

RB 4000

Commercial & Industrial Regulator

Applications

The RB 4000 pressure regulator is designed for industrial use: gas supply networks, district stations, industries, heating plants and all installations where accurate pressure control, ease of adjustment and fast response are required, such as for burners, industrial ovens, boilers, etc.

Description

The RB 4000 regulator is a direct-acting, spring-loaded regulator with an optional integrated safety shut-off device. Its balanced valve design ensures constant outlet pressure when the upstream pressure varies.

A built-in pulsation damper allows stable pressure control even at very low flowrates. An optional built-in shut-off valve offers protection against over-pressure or over-and-under-pressure. Its bypass system eases the shut-off valve relatching.

Technical Features

Inlet pressure	19 bar
Outlet pressure	10 mbar – 2.0 bar (2.5 bar for DN 25)
Accuracy & lock-up pressure	Up to AC5 / up to SG 10
Operating temperature	-20°C to +60°C
Ambient temperature	-30°C to +60°C (body material)
Acceptable gases	Natural gas, town gas, propane, butane, air, nitrogen or any non-corrosive gas
Safety devices	Optional built-in safety shut-off valve Over-pressure shut-off (OPSO) and under-pressure shut-off (UPSO)
Options	Built-in silencer Monitor version

Sizes & Connections

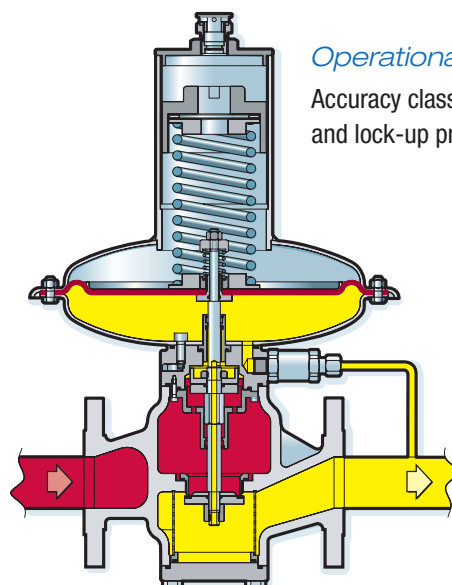
Sizes	DN 25, 40, 50, 50 x 80, 80 and 100
Body lengths	EN 334 face-to-face recommended dimensions
Flanges	Steel: PN16, PN20, PN25, PN50 Cast iron: PN16, PN20, PN25

Materials

Body	Spheroidal graphite cast iron EN-GJS-400-18-LT Steel EN 10213-3 grade G 20 Mn 5
Head	Pressed steel UNI EN 10025
Internal parts	Stainless steel and brass
Seals	Nitrile rubber
Diaphragm	Synthetic rubber with fabric reinforcement



- > High flow accuracy
- > Easy maintenance
- > Rugged construction for durability
- > Balanced valve design eliminates inlet pressure effect
- > Low noise
- > Approved by the major European gas distribution companies



Operational Diagram

Accuracy class (AC), lock-up pressure class (SG) and lock-up pressure zone:

- > 10 - 20 mbar: AC 5 / SG 30
- > 20 - 100 mbar: AC 5 / SG 20
- > 100 mbar: AC 5 / SG 10

The typical lock-up pressure zone is:

