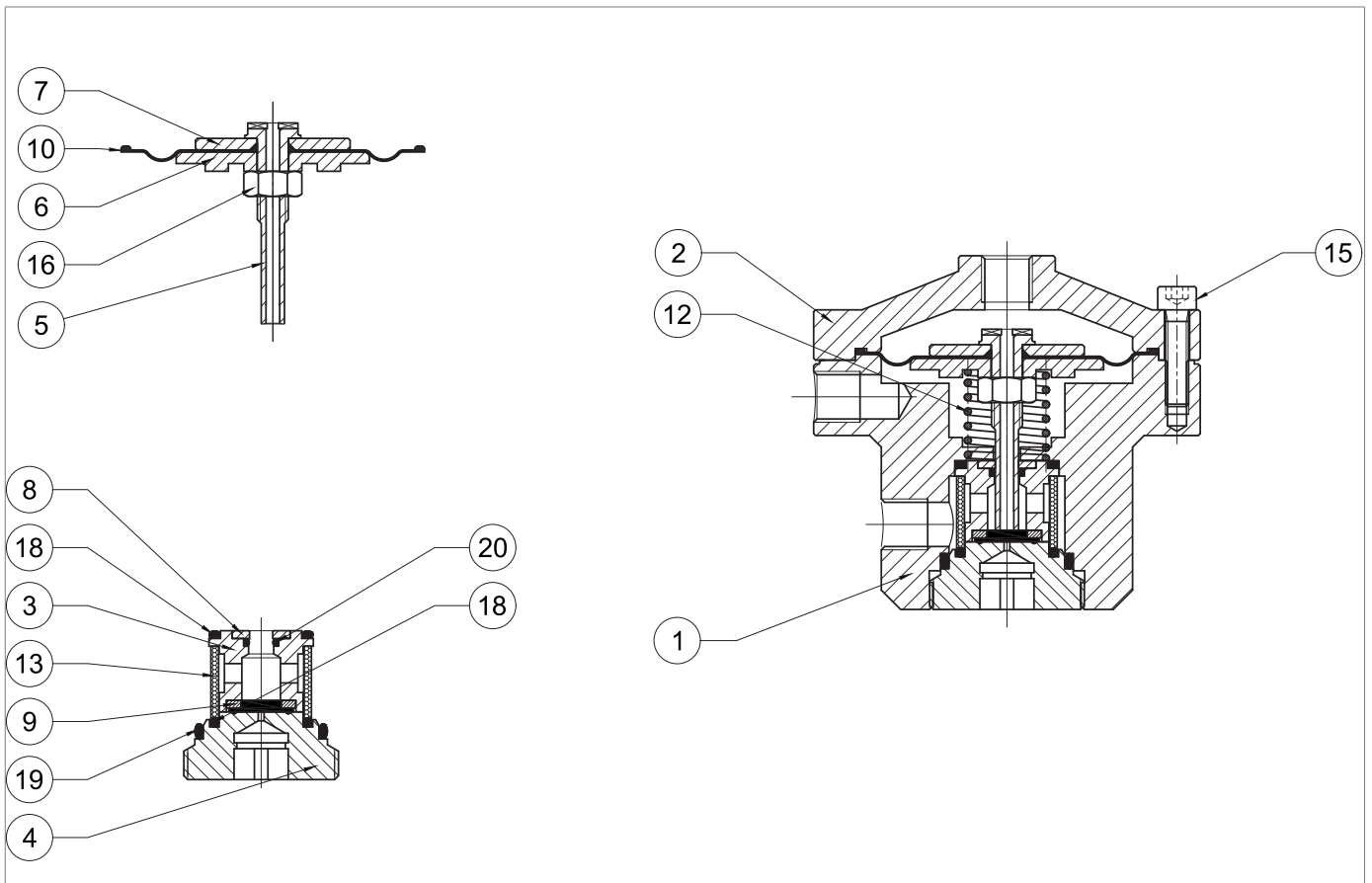









Fig. 9.61. Pre-regulator R31/A

Step	Action
1	Undo and remove the screws (15).
2	Remove the cover (2)
3	Remove assembly "A" (plug).
4	Remove the spring (12).
5	Unscrew and remove the nut (16).  NOTICE! During this step, hold the plug (5) still.
6	Insert the diaphragm protection disc (6) and the diaphragm (10).
7	Remove and replace the gasket (10).  NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
8	Fit the diaphragm protection disc (6).
9	Fit and fix the nut (16) of the plug (5) according to the following tightening torque: <ul style="list-style-type: none"> R31/A: tab. 9.116  NOTICE! During this step, hold the plug (5) still.
10	Unscrew and remove assembly "B" (cap) by adjusting the cap (4).
11	Take out the plug guide (3).
12	Remove the O-ring (18) from the plug guide (3) 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.
13	Remove the plug guide ring (8).
14	Remove the O-ring (20) from the plug guide (3) 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.
15	Remove and replace the reinforced gasket (9).  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
16	Remove and replace the filter (13).
17	Remove the O-rings (18, 19) from the cap (4) and replace them, taking care to lubricate them with synthetic grease.  NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
18	Put the filter (13) and the plug guide (3) in place.
19	Position the plug guide ring (8).
20	Place assembly 'B' (cap) in the body (1).  NOTICE! Take care not to damage the O-rings (18, 19) during this step.

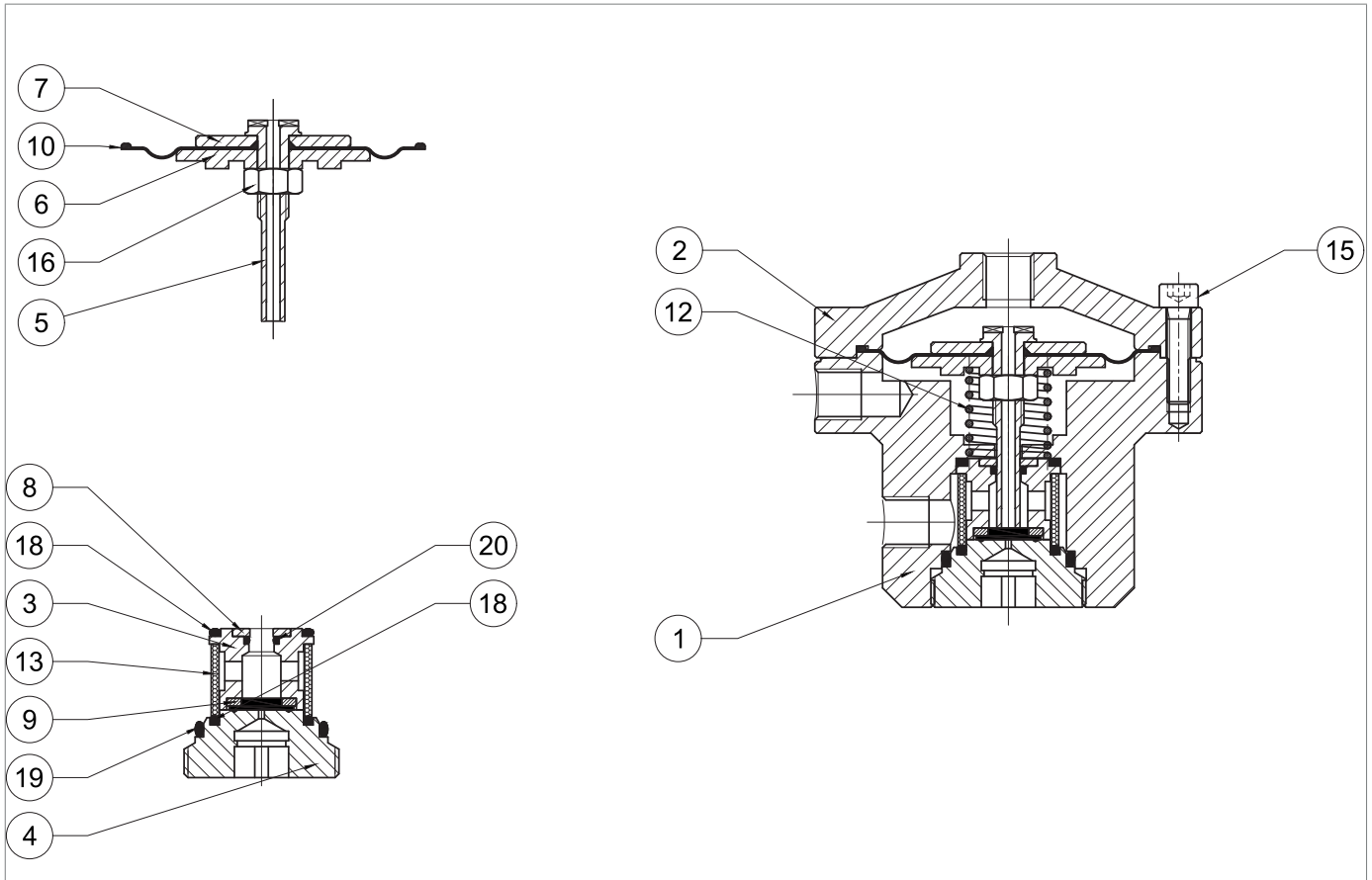


Fig. 9.62. Pre-regulator R31/A

Step	Action
21	Secure the 'B' (cap) assembly by adjusting the cap (4) according to the tightening torque: <ul style="list-style-type: none"> R31/A: Tab. 1.87
22	Fit the spring (12).
23	Insert assembly "A" (plug) into the body (1). <div style="border: 1px solid blue; padding: 5px; margin-top: 5px;"> <p>! NOTICE! Before inserting the plug unit, lubricate the plug surface with silicone grease.</p> </div>
24	Fit the cover (2).
25	Insert and fix the screws (15) according to the following tightening torque: <ul style="list-style-type: none"> R31/A: Tab. 1.87 <div style="border: 1px solid blue; padding: 5px; margin-top: 5px;"> <p>! NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>

Tab. 9.111.

! WARNING!

Ensure that all parts have been fitted correctly.

