



Gas Pressure Regulator R 51

Product information



EN

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Table of content

Application, Characteristics, Technical Data	4
Application	4
Characteristics	4
Type of models / Options (see page 10)	4
Technical data	5
Structure and function	6
Installation example	6
Sectional view	7
$K_{\scriptscriptstyle G}^*$ value and diaphragm assemblies	8
Diaphragm assembly setpoint spring table	8
Dimensions, Connection, and Weight	9
Dimensions and weight	9
Dimensional drawing	9
Connection of the measuring lines and breather lines	9
Types of Models / Options	10
Design	11
Calculation of the required K_g value	11
Device selection	11
Checking the gas velocities	11
Properties of Gases	12
Order Data	12
Contact	13
Notes	15



Observe the following publications in relation to **ATTENTION** installation, start-up and maintenance: DVGW - work sheets G 491 and G 600 Operating and Maintenance Instructions R51

List of abbreviations and formula symbols

AC	Accuracy class	PS	Maximum allowable pressure	SG	Closing pressure group			
HDS	High-pressure spindle	p _u	Inlet pressure	t _u	Gas inlet temperature			
K_{G}	Valve flow rate coefficient Q _n Standard volumetric flow	II .	Standard volumetric flow	VS	Valve seat			
p_d	Outlet pressure			W_d	Outlet			
p_{ds}	Setpoint of the	RE	Diaphragm assembly		gas velocity			
	response pressure	BV Breather valve			esponse pressure BV Breather valv		W_u	Inlet gas velocity
				$\boldsymbol{\rho}_n$	Gas density			

^{*)} KG value for natural gas

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. natural gas supply systems, low flow regulators,

burner circuits, gas motor operation). Can be used as an equipment component on gas consumption facilities as defined in Regulation (EU) 2016/426.

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)
- Optionally with internal or external measuring line

Type of models / Options (see page 10)

- Oxygen model (p_{...} ≤ 10 bar)
- AV breather valve
- RSD2 throttle valve
- Coating with epoxy resin in RAL colors
- Hydrogen model

Gas Pressure Regulator

Accuracy class AC and closing pressure group SG at the outlet pressure range		
p _{d, minimum pressure differential 100 mbar} Prerequisite -20°C to 60°C	AC	SG
20 mbar to 50 mbar	up to	up to
	10	30
50 mbar to 100 mbar	up to	up to
	10	20
> 100 mbar to 500 mbar	up to	up to
	5	10
> 500 mbar	2.5	5



Technical data

Type R 51

Model Integral pressure-tight (IS)

Max. allowable pressure PS16 barMax. inlet pressure $p_{u,max}$ 16 barNominal widthDN 25

Connection type DIN 1092 - PN 16 flanges

(ASME flanges on request)

Material

Housing / actuator housing Al - cast alloy

Corrosivity category DIN EN ISO 12944-2

C1 to C5-I without additional coatings

C5-M an epoxy resin coating is recommended (see page 7)

Temperature range, Class 2

(operating/ambient temperature)

-20°C to +60°C

Closing pressure zone group SZ 2.5

Function, strength and tightness DIN EN 334

CE mark acc. to PED/ PIN number CE-0085-CR0137

Ex protection The mechanical parts of the device do not have any

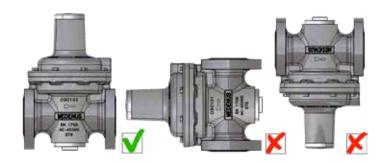
potential ignition sources of their own and therefore do not fall within the scope

of ATEX 95 (94/9/EC). Electrical components fitted to the device

comply with the ATEX requirements.

Preferred installation position

The gas pressure regulators R51 shall be installed in the pipeline preferably in horizontal position. For all nominal widths, the direction of flow is indicated by an arrow on the housing.



