Pressure Regulator RB 4700

- High flow capacity
- Accurate control
- Low differential
- Easy maintenance
- Rugged construction for durability
- Low noise
- Travel indicator
- Approved by the major European gas distribution companies

Pressure Regulator RB 4700

Applications

The RB 4700 regulator is designed for use in industrial and distribution applications such as district stations, heating plants and industrial customers.

Description

The RB 4700 is a pilot-operated regulator with an optional integrated safety shut-off device.
Its pilot system provides a fast and accurate response to flow rate variation. Pilot supply is protected by a separate fine filter. An automatically loaded pressure feeder alows accurate control at high inlet pressure.
The optional built-in shut-off valve offers protection for overpressure or over- and under-pressure. Its bypass system eases the shut-off 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 shut-off (OPSO) and under-pressure shut-off (UPSO)
Options	Noise reduction

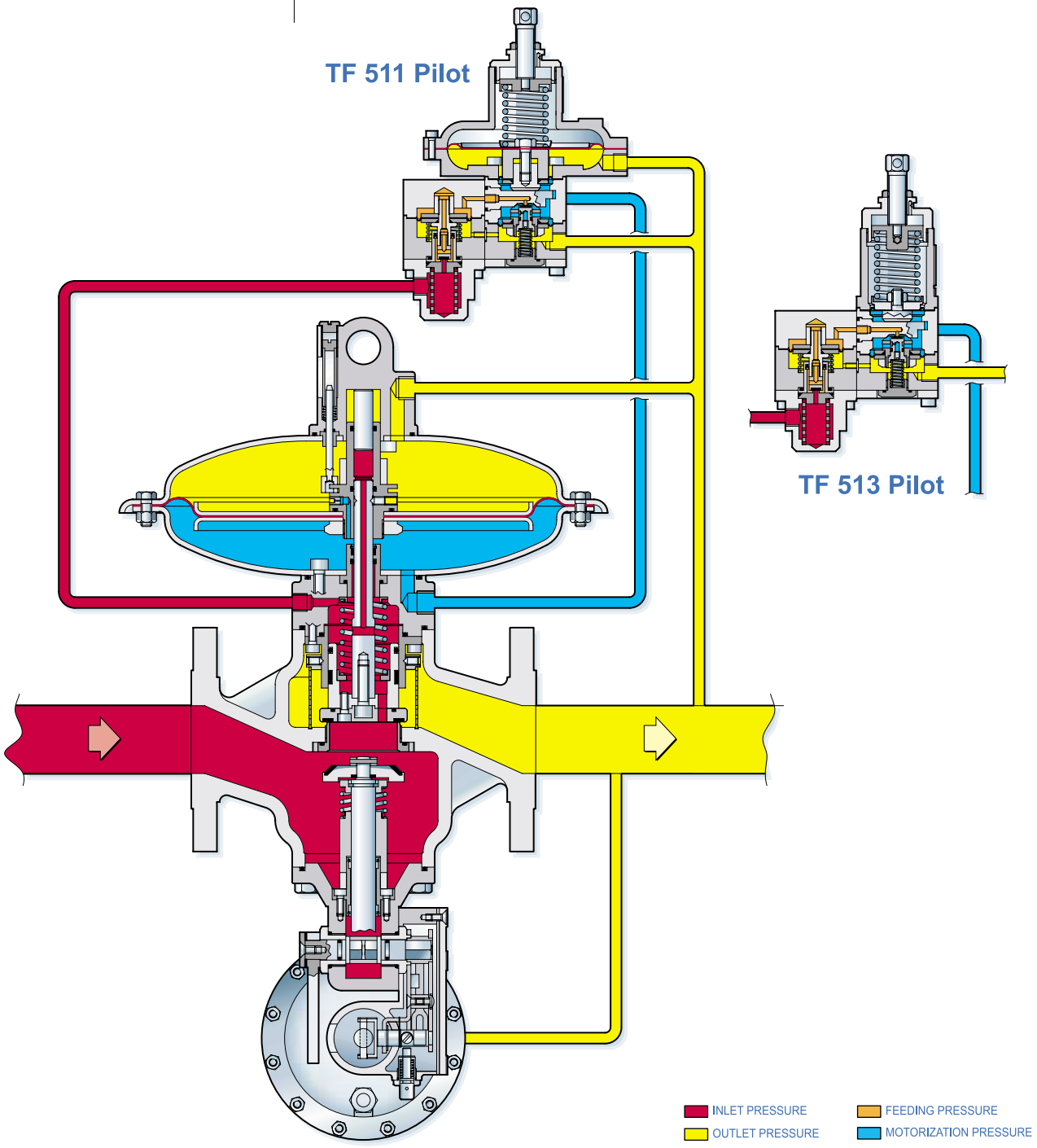
Sizes & Connections

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

RB 4700 Operational Schematic



Accuracy

