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DGI GmbH



## D Series Pressure Regulator Manual

DGI provides a professional solution for natural gas transmission and distribution.





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## Warning

Regulation installations must respect legal directives and norms in force in the country of installation, with particular attention to the health and safety of persons, domestic animals, and property.

Pay special attention to norms and restrictions in matters of positioning for installations, with respect to distance from roads with intense traffic and the geology of the territory, adopting necessary precautions, or contact our technical department for specific installation solutions.

Furthermore, we recommend to contact our technical department in case of installation in a location with special characteristics (chemical installations, refineries, or in extreme climactic and environmental conditions) in order to verify the instruments suitability.

## General

### Description

The series D pressure regulator, equipped with loaded spring, controlling diaphragm and balanced valve, is suitable for low and medium pressure.

The regulators are widely used in both civil and industrial installations using Natural Gas, LPG and other non-corrosive gases.

### Features

- High flow coefficient
- High accuracy, even at high flow rates
- Fail to open
- Reduced lock-up pressure zone and lock-up pressure
- Optional built-in relief valve
- Reduced response time, no internal leakage at zero flow rate
- Optional slam shut device
- Periodic maintenance without disassembling the valve from the pipeline

## Specification

### Operating Parameters

- Maximum inlet pressure: 5bar
- Outlet pressure range: from 15 to 500 mbar
- Overpressure setting range: from 20 to 800 mbar
- Underpressure setting range: from 25 to 370 mbar
- Accuracy class (AC): up to 5
- Lock up pressure class (SG): up to 10
- Working temperature: -20°C – +60°C



### Flow Coefficient (Cg):

D50	D75	D100
115	165	200

### Connecting Parameters

Type	D50	D75	D100
Connecting size	Rp1"	Rp1"	Rp1" xRp1-1/2"
Standard	internal thread in line with ISO 7/1		

### Materials

Valve Body	Covers	Diaphragm	Seat	O-ring
Ductile cast iron (GJS 400-18-LT EN1563) Optional: Cast steel (ASTM A216 WCB)	Aluminum EN AC 46000 EN 1706	Enhanced fiber rubber	Stainless Steel	Nitrile rubber

## Model Introduction

Model	Description
D	Series D Pressure Regulator
50	The different numbers represent different capacity A greater value means a greater capacity
75	
100	
LP	P1 ≤ 5bar, 15mbar ≤ P2 ≤ 150mbar
MP	P1 ≤ 5bar, 100mbar ≤ P2 ≤ 500mbar
R	With internal relief, omit R means no relief

\*P1: Inlet pressure, P2: Outlet pressure

Model	Description
SD	Series SD Shut-off Valve
3	Type 300 Shut-off Valve
1	With over pressure and under pressure shut-off
2	With over pressure shut-off
1	20mbar ≤ OPSO ≤ 254mbar, 25mbar ≤ UPSO ≤ 104mbar*
2	247mbar ≤ OPSO ≤ 800mbar, 93mbar ≤ UPSO ≤ 370mbar

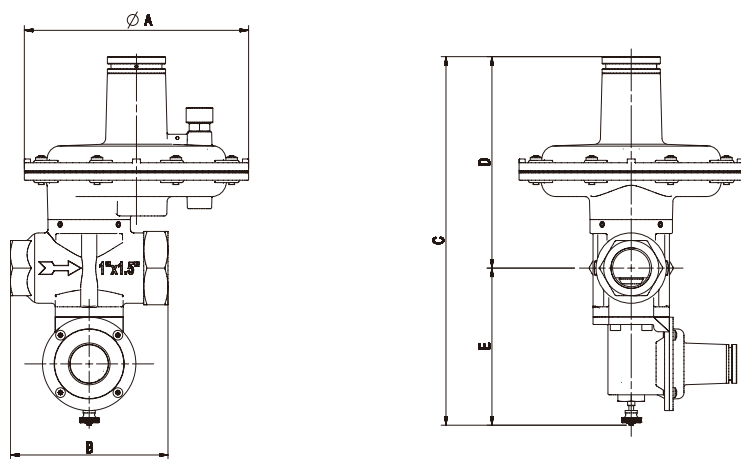
\*OPSO: Over pressure shut-off value, UPSO: Under pressure shut-off value

### Nameplate

DGReg	Type	SN	CE	DGReg	Type	SN	CE
	DN	PN	Year			Year	
Ts	Pumax	Cg		Ts	PS	Functional	
Ps	Bpu	AC		Wdu	Wdo	AG	
Wd	Fluid	SG		Wdsu	Wdso	Made In Germany	
Wds	Relief	Made In Germany					

TS:	Operating temperature range	Bpu:	Inlet pressure range	Cg:	Flow Coefficient
PS:	Allowable pressure	Wdu:	Underpressure Setting range	AC:	Accuracy class
Wd:	Outlet pressure range	Wdsu:	Underpressure range of the spring	SG:	Lock-up pressure class
Wds:	Pressure range of the spring	Wdo:	Overpressure setting range	AG:	Accuracy class of shutoff
Pumax:	Maximum inlet pressure	Wdso:	Overpressure range of the spring		

## Structure Dimensions



Model	A	B	C	D	E	Weight(KG)
D50	145	100	282	162	120	2.6
D75						2.64
D100	185	130	302	174	127	2.8

