



RR 16

Commercial & Industrial Regulator

The RR 16 regulator is designed for industrial use: gas supply networks, district stations, industries, heating plants, as well as for all installations where accurate pressure control, easy adjustment and fast response times are required, such as for burners, industrial ovens, boilers etc.

DESCRIPTION

The RR 16 regulator is a direct-acting, spring-loaded regulator with an optional built-in safety shut-off device.

The balanced valve ensures constant outlet pressure when the upstream pressure varies.

KEY BENEFITS

- » Built-in resistance
- » Cartridge type diaphragm and valve assembly for easy maintenance
- » Wide range of interchangeable orifices
- » Approved by German DVGW

Technical Features

| | |
|-----------------------------|--|
| Maximum inlet pressure | 16.0 bar |
| Outlet pressure | 10 mbar - 1.1 bar |
| Accuracy & lock-up pressure | Up to AC5 / up to SG 10 |
| Operating temperature | Gas: -20° C to +60° C Ambient: -30°C to + 60°C |
| Acceptable gases | Natural gas, propane, butane, air, nitrogen and all non-corrosive gases |
| Safety devices | Optional built-in safety shut-off valve OPSO: Over-pressure shut-off UPSO: Under-pressure shut-off |
| Options | Built-in silencer Monitor version |

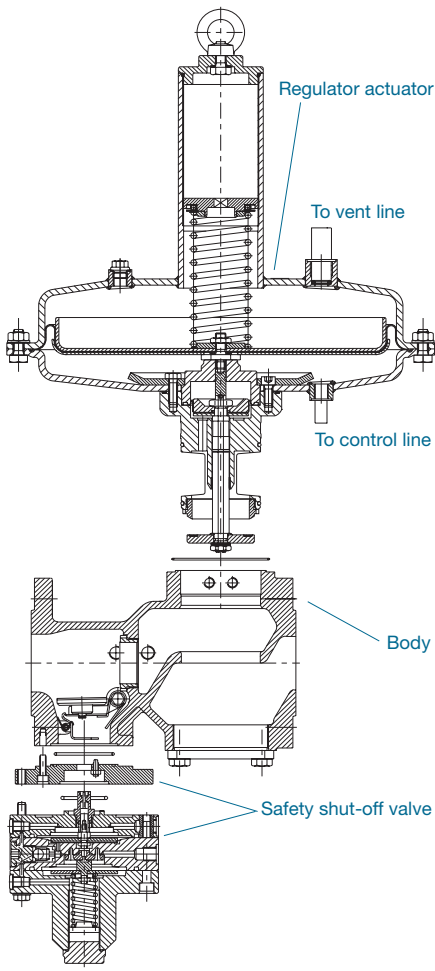
Sizes & Connections

| | |
|--------------|---------------------|
| Sizes | DN 25, DN 50, DN 80 |
| Body lengths | See table page 4 |
| Flanges | PN 16 |

Materials

| | |
|----------------|--|
| Body | Spheroidal graphite cast iron GGG 40, DIN 1693 |
| Actuator | Steel S235 JR |
| SSV actuator | Brass, steel and aluminium |
| Internal parts | Steel, zinc-coated / Stainless steel |
| Seals | NBR rubber / Viton |
| Diaphragm | NBR rubber / NBR rubber, reinforced fabric |

Operational Diagram



RR16 regulator with SL-IZ safety shut-off valve
Cross-section

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

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

The typical lock-up pressure zone is SZ 10.
Reduced zone is available on request.

