

APQ S.A.

www.apq.com.es
EU Product / Spain

DN 50 REGULATOR LBM 5000A3 REGULATOR LBM 5000D3

Cod. RILBM5000A3
Cod. RILBM5000D3

DESCRIPTION

The **LBM 5000□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 5010□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 5000□1)

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

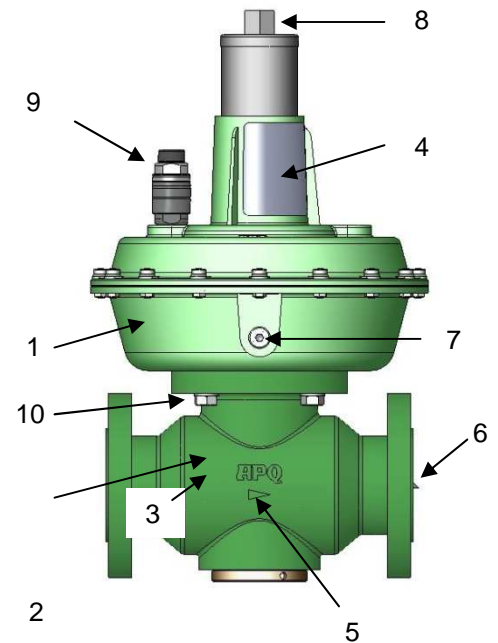
CONNECTIONS

Model LBM 5000 A3 is with 2" ANSI-150 flanges
Model LBM 5000 D3 is with DN-50 PN-25 flanges

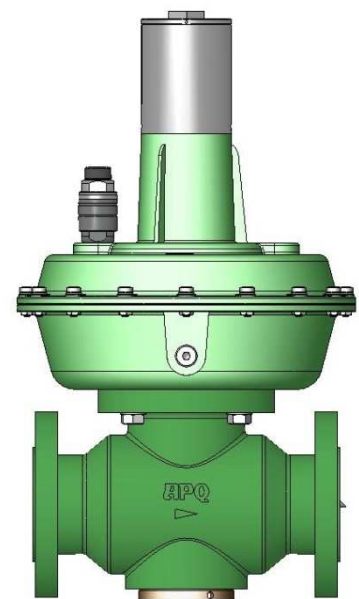
ASSEMBLY

- 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.

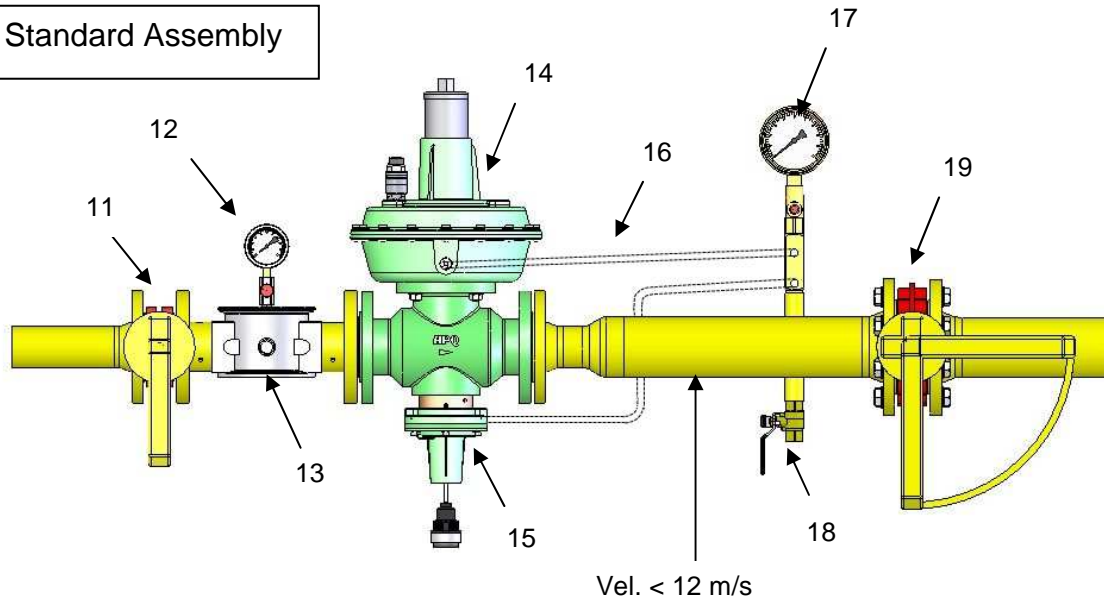
D version (standard)