$$\frac{Q_{\min, Pu}}{Q_{\max, Pu}} = \frac{2.5}{100}$$

- Inlet Pressure
- Outlet Pressure

Outlet Pressure Range

DN 25

Spring Code	Spring Characteristic				Colour	Spring Range		
	d (mm)	Di (mm)	Lo (mm)	Lt		4010/11/12 (Ø 360)	4020/21/22 (Ø 220)	4030/31/32 (Ø220/TR)
20567075	3.5	43	200	15.5	Yellow	18 - 27 mbar	•	•
20567076	3.5	43	200	10.75	Red	25 - 33 mbar	•	•
20567662	4.5	43	160	11	White	25 - 55 mbar	•	•
20567663	5.5	43	160	10.5	Lilac	55 - 100 mbar	0.12 - 0.20 bar	•
20567664	6.5	43	160	10.5	Orange	85 - 210 mbar	0.20 - 0.55 bar	•
20567665	7	43	140	10.5	Brown	•	0.30 - 0.65 bar	0.50 - 1.00 bar
20567666	7.5	43	160	10.5	Green	•	0.40 - 0.90 bar	0.60 - 1.35 bar
20567761	8	43	140	9	Black	•	•	1.10 - 1.70 bar
20567762	9	43	140	9	Grey	•	•	1.10 - 2.50 bar

RB DN 40 / DN 50 / DN 50 x 80

Spring Code	Spring Characteristic				Colour	Spring Range		
	d (mm)	Di (mm)	Lo (mm)	Lt		4010/11/12 (Ø 480)	4020/21/22 (Ø 360)	4030/31/32 (Ø 360/TR)
20568085	4	63	320	15	Orange/Silver	10 - 14 mbar	•	•
20568086	4	63	320	10.5	Brown/Silver	14 - 19 mbar	•	•
20568087	5	63	320	16.5	Dark Green/Silver	19 - 27 mbar	•	•
20568088	5	63	320	13	Light Green/Silver	25 - 36 mbar	•	•
20568089	5	63	320	9.25	Light Blue/Silver	35 - 48 mbar	0.068 - 0.107 bar	•
20568081	6.5	63	270	9.75	Purple/Silver	50 - 85 mbar	0.11 - 0.18 bar	•
20568082	8.5	63	270	15	Yellow	82 - 130 mbar	0.18 - 0.28 bar	•
20568083	8.5	63	270	11.5	Blue/Silver	110 - 140 mbar	0.28 - 0.37 bar	•
20568183	9	63	260	11.5	Blue	120 - 240 mbar	0.27 - 0.45 bar	•
20568283	9	63	243	10.8	Blue	•	0.30 - 0.50	•
20568282	10	63	243	11	Silver	•	0.48 - 0.66	0.70 - 1.02
20568281	11	63	243	11	Purple	•	0.65 - 0.82	0.99 - 1.20
20568286	11.5	63	243	10.8	Yellow/Silver	•	0.80 - 1.00	1.18 - 1.55
20568284	12	63	243	10	Red/Silver	•	0.99 - 1.30	1.50 - 2.00

DN 80 / DN 100

Spring Code	Spring Characteristic				Colour	Spring Range			
	d (mm)	Di (mm)	Lo (mm)	Lt		4010/11/12 (Ø 600)	4020/21/22 (Ø 480)	4030/31/32 (Ø 360)	4040/41/42 (Ø360)
20569590	6	80	350	12.5	Orange	17 - 25 mbar	•	•	•
20569591	6.2	80	350	10	Brown	23 - 30 mbar	•	•	•
20569592	6.5	80	350	10	Dark Green	28 - 37 mbar	•	•	•
20569593	7	80	350	9.5	Light Green	38 - 54 mbar	•	•	•
20569594	8	80	350	11.5	Black	43 - 68 mbar	•	•	•
20569690	9	80	320	10.5	Red	58 - 96 mbar	•	•	•
20569691	9.5	80	320	10	light Blue	72 - 117 mbar	•	•	•
20569585	11	80	320	10.5	White	94 - 170 mbar	•	•	•
20569586	13	80	320	12.5	Pink	150 - 200 mbar	•	•	•
20568082	8.5	63	270	15	Yellow	•	0.082 - 0.13 bar	•	•
20568083	8.5	63	270	11.5	Blue/Silver	•	0.11 - 0.14 bar	•	•
20568183	9	63	260	11.5	Blue	•	0.12 - 0.24 bar	•	•
20568283	9	63	243	10.8	Blue	•	•	0.30 - 0.50 bar	•
20568182	10	63	260	11.5	Silver	•	0.18 - 0.29 bar	•	•
20568282	10	63	243	11	Silver	•	•	0.48 - 0.66 bar	0.70 - 1.02 bar
20568181	11	63	260	11.5	Purple	•	0.24 - 0.37 bar	•	•
20568281	11	63	243	11	Purple	•	•	0.65 - 0.82 bar	0.99 - 1.20 bar
20568186	11.5	63	260	11.5	Yellow/Silver	•	0.30 - 0.47 bar	•	•
20568286	11.5	63	243	10.8	Yellow/Silver	•	•	0.80 - 1.00 bar	1.18 - 1.55 bar
20568184	12	63	260	10.5	Red/Silver	•	0.38 - 0.50 bar	•	•
20568284	12	63	243	10	Red/Silver	•	•	0.99 - 1.30 bar	1.50 - 2.00 bar