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

OUTLET PRESSURE RANGE REGULATOR

RR16

| Size | Actuator Size | Spring Code | Spring Color | Wire (Ø mm) | Spring Range |
|------------|---------------|--------------|--------------|-------------|-----------------|
| DN 25 | 8N - Ø 310 | 955-202-70 | red | 3 | 10 - 25 mbar |
| | | 955-202-77 | brown | 3.8 | 20 - 55 mbar |
| | | 955-202-78 | blue | 4.5 | 45 - 110 mbar |
| | | 955-202-79 | green | 5.6 | 90 - 230 mbar |
| | | 955-202-80 | orange | 6.3 | 200 - 330 mbar |
| | | 955-202-81 | black | 7 | 300 - 450 mbar |
| | 8H - Ø 310 | 955-202-82 | yellow | 9.5 | 300 - 650 mbar |
| | | 955-202-83 | grey | 11 | 600 - 1100 mbar |
| DN 50 & 80 | 12N - Ø 405 | 955-202-77 | brown | 3.8 | 10 - 25 mbar |
| | | 955-202-78 | blue | 4.5 | 20 - 55 mbar |
| | | 955-202-79 | green | 5.6 | 45 - 115 mbar |
| | | 955-202-80 | orange | 6.3 | 100 - 160 mbar |
| | | 955-202-81 | black | 7 | 150 - 225 mbar |
| | 8N - Ø 310 | 955-202-79* | green | 5.6 | 90 - 230 mbar |
| | | 955-202-80 | orange | 6.3 | 200 - 330 mbar |
| | | 955-202-81 | black | 7 | 300 - 450 mbar |
| | | 955-203-73** | red | 8.0 | 130 - 350 mbar |
| | | 955-202-82 | yellow | 9.5 | 300 - 650 mbar |
| | 8H - Ø 310 | 955-202-82 | yellow | 9.5 | 300 - 650 mbar |
| | | 955-202-83 | grey | 11 | 600 - 1100 mbar |

* When the regulator is fitted with this spring, the accuracy class becomes AC 20 instead of AC 10.

** Special spring

Note:

For better accuracy, choose the largest actuator size.

8N actuator offers a reduced overall dimension for compact installation.

FLOW CAPACITY

Flow Coefficient

The RR 16 regulator can be fitted with an orifice of various sizes in order to match the capacity requirements. Large orifices offer extra-large flow rate possibilities, but are not recommended for high inlet pressures.

| Regulator Size | Orifice Size | Max. Inlet Pressure | Flow* Coefficient Kg |
|----------------|--------------|---------------------|----------------------|
| DN 25 | 24 mm | 16 bar | 210 |
| | 31 mm** | 16 bar | 430 |
| DN 50 | 24 mm | 16 bar | 450 |
| | 31 mm** | 16 bar | 580 |
| | 42 mm** | 16 bar | 1000 |
| | 54 mm | 5 bar | 1440 |
| DN 80 | 42 mm | 16 bar | 1400 |
| | 54 mm** | 16 bar | 2300 |
| | 82 mm | 4 bar | 3440 |

* The flow coefficient is calculated for a regulator in the fully opened position.

** When using this orifice, the accuracy classes as indicated are valid if the inlet pressure variation does not exceed 10 bar.

