

Cirval

Medium-low pressure gas regulator



Review A - Edition 09/2022



**OPERATION, MAINTENANCE
AND WARNING MANUAL**

1 - INTRODUCTION

PREFACE

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The Manufacturer is in no way responsible for the consequences of any operations performed in a manner different from what is stated in the manual.

GENERAL CONSIDERATIONS

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

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

Revision: A

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1.1 - REVISION HISTORY

Revision index	Date	Review Contents
A	09/2022	First issue

Tab. 1.1.

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2 - GENERAL INFORMATION

2.1 - MANUFACTURER IDENTIFICATION

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

Tab. 2.2.

2.2 - PRODUCT IDENTIFICATION

Equipment	MEDIUM PRESSURE REGULATOR
Model	CIRVAL

Tab. 2.3.

2.3 - REGULATORY SYSTEM

PIETRO FIORENTINI S.P.A., with registered office in Arcugnano (Italy) - Via E. Fermi, 8/10, declares under its sole responsibility that the equipment of the series CIRVAL subject of this manual, is designed, manufactured, tested and controlled in accordance with the requirements of the standard ANSI B109.4.

NOTICE

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

2.4 - WARRANTY

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




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

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

NOTICE

The warranty conditions are specified in the commercial contract.

2.5 - SYMBOLS USED IN THE MANUAL

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

Tab. 2.4.

DANGER

DANGER - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

NOTICE - It is used to address practices not related to bodily injury.

SAFETY INSTRUCTIONS

SAFETY INSTRUCTIONS (or equivalent) - These are signs that indicate specific safety-related instructions or procedures.

2.6 - RECIPIENTS, SUPPLY AND CONSERVATION OF THE MANUAL

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

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

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

⚠ WARNING

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

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

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

2.7 - LANGUAGE

The original manual was written in Italian.

Any translations must be made starting from the original manual.

⚠ DANGER

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

If inconsistencies are found or the text is not understandable:

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

⚠ WARNING

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

2.8 - IDENTIFICATION PLATES APPLIED

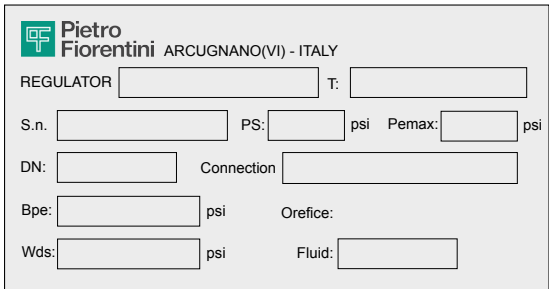
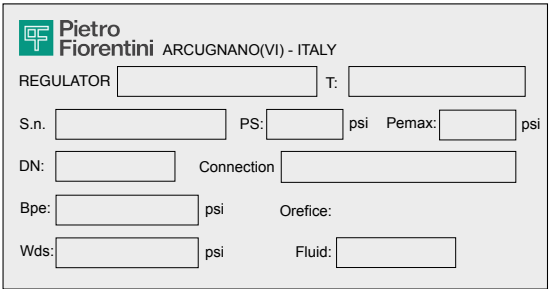
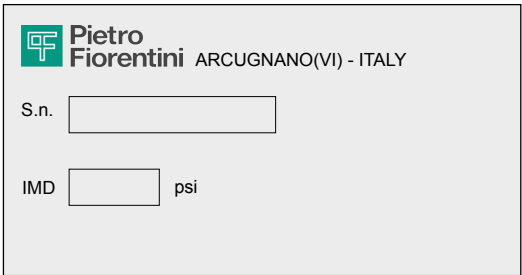
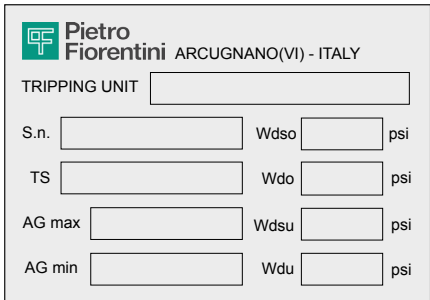
⚠ WARNING

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

The appliance and its accessories are equipped with identification plates.

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

Table 2.5 illustrates the identification plates applied:

Id.	Type	Image
1	IDENTIFICATION PLATE REGULATOR	
2	IDENTIFICATION PLATE MONITOR INCORPORATED IFM	
3	IDENTIFICATION PLATE INCORPORATED IMD MONITOR	
	IDENTIFICATION PLATE SLAM-SHUT VALVE	

Tab. 2.5.

2.8.1 - IDENTIFICATION PLATES GLOSSARY

Table 2.6 describes the terms and abbreviations used on the identification plates:

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

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

Tab. 2.6.

2.9 - MEASUREMENT UNIT GLOSSARY

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

Tab. 2.7.

2.10 - QUALIFIED PROFESSIONALS

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

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

Tab. 2.8.

3 - SAFETY

3.1 - GENERAL SAFETY WARNINGS

⚠ WARNING

The equipment described in this manual is:

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

⚠ WARNING

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

In and around "danger zones" it is absolutely:

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

⚠ CAUTION

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

Never work on the equipment:

- Under the influence of exciting substances such as, for example, alcohol;
 - In the case of using drugs that can lengthen reaction time.
-

NOTICE

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

Before installation, commissioning or maintenance, operators must:

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

3.2 - PERSONAL PROTECTIVE EQUIPMENT

In Table 3.9, Personal Protective Equipment (PPE) and its description are shown. An obligation is attached to each symbol. Personal protective equipment means any equipment intended to be worn by the worker for the purpose of protecting him against one or more hazards likely to threaten his safety or health while at work.

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

Symbol	Meaning
	Obligation to use protective or insulating gloves. Indicates a requirement for personnel to use protective or insulating gloves.
	Obligation to use safety glasses. Indicates a requirement for personnel to use protective goggles to protect their eyes.
	Obligation to use safety shoes. Indicates a requirement for staff to use safety shoes to protect their feet.
	Obligation to use noise protection devices. Indicates a requirement for staff to use ear muffs or ear plugs for hearing protection.
	Wear appropriate protective clothes. Indicates a requirement for personnel to wear the specific protective clothing.
	Mandatory use of protective mask. Indicates a requirement for personnel to use masks for respiratory protection in the event of a chemical hazard.
	Mandatory use of protective helmet. Indicates a requirement for personnel to use the protective helmet.
	Obligation to wear high-visibility vest. Indicates a requirement for personnel to use high-visibility vests.

Tab. 3.9.

⚠ WARNING

Each licensed operator is required to:

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

3.3 - RESIDUAL RISKS

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

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

3.3.1 - TABLE OF RESIDUAL RISKS DUE TO PRESSURE

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

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

Tab. 3.10.

3.3.2 - RESIDUAL RISKS TABLE FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

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

- the pressure regulator CIRVAL;
- the incorporated IFM monitor;
- the incorporated IMD monitor;
- the LA slam-shut valve.

Considering that the silencer has no active functional parts, in this analysis it is considered as an integral part of the CIRVAL regulator.

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

⚠ WARNING

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

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

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

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

Tab. 3.11.

3.4 - OBLIGATIONS AND PROHIBITIONS

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

It is mandatory to:



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

It is forbidden to:

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

3.5 - SAFETY PICTOGRAMS

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

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

Tab. 3.12.

⚠ DANGER

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

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

3.6 - NOISE LEVEL

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

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

⚠ CAUTION

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

4 - DESCRIPTION AND OPERATION

4.1 - GENERAL DESCRIPTION

The CIRVAL equipment is a controlled pressure regulator for medium and low pressure that reduces the pressure of the incoming gas while keeping its downstream value stable even when the following change:

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

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

Pos.	Description	Pos.	Description
1	Plug	4	Spring
2	Stem	5	Main diaphragm
3	Lever mechanism	6	Balance block

Tab. 4.13.

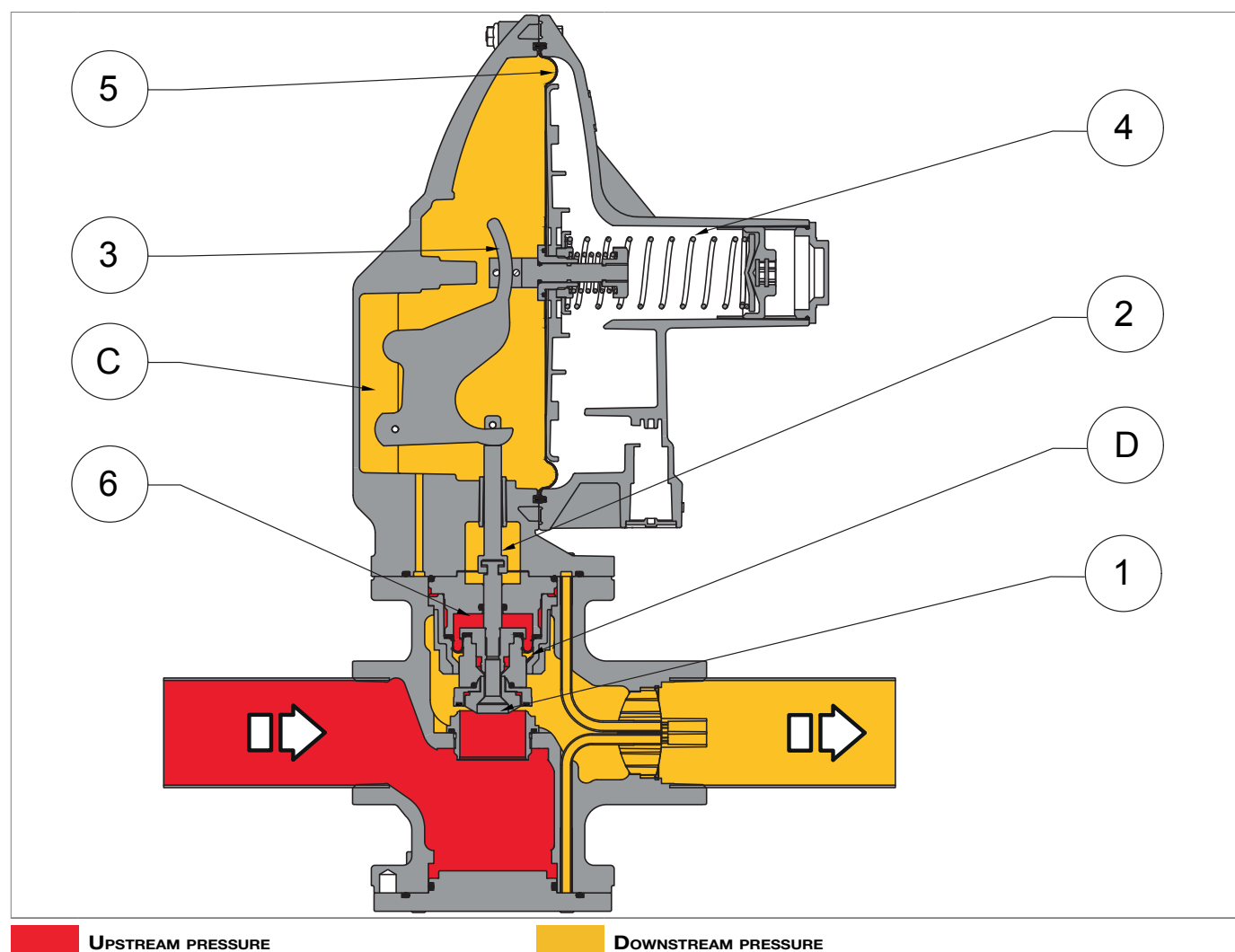


Fig. 4.1. General description CIRVAL

4.1.1 - REGULATOR REACTION MODES

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

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

4.2 - OPERATION

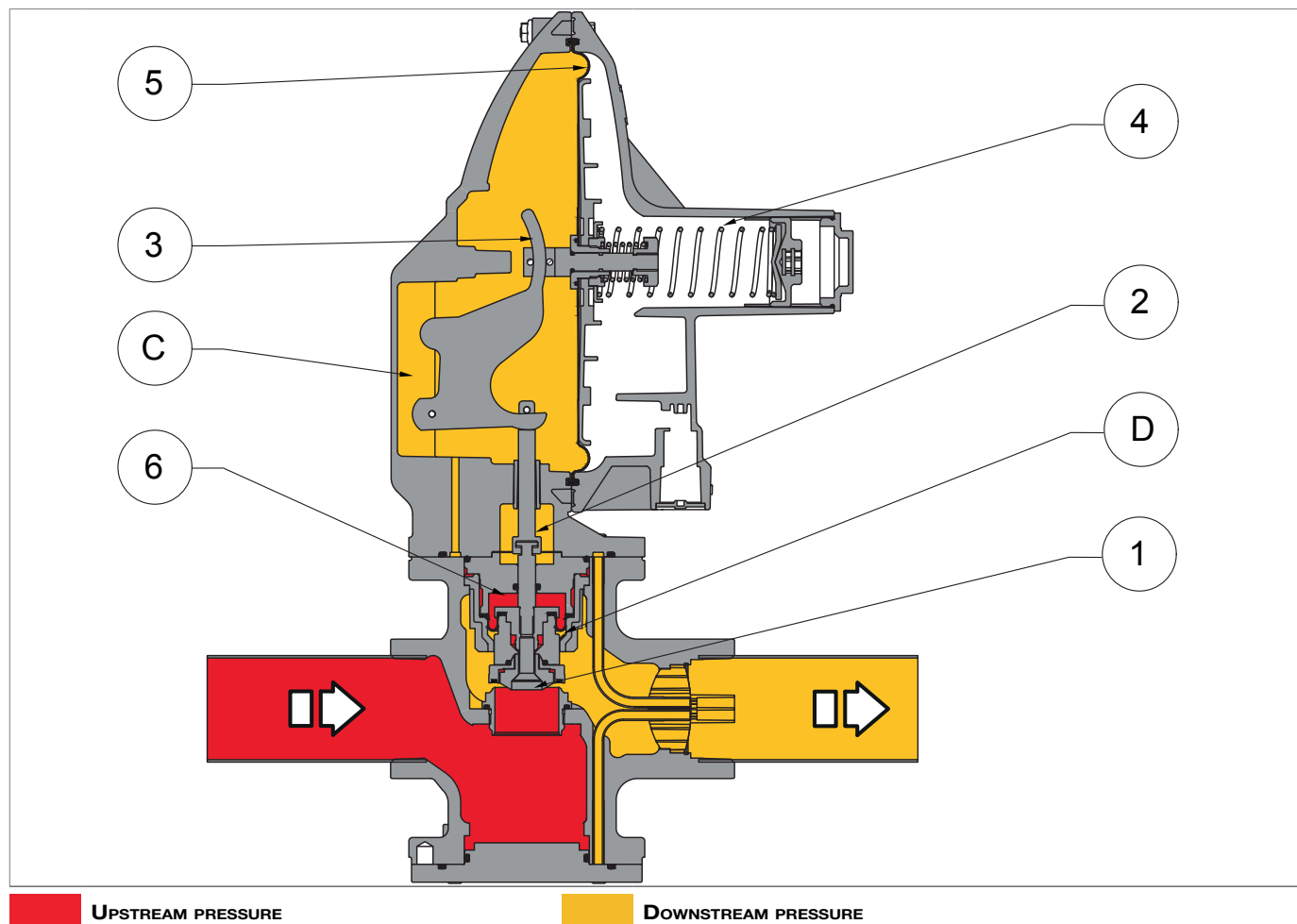


Fig. 4.2. Operation CIRVAL

In the absence of pressure, the plug (1) is kept in the open position by the thrust of the spring (4), via the lever mechanism (3) connected to the stem (2).

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

- calibration spring load (4)
- the thrust that the downstream pressure (P_d) itself exerts on the main diaphragm (5).

The main diaphragm (5) moves the stem (2) and the plug (1). The stem (2) moves perpendicular to the gas flow. In the event of zero flow rate, the plug (1) closes on the seat and allows the downstream pressure not to increase beyond the closing pressure value.

Under normal working conditions, the plug (1) is positioned to maintain the downstream pressure (P_d) around the pre-determined calibration value.

The position of the plug (1) is controlled by the movements of the main diaphragm (5). The forces that affect the position of the plug (1) are:

- towards the closed position: the thrust resulting from the downstream pressure (P_d) in the chamber (C) and in the chamber (D)
- towards the opening position: the load of the calibration spring (4).

Changes in the upstream pressure (P_u) do not substantially change the value of the downstream pressure (P_d) because the mobile equipment is balanced.

If, during operation, the following should occur:

Operating conditions	Operational consequences	Final outcome
Decrease in downstream pressure (P_d) due to: <ul style="list-style-type: none"> • increase in the required flow rate; • drop in upstream pressure (P_u). 	<ul style="list-style-type: none"> • the thrust exerted on the main diaphragm (5) is less than the load of the calibration spring (4) • plug (1) moves to the open position 	Increase in flow rate until the pre-determined value of the downstream pressure (P_d) is restored.
Increased downstream pressure (P_d) due to: <ul style="list-style-type: none"> • decrease in the required flow rate; • increase in upstream pressure (P_u). 	<ul style="list-style-type: none"> • the thrust exerted on the main diaphragm (5) is greater than the load of the calibration spring (4) • the plug (1) moves to the closed position 	Decrease of the flow rate until the pre-determined value of the downstream pressure (P_d) is restored.

Tab. 4.14.

4.3 - INTENDED USE

4.3.1 - INTENDED USE

The equipment in question is intended for:

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

Tab. 4.15.

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

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

The indications to work safely are:

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

4.3.2 - REASONABLY FORESEEABLE MISUSE

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

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

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

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

4.3.3 - TYPES OF FLUIDS

The equipment works with combustible gases used:

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

NOTICE

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

4.4 - TECHNICAL CHARACTERISTICS/PERFORMANCE

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

The main specifications of this regulator are:

Technical features	
Maximum allowable pressure	up to 125 psi
Ambient temperature range	-20°F- +150°F
Inlet gas temperature range	-4°F + 140°F
Inlet pressure range (bpu)	2- 75 psi
Possible adjustment range (Wd)	7" W.C.- 12 psi
Minimum differential pressure	1.75 psi
Accuracy class AC	up to 10 (depending on operating conditions)
Shut-off pressure class (SG)	up to 20 (depending on operating conditions)
Orifice	<ul style="list-style-type: none"> • Cirval 200: 3/4" • Cirval 300: 1" 1/2
Tubing Connections	<ul style="list-style-type: none"> • Cirval 200: 1" 1/4, 1" 1/2 and 2" NPT according to ANSI B1.20.1 • Cirval 300: 2" NPT according to ANSI B1.20.1, 2" S.125FF according to ANSI B16.5

Tab. 4.16.

Coefficients Cg and K1		
Model	Cirval 200	Cirval 300
Coefficient Cg	200	759
Coefficient K1	89	96

Tab. 4.17.

4.5 - POSSIBLE CONFIGURATIONS

4.5.1 - REGULATOR MODELS

Table 4.18 lists the possible combinations of sizes and control heads for the CIRVAL equipment.

		Size		
M O D E L S		1" 1/4	1" 1/2	2"
	CIRVAL 300 BP	-	-	Yes
	CIRVAL 300 MP/TR	-	-	Yes
	CIRVAL 200 BP	Yes	Yes	Yes
	CIRVAL 200 MP/TR	Yes	Yes	Yes

Tab. 4.18.

4.5.2 - ACCESSORIES

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

- Regulator with monitor function
- Incorporated IFM monitor
- Incorporated IMD monitor
- Incorporated LA slam-shut valve.

The possible configurations are listed in Table 4.19:

CIRVAL	Regulator- monitor	IFM	IMD	LA
Regulator + monitor	-	No	No	Yes
IFM	No	-	No	No
IMD	No	No	-	No
Incorporated LA slam-shut valve	Yes	No	No	-

Tab. 4.19.

The installation of the accessories can be carried out directly in the factory or, at a later time, directly in the field.

NOTICE

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

4.5.3 - REGULATOR AS A MONITOR

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

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

The regulator with monitor function is a regulator that has a different balancing device, specific to the application.