Spring characteristics:

d : wire diameter

Di : internal diameter

Lo : height

Lt : no. of spires

Flow Capacity

The following table gives the maximum flow capacity - in m³/h at standard conditions - for the different sizes of the RB 4000 regulator with silencer and built-in Safety Shut-off Valve (SSV). More data are available in the leaflet "RB 4000 Capacity Tables".

Inlet pressure DN 25	Outlet Pressure Setting (mbar)								
	RB 4011/12			RB 4021/22			RB 4031/32		
	20	50	200	300	600	900	1000	2500	
350 mbar	220	220	160	95	•	•	•	•	
700 mbar	340	320	300	280	140	•	•	•	
1.5 bar	440	440	480	500	440	400	360	•	
≥ 5 bar	440	440	480	500	550	600	600	800	

DN 40	RB 4011/12			RB 4021/22			RB 4031/32	
	20	50	200	150	500	1200	1500	2000
350 mbar	500	480	340	420	•	•	•	•
700 mbar	700	700	650	700	440	•	•	•
1.5 bar	1100	1100	1100	1200	1000	600	•	•
≥ 5 bar	1100	1100	1200	1200	1300	1600	1700	1900

DN 50	RB 4011/12			RB 4021/22			RB 4031/32	
	20	50	200	150	500	1200	1500	2000
350 mbar	800	800	550	700	•	•	•	•
700 mbar	1200	1200	1100	1200	700	•	•	•
1.5 bar	1700	1800	1900	1900	1700	1000	•	•
≥ 5 bar	1700	1800	1900	1900	2000	2600	2800	3000

DN 80	RB 4011/12			RB 4021/22			RB 4031/32	RB 4031/32TR
	20	50	200	150	500	600	1200	2100
350 mbar	1600	1600	1000	1100	•	•	•	•
700 mbar	2400	2400	2000	1900	1300	900	•	•
1.5 bar	3600	3800	3400	3200	3000	2800	1800	•
≥ 5 bar	4400	4600	4800	4800	5500	5500	6500	7500

DN 100	RB 4011/12			RB 4021/22			RB 4031/32	RB 4031/32TR
	20	50	200	150	500	600	1200	2100
350 mbar	2200	2000	1400	1400	•	•	•	•
700 mbar	3200	3200	2600	2400	1700	1100	•	•
1.5 bar	4600	5000	4600	4200	4000	3800	2400	•
≥ 5 bar	7000	7000	7500	7500	8500	8500	10000	10000

In order to limit the noise emission it is recommended not to exceed a gas velocity of 100 m/s at the regulator outlet.

Fault Capacity

For a 0.6 specific gravity gas, the wide-open orifice flow (Q) may be calculated using the following equations:

- > Sub-critical flow behaviour: $Q = K_G \sqrt{P_d(P_u - P_d)}$ where $(P_u - P_d) \leq 0.5 P_u$
- > Critical flow behaviour: $Q = K_G P_u / 2$ where $(P_u - P_d) > 0.5 P_u$

Wide-Open Flow Coefficient K_G

DN	25	40	50	80	100
K_G	450	1200	1900	4000	5100

Standard conditions:

- Absolute pressure of 1.013 bar
- Temperature of 15°C

Correction factor for non-natural gas applications:

The flow rates are indicated for a 0.6 specific gravity gas.