Installation upside down only after consultation with Medenus GmbH

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

- DVGW work sheets G 491 and G 600
- Operating and Maintenance Instructions R 51

Structure and function

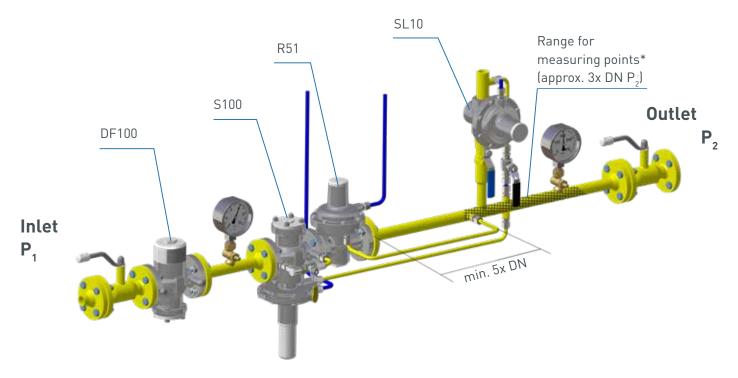
The spring-loaded gas pressure regulator R51 has the function of keeping the outlet pressure of a gaseous medium constant within allowable limit values, independently of the effect of interferences, such as changes in the inlet pressure and/or in the gas tap, in the connected regulation section on the outlet side. The gas pressure regulator is composed of the actuator housing and the "diaphragm assembly plus actuator" functional unit.

The valve seat model is pre-pressure-compensated.

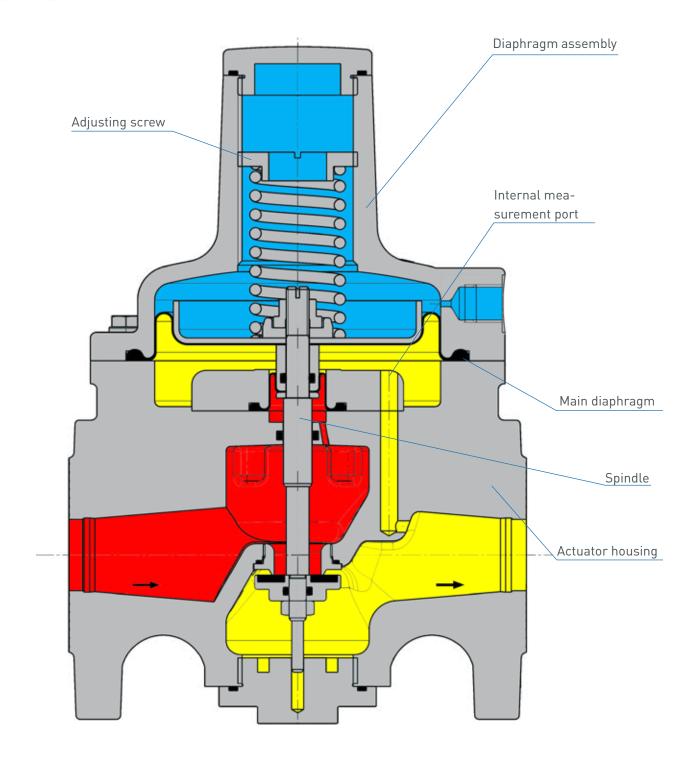
The gas flows through the actuator housing in the direction of the arrow. The internal or external measurement line port is used to pass the outlet pressure to be regulated to the bottom of the main diaphragm of the diaphragm assembly. It compares the actual value with the command variable preset by 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.

Installation example



Sectional view



$K_{\rm g}^{*}$ value and diaphragm assemblies

Nominal width	Valve seat Ø	Flow rate coefficient K _G * [m³/	Diaphragm assembly
	(mm)	(h*bar)]	
DN 25	16.5	175	160

Diaphragm assembly setpoint spring table

Spring data

	pring data		
with Diaphragm assembly		Wire Ø	Color
Ø 160 mm in [mbar]	Spring no.	[mm]	[RAL]
20 - 50	FG100	2.0	9006
50 - 90	FG101	2.3	
75 - 165	FG102	2.6	6018
130 - 345	FG103	3.2	
220 - 670	FG104	4.0	5010
525 - 1185	FG105**	4.5	6010
850 - 2070	FG106***	5.3	7035
1580 - 3000	FG107***	6.0	1028

*) KG value for natural gas:

**)

d=0.64 ($\rho_n=0.83$ kg/m³, $t_u=15^\circ$ C) and external measurement port. With an internal measuring line, the maximum AC flow rate is limited to 100 ³/h. with high-pressure spring plate (HD1) with high-pressure screw spindle (HD2)