9.4.7.6 - PRE-REGULATOR R14/A

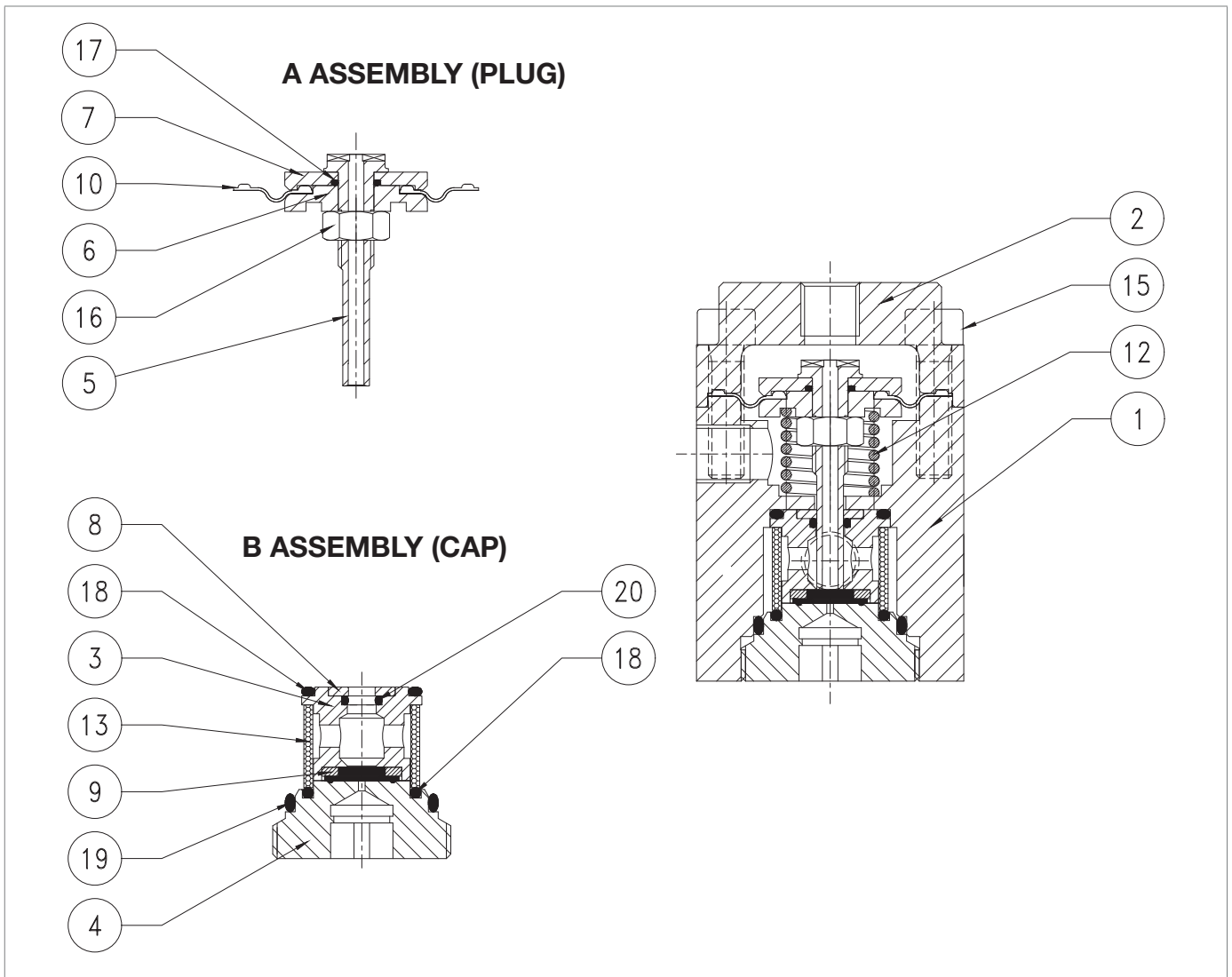
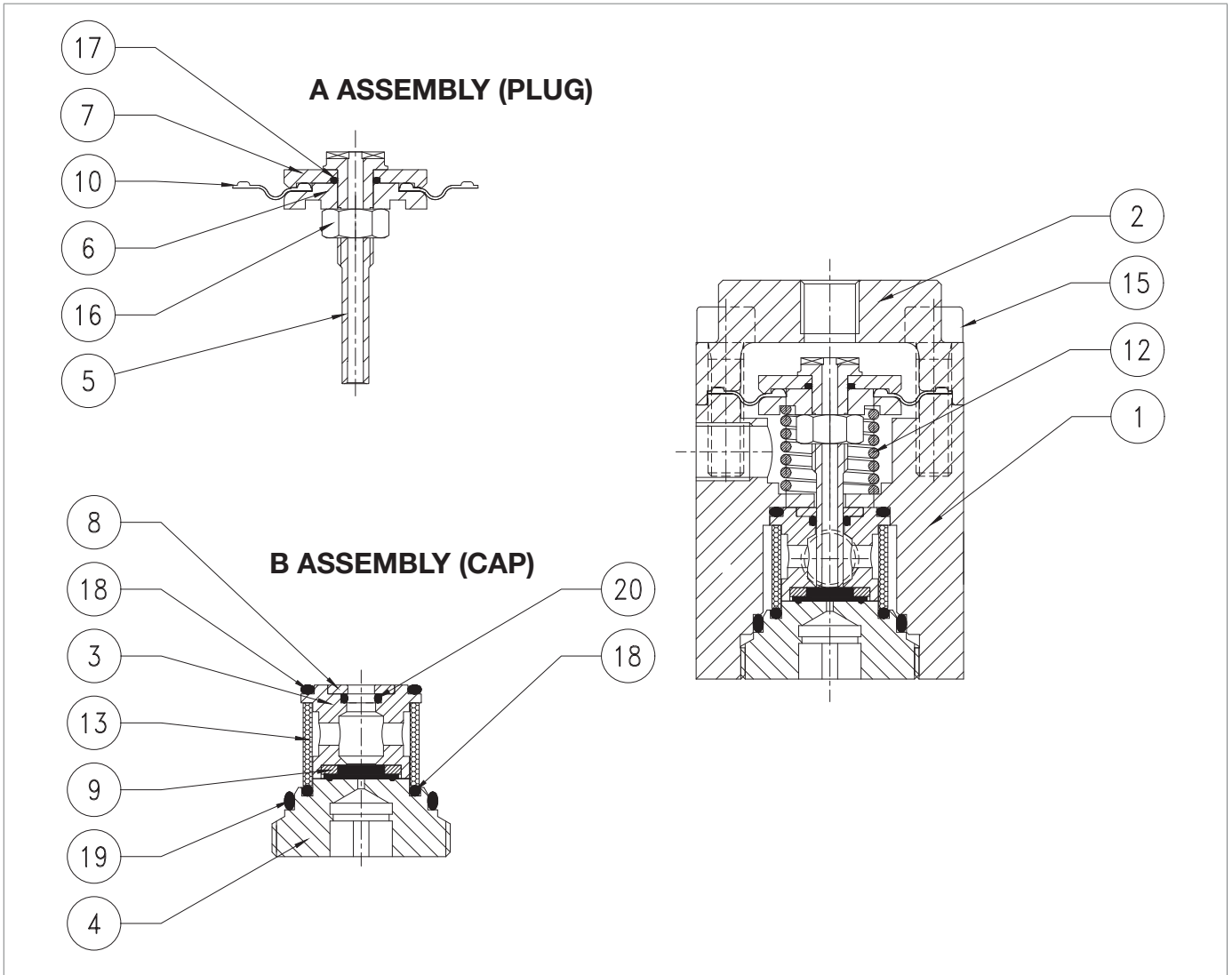


Fig. 9.63. Pre-regulator R14/A

Step	Action
1	Undo and remove the screws (15).
2	Remove the cover (2)
3	Remove assembly "A" (plug).
4	Remove the spring (12).
5	Unscrew and remove the nut (16).
6	Insert the diaphragm protection disc (6) and the diaphragm (10).
7	Remove and replace the O-ring (17) from the diaphragm protection disc (7), lubricating it with synthetic grease. ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
8	Remove and replace the gasket (10). ! NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
9	Fit the diaphragm protection disc (7).
10	Fit and fix the nut (16) of the plug (5) according to the following tightening torque: • R14/A: Tab. 1.88
11	Unscrew and remove assembly "B" (cap) by adjusting the cap (4).
12	Take out the plug guide (3).
13	Remove the O-ring (18) from the plug guide (3) 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	Remove the ring (8).
15	Remove the O-ring (20) from the plug guide (3) 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.
16	Remove and replace the reinforced gasket (9). ! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
17	Remove and replace the filter (13).
18	Remove the O-rings (18, 19) from the cap (4) and replace them, taking care to lubricate them with synthetic grease. ! NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
19	Put the filter (13) and the plug guide (3) in place.



Pre-regulator R14/A

Step	Action
20	Fit the ring (8).
21	Position and secure the assembly " B " (cap). NOTICE! Take care not to damage the O-rings (18, 19) during this step.
22	Fit the spring (12).
23	Insert assembly "A" (plug) into the body (1). NOTICE! Before inserting the plug unit, lubricate the plug surface with silicone grease.
24	Fit the cover (2).
25	Insert and fix the screws (15) according to the following tightening torque: • R14/A: Tab. 1.88 NOTICE! Tighten the screws as shown in the diagram at "1.4.2.2 - Cross diagram for tightening screws".

Tab. 9.112

 **WARNING!**

Ensure that all parts have been fitted correctly.

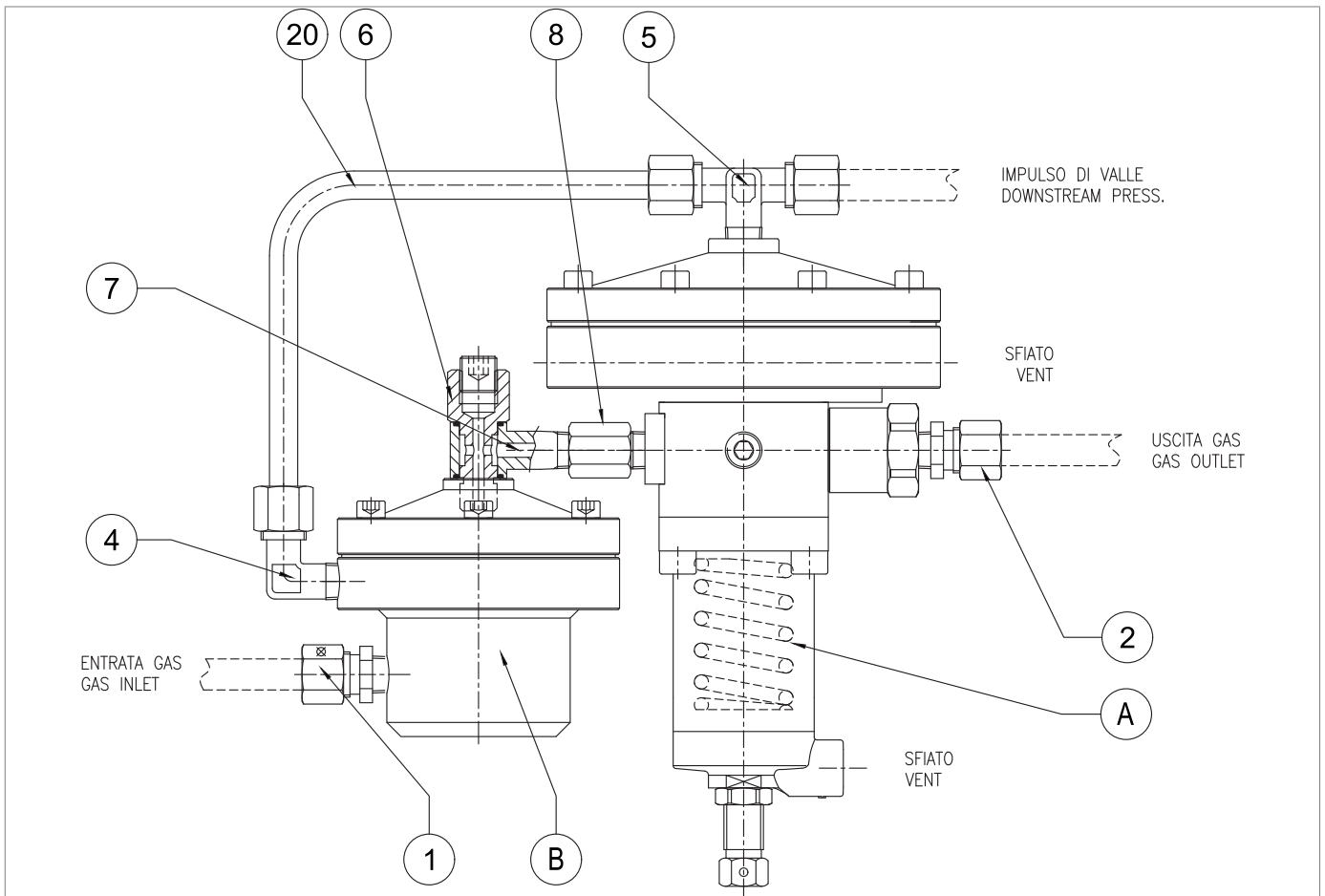
9.4.7.7 - PILOT RECONNECTION SERIES 201/A AND PRE-REGULATOR R31/A


Fig. 9.64. Pilot 201/A and pre-regulator R31/A

To reconnect pilot 201/A, proceed as shown in Tab. 1.113 (Fig. 1.64):

Step	Action
1	Insert and fix the screw (7) to the 201/A pilot.
2	Insert and fasten the screw (6) to connect the pre-regulator R31/A to the pilot 201/A.
3	Connect the pipe (20) by adjusting the fittings (4, 5).
4	Insert and fasten the fastening screw to connect the 201/A pilot to the regulator.
5	Connect the sensing lines between the 201/A pilot and the regulator by adjusting the fittings (1, 2, 3).

Tab. 9.113.