To determine the volumetric flow rate for gases other than natural gas, multiply or calculate the values in the capacity tables using the sizing equations with a correction factor.

The table below lists correction factors for some common gases:

Gas type	Specific gravity	Correction factor
Air	1.00	0.77
Butane	2.01	0.55
Carbon dioxide (dry)	1.52	0.63
Carbon monoxide (dry)	0.97	0.79
Natural gas	0.60	1.00
Nitrogen	0.97	0.79
Propane	1.53	0.63
Propane-Air mix	1.20	0.71

Specific gravity or relative density
(air = 1, non-dimensional value)

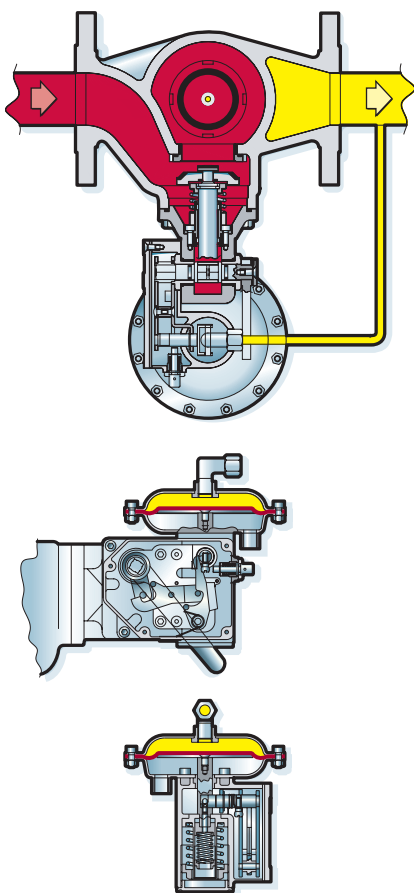
Use the following formula to calculate the correction factor for gases not listed above. In the formula, d is the specific gravity of the gas.

$$\text{Correction factor} = \sqrt{\frac{0.6}{d}}$$

where:

- Q = volumetric flow rate in m³/h at standard conditions
- P_u = absolute inlet pressure in bar
- P_d = absolute outlet pressure in bar

Operational Diagram



■ Inlet Pressure ■ Outlet Pressure

SSV 8600 Safety Shut-off Valve

Accuracy class (AG)

- > Low pressure: AG 10
- > Medium pressure: AG 2.5
- > High pressure: AG 1

Minimum difference between regulator and SSV settings (ΔP_w):

- > 15%, with a minimum difference of 10 mbar for OPSO and 20 mbar for UPSO.

Type Designation and Options

SSV 86	X	X	Versions
	1		ø 150
	2		ø 150/TR
	3		ø 90
	4		ø 90/TR
		1	OPSO
		2	OPSO + UPSO

The RB 4000 Series regulators can be fitted with the SSV 8600 safety shut-off valve for overpressure (OPSO) or combined under-and-over pressure (UPSO/OPSO) protection.

The SSV trip pressure can easily be adjusted independently of regulator set point.

The following accessories make the SSV 8600 easier to use:

- > Manual shut-off button for emergency closing
- > Easily accessible lever for relatching the valve
- > Built-in bypass for balancing pressure before relatching the safety shut-off valve. Use the relatching lever to operate the bypass.