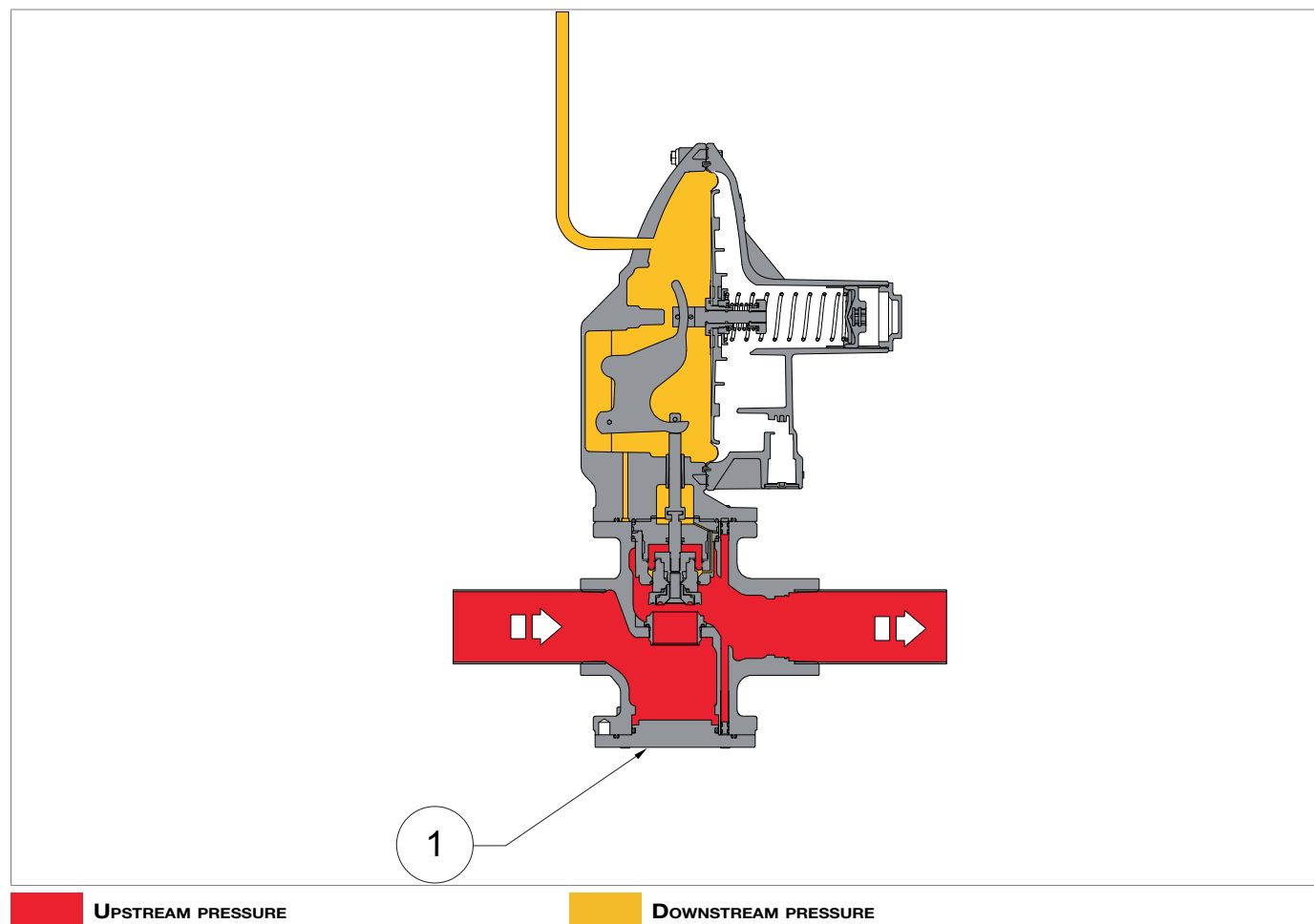


Fig. 4.3. Regulator with monitor function

STANDBY OPERATION

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

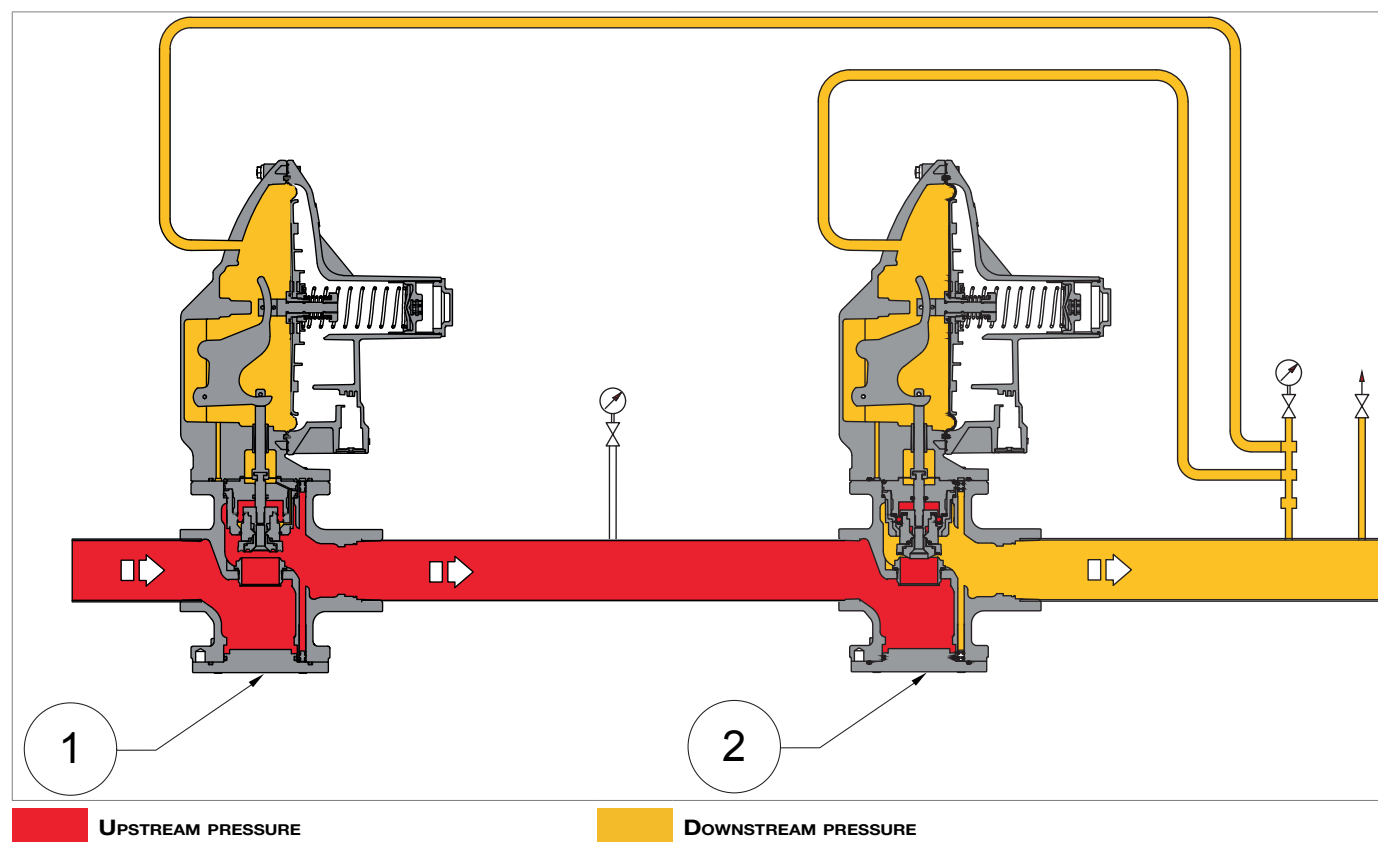


Fig. 4.4. In-line regulator-monitor operation in standby conditions

FAULT OPERATION OF THE MAIN REGULATOR

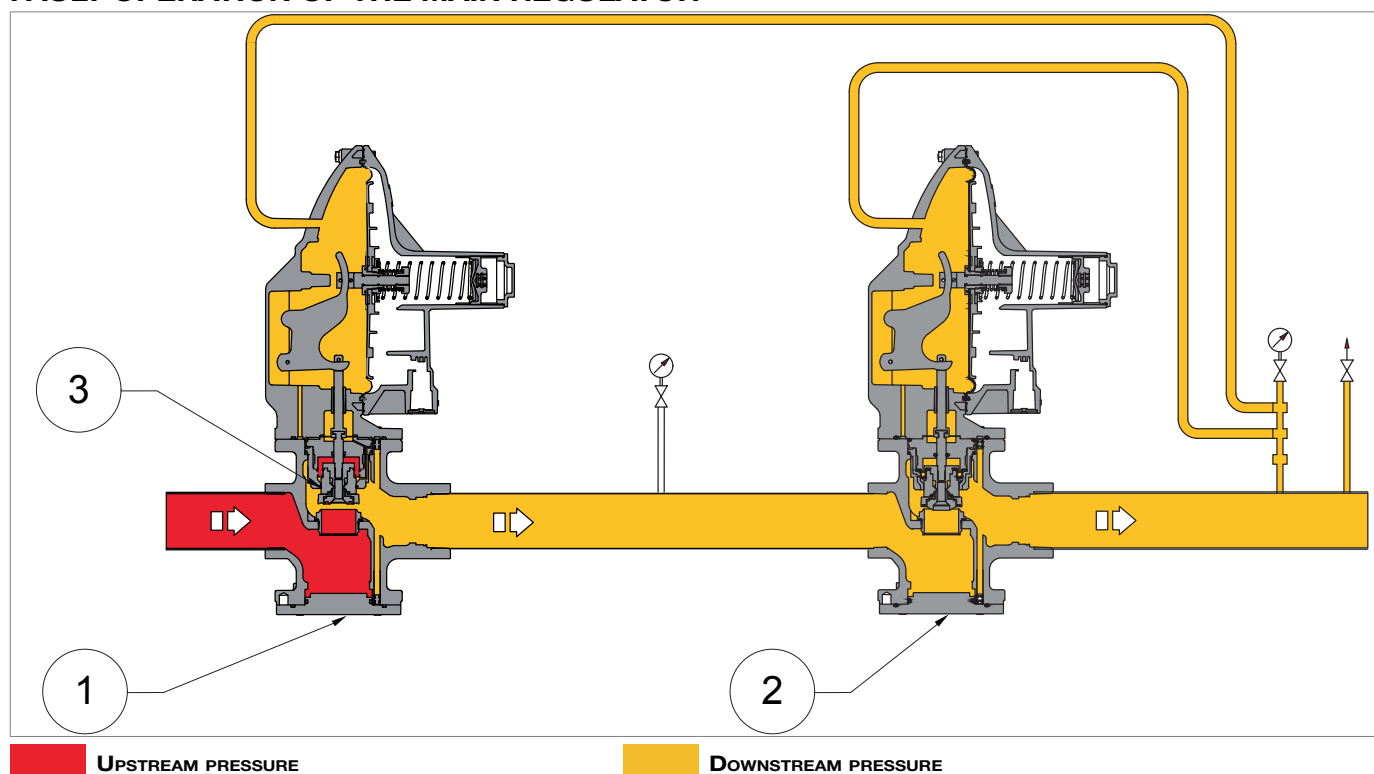


Fig. 4.5. Regulator-monitor operation in main regulator failure conditions

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

If, during operation, the following should occur:

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

Tab. 4.20.

4.5.4 - INCORPORATED MONITOR

The built-in monitor (1) is installed upstream of the main regulator (2) in the fully open position during normal operation.

The built-in monitor (1) has the task of keeping the value of the pressure downstream of the main regulator (2) within the predetermined limits in case of failure of the latter.

The CIRVAL equipment may include the installation of the following built-in monitors:

- IFM
- IMD

4.5.4.1 - INCORPORATED IFM MONITOR

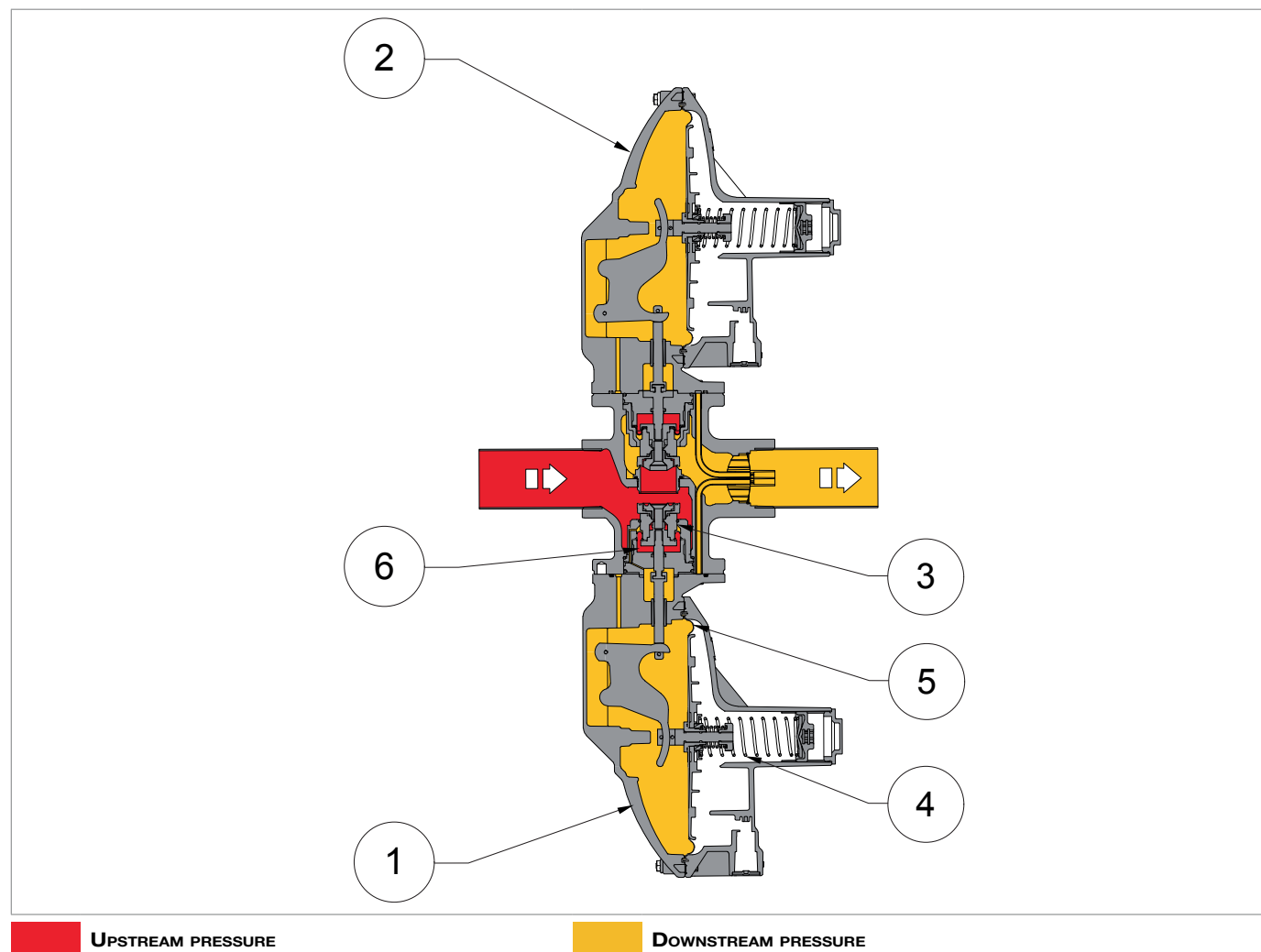


Fig. 4.6. Incorporated IFM monitor

During normal operation, the plug (3) is held in the open position by the calibration spring load (4).

In the event of failure of the main regulator (2), the downstream pressure (P_d) is controlled by the comparison between the load of the calibration spring (4) and the force that the downstream pressure exerts on the diaphragm (5).

The upstream pressure (P_u), although variable, does not affect the adjustment because the plug (3) is balanced by the force of the balancing chamber (6).

NOTICE

Refer to Table 4.21 for IFM incorporated monitor operating conditions.

4.5.4.2 - INCORPORATED IMD MONITOR

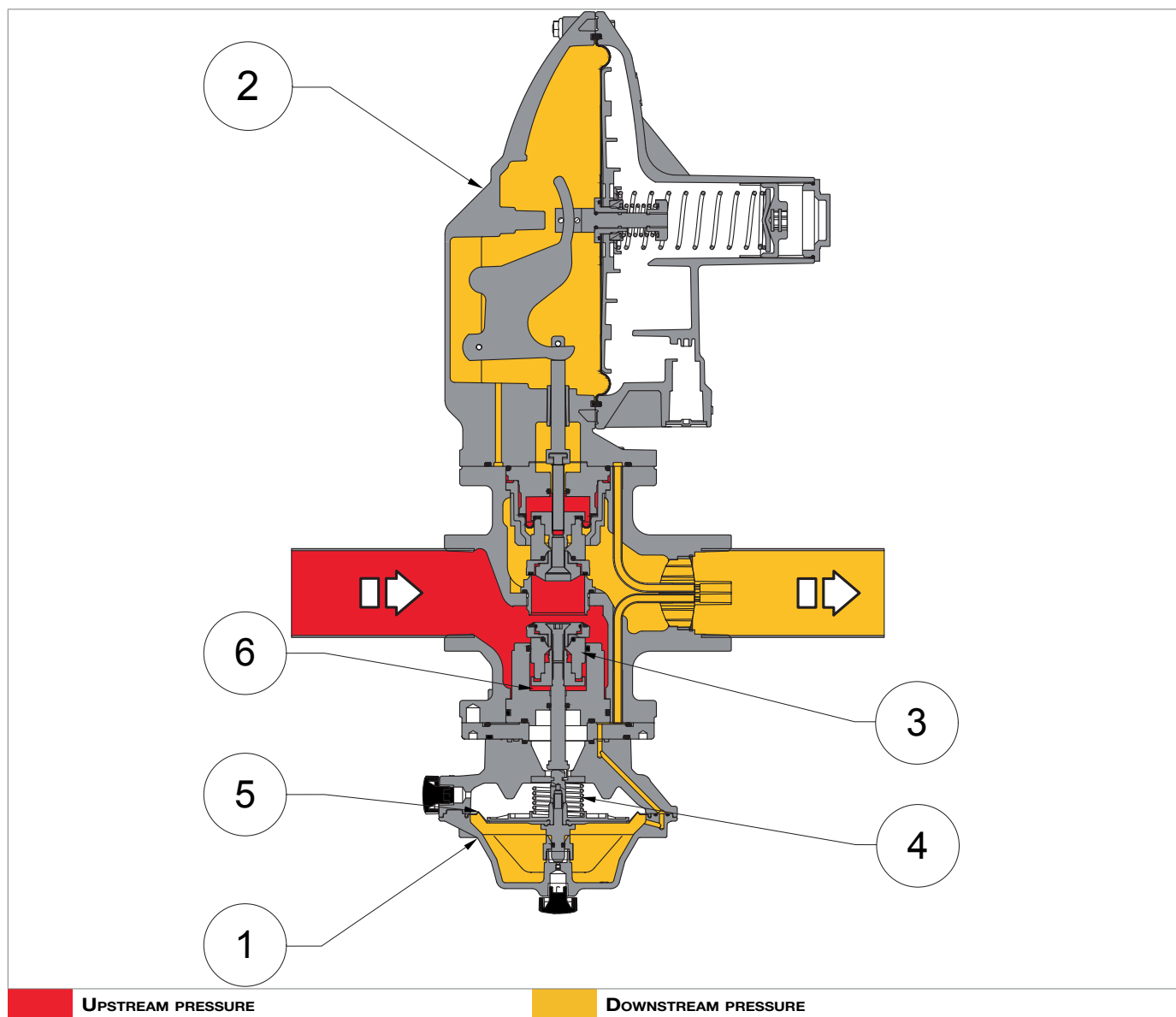


Fig. 4.7. Incorporated IMD monitors

During normal operation, the plug (3) is held in the open position by the calibration spring load (4).

In the event of failure of the main regulator (2), the downstream pressure (P_d) is controlled by the comparison between the load of the calibration spring (4) and the force that the downstream pressure exerts on the diaphragm (5).

The upstream pressure (P_u), although variable, does not affect the adjustment because the plug (3) is balanced by the force of the balancing chamber (6).

NOTICE

Refer to Table 4.21 for IMD incorporated monitor operating conditions.

If, during operation, the following should occur:

Operating conditions	Operational consequences	Final outcome
Decrease in downstream pressure (Pd) due to: <ul style="list-style-type: none"> • increase in the required flow rate; • drop in upstream pressure (Pu). 	<ul style="list-style-type: none"> • the force it exerts on the diaphragm (5) is less than the load of the spring (4); • the diaphragm lowers, • the plug (3) moves to the open position 	Increase in flow rate until the predetermined calibration value of the downstream pressure (Pd) is restored.
Increased downstream pressure (Pd) due to: <ul style="list-style-type: none"> • decrease in the required flow rate; • increase in upstream pressure (Pu). 	<ul style="list-style-type: none"> • the force it exerts on the diaphragm (5) is greater than the load of the spring (4); • the diaphragm rises • the plug (3) moves to the closed position 	Decrease of the flow rate until the predetermined calibration value of the downstream pressure (Pd) is restored.

Tab. 4.21.

4.5.5 - SLAM-SHUT VALVE

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

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

- a control system;
- the locking mechanism.

If tripped, the slam-shut valve closes the regulator supply.

4.5.5.1 - INCORPORATED LA SLAM-SHUT VALVE

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

- from the intervention spring
- manually.

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

- tripping due to increase and / or decrease of the downstream pressure;
- design pressure: 20 bar for all components of the accessory;
- local close button (on request, can be omitted).

Slam-shut valve type		Set	Tripping range (psi)	AG
LA	BP	max	0.43 - 2.61	10
		min	0.09 - 0.9	30
LA	MP	max	2 - 2.59	10
			2.61 - 6.52	5
		min	0.14 - 0.85	30
			0.87 - 3.48	10
LA	TR	max	3.62 - 18.70	10
			18.85 - 79.77	5
		min	1.45 - 50.76	10

Tab. 4.22.

The built-in LA slam-shut valve consists of (see fig. 4.8):

Pos.	Description		
1	Plug pad	6	Intervention spring for pressure increase
2	Reset knob	7	Intervention spring for pressure reduction
3	Coupling device	8	Spring support
4	Stem	9	Control shaft
5	Diaphragm	10	Probe

Tab. 4.23.

OPERATION

In the control head (C), the downstream pressure (Pd) acts on the diaphragm (5), which integral with the control shaft (9) receives an opposite force through the springs (6, 7), which determines the intervention by increase or decrease in pressure.

In case of intervention due to pressure increase:

- the downstream pressure (Pd) exceeds the calibration value
- The load on the diaphragm (6) increases until the spring resistance is overcome (6)
- Moving to the opening position of the control shaft (9) moves the probe (10) through the cam, releasing the linkage.

