Pressure Regulator RB 4600

- Compact
- High flow capacity
- Accurate control
- Low differential
- Easy maintenance
- Rugged construction for durability
- Travel indicators

Applications

The RB 4600 regulator is designed for use in city gate or district stations where the overpressure protection is given by a combination of active regulator and monitor regulator with upstream slam-shut valve.

Description

The RB 4600 is a pilot-operated regulator with a monitor regulator and a safety shut-off device built into a single compact unit. Its pilot system provides a fast and accurate response to flow rate variation. The monitor pilot system is specially fast to react and to take over in case the active regulator fails to control the outlet pressure.
The optional built-in shutoff valve offers protection for overpressure or over-and under-pressure. Its bypass system eases the shutoff valve re-latching.

Technical features

Inlet pressure	25 bar
Outlet pressure	5 mbar – 13 bar
Differential pressure	0,5 bar mini
Accuracy	Up to AC1 / up to SG 2.5
Operating temperature	-20°C to +60°C
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 shutoff (OPSO) and under-pressure shutoff (UPSO)
Options	Noise reduction

Sizes & Connections

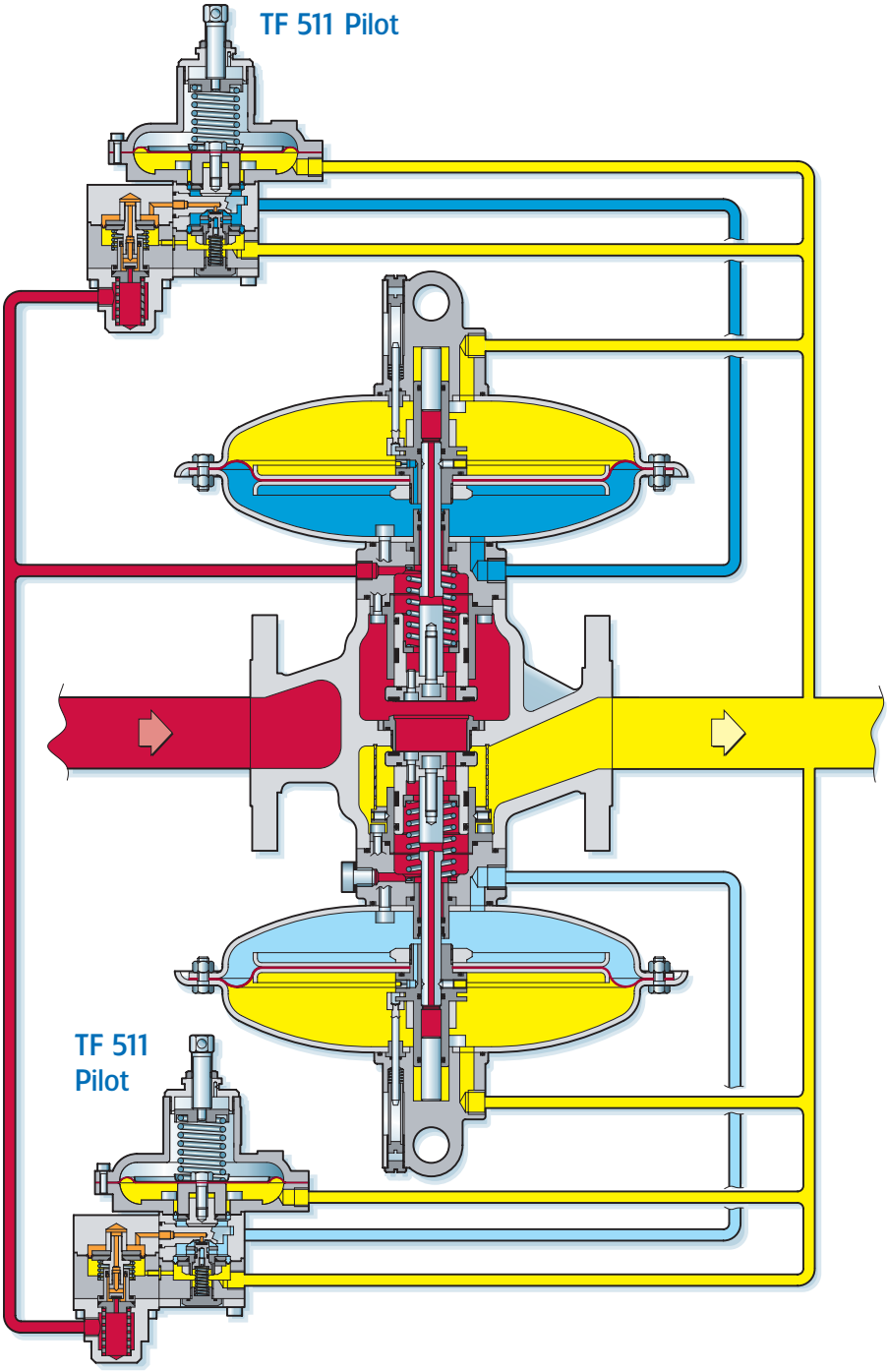
Sizes	DN 25, DN 40, DN 50, DN80, DN100
Body lengths	EN 334 face-to-face recommended dimensions
Flanges	Steel: PN16, PN20, PN 25, PN 50
	Cast iron: PN 16, PN 20, PN 25