Accuracy class (AC), lock-up pressure 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 4700 regulators are equipped with pilot system series 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 series 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 series 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 series 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	520	1.150	2.050	4.400	7.500	Basic
K_G	490	1.050	1.750	3.700	6.000	With SSV and Silencer
K_1	105	105	105	100	95	

K_G coefficient for a regulator with an integral safety shut-off 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:

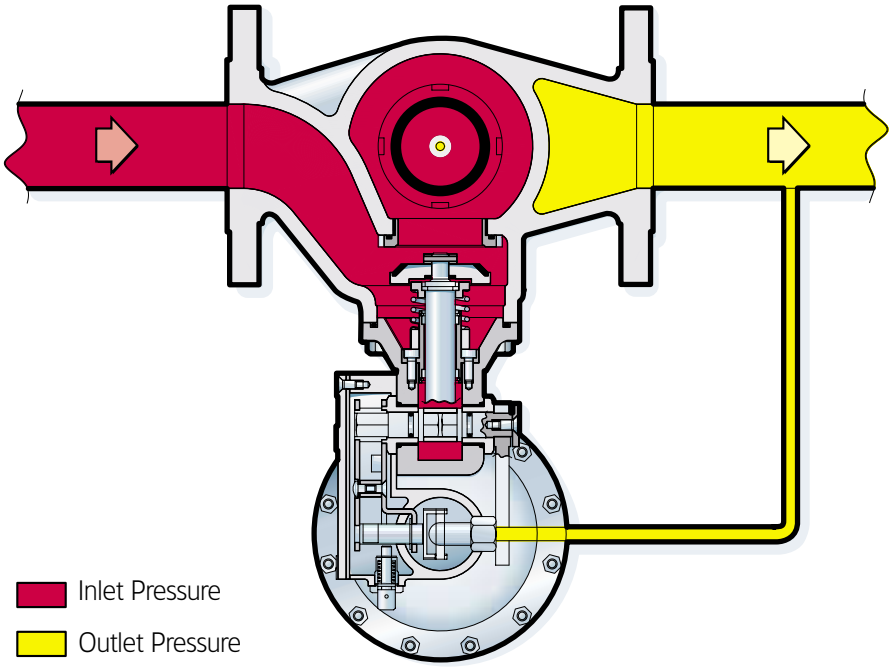
Gas type	*Specific gravity*	*Correction factor*
Air	1.00	0.77
Butane	2.01	0.55
Carbon dioxide (dry)	1.52	0.63
Carbon monoxide (dry)	0.97	0.79
Natural gas	0.60	1.00
Nitrogen	0.97	0.79
Propane	1.53	0.63
Propane-Air mix	1.20	0.71

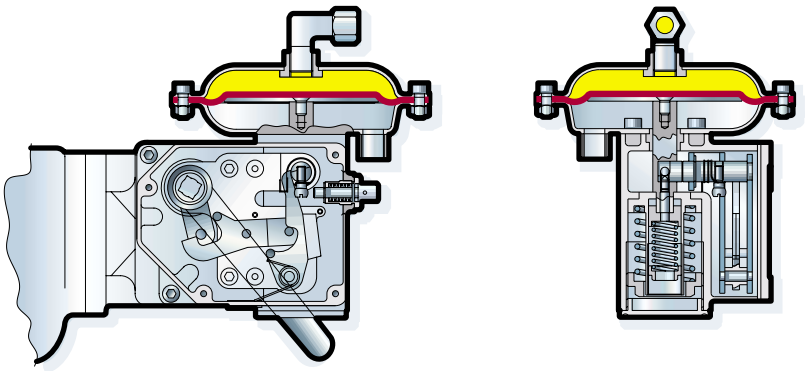
Specific gravity or relative density (air = 1, non-dimensional value)

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 Shut-off 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 Shut-off Valve (cont'd)

The RB 4700 Series regulators can be fitted with the SSV 8600 safety shut-off valve for over pressure (OPSO) or combined under- and-over pressure (UPSO/OPSO) protection.