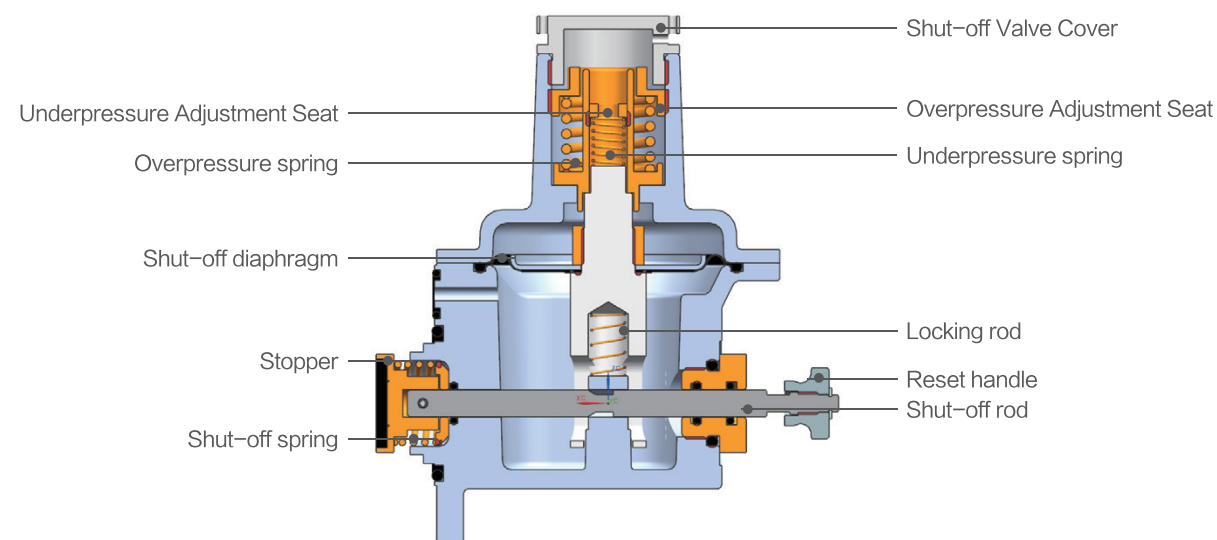
Unit: mm

## Structure Principles

### Shut-off valve

The shut-off valve consists of a sensing device and a shut-off section. It operates independently and is structurally separated from the main pressure regulator, shutting off the upstream pressure of the pressure regulator.

The operation of the shut-off valve is based on the locking system of the shut-off rod. The top of the shut-off rod is equipped with a stopper. If the pressure below the shut-off diaphragm is equal to the underpressure spring load, the shut-off diaphragm is in a balanced position. The steel ball inside the locking rod will restrict the movement of the shut-off rod, preventing the stopper from moving forward. When the pressure below the diaphragm is significantly less than the underpressure spring load, the shut-off diaphragm moves downward, allowing the steel ball to move freely, releasing the shut-off rod. The stopper moves under the action of the shut-off spring. When the pressure below the diaphragm is significantly greater than the overpressure spring load, the shut-off diaphragm moves upward, and the steel ball is also in a free state, releasing the shut-off stem. The stopper moves under the action of the shut-off spring. When the pressure returns to normal, the shut-off valve is reset by pulling the reset handle.



### Main Regulator

Unless otherwise specified, all D Series pressure regulators operate on the same operating principle, as described below: The series D pressure regulator is a direct-acting device to control pressure through internal sensing.

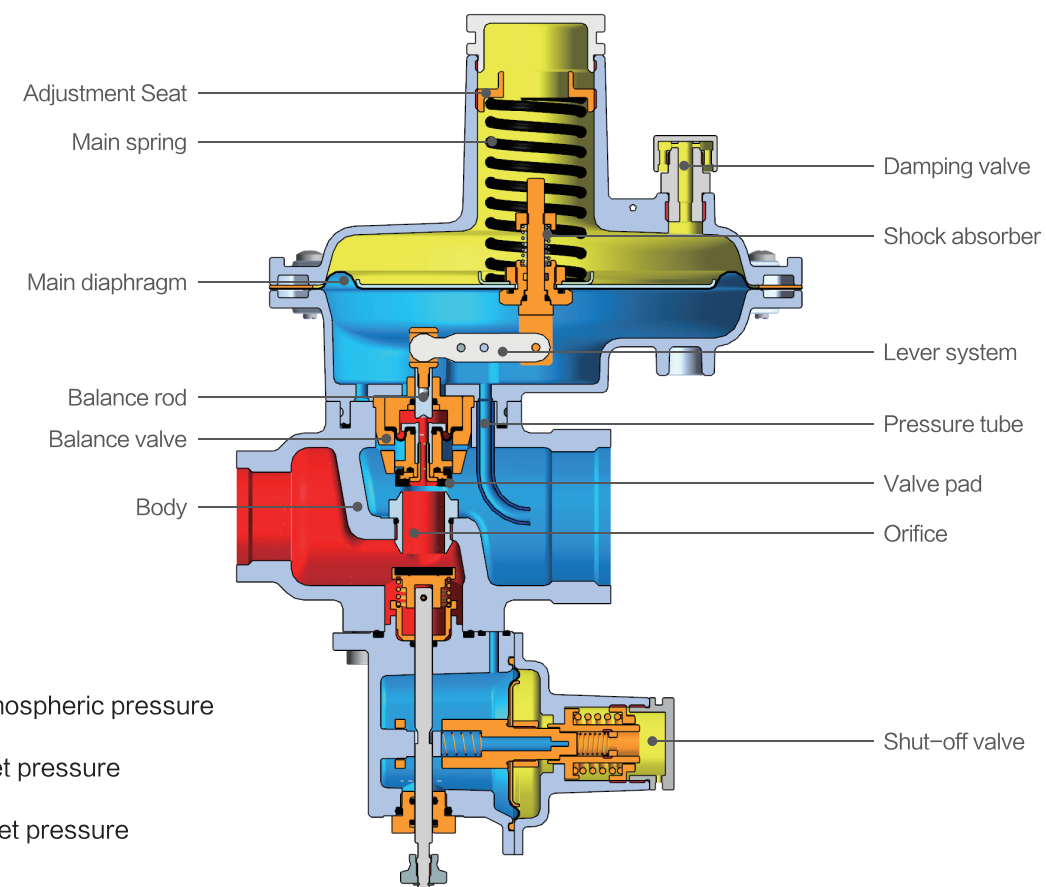
The downstream pressure is controlled by comparing the spring load and the thrust deriving from the downstream pressure on the diaphragm. The diaphragm's movement is transmitted by the lever system to the balance rod and valve pad. The valve pad is vulcanized with rubber and assures hermetic closing with the orifice when the required capacity is nil.