Materials

Body	Spheroidal graphite cast iron ISO 1083 gr 500-7
	Steel ASTM A216 WCB
Head	Pressed steel / UNI EN10025
Internal parts & Pilot	Steel, stainless steel, brass and aluminium
Seals	Nitrile rubber
Diaphragm	Synthetic rubber with fabric reinforcement

Pressure Regulator RB 4600

RB 4600 Operational Schematic



- Inlet Pressure
- Outlet Pressure
- Feeding Pressure
- Motorization Pressure – Monitor
- Motorization Pressure – Active

Accuracy

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

- 10 – 100 mbar: AC 2.5 / SG 5
- > 100 mbar: AC 1 / SG 2.5

The typical lock-up pressure zone is better than:
Qmin,pe / Qmax,pe = 2.5 / 100

Pilot System

The RB 4600 regulator includes 2 pilot operated regulators, each of them being controlled by a pilot system serie TF 500 as follows:.

TF 5	1	X	Options
		1	Low pressure : 5 - 280 mbar
		2	Medium pressure: 0.1 - 1 bar
		3	High pressure: 0.25 - 13 bar

Outlet Pressure Range

Pilot Type	Spring Code	Spring Characteristics				Spring Range	
		D	De	Lo	It	mbar	bar
		mm	mm	mmmm			
TF 511	20565125	2.5	35	50	6	5 - 25	
TF 511	20565126	3	35	50	6	20 - 68	
TF 511	20565127	3.5	35	50	6	40 - 140	
TF 511	20565128	4	35	50	6	80 - 280	
TF 512	20565128	4	35	50	6		0.1 - 0.6
TF 512	20565129	4.5	35	50	6		0.2 - 1
TF 513	20565132	3.5	35	60	6.5		0.3 - 1.3
TF 513	20565133	4	35	60	6.5		0.5 - 2.5
TF 513	20565131	5	35	60	6.5		1.5 - 5.5
TF 513	20565134	6	35	60	6.5		4 - 13

Spring characteristics:
d : wire diameter
De : external diameter
Lo : height
It : nber of spires

The pilot system serie TF 500 includes a built-in pre-regulator which is loaded by the oulet pressure to provide the pilot with a feeding pressure 500 mbar above outlet pressure.
The pre-regulator is fitted with separate filter.

