

HP 100

Gas pressure regulator



Revision 00 - Edition 06/2022

USE, MAINTENANCE
AND WARNING
MANUAL

1 - INTRODUCTION

FOREWORD

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

GENERAL REMARKS

All operating, maintenance instructions and recommendations described in this manual must be followed to in order to:

- obtain the best possible performance from the equipment;
- keep the equipment in efficient conditions.

Training the personnel in charge is essential in order to:

- use and service the equipment properly;
- correctly apply the safety alerts and recommended procedures.

Revision: 00

1.1 - REVISION HISTORY

Revision index	Date	Revision contents
00	06/2022	

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 - IDENTIFICATION OF THE PRODUCT

Equipment	PRESSURE REGULATOR
Series	HP 100
Available models	<ul style="list-style-type: none"> • HP 100 without block • HP 100 with block • HP 100 with in-line monitor • HP 100 with in-line limiteur

Tab. 2.3.

2.3 - REGULATORY FRAMEWORK

PIETRO FIORENTINI S.P.A. with registered offices in Arcugnano (Italy) - Via E. Fermi, 8/10, declares that the equipment of HP 100 described in this manual is designed, manufactured, tested and checked in compliance with the requirements of standards: UNI 11655:2016, UNI EN 16129:2013 where applicable.

NOTICE!

For specific type approvals, see the appropriate section on the Manufacturer's website: <https://www.fiorentini.com>

NOTICE!

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

2.4 - WARRANTY

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

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

NOTICE!

The warranty conditions are specified in the commercial contract.

2.5 - ADDRESSEES, SUPPLY AND STORAGE OF THE INSTRUCTION MANUAL

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

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

The manual, as well as the declaration of conformity and/or test certificate, is an integral part of the equipment and must always accompany it whenever it is moved or resold. It is the responsibility of the qualified professionals (see paragraph 2.10) to use and manage the equipment.

WARNING!

Removing, rewriting or modifying the pages of the manual and their contents is not allowed. PIETRO FIORENTINI S.p.A. shall not be held liable for any damage to people, animals and property caused by failure to adhere to the warnings and operating procedures described in this manual.

2.6 - LANGUAGE

The original instruction manual was drawn up in Italian.

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

HAZARD!

The translations into other languages cannot be fully verified. If any inconsistency is found, please refer to the original instruction manual.




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

- stop any actions;
- immediately contact PIETRO FIORENTINI S.p.A. at the addresses specified in paragraph 2.1 (“Identification of the manufacturer”).

WARNING!

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

2.7 - SYMBOLS USED IN THE MANUAL

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

Tab. 2.4.

HAZARD!

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

WARNING!

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

ATTENTION!

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

NOTICE!

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

2.8 - APPLIED RATING PLATES

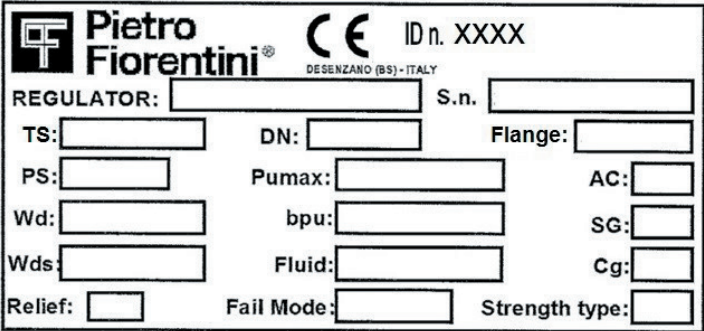
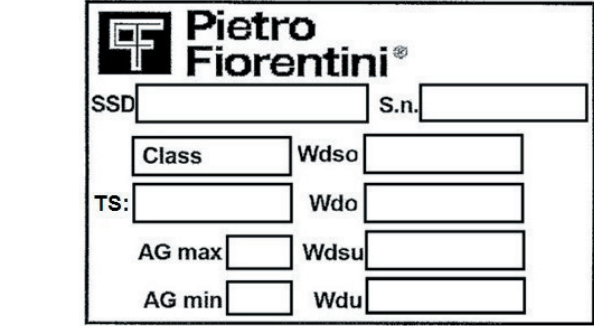


WARNING!

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

The equipment and its accessories are provided with nameplates (from Id.1 to Id.4).

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




List of the rating plates applied:

Id.	Type	Image
1	NAMEPLATE REGULATOR (EC version)	
2	NAMEPLATE SSD	
3	NAMEPLATE MONITOR	
4	NAMEPLATE LIMITEUR VERSION	

Tab. 2.5.

2.8.1 - GLOSSARY FOR NAMEPLATES

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

Term	Description
CE	CE Marking.
Id	Identifier of the body that issued the CE marking.
Regulator	Regulator model.
S.N.	Regulator serial number.
TS	Design temperature.
DN	Size of input and output connections.
Flange	Type of connections.
PS	Maximum admissible pressure that can be supported in safe conditions by the structure of the body of the equipment.
Pumax	Maximum operating pressure at equipment inlet.
AC	Regulation class.
Wd	Calibration range of the pressure regulator/pilot/pre-reducer which can be obtained by using the setting springs indicated in the specific tables and possibly by changing some other part of the device (reinforced gasket, diaphragms, etc.).
bpu	Variation range of inlet pressure of the pressure regulator in normal operating conditions.
SG	Shut-off pressure class.
Wds	Calibration range of the pressure regulator/pilot/pre-reducer which can be obtained by using the parts and setting spring mounted at the time of testing (namely without changing any component of the equipment).
Fluid	Type of gas that the regulator can be used with.
Cg	Flow coefficient. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  NOTICE! The Cg coefficient corresponds to the value of the flow rate expressed in Sm³/h of air supplied by the regulator with the plug in the maximum open position, in critical regime, an absolute upstream pressure of 1 PSI and a temperature of 15°C. </div>
Relief	Indicates the presence of the relief valve (YES/NO).
Fail Mode	Indicates how the controller reacts to a failure (fail open/fail close). <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  NOTICE! <ul style="list-style-type: none"> • Fail open: fully open, gas passes from upstream to downstream without being regulated. • Fail close: complete closure, gas does not flow downstream. </div>
Strength type	Regulator resistance class (IS/DS). <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  NOTICE! <ul style="list-style-type: none"> • IS (Integral Strength): regulator components subject to pressure, they resist up to Ps. • DS (Differential Strength): regulator components subject to pressure, they resist up to PDS < Ps. </div>
Class	Locking device class (according to EN14382).
Wdso	Triggering range due to slam-shut valve overpressure, which can be obtained by using the setting spring mounted the time of testing.

Term	Description
Wdo	Triggering range due to slam-shut valve overpressure, which can be obtained by using the setting springs indicated in the tables.
AG max	Maximum block accuracy class.
Wdsu	Triggering range due to slam-shut valve pressure decrease, which can be obtained by using the setting spring mounted at the time of testing.
AG min	Maximum block accuracy class.
Wdu	Triggering range due to slam-shut valve pressure decrease, which can be obtained by using the setting springs indicated in the tables.

Tab. 2.6.

2.9 - GLOSSARY OF MEASUREMENT UNITS

Type of measurement	Unit of measurement	Description
Volumetric flow rate	Sm ³ /h	Standard cubic metres per hour
	Sm ³	Standard cubic metres
	m ³ /h	Cubic metres per hour
	m ³	Cubic metres
Pressure	bar	Unit of measurement in the CGS system
	"wc	Water column inch
	Pa	Pascal
Temperature	°C	Centigrade degree
	°F	Fahrenheit degree
	K	Kelvin
Tightening torque	Nm	Newton metre
Sound pressure	dB	Decibel
Other measures	V	Volt
	W	Watt
	Ω	Ohm

Tab. 2.7.

2.10 - QUALIFIED PROFESSIONAL FIGURES

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

Professional figure	Definition
<p style="text-align: center;">Installer</p>	<p>Qualified operator able to:</p> <ul style="list-style-type: none"> • handle materials and equipment; • carry out all the operations necessary to properly install the equipment; • perform all the operations necessary to safely operate the equipment and system; • be able to perform all the operations necessary to uninstall and subsequently dispose of the equipment in compliance with the regulations in force in the country of installation.
<p style="text-align: center;">User's technician / Specialised technician</p>	<p>Technician trained and authorised to use and manage the equipment for the activities it was supplied for. They must:</p> <ul style="list-style-type: none"> • be able to perform all operations required for the proper functioning of the equipment and the system, and for their safety and that of any third parties present; • perform maintenance on all parts of the equipment subject to maintenance; • access all device parts for visual inspection, checking equipment status, making adjustments and calibrations; • have proven experience in properly using the equipment similar to that described in this manual, and be trained, informed and instructed in this regard.

Tab. 2.8.

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3 - SAFETY

3.1 - GENERAL SAFETY WARNINGS

WARNING!

The equipment described in this instruction manual is:

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

WARNING!

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

In “danger zones” and in close proximity thereto:

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

WARNING!

- It is strictly forbidden to repair or make any modifications to the equipment.
- For information and warnings concerning the maintenance of the equipment, please refer to Chapter 9 of this manual.

ATTENTION!

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

Never operate the equipment:

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

NOTICE!

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

Before installation, commissioning or maintenance, operators must:

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

3.2 - PERSONAL PROTECTIVE EQUIPMENT

The following table shows the Personal Protective Equipment (PPE) and its description; an obligation is associated with each symbol.

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

For the operators in charge, depending on the type of work requested, the most appropriate PPE from those reported in Tab.3.9 must be used:

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

Tab. 3.9.

WARNING!

Each licensed operator is obliged to:

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

3.3 - OBLIGATIONS AND PROHIBITIONS

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

It is mandatory to:

- carefully read and understand the use, maintenance and warning manual;
- check whether the downstream equipment is suitably sized according to the performance required of the regulator in the actual operating condition;
- before installing the equipment, strictly refer to the details specified on the nameplates and in the manual;
- avoid knocks and violent impact that could damage the equipment.

It is forbidden to:

- operate in various capacities on the equipment without the PPE indicated in the work procedures described in this manual;
- operate in the presence of open flames or bring open flames close to the work area;
- smoke near the equipment or while working on it;
- use the equipment with parameters other than those indicated on the nameplate;
- use the equipment with fluids other than those indicated in this manual;
- use the equipment outside the operating temperature range specified in this manual;
- install or use the equipment in environments other than those specified in this manual.

3.4 - RESIDUAL RISKS

NOTICE!

The equipment from series HP 100 does not fall within the scope of the PED 2014/68/EU directive.

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

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

3.4.1 - TABLE SHOWING RESIDUAL RISKS DUE TO PRESSURE

 **WARNING!**

If there are any functional faults, do not operate. Immediately contact PIETRO FIORENTINI S.p.A. for the necessary directions.

Risk and Hazard	Event and Cause	Effect and Consequence	Solution and Prevention
Pressurised gas leak. Projection of metallic and non-metallic pressurised parts.	<ul style="list-style-type: none"> Violent impact. Impact (also due to falling, improper handling, etc.). 	<ul style="list-style-type: none"> Deformation. Broken connections and, if pressurised, even burst. 	<ul style="list-style-type: none"> a. Handling and installation with appropriate devices to avoid localised stress. b. Installation in suitable places and spaces with appropriate guards and packaging. c. Information/directions contained in this manual.
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Use of inappropriate fluids. 	<ul style="list-style-type: none"> Corrosion. Embrittlement. Explosion. 	<ul style="list-style-type: none"> a. The user must check compliance of the used fluid with what is indicated on the installation sheet.
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Operation at temperatures below the minimum design temperature. 	<ul style="list-style-type: none"> Embrittlement. Breakage. Explosion. 	<ul style="list-style-type: none"> a. Install in places where the temperature is not below the minimum permissible value and/or insulate the equipment adequately. b. The minimum allowable temperature is specified in this manual (refer to paragraph 4.5).
Pressurised gas leak. Projection of metallic and non-metallic pressurised parts. Explosion.	<ul style="list-style-type: none"> Overpressure or exceeding the rated limit values (maximum pressure allowed). 	<ul style="list-style-type: none"> Explosion. Breaks. Cracks. Permanent deformations. 	<ul style="list-style-type: none"> a. The device has appropriate design safety margins. b. The user must check the maximum pressure applicable to the equipment. c. The design pressure is specified in this manual (refer to paragraph 4.5).
Pressurised fluid leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Incorrect fixing of the equipment. 	<ul style="list-style-type: none"> Deformation. Breakage. 	<ul style="list-style-type: none"> a. The device is equipped with unified type process connections and compression fittings. b. The installer must ensure correct fixing to the line. c. Information/directions contained in this manual.
Explosion of the appliance pressurised fluid leakage. Projection of metallic parts.	<ul style="list-style-type: none"> Operation at temperatures above the maximum permissible temperature. 	<ul style="list-style-type: none"> Reduction of mechanical resistance, breakage of the device. Explosion. 	<ul style="list-style-type: none"> a. The commissioning technician must equip the system with suitable control and safety devices. b. The maximum allowable temperature is specified in this manual (refer to paragraph 4.5).
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> Electrostatic potential differential stray currents. 	<ul style="list-style-type: none"> Corrosion localised in the device. 	<ul style="list-style-type: none"> a. The commissioning technician must check the equipment for proper earthing.

