

RB 4700

Commercial & Industrial Regulator

The RB 4700 regulator is designed for use in industrial and distribution applications such as district station and heating plants, and for 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 allows accurate control at high inlet pressure.

The optional built-in shut-off valve offers protection against over-pressure or over- and under-pressure. Its bypass system makes it easy to relatch the shut-off valve.

Technical Features

| | |
|-----------------------|---|
| Inlet pressure | 25 bar |
| Outlet pressure | 5 mbar – 13 bar |
| Differential pressure | 0.3 bar mini |
| Accuracy | Up to AC1 / SG 2,5 |
| Operating temperature | -20°C to +60°C |
| Ambient temperature | -30°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 Travel stop (DN 25 only) |

Sizes & Connections

| | |
|--------------|--|
| Sizes | DN 25, DN 40, DN 50, DN80, DN100 |
| Body lengths | EN 334 face-to-face recommended dimensions (PN 16 - 25; PN 50) |
| Body rating | PN16, PN20, PN25, ANSI CL150, 300 |

Materials

| | |
|------------------------|---|
| Body | Spheroidal graphite cast iron EN 1563 grade EN-GJS-400-18 Steel: EN 10213-3 grade G20 MN5 |
| Head | Pressed steel / UNI EN10025 |
| Internal parts & Pilot | Steel, stainless steel, brass and aluminium |
| Seals | Nitrile rubber |
| Diaphragm | Synthetic rubber with fabric reinforcement |



Key Benefits

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

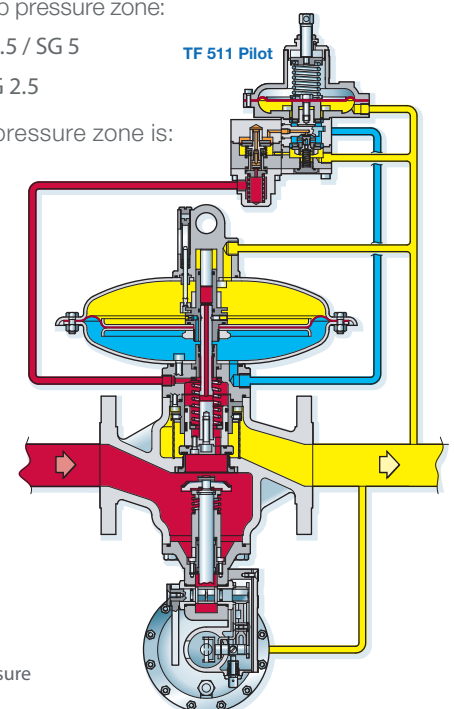
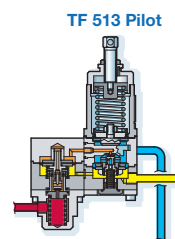
Operational Diagram

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:

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



- Inlet Pressure
- Outlet Pressure
- Feeding Pressure
- Motorization Pressure

Pilot System

RB 4700 regulators are equipped with a TF 500 series pilot system, 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 Characteristic | | | | Spring Range | |
|------------|-------------|-----------------------|---------|---------|-----|--------------|------------|
| | | d (mm) | De (mm) | Lo (mm) | Lt | mbar | bar |
| 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 | | 0,25 - 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 |

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

The pre-regulator is fitted with a separate filter.

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 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 $(P_u - P_d) > 0.5 P_u$

Flow Coefficient K_G

| DN | 25 | 40 | 50 | 80 | 100 | |
|-------|-----|-------|-------|-------|-------|-----------------------|
| K_G | 520 | 1,150 | 2,050 | 4,500 | 8,000 | Basic |
| K_G | 490 | 1,050 | 1,750 | 3,700 | 6,000 | With SSV and Silencer |
| K_I | 105 | 105 | 105 | 100 | 95 | |

Spring characteristics :

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

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 |
| Natural gas +20% H ₂ | 0.50 | 1.10 |

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.

