

MEDENUS

Gas Pressure Regulation



Gas pressure regulator R 100 / R 100U



Product information

EN

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List of abbreviations and formula symbols

| | | | |
|----------|--------------------------------------|----------|------------------------|
| AC | Accuracy class | RE | Control unit |
| HDS | High-pressure screw spindle | BV | Breather valve |
| K_G | Value | SG | Closing pressure group |
| p_d | Outlet pressure | t_u | Gas inlet temperature |
| p_{ds} | Setpoint of the response pressure | VS | Valve seat |
| PS | Maximum allowable pressure | w_d | Outlet gas velocity |
| p_u | Inlet pressure | w_u | Inlet gas velocity |
| Q_n | Standard volumetric flow rate | ρ_n | Gas density |

*) K_G value for natural gas: $d = 0,64$ ($\rho_n = 0,83 \text{ kg/m}^3$), $t_u = 15^\circ \text{ C}$

Application, Characteristics, Technical Data

Application

Gas pressure regulator (GDR), direct-acting (operating without auxiliary power), for systems acc. to DVGW - work sheet G 491 (A) and G 600 (A) (TRGI)

Particularly suitable for dynamic regulation sections (e.g. gas fireplaces, natural gas distribution plants, burner, gas engines)

Can be used as an equipment component on gas consumption facilities as defined in EC Directive (2009/142/EEC)

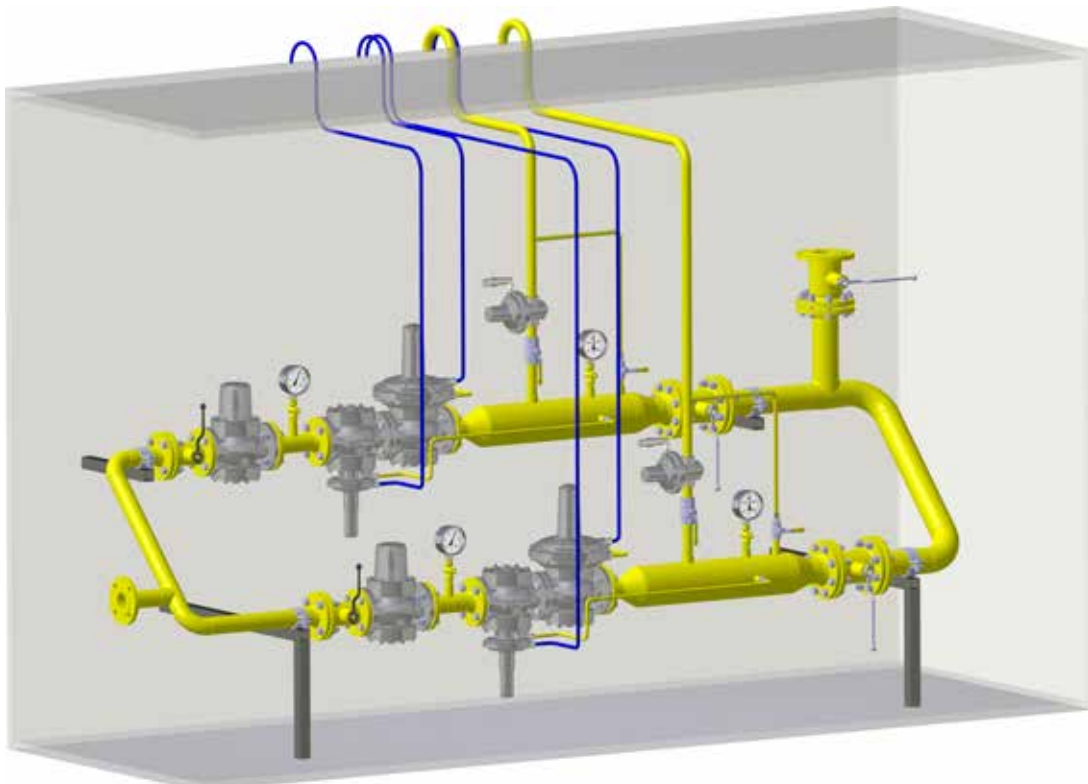
Can be used for the gases defined in DVGW - work sheet G 260 / G 262 and neutral non aggressive gases. (other gases on request)