Risk and Hazard	Event and Cause	Effect and Consequence	Solution and Prevention
Pressurised gas leak. Projection of metallic and non-pressurised parts.	<ul style="list-style-type: none"> • Humidity. • Environments with aggressive atmosphere. 	<ul style="list-style-type: none"> • Deterioration of external surfaces. • corrosion. 	a. The user must shut off the line and contact PIETRO FIORENTINI S.p.A.

Tab. 3.10.

3.4.2 - TABLE OF RESIDUAL RISKS FOR POTENTIALLY EXPLOSIVE ATMOSPHERES

Table 3.11 shows the conditions that can lead the pressure regulators HP 100 to generate a potentially explosive atmosphere.

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

WARNING!

If the gas used is a combustible gas, the area where the equipment is installed is defined as a “hazardous area”, because there are residual risks associated with the formation of potentially explosive atmospheres, where no effective ignition sources must be present.



Operating conditions	Potentially explosive atmosphere	Normative references	Management measures included in the use, maintenance and warning manual
First start-up	No	<ul style="list-style-type: none"> During the production cycle, the external sealing of the equipment is checked according to the UNI 11655:2016 standard. Before commissioning, the external sealing of the system portion on which the equipment is installed is checked according to the requirements applicable in the place of installation (when installed in pressure reduction systems, the provisions of 12186:2014 and UNI EN12279:2007 must be adhered to). 	The manual refers to the need to check the external sealing and, when applicable, meet the requirements of the UNI EN 12186:2014 and UNI EN 12279: 2007 standards.
Operation in normal conditions	No	<p>The provisions in the previous point apply and, in addition:</p> <ul style="list-style-type: none"> the equipment is installed outdoors or in an environment with natural ventilation according to the regulations in force in the place of installation, or, when applicable, standards EN 12186:2014 and EN 12279:2007; is monitored according to the national rules in force, good practice and the instructions of the equipment manufacturer. 	<p>The manual reports that:</p> <ul style="list-style-type: none"> any room that the equipment is installed in must meet the ventilation requirement for the place of installation, or, when applicable, the provisions in standards EN 12186:2014 and EN 12279:2007; periodic checks must be carried out during surveillance in accordance with the national rules in force, if any, and with the specific manufacturer's recommendations.
Breakage of diaphragms	No	This event must be considered a rare malfunction.	The manual refers to the need to meet the periodic check requirements in accordance with the regulations in force in the place of installation.
Breakage of other non-metallic parts (malfunction)	No	This type of malfunction is not reasonably expected as it involves static seals (to the outside) that cannot generate any external leakage.	-

Operating conditions	Potentially explosive atmosphere	Normative references	Management measures included in the use, maintenance and warning manual
Decommissioning	No	<ul style="list-style-type: none"> • Pressure must be reduced in the system section, where the equipment is installed, inside a suitably ventilated room. • The residual gas must be discharged as indicated above. 	The manual refers to the need to operate in a suitably ventilated environment.
Reboot	No	<ul style="list-style-type: none"> • After reassembling the regulator, carry out an external leakage test at a suitable pressure value, as specified by the Manufacturer. • Before commissioning, the external sealing of the system portion on which the equipment is installed is checked according to the requirements applicable in the place of installation (when installed in pressure reduction systems, the provisions of 12186:2014 and UNI EN12279:2007 must be adhered to). 	The following is referred to in the manual: <ul style="list-style-type: none"> • the minimum conditions for testing the equipment for external leakage; • the need to check external sealing and, when applicable, meet the requirements of the UNI EN 12186:2014 and UNI EN 12279: 2007 standards.

Tab. 3.11.

3.5 - SAFETY PICTOGRAMS

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

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

Tab. 3.12.

HAZARD!

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

The user is obliged to replace safety pictograms which, as a result of wear and tear, removal or tampering are illegible (contact PIETRO FIORENTINI S.p.A. for this).

3.6 - RISK LEVEL

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

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

ATTENTION!

The obligation to use earmuffs or ear plugs to protect the hearing of qualified professional figures (reference paragraph 2.10) remains in the event that the noise in the installation environment of the equipment (depending on specific operating conditions) exceeds the value of 85 dBA.

4 - DESCRIPTION AND OPERATION

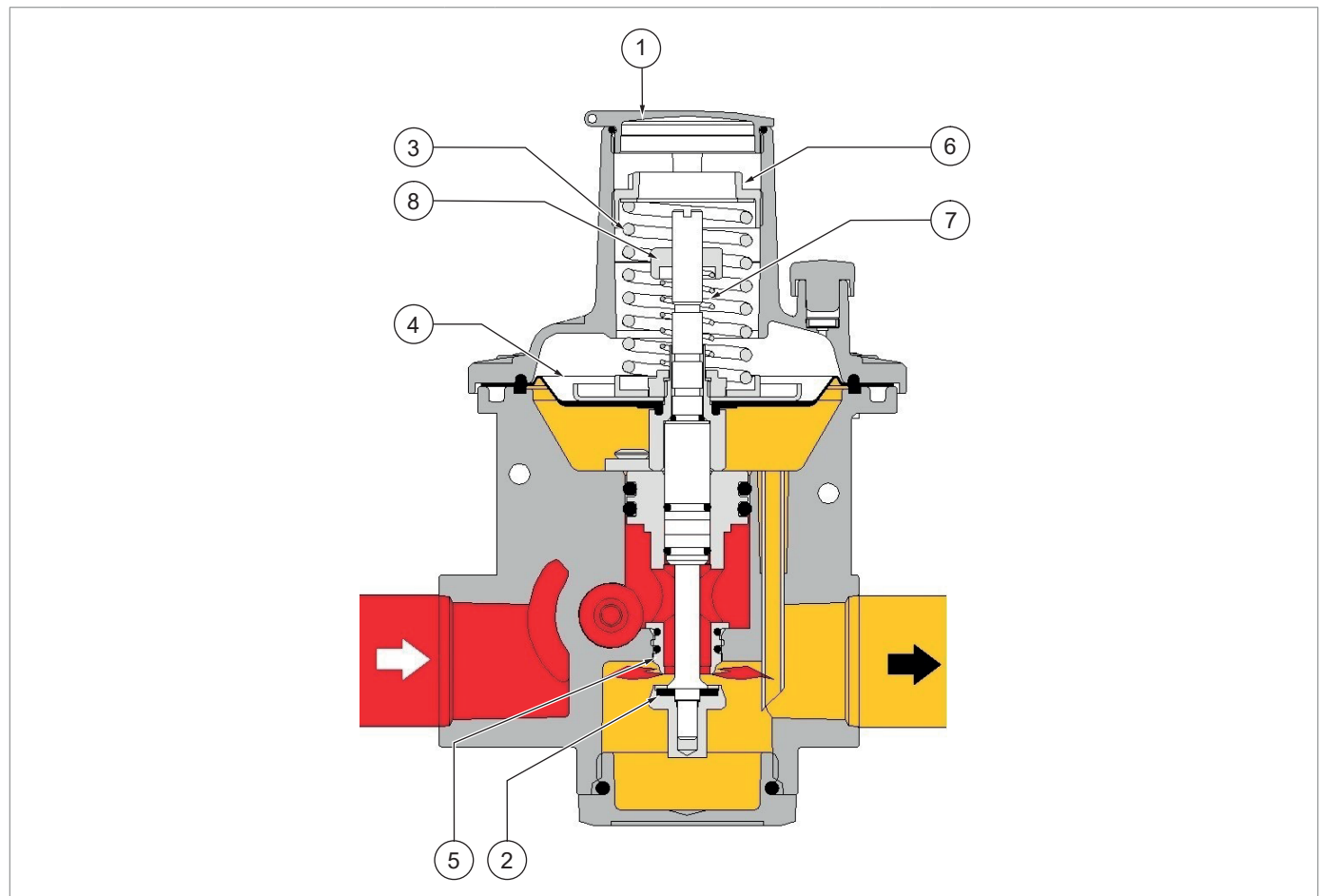
4.1 - GENERAL DESCRIPTION

HP 100 is a single stage balanced plug pressure regulator for gaseous fluids after being purified, suitable for low, medium and high pressure.

The main elements of the equipment are:

Pos.	Description	Pos.	Description
1	Cap	5	Valve seat
2	Plug	6	Output pressure adjustment ring
3	Regulator spring	7	Relief valve spring
4	Diaphragm	8	Relief adjustment ring nut

Tab. 4.13.



 **INLET PRESSURE**

 **OUTPUT PRESSURE**

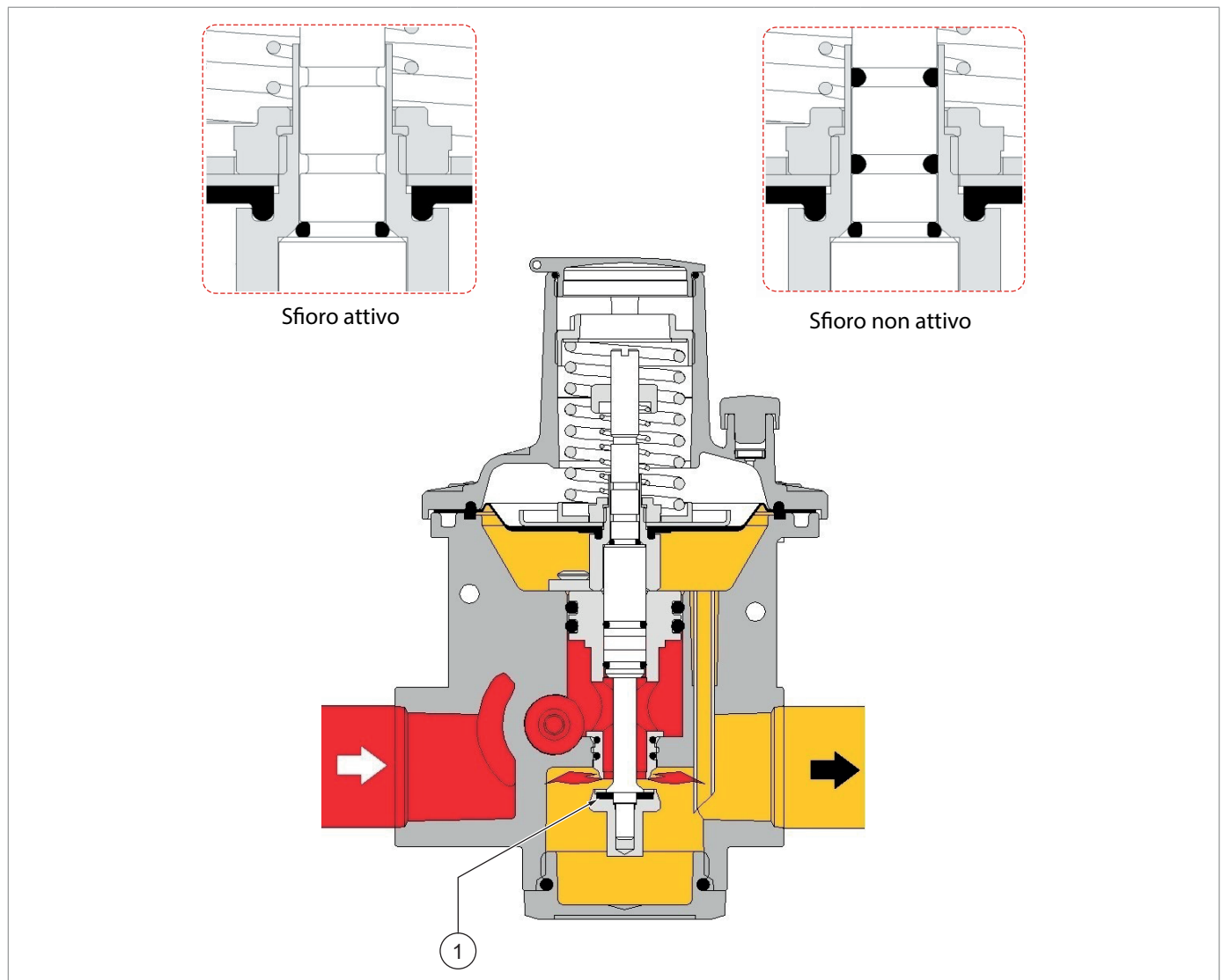
Fig. 4.1. General description HP 100

4.1.1 - REGULATOR REACTION MODES

The HP 100 equipment is a pressure regulator with a “fail open” reaction (on-opening reaction), that is, it opens in the event of:

- breakage of main diaphragm;
- no regulated pressure signal.

4.2 - OPERATION



INLET PRESSURE **OUTPUT PRESSURE**

Fig. 4.2. Operation HP 100

The plug (1) has a vulcanised rubber gasket to provide perfect sealing when the required flow rate is zero.

In normal operating conditions, the plug (1) positions itself so as to keep the output pressure (P_d) at the pre-selected calibration value.

The input pressure (P_u), although variable, does not change this position since the regulator plug (1) is fully balanced.

4.3 - INTENDED USE

4.3.1 - ENVISAGED USE

The equipment in question is intended for:

Operation	Permitted	Unpermitted	Work environment
Adjustment of the downstream pressure for:	Gaseous, and non-aggressive or corrosive fluids filtered beforehand.	<ul style="list-style-type: none"> Liquids. Any product other than those permitted. 	Installations for the distribution of natural gas to supply networks for: <ul style="list-style-type: none"> LPG tanks; commercial use; home use.

Tab. 4.14.