Remote control

The pilot system serie TF 512-PL is designed for applications where the regulator set point shall be controlled remotely, such as leak management systems, process control applications , etc. In the pilot system TF 512-PL, the pilot setting element, which is a spring in conventional pilots, is replaced by an external loading pressure. See separate Technical Information Bulletin

Accessories

A separate accelarator of serie AP may be added to the pilot system serie TF 500. This accelaror is recommended in case of on /off loads in order to limit the pressure surge when the gas demand stops.
The AP serie accelerators can be set in the following ranges:

- AP/1 Low pressure: 5 - 280 mbar
- AP/2 Medium pressure: 0.1 - 1 bar
- AP/3 High pressure: 0.25 - 13 bar

Flow Capacity

Sizing Equation

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

▶ Sub-critical flow behavior, when $(P_e - P_a) \leqslant 0.5\ P_e$

$$Q = K_G \sqrt{(P_e - P_a)}$$

or

$$Q = K_G\ P_e \sin\left[K_1 \sqrt{\frac{(P_e - P_a)}{P_e}}\right]$$

▶ Critical flow behavior, when $(P_e - P_a) > 0.5\ P_e$

$$Q = K_G \frac{P_e}{2}$$

Standard conditions:

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

Where:
Q: volumetric flow rate in m^3/h at standard conditions
P_e: inlet absolute pressure in bar
P_a: outlet absolute pressure in bar
Sin angle in degree

Flow coefficient K_G

DN	25	40	50	80	100
K_G	490	1100	1950	4200	7100
K_1	105	105	105	105	105

K_G coefficient for a regulator with an integral safety shutoff valve should be reduced by approximately 5 %

Correction factor for non-natural gas applications:

The flow rates are indicated or a 0.6 specific gravity gas.
To determine the volumetric flow rate for gases other than natural gas, the values in the capacity tables should be multiplied or calculated using the sizing equations with a correction factor.
The table below lists the correction factors for some common gases:

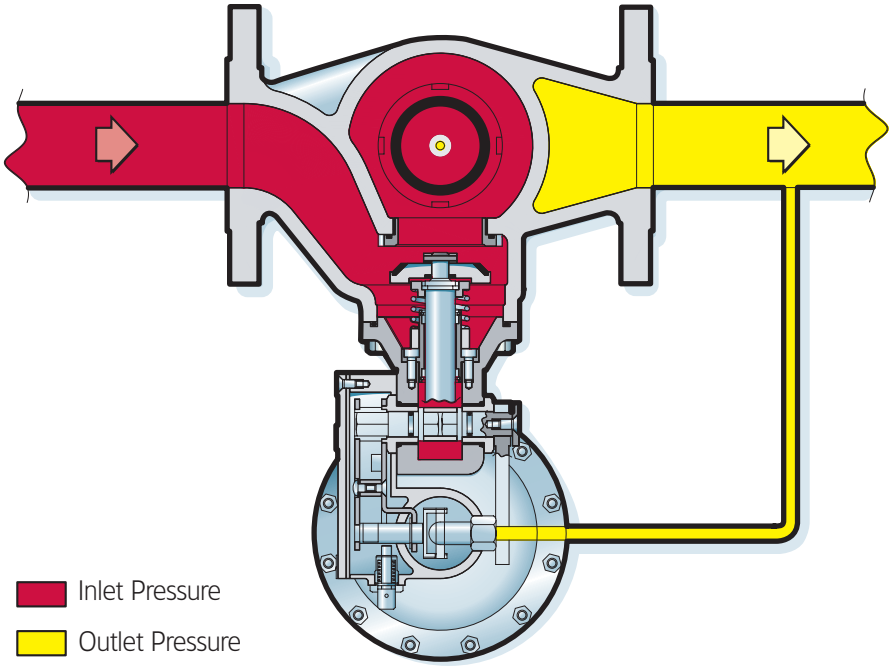
Gas type	*Specific gravity*	*Correction factor*
Air	1.00	0.77
Butane	2.01	0.55
Carbon dioxide (dry)	1.52	0.63
Carbon monoxide (dry)	0.97	0.79
Natural gas	0.60	1.00
Nitrogen	0.97	0.79
Propane	1.53	0.63
Propane-Air mix	1.20	0.71