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 so 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 six different orifices: Ø10 (3/8"); Ø12 (1/2"); Ø16 (5/8"); Ø19 (3/4"); Ø25 (1"); Ø32 (1.1/4"). Each accepts a different range of inlet pressures. See the flow charts.

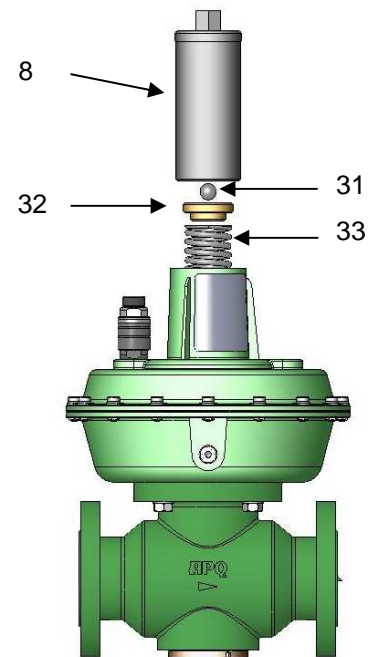
Removing

- 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.

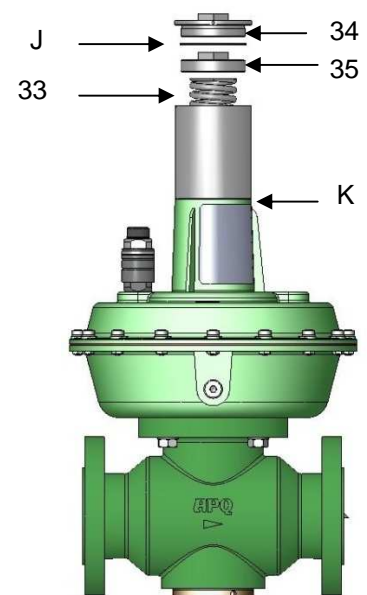
Assembly

- 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 5000 □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
--	---	---	---	--	---

OUTLET PRESSURE ADJUSTMENT SPRINGS FOR THE LBM 5000 □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 5000 □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	78	120	150	175	204	235	262	290	320	350	380	405	435	465		
0.15	78	120	150	180	208	235	262	290	320	350	380	405	435	465	495	525
0.2	78	120	150	180	210	240	270	300	325	350	380	405	435	465	495	525
0.25	78	118	150	180	210	240	270	300	325	350	375	400	425	450	472	495
0.3	78	118	148	180	210	240	270	300	325	350	375	400	425	450	472	495
0.35	45	115	144	170	200	225	260	290	315	340	375	410	430	455	475	495
0.40	45	115	144	170	200	225	255	285	310	340	375	410	430	455	475	495

LBM 5000 □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	100	160	200	245	288	330	366	403	450	500	535					
0.15	100	165	205	255	292	330	372	415	460	500	535	570	600			
0.2	105	170	210	255	292	330	372	415	460	500	550	600	620	645	670	
0.25	105	175	210	250	290	330	372	415	470	510	555	600	620	645	670	690
0.3	100	170	210	250	290	330	376	422	470	510	550	590	615	640	665	690
0.35	65	150	195	245	285	325	365	410	460	490	530	570	590	610	630	650
0.40	60	145	195	245	275	310	360	405	450	480	520	560	585	605	630	650