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

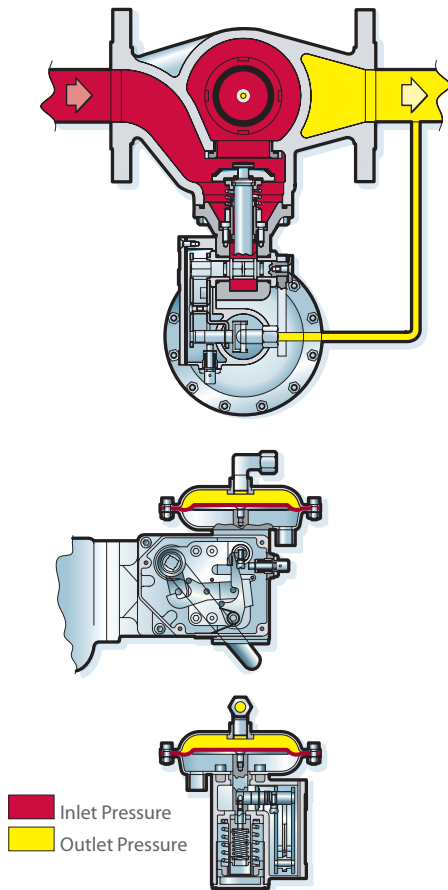
Q = volumetric flow rate in m³/h at standard conditions

P_u = absolute inlet pressure in bar

P_d = absolute outlet pressure in bar

Sin = angle in degrees

Operational Diagram



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 UPSO and 20 mbar for OPSO.

Type Designation and Options

| SSV 86 | X | X | Versions |
|--------|---|---|-------------|
| | 1 | | ∅ 150 |
| | 2 | | ∅ 150/TR |
| | 3 | | ∅ 90 |
| | 4 | | ∅ 90/TR |
| | | 1 | OPSO |
| | | 2 | OPSO + UPSO |

The RB 4700 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 losing
- » 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

| Spring Code | Spring Characteristic | | | | Colour | Spring Range | | | |
|-------------|-----------------------|---------|---------|----|--------|-----------------|--------------------|------------------|---------------------|
| | d (mm) | De (mm) | Lo (mm) | Lt | | 8611/12 (∅ 150) | 8621/22 (∅ 150/TR) | 8631/8632 (∅ 90) | 8641/8642 (∅ 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 - 20,00 bar |

Under-Pressure Shut-Off Springs (UPSO)

| Spring Code | Spring Characteristic | | | | Colour | Spring Range | | | |
|-------------|-----------------------|---------|---------|----|--------|-----------------|--------------------|------------------|---|
| | d (mm) | De (mm) | Lo (mm) | Lt | | 8611/12 (∅ 150) | 8621/22 (∅ 150/TR) | 8631/8632 (∅ 90) | 8641/8642 (∅ 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 - 5,00 bar min $\Delta p = 1$ bar |

SSV 8500 Safety Shut-Off Valve

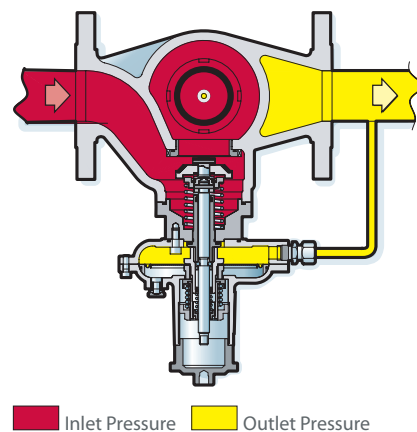
Minimum difference between regulator and SSV settings (ΔP_w):

- » 10 mbar \leq Pds \leq 30 mbar:
OPSO \geq Pds + 20 mbar
UPSO \leq Pds - 10 mbar
- » 30 mbar < Pds \leq 100 mbar:
OPSO \geq Pds + 20 mbar
UPSO \leq Pds - 20 mbar
- » 100 mbar < Pds \leq 300 mbar:
OPSO \geq Pds + 40 mbar
UPSO \leq Pds - 40 mbar
- » Pds > 300 mbar:
OPSO \geq 120% Pds
UPSO \geq 80% Pds

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. 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 size DN 100.