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

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

Safe work parameters are:

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

4.3.2 - REASONABLY FORESEEABLE MISUSE

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

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

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

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

4.3.3 - TYPES OF FLUIDS

The equipment works with combustible gases used:

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

NOTICE!

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

4.4 - TECHNICAL FEATURES/PERFORMANCE

The HP 100 equipment is a low, medium and high pressure regulator.
The main specifications for this regulator are:

Technical features	
Design pressure (PS)	Up to 20 bar
Operating temperature range	-20 °C - +60 °C
Ambient temperature range	-20 °C - +60 °C
Inlet pressure range (bpu)	0.5 - 20 bar
Possible regulation range (Wd)	300 - 800 mbar (AP header) 800 - 4500 mbar (APTR head)
Minimum differential pressure	0.2 bar
Accuracy class (AC)	up to 5
Lock up pressure class (SG)	up to 10
Inlet connection	G 1" EN ISO 228/1 (modular connections on request)
Output connections	<ul style="list-style-type: none"> In-line outlet: G 1" EN ISO 228/1 Square outlet: G 1" 1/2 EN ISO 228/1 (modular connections on request)
Relief valve connection	G 1/8" EN ISO 228/1
External sensing element connection	G 1/4" EN ISO 228/1
Modular connections	<ul style="list-style-type: none"> Gas (as per UNI EN ISO 228-1:2003); Flat swivel joint (as per NF E29-533: 2014 and NF E29-536: 2017); NPT (according to ASME B1.20.1, excluding connections with metal/metal sealing); Special accessories (on request).

Tab. 4.15.

4.5 - POSSIBLE CONFIGURATIONS

The available models of the HP 100 series differ according to the installation of the following accessories:

- slam-shut valve;
- relief valve;
- monitor;
- limiter.

4.5.1 - INCORPORATED SLAM-SHUT VALVE

The main elements of the model with a built-in slam shut valve are:

Pos.	Description	Pos.	Description
1	Plug	5	Calibration spring for maximum downstream pressure
2	Diaphragm	6	Calibration spring for minimum downstream pressure
3	Calibration ring for maximum downstream pressure	7	Manual reset bushing
4	Calibration ring for minimum downstream pressure	8	Cap

Tab. 4.16.

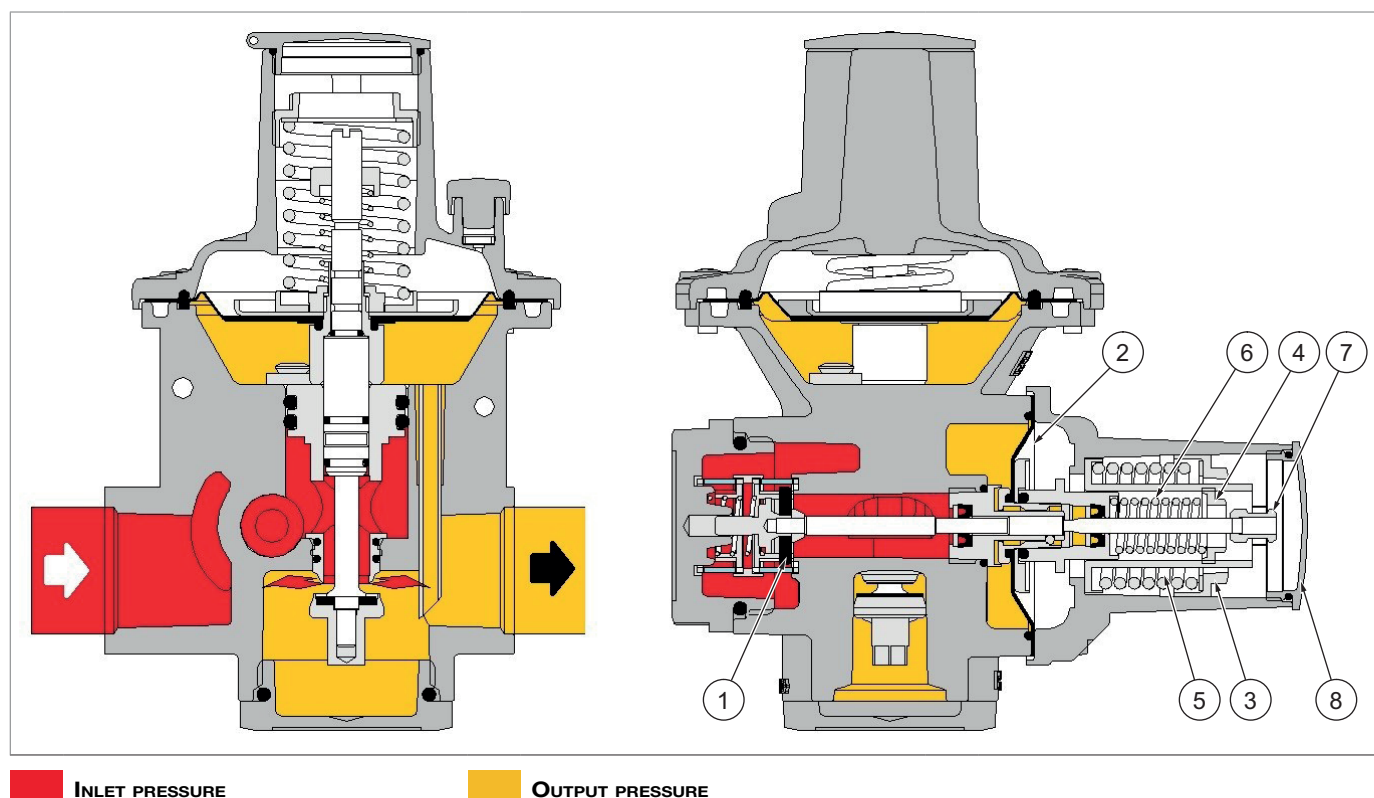


Fig. 4.3. Incorporated slam-shut valve

The minimum and maximum pressure shut-off valve is a device that blocks the gas flow if the outlet pressure (Pd) reaches the preset value for its intervention.

The main specifications of this configuration are:

Technical features	
Maximum allowable pressure (PS)	Up to 20 bar
Precision (AG)	<ul style="list-style-type: none"> • Up to $\pm 5\%$ for pressure increase. • AG 10 minimum 20 mbar per pressure drop.

Tab. 4.17.

4.5.2 - INCORPORATED RELIEF VALVE

The main elements of the model with built-in overflow valve are:

Pos.	Description	Pos.	Description
1	Cap	3	Relief valve spring
2	Relief adjustment ring nut	4	Relief vent

Tab. 4.18.

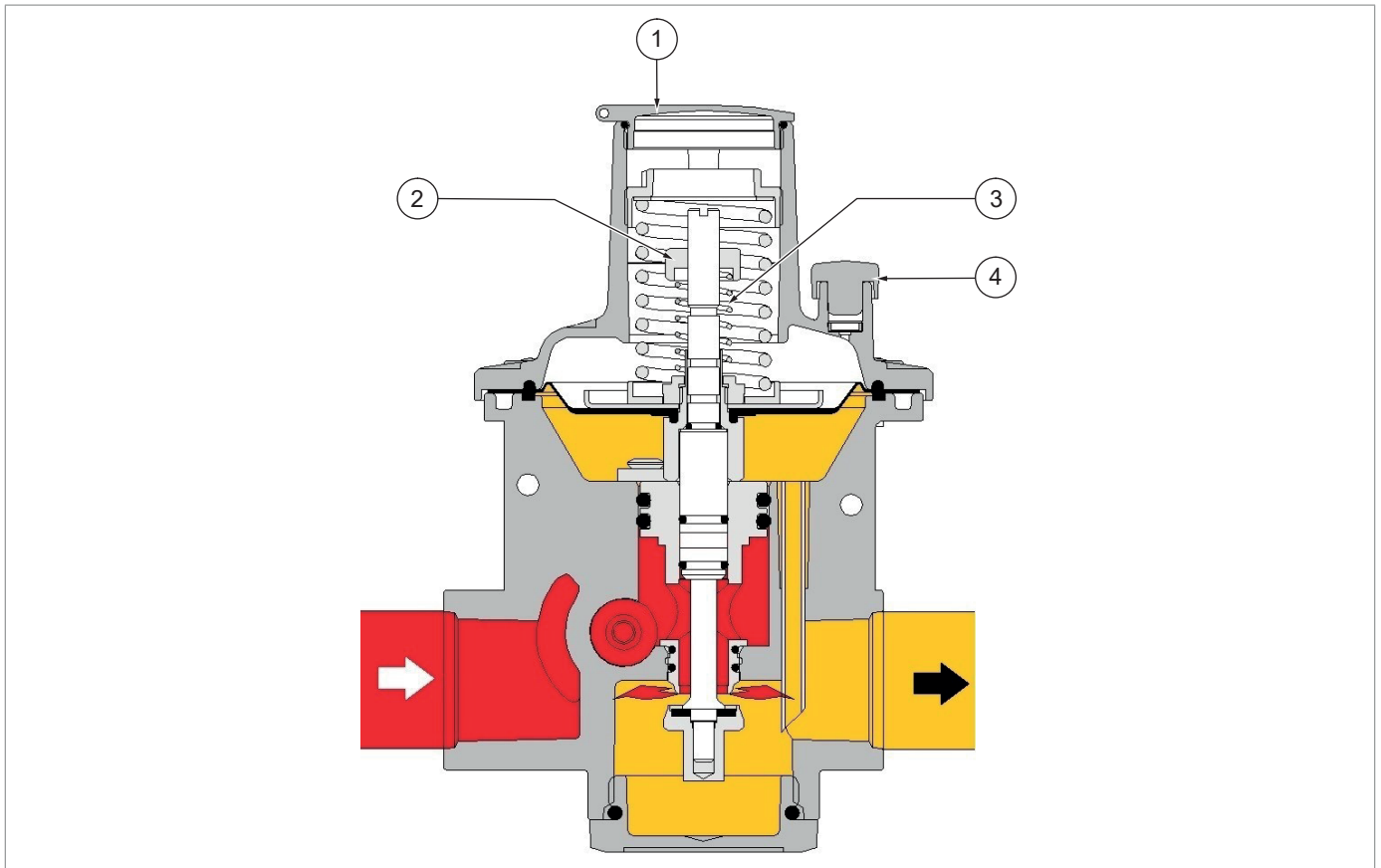


Fig. 4.4. Incorporated relief valve

! NOTICE!

- **The tripping pressure value of the relief valve is lower than the tripping pressure value of the slam-shut valve for maximum downstream pressure.**
- **The amount of gas discharged into the atmosphere depends on the extent of the overpressure in relation to the calibration.**

The relief valve is a safety device that is used to:

- automatically vent a flow of gas into the atmosphere through the relief valve (4) when the downstream pressure exceeds a preset value, preventing the intervention of the shut-off device, and
- to automatically return to shut-off position when the downstream pressure drops below the opening/discharge value.

The relief valve trips due to:

- thermal expansion of the downstream gas with no flow;
- in the presence of on-off valves downstream of the regulator at the same time as low downstream volumes;
- to the non-perfect sealing of the plug (even temporary).

4.5.3 - MONITOR

ATTENTION!

For the in-line monitor configuration, it is the user's responsibility to check that the maximum allowable pressure (PS) of the pressure equipment to be protected is compatible with:

- the calibration of the monitor or any built-in slam shut valve;
- lock up pressure class (SG).

NOTICE!

The HP 100 in monitor configuration (A), only becomes a safety device when installed upstream of another pressure regulator with main control function (B).

Compared to the standard version, the controller with monitor function is only equipped with an external impulse socket (C).

The in-line monitor configuration allows, in the event of a failure of the main regulator (B), to limit the downstream pressure by activating the monitor regulator (A) connected downstream via the external impulse socket (C).

The monitor controller (A) can be fitted with a built-in shut-off valve.

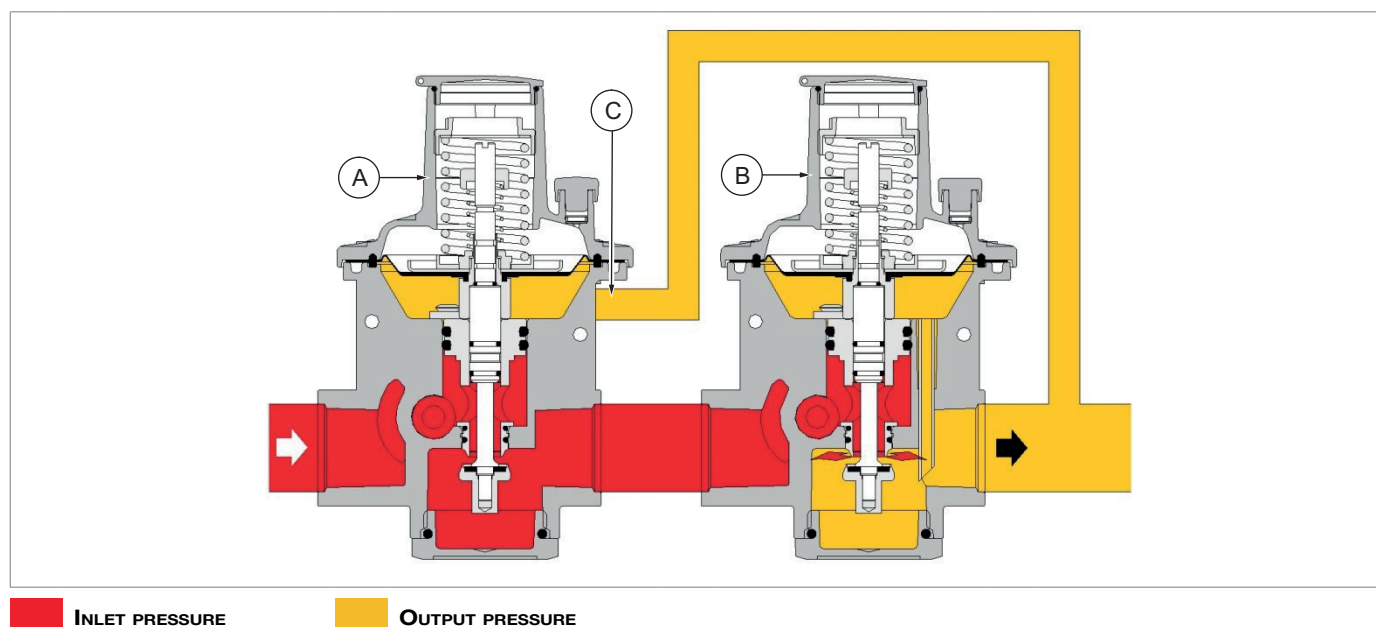


Fig. 4.5. HP 100 with Monitor

4.5.4 - LIMITEUR

⚠ ATTENTION!