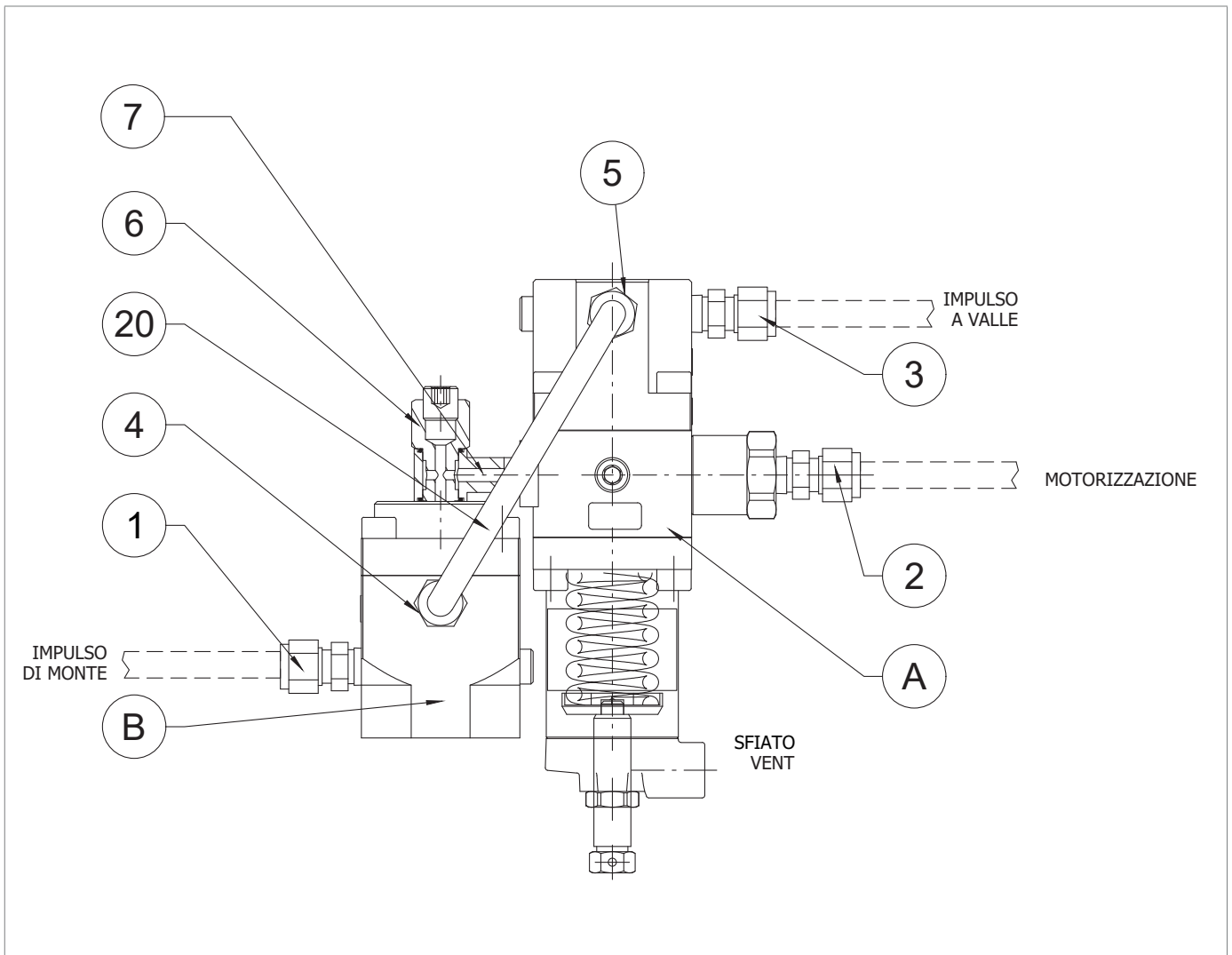
9.4.7.8 - PILOT RECONNECTION SERIES 204/A AND PRE-REGULATOR R14/A


Fig. 9.65. Series 204/A pilot and R14/A pre-regulator

To reconnect pilot 204/A, proceed as shown in Tab. 1.114 (Fig. 1.65):

Step	Action
1	Insert and fix the screw (7) to the 204/A pilot.
2	Insert and fix the screw (6) to connect the R14/A pre-regulator to the 204/A pilot.
3	Connect the pipe (20) by adjusting the fittings (4, 5).
4	Insert and fasten the fixing screw to connect the 204/A pilot to the regulator.
5	Connect the sensing lines between the 204/A pilot and the regulator by adjusting the fittings (1, 2, 3).

Tab. 9.114.

9.4.8 - V/25 ACCELERATOR VALVE MAINTENANCE

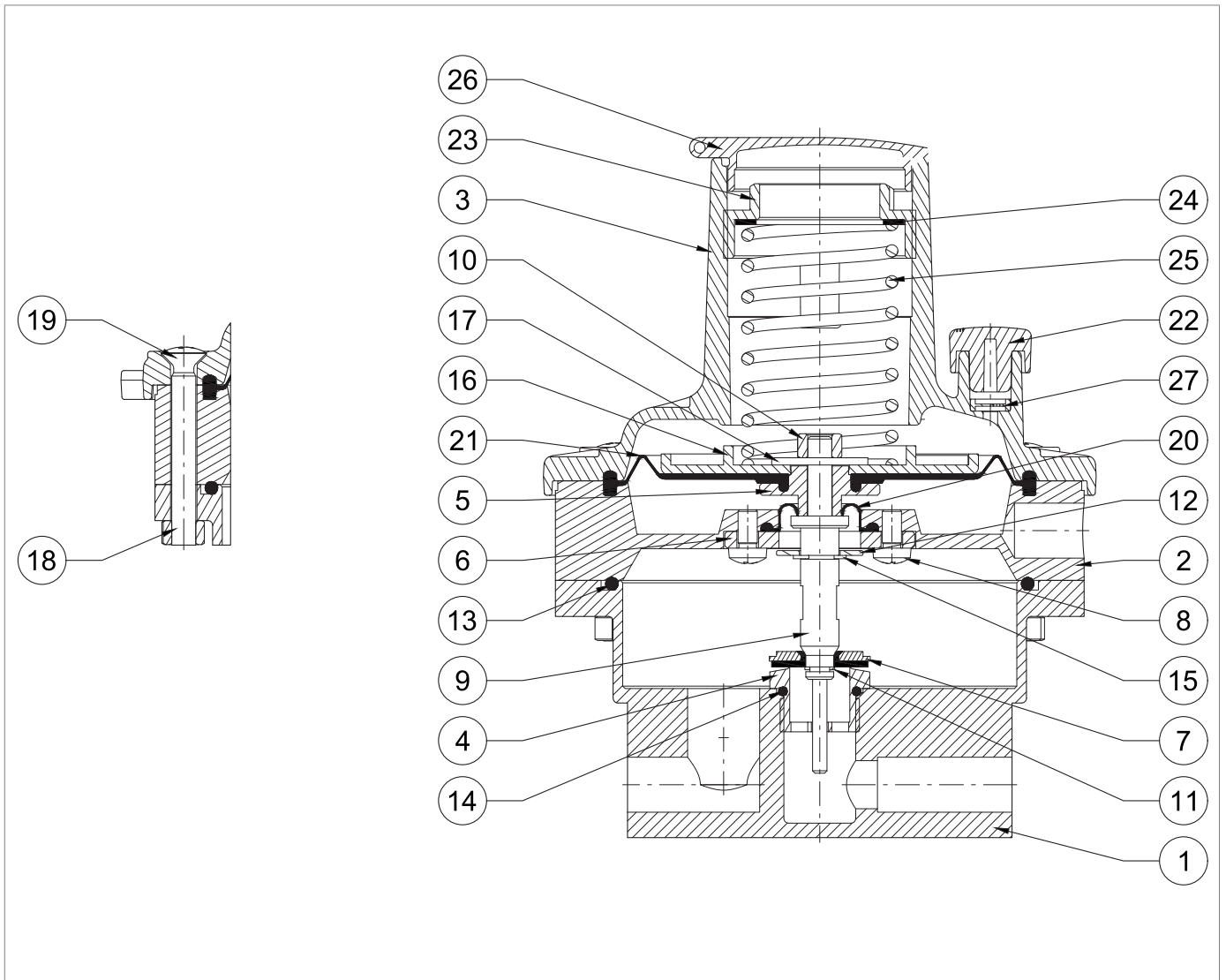
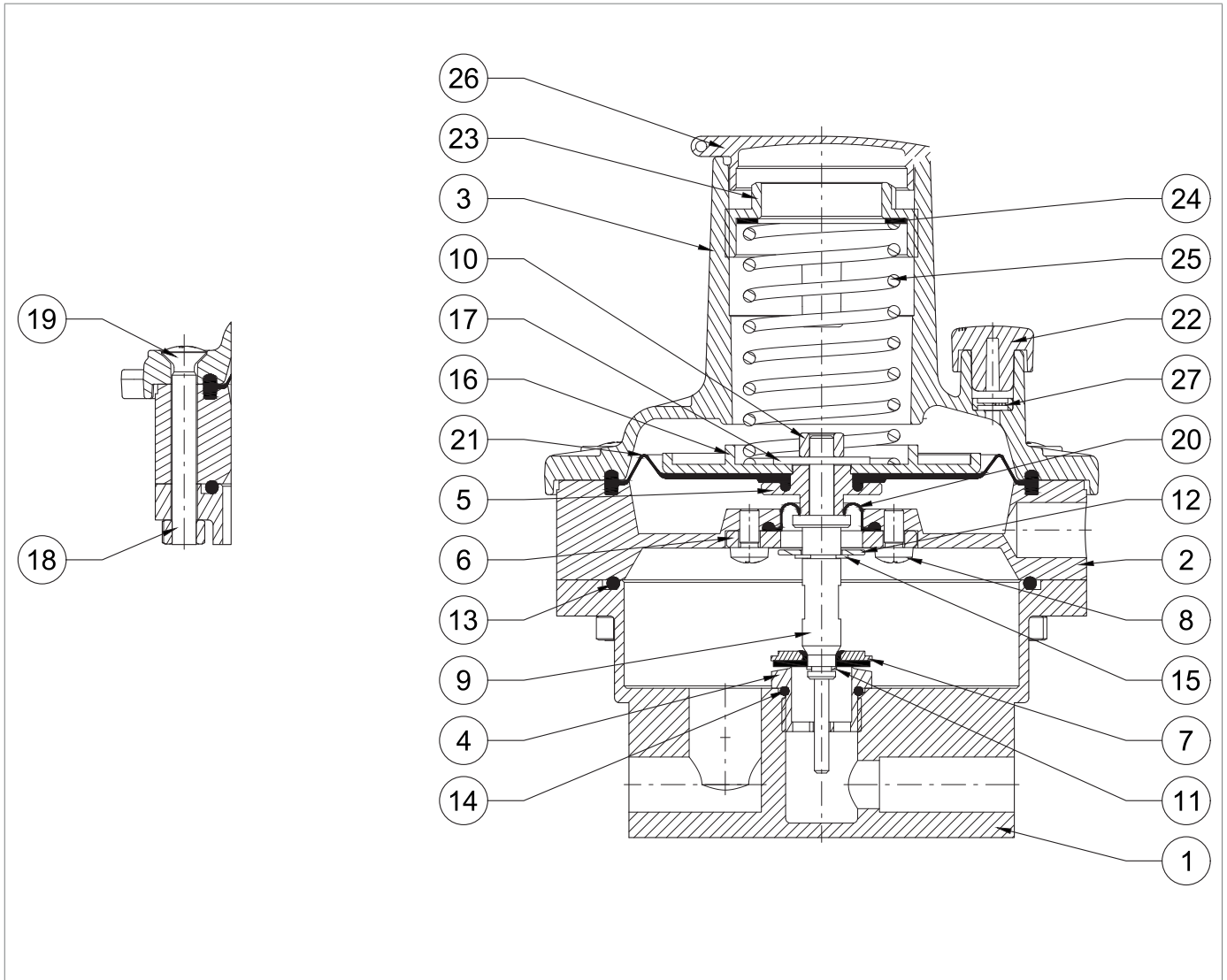



Fig. 9.66. V/25 accelerator valve

Step	Action
1	Unscrew and remove the cap (26).
2	Unscrew and remove the calibration ring nut (23) together with the sliding disc (24).
3	Remove the calibration spring (25).
4	Unscrew and remove the screw (19) together with the nut (18).
5	Remove the cover (3). NOTICE! Check that the vent (22, 27) is free of impurities.
6	Remove the diaphragm assembly together with the intermediate flange (2) from the body (1). NOTICE! Check that the atmospheric exhaust is free of impurities.
7	Remove the O-ring (13) 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.
8	Unscrew and remove the valve seat (4) from the body (1). NOTICE! During this step, take care not to damage the valve seat (4).
9	Remove the O-ring (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.
10	Insert and secure the valve seat (4) in the body (1). NOTICE! During this step, take care not to damage the valve seat (4).
11	Remove the seeger ring (11).
12	Remove the reinforced gasket (7).
13	Unscrew and remove the nut (10), holding the stem (9) in place.
14	Remove the diaphragm holder disc (16).
15	Remove the diaphragm (21) from the diaphragm holder (5). NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
16	Remove the seeger ring (15).
17	Unscrew and remove the screws (8).
18	Remove the disc (6).
19	Remove and replace the diaphragm (20). NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
20	Position the disc (6).
21	Insert and fasten the screws (8). NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.
22	Insert the seeger ring (15).