Operational Diagram



Pds: Set point outlet pressure
OPSO: Over-pressure shut-off
UPSO: Under-pressure shut-off

Type Designation and Options

| SSV 85 | X | X | Versions |
|--------|---|---|-------------|
| | 1 | | Ø 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 | 6 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) | 8531/132 (Ø 90TR) |
| 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 |

Spring characteristics:

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

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) | 8531/132 (Ø 90TR) |
| 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 |

Regulator - Overall Dimensions (mm)

| DN | Actuator | A | | B | C | D | P | Weight (kg) | |
|-----|--------------------------|-------------------------|-------------------|-----|-----|-----|-----|-------------------------|-------------------|
| | | PN 16/20/25 ANSI 150 | PN 50 ANSI 300 | | | | | PN 16/20/25 ANSI 150 | PN 50 ANSI 300 |
| 25 | | 184 | 197 | 345 | 70 | 360 | 270 | 23 | 26 |
| 40 | | 222 | | 365 | 90 | 360 | 270 | 29 | |
| 50 | | 254 | 267 | 375 | 100 | 360 | 270 | 32 | 36 |
| 80 | with TF 511 | 298 | 317 | 440 | 130 | 480 | 330 | 62 | 68 |
| | with TF 512 or TF 513 | | | | | 360 | 270 | | |
| 100 | | 352 | 368 | 462 | 140 | 480 | 330 | 87 | 94 |

Vent and Sensing Lines:

- » Pilot sensing line : Rp 1/4 with compression fitting for 10 mm pipe
- » Regulator sensing line : Rp 1/4" with compression fitting for 12 mm pipe
- » Regulator process line: Rp 3/8 with compression fitting for 10 mm pipe

Safety Shut-Off Valve - Overall Dimensions (mm)

SSV 8600

| DN | E | | C | | Additional weight (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 Lines:

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

SSV 8500

| DN | E | Suppl. poids (kg) |
|----|-----|----------------------|
| 25 | 183 | 2 |
| 40 | 260 | 3 |
| 50 | 268 | 5 |
| 80 | 268 | 5 |

Vent and Sensing Lines:

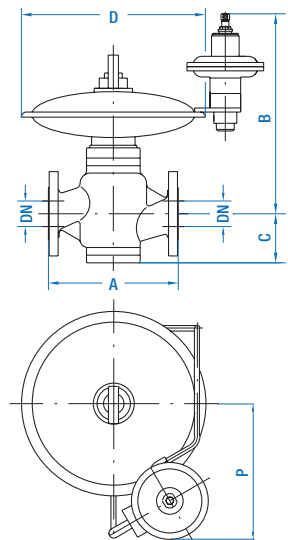
- » SSV sensing line: Rp 1/4 with compression fitting for 10 mm pipe
- » SSV vent line: Rp 1/8

Type Designation And Options

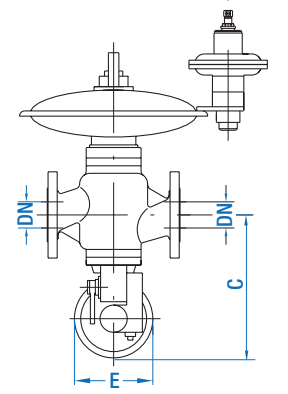
To specify the version of the RB 4000 regulator to be ordered, select the options and relevant codes from the table below.

| R | B | E | 4 | 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 30 mm) |
| | | | | | | | 40 | | | Orifice (Ø 38 mm) |
| | | | | | | | 50 | | | Orifice (Ø 48 mm) |
| | | | | | | | 80 | | | Orifice (Ø 78 mm) |
| | | | | | | | 100 | | | Orifice (Ø 98 mm) |
| | | | | | | | | S | | With built-in silencer |

