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DN 40
REGULATOR LBM 4000A3
REGULATOR LBM 4000D3

Cod. RILBM4000A3
Cod. RILBM4000D3

DESCRIPTION

The **LBM 4000□3** Regulator is designed for use in distribution networks with low to medium inlet pressures.

They are direct acting regulator, where the spring housing/regulator head (1) is mounted directly to the flanged body (2).

The **LBM 4010□3** versions include an optional Over-Pressure (OPSO) and/or Under-Pressure (UPSO) Shut-Off facility, which takes the place of the lower body plug (3).

Available in two versions, the (D, standard) need only be mounted inside an enclosure or cabinet, always protected from the rain. In version (F) the regulator can be mounted outdoors.

MODEL

There are two models in the range, depending on the required inlet/outlet pressures.

Model BP (Low pressure version): For outlet pressures from 2 to 10 kPa (20 to 100 mbar).
(Please refer to technical datasheet LBM 2500□1)

Model MP (Medium pressure version): For outlet pressures from 10 to 40 kPa (100 to 400 mbar).
(This technical sheet)

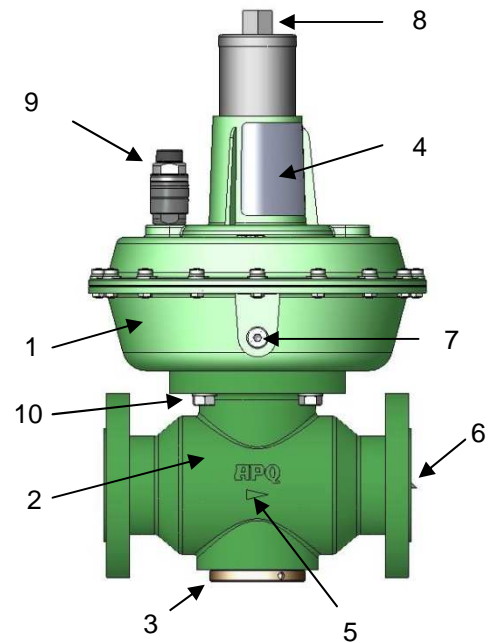
CONNECTIONS

Model LBM 4000 A3 is with 1.½" ANSI-150 flanges
Model LBM 4000 D3 is with DN-40 PN-25 flanges

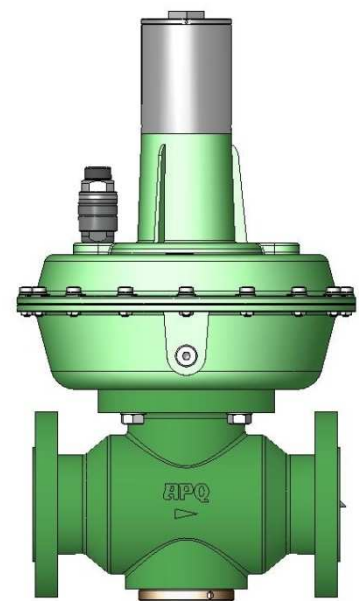
ASSEMBLY

- Prior to installing the regulator, please verify the pressure and connection details required correspond with the information on the label (4).
- Assure that the fluid flows in the direction that the arrow (5) indicates.
- This regulator takes the signal internally (6), so do not need an outlet external signal. However, if you want increase the speed of response and flow, it should make the connection of the sense lines (7) to a straight pipeline, turbulence free, downstream the outlet of the regulator (at a distance of at least 5 times the diameter of the pipe). The sense line tube (16) should have a minimum diameter of 10mm and should be totally exempted of any type of obstruction, valves and diameter reductions.
- The area of installation of the regulator should be adequate to allow maintenance labors and outlet pressure adjustments.
- The OPSO/UPSO Device (Optional) is mounted on the lower section of the regulator. It monitors the downstream pressure independently of the main section of the regulator. The OPSO/UPSO device can be ordered with the regulator, or can be fitted separately, later if required.
- Possibility to activate the internal valve to relief a small quantity of gas to the atmosphere.