In case of intervention due to pressure reduction:

- the downstream pressure (P_d) decreases below the calibration value
- the spring support (7) stops the stroke
- Moving to the closing position of the control shaft (9) moves the probe (10) through the cam, releasing the linkage.

To rearm the LA slam-shut valve:

- pull the reset knob (2) down until the linkage is re-coupled
- wait for the upstream pressure (P_u) to pass downstream of the plug (1), balancing it
- Insert the reset knob (2) into its seat by pressure.

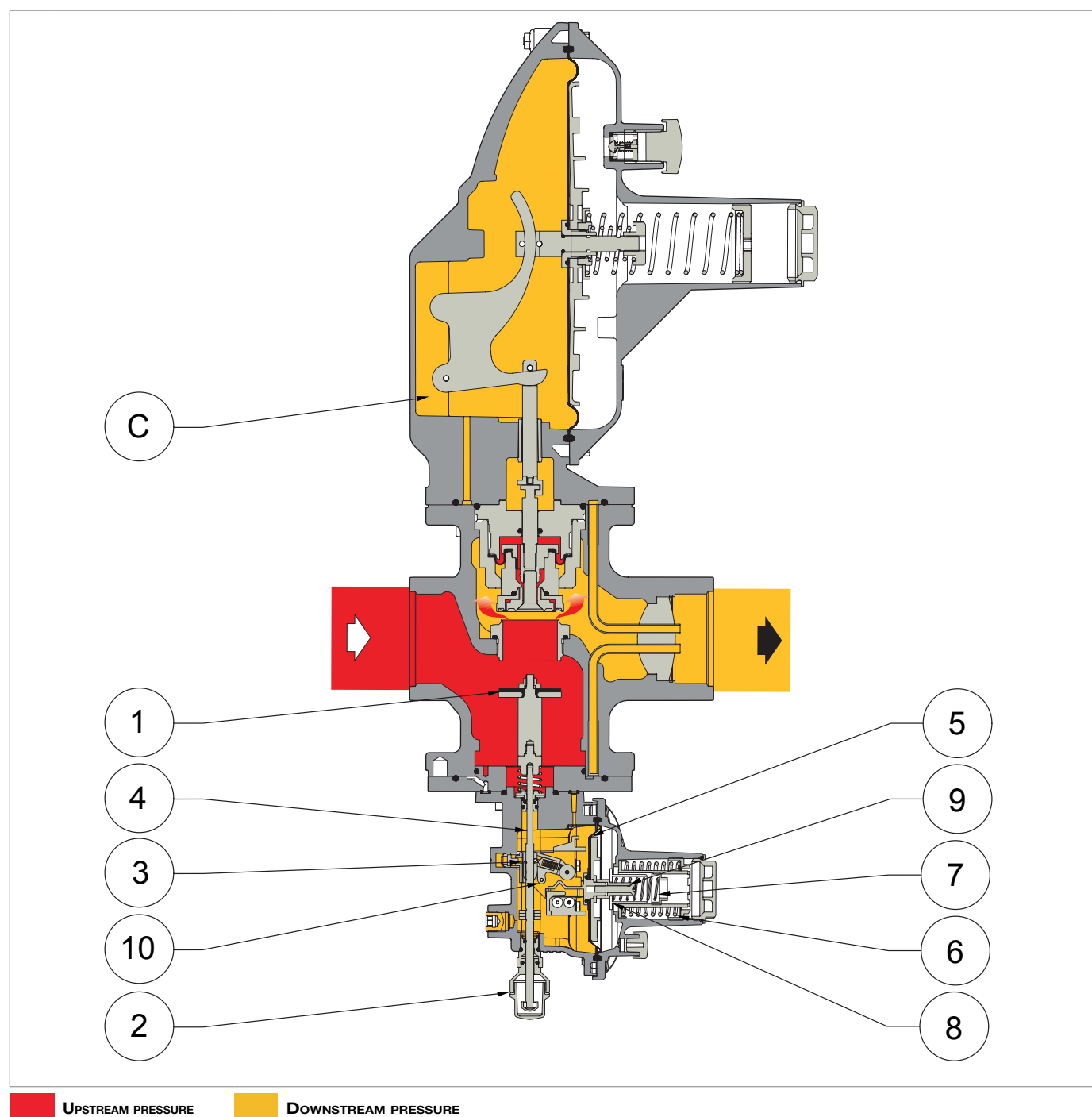


Fig. 4.8. CIRVAL with built-in LA slam-shut valve

5 - TRANSPORT AND HANDLING


5.1 - SPECIFIC WARNINGS FOR TRANSPORT AND HANDLING

NOTICE

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

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

Transportation by forklift or crane

Operator qualification	In charge of transport, handling, unloading and placement on site
PPE required	 <div> ⚠ WARNING The PPE listed in this chart relates to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, refer to: <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any indications provided by the Safety Manager at the installation facility.</u> </div>
Lifting vehicle	Hoist crane, forklift or suitable similar means.
Weights and dimensions of the equipment	For dimensions and weights, refer to paragraph 5.2 "Physical characteristics of the equipment".

Tab. 5.24.

5.1.1 - PACKAGING AND FASTENING SYSTEMS USED FOR TRANSPORT

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

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




Upon receipt of the equipment:

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

NOTICE

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

Table 5.25 shows the types of packaging used:

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

Tab. 5.25.

5.2 - PHYSICAL CHARACTERISTICS OF THE EQUIPMENT

5.2.1 - CIRVAL

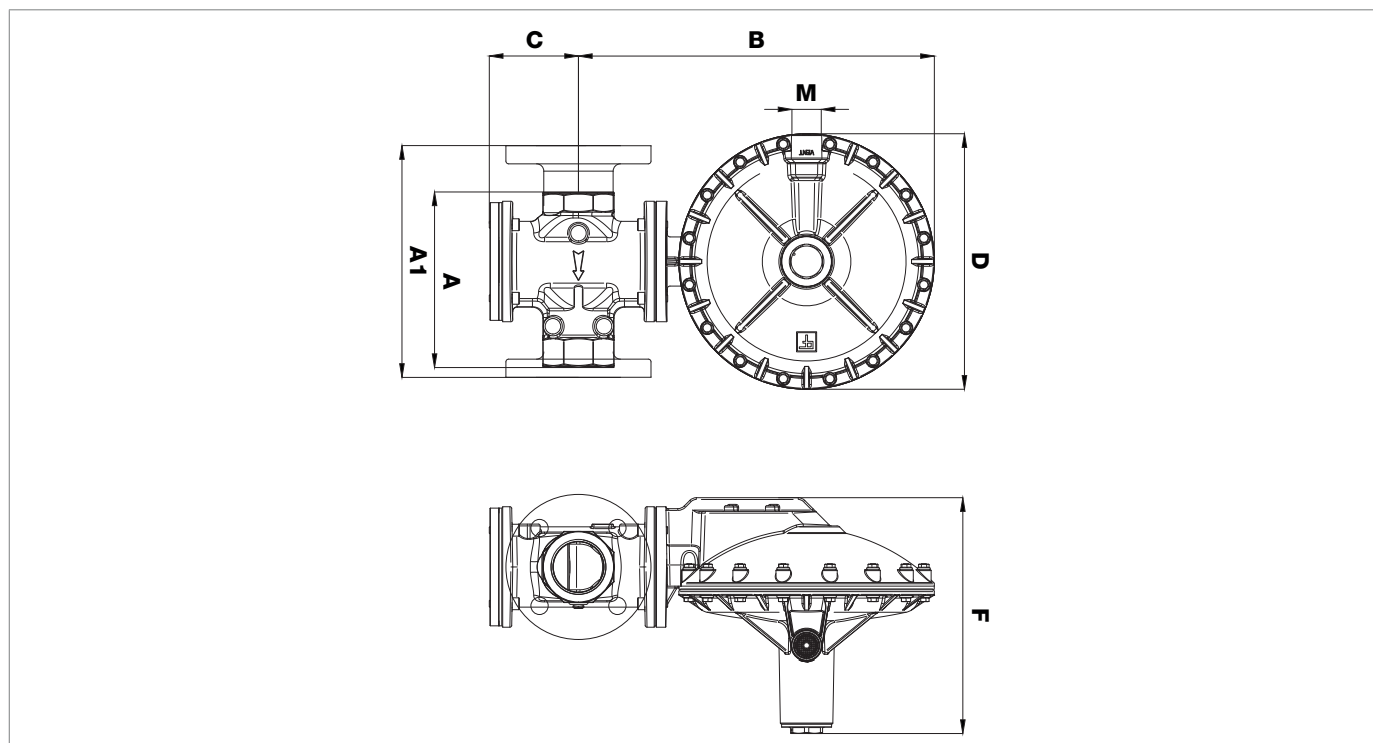


Fig. 5.9. Physical characteristics CIRVAL

Clearances and dimensions CIRVAL		
Model	Cirval 200	Cirval 300
A	6.6"	7.6"
A1	-	10.0"
B	10.2"	15.4"
C	2.6"	3.9"
D	7.3"	11.0"
F	7.0"	10.1"
M	3/4" NPT	3/4" NPT
Inlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Outlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Connecting pneumatic connections	1/4" NPT x 3/8" OD Tubing	

Tab. 5.26.

Weight [lbs]		
NPT	14.1	28.8
FF/RF	-	37.5

Tab. 5.27.

5.2.2 - CIRVAL + IFM

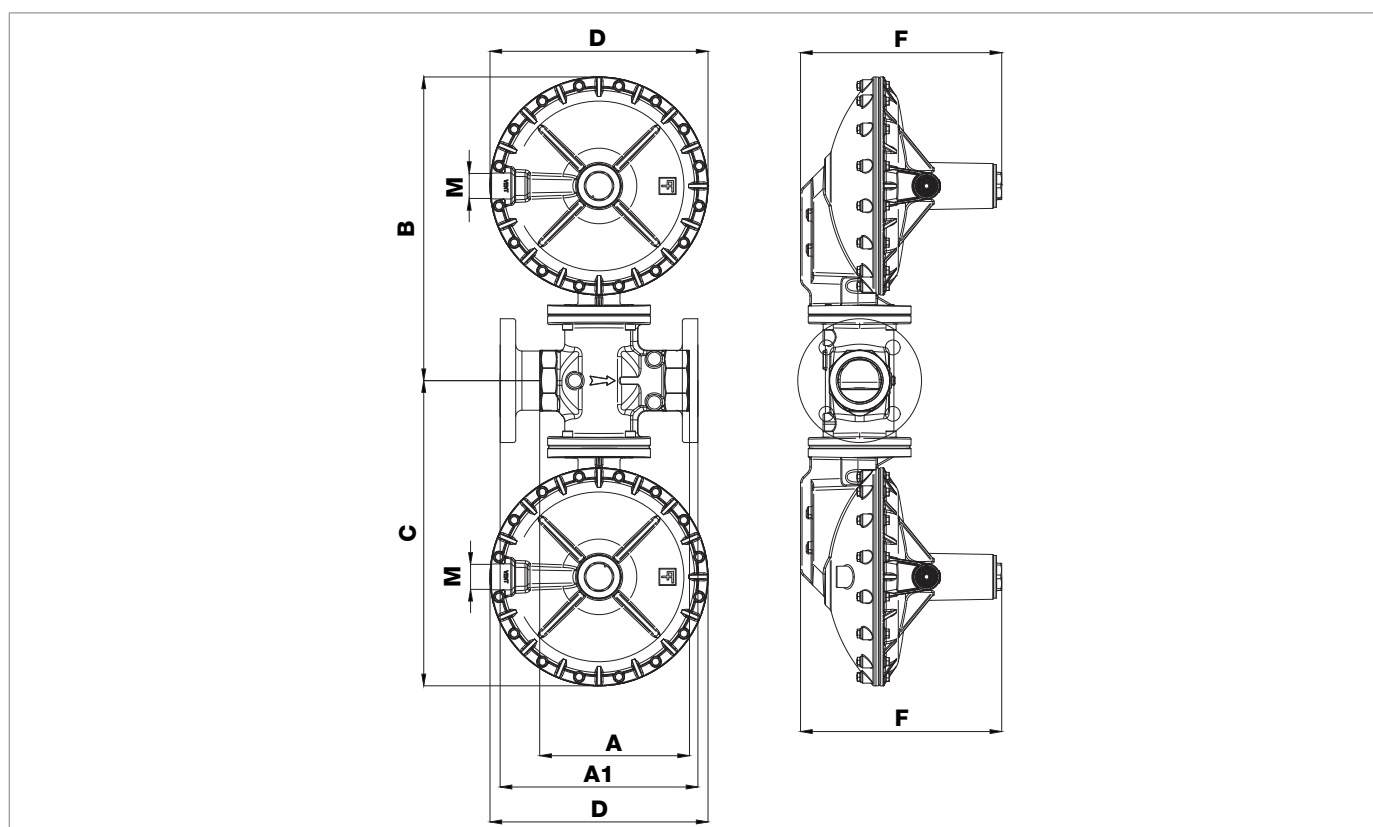


Fig. 5.10. Physical characteristics CIRVAL + IFM

Clearances and dimensions CIRVAL + IFM

Model	Cirval 200	Cirval 300
A	6.6"	7.6"
A1	-	10.0"
B	10.2"	15.4"
C	10.2"	15.4"
D	7.3"	11.0"
F	7.0"	10.1"
M	3/4" NPT	3/4" NPT
Inlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Outlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Connecting pneumatic connections	1/4" NPT x 3/8" OD Tubing	

Tab. 5.28.

Weight [lbs]

NPT	14.6	28.7
FF/RF	-	37.9

Tab. 5.29.

5.2.3 - CIRVAL + IMD

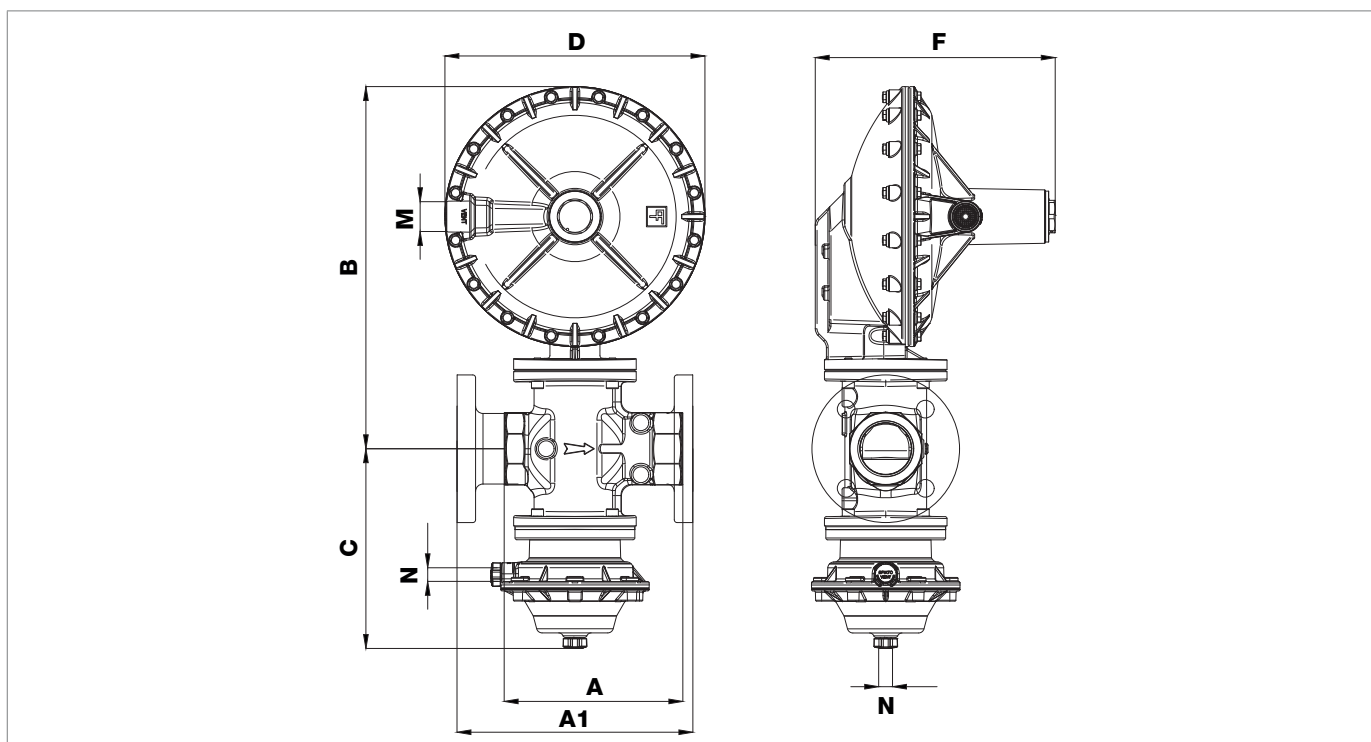


Fig. 5.11. Physical characteristics CIRVAL + IMD

Clearances and dimensions CIRVAL + IMD		
Model	Cirval 200	Cirval 300
A	6.6"	7.6"
A1	-	10.0"
B	10.2"	15.4"
C	6.5"	8.4"
D	7.3"	11.0"
F	7.0"	10.1"
M	3/4" NPT	3/4" NPT
Inlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Outlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Connecting pneumatic connections	1/4" NPT x 3/8" OD Tubing	

Tab. 5.30.

Weight [lbs]		
NPT	14.6	28.7
FF/RF	-	37.9

Tab. 5.31.

5.2.4 - CIRVAL + LA

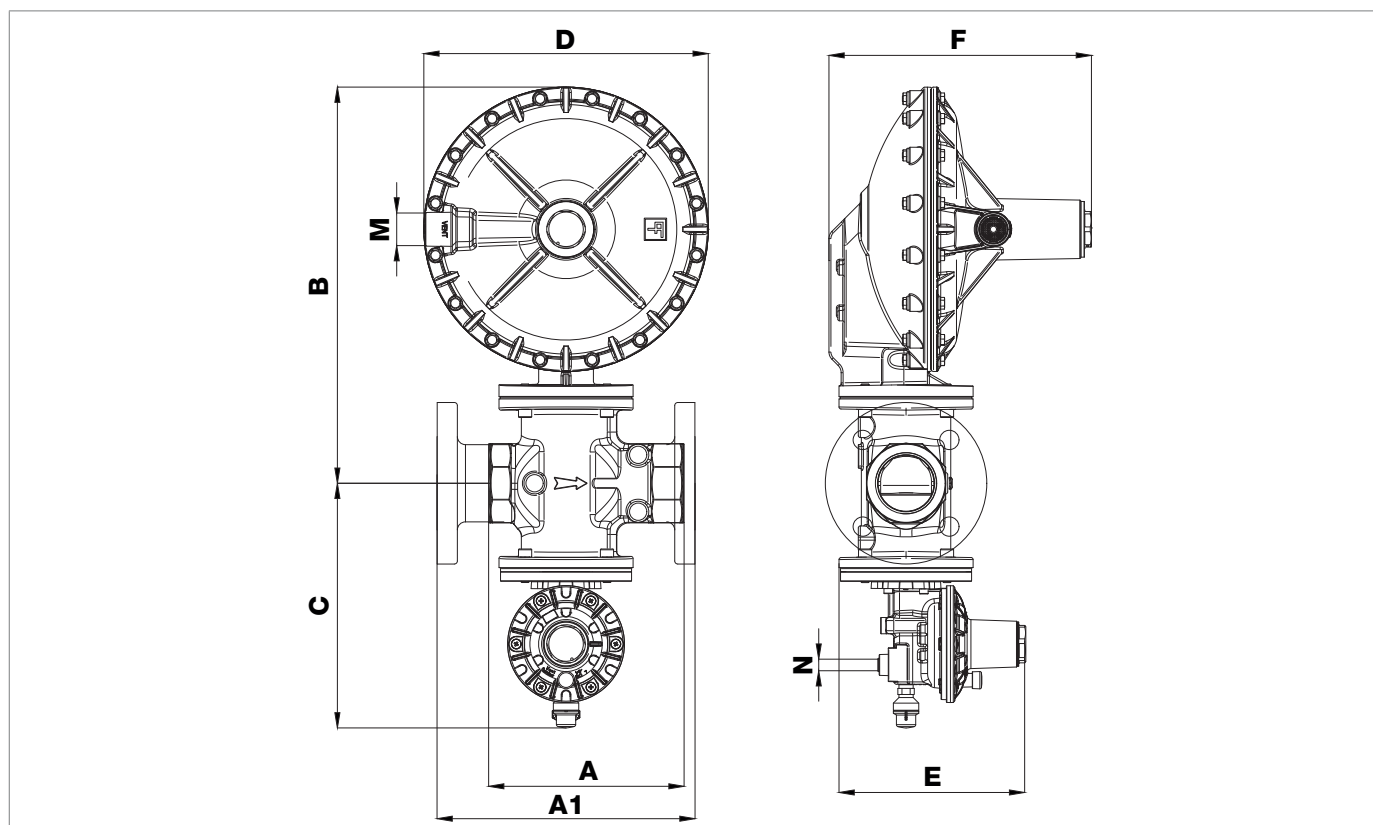


Fig. 5.12. Physical characteristics CIRVAL + LA

Clearances and dimensions CIRVAL + LA

Model	Cirval 200	Cirval 300
A	6.6"	7.6"
A1	-	10.0"
B	10.2"	15.4"
C	8.2"	9.5"
D	7.3"	11.0"
E	6.5"	7.3"
F	7.0"	10.1"
M	3/4" NPT	3/4" NPT
Inlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Outlet	1-1/4"; 1-1/2"; 2" NPT	2" NPT; 2" S125FF
Connecting pneumatic connections	1/4" NPT x 3/8" OD Tubing	

Tab. 5.32.