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 $(P_u - P_d) > 0.5 P_u$

Capacity Tables

| Inlet Pressure | Outlet Pressure Setting (mbar) | Capacities at Standard Conditions (m³/h) | | | | | | | | |
|----------------|--------------------------------|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | Orifice Size | | | | | | | | |
| | | DN 25 24 mm | DN 25 31 mm | DN 50 24 mm | DN 50 31 mm | DN 50 42 mm | DN 50 54 mm | DN 80 42 mm | DN 80 54 mm | DN 80 82 mm |
| 100 mbar | 20 | 60 | 125 | 130 | 165 | 180 | 360 | 405 | 660 | 900 |
| | 50 | 48 | 100 | 105 | 135 | 150 | 190 | 325 | 530 | 810 |
| 200 mbar | 20 | 91 | 185 | 195 | 250 | 360 | 615 | 610 | 990 | 1365 |
| | 50 | 84 | 170 | 180 | 230 | 330 | 460 | 565 | 920 | 1185 |
| | 100 | 70 | 145 | 150 | 195 | 250 | 295 | 470 | 770 | 990 |
| 400 mbar | 20 | 130 | 270 | 280 | 365 | 610 | 885 | 885 | 1440 | 2070 |
| | 50 | 130 | 260 | 275 | 355 | 590 | 800 | 860 | 1400 | 1950 |
| | 100 | 120 | 250 | 260 | 335 | 560 | 700 | 815 | 1330 | 1710 |
| | 200 | 105 | 210 | 220 | 285 | 400 | 430 | 695 | 1130 | 1300 |
| 700 mbar | 20 | 175 | 360 | 375 | 485 | 860 | 1225 | 1180 | 1925 | 2835 |
| | 50 | 175 | 355 | 375 | 480 | 835 | 1150 | 1170 | 1910 | 2700 |
| | 100 | 170 | 350 | 365 | 475 | 810 | 1070 | 1150 | 1880 | 2380 |
| | 200 | 165 | 335 | 350 | 450 | 630 | 800 | 1070 | 1790 | 2080 |
| | 400 | 135 | 280 | 290 | 375 | 470 | 590 | 920 | 1500 | 1670 |
| 1 bar | 20 | 210 | 430 | 450 | 585 | 1060 | 1455 | 1420 | 2315 | 3465 |
| | 50 | 210 | 430 | 450 | 580 | 1060 | 1455 | 1415 | 2310 | 3380 |
| | 100 | 210 | 430 | 450 | 580 | 990 | 1380 | 1410 | 2300 | 3060 |
| | 200 | 205 | 425 | 445 | 570 | 800 | 1035 | 1390 | 2265 | 2790 |
| | 400 | 190 | 395 | 415 | 535 | 710 | 880 | 1300 | 2120 | 2100 |
| | 700 | 150 | 310 | 320 | 415 | 530 | 650 | 1010 | 1650 | 1950 |
| 2 bar | 20 | 315 | 645 | 675 | 875 | 1510 | 2065 | 2125 | 3465 | 5220 |
| | 50 | 315 | 645 | 675 | 875 | 1510 | 2065 | 2125 | 3465 | 5220 |
| | 100 | 315 | 645 | 675 | 875 | 1490 | 1980 | 2125 | 3465 | 3690 |
| | 200 | 315 | 645 | 675 | 875 | 1345 | 1605 | 2125 | 3465 | 3420 |
| | 400 | 315 | 645 | 675 | 875 | 1180 | 1260 | 2125 | 3465 | 3060 |
| | 700 | 315 | 640 | 670 | 865 | 1015 | 1185 | 2105 | 3430 | 3060 |
| | 1000 | 300 | 610 | 640 | 820 | 910 | 1060 | 2000 | 3265 | 3060 |
| 3 bar | 20 | 420 | 860 | 900 | 1000 | 1900 | 2600 | 2830 | 4615 | 6480 |
| | 50 | 420 | 860 | 900 | 1165 | 1900 | 2600 | 2830 | 4615 | 6480 |
| | 100 | 420 | 860 | 900 | 1165 | 1900 | 2600 | 2830 | 4615 | 5100 |
| | 200 | 420 | 860 | 900 | 1165 | 1900 | 2140 | 2830 | 4615 | 4900 |
| | 400 | 420 | 860 | 900 | 1165 | 1600 | 1605 | 2830 | 4615 | 4250 |
| | 700 | 420 | 860 | 900 | 1165 | 1410 | 1530 | 2830 | 4615 | 4250 |
| | 1000 | 420 | 860 | 900 | 1165 | 1370 | 1420 | 2830 | 4615 | 4250 |
| 4 bar | 20 | 480 | 900 | 1130 | 1100 | 2230 | 3060 | 3535 | 5765 | 7650 |
| | 50 | 525 | 1080 | 1130 | 1300 | 2230 | 3060 | 3535 | 5765 | 7650 |
| | 100 | 525 | 1080 | 1130 | 1455 | 2230 | 3060 | 3535 | 5765 | 5900 |
| | 200 | 525 | 1080 | 1130 | 1700 | 2230 | 3060 | 3535 | 5765 | 5500 |
| | 400 | 525 | 1080 | 1130 | 1700 | 2230 | 3060 | 3535 | 5765 | 5100 |
| | 700 | 525 | 1080 | 1130 | 1700 | 2230 | 3060 | 3535 | 5765 | 5100 |
| | 1000 | 525 | 1080 | 1130 | 1700 | 2230 | 3060 | 3535 | 5765 | 5100 |
| 7 bar | 20 | 760 | 1200 | 1800 | 2325 | 3200 | ● | 5650 | 9250 | ● |
| | 50 | 840 | 1500 | 1800 | 2325 | 3200 | ● | 5650 | 9215 | ● |
| | 100 | 840 | 1500 | 1800 | 2325 | 3200 | ● | 5650 | 9215 | ● |
| | 200 | 840 | 1500 | 1800 | 2325 | 3200 | ● | 5650 | 9215 | ● |
| | 400 | 840 | 1500 | 1800 | 2325 | 3200 | ● | 5650 | 9215 | ● |
| | 700 | 840 | 1500 | 1800 | 2325 | 3200 | ● | 5650 | 9215 | ● |
| | 1000 | 840 | 1500 | 1800 | 2325 | 3200 | ● | 5650 | 9215 | ● |
| 10 bar | 20 | 860 | 1200 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| | 50 | 1030 | 1700 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| | 100 | 1080 | 1700 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| | 200 | 1155 | 2370 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| | 400 | 1155 | 2370 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| | 700 | 1155 | 2370 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| | 1000 | 1155 | 2370 | 2480 | 3195 | 3980 | ● | 7765 | 12665 | ● |
| 16 bar | 20 | 1210 | 1700 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |
| | 50 | 1250 | 2000 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |
| | 100 | 1380 | 2200 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |
| | 200 | 1500 | 2500 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |
| | 400 | 1785 | 3660 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |
| | 700 | 1785 | 3660 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |
| | 1000 | 1785 | 3660 | 3000 | 4935 | 5360 | ● | 11995 | 19565 | ● |