V/25 accelerator valve

Step	Action
23	Replace the reinforced gasket (7).
24	Insert the seeger ring (11).
25	Place the diaphragm (21) in the diaphragm holder (5).
26	Position the diaphragm disc (16).
27	Position the nut (10), holding the stem (9) in place.
28	Insert the diaphragm assembly together with the intermediate flange (2) into the body (1).
29	Fit the cover (3).
30	Insert the screws (19) together with the nut (18).
	 NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.
31	Insert the calibration spring (25).
32	Position the sliding disc (24).
33	Insert and screw in the calibration ring nut (23).
34	Insert and screw in the cap (26).

Tab. 9.115.

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.9 - M/A ACCELERATOR VALVE MAINTENANCE

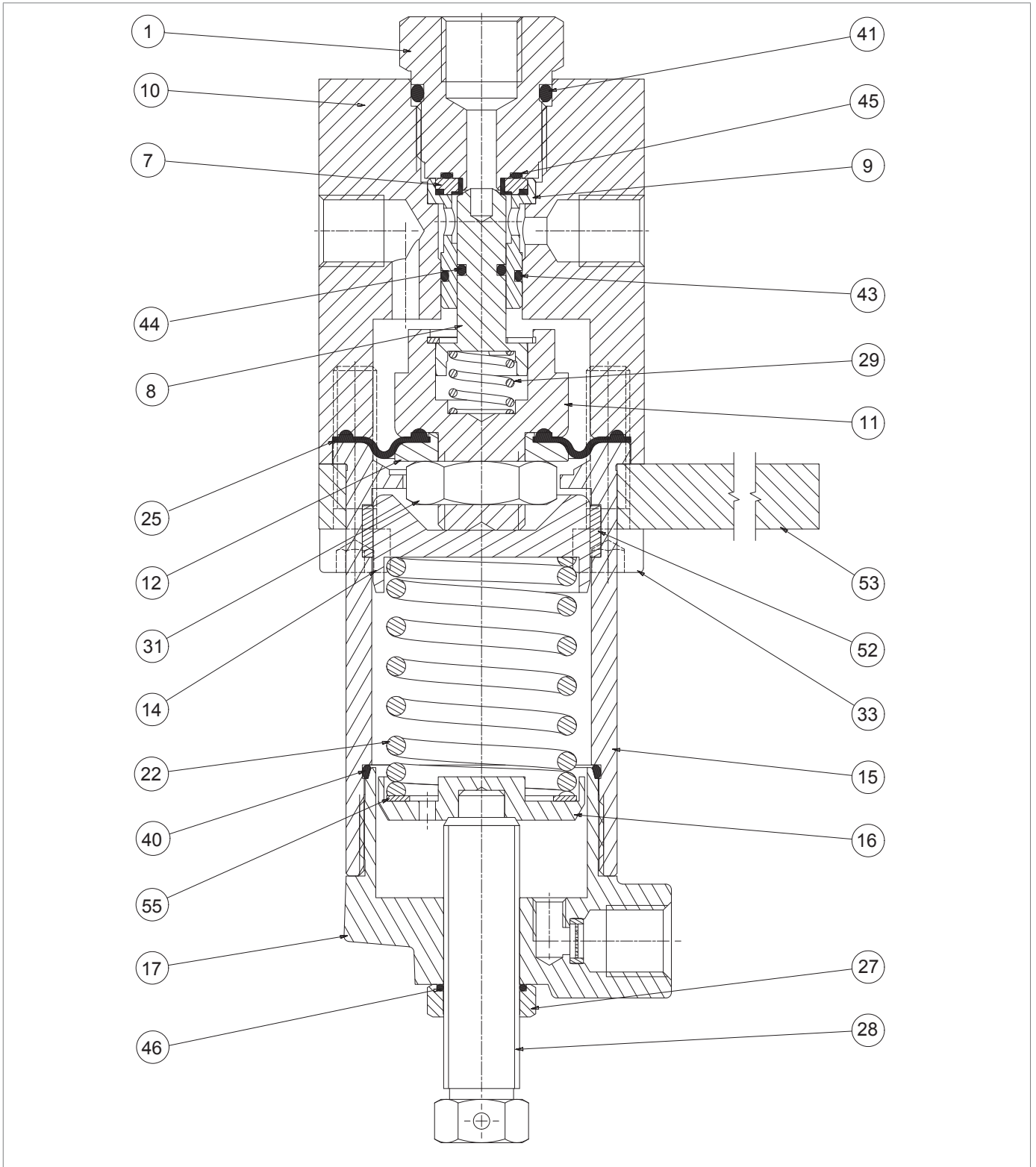






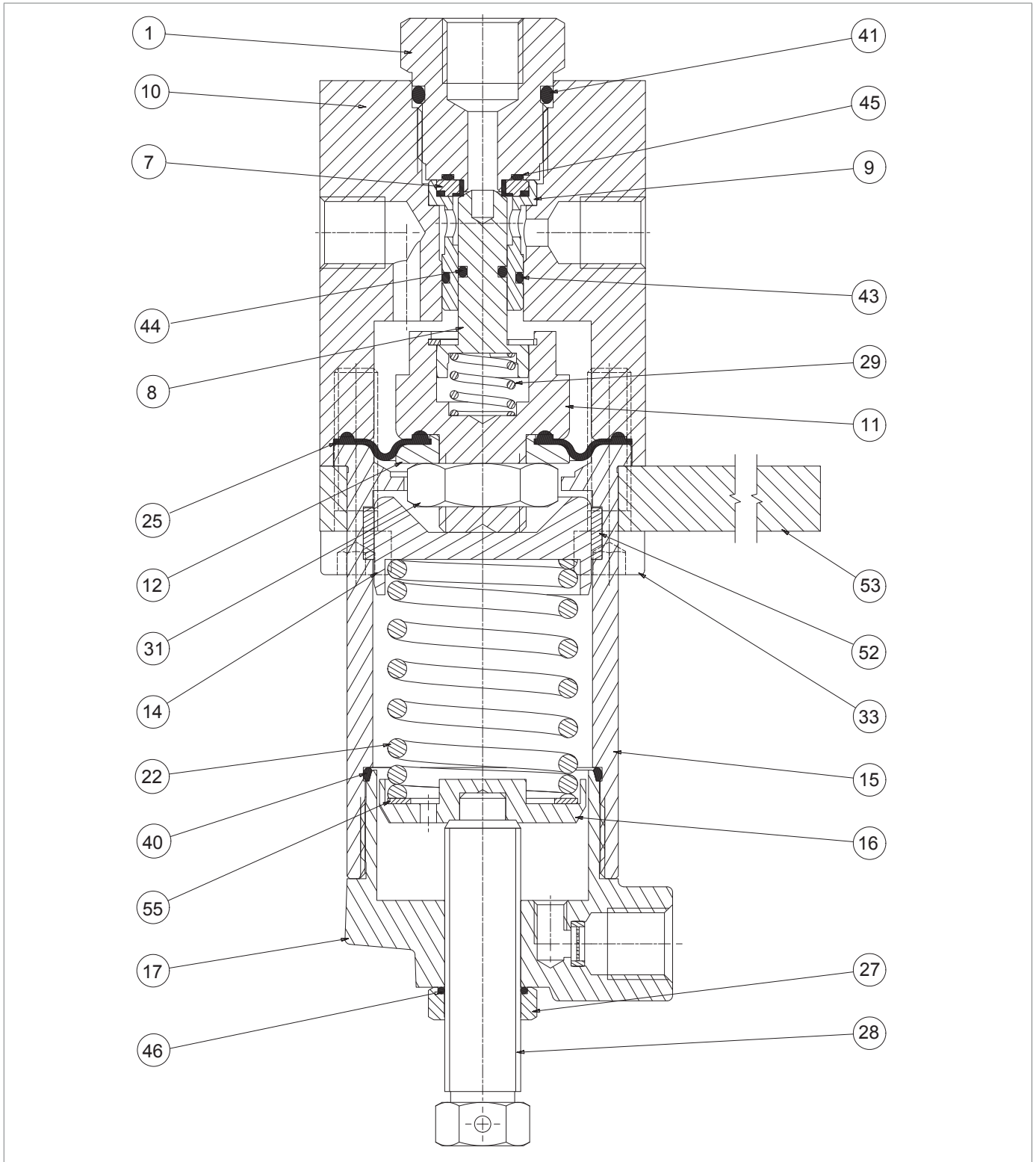





Fig. 9.67. M/A accelerator valve

Step	Action
1	Loosen the nut (27).
2	Completely release the spring (22) by turning the adjusting screw (28).
3	Remove the adjusting screw (28) together with the nut (27).
4	Remove the cap (17).
	Remove the O-ring (40) from the cap (17) and replace it, taking care to lubricate it with synthetic grease.
5	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
6	Remove the lower spring support (16) together with the ring (55).
7	Remove the spring (22).
8	Remove the upper spring support (14).
9	Undo and remove the screws of the lower section (33).
10	Remove the bracket (53) from the sleeve (15).
11	Remove the sleeve (15).
	Remove and replace the I/DWR (52) from the sleeve (15).
12	 NOTICE! Before inserting the replacement I/DWR, clean the retaining slots with a cleaning solution.
13	Take out the diaphragm/plug unit (8,11,12, 25, 29, 31).
14	Unscrew and remove the nut (31).
15	Remove the diaphragm protection disc (12).
	Remove and replace the diaphragm (25).
16	 NOTICE! Before inserting the replacement diaphragm, clean the retaining slots with a cleaning solution.
17	Put the diaphragm protection disc (12) back in place.
18	Refit and secure the nut (31).
	Remove the O-ring (44) from the plug (8) and replace it, taking care to lubricate it with synthetic grease.
19	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
20	Unscrew and remove the gasket support (1).
	Remove the O-rings (41, 45) from the gasket support (1) and replace them, taking care to lubricate them with synthetic grease.
21	 NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
22	Take out the plug guide (9).
23	Remove and replace the reinforced gasket (7) from the plug guide (9).
	Remove the O-ring (43) from the plug guide (9) and replace it, taking care to lubricate it with synthetic grease.
24	 NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
25	Fit the plug guide (9) together with the reinforced gasket (7).
26	Place the gasket support (1) in the body (10).



Accelerator valve M/A

Step	Action
27	Take out the diaphragm/plug unit (8, 11, 12, 25, 29, 31). <div style="border: 1px solid blue; padding: 5px;">  NOTICE! Before inserting the diaphragm/plug unit, lubricate the plug (8) surface with silicone grease. </div>
28	Fit the sleeve (15) and the bracket (53).
29	Insert and fix the screws (33). <div style="border: 1px solid blue; padding: 5px;">  NOTICE! Tighten the screws as shown in the diagram at “1.4.2.2 - Cross diagram for tightening screws”. </div>
30	Position the upper spring support (14) together with the spring (22).
31	Fit the lower spring support (16) together with the ring (55).
32	Fit and secure the cap (17).
33	Remove and replace the O-ring (46) in the nut (27). <div style="border: 1px solid blue; padding: 5px;">  NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution. </div>
34	Fit the adjusting screw (28) together with the nut (27).