Weight [lbs]

NPT	14.1	28.2
FF/RF	-	37.5

Tab. 5.33.

5.3 - METHOD FOR ANCHORING AND LIFTING THE EQUIPMENT

DANGER

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

WARNING

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

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

CAUTION

Before moving the equipment:

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

5.3.1 - FORKLIFT HANDLING METHOD

⚠ DANGER

It is forbidden to:

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

⚠ WARNING

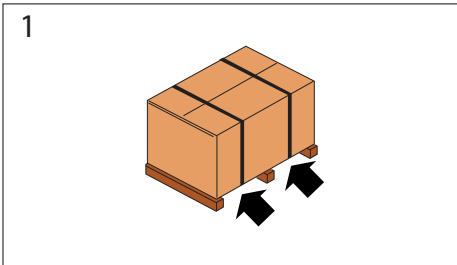


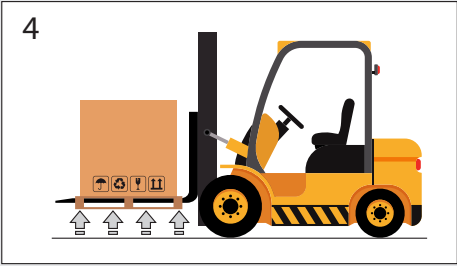
On forklift trucks it is forbidden to:


- transport passengers;
- lift people.

! NOTICE!

The packaging must always be handled in a vertical position

Proceed as described in tab. 5.34:

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

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

Tab. 5.34.

5.3.2 - CRANE HANDLING METHOD

⚠ WARNING

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

Always check that:

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

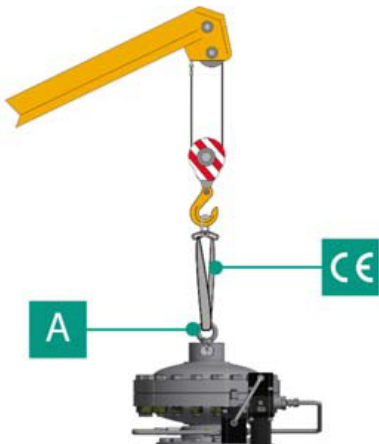
It is forbidden to:

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

NOTICE


The packaging must always be handled in a vertical position.

The handling of the equipment must be performed using the lifting points provided on the equipment itself. To carry out the transport correctly, follow the procedure in tab. 5.35:

Step	Operation	Image
1	Hook the lifting rope or chain to the appropriate supports. ⚠ WARNING <ul style="list-style-type: none"> • The lifting point is sized to lift only the equipment and not other parts of the plant connected to it. 	
2	Slightly lift the load making sure that the ropes or chains are tight. NOTICE Verify that the load is properly balanced.	
3	Move the load avoiding sudden maneuvers.	
4	Place the load in the chosen installation area.	

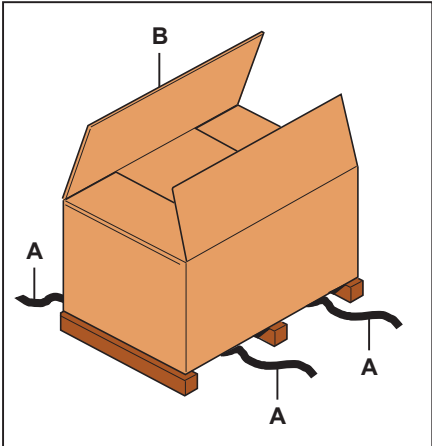
Tab. 5.35.

5.4 - UNPACKING

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

Tab. 5.36.

To unpack the equipment in the cardboard box, proceed as described in tab. 5.37:

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

Tab. 5.37.

NOTICE

After removing all packing materials, check for any abnormalities.

In the presence of anomalies:

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

5.4.1 - PACKAGING DISPOSAL

NOTICE

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

5.5 - STORAGE AND ENVIRONMENTAL CONDITIONS

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

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

Tab. 5.38.

5.5.1 - PRE-INSTALLATION WARNINGS AFTER PROLONGED STORAGE

For installations following storage periods exceeding 3 years, it is necessary to check the conditions of all rubber parts and, if these are deteriorated, replace them so as to be able to guarantee correct operation of the equipment.

NOTICE

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

6 - INSTALLATION

6.1 - INSTALLATION PRE-REQUISITES

6.1.1 - ENVIRONMENTAL CONDITIONS

⚠ WARNING

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

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

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

NOTICE

The equipment must work in correctly lit places using artificial lighting suitable for the protection of the operator (in compliance with UNI EN 12464-1:2011 and UNI EN 12464-2:2014). In the case of maintenance operations located in areas and / or parts not sufficiently illuminated, it is mandatory to use all light sources of the installation plant.

6.1.2 - CHECKS BEFORE INSTALLATION

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

$$MIPd \leq 1,1 \text{ PS}$$

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

⚠ CAUTION


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

The choice of fittings must be compatible with:

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

Before proceeding with the installation you must make sure that:

- the intended dimensions of the installation site are compatible with the dimensions of the equipment;
- there are no impediments to the maintenance operations of the employees;
- upstream and downstream pipes are at the same level and capable of bearing the weight of the equipment;
- the inlet and outlet connections of the pipes are aligned on the flanges;
- the input and output connections of the equipment are clean and have not been damaged;
- the inside of the upstream pipe is clean and free of processing residues such as welding slag, sand, paint residues, water, etc ...

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

Tab. 6.39.

6.2 - INSTALLATION-SPECIFIC SAFETY WARNINGS

⚠ WARNING

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

⚠ WARNING

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

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

6.3 - GENERAL INFORMATION ABOUT CONNECTIONS

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

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

Tab. 6.40.

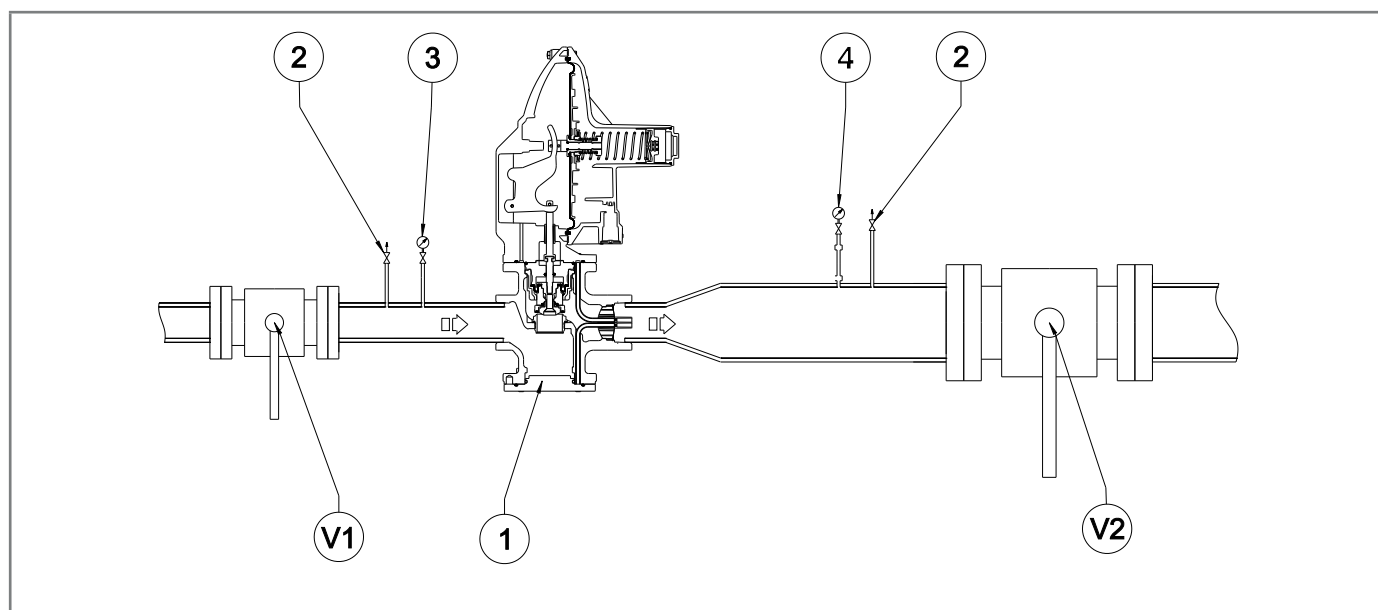


Fig. 6.13. In-line Installation

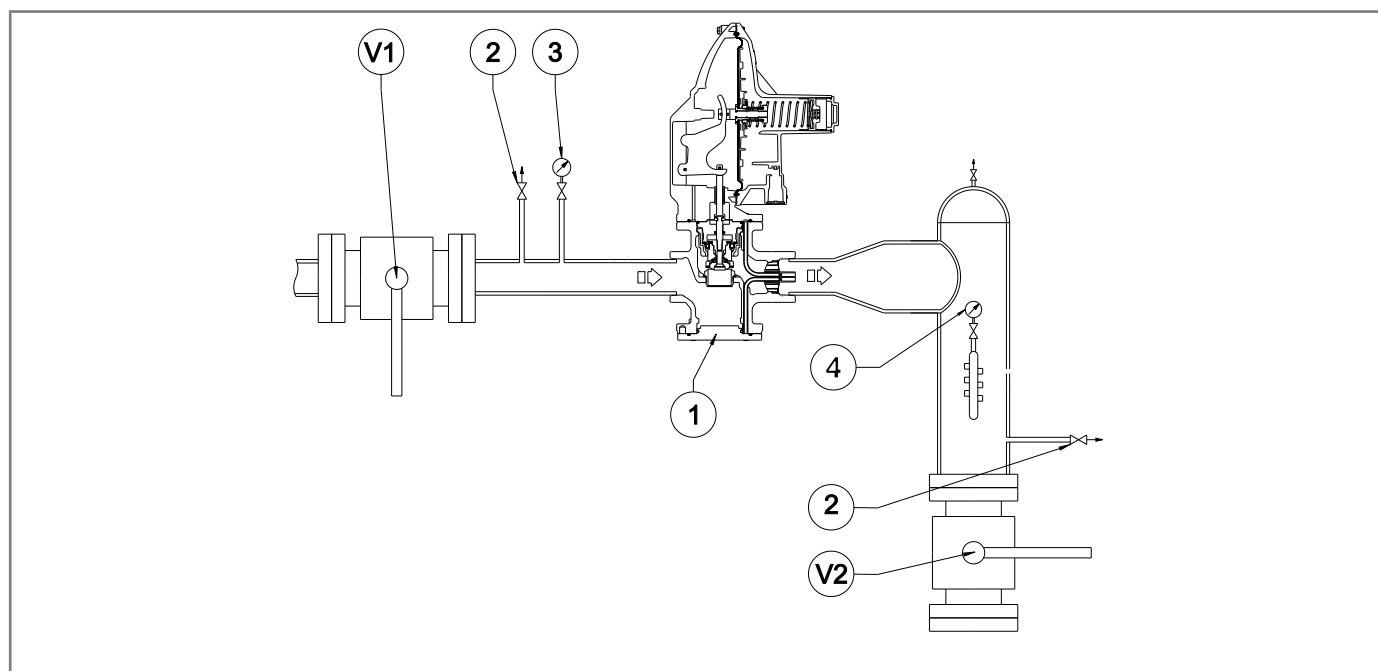


Fig. 6.14. Square installation

NOTICE

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

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

6.4 - INSTALLATION LOCATIONS OF THE REGULATOR

Figures 6.15 and 6.16 illustrate the typical regulator provisions:

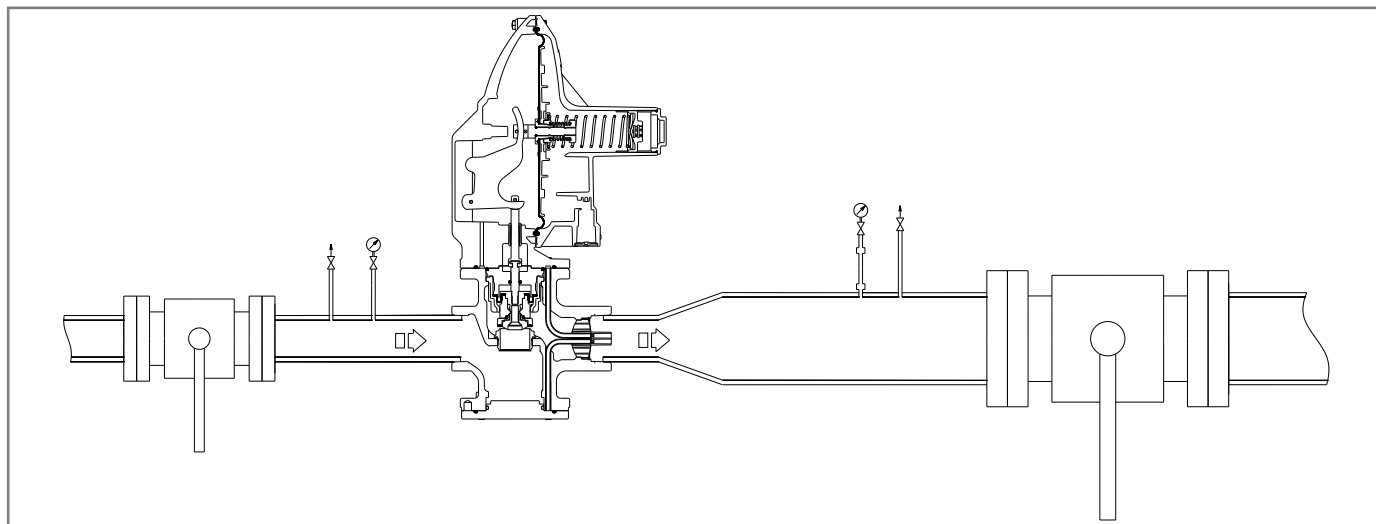


Fig. 6.15. Standard location

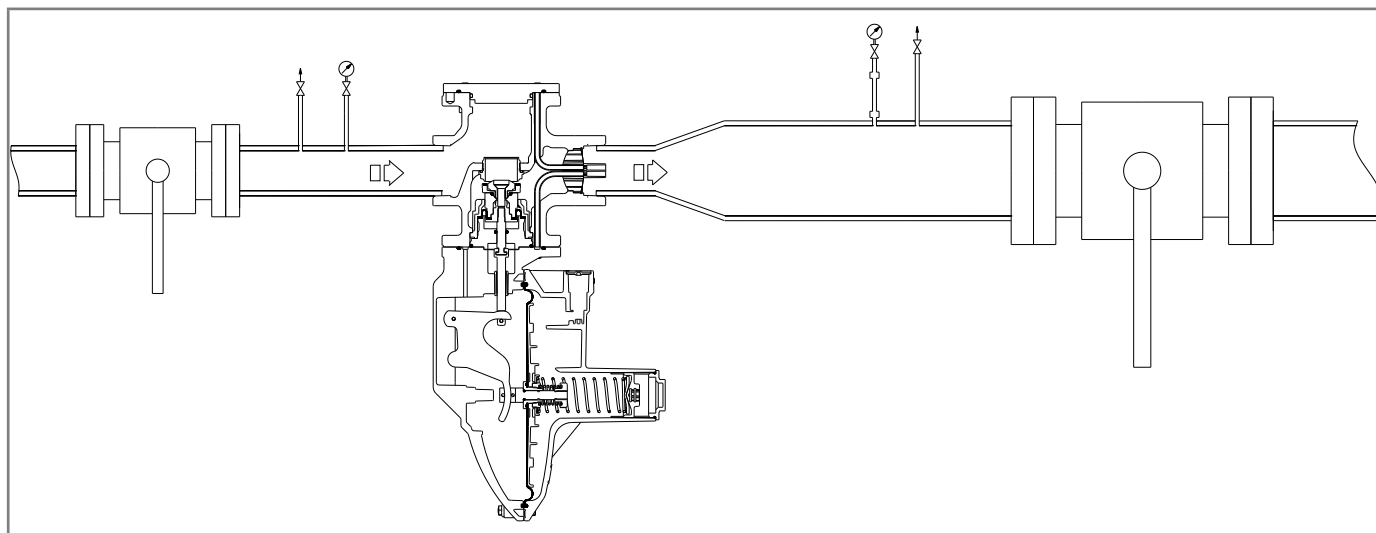


Fig. 6.16. Inverted position

6.5 - INSTALLATION PROCEDURES

6.5.1 - INSTALLATION PROCEDURES OF EQUIPMENT

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

Tab. 6.41.

NOTICE

For installation carried out after maintenance, replace the gaskets.

6.5.2 - CONNECTING THE SENSING LINES TO THE DOWNSTREAM PIPELINE

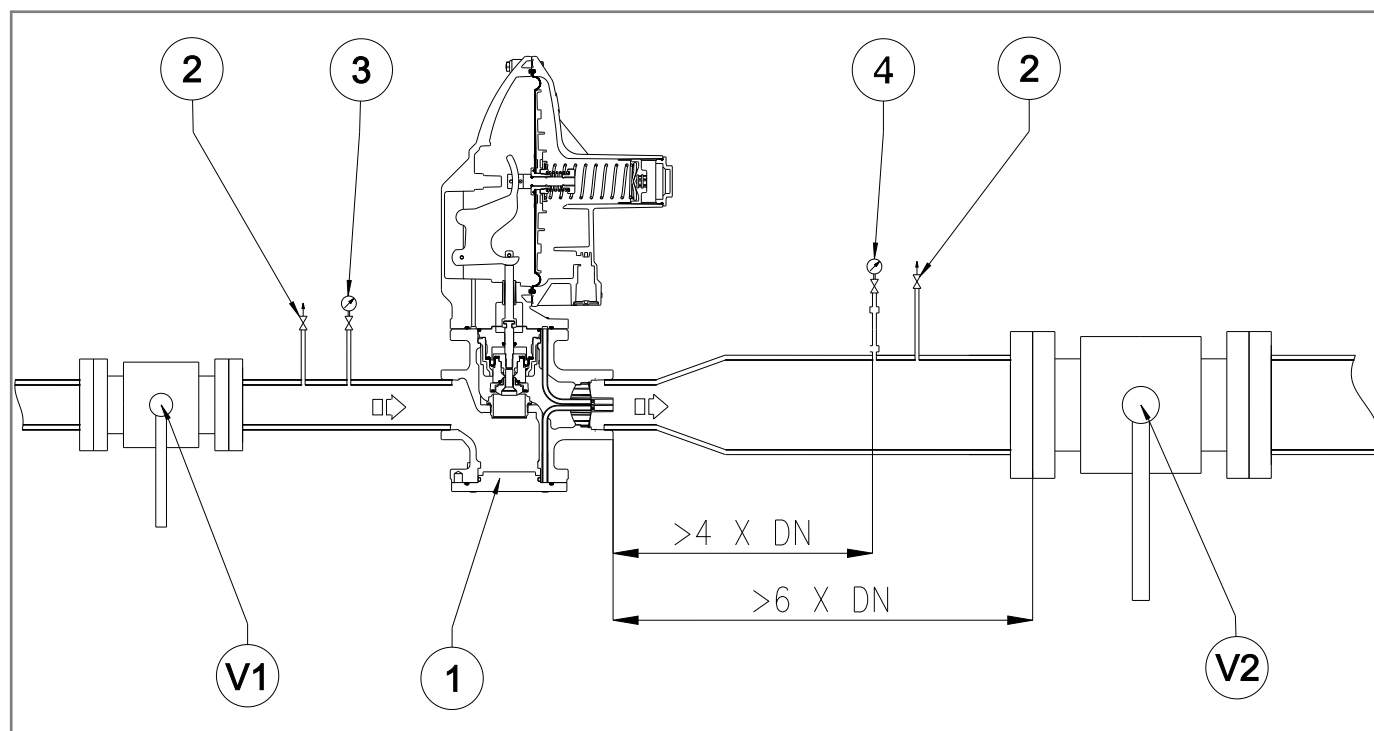


Fig. 6.17. Connecting sensing lines to the downstream pipeline

To obtain a good regulation it is essential that:

- the downstream shut-off valve is placed at least 6 times the nominal diameter of the tube downstream of the regulator;
- if there are external downstream sensing lines, check that they are placed on a straight section of pipe (of uniform diameter) with a length equal to at least 4 times the nominal diameter of the pipe itself;
- the velocity of the fluid under pressure at the setting point does not exceed the following values:

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

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

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 speed in m/sec

Q = gas flow rate in Sm³/h

DN = nominal pipe diameter in mm

Pd = outlet pressure of the regulator in barg

NOTICE

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

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

- the connections of the pneumatic connection are always welded to the top or horizontal axis of the pipe itself (refer to fig. 6.18);
- the hole on the pipe has no burrs or internal protrusions;
- the slope of the pneumatic connection is always 5-10% towards the connection of the downstream pipe.