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

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 shut-off 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

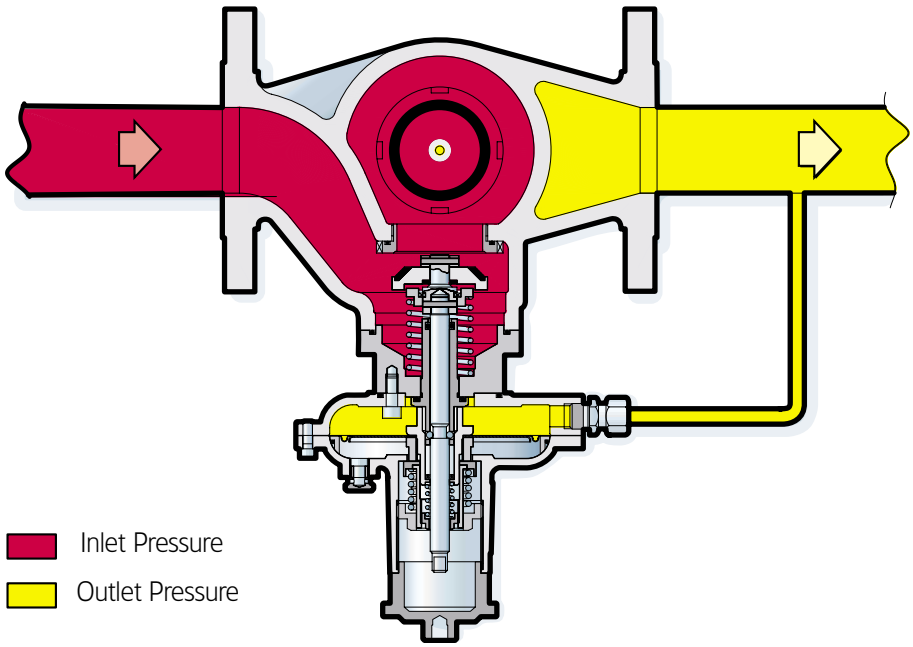
Over-pressure shut-off springs (OPSO)

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 Shut-off 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 Shut-off Valve (cont'd)

The RB 4700 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.

(*) with the exception of size DN 100

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 shut-off 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		180	345	70	360	270	23
40		223	365	90	360	270	29
50		254	375	100	360	270	32
80	with TF 511	300	440	130	360	270	62
	with TF 512 or TF 513				480	330	
100		352	462	140	480	330	87

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

With SSV 8500

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

Vent and sensing line:

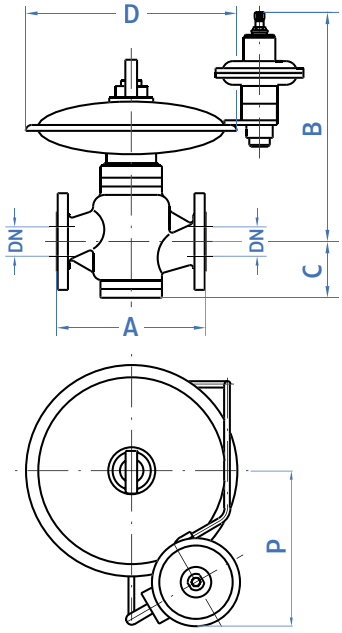
- SSV sensing line: Rp 1/4 with compression fitting for 10 mm pipe
- SSV breather line: Rp 1/8