Remote control accessories (optional):

- > Valve position indicator (inductive detector or Reed switch)
- > Remote triggering by explosion-proof solenoid valve

Spring characteristics:

d : wire diameter Lo : height
De: external diameter Lt : no. of spires

Set Range

Over-Pressure Shut-Off Springs (OPSO)

Spring Code	Spring Characteristic				Colour	Spring Range			
	d (mm)	De (mm)	Lo (mm)	Lt (mm)		8611/12 (ø 150)	8621/22 (ø 150/TR)	8631/8632 (ø 90)	8641/8642 (ø 90/TR)
20565233	2.2	35	60	7	Yellow	28 - 65 mbar	•	•	•
20565234	2.5	35	60	7	Red	45 - 100 mbar	•	•	•
20565330	2.7	35	60	7	White	80 - 140 mbar	•	•	•
20565331	3	35	60	7	Blue	100 - 240 mbar	•	0.60 - 0.90 bar	•
20565332	3.5	35	60	7	Orange	190 - 350 mbar	0.55 - 0.90 bar	0.90 - 1.40 bar	•
20565333	4	35	60	7	Brown	350 - 700 mbar	0.90 - 1.70 bar	1.40 - 2.40 bar	2.30 - 4.10 bar
20565334	4.2	35	60	7	Green	450 - 800 mbar	1.50 - 2.00 bar	2.00 - 3.10 bar	3.10 - 5.00 bar
20565430	4.5	35	60	7	Black	600 - 1000 mbar	1.70 - 2.30 bar	2.50 - 3.90 bar	3.80 - 6.00 bar
20565431	5	35	60	7	Grey	950 - 1300 mbar	2.30 - 3.00 bar	3.90 - 4.60 bar	5.70 - 7.50 bar
20565432	5.5	35	60	7	Yellow	•	•	4.60 - 6.30 bar	7.50 - 10.00 bar
20565134	6	35	60	7	Red	•	•	6.30 - 10.80 bar	10.00 - 15.00 bar

Under-Pressure Shut-Off Springs (UPSO)

Spring Code	Spring Characteristic				Colour	Spring Range			
	d (mm)	De (mm)	Lo (mm)	Lt (mm)		8611/12 (ø 150)	8621/22 (ø 150/TR)	8631/8632 (ø 90)	8641/8642 (ø 90/TR)
20561124	1.2	15	40	10	White	5 - 18 mbar	•	•	•
20561221	1.5	15	40	10	Blue	10 - 55 mbar	•	•	•
20561222	1.7	15	40	10	Orange	30 - 75 mbar	0.11 - 0.29 bar	0.23 - 0.37 bar	0.32 - 0.63 bar
20561223	2	15	40	10	Brown	60 - 150 mbar	0.16 - 0.49 bar	0.26 - 0.66 bar	0.42 - 1.10 bar
20561224	2.5	15	40	10	Green	100 - 250 mbar	0.21 - 0.74 bar	0.32 - 1.00 bar	0.60 - 2.20 bar
20561321	2.8	15	35	7	•	•	•	•	2.20 - 3.30 bar min $\Delta p = 1$ bar

SSV 8500 Safety Shut-off Valve

Accuracy class (AG)

- > Low pressure: AG 10
- > Medium pressure: AG 2.5
- > High pressure: AG 1

Minimum difference between regulator and SSV settings (ΔP_w):

- > Standard: 15% with a minimum difference of 10 mbar for UPSO, 20 mbar for OPSO
- > High pressure: 20% with a minimum difference of 40 mbar for UPSO, 40 mbar for OPSO

The RB 4000 Series regulators (*) can be fitted with the SSV 8500 safety shut-off valve for overpressure (OPSO) or combined under-and-over pressure (UPSO/OPSO) protection.

The SSV trip pressure can easily be adjusted independently of the regulator set point. The closing plug of the SSV controller is used as pulling tool to relatch the valve. A built-in bypass, for balancing pressure before relatching the safety shut-off valve, is operated by pulling the valve stem.

(*) except for sizes DN 50 x 80 and DN 100.