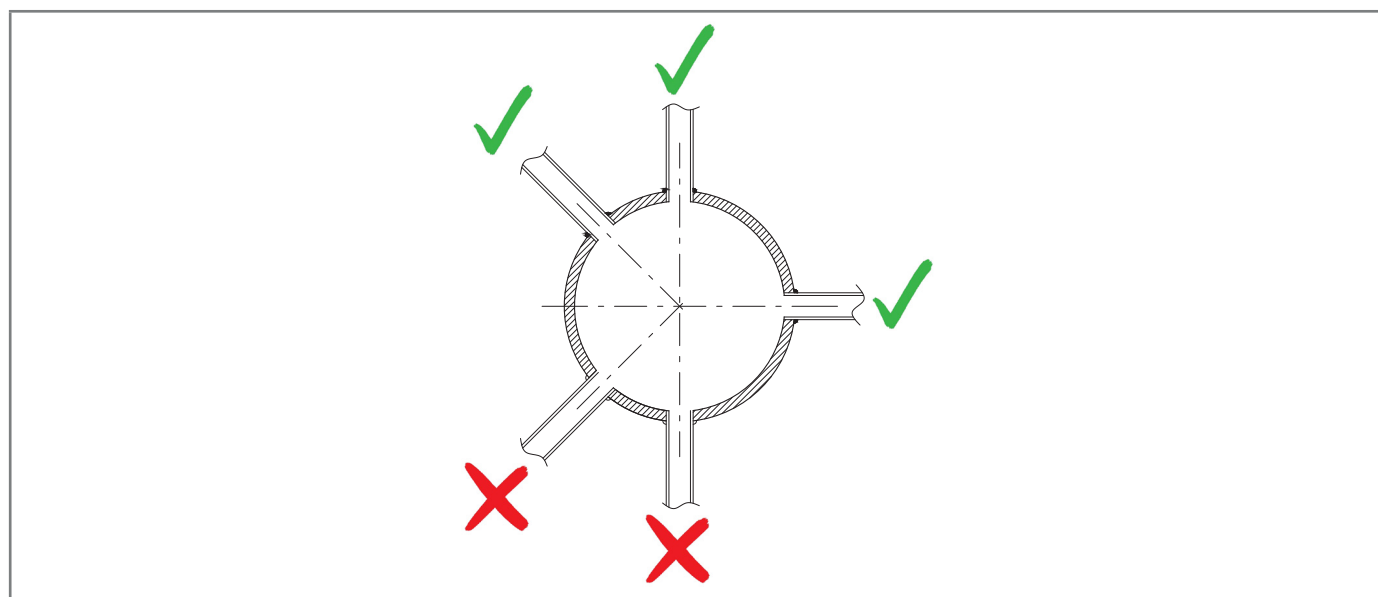


Fig. 6.18. Welded pipe connections

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

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

NOTICE

It is not recommended to interpose shut-off valves on the sensing lines in case a multiple sensing line is present.

In any case, follow the regulations in force at the place of installation and use of the equipment.

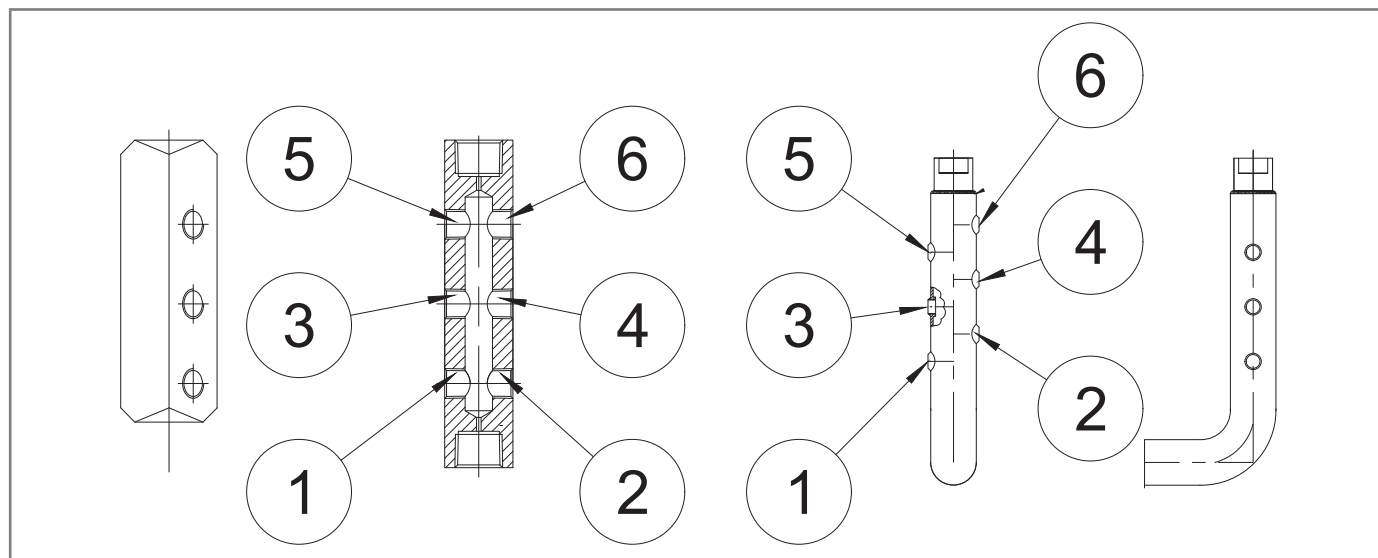


Fig. 6.19. Equipment connections






6.6 - POST-INSTALLATION AND PRE-COMMISSIONING VERIFICATION

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

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







7 - COMMISSIONING/MAINTENANCE EQUIPMENT






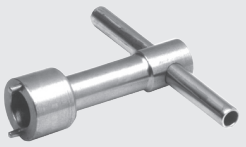


7.1 - EQUIPMENT LIST

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

Tab. 7.42.

Table 7.43 shows the types of equipment needed to commission and service the equipment:

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

Ref.	Type of equipment	Image
G	Hexagonal socket "T" wrench	
H	Phillips screwdriver	
I	Slotted screwdriver	
L	O-ring extraction tool	
M	Ring pliers	
N	Fiorentini special key	
O	Fiorentini special key	
P	Fiorentini special tool	
Q	Special key for IFM, IMD monitor	
R	Torx wrench	

Tab. 7.43.

7.2 - EQUIPMENT NEEDED FOR THE DIFFERENT CONFIGURATIONS

Each table is distinguished by:

Term	Description
Ch.	Key, referring to the equipment shown in tab. 7.43.
Code	Code, referring to equipment.
DN	Nominal diameter of the reference configuration.
L.	Length, referring to equipment.
Ref.	Equipment reference.
Type	Type (size) or code of equipment.

Tab. 7.44.

CIRVAL (+ CIRVAL with monitor function)			
Equipment		Model	
Ref.	Type	CIRVAL 200	CIRVAL 300
D	Ch.	6 - 17 - 20 - 26	6 - 24 - 26 - 10 - 46
E	Ch.	3 - 5	5 - 6

Tab. 7.45.

CIRVAL + IFM			
Equipment		Model	
Ref.	Type	CIRVAL 200	CIRVAL 300
D	Ch.	6 - 17 - 20 - 26	6 - 24 - 26 - 10 - 46
E	Ch.	3 - 5	5 - 6

Tab. 7.46.

CIRVAL + IMD			
Equipment		Model	
Ref.	Type	CIRVAL 200	CIRVAL 300
A	Ch.	10 - 14 - 19	
D	Ch.	6 - 17 - 20 - 26	6 - 24 - 26 - 10 - 46
E	Ch.	3 - 5	5 - 6
I	L.	65 x 100	

Tab. 7.47.

CIRVAL + LA			
Equipment		Model	
Ref.	Type	CIRVAL 200	CIRVAL 300
A	Ch.	7 - 13 - 14	
D	Ch.	6 - 8 - 17 - 20 - 26	6 - 8 - 10 - 24 - 26 - 46
E	Ch.	3 - 5	5 - 6
R	Type	T25 - T20	

Tab. 7.48.

8 - COMMISSIONING

8.1 - GENERAL WARNINGS

8.1.1 - SAFETY REQUIREMENTS FOR COMMISSIONING

⚠ DANGER

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

⚠ DANGER

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

⚠ WARNING

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

NOTICE

Commissioning must be carried out by authorized and licensed personnel.

The equipment is delivered already calibrated.

Even in case the built-in LA slam-shut valve and pressure switches present will be already calibrated on the equipment.






NOTICE

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

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

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

Commissioning

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

Tab. 8.49.

8.2 - PRELIMINARY PROCEDURES FOR COMMISSIONING

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

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

Commissioning can be performed by following two different procedures:

Types of commissioning

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

Tab. 8.50.

8.3 - VERIFICATION OF THE EXTERNAL SEAL

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

8.4 - CALIBRATION OF THE EQUIPMENT AND ACCESSORIES PRESENT

NOTICE

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

8.5 - REGULATOR COMMISSIONING PROCEDURE

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

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

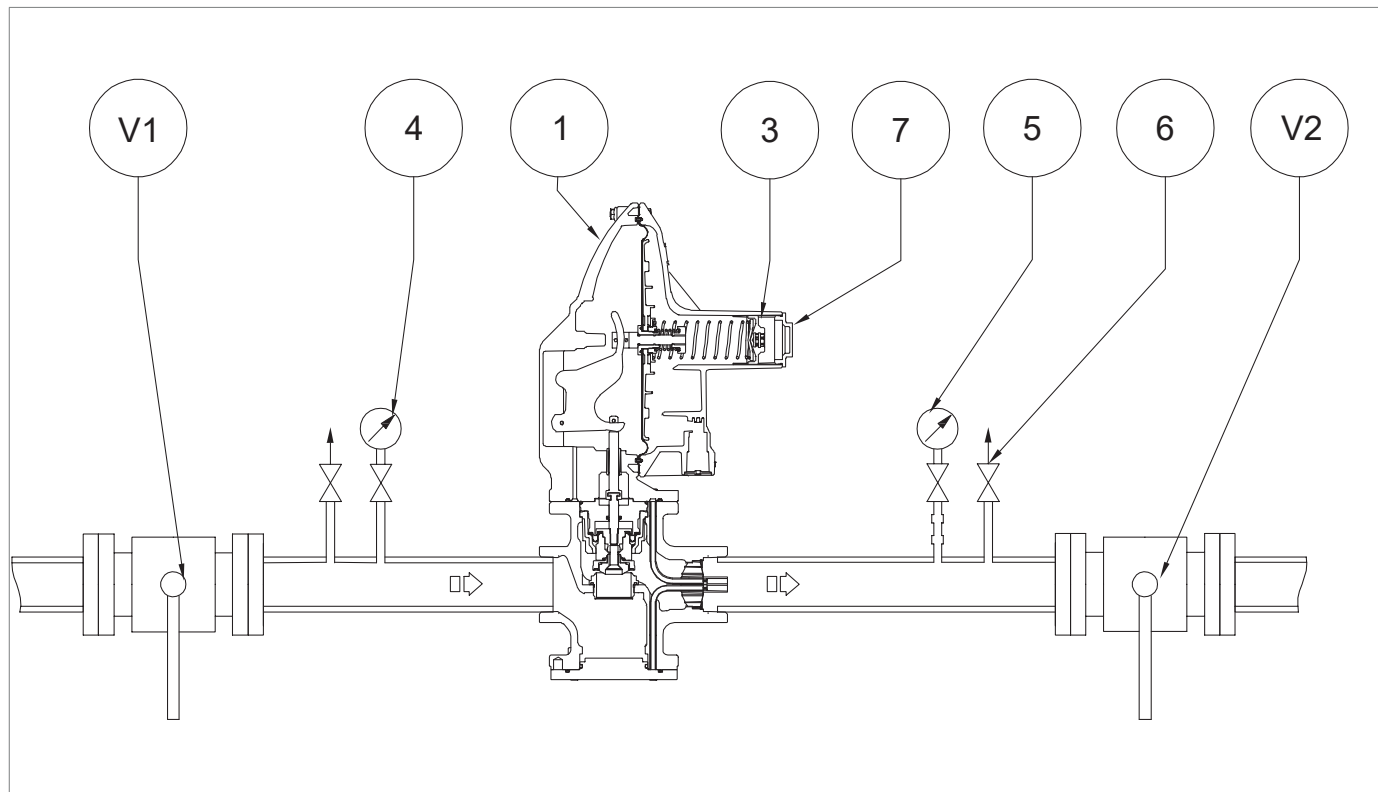


Fig. 8.20. Commissioning of the CIRVAL regulator

Step	Operation
1	Partially open the drain cock (6).
2	<p>Very slowly open the upstream shut-off valve (V1).</p> <p>NOTICE</p> <p>Check the pressure by referring to the pressure gauge (4) located upstream.</p>
3	Check the pressure of the line inlet pipe by referring to the upstream pressure gauge (4).
4	<p>To calibrate the regulator (1) to the required calibration value, turn the calibration ring nut (3):</p> <ul style="list-style-type: none"> • clockwise to increase the pressure value • counterclockwise to decrease the pressure value <p>NOTICE</p> <p>Check the pressure by referring to the pressure gauge (5) located downstream.</p>
5	Place and secure the end cap (7).
6	Close the drain cock (6).
7	<p>Check that the downstream pressure, after an increment phase, does not exceed the closing pressure value (refer to the nameplate SG value, see par. 2.8).</p> <p>NOTICE</p> <p>If the downstream pressure exceeds the shutdown pressure value, refer to Chapter 9 "Trouble-shooting" to remove the causes of malfunctions.</p>
8	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
9	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the downstream pressure gauge (5).

Tab. 8.51.

8.6 - COMMISSIONING PROCEDURE OF THE CIRVAL REGULATOR AND THE REGULATOR IN MONITOR OPERATION

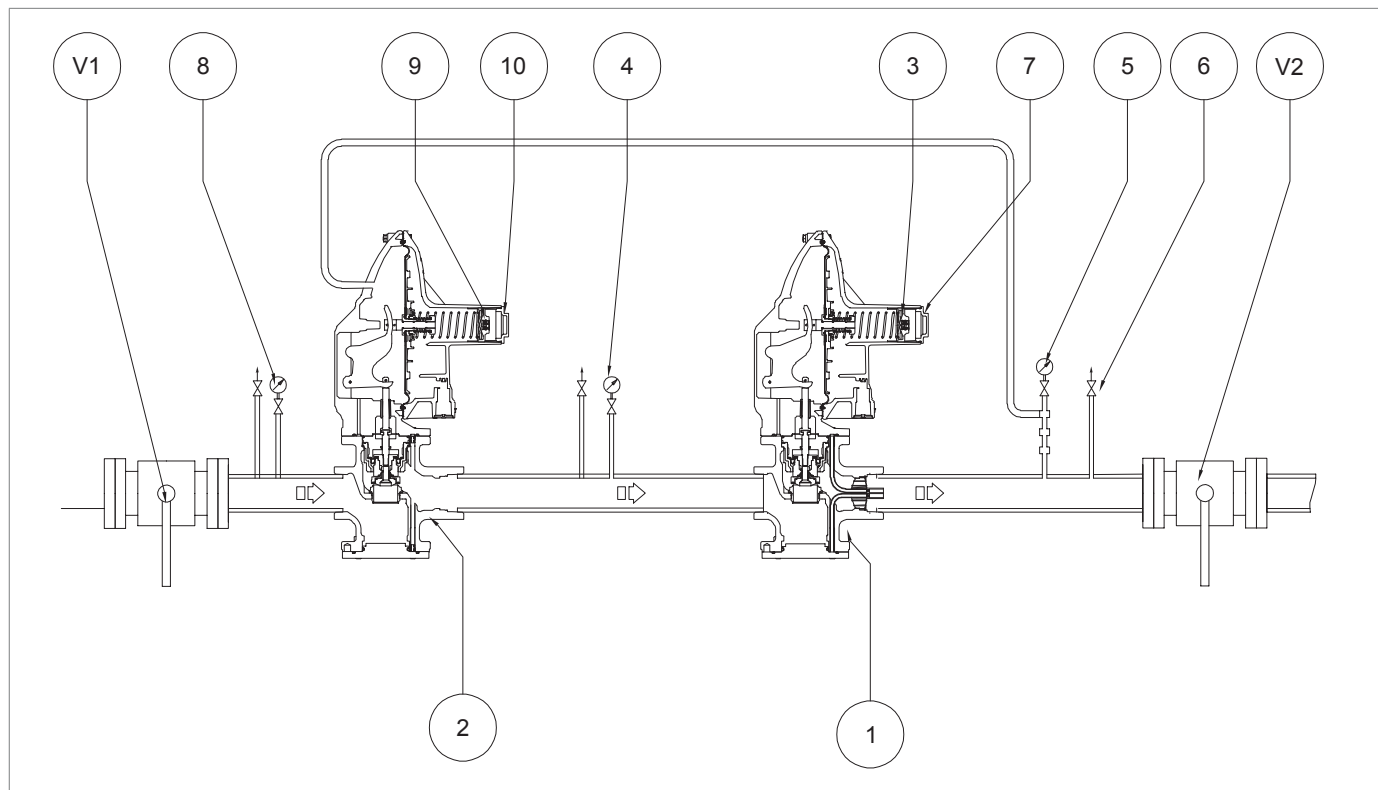


Fig. 8.21. Commissioning of the CIRVAL regulator + regulator in monitor function

Step	Operation
1	Remove the cap (7) from the main regulator (1).
2	Remove the cap (10) from the regulator in inline monitor function (2).
3	Partially open the drain cock (6).
4	Very slowly open the upstream shut-off valve (V1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required setting value by more than 50%.
5	Check the pressure of the line inlet pipe by referring to the upstream pressure gauge (8).
6	Insert and tighten the R key (tab. 7.43) in the slot of the cap (7) to fully open the main regulator (1).
7	To calibrate the regulator with inline monitor function (2) to the required calibration value, turn the calibration ring nut (9): <ul style="list-style-type: none"> clockwise to increase the pressure value counterclockwise to decrease the pressure value <div style="background-color: #0070c0; color: white; padding: 2px; text-align: center;">NOTICE</div> <u>Check the pressure by referring to the pressure gauge (5) located downstream.</u>
8	Close the drain cock (6).
9	Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value (refer to the nameplate SG value, see par. 2.8).
10	Partially open the drain cock (6).
11	Unscrew and remove the R key (tab. 7.43) from the slot of the cap (7).

Step	Operation
12	Check that the calibration pressure of the main regulator (1) is at the set value by referring to the pressure value indicated by the downstream pressure gauge (5).
13	<p>Verify that the regulator with inline monitor function (2) is fully open (100%).</p> <p>NOTICE</p> <p>The main regulator (1) is fully open, when the pressure indicated on the intermediate pressure gauge (4) is the same as the upstream pressure gauge (8).</p>
14	Close the drain cock (6).
15	Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value (refer to the nameplate SG value, see par. 2.8).
16	Insert the plug (7) into the main regulator (1).
17	Insert the plug (10) into the regulator in monitor function (2).
18	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
19	<p>Slowly open downstream shut-off valve (V2) until the pipeline is completely flooded</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the downstream pressure gauge (5).

Tab. 8.52.

8.7 - COMMISSIONING PROCEDURE OF THE REGULATOR + BUILT-IN IFM MONITOR

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

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

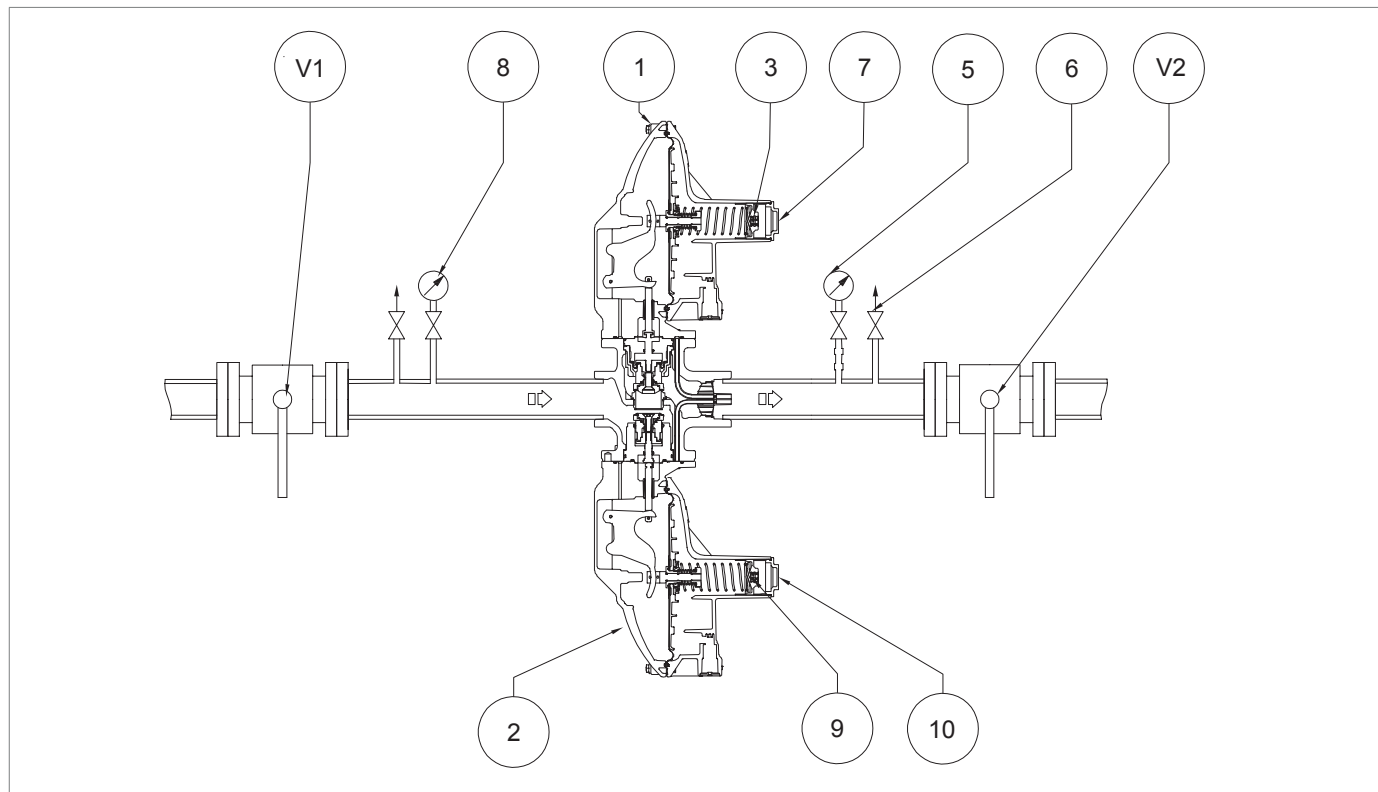


Fig. 8.22. Commissioning of the CIRVAL regulator + built-in IFM monitor

Step	Operation
1	Remove the cap (7) from the main regulator (1).
2	Remove the cap (10) from the built-in IFM monitor (2).
3	Partially open the drain cock (6).
4	Very slowly open the upstream shut-off valve (V1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required setting value by more than 50%.
5	Check the pressure of the line inlet pipe by referring to the upstream pressure gauge (8).
6	Insert and tighten the R key (tab. 7.43) in the slot of the cap (7) to fully open the main regulator (1).
7	<p>To calibrate the built-in IFM monitor (2) to the required calibration value, turn the calibration ring nut (9):</p> <ul style="list-style-type: none"> • clockwise to increase the pressure value • counterclockwise to decrease the pressure value <p>NOTICE</p> <p>Check the pressure by referring to the pressure gauge (5) located downstream.</p>
8	Close the drain cock (6).
9	Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value of the built-in monitor IFM (2) (refer to the nameplate SG value, see par. 2.8).
10	Partially open the drain cock (6).
11	Unscrew and remove the R key (tab. 7.43) from the slot of the cap (7).
12	Check that the calibration pressure of the main regulator (1) is at the preset value by referring to the pressure value indicated by the downstream pressure gauge (5).
13	Close the drain cock (6).
14	Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value of the main regulator (1) (refer to the nameplate SG value, see par. 2.8).
16	Insert the plug (7) into the main regulator (1).
16	Insert the plug (10) into the built-in IFM monitor (2).
17	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
18	<p>Slowly open downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the downstream pressure gauge (5).