Characteristics

- Integral pressure-tight model (IS)
- Pilot pressure-compensated double-seat valve
- High flow rate capacity
- outdoor version as standard

Type of model (options)

- with throttle valve (RSD) for the impulse line on the control units
- Oxygen model
- with FKM sealings + stainless steel seat (e.g. for biogas applications)
- Coating with epoxy resin in RAL colours



double gas train

Technical Data

| | |
|--|---|
| Type | R 100 / R 100 U |
| Model | Integral pressure-tight (IS) |
| Max. allowable pressure PS | 8 bar |
| Max. inlet pressure $p_{u,max}$ | R 100: 8 bar / R 100 U: 1.2 bar |
| Nominal size | R 100: DN 50, DN 80, DN 100, DN 150, DN 200 |
| Connection type | DIN EN 1092 - PN 16* flanges ASME - B16.5 flanges Class 150 RF |
| Material | |
| Housing / actuator housing/ Control device housing | Al - cast alloy** |
| Temperature range, Class 2 (operating/ambient temperature) | -20°C to +60°C |
| Closing pressure group | SZ 10 |

Gas pressure regulator

| Accuracy class AC and closing pressure group SG at the outlet pressure range $p_{d, \text{minimum pressure differential 100 mbar}}$ | AC | SG |
|--|----|----|
| 8 mbar to 22 mbar | 10 | 50 |
| > 22 mbar to 1200 mbar | 10 | 20 |

| | |
|---|----------------|
| Function, Strength and Tightness | DIN EN 334 |
| CE mark acc. to PED/ PIN number | CE-0085-AQ0410 |

Ex protection The mechanical parts of the device do not have any potential ignition sources of their own and therefore do not fall within the scope of ATEX 95 (94/9/EC). Electrical components fitted to the device comply with the ATEX requirements.

*) DN 200 flange - DIN EN 1092 PN 10

**) Corrosivity category according to DIN EN ISO 12944-2.

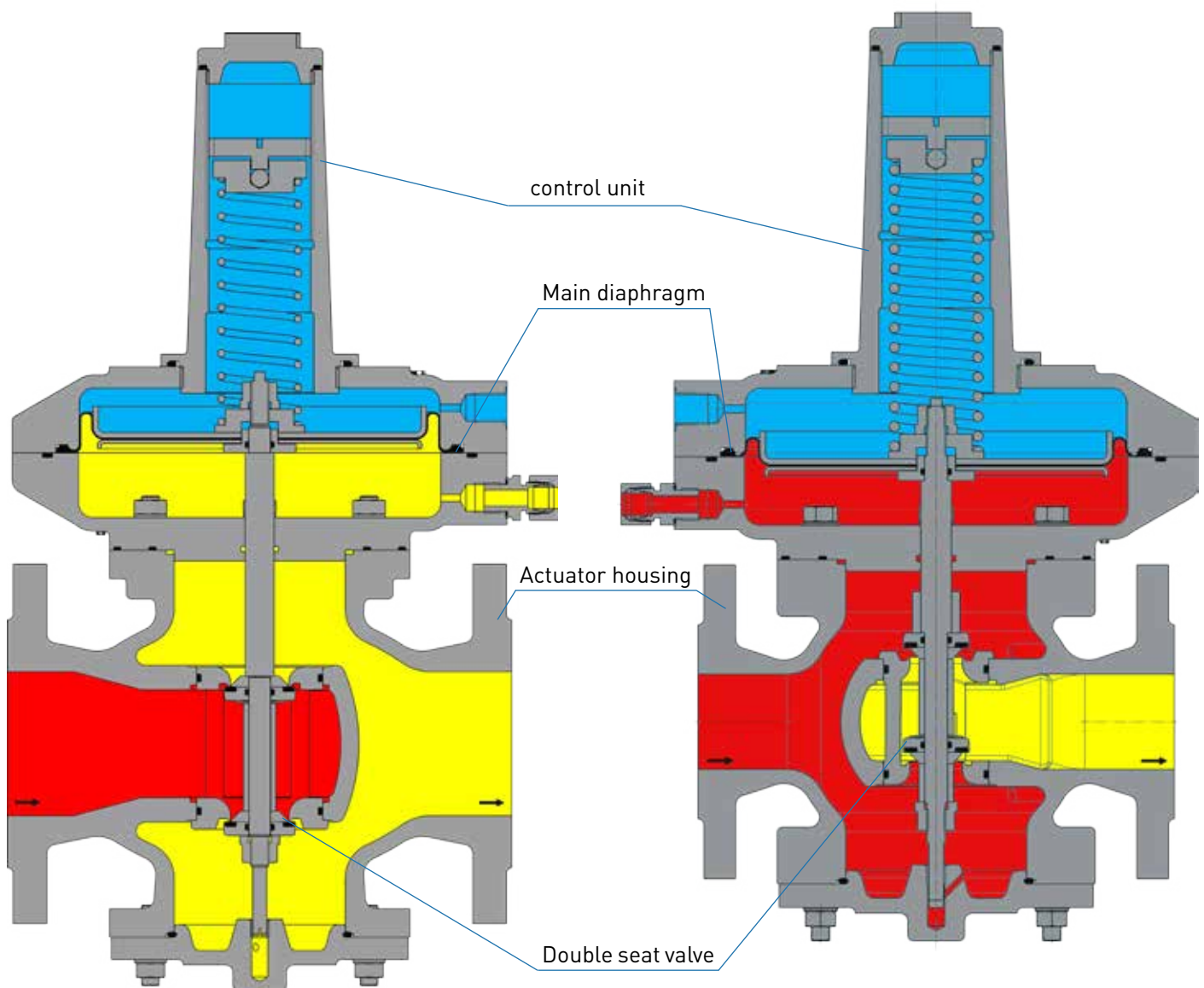
The categories C1 to C5-I including guaranteed without additional coatings.
For the category C5-M a coating with epoxy resin is recommended.