With SSV 8600

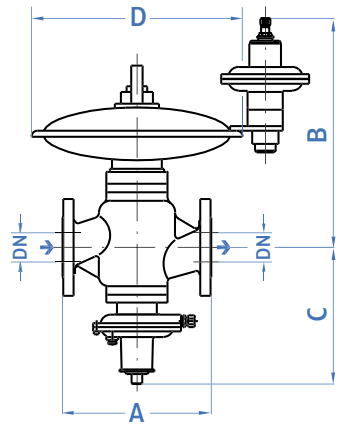
DN	E	C	E	C	Weight add (kg)
	Actuator Ø 150		Actuator Ø 90		
25	150	260	90	230	4
40	150	285	90	255	5
50	150	285	90	255	7
80	150	335	90	305	9
100	150	335	90	305	10

Vent and sensing line:

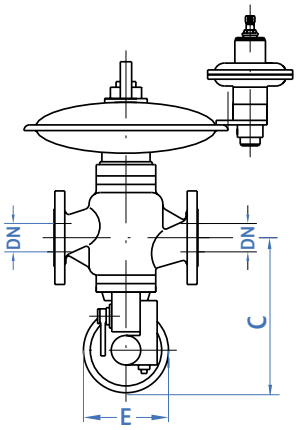
- SSV sensing line: Rp 1/4 with compression fitting for 10 mm pipe
- SSV breather line: Rp 1/4



RB 4700 without SSV



RB 4700 with 8500



RB 4700 with 8600

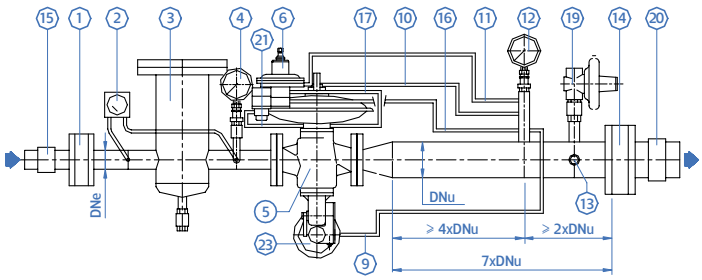
Type designation & options

To specify the version of the RB 4700 series to be ordered, the options and relevant codes should be selected from the table below.

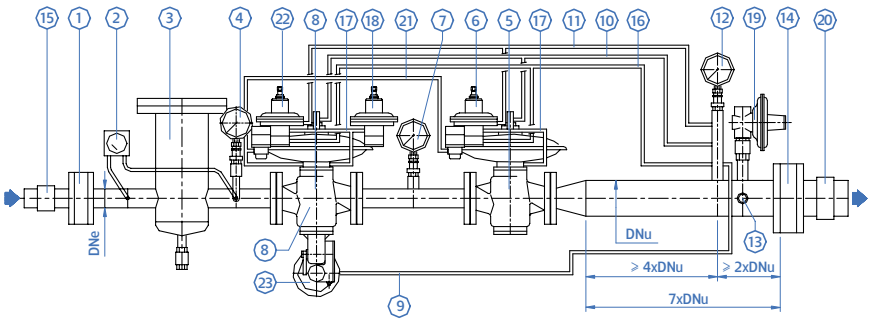
R	B	E	4	7	X	X	DN	X	X	Options
					1					Pilot TF 511
					2					Pilot TF 512
					3					Pilot TF 513
						0				Without safety device
						1				Over-pressure shut-off
						2				Over- and under-pressure shut-off
								25		Orifice (Ø 23 mm)
								40		Orifice (Ø 38 mm)
								50		Orifice (Ø 48 mm)
								80		Orifice (Ø 78 mm)
								100		Orifice (Ø 98 mm)
									S	With integral silencer

Example: Model RBE 4711 DN25 S is a regulator with a TF 511 pilot, an over-pressure shut-off and silencer.

Installation



▶ Typical installation with safety shut-off valve



▶ Typical installation with safety shut-off valve, monitor and active regulators

Item	
1	Upstream valve
2	Differential pressure gauge
3	Strainer / Filter
4	Upstream pressure gauge
5	Regulator
6	Pilot
7	Pressure gauge
8	Monitor regulator
9	Shut-off valve sensing line
10	Regulator process line
11	Pilot sensing line
12	Downstream pressure gauge
13	Discharge vent pipe
14	Downstream valve
15	Pilot process line (TF 511 only)
17	Motorization line
18	Accelerator
19	Safety relief valve (optional)
20	Monitor pilot
23	Shu-off valve

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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