Tab. 8.53.

8.8 - COMMISSIONING PROCEDURE OF THE REGULATOR + IMD BUILT-IN MONITOR

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

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

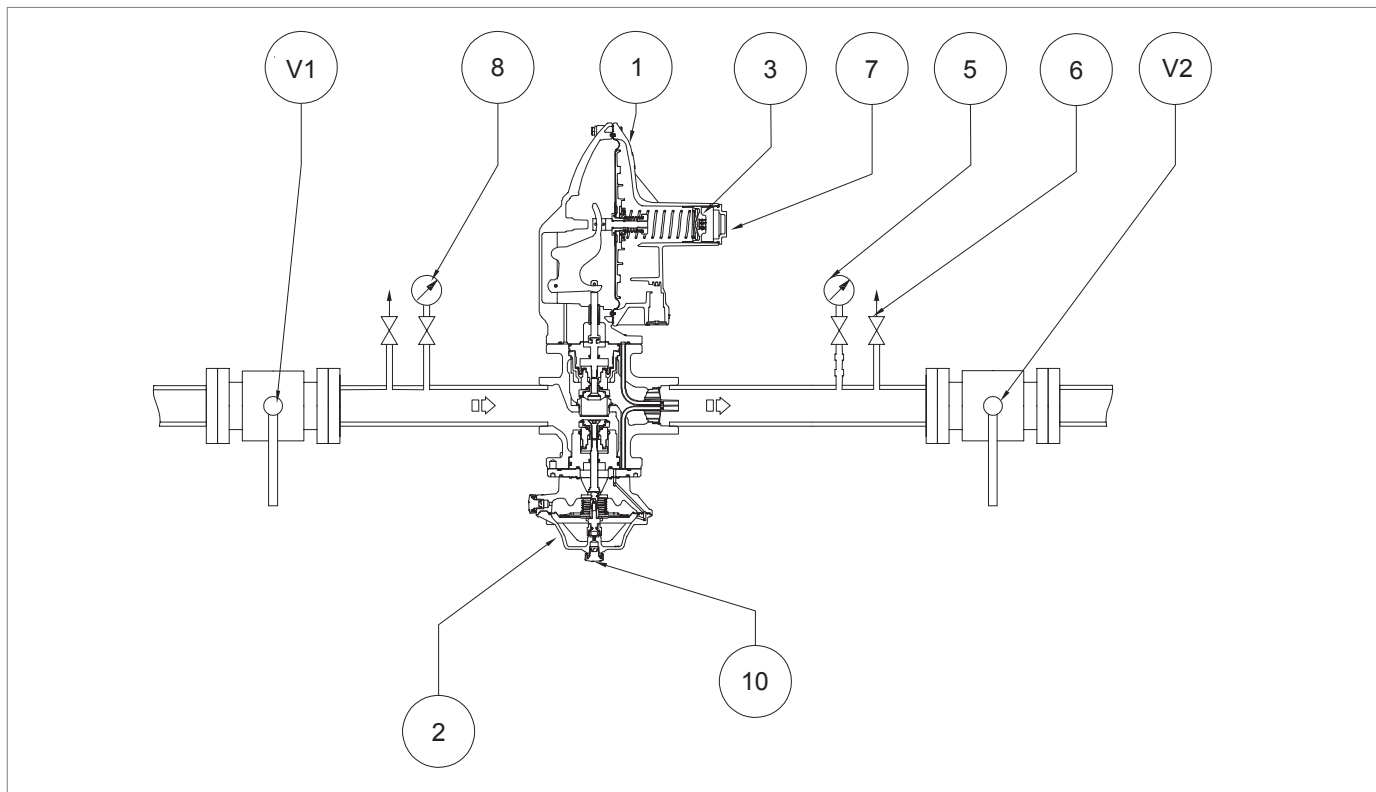


Fig. 8.23. Commissioning of the regulator CIRVAL + IMD built-in monitor

Step	Operation
1	Remove the cap (7) from the main regulator (1).
2	Partially open the drain cock (6).
3	Very slowly open the upstream shut-off valve (V1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required setting value by more than 50%.
4	Check the pressure of the line inlet pipe by referring to the upstream pressure gauge (8).
5	Insert and tighten the R key (tab. 7.43) in the slot of the cap (7) to fully open the main regulator (1).
6	Check the calibration value of the built-in IMD monitor (2) by referring to the downstream pressure gauge (5).
7	<p>Check the controlled escape of gas from the vent (10).</p> <p>NOTICE</p> <p>Check with foaming solution</p>
8	Close the drain cock (6).
9	Verify that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value of the IMD built-in monitor (2) (refer to the nameplate SG value, see par. 2.8).
10	<p>Check the controlled escape of gas from the vent (10).</p> <p>NOTICE</p> <p>Check with foaming solution</p>
11	Partially open the drain cock (6).
12	Unscrew and remove the R key (tab. 7.43) from the slot of the cap (7).
13	<p>Check that the calibration pressure of the main regulator (1) is at the preset value by referring to the pressure value indicated by the downstream pressure gauge (5).</p> <p>NOTICE</p> <p>To calibrate the main regulator (1), act as follows:</p> <ul style="list-style-type: none"> • Turn the ring nut (3) clockwise to increase the calibration value • Turn the ring nut (3) counterclockwise to decrease the calibration value
14	Close the drain cock (6).
15	<p>Check that there is no gas leakage from the vent (10).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • Check with foaming solution • If a gas leak is present, refer to Chapter 9 "Fault finding and troubleshooting" to remove the causes of malfunctions
16	Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value of the main regulator (1) (refer to the nameplate SG value, see par. 2.8).
17	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
18	<p>Slowly open downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the downstream pressure gauge (5).

Tab. 8.54.

8.9 - COMMISSIONING PROCEDURE OF THE CIRVAL REGULATOR + SLAM-SHUT VALVE LA

8.9.1 - CHECK FOR LEAKAGE OF THE LA SLAM-SHUT VALVE

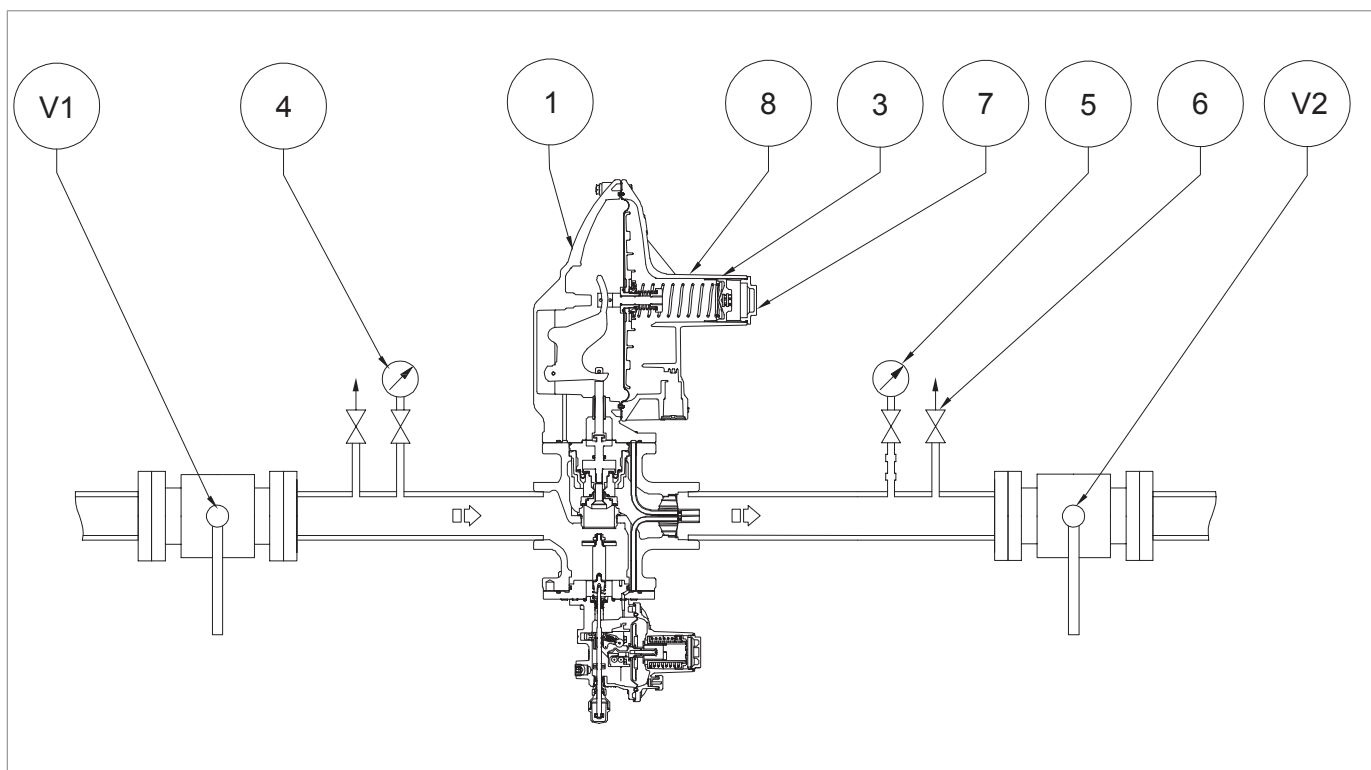


Fig. 8.24.

Commissioning of the CIRVAL regulator with LA slam-shut valve

Step	Operation
1	Check that the slam-shut valve is in the closed position.
2	Open the drain cock (6) to completely drain the downstream section.
3	Slowly open the upstream shut-off valve (V1).
4	<p>Check the internal seal of the slam-shut valve through the drain valve (6).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • Check the seal with a foaming substance; • In case of leakage, refer to Chapter 9 "Fault finding and troubleshooting" to remove the causes of malfunctions.

Tab. 8.55.

8.9.2 - COMMISSIONING OF CIRVAL REGULATOR + LA SLAM-SHUT VALVE

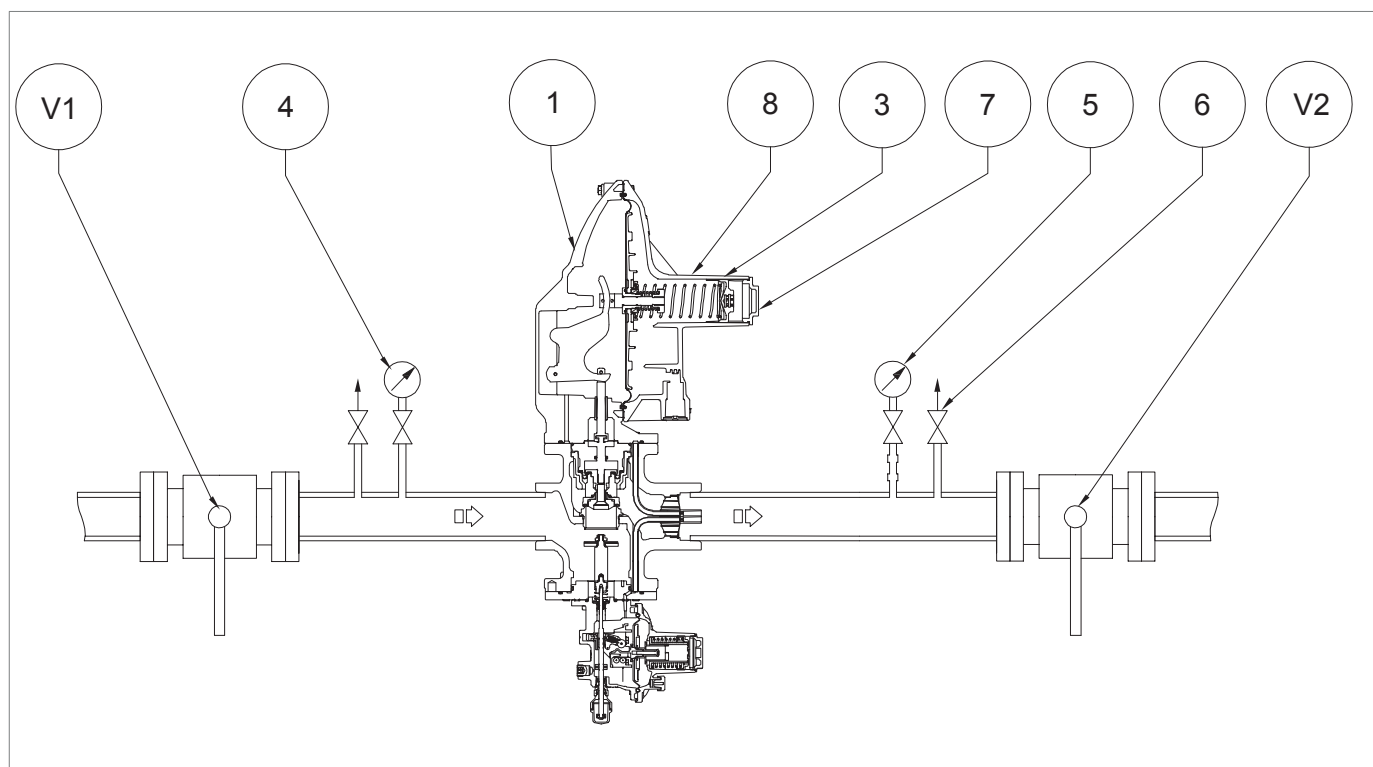


Fig. 8.25. Commissioning of the CIRVAL regulator with LA slam-shut valve

Step	Operation
1	Check that the drain cock (6) is partially open.
2	Check that the LA slam-shut valve is in the closed position.
3	Partially open the upstream shut-off valve (V1), checking the pressure value indicated by the upstream pressure gauge (4).
4	Perform the internal leakage test of the LA slam-shut valve, referring to Chapter 8.9.1. NOTICE In case of leakage, refer to Chapter 9 "Fault finding and troubleshooting" to remove the causes of malfunctions.
5	Slowly pressurize the control line by turning the knob on the LA slam-shut valve (refer to the "Operation" section of par. 4.5.5.1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required calibration value by more than 50%.
6	At the time the regulator goes into service, the pressure of the downstream pressure gauge (5) will be equal to the setting value of the main regulator. NOTICE In the first pressurization phase of the line, the pressure of the downstream pressure gauge (5) may exceed the required calibration value, depending on the response time of the regulator.
7	Fully open the upstream shut-off valve (V1).
8	Check the pressure switch settings of the LA slam-shut valve by referring to Section 8.9.3.

Step	Operation
9	<p>If the downstream pressure (Pd) is not at the required calibration value, act as below:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the adjustment ring nut (3) clockwise • value of downstream pressure (Pd) higher than the required calibration value: discharge the calibration spring by turning the adjustment ring nut (3) counterclockwise
10	Check the downstream pressure (Pd) by referring to the downstream pressure gauge (5).
11	Close the drain cock (6).
12	<p>Check that the downstream pressure (Pd), after an increment phase, does not exceed the closing pressure value (SG 20).</p> <p>NOTICE</p> <p>If the pressure in the section of pipeline between the regulator and the downstream shut-off valve (V2) exceeds the shut-off pressure value, refer to Chapter 9 "Fault finding and troubleshooting" to remove the causes of malfunctions.</p>
13	Check all connections between shut-off valves (V1, V2) for tightness with a foaming substance.
14	In case external leakage is found, eliminate the leakage points and repeat the procedure from step 7.
15	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the pressure of the downstream pipeline is lower than the calibration pressure, partialize the opening of the downstream shut-off valve (V2) so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the downstream pressure gauge (5).

Tab. 8.56.

8.9.3 - CALIBRATION PROCEDURE FOR LA SLAM-SHUT VALVE (LA-BP, LA-MP, LA-TR)

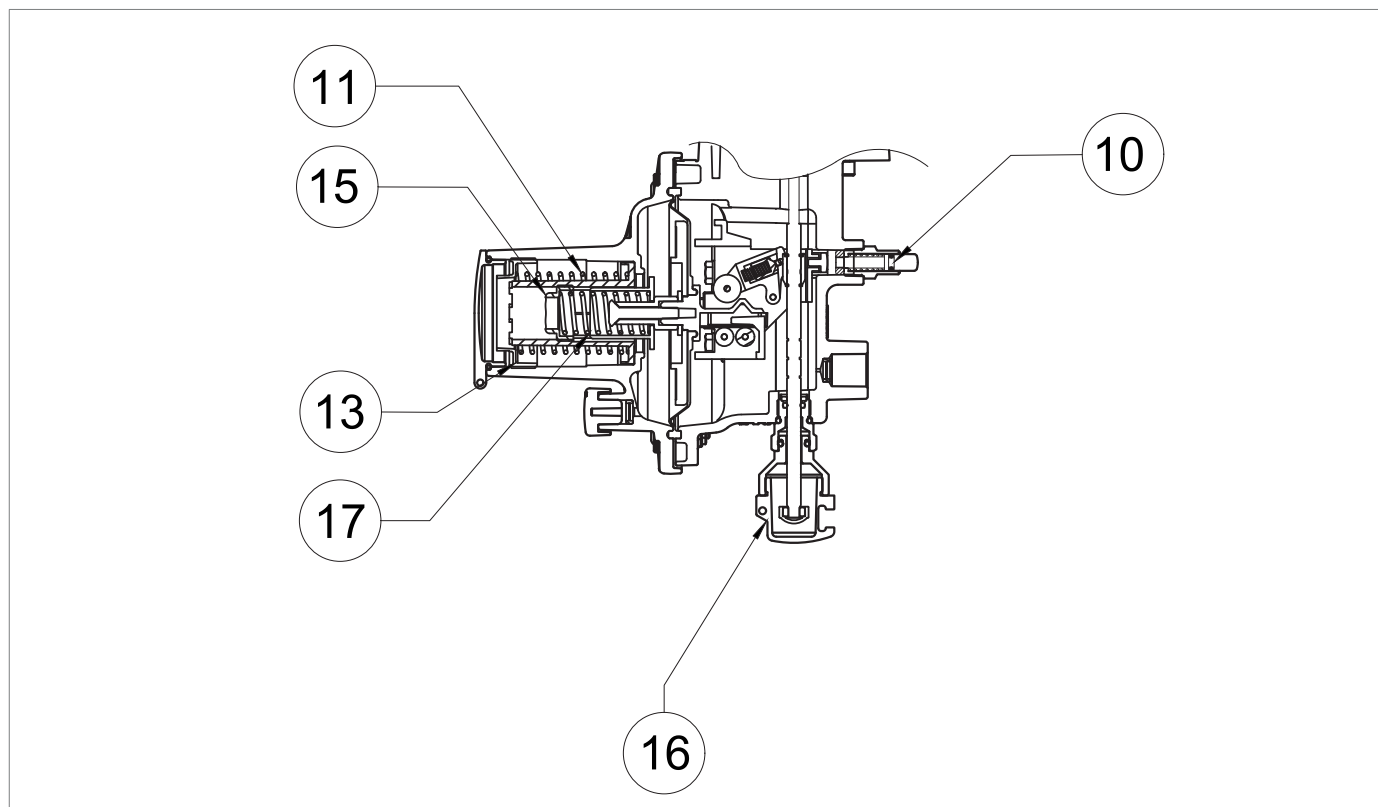


Fig. 8.26. LA Slam-shut valve calibration

CALIBRATION OF SPRING TO TRIP FOR MAXIMUM PRESSURE

Step	Operation
1	<p>Increase the downstream pressure to the slam-shut valve's tripping value by connecting an external pressure source to the drain valve (fig. 8.20, ref. 6) placed on the downstream pipeline.</p> <p>NOTICE</p> <p>Check the pressure by referring to the pressure gauge (fig. 8.20, ref. 5) placed downstream of the main regulator.</p> <p>If the slam-shut valve:</p> <ul style="list-style-type: none"> trips before the expected pressure value: tighten (clockwise) the adjusting screw (13) so as to compress the spring (11) more; does not trip at the expected pressure value: unscrew (counterclockwise) the adjusting screw (13), so as to relieve the spring (11).
2	Decrease the pressure of the downstream section by opening the drain cock (fig. 8.20, ref. 6) to bring it up to the calibration value of the main regulator.
3	Close the drain cock (fig. 8.20, ref. 6).
4	Arming the slam-shut valve by acting on the reset knob (16).
5	<p>Repeat steps 2-3-4 at least three times.</p> <p>NOTICE</p> <p>The calibration value must comply with the operating limits indicated on the nameplate.</p>
6	Disconnect the external pressure source from the drain cock (fig. 8.20, ref. 6).