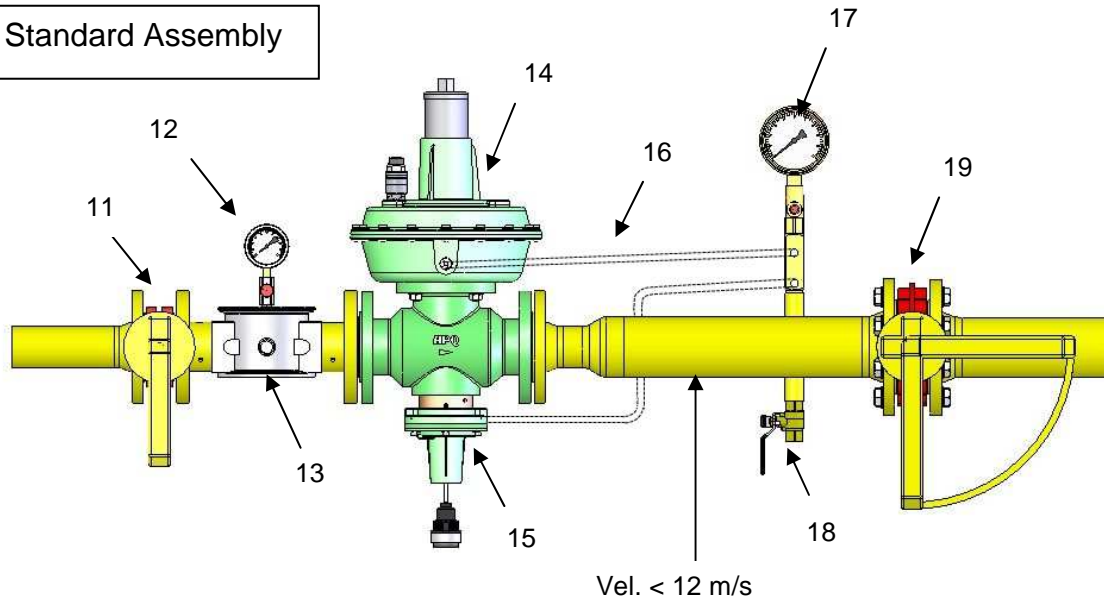
D version (standard)



F version



Standard Assembly



STARTUP PROCEDURE

- Open the bleed valve (18) to provide a slight flow of gas.
- Slightly and slowly, open the inlet valve (11), located immediately upstream of the regulator.
- Check that the inlet pressure (12) is correct.
- Verify that the outlet pressure (17) has stabilized.
- The main inlet valve (11), found at the inlet of the filter (13), can now be fully opened.
- Slowly open the outlet valve (19).
- If the regulator is fitted with an OPSO/UPSO (15), this should be kept in mind.

REGULATOR SETUP

Outlet Pressure Adjustment:

- Remove the cap, located on the top of the regulator. (F version)
- To increase outlet pressure, turn the main spring adjustment bolt (8) CLOCKWISE with a Tube Spanner 24mm.
- Turning this bolt anti-clockwise will decrease the outlet pressure.
- Place the cap back onto the regulator top, make sure to put the O-ring. (F version)

The spring used in these regulators (33) have been designed to provide specific outlet pressure ranges. For outlet pressures outside the specified range, a spring change will be required.

Causes of abnormal operation:

- Sense lines (16) -optional- , not connected, blocked or leaking.
- Sense lines (16) -optional- may be of insufficient diameter, or connected at a location of turbulence in the pipeline.
- Pressure required is outside the range of the spring installed.
- Flow capacity requires exceeds regulator capacity.
- Atmospheric Vent (9) blocked or restricted.