Tab. 9.116

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.10 - SEALING OF THE SA BUILT-IN SLAM-SHUT VALVE

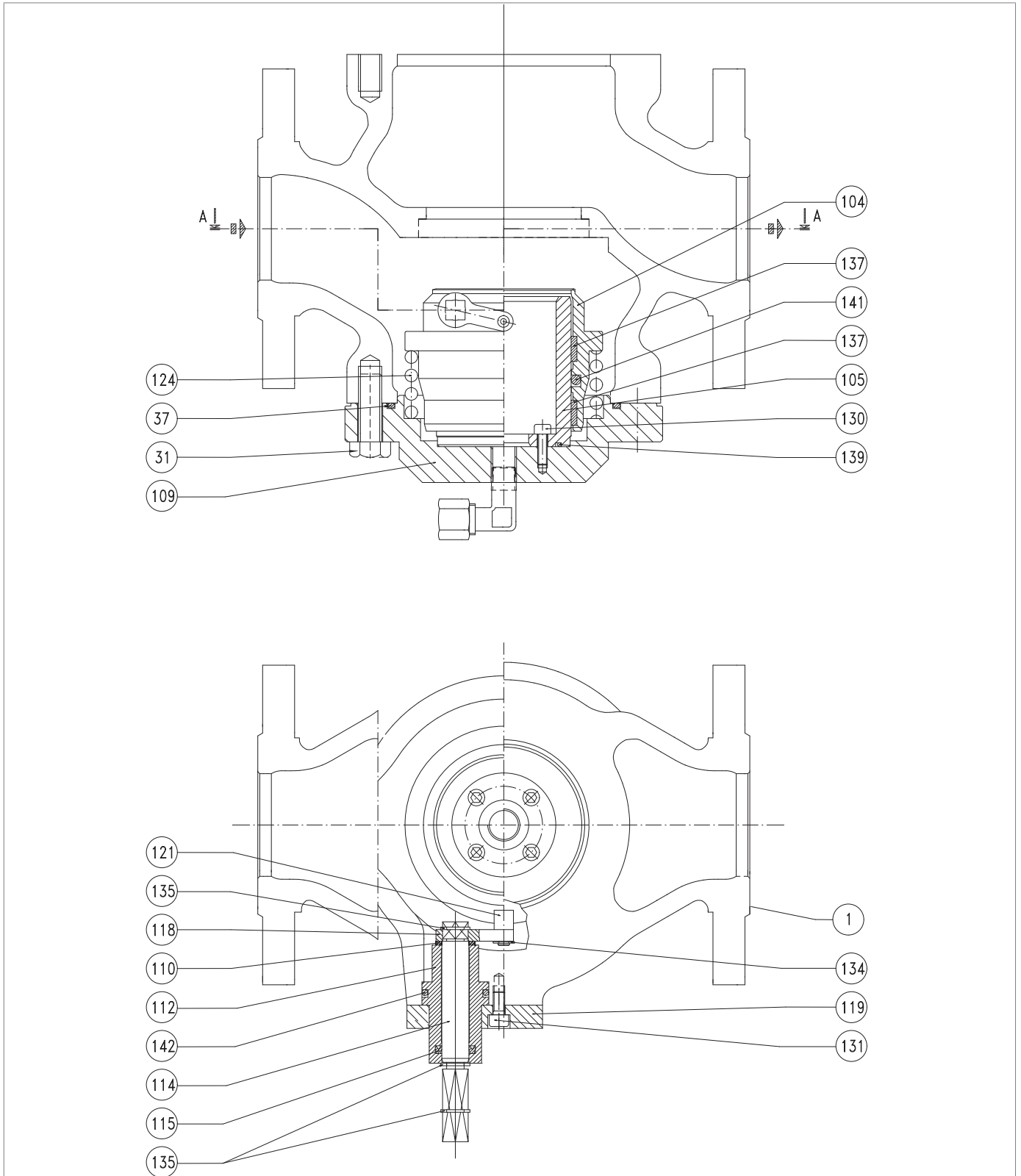









Fig. 9.68. Slam-shut valve SA

Step	Action
1	 WARNING! Check that the slam-shut valve is in the closed position.
2	Remove the seeger ring (135).
3	Unscrew and remove the screws (131).
4	Remove the flange (119).
5	Pull the sleeve (112) out of the regulator body (1).
6	Remove the O-rings (115, 142) from the bush (112) and replace them, taking care to lubricate them with synthetic grease.  NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.
7	Insert the sleeve (112) into the regulator body (1).
8	Fit the flange (119).
9	Insert and fix the screws (131) according to the following tightening torque: <ul style="list-style-type: none"> • 1": Tab. 1.89 • 2": Tab. 1.90 • 2" ½: Tab. 1.91 • 3": Tab. 1.92 • 4": Tab. 1.93  NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.
10	Fit the seeger ring (135).
11	Unscrew and remove the screws (31) from the flange (109), taking care to support it.
12	Remove the flange (109) together with the spring (124) and plug (104) from the regulator body (1).
13	Remove the O-ring (37) from the flange (109) 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	Remove the plug (104) and place it on a shockproof surface.
15	Remove the spring (124).
16	Remove the I/DWR rings (137) from the plug (104) and replace them; lubricate with synthetic grease.  NOTICE! Before inserting the replacement I/DWR rings, clean the retaining slots with a cleaning solution.
17	Remove the O-ring (141) from the plug (104) 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.
18	Unscrew and remove the screws (130).
19	Remove the plug guide (105) from the flange (109).
20	Remove the O-ring (139) from the plug guide (105) 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.

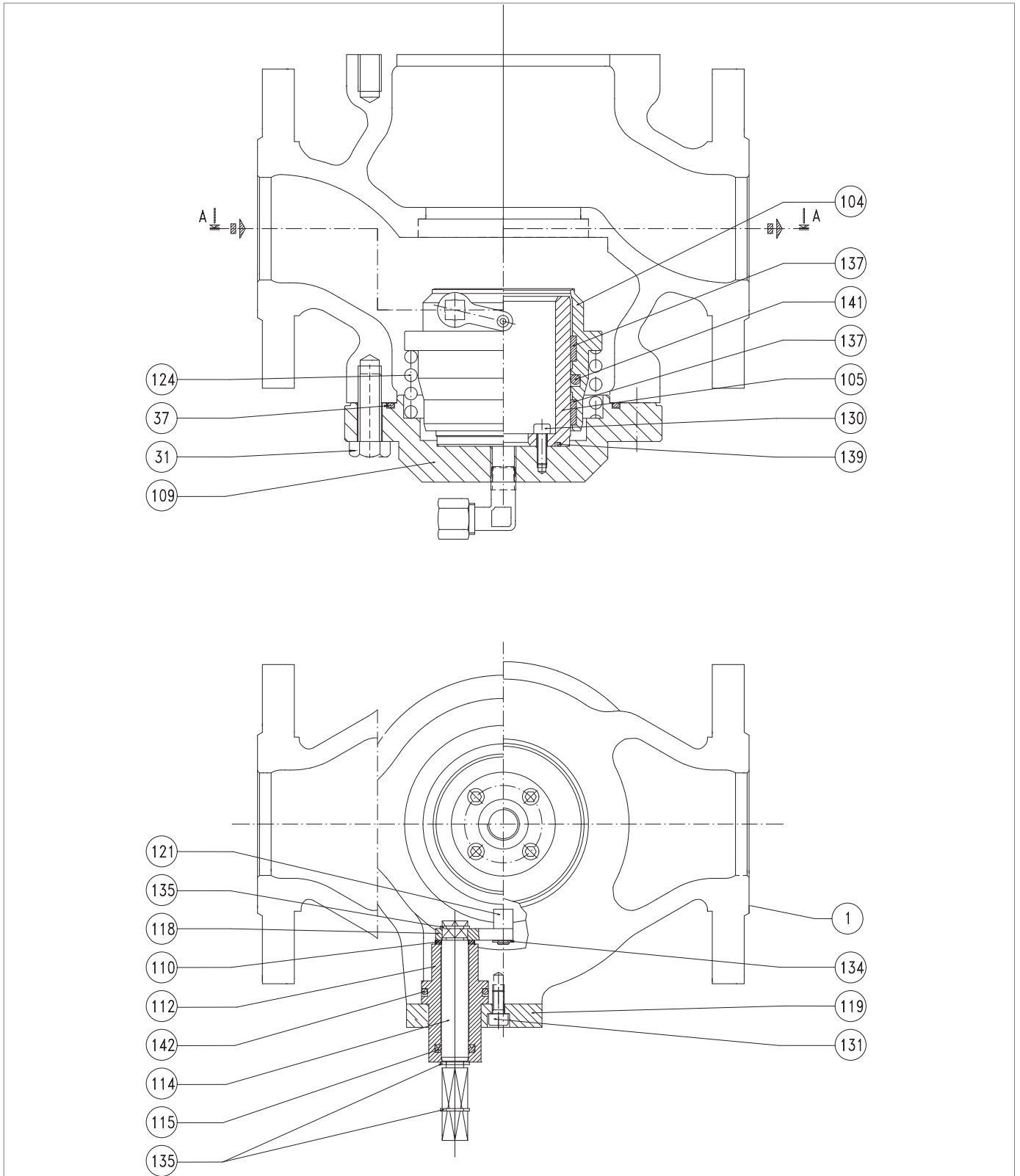


Fig. 9.69. Slam-shut valve SA

Step	Action
21	Position the plug guide (105) in the flange (109).
22	<p>Insert and fix the screws (130) according to the following tightening torque:</p> <ul style="list-style-type: none"> • 1": Tab. 1.89 • 2": Tab. 1.90 • 2" ½: Tab. 1.91 • 3": Tab. 1.92 • 4": Tab. 1.93 <div style="border: 1px solid blue; padding: 5px;"> <p>NOTICE!</p> <p>Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</p> </div>
23	Insert the spring (124) into the plug (104).
24	Place the plug (104) in the flange (109).
25	Position the assembly (104, 109, 124) in the regulator body (1).
26	Insert and secure the screws (31) in the flange (109).

Tab. 9.117.

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.11 - MAINTENANCE OF PRESSURE SWITCH MOD. SA

9.4.11.1 - PRESSURE SWITCH DISCONNECTION MOD. SA

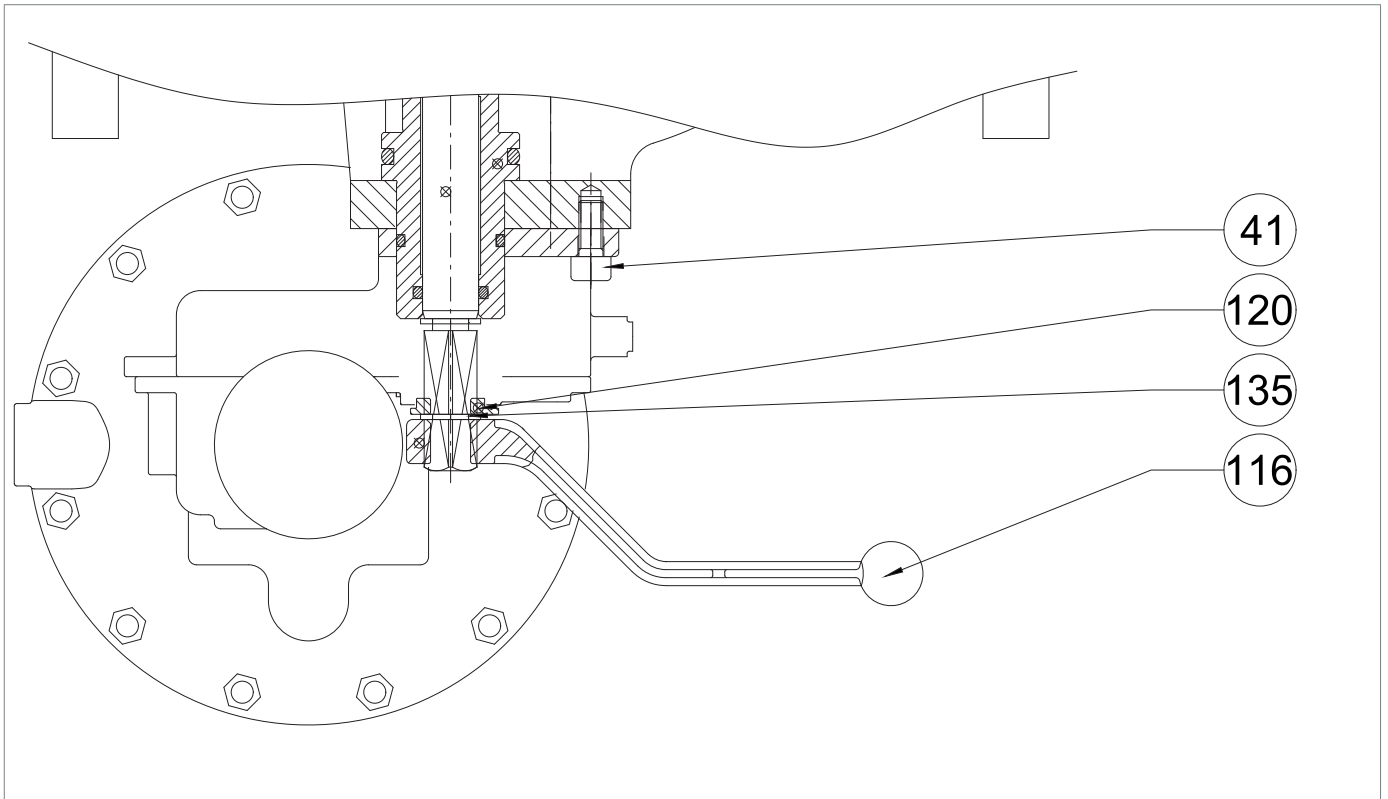


Fig. 9.70. Pressure switch mod. SA

To disconnect the pressure switches mod. SA, proceed as indicated in Tab. 1.118 (Fig. 1.70):

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. 9.118.