8

Dimensions, Connection, and Weight

Dimensions and weight

Nominal width	Ø	А	В	L	HD2	Χ	Weight	Weight
DN	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(kg)	HD2 (kg)
25	145	178	59	160	112	180	3.6	0.4

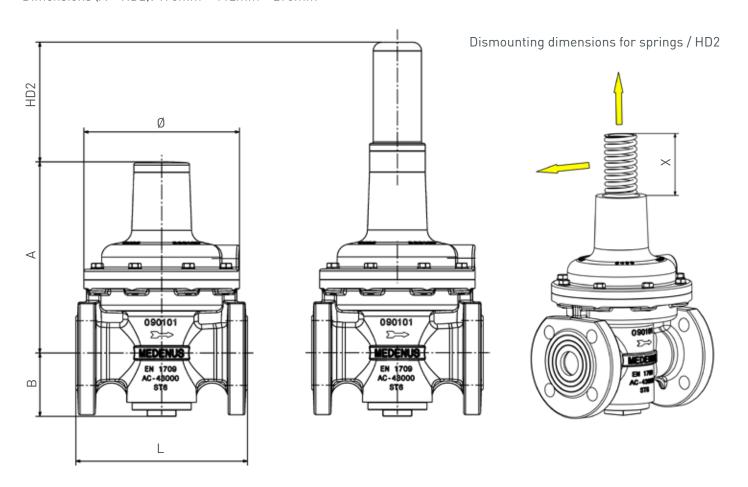
Dimensional drawing

Example:

R51/025/160 with HD2

Weight (regulator + HD2): 3.6kg + 0.4kg = 4kg

Dimensions (A + HD2): 178mm + 112mm = 290mm



Connection of the measuring lines and breather lines

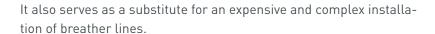
Nominal width	Diaphragm assembly					
	External measurement line	Breather line				
DN 25	Connection* for: tube 10 x 1.5 (thread G 1/4)	Connection* for: tube 10 x 1.5 (thread G 1/4)				
	(tillead G 1/4)	(tilleau 0 1/4)				

^{*)} Threaded pipe connections to DIN EN ISO 8434-1 (DIN 2353)

Types of Models / Options

AV breather valve

The AV breather valve is used to secure the installation room against inadmissible escape of gas from diaphragm comparator compartments of safety shut-off valves. In case of a defect, the impermissible escape of gas into the surrounding atmosphere is limited to a maximum of 30l/h (air).





(Option not available for hydrogen version H₂)

RSD2 throttle valve

The RSD2 is a throttle valve which regulates the volume flow in the sensing/impulse line by means of a continuously adjustable cross-sectional reduction. The setting is made tool-free by means of a rotary knob and can be adjusted using a screw to be fixed. The throttle valve cannot be completely shut off, therefore a guaranteed minimum flow is ensured.



External impulse tap

Available either with an internal or an external measurement line nort

The internal or external measurement line port is used to pass the outlet pressure to be regulated to the bottom of the main diaphragm of the diaphragm assembly.

It compares the actual value with the command variable preset by the force of the setpoint spring.



Epoxy resin coating in RAL colors

To protect the gas pressure regulator from external influences, starting from a corrosivity category C5-M we recommend an epoxy resin coating.



Types of models

Oxygen model O_2 $(p_{\parallel} \le 10 \text{ bar})$

Hydrogen model H_2 (with helium leak test)

The Medenus gas pressure regulators are suitable for use with hydrogen as a medium up to a proportion of 100%. Further information can be found in the special edition (10/2019) of gwf Gas+Energie and on our homepage at

(www.medenus.de)



Design

Note

All calculated pressures are absolute pressures for natural gas. (p+1 bar)

The required KG value for a gas pressure regulator is determined with the smallest inlet pressure or lowest pressure drop. p_u Inlet pressure (bar)

p_d Outlet pressure (bar)

 $Q_{_{n}}$ Standard volumetric flow rate

(m³/h)