During operation if the downstream flow increase, the downstream pressure will decrease. So the thrust deriving from the downstream pressure is less than the spring load, the diaphragm lowers itself, and draws the valve pad away from the orifice, so more gas can be provided. And if the downstream flow decrease, the downstream pressure will increase. So the pressure under the main diaphragm is larger than the spring load, the diaphragm raises itself and draws the valve pad closer to the orifice. The flow will decrease.

These models are also equipped with several incorporated devices benefit to the performance of the regulator:  
 Balance valve: It helps the regulator to prevent the downstream pressure being changed when the upstream pressure varies. The upstream pressure is led to the upper balance diaphragm. So the upstream pressure is loaded both on the bottom valve pad and the upper balance diaphragm, they are balanced. When the upstream pressure varies, it will not affect to the moving of the valve pad.

Shock absorber: It protects the valve pad from damage due to abrupt increases in the regulated pressure. When the valve pad comes up against the orifice, and the regulated pressure exceeds the normal overload value, the mobile equipment stops, the main diaphragm will compress the spring of the shock absorber and move up alone until the gas release.

Damping valve. It reduces the inflow of the gas to the actuator during transitory phases, in order to exclude pumping phenomenon.



- atmospheric pressure
- inlet pressure
- outlet pressure



## Installation

### General Indications

The following is a list of general aspects which must be taken into consideration in using the instruments in gas regulation systems:

- A. Install a suitable filter upstream from the regulator to avoid damage due to impurities;
- B. Install instruments and regulation systems to protect environments such as containment kiosks or cement housings;
- C. Transport the instruments to the installation site in their original packing and make certain lifting mechanisms are available which are suited to the weight of the instrument, proceeding with handling operations using the lifting supports situated on the head;
- D. Carry out a visual check of the instrument, to make certain there has been no damage to the packing, such as dents to the heads, cracks on the body, and scratches in the flange sealing areas;
- E. Verify that the type of installation allows for a connection of the instrument impulse sockets, in accordance with norms in force;
- F. Verify that the part of pipes downstream from the instrument up to the impulse sockets presents no stop valves or other flow disruptors;
- G. Verify that the tightening of bolts and tie-rods is uniform, in order to avoid tensions, and that, for the flanged connections, gaskets are applied that are suitable for the type of fluid employed;
- H. Verify that in case of use with On/Off installations, there must be an adequate volume of gas between the instrument and the burner, so as to partly absorb pressure swings caused by rapid capacity variations.

### Preliminary operations

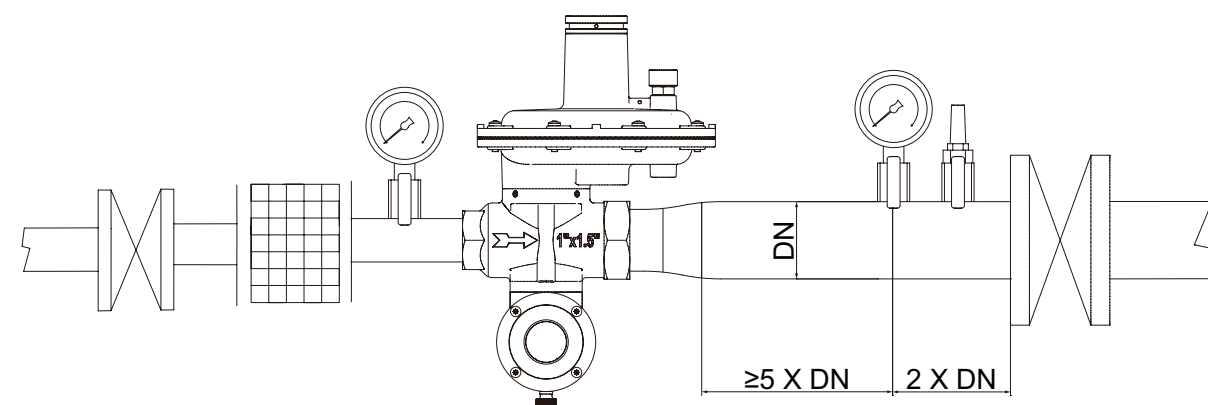
Before installing the regulator, check for the following:

- A. Sufficient space for pressure regulator installation and operation;
- B. The pipes upstream and downstream are aligned, correctly centered and capable of sustaining the regulator's weight without transmitting flex-torsion stress to the regulator body;
- C. The connection flanges are parallel and clean, the pipes upstream has been cleaned of any impurities (welding residue and slag), and flushed out of any residues of paint, water, etc.