Standard conditions:

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

Capacities are indicated for a regulator with a built-in safety shut-off valve. When a noise abatement device is built into the regulator as well, the values mentioned in the tables -- or calculated from the sizing equation -- should be reduced by 10%.

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.

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

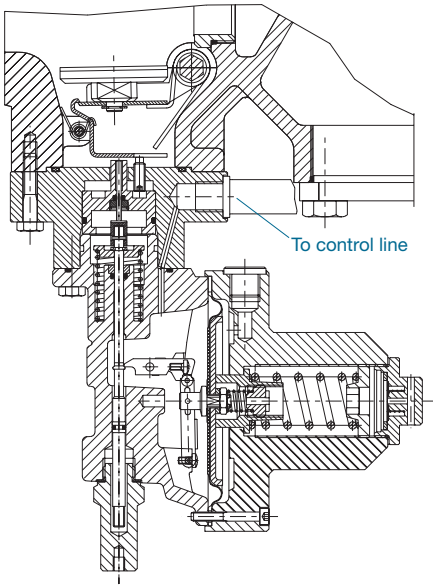
Do not operate the orifice in the inlet pressure areas marked with ●.

SAFETY SHUT-OFF VALVE

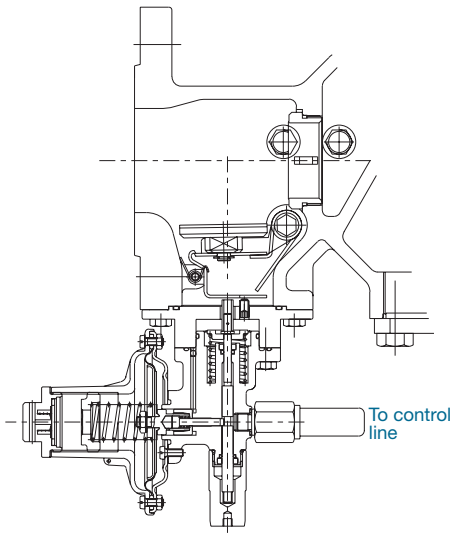
Selecting the SSV

| SSV Type | Max. Operating Pressure | Function | Range Wdso | Wdsu |
|----------|-------------------------------|---------------|------------------------|-------------------|
| SL-IZ | Built-in resistance 16 bar | OPSO | 35 mbar to 1.7 bar | - |
| 033 | 5 bar | OPSO | 40 mbar to 0.45 bar | - |
| 022 | Built-in resistance 16 bar | OPSO and UPSO | 40 mbar to 1.7 bar | 10 to 220 mbar |

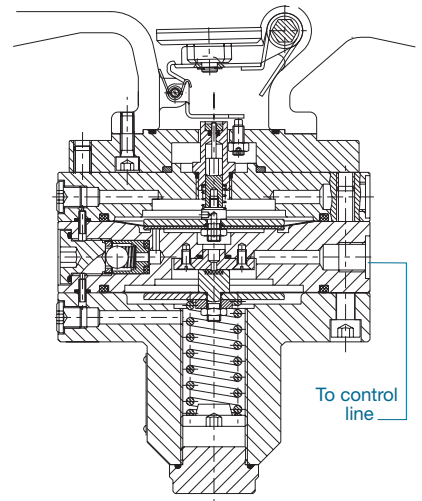
Note that OPSO and UPSO settings are adjustable separately.