LBM 5000 □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	135	215	350	465	530	600	685	770								
0.15	150	265	385	470	570	675	730	780	855							
0.2	180	290	380	485	580	675	730	785	860	930	990					
0.25	170	290	380	475	550	620	700	785	860	930	965	1000				
0.3	160	285	380	470	550	630	695	760	845	930	965	1000	1000	1000		
0.35	100	245	340	440	525	610	685	760	845	930	1005	1080	1080	1080	1080	
0.40	90	260	360	450	540	630	710	790	875	960	1020	1080	1080	1080	1080	

LBM 5000 □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	205	350	460	550	655	760										
0.15	190	330	450	570	670	765	865	955								
0.2	210	340	460	580	680	775	875	960	1060							
0.25	210	370	470	580	690	800	900	1000	1060	1125						
0.3	195	350	460	575	710	845	925	1000	1060	1120	1120					
0.35	120	285	430	525	670	810	845	880	1050	1220	1220	1220				
0.40	115	290	445	590	715	840	915	990	1090	1185	1185	1185	1185			

LBM 5000 □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	285	475	645	785												
0.15	270	465	620	760	910											
0.2	250	440	600	750	945	1140										
0.25	280	490	685	800	975	1155	1155									
0.3	280	520	690	815	985	1170	1170	1170								
0.35	165	365	500	740	880	1015	1015	1015								
0.40	165	380	560	755	885	1010	1010	1010	1010							

LBM 5000 □3 Orifice Ø 32 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	456	724	991	1200												
0.15	355	574	1000	1192												
0.2	340	723	1058	1244	1244											
0.25	418	762	1080	1296	1296											
0.3	449	769	1080	1347	1397	1397										
0.35	190	413	587	756	905	1050										
0.40	198	438	608	765	895	1026	1026									

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:

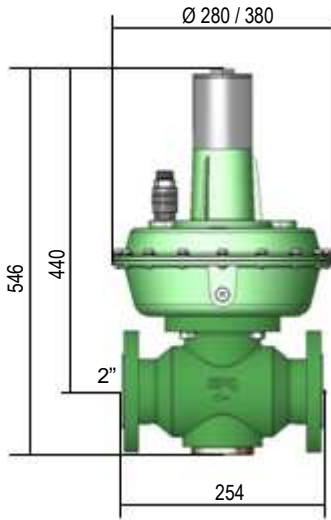
$$Q \text{ (n)m}^3/\text{h natural gas} \times 0.78 = Q \text{ (n)m}^3/\text{h air}$$

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

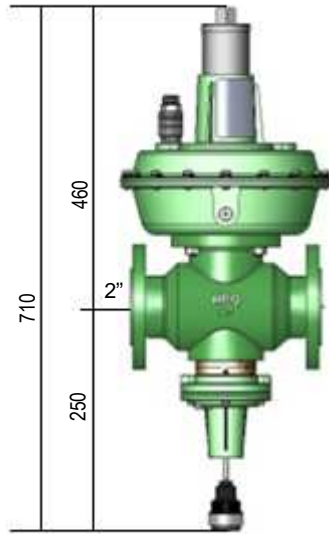
Correction factor Fc a 15°C	
Butane	0.55
Propane	0.64
Oxygen	0.76
Air	0.78
Nitrogen	0.81
Biogas	0.85
Town gas	1.23
Hydrogen	3.04

ADJUSTING LBM-5000 □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



5000 □3



5010 □3

Technical features of LBM 5000 □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 5000 □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	2" ANSI or DN-50 PN-25
Outlet connection	2" ANSI or DN-50 PN-25
Connections position	Axial
Weight LBM-5000 □3	33 Kg
Weight LBM-5010 □3	34 Kg