9.4.11.2 - PRESSURE SWITCH SA-91, SA-92

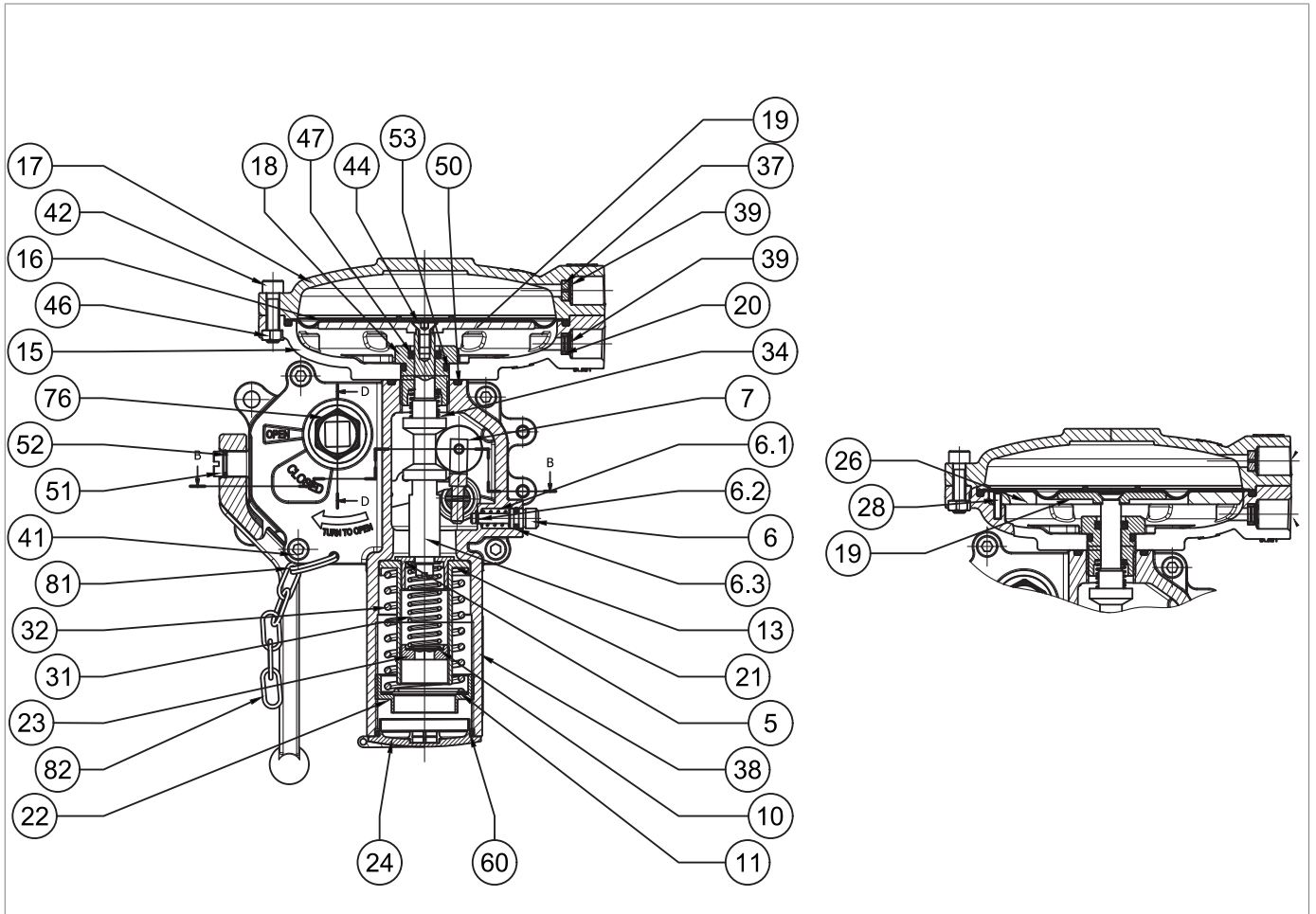


Fig. 9.71. Pressure switch SA-91, SA-92

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. <div style="border: 1px solid black; padding: 5px;">! NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.</div>
3	Unscrew and remove the screws (42) together with the nuts (46).
4	Remove the cover (17).
5	Remove the diaphragm (16).
6	Unscrew the screw (44) while holding 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. <div style="border: 1px solid black; padding: 5px;">! NOTICE! Before inserting the replacement O-rings, clean the retaining slots with a cleaning solution.</div>
11	Remove replace the O-ring (53) from the sleeve (18), lubricating it 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>
12	Remove the U-shaped ring (47) from the bush (18) and replace it, taking care to lubricate it with synthetic grease. <div style="border: 1px solid black; padding: 5px;">! NOTICE! Before inserting the replacement ring, clean the retaining slots with a cleaning solution.</div>
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 SA-91: Tab. 1.94 • Pressure switch SA-92: Tab. 1.95
15	Put the diaphragm protection disc (19) back in place
16	Insert and fasten the screw (44) while holding the diaphragm protection disc (19) in place, according to the tightening torque: <ul style="list-style-type: none"> • Pressure switch SA-91: Tab. 1.94 • Pressure switch SA-92: Tab. 1.95 <div style="border: 1px solid black; padding: 5px;">! NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</div>
17	Position the diaphragm (16).
18	Fit the cover (17).
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 SA-91: Tab. 1.94 • Pressure switch SA-92: Tab. 1.95 <div style="border: 1px solid black; padding: 5px;">! NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.</div>

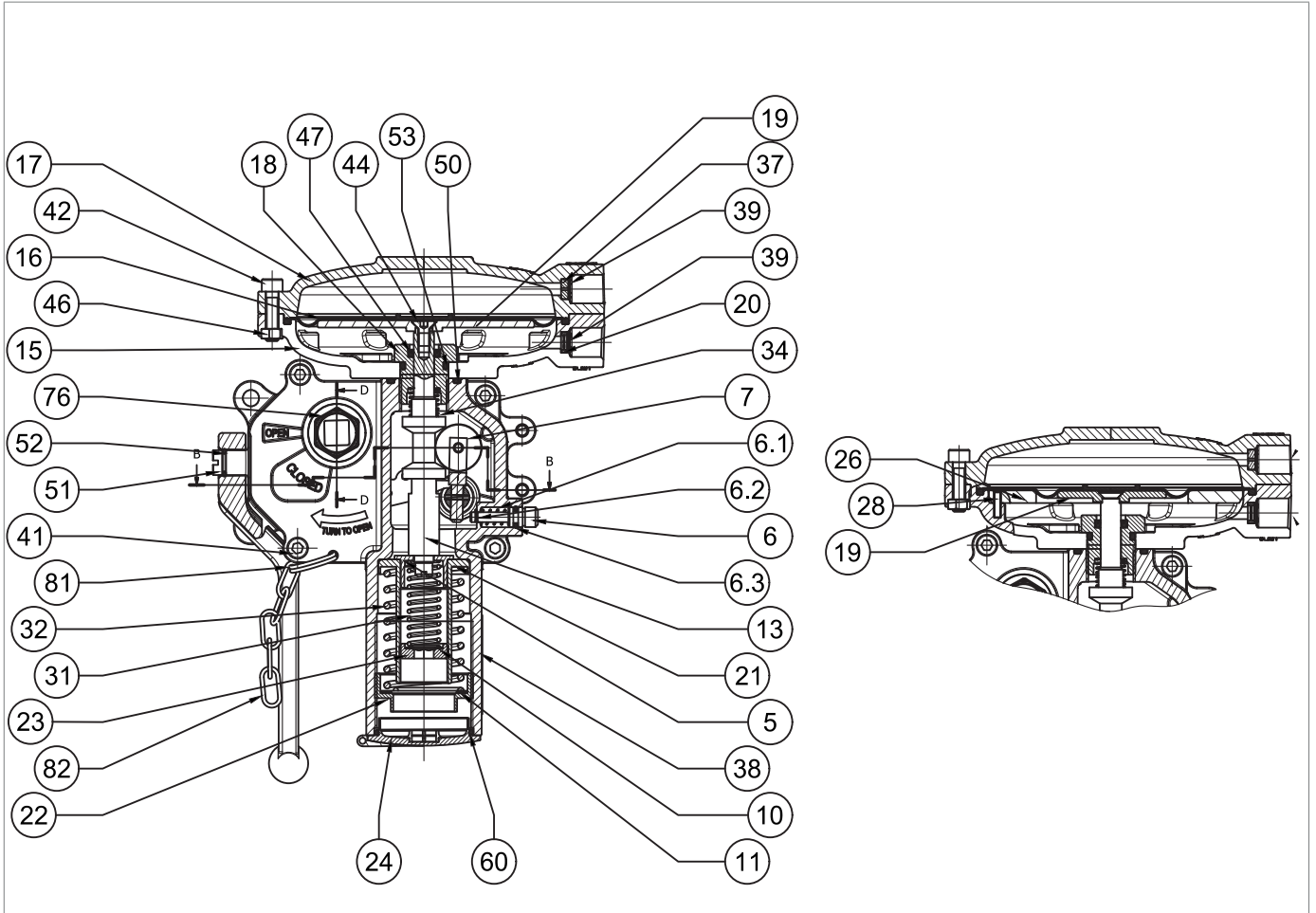


Fig. 9.72. Pressure switch SA-91, SA-92

Step	Action
20	Insert and fix the cap (24).

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.11.3 - PRESSURE SWITCH SA-93