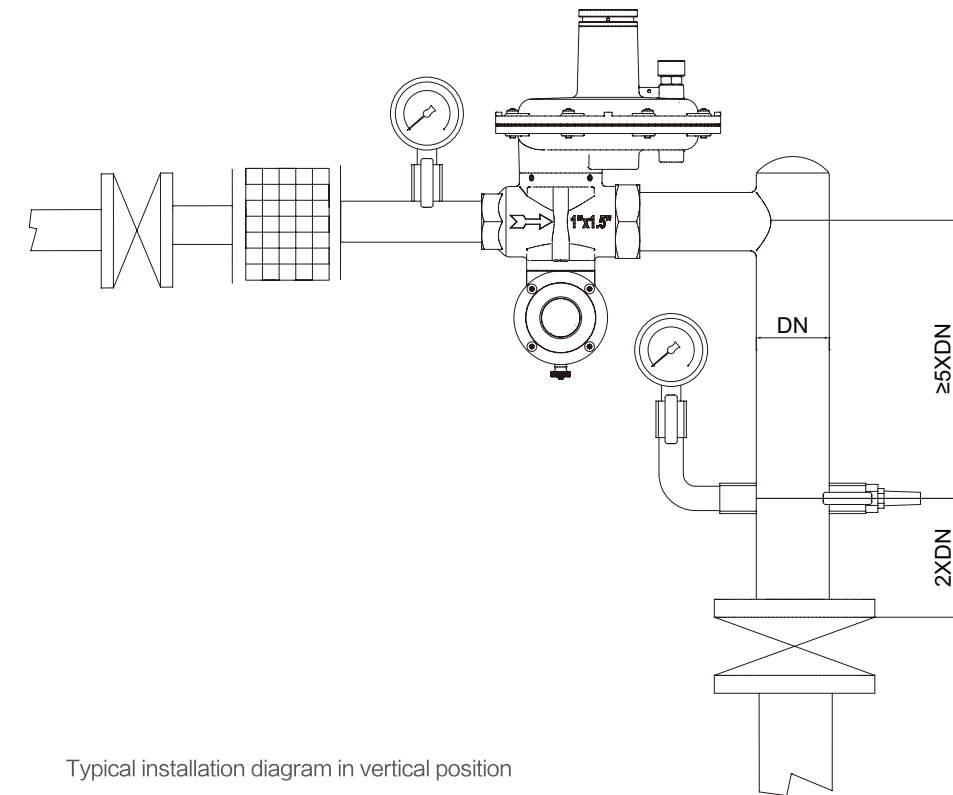
When the installation requirements demand it, the regulator can also be installed upside down. Pay attention to the fact that for this usage, the spring and calibration range for the device are different from standard settings. Please remember to specify the type of installation when ordering.

### Connections

- A. Be sure the regulator has been assembled so that the direction of gas flow corresponds to the direction of the arrow on the body of the instrument.
- B. Connect the pressure regulator as shown in the diagram, which illustrates the typical installation method.

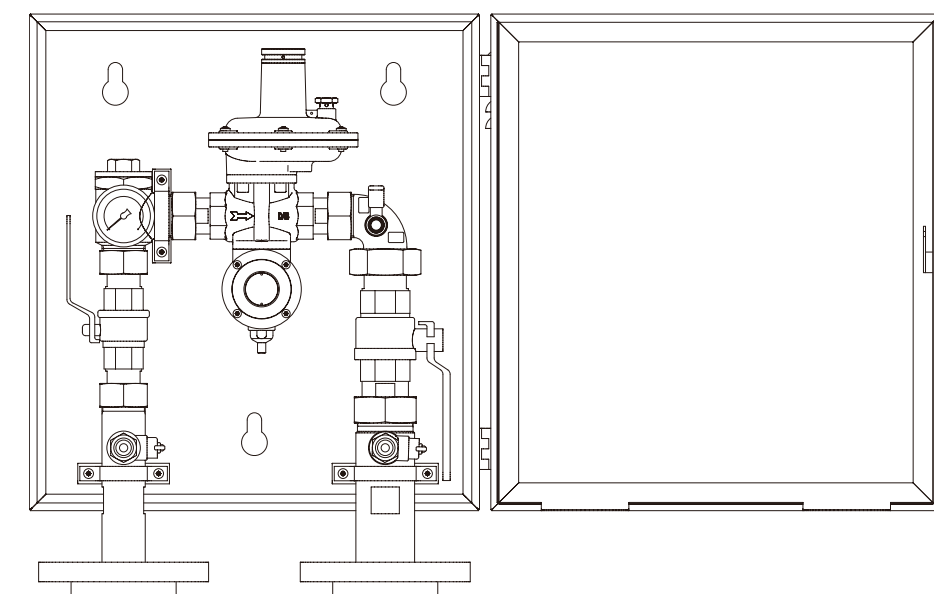


Typical installation diagram in horizontal position



Typical installation diagram in vertical position

- B. The pressure regulator is suitable for installation inside a case, which can generally save space.