BUILT-IN RELIEF VALVE

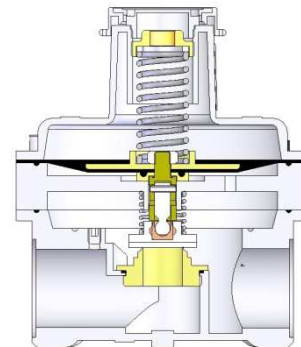
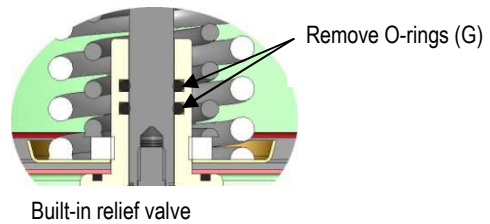
The regulator has an internal relief valve, which allows a certain quantity of free gas in case of abrupt changes of flow or by heating the tubes with no flow.

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.

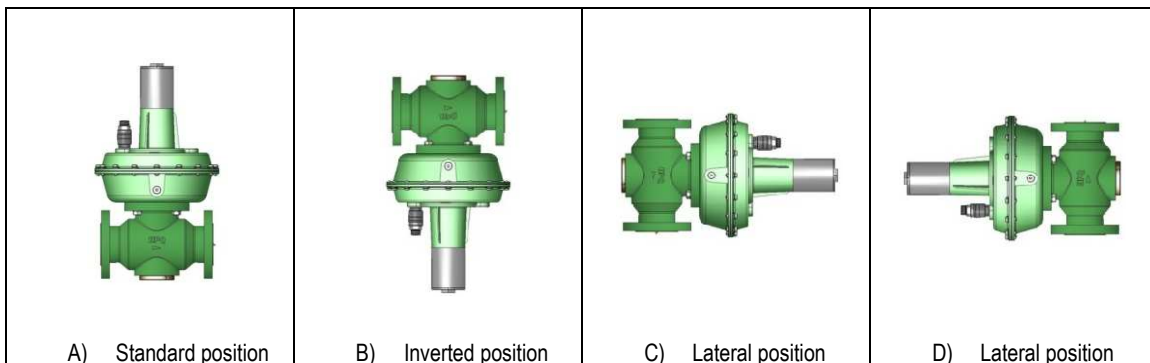
The quantity of gas released by pressure relief valve is related to the difference of inlet pressure and his calibrated. In the attached image is shown as an example, the relief valve VS 25 model. In which its operation is based on the confrontation of forces on both sides of the membrane.