Type 022 Safety Shut-off Valve - Cross-section



Type 033 Safety Shut-off Valve - Cross-section



Type SL-IZ Safety Shut-off Valve - Cross-section

OUTLET PRESSURE RANGE SAFETY SHUT-OFF VALVES

022

| Variant | Spring Code | Spring Color | Wire (Ø mm) | Spring Range |
|--------------------------------|-------------|--------------|-------------|----------------|
| Over Pressure Shut-off (OPSO) | 955-200-22 | red | 1.4 | 20 - 60 mbar |
| | 955-200-23 | blue | 1.6 | 50 - 120 mbar |
| | 955-200-24 | green | 2.6 | 100 - 450 mbar |
| | 955-203-41 | black | 3.2 | 0.35 - 1.0 bar |
| | 955-203-42 | yellow | 4.0 | 0.8 - 1.7 bar |
| Under Pressure Shut-off (UPSO) | 955-200-32 | red | 0.8 | 10 - 50 mbar |
| | 955-203-51 | brown | 1.25 | 40 - 120 mbar |
| | 955-203-52 | yellow | 1.6 | 100 - 220 mbar |

Accuracy Class (AG):

- » OPSO:
 - 40 - 400 mbar: AG 10
 - 0.4 - 1 bar: AG 5
 - 1 - 1.7 bar: AG 2.5
- » UPSO:
 - 10 - 20 mbar: AG 30
 - 20 - 220 mbar: AG 20

Minimum difference between regulator and SSV settings (ΔP_w):

- » 10 mbar for UPSO
- » 20 mbar for OPSO

033

| Over Pressure Shut-off (OPSO) | Spring Code | Spring Color | Wire (Ø mm) | Spring Range |
|-------------------------------|-------------|--------------|-------------|----------------|
| | 955-200-22 | red | 1.4 | 40 - 70 mbar |
| | 955-200-23 | blue | 1.6 | 50 - 150 mbar |
| | 955-200-24 | green | 2.6 | 140 - 450 mbar |

Accuracy Class (AG):

- » OPSO:
 - AG 10

Minimum difference between regulator and SSV settings (ΔP_w):

- » 20 mbar for OPSO

SL-IZN.1 and SL-IZM.1

| Over Pressure Shut-off (OPSO) | Spring Code | Spring Color | Wire (Ø mm) | Spring Range |
|-------------------------------|-------------|--------------|-------------|----------------|
| IZN.1 head | 955-202-36 | red | 1.8 | 35 - 250 mbar |
| | 955-202-37 | green | 2.5 | 200 - 800 mbar |
| IZM.1 head | 955-202-38 | yellow | 3.6 | 0.6 - 1.7 bar |

SL-IZN.1 Accuracy Class (AG):

- » OPSO:
 - 35 - 100 mbar: AG 10

Minimum difference between regulator and SSV settings (ΔP_w):

- » 20 mbar for OPSO

SL-IZN.1 or -IZM.1 Accuracy Class (AG):

- » OPSO > 100 mbar:
 - AG 5

Minimum difference between regulator and SSV settings (ΔP_w):