If regulator does not close perfectly, this may be caused by:

- A worn, damaged, or pitted Valve Seat Disc.
- Orifice may be worn.
- O-ring may be worn.
- Deterioration of the main diaphragm.

If the OPSO/UPSO does not close perfectly:

- Please refer to the Technical Data Sheet relevant to the OPSO/UPSO device concerned.

To avoid particle damage of the internal working parts of the regulator, it is necessary to install a filter (13) of not less than 50 microns prior to the regulator.

CHANGING THE MAIN SPRING:

Removing the main spring:

- Close inlet valve (11) and the outlet valve (19).
- Depressurize the inlet and outlet side of the regulator via purge valve 18.
- In F version with a 30mm Open-end spanner, remove the main regulator cap to access the bolt (8). After use a Tube spanner 24mm.
- In D version, wind the adjustment bolt (8) ANTI-CLOCKWISE, until all pressures is taken off the main spring.
- Extract the spring.

Re-assembly:

- Insert the spring of appropriate outlet pressure range.
- Re-assemble the main spring housing in reverse order to the above instructions.
- **Please ensure only spring of appropriate size are fitted, and the spring plate and ball-bearing (D version) are relocated on the top of the replacement spring, as failure to do soy may cause regulator damage or failure.**

REMOVAL OF THE MOBILE DEVICE:

- Close inlet Valve (11) and outlet Valve (19).
- Depressurize the inlet and outlet side of the regulator via purge valve 18.
- Using a 13mm spanner, loosen and remove the four body bolts (10).
- The regulator head can now be safely removed.

Re-assembly

- Insert the seat disc with a little bit of pressure.
- To re-fit the regulator head, reverse the above procedure.

ORIFICE REPLACEMENT

There are five different orifices: Ø10 (3/8"); Ø12 (1/2"); Ø16 (5/8"); Ø19 (3/4"); Ø25 (1"). Each accepts a different range of inlet pressures. See the flow charts.

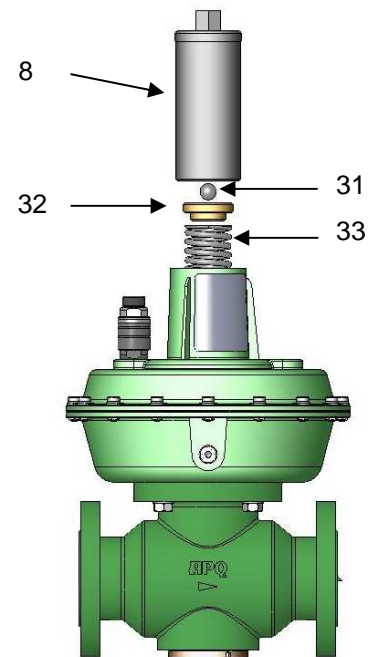
Removing

- Close the gas shutoff valves located at the inlet and outlet of the regulator (11) and (19).
- Open the purge valve (18) located at the outlet of the regulator, to get the total depressurization of gas in the regulator.
- Using a 19mm spanner, disconnect the pressure inlet pipe (16) – optional – that is connected to the hermeto (7).
- Using a 13mm spanner, loosen and remove the four body bolts (10).
- Pull upward the regulation motor and the obturator guide and remove from de body valve.
- Using a 36mm tube spanner, remove the orifice (P) and replace it.

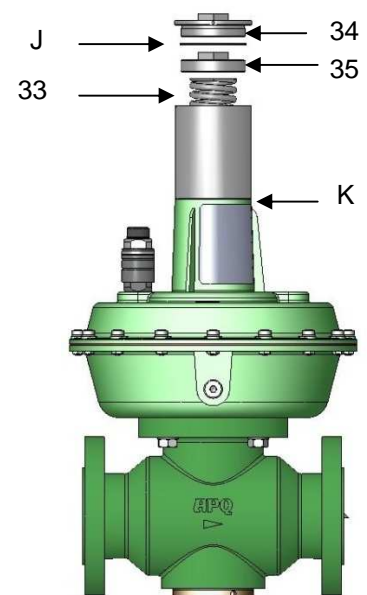
Assembly

- Check that the O-ring (B) is in good condition.
- Once the orifice (P) has been replaced, reverse the procedure described in "Removing".