For limit configuration, it is up to the user to check that the maximum permissible pressure (PS) of the pressure equipment to be protected is compatible with:

- the calibration of the monitor or any built-in slam shut valve;
- lock up pressure class (SG).

! NOTICE!

The HP 100 in limiter configuration, only becomes a safety device if the controller with main control function (A) is immovably assembled to the controller with limiteur function (B).

The in-line limiter configuration allows, in the event of a failure of the main regulator (A), to limit the downstream pressure by activating the limiteur regulator (B).

The limiteur regulator (B) can be fitted with a built-in slam shut valve.

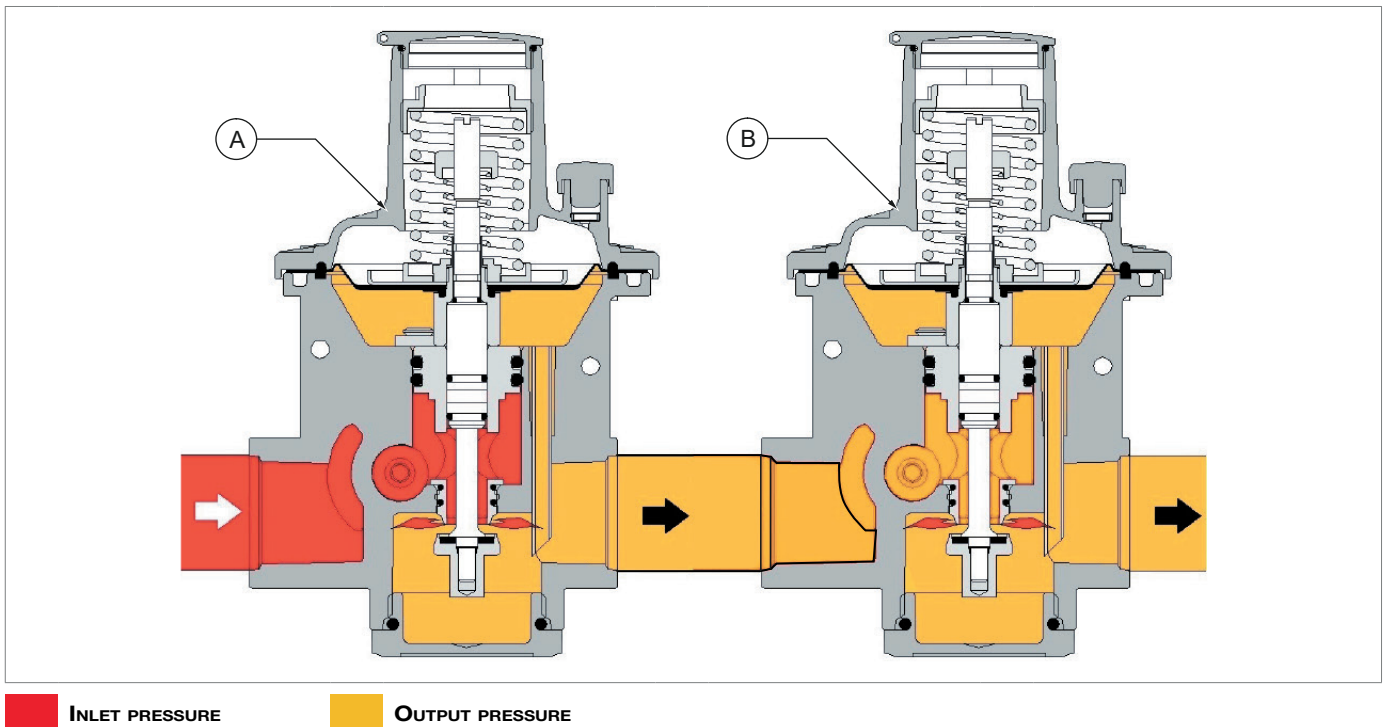


Fig. 4.6. HP 100 with Limiteur

5 - TRANSPORT AND HANDLING



5.1 - SPECIFIC WARNINGS FOR TRANSPORT AND HANDLING

NOTICE!

Transport and handling must be carried out in compliance with the regulations in force in the country of installation by personnel who are:

- qualified (specially trained);
- who are familiar with accident prevention and workplace safety regulations;
- authorised to use lifting equipment.

Transport and handling

Operator qualification	<ul style="list-style-type: none"> • Installer.
PPE required	<div style="display: flex; align-items: center;">  </div> <div style="background-color: #f4a460; padding: 5px; margin-top: 5px;">  WARNING! </div> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • <u>any information provided by the Safety Manager at the installation facility.</u>
Weights and dimensions of the equipment	For dimensions and weights, refer to paragraph 5.2 "Physical characteristics of the equipment".

Tab. 5.19.

5.1.1 - PACKAGING AND FASTENERS USED FOR TRANSPORT

The transport packaging is designed and manufactured to avoid damage during normal transport, storage and handling. The equipment must be kept in the packaging until installation.



Upon receiving the equipment, please:

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

NOTICE!

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

Tab. 5.22. describes the types of packaging used:

Ref.	Type of packaging	Image
A	Multiple cardboard box (impact protection)	
B	Single cardboard box	

Tab. 5.20.

5.2 - PACKAGING CONTENT

The packaging contains:

Description of content

HP 100 gas meter including:

- regulator;
- any seals (if there are swivel fittings);
- installation instructions.

Tab. 5.21.



NOTICE!

The use, maintenance and warning manual can be downloaded from the Manufacturer's website: <https://www.fiorentini.com>

5.3 - PHYSICAL CHARACTERISTICS HP 100

NOTICE!

See the product configurator ('sizing') at PIETRO FIORENTINI S.p.A. (www.fiorentini.com) for equipment dimensions and weights.

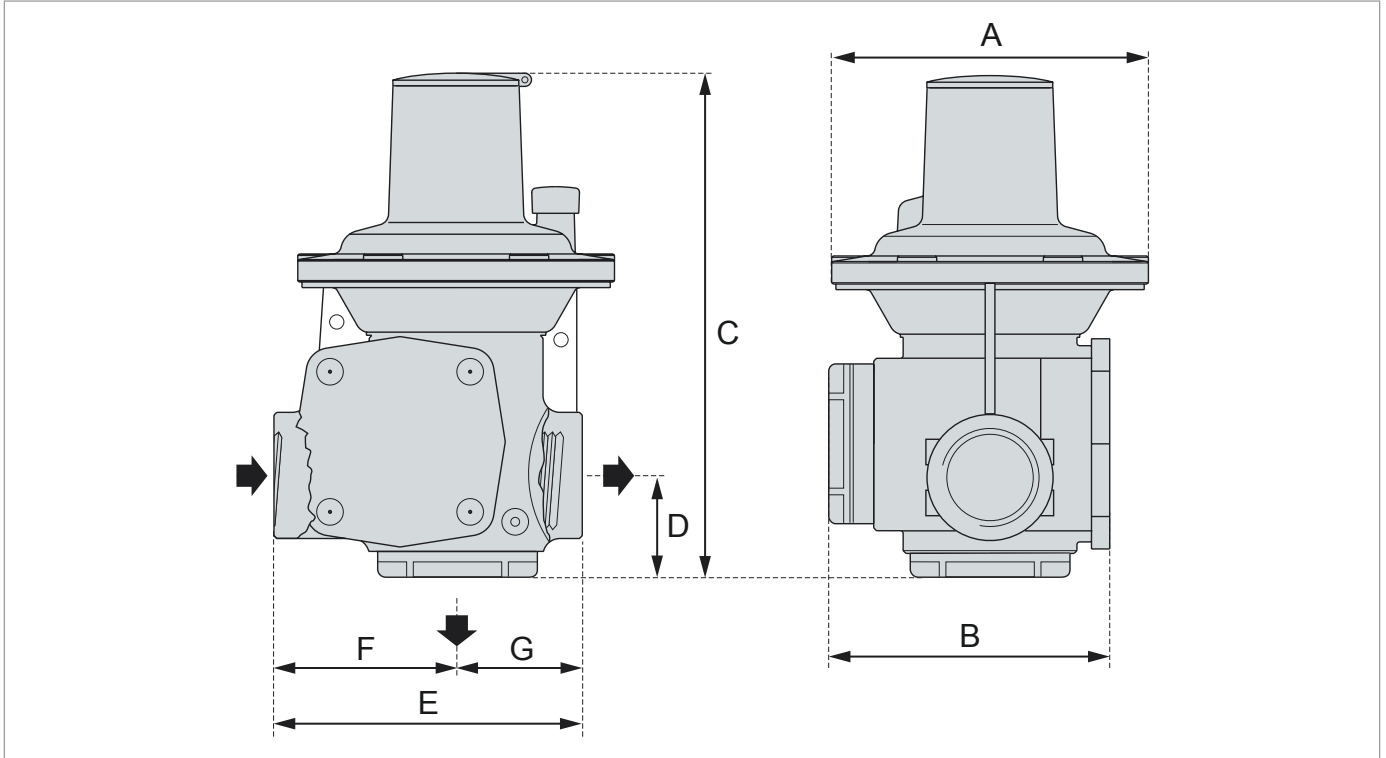


Fig. 5.7. Physical characteristics HP 100

Overall dimensions	
Ref.	Dimensions [mm]
A	Ø115
B	102
C	187
D	43
E	110
F	65
G	45

Tab. 5.22.

Weights [kg]	
Regulator	1.7
Regulator + flange DN25	3.2
Regulator + DN40 flange (inlet) + DN50 flange (outlet)	5.9

Tab. 5.23.

5.4 - PHYSICAL CHARACTERISTICS HP 100/B

! NOTICE!

See the product configurator ('sizing') at PIETRO FIORENTINI S.p.A. (www.fiorentini.com) for equipment dimensions and weights.

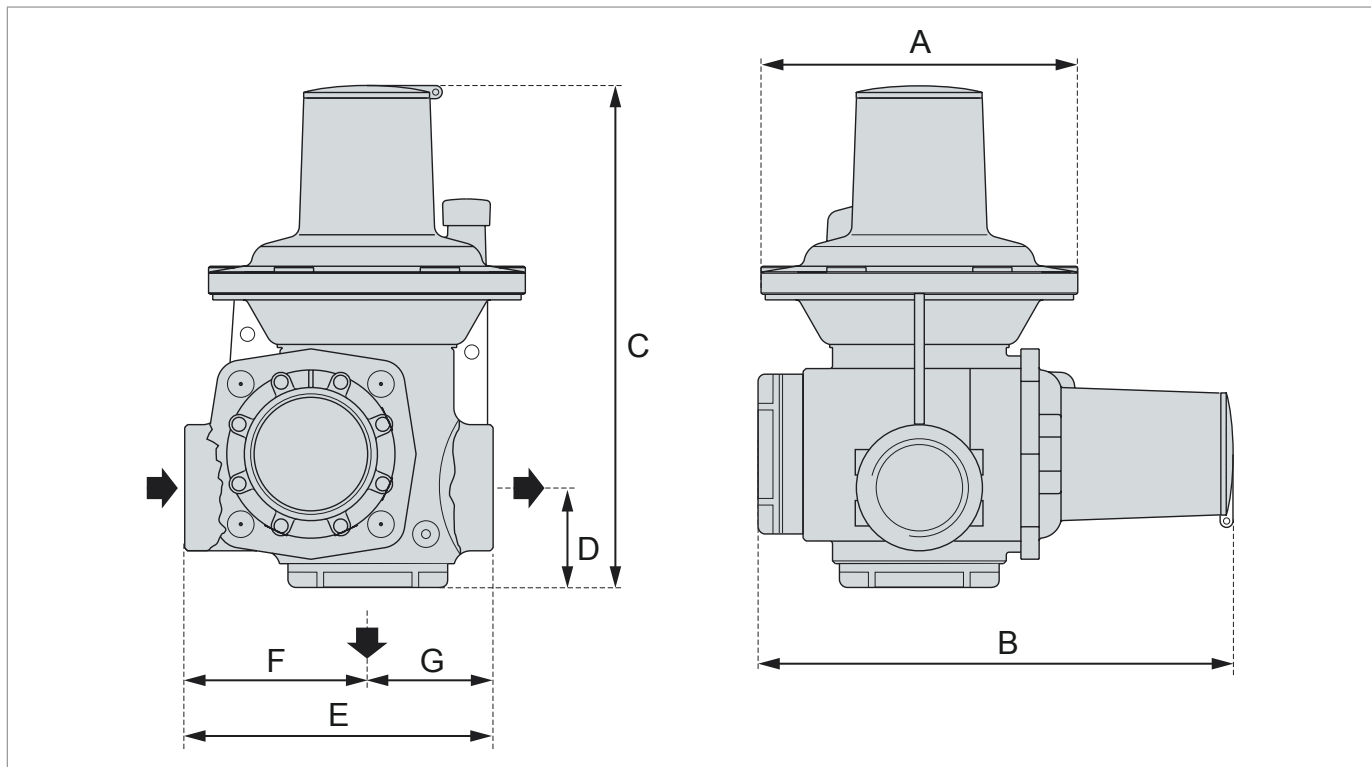


Fig. 5.8. Physical characteristics HP 100/B

Overall dimensions	
Ref.	Dimensions [mm]
A	Ø115
B	172
C	187
D	43
E	110
F	65
G	45

Tab. 5.24.