Application, Characteristics, Technical Data

Design and Function R 100

The spring-loaded gas pressure regulator R 100 have the function of keeping the outlet pressure of a gaseous medium constant within allowable limit values, independently of the effect of interferences, such as changes in the inlet pressure and/or in the gas train, in the connected regulation section on the outlet side. The gas pressure regulator is composed of the actuator housing and the "control unit plus actuator" functional unit. The double-seat valve seat model is pre-pressure-compensated. The gas flows through the actuator housing in the direction of the arrow. The external measurement line port is used to pass the outlet pressure to be regulated to the bottom of the main diaphragm of the control unit. It compares the actual value with the command variable preset by the force of the setpoint spring. The setpoint required in each case is set via the setting screw. Any deviation from the setpoint is transmitted by the screw spindle to the actuator, which is adjusted such that the actual value is adjusted to the setpoint. In case of zero tap, the actuator will close tight, causing the closing pressure to be established.



shown R 100

shown R 100 U

Design and Function R 100 U

The spring-loaded gas pressure regulator R 100 U have the function of keeping the inlet pressure of a gaseous medium constant within allowable limit values, independently of the effect of interferences, such as changes in the outlet pressure and/or in the gas train, in the connected regulation section on the inlet side. The gas pressure regulator is composed of the actuator housing and the "control unit plus actuator" functional unit. The double-seat valve seat model is pre-pressure-compensated. The gas flows through the actuator housing in the direction of the arrow. The external measurement line port is used to pass the inlet pressure to be regulated to the bottom of the main diaphragm of the control unit. It compares the actual value with the command variable preset by the force of the setpoint spring. The setpoint required in each case is set via the setting screw. Any deviation from the setpoint is transmitted by the screw spindle to the actuator, which is adjusted such that the actual value is adjusted to the setpoint.

Options

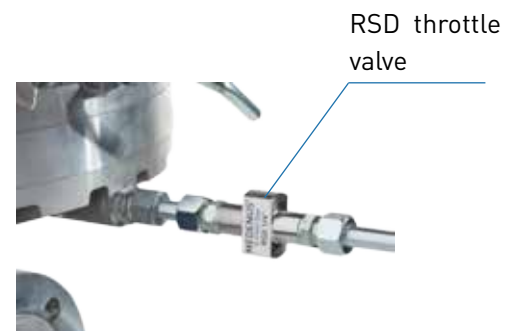
Safety diaphragm

The safety diaphragm design provides a safety diaphragm above the main diaphragm. In case the main diaphragm breaks, the safety diaphragm presses against the upper diaphragm cover and prevents leaking into the atmosphere.