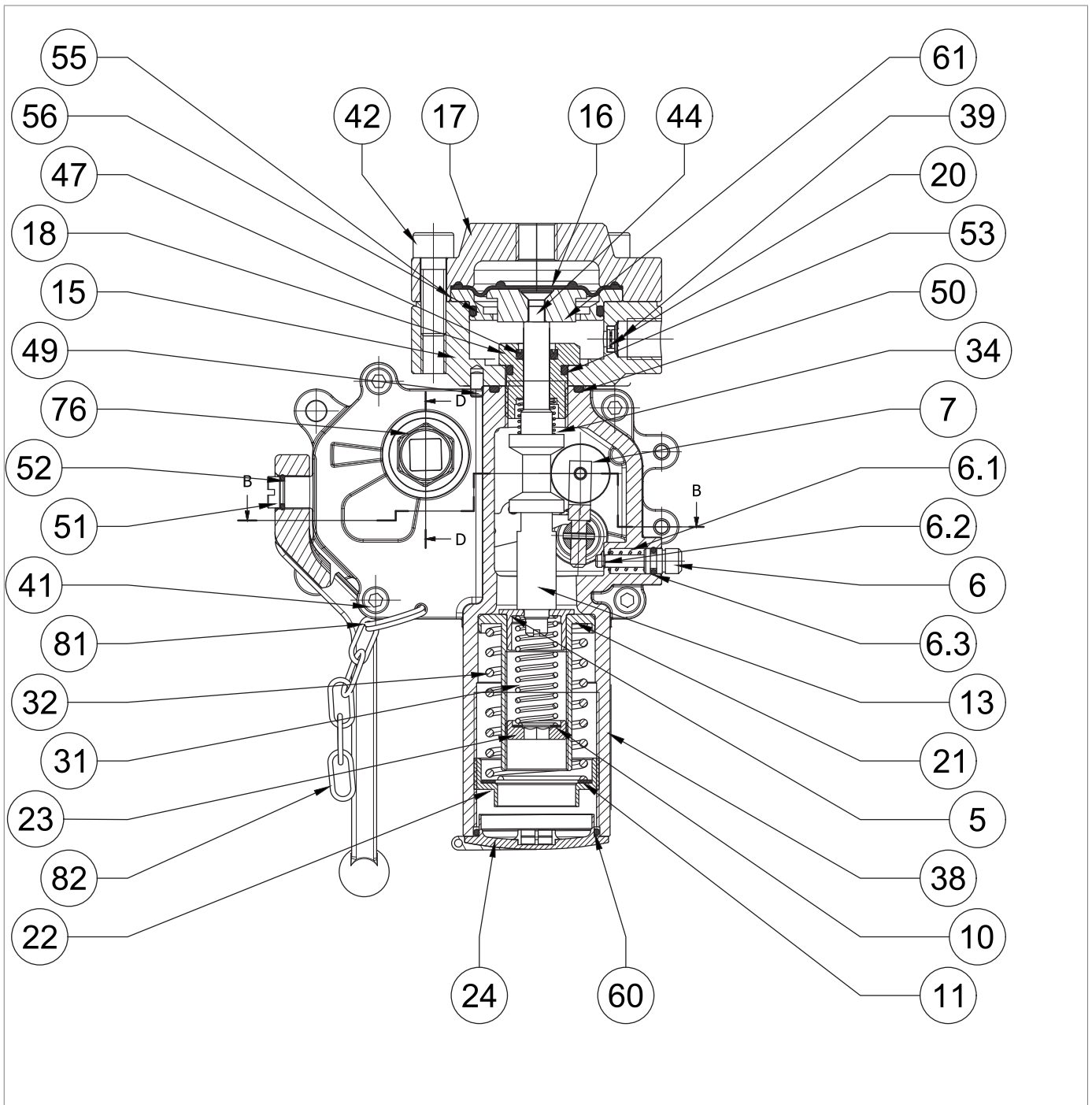
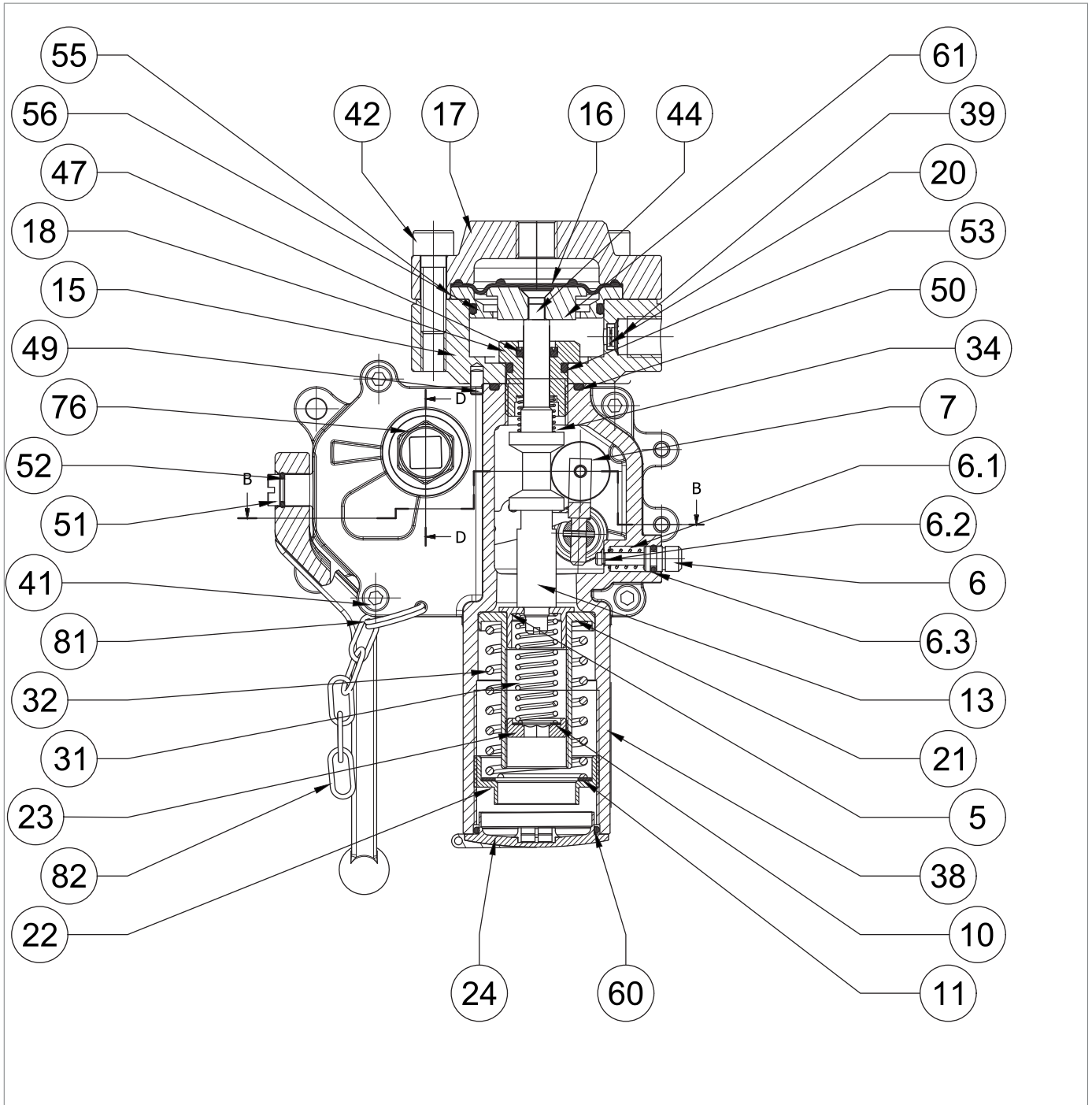


Fig. 9.73. Pressure switch SA-93

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	Undo and remove the screws (42).
4	Remove the upper cover (17).
5	Remove the diaphragm (16).
6	Unscrew the screw (44), holding the diaphragm holder (61) in place.
7	Remove the diaphragm holder (61).
8	Remove the diaphragm protection disc (55) from the flange (15).
9	Remove and replace the O-ring (56) from the diaphragm protection disc (55), lubricating it with synthetic grease. NOTICE! Before inserting the replacement O-ring, clean the retaining slots with a cleaning solution.
10	Unscrew and remove the slam-shut device guide (18).
11	Remove the flange (15).
12	Remove the O-ring (50) 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.
13	Remove the O-ring (53) from the bush (18) 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	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 O-rings, clean the retaining slots with a cleaning solution.
15	Fit the flange (15).
16	Insert and secure the slam-shut device guide (18) according to the tightening torque: <ul style="list-style-type: none"> Pressure switch SA-93: Tab. 1.96
17	Insert the diaphragm protection disc (55) into the flange (15).
18	Position the diaphragm holder (61).
19	Insert and fasten the screw (44) while holding the diaphragm holder (61) in place, according to the tightening torque: <ul style="list-style-type: none"> Pressure switch SA-93: Tab. 1.96 NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.
20	Position the diaphragm (16).
21	Fit the cover (17)
22	Insert and fix the screws (42) according to the following tightening torque: <ul style="list-style-type: none"> Pressure switch SA-93: Tab. 1.96 NOTICE! Tighten the screws according to the cross diagram in paragraph 9.4.2.2.



Pressure switch SA-93

Step	Action
23	Insert and fix the cap (24).

Tab. 9.119.

 **WARNING!**

Ensure that all parts have been fitted correctly.

9.4.11.4 - PRESSURE SWITCH RECONNECTION MOD. SA

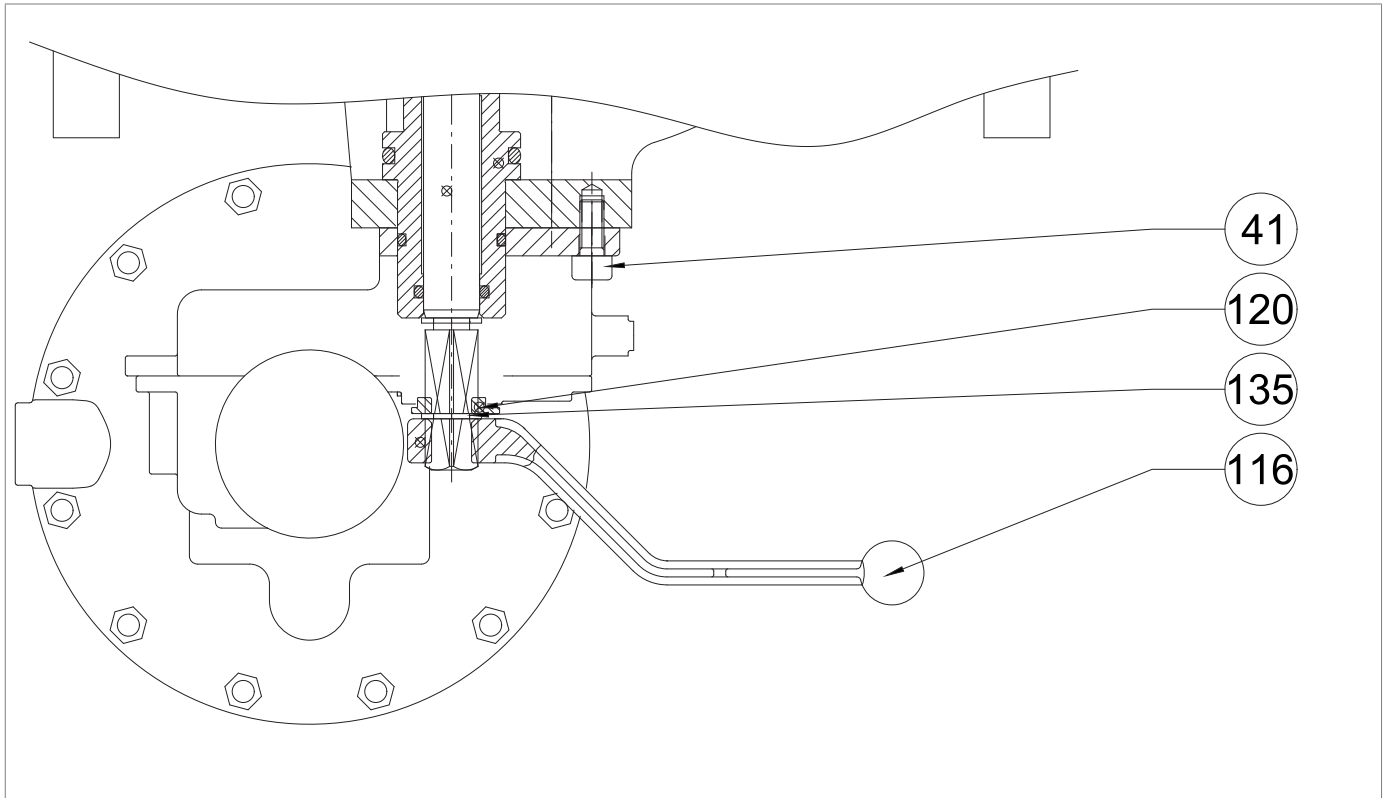


Fig. 9.74. Pressure switch mod. SA

To connect pressure switches mod. SA proceed as shown in Tab. 1.120 (Fig. 1.74):

Step	Action
1	Insert and fix the screws (41) according to the following tightening torques: <ul style="list-style-type: none"> • Pressure switch SA-91: Tab. 1.94 • Pressure switch SA-92: Tab. 1.95 • Pressure switch SA-93: Tab. 1.96
2	Position the indicator (120).
3	Fit the seeger ring (135).
4	Fit the lever (116).

Tab. 9.120.

9.4.12 - PROCEDURE FOR RECOMMISSIONING AFTER MAINTENANCE

NOTICE!

For the recommissioning procedure, refer to the relevant paragraph.

10 - TROUBLESHOOTING

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

10.1 - GENERAL WARNINGS

HAZARD!

Maintenance work must be carried out by qualified personnel:

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

WARNING!







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

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

NOTICE!

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

10.2 - OPERATOR QUALIFICATION SPECIFICATION

Commissioning	
Operator qualification	<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; • any information provided by the Safety Manager at the installation facility.
Equipment required	Refer to chapter 7 “Equipment for commissioning/maintenance”.

Tab. 10.121.

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!

Refer to chapter 9 “Maintenance and functional checks” for the pictures of the **APERVAL** regulator and its accessories.