Installation Inside Case

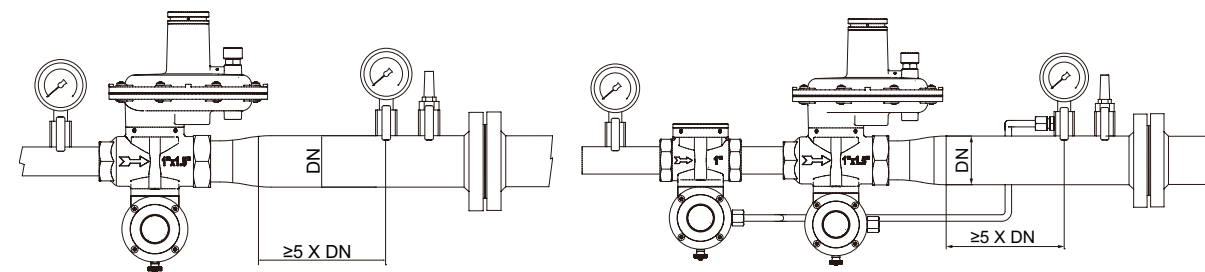
## Operation of the Regulator

### General Indications

- A. After installation, ensure that the input and output valves, as well as the by-pass valve, are closed, and that the pressure regulator cover is properly installed.
- B. Before start-up, we recommend checking that the instrument specifications conform to operating conditions. Check the instrument nameplate identification data.
- C. Before proceeding with the instrument start-up, we also recommend verifying that the system is sealed towards the outside. Proceed by spreading soapy water or some other foamy product over those areas which can allow the passage of gas between the inside and outside of the instrument (contact area of covers, screw housings, surface areas, etc.). If a leak is present, swelling and/or bubbles will be noted.
- D. The instruments are generally supplied already calibrated at our manufacturing plant, based on customer order specifications. In any case, we recommend verifying that the calibration values requested for the regulator and its accessories correspond to the data on the identification nameplate.
- E. For pressure systems with 2 or more streams, when starting, proceed with the start-up of one stream at a time, starting with the one designated as the standby.
- F. We recommend activating the stop valves very slowly and keep the gauge being closed during the valve opening phase. Otherwise it could damage the instrument.

### Start up

- A. Slightly open the downstream shut-off valve to allow the minimum required flow.
- B. Slowly open the upstream valve.
- C. Gradually open the shut-off valve; initially, open it to a small degree. Wait for the downstream pressure to rise near the set pressure before fully lifting the shut-off valve.
- D. If there are both independent shut-off valves and built-in shut-off valves installed on the pipeline, follow step C and first open the shut-off valve closest to the input valves on the flow direction.



Regulator with slam shut device

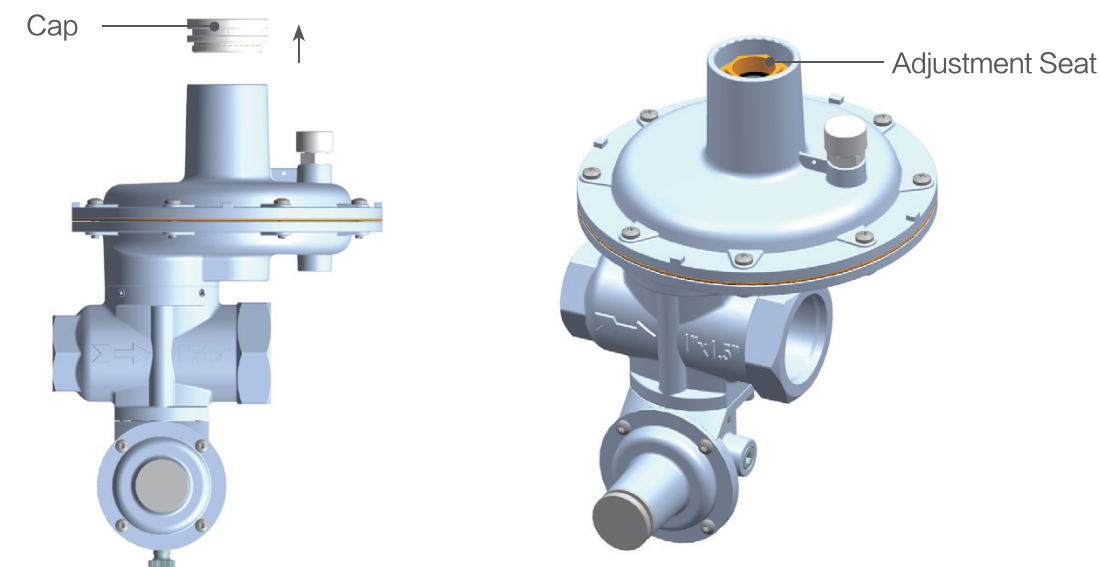
Regulator with slam shut + slam shut device

### Calibration

The pressure regulator is preset according to user order requirements before leaving the factory. If adjustments are necessary, they should be made within the allowable range of the installed spring. After adjusting the set pressure, verify whether the shutoff pressure needs to be adjusted synchronously.

Calibration should be proceed as follows:

- A. Install a pressure gauge downstream of the pressure regulator to check the regulated pressure.
- B. Remove the cap.
- C. Slowly open the gauge downstream and the stop valve upstream,
- D. Turn the adjustment seat of the regulator (clockwise to increase the pressure and counter-clockwise to reduce it). If there is a significant difference between the pressure that needs to be adjusted to and the originally set pressure, it may be necessary to replace the spring, selecting a spring, the most suitable from the table of springs.