Type Designation and Options

SSV 85	X	X	Versions
	1		Ø 120 or 150
	2		Ø 90
	3		Ø 90/TR
		1	OPSO
		2	OPSO + UPSO

Maximum Inlet Pressure

For higher inlet pressure, the SSV 8500 is fitted with heavier closing spring which gives a positive lock-up even in case of high pressure differential across the valve. The following table indicates the maximum inlet pressure for both options.

DN	25	40	50	80
Standard	6 bar	6 bar	6 bar	6 bar
Heavy duty	16 bar	16 bar	16 bar	16 bar

Set Range

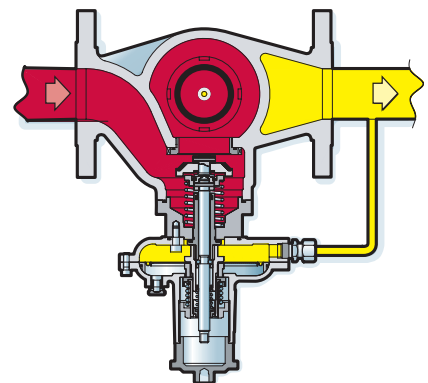
Over-Pressure Shut-Off Springs (OPSO)

Spring Code	Spring Characteristic				Spring Range		
	d (mm)	De (mm)	Lo (mm)	Lt	8511/12 (Ø 150)	8521/22 (Ø 90)	8531/32 (Ø 90 TR)
20565225	2	35	50	6	25 - 49 mbar	0.13 - 0.24 bar	•
20565125	2.5	35	50	6	44 - 120 mbar	0.20 - 0.46 bar	•
20565126	3	35	50	6	95 - 200 mbar	0.42 - 0.90 bar	•
20565127	3.5	35	50	6	200 - 350 mbar	0.83 - 1.84 bar	1.25 - 3.00 bar
20565128	4	35	50	6	•	1.32 - 2.25 bar	2.30 - 4.20 bar
20565129	4.5	35	50	6	•	2.28 - 3.15 bar	3.60 - 5.60 bar

Under-Pressure Shut-Off Springs (UPSO)

Spring Code	Spring Characteristic				Spring Range		
	d (mm)	De (mm)	Lo (mm)	Lt	8511/12 (Ø 150)	8521/22 (Ø 90)	8531/32 (Ø 90 TR)
20561022	1.2	15	35	7.75	9 - 19 mbar	0.06 - 0.10 bar	•
20560815	1.3	15	35	8	14 - 30 mbar	0.10 - 0.25 bar	0.15 - 0.40 bar
20561023	1.5	15	35	7.75	28 - 60 mbar	0.10 - 0.33 bar	0.30 - 0.60 bar
20561024	1.8	15	35	7.5	60 - 100 mbar	0.30 - 0.70 bar	0.58 - 1.25 bar
20561121	2	15	35	7.25	•	0.60 - 1.10 bar	1.20 - 1.70 bar
20561122	2.5	15	35	7.25	•	•	1.08 - 2.50 bar

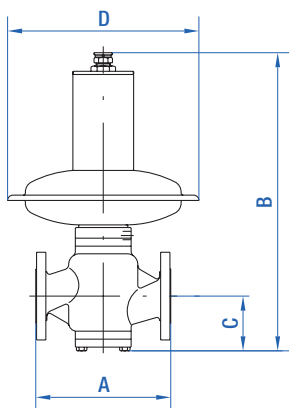
Operational Diagram



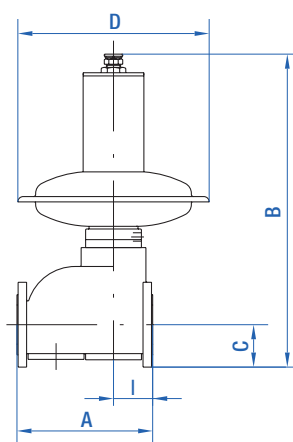
■ Inlet Pressure ■ Outlet Pressure

Spring characteristics:

d : wire diameter
De: external diameter
Lo: height
Lt : no. of spires



> Regulator RB 4000 - DN 25, 40, 50 & 80



> Regulator RB 4000 - DN 100

Regulator - Overall Dimensions (mm)