Weights [kg]	
Regulator	1.9
Regulator + flange DN25	3.5
Regulator + DN40 flange (inlet) + DN50 flange (outlet)	6.1

Tab. 5.25.

5.5 - EQUIPMENT ANCHORING AND LIFTING METHOD

HAZARD!

Using lifting equipment (if necessary) for unloading, carrying and handling packages is reserved only for skilled operators who have been properly trained (and are appropriately qualified if required by the regulations in force in the country of installation) and are familiar with:

- accident prevention rules;
- workplace safety provisions;
- lifting equipment features and limits.

HAZARD!

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

ATTENTION!

Before moving the equipment:

- remove any movable or hanging component or firmly secure it to the load;
- protect fragile equipment;
- check that the load is stable;
- make sure to have perfect visibility along the route.

5.5.1 - FORKLIFT HANDLING METHOD

HAZARD!

It is forbidden to:

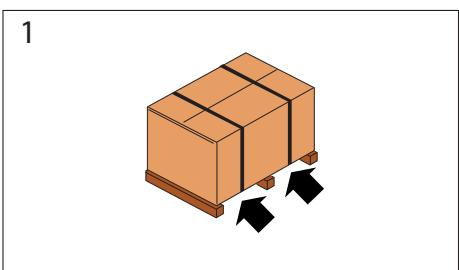
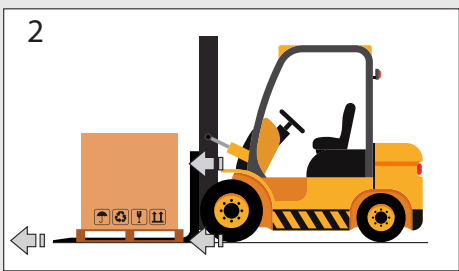
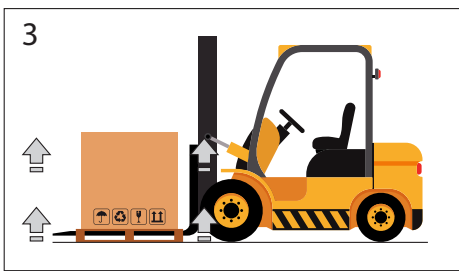
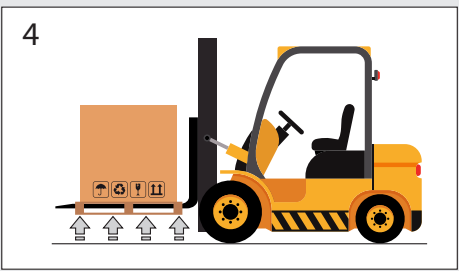
- Do not transit under suspended loads;
- Do not move the load over the personnel operating in the site/plant area.

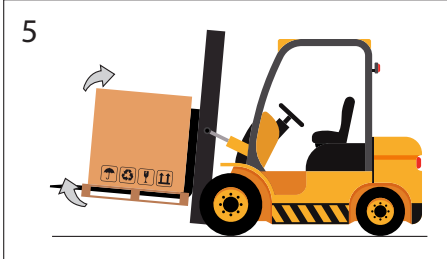
WARNING!

The following is not allowed on forklifts:

- carrying passengers;
- lifting people.


If cardboard boxes (single or multiple) are carried on a pallet, proceed as indicated in Tab. 5.26.:

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

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

Tab. 5.26.

5.6 - PACKAGING REMOVAL

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

Tab. 5.27.

To unpack the cardboard boxes (single or multiple) supported by a pallet, proceed as described in Tab. 5.28.:

Step	Action
1	Remove the stretch film around the pallet.
2	Remove the 4 support corners.
3	Move the boxes of the equipment from the pallet to their intended place. <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <p>NOTICE!</p> <p>Have at least 2 operators manually move the packages if required due to their dimensions/weight.</p> </div>

Tab. 5.28.

NOTICE!

After removing all packaging materials, check for any anomalies.
If there are anomalies:

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

WARNING!

The single piece of equipment is contained in a specifically created cardboard box.
Avoid taking the equipment out of the box before its installation.

5.6.1 - PACKAGING DISPOSAL

NOTICE!

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

5.7 - STORAGE AND ENVIRONMENTAL CONDITIONS

WARNING!

Protect the regulator from blows and impacts, even accidental, until it is installed.

If the equipment needs to be stored for an extended period, the minimum environmental conditions for the intended storage are provided in Tab.5.29. Compliance with these conditions will guarantee the declared performance:

Conditions	Data
Maximum storage period	5 years.
Temperature	Not above 40°C
Humidity	Not above 70%
Radiation and light sources	Away from radiation and light sources according to UNI ISO 2230:2009

Tab. 5.29.

5.7.1 - STORAGE LASTING LONGER THAN THE MAXIMUM TIME ALLOWED

NOTICE!

After a storage period exceeding the maximum time allowed (5 years), the equipment must be scrapped.

6 - INSTALLATION

6.1 - INSTALLATION PRE-REQUISITES

6.1.1 - ALLOWED ENVIRONMENTAL CONDITIONS

 **WARNING!**

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

 **WARNING!**

The regulator must be installed away from atmospheric agents and direct sunlight.

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

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

6.1.2 - STORAGE LASTING LONGER THAN THE MAXIMUM TIME ALLOWED

 **WARNING!**

Installing the equipment after storage exceeding the maximum admissible time (5 years) is not allowed. After a storage period exceeding the maximum time allowed, the equipment must be scrapped.

6.1.3 - CHECKS BEFORE INSTALLATION

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

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

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

ATTENTION!

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

The choice of fittings must be compatible with:

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

Before installation, it must be ensured that:

- the flow direction is observed as shown on the regulator;
- at least one shut-off valve is installed upstream;
- the data on the identification plates attached to the regulator (see section 2.8 of the manual) correspond to the requirements of the connected combustion appliance(s);
- the regulator has not been damaged during transport;
- the intended installation compartment meets the provisions in force on safety and is away from any possible damage of mechanical origin, away from sources of heat or naked flames, in a dry place and protected from external agents;
- there are no impediments that could hinder the installation operations;
- the inlet and outlet pipes are at the same level and able to support the weight of the regulator;
- on the input/output connections are totally free of mechanical stress;
- the pipe inlet/outlet connections are parallel and clean;
- the inlet piping has been cleaned in order to expel residual impurities such as welding slag, sand, paint residues, water, etc.

6.2 - SPECIFIC SAFETY INSTRUCTIONS FOR THE INSTALLATION STEP

WARNING!

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

WARNING!

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

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

WARNING!

Near the equipment, do not:

- use open flames (e.g. for welding operations);
- smoke.

WARNING!

The equipment must be installed away from atmospheric agents and direct sunlight.

WARNING!

The room where the equipment is installed must:

- be properly aerated/ventilated;
- have an ambient temperature of use as indicated in paragraph 4.5 (“Technical characteristics/performance”).

WARNING!

The installer must:

- use the fittings and gaskets supplied with the equipment by PIETRO FIORENTINI S.p.A.
- fix the swivel joints (when provided) according to the tightening torques specified by standards: NF E29-533: 2014 and NF E29-536: 2017.

ATTENTION!

Do not use the equipment as a reference template (available on request).

6.3 - GENERAL INFORMATION ON THE LINE

The device must be installed in the line, with the arrow on its body pointing to the gas flow direction.
The usual layout of the regulator HP 100 is as shown in Fig.6.9:

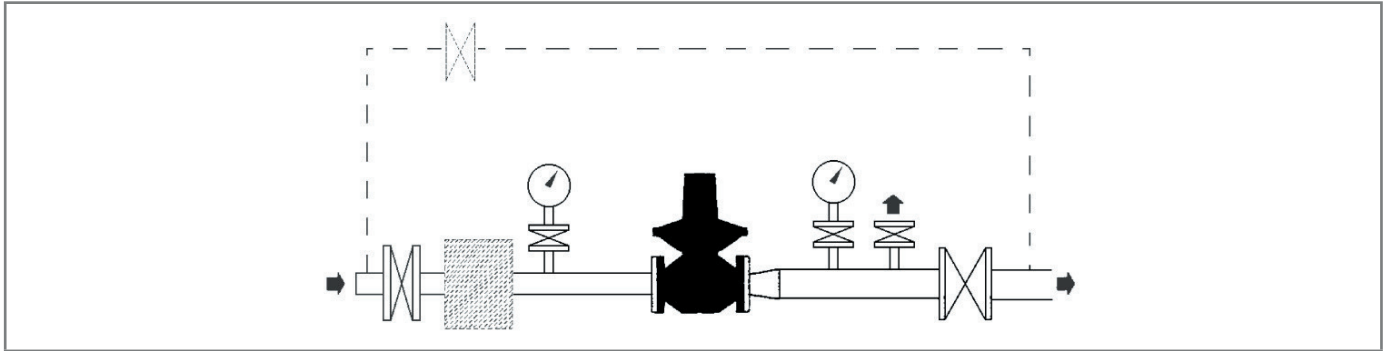


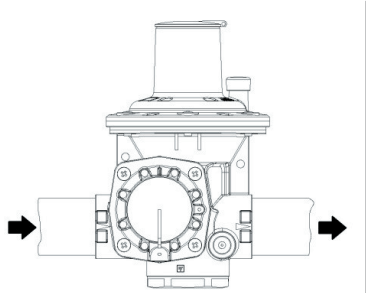
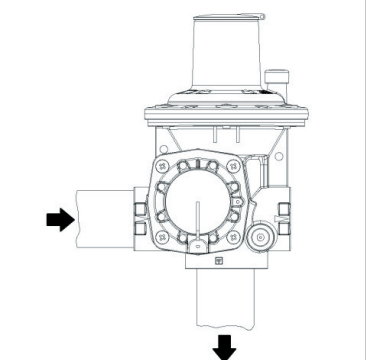
Fig. 6.9. In-line placement

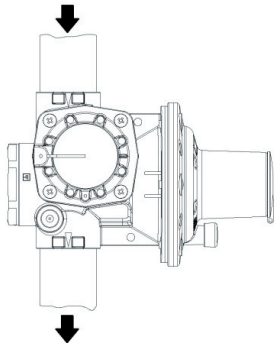
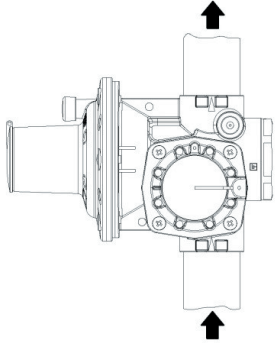
6.3.1 - POSSIBLE INSTALLATION POSITIONS

NOTICE!

- With natural gas or other non-corrosive gases that are not subject to recondensation, the equipment can be installed in any flow direction.
- Please avoid any mounting positions with outlet flow facing upwards in installations using LPG.


For information about how to mount the regulator in keeping with the available models and configurations, refer to Tab. 6.30.:

Flow direction	Installation position:	Installation requirements in the presence of recondensation phenomena
Horizontal flow		-
Square horizontal flow		-

Flow direction	Installation position:	Installation requirements in the presence of recondensation phenomena
Vertical flow		<p>! NOTICE!</p> <p>In this position, the vents on the regulator allow for the evacuation of condensate.</p>
Reversed vertical flow (from bottom to top)		<p>! WARNING!</p> <p>If condensation occurs, only the cover can be installed by 180°.</p>

Tab. 6.30.

6.4 - INSTALLATION PROCEDURES

Installation	
Operator qualification	<ul style="list-style-type: none"> • Installer.
PPE required	<div style="display: flex; align-items: center;">  </div> <p>! WARNING!</p> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any information provided by the Safety Manager at the installation facility.
Necessary equipment	<p>Refer to Chapter 7 'Commissioning/maintenance equipment'.</p>

Tab. 6.31.