Tab. 8.57.

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

Step	Operation
1	Partially open the drain cock (fig. 8.20, ref. 6) in the atmosphere and keep it open for the next steps.
2	Turn the adjustment ring nut counterclockwise (fig. 8.20, ref. 3) of the regulator to decrease the downstream pressure (Pd) to the minimum pressure required for the slam-shut valve to trip.
3	<p>In case the required minimum pressure value is not reached by intervention of the minimum block, remove the adjustment ring nut (fig. 8.20, ref. 3) and remove the adjustment spring (fig. 8.24, ref. 8).</p> <p>NOTICE</p> <p>Check the value of the slam-shut valve tripping pressure indicated by the downstream pressure gauge (fig. 8.20, ref. 5).</p>
4	<p>If the slam-shut valve:</p> <ul style="list-style-type: none"> trips before the expected pressure value: unscrew (counterclockwise direction) the adjustment ring nut (fig. 8.20, ref. 3) so as to unload the spring (fig. 8.26, ref. 17); does not trip at the expected pressure value: screw (clockwise) the adjustment ring nut (fig. 8.20, ref. 3), so as to compress the spring more (fig. 8.26, ref. 17).
5	<p>After verifying that the slam-shut valve trips at the preset value, act as follows:</p> <ol style="list-style-type: none"> Close the air vent valve (fig. 8.20, ref. 6) Position the adjustment spring (fig. 8.24, ref. 8), the end cap (fig. 8.24, ref. 7), adjusting screw (fig. 8.20, ref. 3) Slowly open the upstream shut-off valve (V1) until the downstream pressure value (Pd) reaches the regulator's set value, referring to the downstream pressure gauge (fig. 8.20, ref. 5) Close the upstream shut-off valve (V1) Slowly and partially open the air vent valve (fig. 8.20, ref. 6) to decrease the downstream pressure by referring to the downstream pressure gauge (fig. 8.20, ref. 5) until the minimum pressure trip value is reached Verify the correct calibration of the minimum spring by repeating steps 3-4-5 at least three times Perform calibration of the main regulator referring to par. 8.5
6	Open the slam-shut valve by acting on the reset knob (fig. 8.26, ref. 16) and keep it open manually.
7	Turn the adjustment screw clockwise (fig. 8.20, ref. 3) to increase the downstream pressure to the set value of the regulator.
8	Arming the slam-shut valve by acting on the reset knob (fig. 8.26, ref. 16).
9	Close the drain cock (fig. 8.20, ref. 6).

Tab. 8.58.

COMMISSIONING OF THE REGULATOR

NOTICE

Refer to Section 8.5 "Regulator Commissioning Procedure" in this chapter.

SLAM-SHUT VALVE CALIBRATION RANGE

NOTICE

Refer to Chapter 13 "Calibration tables".

8.10 - REGULATION LINE COMMISSIONING PROCEDURE CIRVAL, REGULATOR WITH IN-LINE MONITOR FUNCTION + SLAM-SHUT VALVE THE

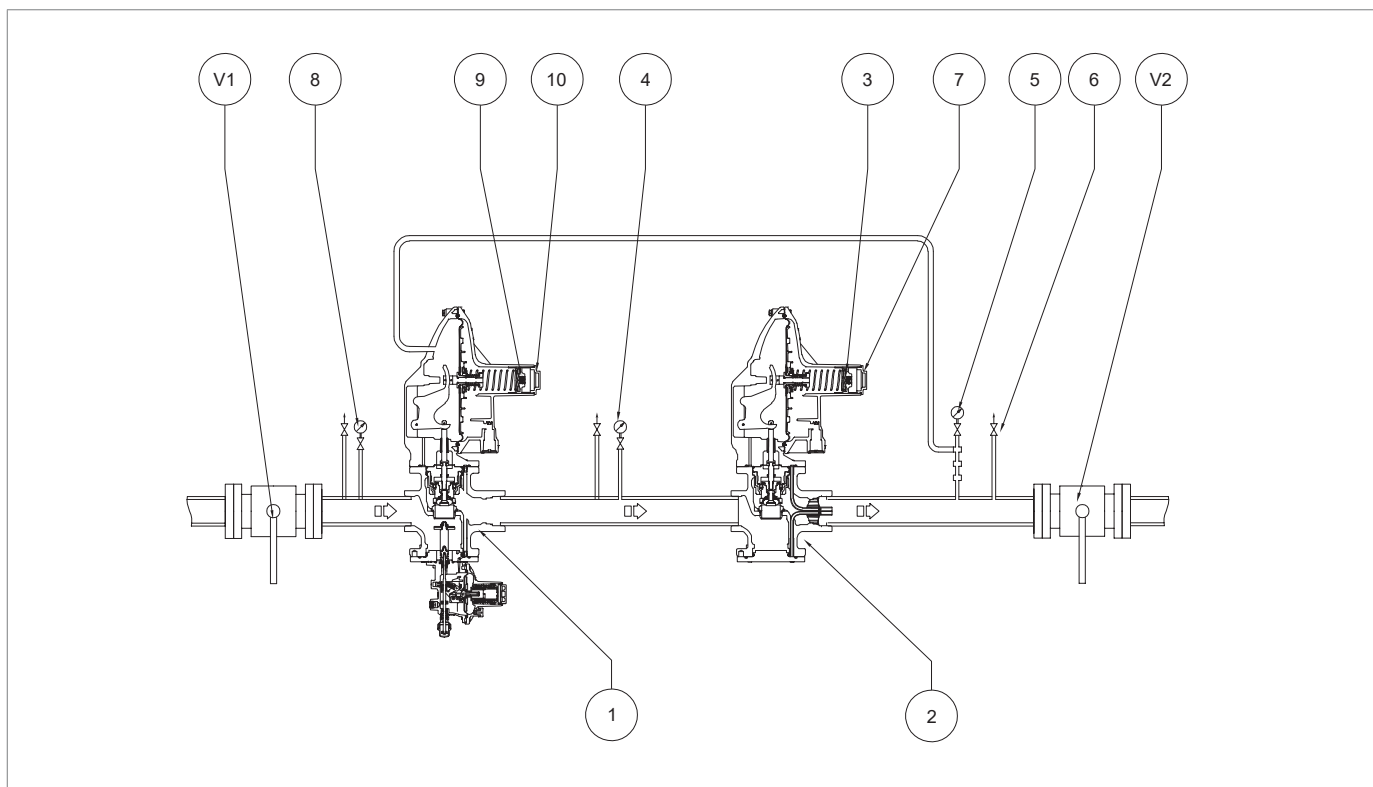


Fig. 8.27. Commissioning of CIRVAL regulator + regulator with online monitor function + LA

Step	Operation
1	Partially open the drain cock (6).
2	Remove the cap (7) from the main regulator (2).
3	Remove the cap (10) from the regulator with in-line monitor function (1).
4	Insert and tighten the R key (tab. 7.43) in the slot of the cap (7) to fully open the main regulator (1).
5	Very slowly and partially open the inlet shut-off valve (V1). NOTICE Check the pressure by referring to the pressure gauge (8) located upstream.
6	Perform the internal leakage test of the LA slam-shut valve, referring to Chapter 8.9.1. NOTICE In case of leakage, refer to Chapter 9 "Fault finding and troubleshooting" to remove the causes of malfunctions.
7	Slowly pressurize the control line, acting on the knob of the LA slam-shut valve (refer to the "Operation" section of par. 4.5.5.1), checking that the downstream pressure (Pd) indicated by the downstream pressure gauge (5) does not exceed the required calibration value by more than 50%.
8	At the time the regulator enters into service, the pressure of the downstream pressure gauge (5) will be equal to the calibration value of the main regulator
9	Fully open the upstream shut-off valve (V1).
10	Check the setting of the LA slam-shut valve pressure switch by referring to Section 8.9.3.

Step	Operation
11	<p>Pull the slam-shut valve reset stem outward until the LA slam-shut valve is engaged.</p> <p>NOTICE</p> <p>Check the calibration pressure of the regulator with in-line monitor function in the pressure gauge (5) after inserting the plug (10) into the regulator with in-line monitor function (1).</p>
12	<p>If the downstream pressure (Pd) is not at the required calibration value, act as below:</p> <ul style="list-style-type: none"> • value of downstream pressure (Pd) less than the required calibration value: load the calibration spring by turning the adjustment ring nut (9) clockwise • value of downstream pressure (Pd) higher than the required calibration value: discharge the calibration spring by turning the adjustment ring nut (9) counterclockwise <p>NOTICE</p> <p>Check the pressure by referring to the pressure gauge (5) located downstream.</p>
13	Close the drain cock (6).
14	Check the closing pressure (refer to the nameplate SG value, see par. 2.8).
15	Partially open the drain cock (6).
16	Unscrew and remove the R key (tab. 7.43) from the cap slot (7)
17	<p>Verify that the regulator with inline monitor function (1) is fully open (100%).</p> <p>NOTICE</p> <p>The regulator with in-line monitor function (1) is fully open, when the pressure indicated on the intermediate pressure gauge (4) is the same as the upstream pressure gauge (8).</p>
18	Close the drain cock (6).
19	<p>Verify that the downstream pressure, after an increase phase, does not exceed the closing pressure value (SG 20).</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If the downstream pressure exceeds the shutdown pressure value, refer to Chapter 9 "Troubleshooting" to remove the causes of malfunctions. • Check the pressure by referring to the pressure gauge (5) located downstream.
20	Check with a foaming substance the tightness of all joints located between the shut-off valves (V1, V2).
21	<p>Very slowly open the downstream shut-off valve (V2) until the pipeline is completely flooded.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • If at the beginning of this operation the pressure in the pipeline is much lower than the set pressure, it will be advisable to partialize the opening of this valve so as not to exceed the value of the maximum flow rate of the system. • Check the pressure by referring to the pressure gauge (5) located downstream.

Tab. 8.59.

SLAM-SHUT VALVE CALIBRATION

NOTICE

Refer to section 8.9.3 "Pressure switch calibration procedure for LA slam-shut valve".

9 - FAULT FINDING AND TROUBLESHOOTING

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

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

9.1 - GENERAL WARNINGS

DANGER

Maintenance operations shall be carried out by qualified personnel:

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

WARNING






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

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

NOTICE

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

9.2 - SPECIFIC QUALIFICATION OF THE OPERATOR

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

Tab. 9.60.

9.3 - TROUBLESHOOTING PROCEDURES

The following steps should be taken for proper troubleshooting:

- Close the upstream and downstream shut-off valves;
- Refer to the troubleshooting tables listed below.

9.4 - TROUBLESHOOTING TABLES

9.4.1 - CIRVAL REGULATOR TROUBLESHOOTING

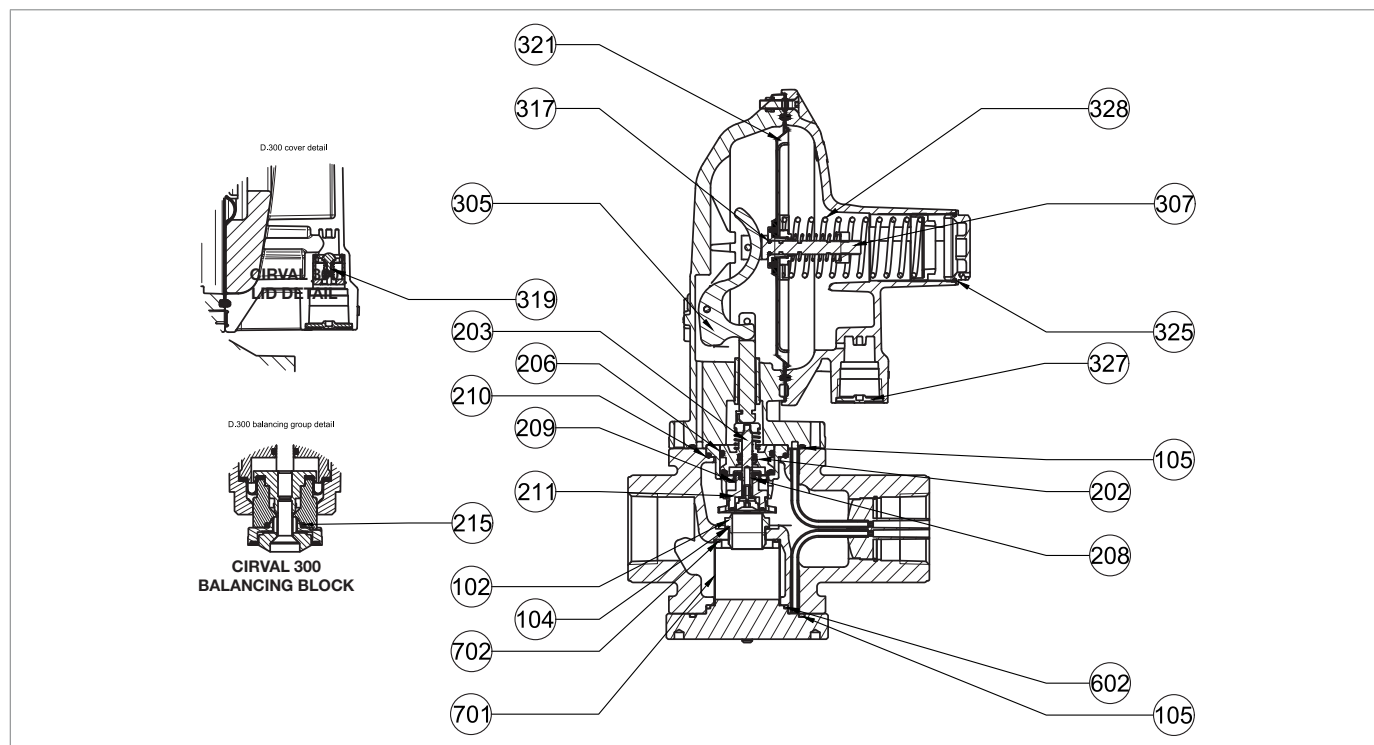


Fig. 9.29. Troubleshooting CIRVAL

Fault	Possible causes	Intervention
Leakage from the regulator vent in dispensing	Main diaphragm (321) broken	Replace
	Relief valve (307) not calibrated	Repeat calibration
	O-ring (317) of the relief valve dirty or worn out	Clean and if necessary replace
Leakage from the regulator vent in static	Main diaphragm (321) broken	Replace
	Relief valve (307) not calibrated	Repeat calibration
	O-ring (317) of the relief valve dirty or worn out	Clean and if necessary replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	VALID ONLY FOR CIRVAL 300	
	O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Balancing diaphragm (209) damaged	Replace
Downstream pressure (Pd) increases in dynamic	Main diaphragm (321) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Balancing diaphragm (209) damaged	Replace

Fault	Possible causes	Intervention
Downstream pressure (Pd) increases in static	Relief valve (307) not calibrated	Repeat calibration
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	VALID ONLY FOR CIRVAL 300 O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Balancing diaphragm (209) damaged	Replace
Downstream pressure (Pd) decreases in dynamic	Spring (328) snared	Replace
	Insufficient upstream pressure (Pu)	Check the values of the upstream pressure (Pu)
	Stem (203) blocked	Clean
	Filter (701) clogged	Clean
	Lever (305) stuck	Clean
	Ice formation on the diaphragm (321)	Increase the input temperature of the regulator
Downstream pressure (Pd) decreases in static	Main diaphragm (321) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Stem (203) blocked	Clean
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Lever (305) stuck	Clean
	VALID ONLY FOR CIRVAL 300 Anti-pumping valve (319) clogged	Clean
	Obstructed anti-freezing device	Clean

Tab. 9.61.

9.4.2 - TROUBLESHOOTING OF REGULATOR CIRVAL WITH MONITOR FUNCTION

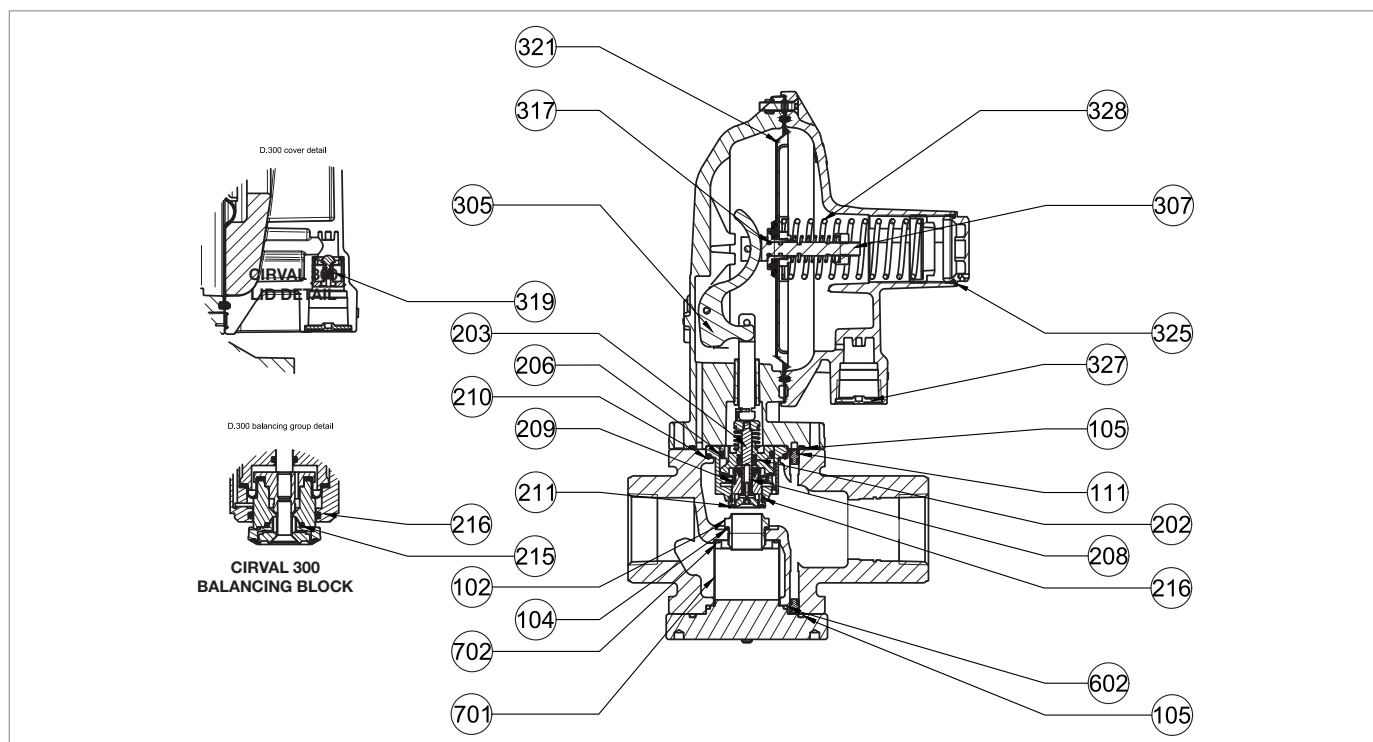


Fig. 9.30. Troubleshooting CIRVAL in monitor function

Fault	Possible causes	Intervention
Leakage from the regulator vent in dispensing	Main diaphragm (321) broken	Replace
	Relief valve (307) not calibrated	Repeat calibration
	O-ring (317) of the relief valve dirty or worn out	Clean and if necessary replace
Leakage from the regulator vent in static	Main diaphragm (321) broken	Replace
	Relief valve (307) not calibrated	Repeat calibration
	O-ring (317) of the relief valve dirty or worn out	Clean and if necessary replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	VALID ONLY FOR CIRVAL 300	
	O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
Downstream pressure (Pd) increases in dynamic	Balancing diaphragm (209) damaged	Replace
	Main diaphragm (321) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Balancing diaphragm (209) damaged	Replace

Fault	Possible causes	Intervention
Downstream pressure (Pd) increases in static	Relief valve (307) not calibrated	Repeat calibration
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	VALID ONLY FOR CIRVAL 300 O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Balancing diaphragm (209) damaged	Replace
Downstream pressure (Pd) decreases in dynamic	Spring (328) snared	Replace
	Insufficient upstream pressure (Pu)	Check the values of the upstream pressure (Pu)
	Stem (203) blocked	Clean
	Filter (701) clogged	Clean
	Lever (305) stuck	Clean
	Ice formation on the diaphragm (321)	Increase the input temperature of the regulator
Downstream pressure (Pd) decreases in static	Main diaphragm (321) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Stem (203) blocked	Clean
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Lever (305) stuck	Clean
	VALID ONLY FOR CIRVAL 300 Anti-pumping valve (319) clogged	Clean
	Obstructed anti-freezing device	Clean
Monitor blocked in fully open position	Lack of O-ring sealing (111)	Clean and if necessary replace
	Lack of O-ring sealing (216)	Clean and if necessary replace

Tab. 9.62.