RSD throttle valve

The RSD is a throttle valve which regulates the volume flow within the measuring line from the outside. This is achieved by a continuously adjustable cross sectional narrowing. The adjustment is made by means of an Allen key (4mm).



Application, Characteristics, Technical Data

K_G * value and control unit

| | R 100 | | | | | R 100 U | | | | |
|----------------------------|----------------------|-------|--------|--------|--------|---------|-------|--------|--------|--------|
| Nominal size | DN 50 | DN 80 | DN 100 | DN 150 | DN 200 | DN 50 | DN 80 | DN 100 | DN 150 | DN 200 |
| control unit \varnothing | 160 | 160 | 160 | 275-2 | 275-2 | 160 | 160 | 160 | 275-2 | 275-2 |
| | 275 | 275 | 275 | 385 | 385 | 275 | 275 | 275 | 385 | 385 |
| Valve seat \varnothing | 390 | 390 | 390 | | | 390 | 390 | 390 | | |
| 27.5 - 27.5 mm | 800 | | | | | 1100 | | | | |
| 32.5 - 32.5 mm | | 1500 | | | | | 1700 | | | |
| 42.5 - 42.5 mm | | | 2400 | | | | | 3200 | | |
| 45.0 - 50.0 mm | | 2500 | | | | | 3400 | | | |
| 60.0 - 65.0 mm | | | 4700 | | | | | 6000 | | |
| 65.0 - 65.0 mm | | | | 5200 | | | | | 7000 | |
| 90.0 - 90.0 mm | | | | | 10000 | | | | | 11000 |
| 95.0 - 100.0 mm | | | | 12000 | | | | | 13500 | |
| 125.0 - 130.0 mm | | | | | 20200 | | | | | 25000 |
| Connection | DIN EN 1092 - PN16** | | | | | | | | | |

*) K_G value for natural gas: $d = 0.64$ ($\rho_n = 0.83 \text{ kg/m}^3$), $t_u = 15^\circ\text{C}$

***) DN 200 flange - DIN EN 1092 PN10

Application, Characteristics, Technical Data

Control unit setpoint spring table* R 100 / R 100 U

| Specific command range W_{ds} [mbar] | | | | Spring data | |
|--|------------|------------|-----------|-------------|--------------|
| RE 205 | RE 275 | RE 320 | RE 390 | Spring no. | Colour [RAL] |
| 36 - 39 | 23 - 25 | 10 - 12 | 8 - 10 | FA 01 | blank |
| 38 - 45 | 24 - 28 | 11 - 13 | 9 - 12 | FA 02 | 9006 |
| 44 - 52 | 27 - 31 | 14 - 18 | 11 - 13 | FA 03 | 5015 |
| 51 - 64 | 30 - 37 | 17 - 22 | 12 - 15 | FA 04 | 4002 |
| 62 - 81 | 35 - 46 | 21 - 29 | 14 - 19 | FA 05 | 7037 |
| 78 - 107 | 43 - 59 | 28 - 39 | 18 - 24 | FA 06 | 9005 |
| 103 - 147 | 55 - 80 | 38 - 54 | 23 - 32 | FA 07 | 3020 |
| 140 - 205 | 73 - 110 | 53 - 77 | 31 - 45 | FA 08 | 9010 |
| 195 - 295 | 100 - 156 | 76 - 111 | 42 - 64 | FA 09 | 7016 |
| 280 - 430 | 141 - 225 | 110 - 166 | 59 - 94 | FA 10 | 6010 |
| 419 - 653 | 208 - 339 | 165 - 250 | 88 - 142 | FA 11 | 2002 |
| 595 - 935 | 293 - 484 | 239 - 361 | 124 - 203 | FA 12* | 7035 |
| 819 - 1408 | 436 - 726 | 360 - 544 | 185 - 305 | FA 13* | 5010 |
| 1245 - 1976 | 607 - 1017 | 506 - 765 | 258 - 428 | FA 14* | 1028 |
| 1212 - 2553 | 699 - 1333 | 535 - 978 | 297 - 568 | FA 15* | 6018 |
| 1330 - 3012 | 785 - 1580 | 602 - 1157 | 333 - 673 | FA 16* | 3020 |