6.4.1 - EQUIPMENT INSTALLATION PROCEDURE

To install the equipment in line, proceed as specified in Tab. 6.32.:

Step	Action
1	Apply the checks in paragraph 6.1.3 ("Checks before installation").
2	Remove any type of packaging/equipment protection (if any). NOTICE! For proper disposal of packaging, please refer to the regulations in force in the country where the equipment is installed.
3	Set up the connection making sure that: <ul style="list-style-type: none"> the inlet and outlet pipes do not exert excessive bending or traction forces on the regulator body as a result of not being aligned. If necessary, clamp the inlet/outlet pipes for proper alignment; the connections and/or terminals of the inlet and outlet pipes are suitable for and compatible with the fittings on the regulator. NOTICE! <ul style="list-style-type: none"> If there are swivel connectors, use the gaskets supplied by PIETRO FIORENTINI S.p.A. In case of direct assembly in the regulator body, use only cylindrical GAS connections (ref. UNI EN ISO 228-1).

Tab. 6.32.

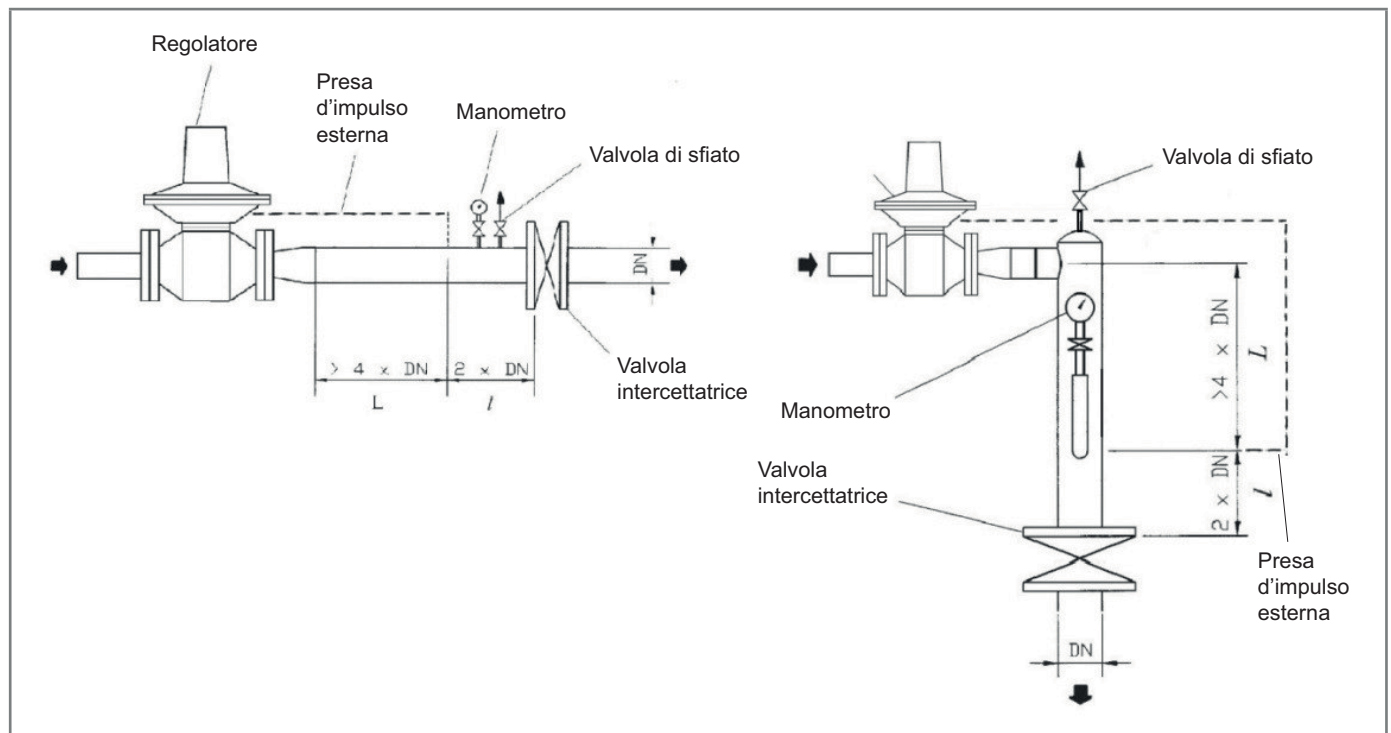


Fig. 6.10. Installation diagram

NOTICE!

The warranty shall be deemed null and void and PIETRO FIORENTINI S.p.A. shall not be held liable for any damage and/or malfunctions if the fittings used during installation are not those supplied.

6.5 - POST-INSTALLATION INSTRUCTIONS

WARNING!

Ensure that all connections are:

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

WARNING!

Protect the regulator from blows and impacts, even accidental.

6.6 - EQUIPMENT ADJUSTMENTS



NOTICE!

All regulators are calibrated to the values requested by the customer directly at PIETRO FIORENTINI S.p.A. factory

No further adjustments are required.

The calibration values are specified on the nameplate (refer to paragraph 2.8 “Applied rating plates”).

Adjustment

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

Tab. 6.33.

NOTICE!

Minor $\pm 10\%$ calibration changes with respect to the nameplate value (see paragraph 2.8 “Applied rating plates”) can be made only by adhering to the spring ranges specified in the tables in chapter 13 (“Calibration tables”).

NOTICE!

The relief valve pressure does not need to be adjusted.

NOTICE!

When varying the operating pressure you must:

- also vary the setting of the slam shut valve intervention for maximum and minimum pressure;
- check that the relief valve trips.

WARNING!

Contact PIETRO FIORENTINI S.p.A. for any further need.

Do not make any unauthorised changes to the equipment without the approval of PIETRO FIORENTINI S.p.A.

If it is necessary to change the calibration values, proceed as indicated in Tab. 6.34. to increase or decrease the operating pressure:

Step	Action	Necessary equipment
1	Loosen the upper cap (A) of the regulator.	-
2	Turn the ring nut (B) clockwise <ul style="list-style-type: none"> to increase the downstream pressure; anti-clockwise to decrease the downstream pressure. 	27 mm tubular socket wrench.
3	Tighten the upper cap (A) of the regulator.	-
4	Remove the cap of the slam-shut device (C).	-
5a	Turn the ring nut (D1): <ul style="list-style-type: none"> clockwise to increase the slam-shut valve's cut-in pressure for minimum pressure; anti-clockwise to decrease the slam-shut valve's tripping pressure due to minimum pressure. 	13 mm tubular socket wrench.
5b	Turn the ring nut (D2): <ul style="list-style-type: none"> clockwise to increase the slam-shut valve's cut-in pressure for maximum pressure; anti-clockwise to decrease the slam-shut valve's tripping pressure due to maximum pressure. 	27 mm tubular socket wrench.
6	Put the cap of the slam-shut device (C) back in place.	-

Tab. 6.34.

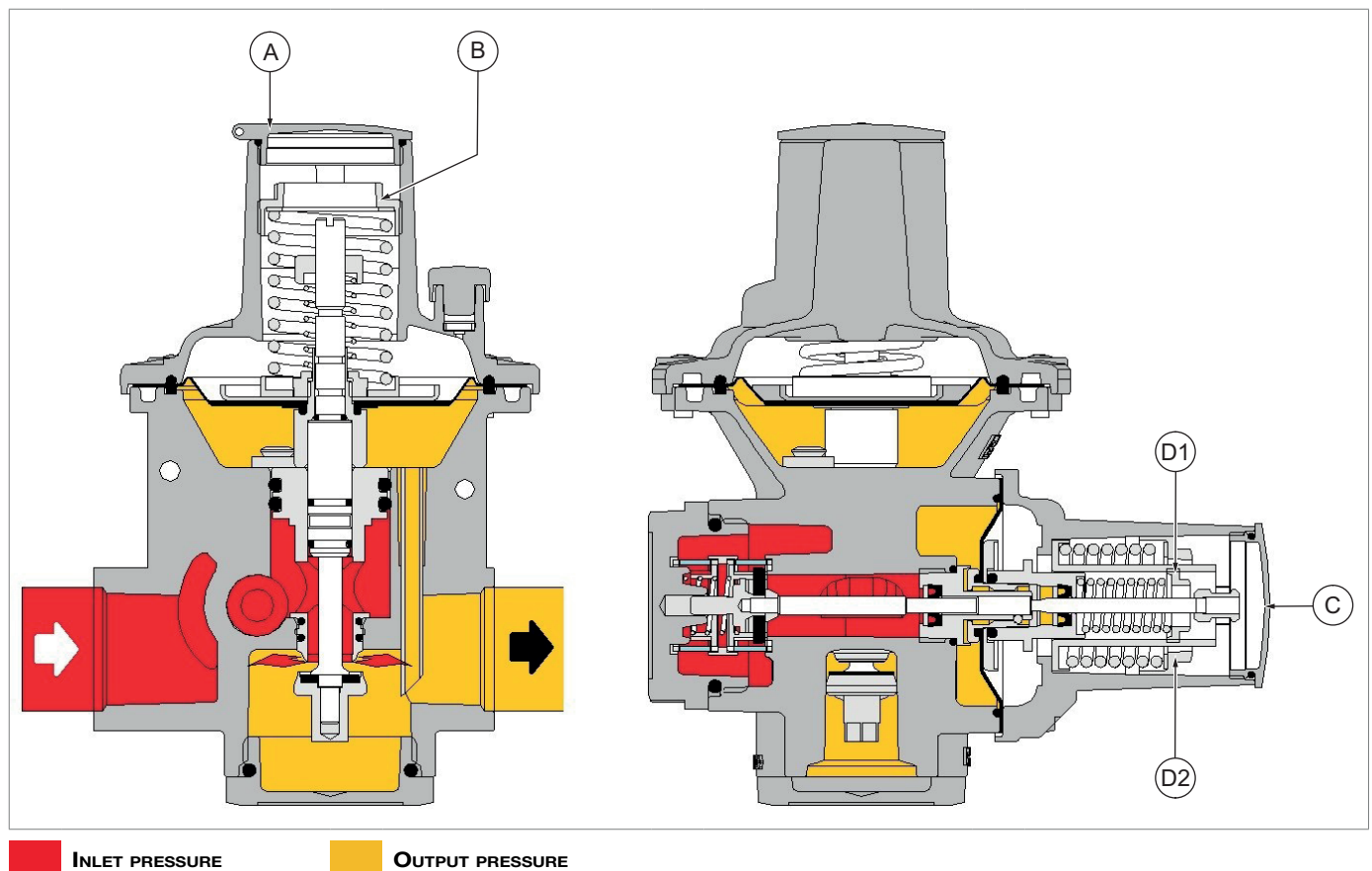



Fig. 6.11. Operating pressure regulations

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7 - COMMISSIONING/MAINTENANCE EQUIPMENT

7.1 - LIST OF EQUIPMENT

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

Tab. 7.35.

We list the types of equipment required for commissioning and maintenance of the regulator:

Ref.	Equipment type	Image
A	Combination wrench.	
B	Adjustable wrench.	
C	"Torx" screwdriver with hole.	
D	Double ended bi-hex tubular socket wrench.	

Tab. 7.36.

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8 - COMMISSIONING

8.1 - GENERAL WARNINGS

8.1.1 - SAFETY REQUIREMENTS FOR COMMISSIONING

HAZARD!

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

HAZARD!

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

WARNING!

During commissioning, remove any unauthorised personnel.

NOTICE!

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

The regulator and possibly other equipment (slam-shut valve, monitor) are normally supplied already calibrated at the required value.



NOTICE!

It is possible that for several reasons (e.g. vibrations during transport), calibrations could undergo changes, in any case remaining within the range allowed for the springs used. It is therefore advisable to check calibrations according to the procedures described in this manual.

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

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

Commissioning

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

Tab. 8.37.

8.2 - PRELIMINARY PROCEDURES FOR COMMISSIONING

HAZARD!

Before commissioning the equipment, it must be ensured that any risk of explosion or ignition source has been eliminated.

WARNING!

Before commissioning, it must be ensured that:

- the conditions of use comply with the characteristics of the equipment;
- during pressurisation, the equipment has no leaks.

ATTENTION!

To protect the equipment from damage, never:

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

8.3 - CALIBRATION OF SAFETY DEVICES

NOTICE!

The equipment is regulated at PIETRO FIORENTINI S.p.A. production plants

WARNING!

Do not tamper with or make any unauthorised changes to the equipment without the approval of PIETRO FIORENTINI S.p.A.

8.4 - COMMISSIONING THE REGULATOR

NOTICE!

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

8.5 - COMMISSIONING PROCEDURE WITHOUT BUILT-IN SLAM-SHUT VALVE

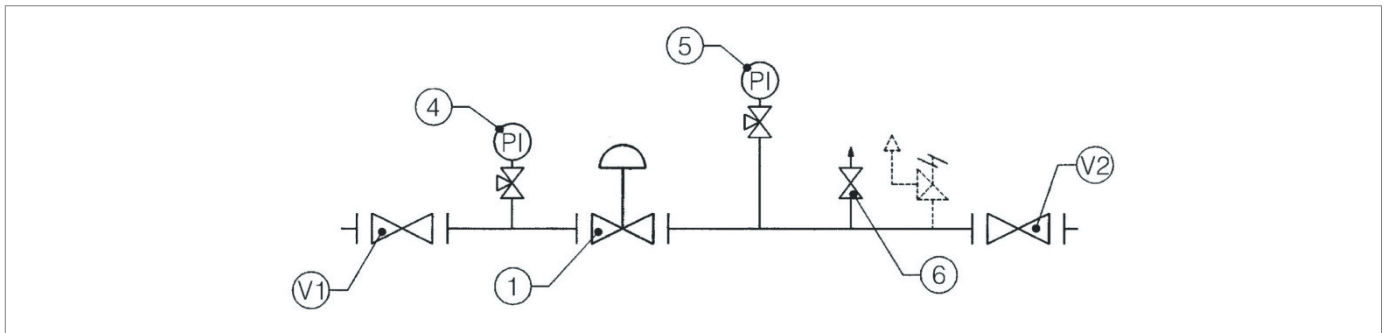


Fig. 8.12. Commissioning of regulator with built-in slam-shut valve

To commission the regulator, proceed as described in Tab. 8.38.:

Step	Action
1	Partially open the pressure relief valve (6) on the outlet pipe.
2	Open the inlet shut-off valve (V1) very slowly. <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p>! NOTICE! Check the pressure referring to the upstream pressure gauge (4).</p> </div>
3	Close the air vent valve and check: <ul style="list-style-type: none"> the tightness of the regulator; the value of its closing overpressure.
4	Using a foaming agent, check all the junctions between shut-off valves (V1 and V2) for proper sealing.
5	Open the downstream shut-off valve (V2) very slowly until the piping has been filled completely.