## Operation of the Shut-off Valve

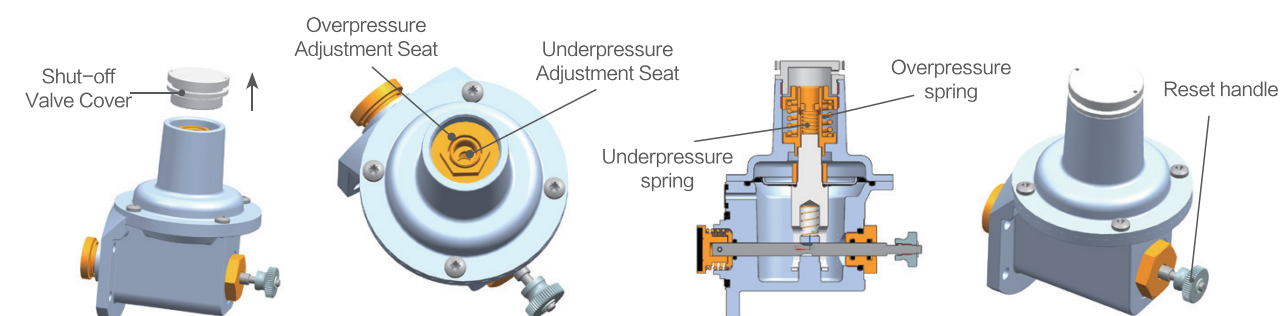
A. Remove the Shut-off Valve Cover

B. Turn the overpressure adjustment seat for overpressure shut-off and the underpressure adjustment seat for underpressure shut-off. Both adjustment seat are turned clockwise to increase the pressure and counter clockwise to reduce it.

C. If you need to achieve a pressure significantly different from the originally set pressure, you may need to replace the overpressure/underpressure spring. Select a suitable spring from the spring chart, dismantle the overpressure / underpressure adjustment seat and the original spring, install the new spring, and screw back the overpressure / underpressure adjustment seat. Adjust the shutoff pressure following step B.

D. Screw the shut-off Valve Cover back after adjusting.

E. Set the shut-off valve. When the shutoff reason is removed, pull the reset handle and release it slowly until the shut-off valve is set.



## Troubleshooting

At times, due to normal wear and tear of parts, special operating conditions, gas type variations, or during the initial operational phase, the pressure regulator may experience certain malfunctions. The table below lists common causes and solutions. These tables are not a substitute for professional troubleshooting and are intended only as an initial reference for problem-solving. If issues persist, please contact our technical department or authorized distributor for assistance.

No.	Problem	Reason	Solution
1	Regulator wide open	Main diaphragm damaged	Replace the diaphragm
		Main spring is soft and being solid pressed	Check the adjustment range of the spring and replace the spring
		The outlet pressure feed is not connected to the bottom diaphragm cavity	Connect the outlet pressure
2	Imperfect seal	Seal pad or orifice is worn out	Replace the pad or orifice
		Dirt in seal area	Clean the seal area
		Balancing diaphragm damaged	Replace the balancing diaphragm
3	No flow	Shut-off device is in closing position	Open the shut-off device
		Upstream valve is closed	Open the upstream valve
4	The outlet pressure reduced	The upstream pressure is too weak	Increase the upstream pressure
		Valve upstream is not widely open	Widely open the upstream valve
		Capacity request is more than instrument capacity	Decrease the flow or replace a larger regulator
		Filter upstream is clogged	Clean the filter
5	The shut-off valve is not worked	The shut-off diaphragm is broken	Replace the diaphragm
		The feed pipe to the shut-off valve is clogged	Clean the pipe
		The shut-off spring is solid pressed	Decrease the shutoff pressure value or replace a hard spring
6	The shut-off valve couldn't be set	The pressure downstream is not removed	Find the reason and remove it
		The pressure downstream is too high	Decrease the pressure downstream or adjust the shutoff spring to increase the shutoff pressure