- » 20 mbar for OPSO

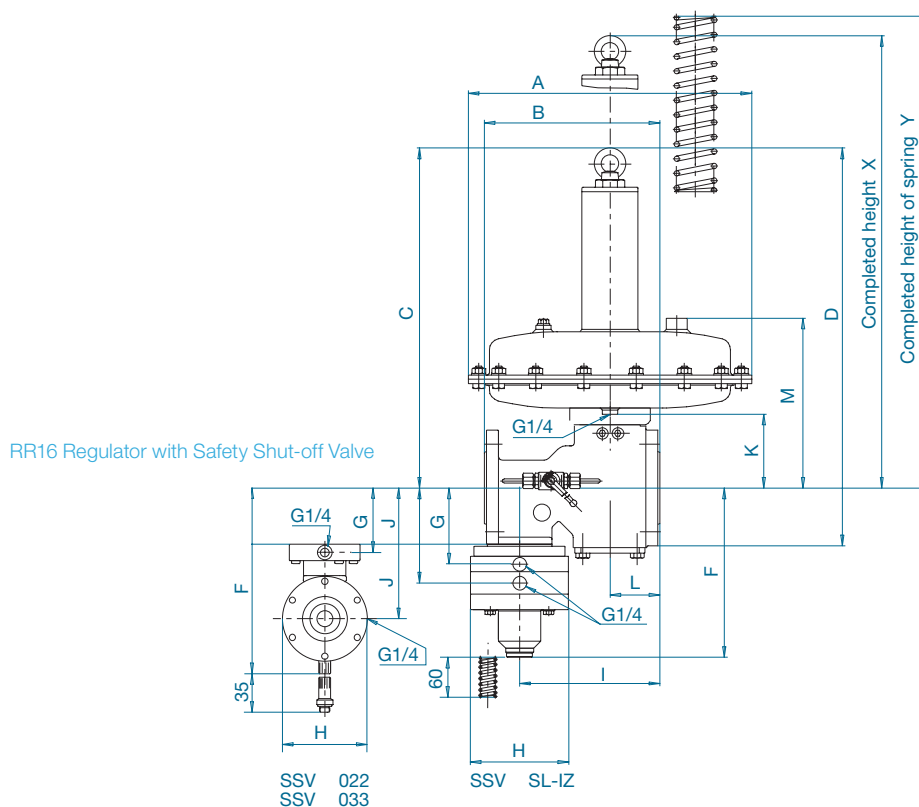
OVERALL DIMENSIONS (mm)

Regulator

| DN | Actuating Drive Body | A | B | C | D | E | I | K | L | M | X | Y |
|----|----------------------|-----|-----|-----|-----|----|-----|-----|----|-----|-----|-----|
| 25 | 8 N | 310 | 180 | 470 | 525 | 95 | 140 | 90 | 47 | 225 | 575 | 660 |
| 25 | 8H | 310 | 180 | 550 | 610 | 95 | 140 | 90 | | 225 | 660 | 765 |
| 50 | 8 N | 310 | 250 | 485 | 570 | 95 | 200 | 105 | 71 | 240 | 620 | 680 |
| 50 | 8 H | 310 | 250 | 570 | 650 | 95 | 200 | 105 | | 240 | 700 | 785 |
| 50 | 12 N | 405 | 250 | 485 | 570 | 95 | 200 | 105 | | 240 | 620 | 680 |
| 80 | 8 N | 310 | 300 | 545 | 645 | 95 | 240 | 165 | 90 | 300 | 720 | 735 |
| 80 | 8 H | 310 | 300 | 630 | 730 | 95 | 240 | 165 | | 300 | 805 | 840 |
| 80 | 12 N | 405 | 300 | 545 | 645 | 95 | 240 | 165 | | 300 | 720 | 735 |

Safety Shut-off Valve (SSV)

| DN | F SL-IZ N, M | F 022 | F 033 | G SL-IZ N, M | G 022 | H 022 Ø | H 033 Ø | H SL-IZ N, M Ø | I | J SL-IZ N, M | J 022 | J 033 |
|----|--------------------|----------|----------|--------------------|----------|---------------|---------------|-------------------------|-----|--------------------|----------|----------|
| 25 | 240 | 252 | 195 | 105 | 88 | 114 | 100 | 140 | 140 | 132 | 177 | 140 |
| 50 | 245 | 255 | 195 | 108 | 93 | 114 | 100 | 140 | 200 | 135 | 182 | 140 |
| 80 | 285 | 300 | 240 | 151 | 134 | 114 | 100 | 140 | 240 | 178 | 223 | 185 |



Weight (kg)

| With SSV... | SL-IZ | | | 022 | | |
|-------------|-------|------|----|------|------|------|
| | DN | 8N | 8H | 12N | 8N | 8H |
| 25 | 30 | 36.8 | - | 26.8 | 33.6 | - |
| 50 | 35 | 41.8 | 45 | 31.8 | 38.6 | 41.8 |
| 80 | 53 | 59.8 | 63 | 49.8 | 56.6 | 59.8 |