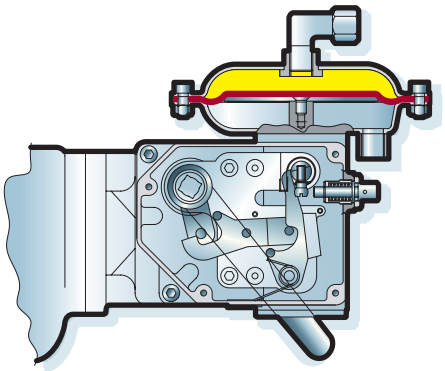
Specific gravity or relative density (air = 1, non-dimensional value)

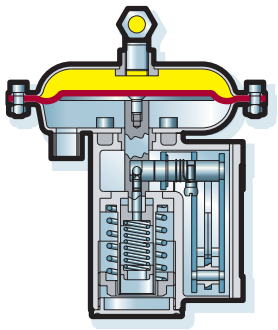
To calculate the correction factor for gases not listed above, the specific gravity (d) of the gas should be taken and used in the following formula:

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

SSV 8600 Safety Shutoff Valve







Accuracy class (AG):

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

Minimal difference between regulator and SSV settings (ΔP_W):

- > 15 %, with a minimum difference of 10 mbar to OPSO and 20 mbar to 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

SSV 8600 Safety Shutoff Valve (cont'd)

The RB 4600 Series regulators (*) can be fitted with the SSV 8600 safety shutoff valve for overpressure (OPSO) or combined under-and-over pressure (UPSO/OPSO) protection.

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

(*) with the exception of size DN100

The following **accessories** ease the use of SSV 8600:

- Manual shut-off button for emergency closing
- Easily accessible lever for relatching the valve
- Built-in bypass for balancing pressure before relatching the safety shutoff valve. This bypass is operated when acting on the relatching lever.

Remote control accessories (optional):

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

Set Range

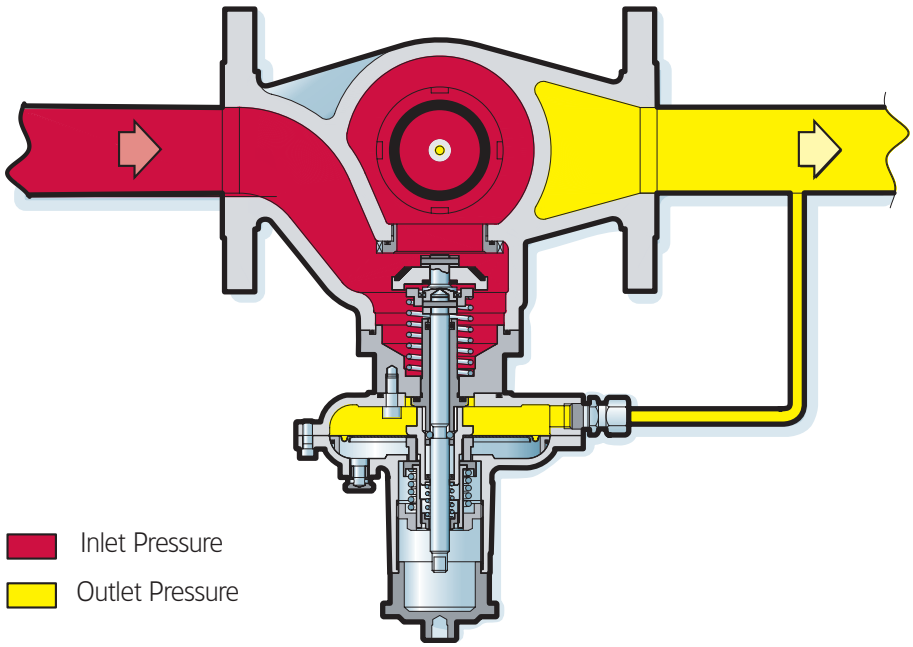
Over-pressure shut-off springs (OPSO)