Tab. 8.38.

8.6 - START-UP WITH BUILT-IN SLAM-SHUT VALVE

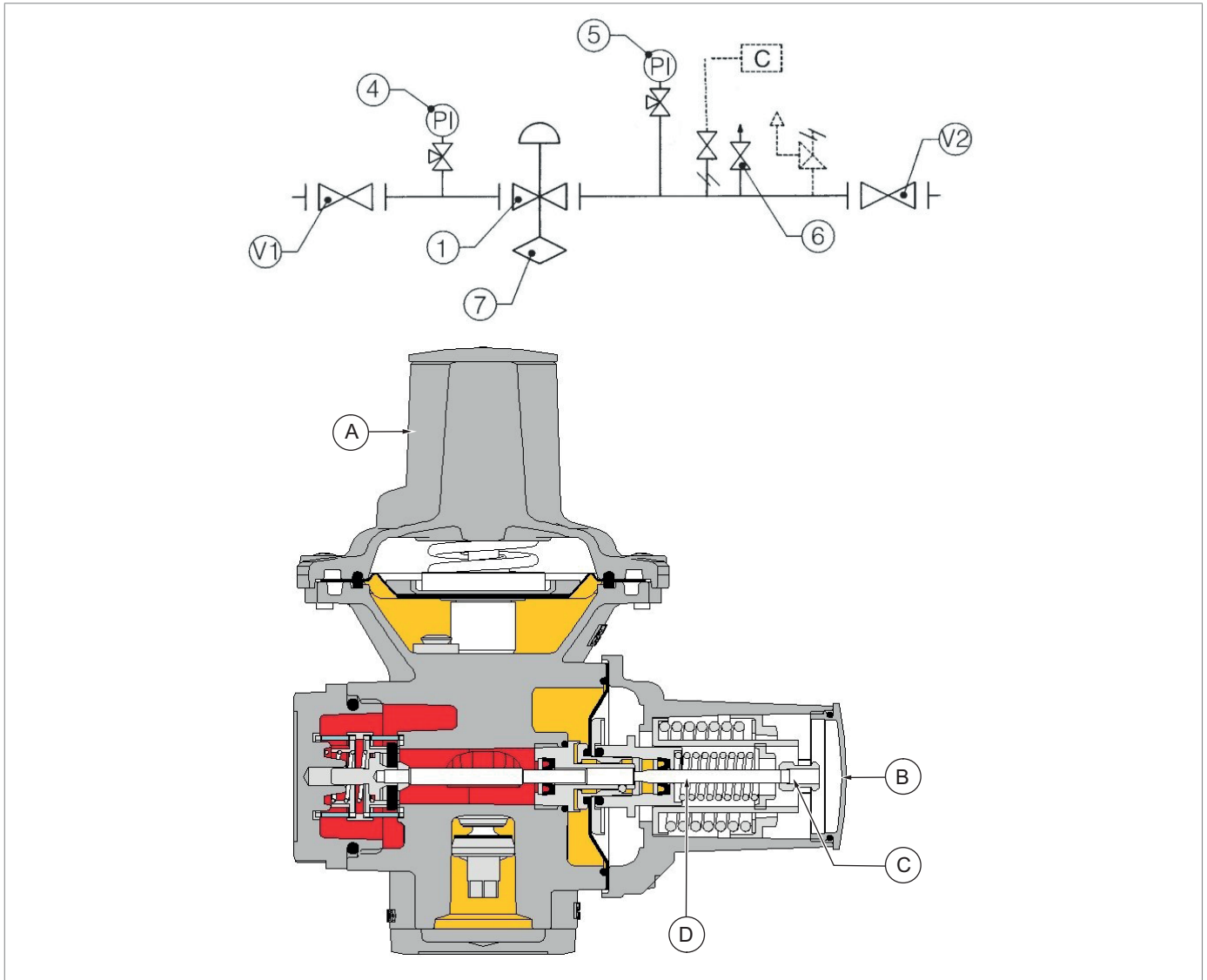


Fig. 8.13. Commissioning of regulator with built-in slam-shut valve

After completion of the slam-shut valve tightness test, for commissioning the regulator (A) with in-built slam-shut valve, proceed as shown in Tab. 8.39.:

Step	Action
1	Make sure that the slam-shut device is in the closed position.
2	Slowly open the inlet shut-off valve (V1) upstream of the regulator (A) to feed it.
3	Unscrew the protective cap (B).
4	Slowly press the reset bushing (C) to create the downstream bypass of the blocking pad. <div style="border: 1px solid blue; padding: 5px;"> <p>NOTICE! The bushing (C) must be pressed a few millimetres and the flooding time is a function of the downstream volume.</p> </div>
5	Press the bushing reset knob (C) fully down, once the filling is complete, to reset the slam-shut valve. The bushing stroke (C) is approximately 10 mm and will remain in position if reset. <div style="border: 1px solid blue; padding: 5px;"> <p>NOTICE! When pressing on the bushing, absolutely avoid rotation and bending of the shaft (D).</p> </div>

Step	Action
6	Check that the slam-shut valve remains cocked.
7	Partially open the pressure relief valve (6) on the outlet pipe.
8	Close the pressure relief valve (6) and check the lock up pressure value.
9	Using a foaming agent, check all the joints between shut-off valves (V1 and V2) for proper tightness.
10	Open the downstream shut-off valve (V2) very slowly until the piping has been filled completely.

Tab. 8.39.

8.7 - COMMISSIONING (WITH AND WITHOUT BUILT-IN SLAM-SHUT VALVE) AND MONITOR

! NOTICE!

For the commissioning procedure of the regulator (A) with monitor (with and without slam-shut valve - B) follow the procedures described in sections 8.6 (for the regulator with slam-shut valve) and 8.5 (for the regulator without slam-shut valve).

! NOTICE!

The regulator (A) with monitor (with and without slam-shut valve - B) does not require any field calibration.

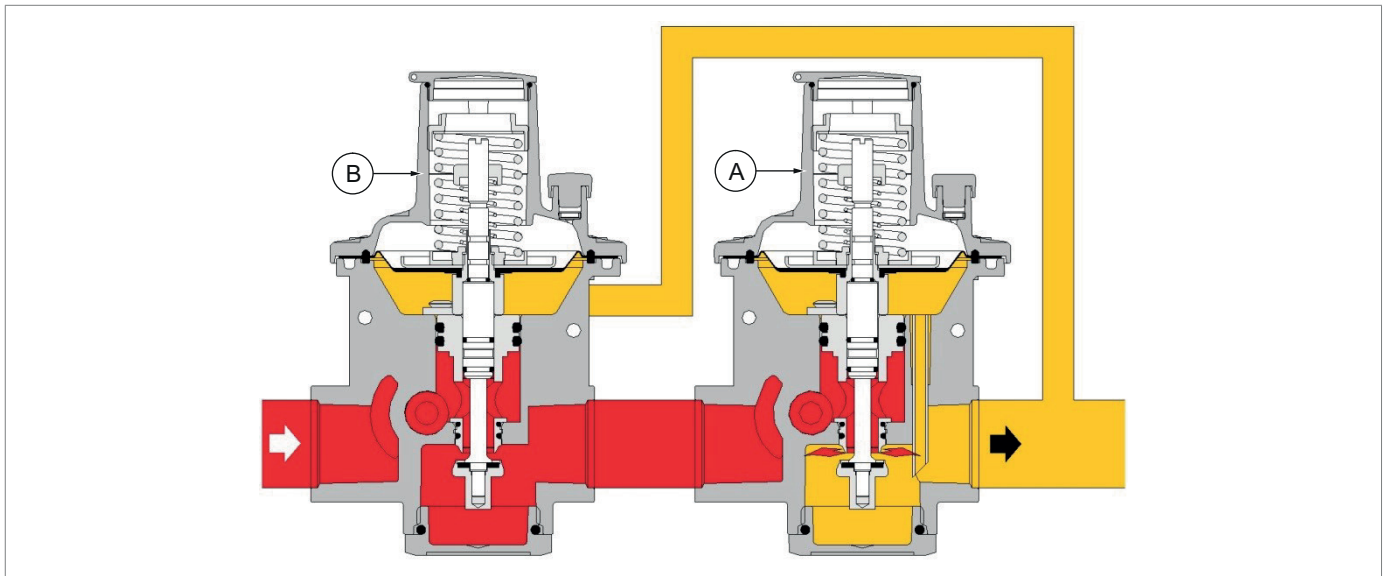


Fig. 8.14. Commissioning Regulator + Monitor

! NOTICE!

If present, proceed as described in section 8.6.1 to check the tightness of the slam-shut valve.

8.8 - PROPER COMMISSIONING CHECK

Check the connections made during the installation of the equipment (refer to chapter 6 “Installation”) for proper sealing through a foaming solution (or equivalent control system).

8.9 - RESET OF SAFETY DEVICES AFTER COMMISSIONING

HAZARD!

Before resetting the safety devices, eliminate the causes that caused them to trip.

ATTENTION!

- The maximum pressure slam-shut device is not reset if overpressure has not been eliminated in the network, downstream of the gearbox.
- The minimum pressure device will not reset if the fault has not been rectified in the network.

NOTICE!

While resetting the safety devices, the relief valve can temporarily trip.

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9 - MAINTENANCE AND FUNCTIONAL CHECKS

9.1 - GENERAL WARNINGS

HAZARD!

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

HAZARD!

Extraordinary maintenance:

- requires extensive and specialised knowledge of the machines, operations required, risks involved and correct procedures to operate safely;
- must be provided by qualified, trained and authorised technicians.

WARNING!

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

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

WARNING!

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

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

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

NOTICE!

Maintenance work is strictly related to:

- the quality of the conveyed gas (impurities, humidity, gasoline, corrosive substances);
- the state of cleanliness and preservation of the pipes upstream of the regulator;
- the level of reliability required by the reduction system;
- the equipment conditions of use.

Before beginning disassembly of the equipment, make sure that:



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

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

Commissioning and maintenance operations	
Routine maintenance	Reference UNI 10702-1:2019: “Pressure control and/or gas measurement systems operating with upstream pressure between 0.04 bar and 12 bar - Part 1: Surveillance of pressure control”.
Extraordinary maintenance	All those operations to be carried out by the operator as required by the equipment.

Tab. 9.40.

9.2 - MAINTENANCE OPERATIONS

Routine and extraordinary maintenance work	
Operator qualification	<ul style="list-style-type: none"> • Name of the user. • Specialised technician.
PPE required	 <div style="background-color: #f4a460; padding: 5px; margin-top: 10px;">  WARNING! </div> <p>The PPE listed in this table is related to the risk associated with the equipment. For the PPE required to protect against risks associated with the workplace, installation or operating conditions, please refer to:</p> <ul style="list-style-type: none"> • the regulations in force in the country of installation; • any information provided by the Safety Manager at the installation facility.
Necessary equipment	Refer to Chapter 7 'Commissioning/maintenance equipment'.

Tab. 9.41.

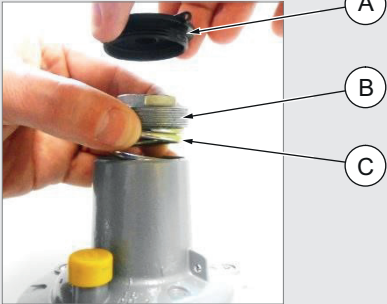
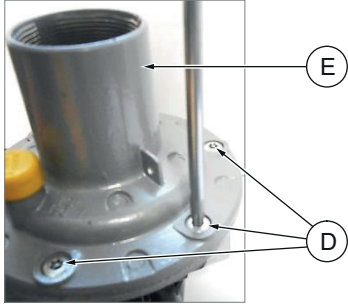
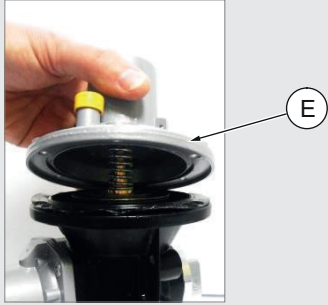
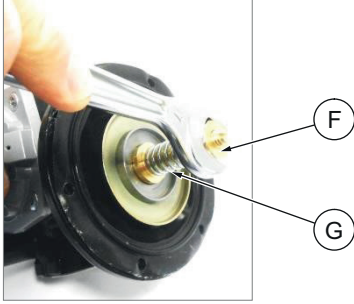
9.2.1 - PRELIMINARY OPERATIONS




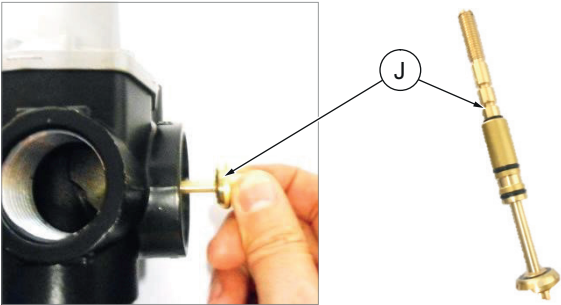

Before proceeding with maintenance operations, it must be ensured that:

- the regulator is in safe conditions;
- that the pressure upstream and downstream of the regulator is zero.