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



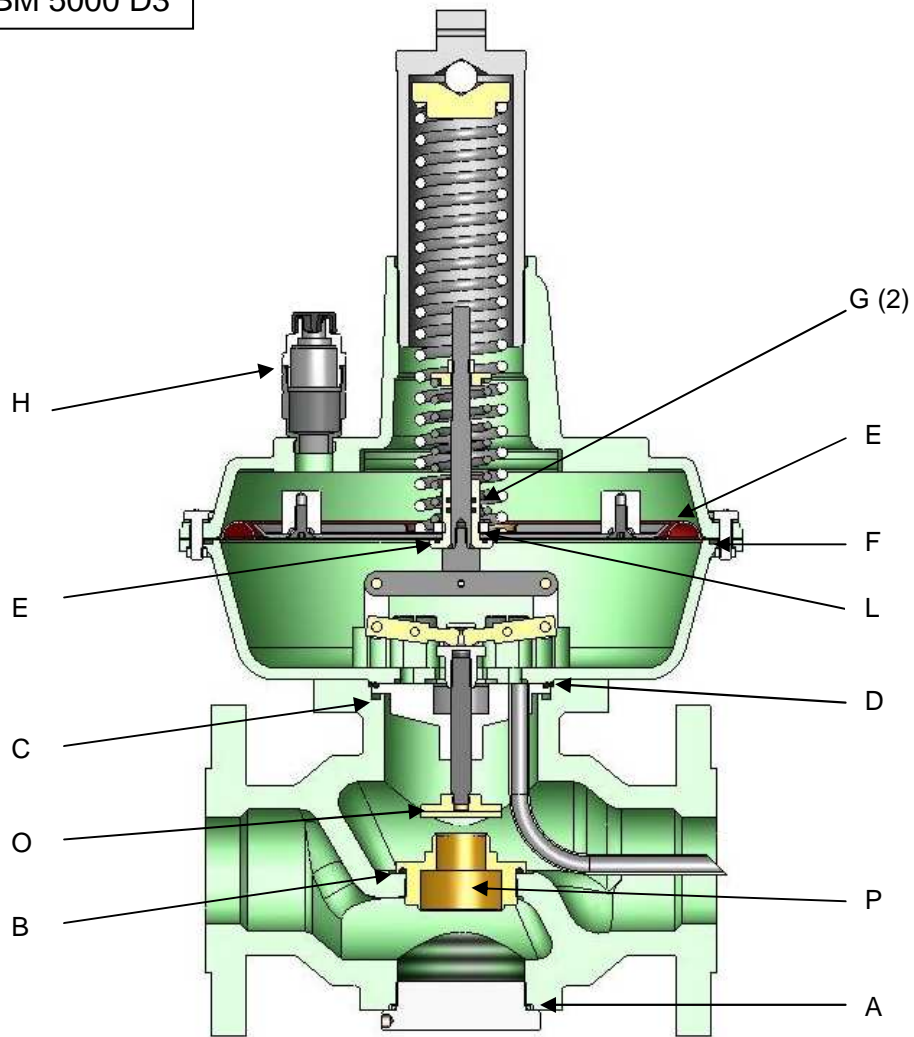
External relief valve VS-25

MOUNTING POSITION


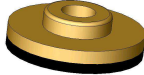




For correct operation, the regulator must be mounted according to the above figures; the first image (A) is the usual position of mounting. There should be enough space for the maintenance work.

LBM 5000 D3



SPARE PARTS FOR ORDINARY MAINTENANCE OF THE LBM 5000 □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> <tr> <td>32</td> <td>ZM.1.00.3634</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	32	ZM.1.00.3634	 <p>Obturator (O) ZM.1.00.06541</p> <hr/>  <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.1.00.1299</td> </tr> <tr> <td>B</td> <td>ZM.1.00.1355</td> </tr> <tr> <td>C</td> <td>ZM.1.00.3146</td> </tr> <tr> <td>D</td> <td>ZM.1.00.1431</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.1.00.1299	B	ZM.1.00.1355	C	ZM.1.00.3146	D	ZM.1.00.1431	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
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																																							
32	ZM.1.00.3634																																							
Position	Code																																							
A	ZM.1.00.1299																																							
B	ZM.1.00.1355																																							
C	ZM.1.00.3146																																							
D	ZM.1.00.1431																																							
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																																							

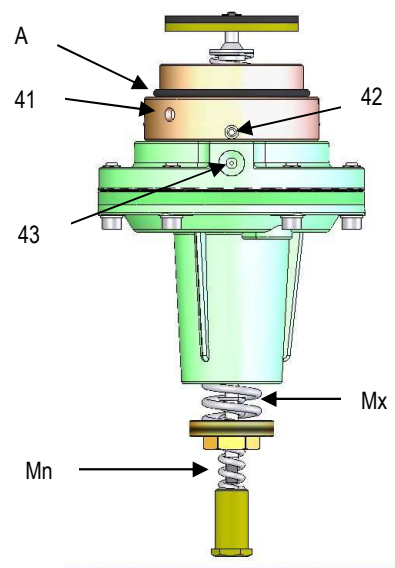
SAFETY SHUT-OFF DEVICE (SAV)

The LBM 5000 □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.0502 and instead on the cap (3)

SAV installation

- With the Open-end spanner, loosen and remove the cap (3)
- Insert the RI.ORG.0502, 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.