Spring Code	Spring Characteristics				Colour	Spring Range			
	d	De (mm)	Lo (mm)	lt (mm)		8611/12 (Ø 150)	8621/22 (Ø 150/TR)	8631/8632 (Ø 90)	8641/8642 (Ø90/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 - 160 mbar			
20565331	3	35	60	7	Blue	100 - 250 mbar		0.6 - 1.2 bar	
20565332	3.5	35	60	7	Orange	190 - 350 mbar	0.6 - 1.2 bar	1.0 - 2.0 bar	
20565333	4	35	60	7	Brown	350 - 700 mbar	1.0 - 2.0 bar	1.5 - 3.1 bar	2.3 - 5.1 bar
20565334	4.2	35	60	7	Green	450 - 870 mbar	1.5 - 2.5 bar	2.0 - 3.8 bar	3.1 - 5.8 bar
20565430	4.5	35	60	7	Black	600 - 1050 mbar	1.7 - 2.8 bar	2.5 - 4.8 bar	3.8 - 6.8 bar
20565431	5	35	60	7	Grey	950 - 1400 mbar	2.7 - 4.3 bar	3.9 - 6.3 bar	5.7 - 9.3 bar
20565432	5.5	35	60	7	Yellow	•	•	5.0 - 8.0 bar	9.0 - 13.0 bar
20565134	6	35	60	7	Red	•	•	7.7 - 10.8 bar	12.7 - 15.0 bar

Under-pressure shut-off springs (UPSO)

Spring Code	Spring Characteristics				Colour	Spring Range			
	d (mm)	De (mm)	Lo (mm)	lt		8611/12 (Ø 150)	8621/22 (Ø 150/TR)	8631/8632 (Ø90)	8641/8642 (Ø90/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	0.2 - 0.2 bar	0.3 - 0.4 bar	0.4 - 0.6 bar
20561223	2	15	40	10	Brown	60 - 150 mbar	0.2 - 0.4 bar	0.3 - 0.7 bar	0.5 - 1.1 bar
20561224	2.5	15	40	10	Green	100 - 250 mbar	0.3 - 0.7 bar	0.4- 1.0 bar	0.6 - 1.5 bar

SSV 8500 Safety Shutoff Valve



Accuracy class (AG):

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

Minimal difference between regulator and SSV settings (ΔP_W):

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

Type designation and options

SSV 85	X	X	Versions
	1		ø 150
	2		ø 90
	3		ø 90/TR
		1	OPSO
		2	OPSO + UPSO

SSV 8500 Safety Shutoff Valve (cont'd)

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

(*) with the exception of size DN100.

The SSV trip pressure can easily be adjusted independantly of 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 shutoff valve, is operated when pulling the valve stem.

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 executions.

DN	25	40	50	80
Standard	10 bar	10 bar	6 bar	6 bar
Heavy duty	19 bar	19 bar	19 bar	19 bar

Set Range

Over-pressure shut-off springs (OPSO)

Spring Code	Spring Characteristics				Spring Range		
	d mm)	De (mm)	Lo (mm)	It	8511/12 (Ø 150)	8521/22 (Ø 90)	8531/32 (Ø90/TR)
20565225	2	35	50	6	25 49 mbar	0.2 - 0.2 bar	•
20565125	2.5	35	50	6	44 - 120 mbar	0.2 - 0.4 bar	•
20565126	3	35	50	6	95 - 200 mbar	0.5 - 0.9 bar	•
20565127	3.5	35	50	6	200 - 300 mbar	0.9 - 1.8 bar	1.3 - 3.0 bar
20565128	4	35	50	6	•	1.4 - 2.2 bar	2.3 - 4.2 bar
20565129	4.5	35	50	6	•	2.3 - 3.1 bar	3.6 - 5.6 bar

Under-pressure shut-off springs (UPSO)

Spring Code	Spring Characteristics				Spring Range		
	d (mm)	De (mm)	Lo (mm)	It	8512 (Ø 150)	8522 (Ø90)	8532 (Ø90/TR)
20561022	1.2	15	35	7.75	9 - 19 mbar	0.06 - 0.1 bar	•
20560815	1.3	15	35	8	14 - 30 mbar	0.1 - 0.2 bar	0.2 - 0.4 bar
20561023	1.5	15	35	7.75	28 - 60 mbar	0.2 - 0.4 bar	0.3 - 0.6 bar
20561024	1.8	15	35	7.5	60 - 100 mbar	0.4 - 0.7 bar	0.6 - 1.2 bar
20561121	2	15	35	7.25	•	0.6 - 1.1 bar	1.2 - 1.7 bar
20561122	2.2	15	35	7	•	•	1.1 - 2.5 bar