10.4.1 - TROUBLESHOOTING APERVAL REGULATOR

Failure	Device	Possible causes	Service
Operation faults	LAMINATION VALVE AR100	Unsuitable feed pressure to the regulator	Adjust the flow rate of the AR100 lamination valve
	SERIE 300 PILOTS	Diaphragm holder (16) friction	Centre the hole, assembly and shaft movement
		Balancing pin friction	Lubricate O-ring (51)
		Worn diaphragms (16)	Replace
		Diaphragm (49) worn (for 302/A pilot only)	Replace
		Spring (22) collapsed or out of level	Refit and replace if needed
	REGULATOR	Dirty or worn diaphragm (20)	Clean and replace if needed
		Diaphragm (20) out of level	Refit
		Unsuitable spring (45)	Replace
	Pumping	LAMINATION VALVE AR100	Unsuitable feed pressure to the regulator
SERIE 300 PILOTS		Operating frictions	Check the pilot
No sealing at zero flow	SERIE 300 PILOTS	Dirty or worn plug (17)	Clean and replace if needed
		O-ring (50) not sealing	Clean and replace if needed
		O-ring (51) not sealing	Clean and replace if needed
		O-ring (52) not sealing	Clean and replace if needed
		Upper diaphragm (16) worn (excluding 302/A pilot)	Replace
		O-ring (18) not sealing (for pilots 304/A-305/A only)	Clean and replace if needed
	REGULATOR	Dirty or worn diaphragm (20)	Clean and replace if needed
		Diaphragm (20) out of level	Replace
		O-ring (39) not sealing	Clean and replace if needed
		O-ring (40) not sealing	Clean and replace if needed
		O-ring (41) not sealing	Clean and replace if needed
		Damaged grille (13)	Replace

Failure	Device	Possible causes	Service
Downstream pressure increases	LAMINATION VALVE AR100	Filter cartridge (11) clogging	Replace
	SERIE 300 PILOTS	Plug (17) worn	Replace
		Diaphragm (49) worn (for 302/A pilot only)	Replace
		Worn diaphragms (16)	Replace
	REGULATOR	Diaphragm (20) worn	Replace
LAMINATION VALVE AR100	Incorrect adjustment	Adjust the flow rate of the AR100 lamination valve	
Downstream pressure decreases	SERIE 300 PILOTS	Ice formation on the valve seat	Increase pilot circuit gas inlet temperature
		Clogging due to valve seat soiling	Clean and check
	REGULATOR	Breakage within the sealing edge of the control element (20)	Replace

Tab. 10.122

10.4.2 - DB SILENCER TROUBLESHOOTING

Failure	Device	Possible causes	Service
Increase in noise	DB SILENCER	Breakage of the external basket (64)	Replace
No sealing Zero flow rate	DB SILENCER	O-ring (39) not sealing	Clean and replace if needed
		O-ring (84) not sealing	Clean and replace if needed

Tab. 10.123.

10.4.3 - PM/182 BUILT-IN MONITOR TROUBLESHOOTING

Failure	Device	Possible causes	Service
Operation faults	PRE-REGULATOR R14/A	Dirty or worn plug (5)	Clean and replace if needed
		Plug guide ring (8) worn	Replace
	204/A SERIES PILOTS	Dirty or worn plug (17)	Clean and replace if needed
		Diaphragm holder (16) friction	Align the bore of the diaphragm support (5) with the valve seat (3)
		Worn diaphragms (16)	Replace
		Spring (22) collapsed or out of level	Reposition and replace if necessary
		AC out of class due to unsuitable spring (22)	Replace
		SG out of class due to dirty or worn plug (17)	Clean and replace if needed
	PM 182 MONITOR	Reinforced gasket (8) dirty or worn	Clean and replace if needed
		O-ring (35) friction	Lubricate and replace if necessary
		Stem guide O-ring (36) frictions	Lubricate and replace if necessary
		I/DWR (52) frictions	Lubricate and replace if necessary
		I/DWR (51) friction	Lubricate and replace if necessary
		Breakage of the diaphragm (50)	Replace
	SG out of class due to reinforced gasket (8) dirty or damaged	Clean and replace if needed	

Failure	Device	Possible causes	Service
No sealing Zero flow rate	PRE-REGULATOR R14/A	O-ring (17) not sealing	Clean and replace if needed
		O-ring (18) not sealing	Clean and replace if needed
		O-ring (20) not sealing	Clean and replace if needed
		Diaphragm (10) worn	Replace
	204/A SERIES PILOTS	Upper diaphragm (16) worn	Replace
		Dirty or worn plug (17)	Clean and replace if needed
	PM 182 MONITOR	Reinforced gasket (8) dirty or damaged	Clean and replace if needed
		No sealing of the O-ring (35)	Clean and replace if needed
		Balancing piston O-ring (36) not sealing	Clean and replace if needed
		O-ring (42) not sealing	Clean and replace if needed
		O-ring (43) not sealing	Clean and replace if needed

Failure	Device	Possible causes	Service
Downstream pressure increases	PRE-REGULATOR R14/A	Plug (5) damaged	Replace
	204/A SERIES PILOTS	Plug (17) damaged	Replace
		Diaphragm holder (16) and plug (17) assembly locked in open position	Check and clean if necessary
		Plug spring (21) collapsed	Replace
		Downstream sensing line obstructed	Clean
	PM 182 MONITOR	Reinforced gasket (8) damaged	Replace
		Ice between reinforced gasket (8) and plug (71)	Increase the regulator gas inlet temperature
		Soiling between reinforced gasket (8) and plug (71)	Clean and check gas filtration
		Plug (71) locked	Clean and check the movements
		Control element assembly tightening defective	Tighten properly
		Transfer hole clogged	Clean
		Plug guide O-ring (35) damaged	Replace
		Stem guide O-ring (36) frictions	Lubricate and replace if necessary
		I/DWR (52) frictions	Lubricate and replace if necessary
		I/DWR (51) friction	Lubricate and replace if necessary
Spring (80) collapsed	Replace		

Failure	Device	Possible causes	Service
Downstream pressure decreases	PRE-REGULATOR R14/A	Filter (13) clogged	Replace
		Reinforced gasket (9) damaged	Replace
		Diaphragm (10) damaged	Replace
		Plug (5) locked during shut-off	Clean and lubricate
		Plug (5) obstructed	Clean
	204/A SERIES PILOTS	Plug (17) locked in shut-off position	Clean and lubricate
		Diaphragms (16) damaged	Replace
		Diaphragm holder (16) and plug (17) assembly locked in open position	Check and clean if necessary
		Valve seat (3) clogged	Clean
		Spring (22) collapsed	Replace
	PM 182 MONITOR	No upstream pressure	Check line filter cartridges for clogging
		Plug (71) locked	Clean and check the movements
		Dirty O-ring (35)	Clean and replace if needed
		Stem guide O-ring (36) frictions	Lubricate and replace if necessary
		I/DWR (52) frictions	Lubricate and replace if necessary
		I/DWR (51) friction	Lubricate and replace if necessary
Ice formation		Increase the regulator gas inlet temperature	
Diaphragm (50) damaged		Replace	
Stem guide (11) loose	Screw		

Tab. 10.124.

10.4.4 - TROUBLESHOOTING OF THE SA SLAM-SHUT VALVE

Failure	Device	Possible causes	Service
Incorrect tripping pressure	PRESSURE SWITCHES MOD. SA-91, SA-92, SA-93	Incorrect maximum (32) and/or minimum (31) spring setting	Carry out the calibration again by adjusting the ring nuts
		Levers with friction	Clean and lubricate the linkage and replace the pressure switch if necessary
		Springs (31, 32) collapsed	Replace
		Springs (31, 32) out of level	Refit
Impossible to reset	PRESSURE SWITCHES MOD. SA-91, SA-92, SA-93	Incorrect maximum (32) and/or minimum (31) spring setting	Carry out the calibration again by adjusting the ring nuts
		Downstream pressure is not consistent with minimum and/or maximum slam-shut device setting	Adjust the downstream pressure
		Levers broken or chipped	Replace pressure switch
		Diaphragm breakage (16) if min. spring is installed	Replace
		Manual release button (6) locked	Clean and lubricate
Failure to provide service	SLAM-SHUT VALVE SA	Plug (151) locked in opening	Clean and lubricate
		I/DWR (175) dirty or damaged	Clean and replace if needed
		Spring (152) collapsed	Replace
		Stem (114) locked	Clean and lubricate
	PRESSURE SWITCHES MOD. SA-91, SA-92, SA-93	Diaphragm (16) breakage if min. spring is missing	Replace
		Locked levers	Clean and lubricate
Downstream pressure increase with slam-shut device shutting off	SLAM-SHUT VALVE SA	Plug profile (151) damaged	Replace
		O-ring (176) not sealing	Clean and replace if needed
		Reinforced gasket (8) not sealing	Clean and replace if needed
		Lack of O-ring seal (39)	Clean and replace if needed

Tab. 10.125.

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	Refer to chapter 7 "Equipment for commissioning/maintenance".

Tab. 11.126.

11.3 - UNINSTALLATION

ATTENTION!

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

NOTICE!

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

11.4 - INFORMATION REQUIRED IN CASE OF RE-INSTALLATION

NOTICE!

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

- "Installation";
- "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. 1.124:

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. 11.127.

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.
Iron	Disassemble and collect separately. It must be recycled through the specific collection centres.
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. 11.128.

NOTICE!

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

12 - RECOMMENDED SPARE PARTS

12.1 - GENERAL WARNINGS

NOTICE!

If spare parts not marked are used, PIETRO FIORENTINI S.p.A. their declared performance cannot be guaranteed.

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

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

12.2 - HOW TO REQUEST SPARE PARTS

NOTICE!

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

13 - CALIBRATION TABLES

13.1 - 300 SERIES PILOT CALIBRATION TABLES

301 A							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2700680	Brown	2.3	60	35	0.005	0.019
2	2700830	Red/Black	2.5			0.02	0.045
3	2700920	White/yellow	2.8			0.046	0.078
4	2701040	White/orange					

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

Tab. 13.129.

301/A/TR							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2701040	White/orange	3	60	35	0.1	0.19
2	2701260	White	3.5			0.191	0.42
3	2701530	Yellow	4			0.421	0.78
4	2701790	Yellow/Black	4.5			0.781	1.2
5	2702070	Orange	5			1.201	2

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

Tab. 13.130.

302/A							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2701800	Yellow	4.5	100	35	0.8	1.1
2	2702080	Orange	5			1.201	2.2
3	2702290	Red	5.5			2.201	3.5
4	2702460	Green	6			3.501	5.6
5	2702660	Black	6.5			5.601	7.3

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

Tab. 13.131.

13.2 - 200 SERIES PILOT CALIBRATION TABLES

The PM/182 monitor uses pilots 201/A and 204/A.

The adjustment ranges of the different pilots are shown in the following tables:

Pilot 201/A							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2702820	Blue	7	100	35	20	30
2	2703045	Brown	7.5			30.001	44
3	2703224	Grey	8			44.001	60

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

Tab. 13.132.

Pilot 204/A							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2701260	White	3.5	60	35	0.3	1
2	2701530	Yellow	4			1.001	2
3	2702070	Orange	5			2.001	6
4	2702450	Red	6			6.001	12
5	2702815	Green	7			12.001	18
6	2703220	Black	8			18.001	28
7	2703420	Blue	8.5			28.001	43

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

Tab. 13.133.

13.3 - PRESSURE SWITCH CALIBRATION TABLES MOD. SA

Listed below are the calibration tables of possible pressure switches in the SA built-in slam-shut valve:

Mod. SA-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	2701070	Orange	5			0.901	1.1

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

Tab. 13.134.

Mod. SA-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. 13.135.

Mod. SA-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. 13.136.

Mod. SA-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. 13.137.

Mod. SA-93 - Max pressure

Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2701530	Yellow	4	60	35	3	4.3
2	2701790	Yellow/black	4.5			4.301	7
3	2702070	Orange	5			7.001	8.5
4	2702280	White/red	5.5			8.501	13.3

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

Tab. 13.138.

Mod. SA-93 - Min pressure

Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max.
1	2700713	Green	2.3	40	15	0.8	1.4
2	2700750	Black	2.5			1.401	3.9
3	2700985	Brown	3			3.901	7.7

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

Tab. 13.139.

13.4 - M/A ACCELERATOR VALVE CALIBRATION TABLE

M/A							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2701260	White	3.5	60	35	0,3	1
2	2701530	Yellow	4			1,001	2,1
3	2702070	Orange	5			2,101	5,5
4	2702450	Red	6			5,501	11
5	2702815	Green	7			11,001	20

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

Tab. 13.140

M/A 1							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2702820	Blue	7	100	35	20	33
2	2703045	Brown	7,5			33,001	43
3	2703224	Grey	8			43,001	63

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

Tab. 13.141

M/A 2							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2703224	Grey	8	100	35	40	75

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

Tab. 13.142

13.5 - V/25 ACCELERATOR VALVE CALIBRATION TABLE

V/25 BP							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2700675	Yellow	2,3	50	35	0,015	0,039
2	2700830	Red/black	2,5	60		0,04	0,079
3	2701040	White/orange	3			0,08	0,2

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

Tab. 13.143

V/25 MP							
Pos.	Spring item code	Spring colour	d	Lo	De	Min.	Max
1	2701247	Red	3,5	70	34	0,2	0,399
2	2701393	Black	3,8	68		0,4	0,6

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

Tab. 13.144

TM0016ENG



**Pietro
Fiorentini**