D version (standard)



Versión F



TOOLS REQUIRED FOR THE MAINTAINANCE OF THE LBM 4000 □3 REGULATORS

 Hook-Spanner 60-90	 Philips Screwdriver	 O-ring Extractor	 Allen Key 4 - 5 - 6	 Tube Spanner 13-24-27-36-30-41	 Open-end Spanner 13-17-19-27-30
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OUTLET PRESSURE ADJUSTMENT SPRINGS FOR THE LBM 4000 □3 REGULATORS

Spring Code	Spring Color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	n° Turns	Spring Range in kPa (mbar)
ZM.3.50.260551A	Pink	5.5	260	50	18	10 ÷ 15 (100 ÷ 150)
ZM.3.50.260601A	Green	6.0	260	50	17	12.5 ÷ 20 (125 ÷ 200)
ZM.3.50.240701A	Blue	7.0	240	50	17	17.5 ÷ 30 (175 ÷ 300)
ZM.3.50.240801A	Black	8.0	240	50	17	20 ÷ 40 (200 ÷ 400)

FLOW

Flow regulator (n)m³/h natural gas with sense line (16) connected. Flow with different orifices.

Without the sense line making (16) the flow decreases 6%

The regulator should work within the range indicated in the tables, with the maximum inlet pressure, the resulting variable output pressure and the orifice attached, these must not be exceed the limits described in the table.

The speed of the gas flowing through the outlet pipe where the pressure is taken to drive the regulator (16) and Shut-off valve must be less than 12 m/sec.

The accuracy class is AC20 / SG30

LBM 4000 □3 Orifice Ø 10 mm

P _a (bar)	P _e (bar)															
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
0.1	63	100	120	142	166	190	208	232	258	285	306	335	352	375		
0.15	63	100	120	142	166	190	208	232	258	285	306	335	352	375	390	412
0.2	58	100	120	142	166	190	208	232	258	285	306	335	352	375	390	412
0.25	56	100	120	142	166	190	208	232	258	285	306	335	352	375	390	412
0.3	45	94	120	142	166	190	208	232	258	285	306	335	352	375	390	412
0.35	40	94	120	142	166	190	208	232	258	285	306	335	352	375	390	412
0.40	38	92	110	142	166	190	208	232	258	285	306	335	352	375	390	412

LBM 4000 □3 Orifice Ø 12 mm

P _a (bar)	P _e (bar)															
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
0.1	86	142	174	214	248	282	318	352	394	426	460					
0.15	86	142	174	214	248	282	318	352	394	426	460	488	520			
0.2	77	132	174	214	248	282	318	352	394	426	460	488	520	544	575	
0.25	77	132	174	214	248	282	318	352	394	426	460	488	520	544	575	600
0.3	58	122	174	214	248	282	318	352	394	426	460	488	520	544	575	600
0.35	52	122	174	214	248	282	318	352	394	426	460	488	520	544	575	600
0.40	46	122	174	214	248	282	318	352	394	426	460	488	520	544	575	600

LBM 4000 □3 Orifice Ø 16 mm

P _a (bar)	P _e (bar)															
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
0.1	144	234	292	360	425	485	548	608								
0.15	130	225	292	360	425	485	548	608	670							
0.2	118	215	292	360	425	485	548	608	670	730	795					
0.25	110	203	275	360	425	485	548	608	670	730	795	856				
0.3	90	178	270	360	425	485	548	608	670	730	795	856	860	860		
0.35	82	178	270	360	425	485	548	608	670	730	795	856	860	860	860	
0.40	75	178	270	360	425	485	548	608	670	730	795	856	860	860	860	