## Spring Gauge Chart

### Pressure range of the regulator spring

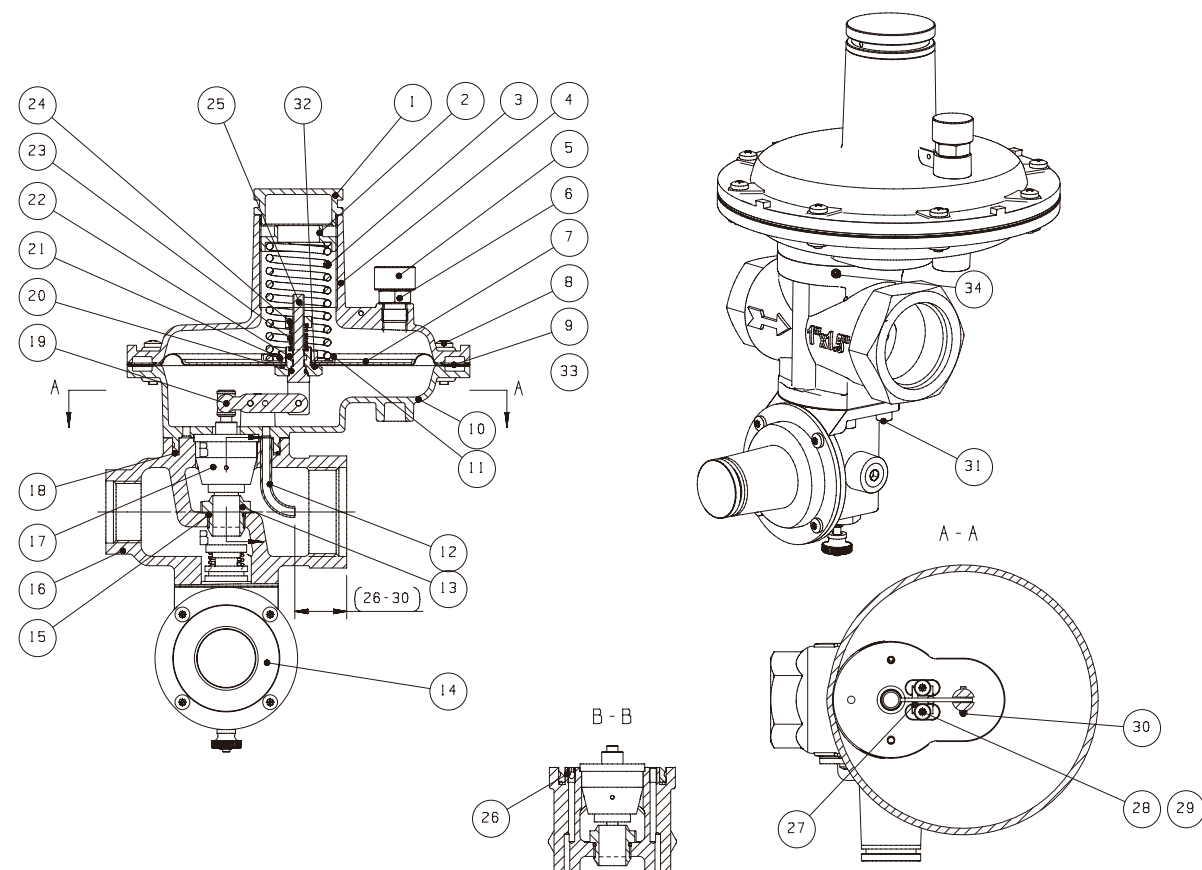
Model	Outlet pressure range (mbar)	Part number	Color
D50/75	15-30	19010807041	white
	25-45	19010807042	yellow
	40-75	19010807043	green
	70-130	19010807044	blue
	120-230	19010807045	red
	220-450	19010807046	black
	400-550	19010807047	white
D100	17-26	19010803152	yellow
	23-35	19010803153	green
	30-50	19010803154	blue
	45-70	19010803155	red
	60-90	19010803156	black
	85-150	19010803157	white
	145-200	19010803158	yellow
	190-270	19010803159	green
	260-360	190108031510	blue
	330-470	190108031511	red
	460-640	190108031512	black

### Pressure range of the shut-off spring

Model	version	Shut-off pressure range (mbar)	Part number	Color
Over pressure shut-off	SD301	28-50	19010803917	white
		40-70	19010803911	white
		74-140	19010803912	yellow
	SD302	140-220	19010803913	green
		240-370	19010803914	blue
		450-590	19010803915	red
Under pressure shut-off	SD301	760-900	19010803916	black
		28-78	19010803922	yellow
		60-140	19010803923	green
	SD302	125-245	19010803924	blue
		200-350	19010803925	red

## Parts List

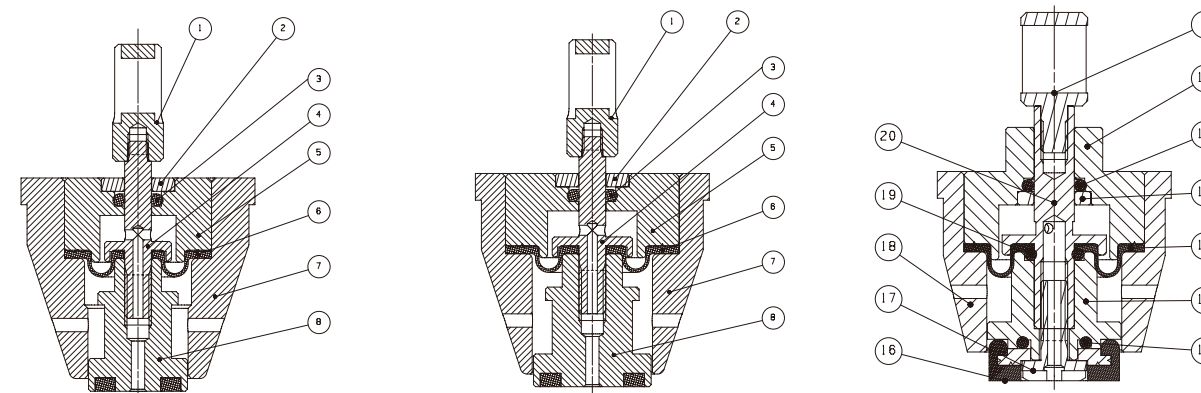
### Main Regulator



\* Recommended spare parts package parts

No.	Name	No.	Name	No.	Name
1	Cap	13	Orifice *	25	Diaphragm stem
2	Adjustment seat*	14	Shut-off valve	26	Screw
3	Main spring	15	O-ring*	27	Cylindrical pin
4	Top cover	16	Valve body	28	Screw
5	Cap	17	Balanced valve	29	Washer
6	Connecting head	18	O-ring*	30	Rivet
7	Liner	19	Lever	31	Screw
8	Screw	20	O-ring*	32	O-ring*
9	Diaphragm*	21	Diaphragm nut	33	Sealing gasket*
10	Bottom cover	22	Diaphragm base	34	Screw
11	Spring pad	23	Release spring		
12	Pressure tube	24	Diaphragm nut		