Calculation of the required K_e value

$$\begin{array}{c} p_{_{d}} \, / \, p_{_{u}} > 0.5 \\ \text{Value flow rate coefficient } K_{_{G}} \, \text{at} \\ \text{a subcritical pressure ratio} \\ K_{_{G}} = Q_{_{n}} \, / \sqrt{p_{_{d}} \cdot (p_{_{u}} - p_{_{d}})} \end{array}$$

$$p_d/p_u \le 0.5$$

Value flow rate coefficient K_g at a supercritical pressure ratio $K_g = 2 \bullet Q_n/p_u$

Device selection

Note

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

The device is selected on the basis of its K_g value from the table of flow rate coefficients (page 8)

Example: Overpressure Absolute pressure

p _{u min}	5.0 bar	6.0 bar
P _{d min}	0.5 bar	1.5 bar
Q .	200 m ³ /h	

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

→ Supercritical pressure ratio $K_g = 2 \cdot 200 / 6 = 67 \text{ m}^3/(\text{h*bar})$

Selected device

Туре	R51
DN - Nominal width	25
D - Nozzle	V 16.5

 K_e value 175 m³/(h*bar)

Checking the gas velocities

$$W = 380 \bullet Q_p / (DN^2 \bullet p_{abs})$$

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: $w_{corr} = w \cdot (t_{gas} + 273.15)/290$

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 15 m/s max. value for outlet pressures below 100 mbar

Nominal width of input and output of pipeline according to the selected device: 25 mm Selected widening of outlet pipeline: 50 mm

$$W_{ij} = 380 \cdot 200 / (25^2 \cdot 6) = 20 \text{m/s}$$

$$W_d = 380 \cdot 200 / (25^2 \cdot 1.5) = 81 \text{ m/s}$$

$$W_{Impulse} = 380 \cdot 200 / (50^2 \cdot 1.5) = 20 \text{ m/s}$$

The device selected in the example of nominal width DN 25 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)

Properties of Gases

- for natural gas (ρ_n = 0.83 kg/m³; t = 15°C) f natural gas conversion factor- L

Gas	f	Hs,n	Gas f		Hs,n
		[kWh/m³]			[kWh/m³]
Acetylene	0.84	16.25	Sewage gas	0.84	
Ammonia	1.04	4.83	Carbon monoxide	0.81	3.51
Butane	0.55	37.23	Carbon dioxide	0.65	-
Chlorine	0.51	-	Air	0.80	-
Landfill gas	approx. 0.80		Methane	1.08	11.06
Natural gas L	1.00	9.77	Propane	0.64	28.03
Natural gas H	1.03	11.45	Oxygen	0.76	-
Ethane	0.78	19.55	Sulphur dioxide	0.53	-
Ethylene	0.97	16.516	Nitrogen	0.81	-
Mine gas	(30% CH4)	0.86	Hydrogen	3.04	13.43
Helium	2.15	-			

Order Data

Example:	Gas pressure regulator:	R51/025/160/16.5/left/BV/ext/WAZ/So								
	Order code:	R51	025	160	16.5	left	BV	ext	WAZ	So
Order selection	Designation									
Туре										
R51	R51	R51								
DN - Nominal width			025							
RE - Diaphragm assembly	160			160						
D - Nozzle (valve seat diameter)	16.5				16.5					
Direction of flow										
Right (from left to right)	-									
Left (from right to left)	left					left				
Accessories										
without accessories	-									
Breather valve	BV						BV			
Measurement line										
internal	int									
external	ext							ext		
Acceptance test certificate to EN 10204/3.1										
without acceptance test certificate	-									
with acceptance test certificate	WAZ								WAZ	
Special model - Coating with epoxy resin in RAL colors - Oxygen model	So									So

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

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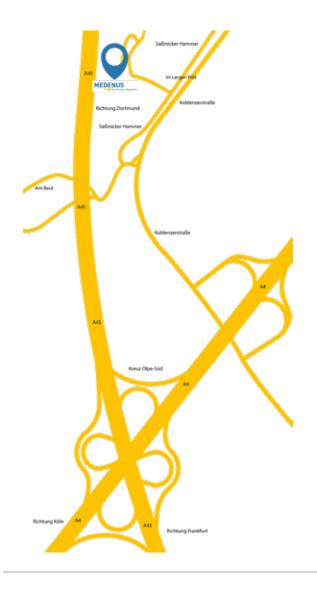
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Trade representation worldwide medenus.de/de/kontakt.html

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Notes



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