LBM 4000 □3 Orifice Ø 19 mm

P _a (bar)	P _e (bar)															
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
0.1	176	288	396	465	560	645										
0.15	161	285	396	465	560	645	736	825								
0.2	156	281	382	465	560	645	736	825	900							
0.25	142	278	382	465	560	645	736	825	900	1065						
0.3	131	266	364	465	560	645	736	825	900	1065	1065					
0.35	109	258	364	465	560	645	736	825	900	1065	1065	1065				
0.40	101	253	364	465	560	645	736	825	900	1065	1065	1065	1065			

LBM 4000 □3 Orifice Ø 25 mm

P _a (bar)	P _e (bar)															
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
0.1	256	402	548	664												
0.15	235	392	548	664	735											
0.2	208	386	548	664	735	908										
0.25	186	378	548	664	735	908	930									
0.3	150	342	548	664	735	908	930	985								
0.35	146	334	512	664	735	908	930	985								
0.40	135	326	512	664	735	908	930	985	985							

Flow in (n)m³/h natural gas

Flow with other gases

In the tables above, the flow is in (n)m³/h natural gas with a density 0.61 and temperature 15° C

To convert to other gas flow, using the following formula:

$$Q \text{ (n)m}^3/\text{h natural gas} \times F_c = Q \text{ (n)m}^3/\text{h n gas}$$

Example:

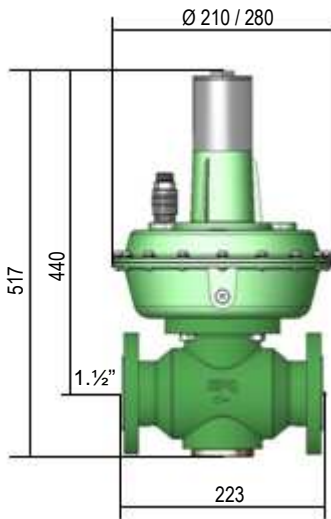
$$Q \text{ (n)m}^3/\text{h natural gas} \times 0.78 = Q \text{ (n)m}^3/\text{h air}$$

$$1 \text{ (n)m}^3/\text{h natural gas} = 0.78 \text{ (n)m}^3/\text{h air}$$

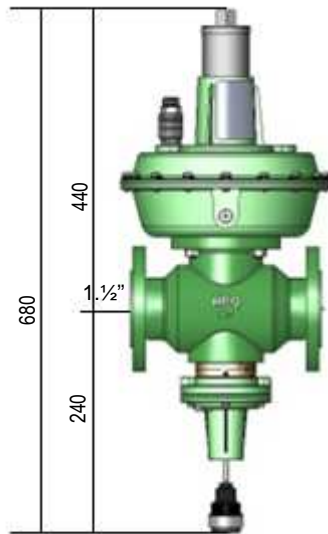
Correction factor Fc a 15°C	
Butane	0.55
Propane	0.64
Oxygen	0.76
Air	0.78
Nitrogen	0.81
Biogas	0.85
Town gas	1.23
Hydrogen	3.04

ADJUSTING LBM-4000 □3 FORMED BY REGULATOR + RELIEF VALVE + OPSO AND UPSO			
Outlet pressure Pa	Setting relief valve	Setting OPSO	Setting UPSO
100 ÷ 400 mbar	> Pa x 1.3	> Pa x 1.5	< Pa x 0.6

DIMENSIONS AND WEIGHTS



4000 □3



4010 □3

Technical features of LBM 4000 □3

bpu	0.2 ÷ 10 bar	(inlet pressure range)
Ps	10 bar	(design pressure)
Pu	10 bar	(maximum inlet pressure)
Wd		(outlet pressure range)
LBM 4000 □3	100 ÷ 400 mbar	
Wdo	180 ÷ 800 mbar	(OPSO range)
Wdu	35 ÷ 400 mbar	(UPSO range)
Wrv	+10 ÷ +20% Pd	(Relief valve range)
Ac	until 10 %	(accuracy class)
Sg	until 20 %	(accuracy class)
T	-20°C ÷ 60°C	(working temperature)