| Specific command range W_{ds} [mbar] | | | Spring data | |
|--|------------|-----------|-------------|--------------|
| RE 275-2 | RE 385-2 | RE 485 | Spring no. | Colour [RAL] |
| 59 - 69 | 31 - 35 | 19 - 22 | FB 701 | 6018 |
| 68 - 83 | 34 - 41 | 21 - 25 | FB 702 | 9006 |
| 80 - 105 | 40 - 51 | 24 - 31 | FB 703 | 5015 |
| 96 - 127 | 50 - 61 | 28 - 36 | FB 704 | 4002 |
| 112 - 156 | 60 - 77 | 33 - 44 | FB 705 | 7037 |
| 146 - 207 | 76 - 100 | 41 - 56 | FB 706 | 9005 |
| 184 - 266 | 98 - 127 | 51 - 71 | FB 707 | 3020 |
| 238 - 358 | 125 - 167 | 65 - 94 | FB 708 | 9010 |
| 302 - 450 | 165 - 215 | 82 - 118 | FB 709 | 7016 |
| 397 - 596 | 212 - 285 | 105 - 155 | FB 710 | 6010 |
| 542 - 814 | 280 - 390 | 140 - 209 | FB 711 | 2002 |
| 742 - 1078 | 385 - 520 | 188 - 275 | FB 712 | 7035 |
| 977 - 1442 | 515 - 671 | 246 - 369 | FB 713* | 5010 |
| 1245 - 1878 | 661 - 873 | 311 - 479 | FB 714* | 1028 |
| 1547 - 2469 | 712 - 1186 | 393 - 618 | FB 715* | 6018 |
| 2136 - 3008 | 975 - 1514 | 517 - 752 | FB 716* | 3020 |

*) with high-pressure screw spindle

Dimensions, Connection and Weight

Dimensions and weight

| Nominal size | | R100 / R100 U | | | | |
|-----------------------|---------|---------------------|-------|-------|--------|--------|
| | | RE | DN 50 | DN 80 | DN 100 | DN 150 |
| A [mm] | 160 | 398 | 421 | 433 | - | - |
| | 275 | 372 | 395 | 407 | 694 | 724 |
| | 385/390 | 372 | 395 | 407 | 647 | 677 |
| HDS [mm] | | 125 | 125 | 125 | 205 | 205 |
| B [mm] | | 115 | 138 | 150 | 195 | 245 |
| L [mm] | | 250 | 280 | 300 | 380 | 420 |
| X [mm] | | 260 | 260 | 260 | 410 | 410 |
| Weight [kg] | 160 | 14 | 16 | 19 | - | - |
| | 275 | 17 | 19 | 22 | 62 | 60 |
| | 385/390 | 19 | 22 | 25 | 65 | 64 |
| Safety diaphragm - SM | 275 | 3 | 3 | 3 | 3,3 | 3,3 |
| - Weight [kg] | 385/390 | 5 | 5 | 5 | 6 | 6 |
| HDS - Weight [kg] | | 0.6 | 0.6 | 0.6 | 1.6 | 1.6 |
| Connection | | DIN EN 1092 - PN16* | | | | |

Example:

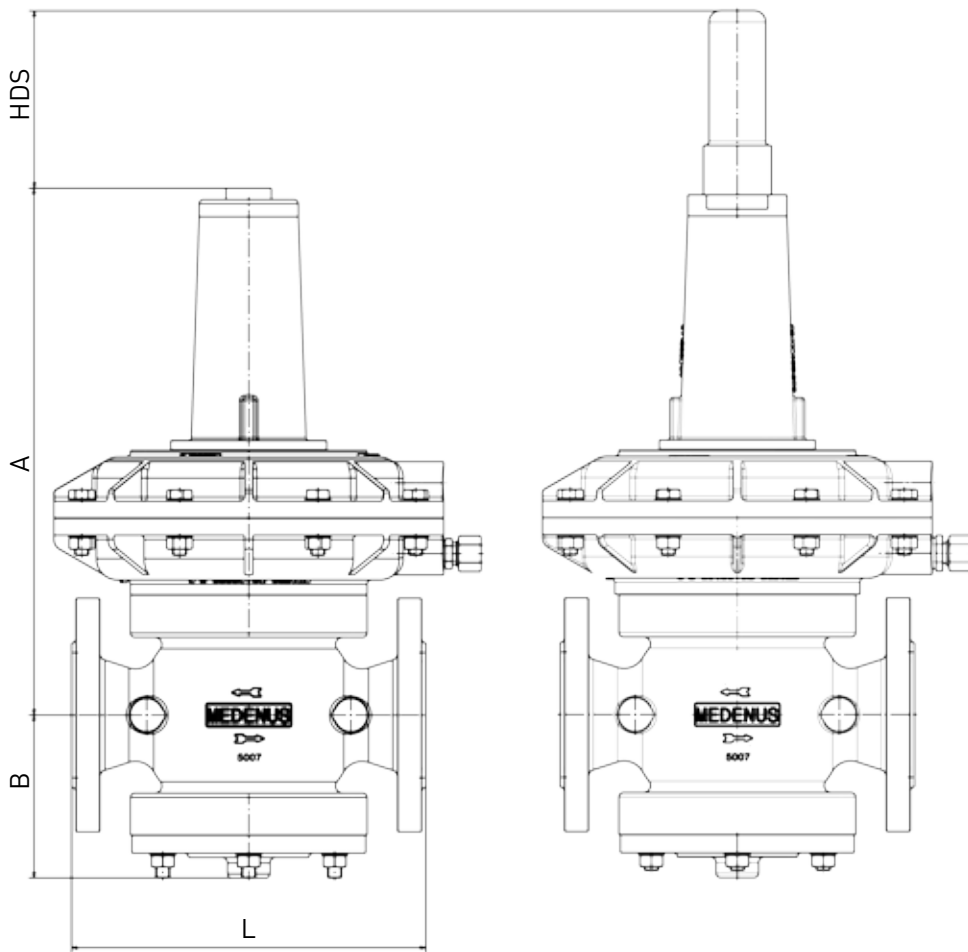
R100/050/390 with HDS and Safety diaphragm

Weight (regulator + HDS + SM): $19\text{kg} + 0,6\text{kg} + 5\text{kg} = 24,6\text{kg}$

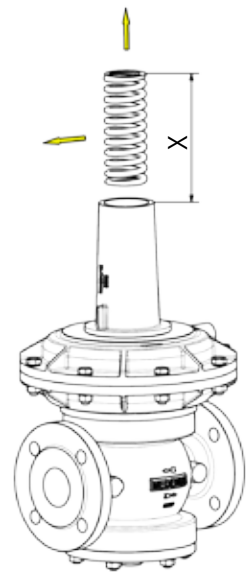
Dimensions (A + HDS + SM): $372\text{mm} + 125\text{mm} + 32,5\text{mm} = 529,5\text{mm}$

*) DN 200 flange - DIN EN 1092 PN10

Dimensional drawing



Dismounting dimensions for springs / HDS



Installation situation



Dimensions, Connection and Weight

Connection of the measuring lines and breather lines

| Nominal size | control unit | |
|--------------|---|---------------|
| | Measuring line | Breather line |
| DN 050 | | |
| DN 080 | Connection* for: Rohr 12 x 1.5 (thread G 3/8) | |
| DN 100 | | |
| DN 150 | | |
| DN 200 | | |

Note

Observe the following publications in relation to installation, start-up and maintenance:

DVGW - work sheets G 491 and G 600

Operating and Maintenance Instructions R 100 / R 100 U

The gas pressure regulators R 100 and R 100 U shall be installed in the pipeline preferably in horizontal position with vertical position of the control unit spring cap. For all nominal sizes, the direction of flow is indicated by an arrow on the housing.

Selection

Calculation of the required K_G value

The standard flow rate value for a completely open actuator ($p_u = 2$ bar; $p_d = 1$ bar) corresponds to the K_G value.

The K_G value refers to natural gas of density 0.83 kg/m^3

at 15°C . For other gases, a flow rate equivalent to that of natural gas is to be expected.