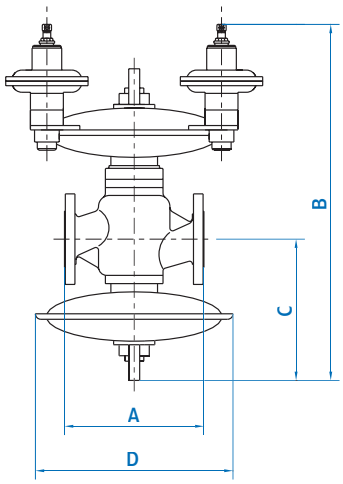
Overall dimensions (in mm)

Regulator

DN	ACTUATOR	A	B	C	D	P	Weight (kg)
25		183	630	280	360	270	50
40		223	660	300	360	270	58
50		254	690	315	360	270	59
80	with TF 511	298	825	370	360	270	115
	with TF 512 or TF 513				480	330	
100		352	860	395	480	330	130

Vent and sensing line:

- Pilot sensing line: Rp 1/4 with compression fitting for 10 mm pipe
- Regulator process line: Rp 3/8 with compression fitting for 10 mm pipe



▶ RB 4600 without SSV

With SSV 8500

DN	E	Weight add (kg)
25	183	2
40	260	3
50	268	5
80	318	5

Vent and sensing line:

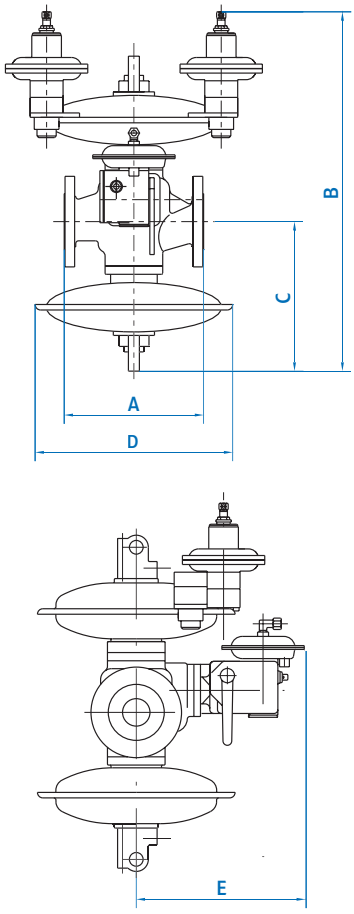
- SSV sensing line: Rp 1/4 with compression fitting for 10 mm pipe
- SSV breather line: Rp 1/8

With SSV 8600

DN	E	F	E	F	Weight add (kg)
	Actuator Ø 150		Actuator Ø 90		
25	290	150	260	90	4
40	305	150	275	90	5
50	310	150	280	90	7
80	375	150	345	90	9

Vent and sensing line:

- SSV sensing line: Rp 1/4 with compression fitting for 10 mm pipe
- SSV breather line: Rp 1/4



▶ RB 4600 with SSV 8600

Type designation & Options

To specify the version of the RB 4600 series to be ordered, the options and relevant codes should be selected from the table below.

R	B	E	4	6	X	X	DN	X	X	Options
					1					Pilot TF 511
					2					Pilot TF 512
					3					Pilot TF 513
						0				Without safety device
						1				Over-pressure shut-off
						2				Over- and under-pressure shut-off
								25		Orifice (Ø 23 mm)
								40		Orifice (Ø 38 mm)
								50		Orifice (Ø 48 mm)
								80		Orifice (Ø 78 mm)
								100		Orifice (Ø 98 mm)
									S	With integral silencer

Information to be specified when ordering:

- Regulator type code
- SSV type
- Minimum and maximum inlet pressures
- Outlet pressure range setting
- Outlet pressure setting
- OPSO setting*
- UPSO setting*
- Connection type
- Options

* If requested

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