Inlet connection	1.½" ANSI or DN-40 PN-25
Outlet connection	1.½" ANSI or DN-40 PN-25
Connections position	Axial
Weight LBM-4000 □3	27 Kg
Weight LBM-4010 □3	28 Kg

BUILT-IN RELIEF VALVE

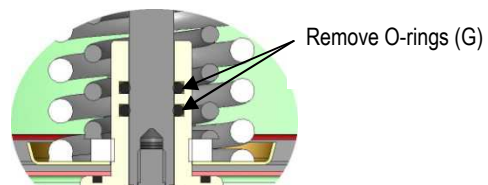
The regulator has an internal relief valve, which allows a certain quantity of free gas in case of abrupt changes of flow or by heating the tubes with no flow.

To activate the relief valve must be removed, the two O-rings (G) mounted on the fitting assembly of the membrane.

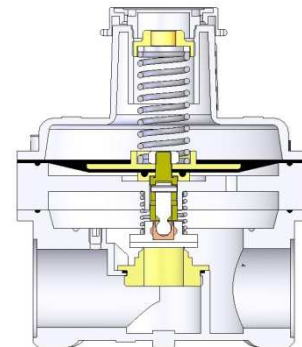
For installations ON-OFF, the output of the regulator should be sufficiently large lungs to absorb water hammer. It is recommended that lung mounted external relief valve capable of removing pressure peaks.

The quantity of gas released by pressure relief valve is related to the difference of inlet pressure and his calibrated. In the attached image is shown as an example, the relief valve VS 25 model. In which its operation is based on the confrontation of forces on both sides of the membrane.

On one side of the membrane, the gas pressure acts, on the opposite side and the spring force adjustment.