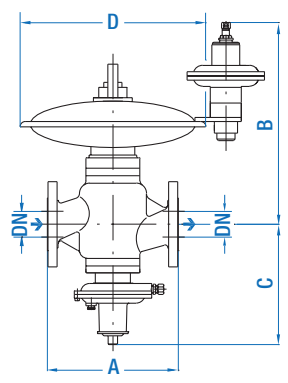
Example: Model RBE4711 DN25 S is a regulator with a TF 511 pilot, an over-pressure shut-off and silencer.



RB 4700 without SSV



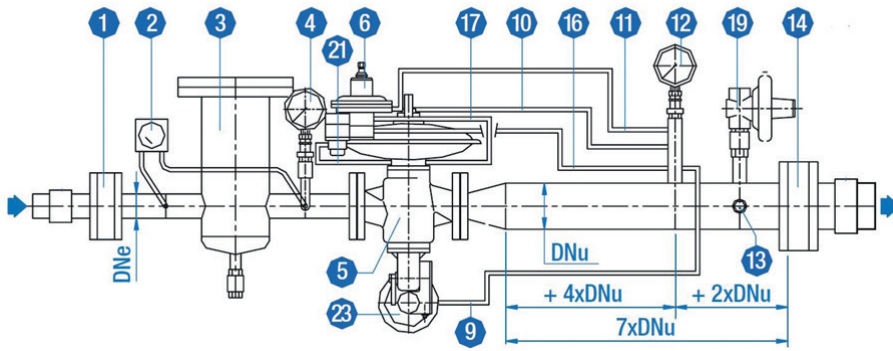
Regulator RB 4700 and SSV 8600



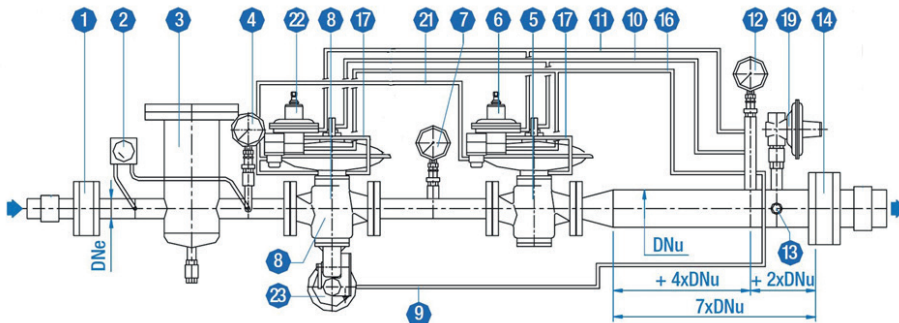
Regulator RB 4700 and SSV 8500

Installation

- | | |
|---|--|
| 1 Upstream valve | 12 Downstream pressure gauge |
| 2 Differential pressure gauge | 13 Discharge vent pipe |
| 3 Strainer / Filter | 14 Downstream valve |
| 4 Upstream pressure gauge | 15 - |
| 5 Regulator | 16 Pilot feeder sensing line Downstream Pd |
| 6 Pilot | 17 Loading pressure line pilot->regulator |
| 7 Pressure gauge (only with monitor installation) | 18 - |
| 8 Monitor regulator (only with monitor installation) | 19 Safety relief valve (SRV) optional |
| 9 Shut-off valve sensing line (SSV) Downstream Pd | 20 - |
| 10 Regulator sensing line Downstream Pd | 21 Inlet pressure sensing line |
| 11 Pilot sensing line (TF511/512) | 22 Monitor pilot (only with monitor installation) |
| | 23 Shut-off valve |



RB47xx typical installation with safety shut-off valve SSV86xx



RB47xx typical installation with monitor and active regulators and safety shut-off valve SSV86xx

Information to be specified when ordering:

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

* (if requested)

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