Valve flow rate coefficient K_G at a sub-critical pressure ratio

$$p_d / p_u > 0.5$$

$$K_G = Q_n / \sqrt{p_d \cdot (p_u - p_d)}$$

$$Q_{n \text{ natural gas}} = Q_{n \text{ gas}} / \sqrt{(0.83 / \rho_{n \text{ gas}})}$$

K_G value at a super-critical pressure ratio

$$p_d / p_u \leq 0.5$$

$$K_G = 2 \cdot Q_n / p_u$$

Note: all calculated pressures are absolute pressures.

Device selection

The device is selected on the basis of its K_G value from the table (page 8)

Note: For spring-loaded devices, a capacity reserve of 10-20% is recommended in order to comply with the accuracies given.

Checking the gas velocities

$$w = 380 \cdot Q_n / (\text{DN}^2 \cdot p_{\text{abs}})$$

Note: The factor 380 refers to an operating gas temperature from approx. 15°C to 20°C . For other temperatures, the velocity must be corrected as follows: $w_{\text{corr}} = w \cdot (t_{\text{gas}} + 273.15) / 290$

Recommended max. gas velocity at the inlet flange:
50 - 70 m/s Lower value for redirections upstream of the control valve, 20 m/s for upstream filters

Recommended max. gas velocity at the outlet flange:
100 - 200 m/s Lower value to reduce noise emissions

Recommended max. gas velocity on impulse tap: 15 - 25 m/s Lower value for outlet pressures below 100 mbar

Example:

$$\begin{array}{l} p_u \text{ min } 5 \text{ bar} \quad / \quad p_u \text{ max } 8 \text{ bar} \\ p_{ds} 0.5 \text{ bar} \quad / \quad Q_n 2500 \text{ m}^3/\text{h} \end{array}$$

$$1.5 \text{ bar} / 6 \text{ bar} = 0.25 < 0.5$$

$$K_G = 2 \cdot 2500 / 6 = 833 \text{ (m}^3/\text{h)/bar}$$

R 100 DN 80 VS 32.5 - 32.5
 K_G value: 1500 (m³/h)/bar

Inlet and outlet nominal size of the pipeline according to the selected device: 80 mm
Selected widening of outlet pipeline: 200 mm

$$w_u = 380 \cdot 2500 / (80^2 \cdot 6) = 24.7 \text{ m/s}$$

$$w_d = 380 \cdot 2500 / (80^2 \cdot 1.5) = 99 \text{ m/s}$$

$$w_{\text{impulse}} = 380 \cdot 2500 / (200^2 \cdot 1.5) = 16 \text{ m/s}$$

The device selected in the example of nominal size DN 80 can be operated under these conditions.

Note: To obtain a more accurate design configuration of our gas pressure regulators, you can use our configurator, on our homepage medenus.de, under Service. (medenus.de/de/service/konfigurator.html)

Order data

Example:

Gas pressure regulator: R100/050/205/32,5/HDS/links/SM/RSD/WAZ/So

| Order selection | Designation | Order code: | R100 | 050 | - | 205 | 32,5 | HDS | links | SM | RSD | WAZ | So |
|--|-------------|-------------|------|-----|-----|------|------|-----|-------|----|-----|-----|----|
| Typ | | | | | | | | | | | | | |
| R 100 | R 100 | R100 | | | | | | | | | | | |
| R 100 U | R 100 U | | | | | | | | | | | | |
| DN - Nominal size | Table p. 15 | | 050 | | | | | | | | | | |
| Flange model | | | | | | | | | | | | | |
| PN 16 | - | | | - | | | | | | | | | |
| Class 150 | C | | | | | | | | | | | | |
| RE - control unit | Table p. 15 | | | | 205 | | | | | | | | |
| D - Orifice (valve seat diameter) | Table p. 15 | | | | | 32,5 | | | | | | | |
| High-pressure screw spindle | | | | | | | | | | | | | |
| without | - | | | | | | | | | | | | |
| with high-pressure screw spindle | HDS | | | | | | | HDS | | | | | |
| Direction of flow | | | | | | | | | | | | | |
| Right (from left to right) | - | | | | | | | | | | | | |
| Left (from right to left) | links | | | | | | | | links | | | | |
| Additional unit, control unit | | | | | | | | | | | | | |
| without | - | | | | | | | | | | | | |
| Safety diaphragm | SM | | | | | | | | | SM | | | |
| Throttle valve | | | | | | | | | | | | | |
| without | - | | | | | | | | | | | | |
| with throttle valve | RSD | | | | | | | | | | RSD | | |
| Acceptance test certificate to EN 10204/3.1 | | | | | | | | | | | | | |
| without | - | | | | | | | | | | | | |
| with acceptance test certificate | WAZ | | | | | | | | | | | WAZ | |
| Special model | So* | | | | | | | | | | | | So |

In every selection group, only one option can be selected in each case.