9.2.2 - HP100 REGULATOR

The procedure for disassembling and assembling the regulator, in order to service its internal components, is described in Tab. 9.42.:

Step	Action	Image
1	Disconnect the fittings between the regulator and the downstream pressure sensing point (sensing line), if foreseen.	
2	<p>Unscrew the cap (A) and inner adjustment ring (B) by hand, then pull out the spring (C).</p> <p>Equipment required to unscrew the ring nut (B): 27 mm double polygonal socket spanner.</p>	
3	<p>Remove the screws (D) which fasten the upper support lid (E) to the body.</p> <p>Equipment required to unscrew the screws (D): "Torx" T25 screwdriver with hole.</p>	
4	Remove the top cover (E).	
5	<p>Unscrew the nut (F) completely and pull off the spring (G).</p> <p>Equipment required to unscrew the nut (F): combination spanner 17 mm.</p>	

Step	Action	Image
6	Take out the diaphragm unit (H).	
7	Unscrew the lower cap (I). Equipment required to unscrew the lower cap (I): adjustable needle spanner CH50 mm.	
8	Take out the shaft (J). <div style="background-color: #f4a460; padding: 5px; border: 1px solid black;">  WARNING! </div> <ul style="list-style-type: none"> INTERNAL RELIEF VALVE ACTIVE: the o-ring must be in the lower groove of the diaphragm shaft. INTERNAL RELIEF VALVE DEACTIVATED: the o-rings must be in the three grooves. 	
9	Reassemble the regulator by replacing the diaphragm assembly (Step 6) and shaft (Step 8) by performing the steps described in reverse order. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  NOTICE! </div> <ul style="list-style-type: none"> Grease the fixing screws (D) of the upper support cover (E) and the regulator cap (A) before tightening: <ul style="list-style-type: none"> screw tightening torque: 4Nm; cap tightening torque 10 Nm. Lubricate the o-ring with grease suitable for NBR elastomeric materials before inserting the shaft (J). 	

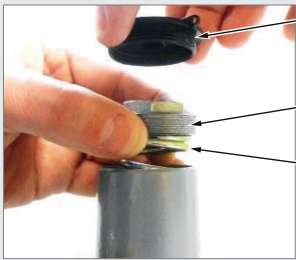
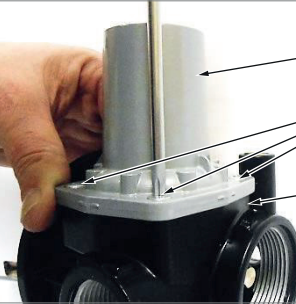
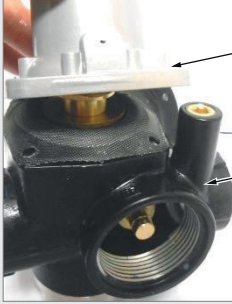
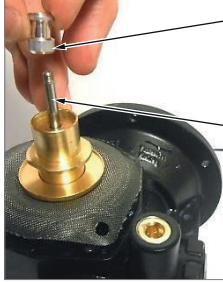
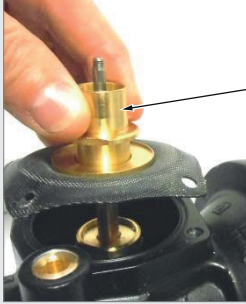
Tab. 9.42.

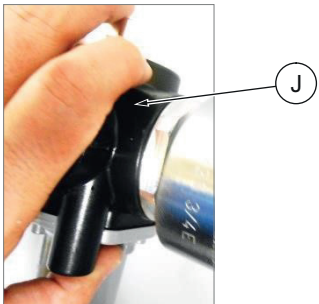
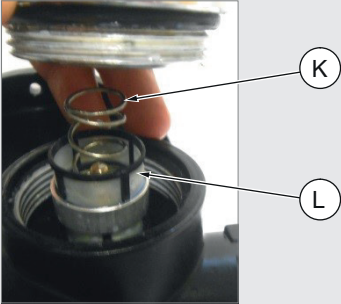
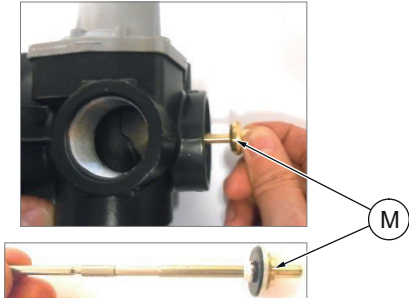
 **NOTICE!**

Check adjustment and internal/external seals of the regulator at the end of maintenance.

9.2.3 - SLAM-SHUT VALVE

The procedure for disassembling and assembling the slam-shut valve, in order to service its internal components, is described in Tab. 9.43.:

Step	Action	Image
1	Make sure that the slam-shut device is in the closed position.	
2	Unscrew the cap (A) and inner adjustment ring (B) by hand, then pull out the spring assembly (C). Equipment required to unscrew the ring nut (B): 27 mm double polygonal socket spanner.	
3	Remove the screws which fasten the support lid (E) to the body (F). Equipment required to unscrew the screws (D): "Torx" T25 screwdriver with hole.	
4	Remove the support cover (E).	
5	Unscrew the manual reset sleeve (H) by hand from the lock shaft (G).	
6	Remove the slam-shut diaphragm assembly (I) by pulling the slam-shut shaft (G) slightly upwards.	

Step	Action	Image
7	Unscrew the lower cap (J). Equipment required to unscrew the lower cap (J): adjustable needle spanner CH50 mm.	
8	Remove the spring (K) and the filter (L);	
9	Take out the shaft (M).	
10	Reassemble the regulator by replacing the diaphragm assembly (Step 6) and shaft (Step 9) by performing the steps described in reverse order. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>! NOTICE!</p> <ul style="list-style-type: none"> • When inserting the diaphragm assembly (I), check that the 3 locking balls are inside the 3 holes of the housing. • Grease the fixing screws (D) of the support cover (E) and the regulator cap (A) before tightening: <ul style="list-style-type: none"> • screw tightening torque: 4Nm; • cap tightening torque 10 Nm. • Lubricate the o-ring with grease suitable for NBR elastomeric materials, before inserting the shaft (M). </div>	

Tab. 9.43.

! NOTICE!

Check the setting and internal/external seals of the slam-shut valve after completion of maintenance.

10 - TROUBLESHOOTING

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

10.1 - GENERAL WARNINGS

HAZARD!

Maintenance work must be carried out by qualified personnel:

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

WARNING!






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

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

NOTICE!

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

10.2 - OPERATOR QUALIFICATION SPECIFICATION

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

Tab. 10.44.

10.3 - TROUBLESHOOTING PROCEDURES

For proper troubleshooting, proceed as follows:

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

10.4 - TROUBLESHOOTING TABLES

NOTICE!

Refer to chapter 9 “Maintenance and functional checks” for the pictures of the HP 100 regulator and its accessories.

10.4.1 - TROUBLESHOOTING HP100 REGULATOR

Failure	Possible causes	Intervention
No sealing at zero flow.	Valve seat damaged.	Send the regulator to the manufacturer for extraordinary maintenance.
	Damaged plug.	Replacement.
	Damaged membrane.	Replacement.
	Filth or foreign bodies in sealing area.	Cleaning.
Pumping.	Unsuitable feed pressure to the regulator.	Adjust the flow rate of the AR100 lamination valve.
	Abnormal friction of plug rod unit.	Clean and/or possibly replace sealing and/or guide elements.
Increase Pd with Q>0	Diaphragm breakage.	Replacement.

Tab. 10.45.

10.4.2 - SLAM-SHUT VALVE TROUBLESHOOTING

WARNING!

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

Failure	Possible causes	Intervention
The slam-shut plug does not close.	Breakage of measuring head diaphragm.	Replacement.
Leakage of slam-shut plug.	Plug gasket worn.	Replacement.
	Plug seat eroded or tarnished.	Regulator to be replaced.
Increase Pd with Q>0.	Diaphragm breakage.	Replacement.
Incorrect release pressure.	Incorrect max and/or minimum spring calibration.	Repeat calibration by adjusting the ring nuts.
	Abnormal friction of plug rod unit.	Cleaning and possible replacement.
The slam-shut valve does not reset.	Persistence of the cause led to downstream pressure increase or decrease.	Drop or increase the downstream pressure.
	Shafts broken or chipped.	Replacement.
	Release device broken.	Replacement.

Tab. 10.46.

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11 - UNINSTALLATION AND DISPOSAL

11.1 - GENERAL SAFETY WARNINGS

HAZARD!



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

WARNING!

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

11.2 - QUALIFICATION OF THE OPERATORS IN CHARGE

Commissioning

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


Tab. 11.47.

11.3 - UNINSTALLATION

ATTENTION!

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

To properly uninstall the equipment, proceed as specified in Tab. 11.61.:

Step	Action
1	Close the valves upstream and downstream of the equipment.
2	Disconnect the upstream and downstream pipes from the equipment by unscrewing the fittings with adequate hand tools.
3	Remove the equipment. <div style="border: 1px solid #0070c0; padding: 5px; margin-top: 5px;">  NOTICE! </div> <p>Seal the valves upstream and downstream of the equipment if:</p> <ul style="list-style-type: none"> closing the system; the equipment is not replaced immediately.

Tab. 11.48.

11.4 - INFORMATION REQUIRED IN CASE OF RE-INSTALLATION

NOTICE!

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

- “Installation”;
- “Commissioning”.

11.5 - DISPOSAL INFORMATION

NOTICE!

- **Proper disposal prevents damage to humans and the environment and promotes the reuse of precious raw materials.**
- **Bear in mind that the regulations in force in the country of installation must be complied with.**
- **Illegal or improper disposal involves the application of the penalties provided for by the regulations in force in the country of installation.**

The equipment was manufactured with materials that can be recycled by specialised companies.
For proper disposal of the equipment, proceed as specified in Tab. 11.62:

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

Tab. 11.49.

The equipment in any configuration consists of the materials described in Tab.11.63.:

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

Tab. 11.50.

NOTICE!

The above materials refer to standard versions. Different materials can be provided for specific needs.

NOTICE!

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

12 - RECOMMENDED SPARE PARTS

12.1 - GENERAL WARNINGS

NOTICE!

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

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

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

12.2 - HOW TO REQUEST SPARE PARTS

NOTICE!

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

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13 - CALIBRATION TABLES

13.1 - REGULATOR SPRINGS AND RELIEF VALVE CALIBRATION TABLES

! NOTICE!

When the value indicated on the regulator plate is equal to the minimum or maximum value of a spring referred to in the tables, the spring installed in the regulator is the one featuring the minimum range value equal to the calibration value specified on the data plate.

SPRING NOTES

N	Description
1	Relief spring code 64470038GI [Pd+(100 - 549)]
2	Relief spring code 64470031RO [Pd+(200 - 399)]
3	Relief spring code 64470038GI [Pd+(400 - 1299)]

Tab. 13.51.

HP 100 AP

Pos.	Code	Colour	d	Lo	De	No.	Setting field (mbar)
1	64470135GI	YELLOW	3.2	63	34	1	300 - 349
2	64470203VE	GREEN	4	64	34	1	350 - 800

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = Outer Diameter (mm) **N** = Spring Notes (see Tab. 13.52.)

Tab. 13.52.

HP 100 APTR

Pos.	Code	Colour	d	Lo	De	No.	Setting field (mbar)
1	64470203VER	GREEN	4	64	34	2-3	800 - 1499
2	64470118RO	RED	4.5	68	34	3	1500 - 2499
3	64470165BI	WHITE	5	64	34	3	2500 - 4500

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = Outer Diameter (mm) **N** = Spring Notes (see Tab. 13.52.)

Tab. 13.53.

13.2 - CALIBRATION TABLES FOR SLAM-SHUT VALVE SPRINGS

HP 100					
Code	Colour	d	Lo	De	Setting field (mbar)
					Maximum pressure triggering
64470116GI	YELLOW	34	40	3.2	450 - 599
64470051BI	WHITE	34	50	3.2	600 - 1299
64470057BL	BLUE	34	50	3.5	1300 - 1999
64470058AR	ORANGE	34	50	4	2000 - 3499
64470059AZ	SKY BLUE	34	50	4.5	3500 - 4999
64470060NE	BLACK	34	48	5	5000 - 7000
					Maximum pressure triggering
64470024BI	WHITE	15	45	1.3	100 - 199
64470038GI	YELLOW	15	40	2	200 - 999
64470045MA	BROWN	15.3	41	2.4	1000 - 1999
64470046BL	BLUE	15	40	3	2000 - 3000
d = Wire Diameter (mm) Lo = Spring Length (mm) De = External Diameter (mm)					

Tab. 13.54.

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