9.4.3 - INCORPORATED IFM MONITOR TROUBLESHOOTING

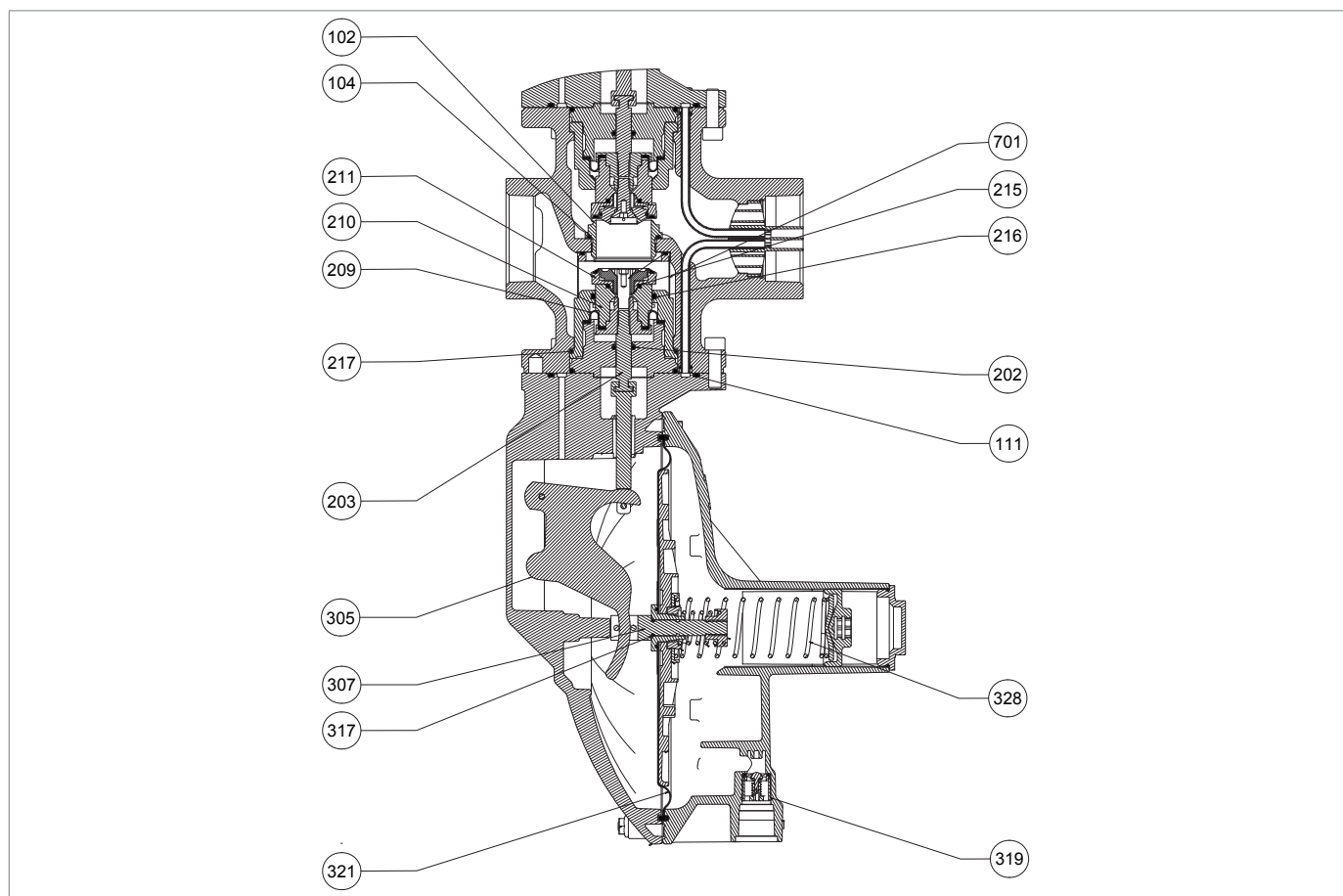


Fig. 9.31. Incorporated IFM monitor troubleshooting

Fault	Possible causes	Intervention
Leakage from the regulator vent in dispensing	Main diaphragm (321) broken	Replace
	Relief valve (307) not calibrated	Repeat calibration
	O-ring (317) of the relief valve dirty or worn out	Clean and if necessary replace
	VALID ONLY FOR CIRVAL 300 Dirty or worn O-ring (216, 217)	Clean and if necessary replace
	VALID ONLY FOR CIRVAL 200 Dirty or worn O-ring (210, 216)	Clean and if necessary replace

Fault	Possible causes	Intervention
Leakage from the regulator vent in static	Main diaphragm (321) broken	Replace
	Relief valve (307) not calibrated	Repeat calibration
	O-ring (317) of the relief valve dirty or worn out	Clean and if necessary replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	VALID ONLY FOR CIRVAL 300 O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Balancing diaphragm (209) damaged	Replace
Downstream pressure (Pd) increases in dynamic	Main diaphragm (321) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Balancing diaphragm (209) damaged	Replace
	VALID ONLY FOR CIRVAL 300 Dirty or worn O-ring (216, 217)	Clean and if necessary replace
	VALID ONLY FOR CIRVAL 200 Dirty or worn O-ring (210, 216)	Clean and if necessary replace
Downstream pressure (Pd) increases in static	Relief valve (307) not calibrated	Repeat calibration
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	VALID ONLY FOR CIRVAL 300 O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Balancing diaphragm (209) damaged	Replace
	VALID ONLY FOR CIRVAL 300 Dirty or worn O-ring (216, 217)	Clean and if necessary replace
	VALID ONLY FOR CIRVAL 200 Dirty or worn O-ring (210, 216)	Clean and if necessary replace
Downstream pressure (Pd) decreases in dynamic	Spring (328) snared	Replace
	Insufficient upstream pressure (Pu)	Check the values of the upstream pressure (Pu)
	Stem (203) blocked	Clean
	Filter (701) clogged	Clean
	Lever (305) stuck	Clean
	Ice formation on the diaphragm (321)	Increase the input temperature of the regulator

Fault	Possible causes	Intervention
Downstream pressure (Pd) decreases in static	Main diaphragm (321) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Stem (203) blocked	Clean
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Lever (305) stuck	Clean
	VALID ONLY FOR CIRVAL 300	Clean
	Anti-pumping valve (319) clogged	Clean
Monitor blocked in fully open position	Obstructed anti-freezing device	Clean
	Lack of O-ring sealing (111)	Clean and if necessary replace
	Lack of O-ring sealing (216)	Clean and if necessary replace

Tab. 9.63.

9.4.4 - INCORPORATED IMD MONITOR TROUBLESHOOTING

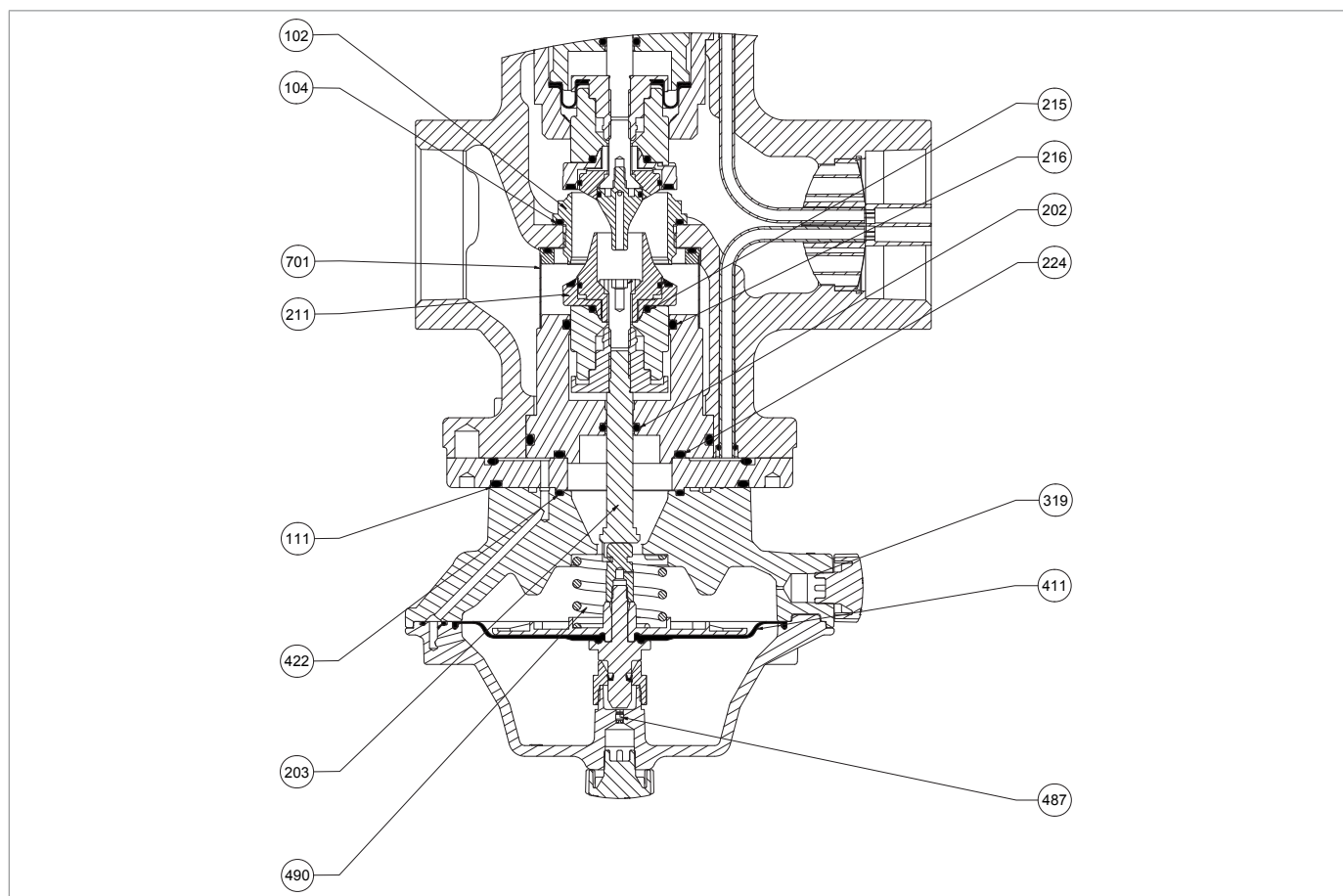


Fig. 9.32. Incorporated IMD monitor troubleshooting

Fault	Possible causes	Intervention
Leakage from the IMD built-in monitor vent in dispensing	Diaphragm (411) broken	Replace
	O-ring (202) of the balance block dirty or worn out	Clean and if necessary replace
	O-ring (224) of the balance block dirty or worn out	Clean and if necessary replace
	Dirty or worn flange O-ring (422)	Clean and if necessary replace
Leakage from the IMD built-in monitor vent in static	Diaphragm (411) broken	Replace
	O-ring (202) of the balance block dirty or worn out	Clean and if necessary replace
	O-ring (224) of the balance block dirty or worn out	Clean and if necessary replace
	Dirty or worn flange O-ring (422)	Clean and if necessary replace
Downstream pressure (Pd) increases in dynamic	Diaphragm (411) broken	Replace
	O-ring (202) of the balance block dirty or worn out	Clean and if necessary replace
	O-ring (224) of the balance block dirty or worn out	Clean and if necessary replace
	Dirty or worn flange O-ring (422)	Clean and if necessary replace

Fault	Possible causes	Intervention
Downstream pressure (Pd) increases in static	Diaphragm (411) broken	Replace
	O-ring (202) of the balance block dirty or worn out	Clean and if necessary replace
	O-ring (224) of the balance block dirty or worn out	Clean and if necessary replace
	Dirty or worn flange O-ring (422)	Clean and if necessary replace
	Nozzle (487) clogged	Clean and if necessary replace
Downstream pressure (Pd) decreases in dynamic	Spring (490) snared	Replace
	Insufficient upstream pressure (Pu)	Check the values of the upstream pressure (Pu)
	Stem (203) of the block locked	Clean and if necessary replace
	Filter (701) clogged	Clean and if necessary replace
	Ice formation on the diaphragm (411)	Increase the input temperature of the regulator
Downstream pressure (Pd) decreases in static	Main diaphragm (411) broken	Replace
	Reinforced gasket (211) dirty or worn out	Clean and if necessary replace
	Stem (203) blocked	Clean
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
	O-ring (215) of reinforced gasket damaged	Replace
	O-ring (202) of the stem damaged	Replace
	Obstructed anti-freezing device	Clean
Monitor blocked in fully open position	Lack of O-ring sealing (111)	Clean and if necessary replace
	Lack of O-ring sealing (216)	Clean and if necessary replace

Tab. 9.64.

9.4.5 - LA SLAM-SHUT VALVE TROUBLESHOOTING

⚠ WARNING

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

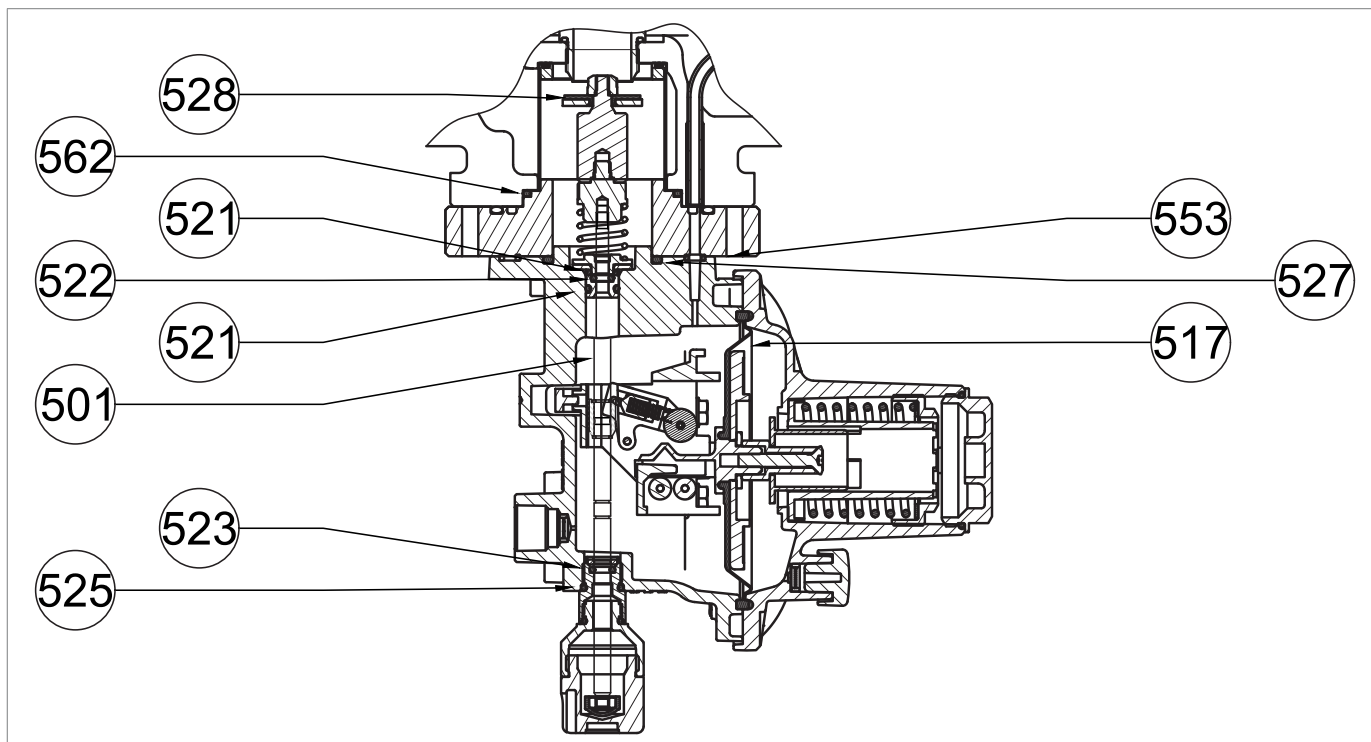


Fig. 9.33. LA slam-shut valve troubleshooting

Fault	Possible causes	Intervention
Failure of the slam-shut valve to trip	Stem (501) locked in opening	Clean and if necessary reposition
External leakage	Diaphragm (517) broken	Replace
Downstream pressure (Pd) increases in valve open position	Lack of O-ring seal (521)	Replace
	Lack of O-ring seal (523)	Replace
	Stem (501) damaged	Replace
Downstream pressure (Pd) increases in the closed position of the valve	Lack of O-ring seal (521)	Replace
	Stem (501) damaged	Replace
	Reinforced gasket (528) damaged	Replace
	Damaged valve seat (102)	Replace
	O-ring (104) of the valve seat damaged	Replace
Failure of slam-shut valve to trip due to pressure increase	Diaphragm (517) broken	Replace
Failure of slam-shut valve to trip due to pressure decrease	Diaphragm (517) broken	Replace

Tab. 9.65.

10 - UNINSTALLATION AND DISPOSAL

10.1 - GENERAL SAFETY WARNINGS

⚠ DANGER


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

⚠ WARNING

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

10.2 - QUALIFICATION OF THE OPERATORS IN CHARGE

Commissioning

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

Tab. 10.66.

10.3 - UNINSTALLING

⚠ CAUTION

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

NOTICE

Refer to the installation procedures for uninstalling the equipment (see Chapter 6 "Installation") by proceeding in reverse order.

10.4 - INFORMATION NEEDED IN CASE OF RE-INSTALLATION

NOTICE

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

- 6 "Installation;
- 8 "Commissioning.

10.5 - DISPOSAL INFORMATION

NOTICE

Please remember to comply with the laws in force in the country where the equipment is installed. Illegal or improper disposal will result in the application of the penalties provided for in the regulations in force in the country of installation.

NOTICE

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

The equipment is made of materials that can be recycled by specialized companies.
For proper disposal of the equipment, proceed as shown in tab. 10.66:

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

Tab. 10.67.

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

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

Tab. 10.68.

11 - RECOMMENDED SPARE PARTS

11.1 - GENERAL WARNINGS

NOTICE

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

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

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

11.2 - HOW TO REQUEST REPLACEMENT PARTS

NOTICE

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

12 - CALIBRATION TABLES

12.1 - CALIBRATION TABLE CIRVAL 200

The setting ranges of the springs for the CIRVAL regulator are shown in the following tables:

CIRVAL 200 BP							
Pos.	Spring article code	Spring color	d	Lo	De	Min.	Max.
1	64470068GI	Yellow	2	110	34	0.2321	0.3481
	64470024BI	White	1.3	45	15		
2	64470139NE	Black	2.2	115	34	0.3626	0.5076
	64470024BI	White	1.3	45	15		
3	64470140MA	Brown	2.7	106	34	0.5221	0.8847
	64470024BI	White	1.3	45	15		
4	64470071GR	Grey	2.8	115	34	0.8992	1.5083
	64470031RO	Red	1.7	40	15		

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

Tab. 12.69.

CIRVAL 200 MP							
Pos.	Spring article code	Spring color	d	Lo	De	Min.	Max.
1	64470141VE	Green	3.2	120	34	1.4648	2.393
	64470031RO	Red	1.7	40	15		
2	64470338BL	Blue	3.8	110	34	2.4075	5.2937
	64470031RO	Red	1.7	40	15		

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

Tab. 12.70.

CIRVAL 200 TR							
Pos.	Spring article code	Spring color	d	Lo	De	Min.	Max.
1	64470144VI	Green	5	100	34	5.2212	11.9942
	64470031RO	Red	1.7	40	15		

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

Tab. 12.71.

12.2 - CALIBRATION TABLE CIRVAL 300

CIRVAL 300 BP							
Pos.	Spring article code	Spring color	d	Lo	De	Min.	Max.
1	64470382NE	Black	2.5	160	39	0.2321	0.3916
	2700525	Orange	2	40	22		
2	64470301GI	Yellow	2.8	145	39	0.4061	0.5801
	2700645	Red	2.3	40	22		
3	64470302VI	Purple	3.8	140	39	0.5946	1.2038
	2700999	Grey	3	37	22		
d = Wire Diameter (mm) Lo = Spring Length (mm) De = External Diameter (mm) Min./Max. = pressure (psi)							

Tab. 12.72.

CIRVAL 300 MP							
Pos.	Spring article code	Spring color	d	Lo	De	Min.	Max.
1	64470262AR	Orange	4.5	140	39	1.1603	2.393
	2700999	Grey	3	37	22		
2	64470398AZ	Light blue	5	140	39	2.4075	4.2059
	2700999	Grey	3	37	22		
3	64470408RO	Red	5.5	140	40	4.2204	7.2951
	2700999	Grey	3	37	22		
d = Wire Diameter (mm) Lo = Spring Length (mm) De = External Diameter (mm) Min./Max. = pressure (psi)							

Tab. 12.73.

CIRVAL 300 TR							
Pos.	Spring article code	Spring color	d	Lo	De	Min.	Max.
1	64470398AZ	Light blue	5	140	39	7.2519	11.9946
	2700999	Grey	3	37	22		
d = Wire Diameter (mm) Lo = Spring Length (mm) De = External Diameter (mm) Min./Max. = pressure (psi)							

Tab. 12.74.

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