So*) e.g.:

- Coating with epoxy resin in RAL colours
- BV breather valve
- Oxygen model
- FKM sealings + stainless steel seat

DN - Nominal size

| Regulator type | 050 | 080 | 100 | 150 | 200 |
|----------------|-----|-----|-----|-----|-----|
| R100 / R100U | X | X | X | X | X |

RE - Control unit

| Regulator type | Nominal size | Description | Recommended use of the high-pressure screw spindle in the pressure range [mbar] | Outlet pressure ranges [mbar] |
|----------------|-------------------------|-------------|---|-------------------------------|
| R100 / R100U | DN 50 DN 80 DN100 | with RE 390 | 130 - 450 | 8 - 130 |
| | | with RE 275 | 450 - 1,100 | 130 - 450 |
| | | with RE 160 | | 450 - 1,200 |
| | DN 150 DN 200 | with RE 385 | 350 - 850 | 8 - 350 |
| | | with RE 275 | 850 - 1,200 | 350 - 850 |

D - Orifice (valve seat diameter)

| Regulator type | | R100 / R100 U | | | | |
|----------------|--|---------------|-----|-----|-----|-----|
| Nominal size | | 050 | 080 | 100 | 150 | 200 |
| Valve | | | | | | |
| 27.5-27.5 | | X | | | | |
| 32.5-32.5 | | | X | | | |
| 42.5-42.5 | | | | X | | |
| 45-50 | | | X | | | |
| 60-65 | | | | X | | |
| 65-65 | | | | | X | |
| 90-90 | | | | | | X |
| 95-100 | | | | | X | |
| 125-130 | | | | | | X |

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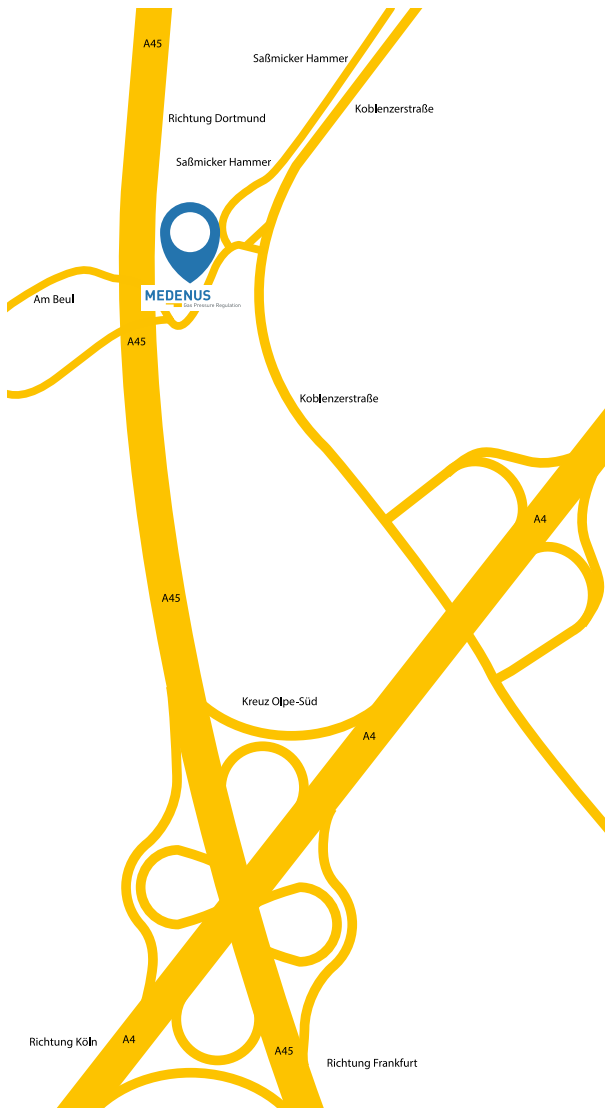
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