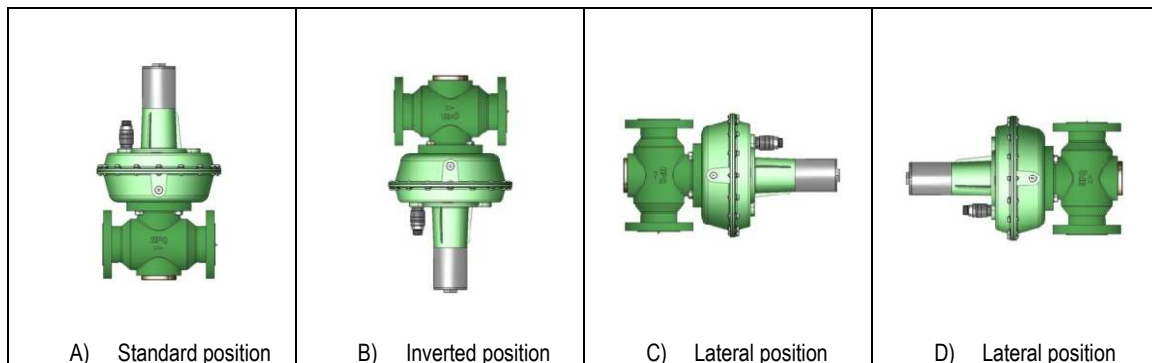


Built-in relief valve



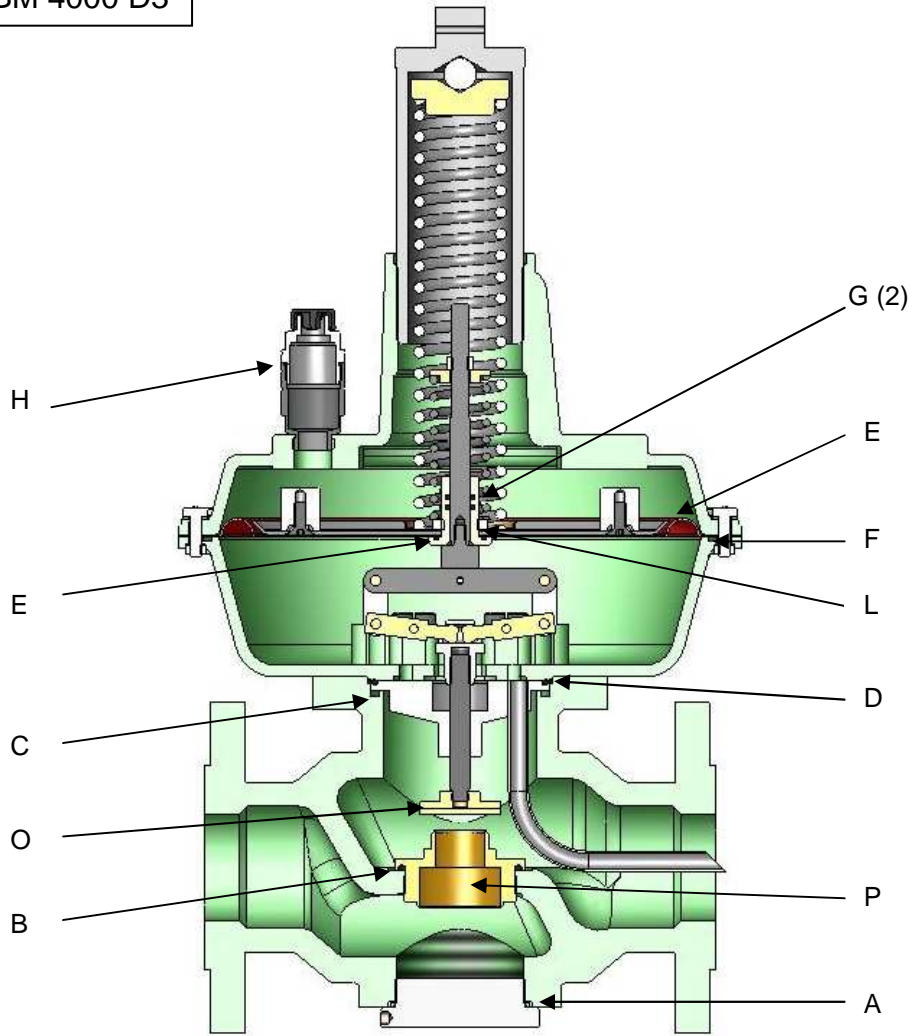
External relief valve VS-25

MOUNTING POSITION


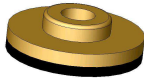




For correct operation, the regulator must be mounted according to the above figures; the first image (A) is the usual position of mounting. There should be enough space for the maintenance work.