RB 4000

DN	Actuator	A (mm)	B (mm)	C (mm)	D (mm)	I (mm)	Weight (kg)
25	Ø 360	184	440	70	360	•	20
25	Ø 220	184	385	70	220	•	13*
40	Ø 480	222	555	90	480	•	39
40	Ø 360	222	530	90	360	•	27*
50	Ø 480	254	565	100	480	•	41
50	Ø 360	254	540	100	360	•	29*
50 x 80	Ø 480	267	565	100	480	•	42
50 x 80	Ø 360	267	540	100	360	•	30*
80	Ø 600	298	710	130	600	•	70
80	Ø 480	298	655	130	480	-	56
80	Ø 360	298	625	130	360	•	49
100	Ø 600	352	730	110	600	101	95
100	Ø 480	352	674	110	480	101	81
100	Ø 360	352	652	110	360	101	74

* Add 4 kg for the TR version

Note: Flange holes on DN 100 size are threaded:
 on PN16 flanges, M16 thread
 on PN20 flanges, 5/8 UNC 2B thread

Vent and Sensing Lines

- > Regulator sensing line: Rp 3/8 with compression fitting DN 12
- > Regulator vent line: Rp 3/4

Type Designation and Options

Regulator

To specify the version of the RB 4000 regulator to be ordered, select the options and relevant codes from the table below.

R	B	E	4	0	X	X	DN	X	X	Options
					1					Low pressure (from 10 to 150 mbar)
					2					Medium pressure (from 0.15 to 1 bar)
					3					High pressure (from 1.0 to 2.1 (2.5) bar)
					0					Without safety device
					1					Over-pressure shut-off valve
					2					Over and low-pressure shut-off valve
						TR				Controller size reduction
						25				Orifice (Ø 30 mm)
						40				Orifice (Ø 38 mm)
						50				Orifice (Ø 48 mm)
						50/80				Orifice (Ø 48 mm)
						80				Orifice (Ø 78 mm)
						100				Orifice (Ø 98 mm)
							M			Monitor version
								S		with built-in silencer

Example: Mod. 4011 DN25 M/S is a 1" regulator with over-pressure shut-off valve, monitor version and silencer.

Safety Shut-off Valve - Overall Dimensions (mm)

SSV 8600

DN	E Actuator Ø 150	F	E Actuator Ø 90	F	H	C2	Additional weight (kg)
25	290	150	260	90	•	•	4
40	298	150	268	90	•	•	5
50	306	150	276	90	•	•	7
50 x 80	306	150	276	90	•	•	7
80	362	150	332	90	•	•	9
100	135	150	135	90	149	294	10

Vent and Sensing Lines

- > SSV sensing line: Rp 1/4 with compression fitting DN 10
- > SSV 8600 vent line: Rp 1/4

SSV 8500

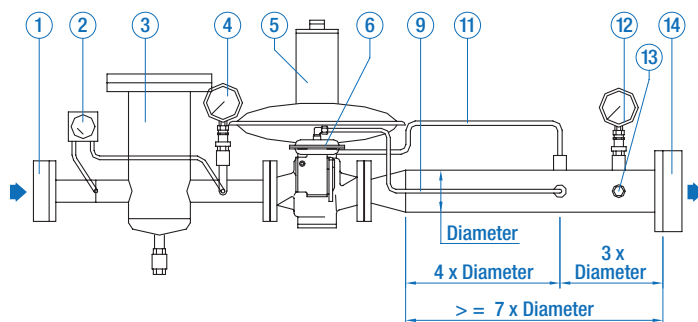
DN	E	Additional weight (kg)
25	183	2
40	260	3
50	268	5
80	318	7