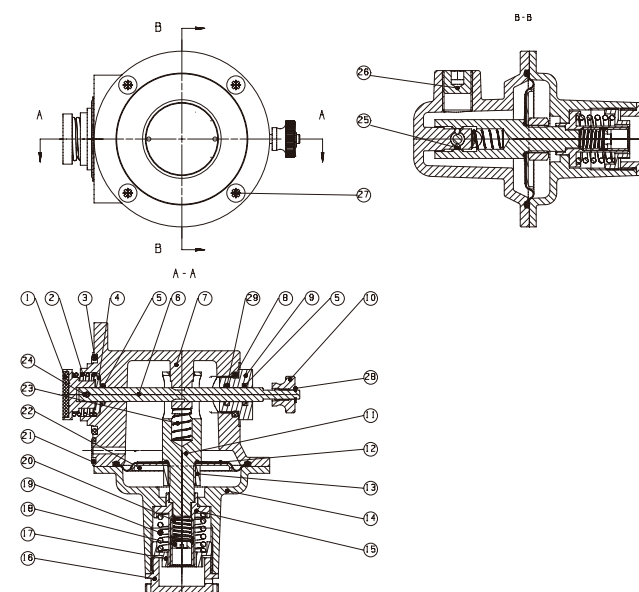
### Balanced valve



No.	Name	No.	Name	No.	Name
1	Connecting head	8	Valve Pad *	15	O-ring*
2	Compression ring	9	Connecting head	16	Valve pad*
3	O-ring*	10	Support seat	17	Screw
4	Valve stem	11	O-ring*	18	Liner
5	Support seat	12	Compression ring	19	O-ring*
6	Balanced diaphragm*	13	Balanced diaphragm*	20	Valve stem
7	Liner	14	Support block		

\* Recommended spare parts package parts

### Shut-off valve



No.	Name	No.	Name
1	Shut-off valve pad *	16	Cap
2	Spring	17	Overpressure adjustment seat*
3	O-ring*	18	Underpressure adjustment seat
4	Spacer	19	Overpressure spring
5	O-ring*	20	Underpressure spring
6	Shut-off valve stem	21	O-ring*
7	Valve body	22	Liner
8	O-ring*	23	Spring
9	Adapter	24	Elastic cylindrical pin
10	Nut	25	Steel ball
11	Diaphragm stem	26	Hexagon socket screw
12	Diaphragm*	27	Screw
13	Nut	28	Split pin
14	Top cover	29	O-ring*
15	Underpressure spring chamber		

\* Recommended spare parts package parts



## Product Maintenance

A correct maintenance program is indispensable for the proper operation of the instruments over time. Remember that all interventions on the equipment must be performed by technically qualified personnel. Before beginning disassembly operations on the instruments, be sure that you have available a series of wrenches and a series of spare parts. We recommend affixing indication signs on parts which may present problems of placement or positioning during the assembly phase.

A.Tightness test: Close the stop valve downstream from the instrument. An increase will be noted in pressure due to the normal overload in closing, which will stabilize after a few seconds. If, on the contrary, a pressure increase is noted downstream, even slowly, it is an obvious sign that the stopper is not providing a perfect seal. In this case, proceed with maintenance.

B.Trip test for slam shut device: Cut off the stream by means of the valves upstream and downstream, discharge the pressure by opening the valve. The slam shut device will release (if foreseen), connect suitable equipment to the valve to enable a variation in pressure, Increase the pressure up to the lock tripping value for maximum pressure, and check the value, continue to raise the pressure up to the trip of the 2nd slam shut (if present) and check the value, disconnect the test equipment, close the valve and service the stream.

C.Periodic maintenance: In order to prevent damage to the instruments and consequent installation shutdowns, we recommend carrying out the periodic replacement of components (mainly valve pad and main diaphragm) which can deteriorate due to normal mechanical wear .In conjunction, we recommend also verifying the accessory equipment on the decompression stream, such as, for example, filters, valves, etc.

### Tool List

Before performing maintenance operations, ensure that the appropriate tools are available to ensure the successful disassembly or assembly. Refer to the specific tool list for the required tools.

No.	DN	D50	D75	D100
A	L	150	150	150
B	Ch.	12,17,22	12,17,22	12,17,22
C	Ch.	3,4,5	3,4,5	2.5,3,4,5
D	Ch.	8"	8"	8"
E	Ch.	1/2"	1/2"	1/2"
F	Ch.	17,19,20,24	17,19,20,24	17,19,24,27
G	L	300	300	300
H	Ch.	2#	2#	2#
I	Ch.	2#	2#	2#
J	Ch.	2#	2#	2#
K	Cod	1901000200GZzp	1901000200GZzp	1901000200GZzp
L	Cod	1901080710GZzp	1901080710GZzp	1901080710GZzp

		
A Adjustable spanner	B Combined spanner	C Allen key
		
D Tapared nose plier	E Bent rod	F Exagonal bushing spanner
		
G hammer	H hexagonal screwdriver	I Flat screwdriver
		
J Philips screwdriver	K O-Ring extraction special tool	L Special tool