Connections

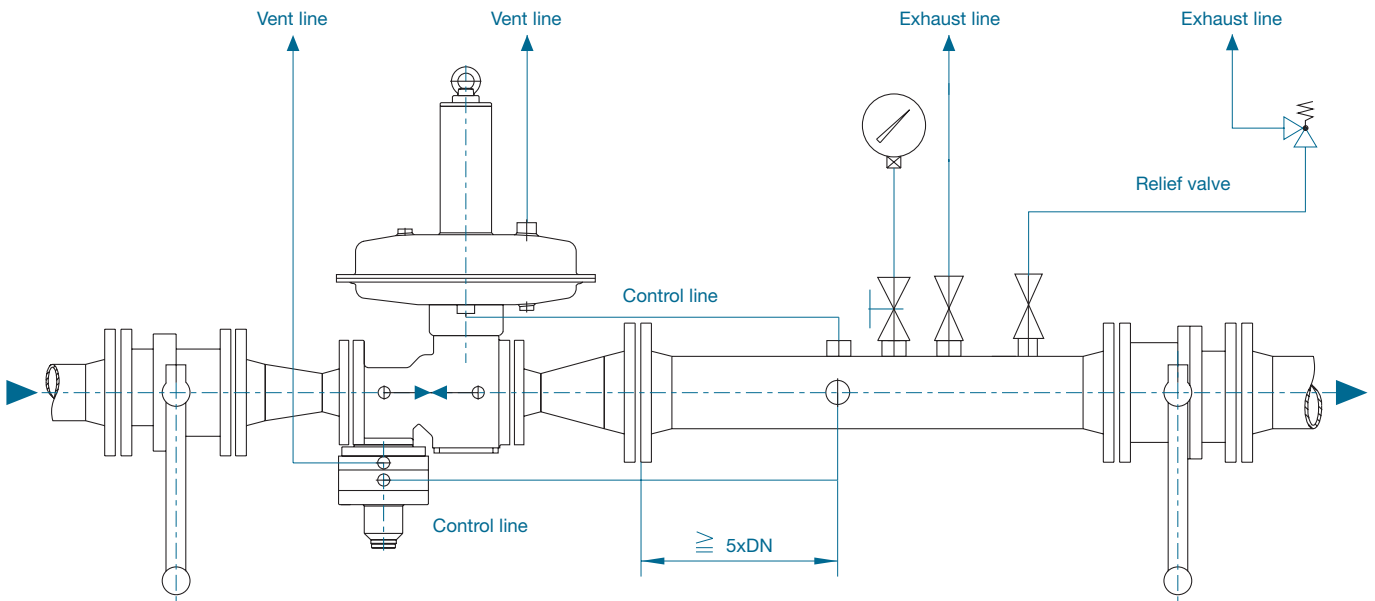
| DN | Number of Thread Holes | Thread | Hex Bolt DIN (1) 931-5.6 | Hex Nut DIN (1) 934-5 |
|----|------------------------|--------|-----------------------------|--------------------------|
| 25 | 4 | M 12 | M 12 x 40 | M 12 |
| 50 | 4 | M 16 | M 16 x 60 (2) | M 16 |
| 80 | 8 | M 16 | M 16 x 60 (2) | M 16 |

(1) Bolts and nuts are not supplied with RR16 regulator

(2) Screw bolt DIN 2509

INSTALLATION

The following drawing shows a model installation for the RR 16 regulator with a built-in safety shut-off valve, Type SL-IZ. The usual position for installation is horizontal.



Typical installation

Type Designation

| RR16- | XX- | XX- | XXX- | S..-XXX | Variants |
|-------|----------------|----------------------------|--------------------|--|--|
| | 25 50 80 | | | | DN size |
| | | 24 31 42 54 82 | | | Orifice size (DN 25 & DN 50) (DN 25 & DN 50) (DN 50 & DN 80) (DN 50 & DN 80) (DN 80 only) |
| | | | 8 N 8 H 12 N | | Actuator size |
| | | | | SL-IZN.1 SL-IZM.1 SSV-033 SSV-022 | SSV (OPSO) SSV (OPSO and UPSO) |

OPTIONS

- » **Monitor application:** special balanced stem for regulator installed in the upstream monitor position.
- » **Silencer:** noise abatement device around the valve seat to reduce the sound pressure level by around 10 dbA.
- » **Valve travel indicator**

SSV options

- » **Valve position switch:** Ex proximity switch
- » **Emergency push-button**

Information to be specified when ordering:

- » Regulator type code
- » 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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