Vent and Sensing Lines

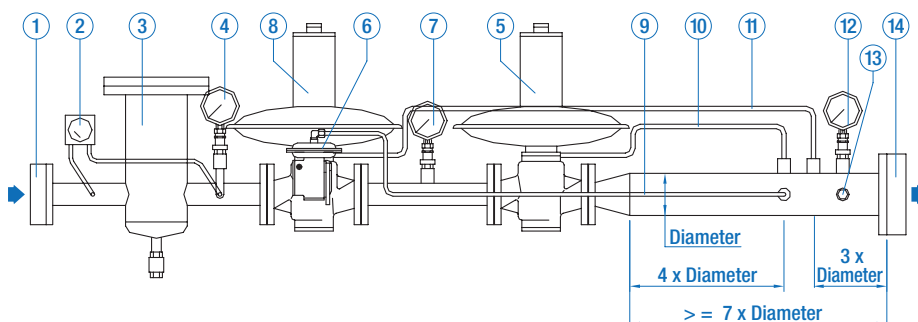
- > SSV sensing line: Rp 1/4 with compression fitting DN 10
- > SSV 8500 vent line: Rp 1/8

Installation

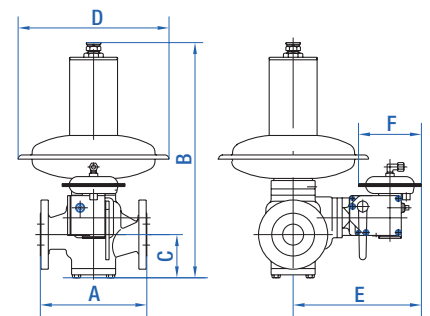
- Upstream valve
- Differential pressure gauge
- Strainer / Filter
- Upstream pressure gauge
- Regulator
- Shut-off valve
- Pressure gauge
- Monitor regulator
- Shut-off valve sensing line
- Regulator sensing line
- Monitor regulator sensing line
- Downstream pressure gauge
- Discharge vent pipe
- Downstream valve



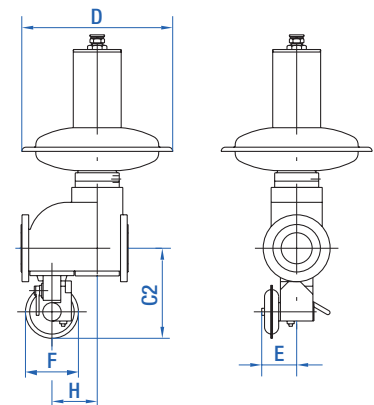
> Figure 6: Regulator installation



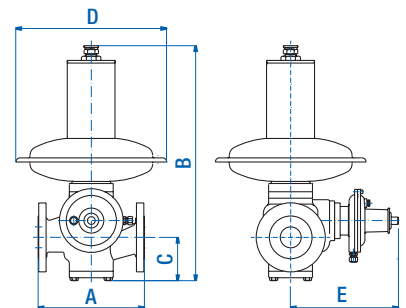
> Figure 7: Monitor application



> Regulator RB 4000 and SSV 8600 DN 25, 40, 50 & 80



> Regulator RB 4000 and SSV 8600 DN 100



> Regulator RB 4000 and SSV 8500

Information to be specified when ordering:

- Regulator type code
- Minimum and maximum inlet pressures
- Outlet pressure range
- Outlet pressure setting
- Connection type
- Options
 - OPSO setting*
 - UPSO setting*
- * (if requested)

About Itron Inc.

Itron Inc. is a leading technology provider to the global energy and water industries. Our company is the world's leading provider of metering, data collection and utility software solutions, with nearly 8,000 utilities worldwide relying on our technology to optimize the delivery and use of energy and water. Our products include electricity, gas and water meters, data collection and communication systems, including automated meter reading (AMR) and advanced metering infrastructure (AMI); meter data management and related software applications; as well as project management, installation, and consulting services. To know more, start here: www.itron.com

For more information, contact your local sales representative or agency.



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