LBM 4000 D3



SPARE PARTS FOR ORDINARY MAINTENANCE OF THE LBM 4000 □3

 <p>Orifice (P)</p> <table border="1"> <thead> <tr> <th>Ø</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>ZM.1.00.2692</td> </tr> <tr> <td>12</td> <td>ZM.1.00.2693</td> </tr> <tr> <td>16</td> <td>ZM.1.00.2430</td> </tr> <tr> <td>19</td> <td>ZM.1.00.2431</td> </tr> <tr> <td>25</td> <td>ZM.1.00.2432</td> </tr> </tbody> </table>	Ø	Code	10	ZM.1.00.2692	12	ZM.1.00.2693	16	ZM.1.00.2430	19	ZM.1.00.2431	25	ZM.1.00.2432	 <p>Obturator (O) ZM.1.00.06541</p>  <p>Main Diaphragm (E) Code ZM.1.00.2191</p>	 <p>O-rings</p> <table border="1"> <thead> <tr> <th>Position</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>ZM.1.00.3336</td> </tr> <tr> <td>B</td> <td>ZM.1.00.1355</td> </tr> <tr> <td>C</td> <td>ZM.1.00.1820</td> </tr> <tr> <td>D</td> <td>ZM.1.00.1299</td> </tr> <tr> <td>E</td> <td>ZM.1.00.0893</td> </tr> <tr> <td>F</td> <td>ZM.1.00.3159</td> </tr> <tr> <td>G</td> <td>ZM.1.00.0974</td> </tr> <tr> <td>H</td> <td>ZM.1.00.1718</td> </tr> <tr> <td>J</td> <td>ZM.1.00.0509</td> </tr> <tr> <td>K</td> <td>ZM.1.00.1428</td> </tr> <tr> <td>L</td> <td>ZM.1.00.0285</td> </tr> </tbody> </table>	Position	Code	A	ZM.1.00.3336	B	ZM.1.00.1355	C	ZM.1.00.1820	D	ZM.1.00.1299	E	ZM.1.00.0893	F	ZM.1.00.3159	G	ZM.1.00.0974	H	ZM.1.00.1718	J	ZM.1.00.0509	K	ZM.1.00.1428	L	ZM.1.00.0285
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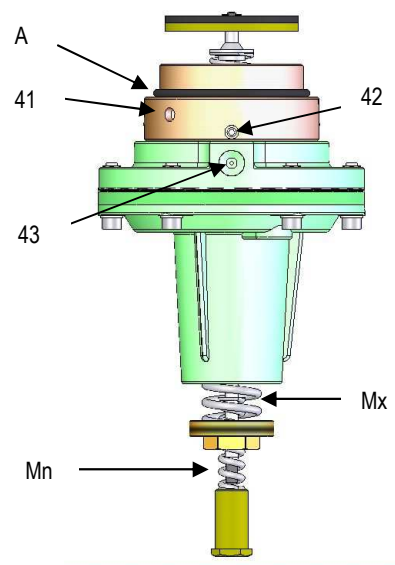
SAFETY SHUT-OFF DEVICE (SAV)

The LBM 4000 □3 regulator, is available with built-in safety valve (SAV), or can also be mounted in the future if the installation conditions vary.

In the future if you want to mount the SAV, request the set RI.ORG.0402 and instead on the cap (3)

SAV installation

- With the Open-end spanner, loosen and remove the cap (3)
- Insert the RI.ORG.0402, threading clockwise, taking care to reassemble the O-ring (A). Tighten the neck of the SAV with the spanner hook inserted into the holes (41)
- Loosen the screws (42) with a 2.5 mm Allen key and turn the SAV to connect the pressure tubing between the fitting (43) and exit the lung.
- Tighten the screws (42) with 2.5 mm Allen key.
- Connect with 10 mm diameter tube, the fitting (43) and the lung that are located at the exit, a distance at least 5 times the diameter of the lung output, taking care not to ride in this tube, gas valves that can break up the gas.



UPSO ADJUSTMENT SPRINGS

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)
ZM.3.12.055201	Blue	2.0	55	12.3	3.5 ÷ 11 (35 ÷ 110)
ZM.3.12.055231	Black	2.3	55	12.3	5 ÷ 25 (50 ÷ 250)
ZM.3.12.055251	Purple	2.5	55	12.3	8 ÷ 40 (80 ÷ 400)

OPSO ADJUSTMENT SPRINGS

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)
ZM.3.30.060251	Green	2.5	60	30	18 ÷ 29 (180 ÷ 290)
ZM.3.30.060271	Red	2.7	60	30	23 ÷ 37 (230 ÷ 370)
ZM.3.30.060321	Yellow	3.2	60	30	30 ÷ 50 (300 ÷ 500)
ZM.3.30.060351	Blue	3.5	60	30	40 ÷ 80 (400 ÷ 800)

WARNING! It is potentially dangerous to manipulate a gas installation and its components. Therefore all start-up, adjustments and maintenance of the regulator must be carried out by duly authorized people with sufficient technical knowledge.