

# MEDENUS

Gas Pressure Regulation



## Gas Pressure Regulator R 51

Product Information

EN



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## List of abbreviations and formula symbols

AC	accuracy class	PS	maximum allowable	SG	closing pressure class
HPS	high-pressure screw spindle		pressure	$t_u$	inlet gas temperature
$K_G$	values	$p_u$	inlet pressure	VS	valve seat
$p_d$	outlet pressure	$Q_n$	standard volumetric flow rate	$w_d$	outlet gas velocity
$p_{ds}$	setpoint of outlet pressure	DA	diaphragm assembly	$w_u$	inlet gas velocity
		BV	breather valve	$\rho_n$	gas density

\*)  $K_G$  value for natural gas

# Application, Features , Technical Data

## Application

Gas pressure regulator (GPR) direct-acting, (working without power supply), for installations according to DVGW - Code of Practice G 491 (A) and G 600 (A) (TRGI)

Particularly suitable for dynamic regulating lines (e.g. gas firing installations, burner circuits, gas-powered operation)

For use as equipment part for gas consumption installations according to EC Directive (90/396/EEC)

For use for gases according to DVGW - Code of Practice G 260 / G 262 and neutral non-aggressive gases.

(other gases on request)

## Features

- Integral flameproof design (IS)
- diaphragm assembly with internal or external measuring line

## Type of model (options)

- Oxygen model
- with BV breather valve

## Technical Data

<b>Type</b>	R 51
<b>Model</b>	Integral Pressure resistant (IS)
<b>Maximum allowable pressure PS</b>	10 bar
<b>Max. gas inlet pressure <math>p_{u,max}</math></b>	10 bar
<b>Nominal width</b>	DN 25
<b>Connection type</b>	DIN - flanges PN 16 (ASME flanges upon request)
<b>Material</b>	
Housing / actuator housing	Al cast alloy
<b>Temperature range class 2</b> (Operating / ambient temperature)	-20 °C bis +60 °C
<b>Closing pressure class</b>	SZ 2,5

### Gas pressure regulator

Accuracy class AC and closing pressure class SG at the outlet  
pressure range  $p_d$   
requirement -20°C to 60°C

	AC	SG
50 mbar up to 100 mbar	up to 10	up to 20
> 100 mbar up to 500 mbar	up to 5	up to 10
> 500 mbar	2,5	5

<b>Function, strength and density</b>	DIN EN 334
<b>CE mark according to PED/ PIN number</b>	CE-0085-CR0137

### Ex protection



The mechanical components of the device do not contain any potential ignition sources of their own; thus, they do not fall under the scope of ATEX 95 (94/9/EC). The electrical components of the device comply with ATEX requirements.

# Application, Features , Technical Data

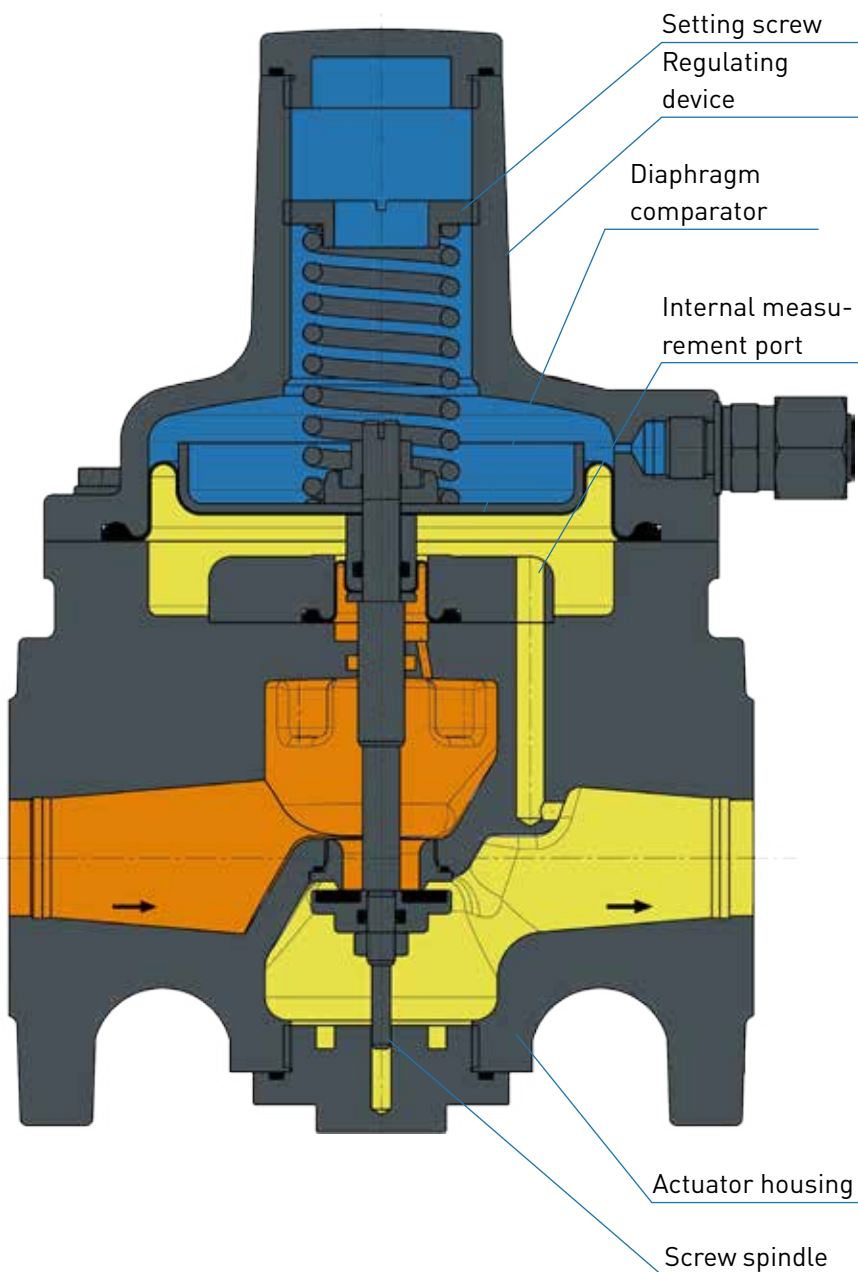
## Design and function

The spring-loaded gas pressure regulator R 51 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 regulating line on the outlet side. The gas pressure regulator is composed of the actuator housing and the „diaphragm assembly plus actuator“ functional unit.

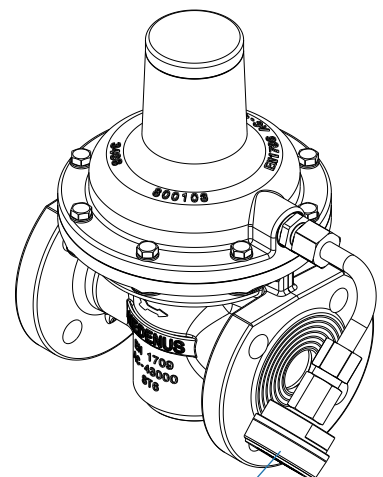
The valve seat model is pre-pressure-compensated.

The gas flows through the actuator housing in the direction of the arrow. The internal or external measuring line connection is used to pass the outlet pressure to be regulated to the bottom of the diaphragm comparator 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 valve stem 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.

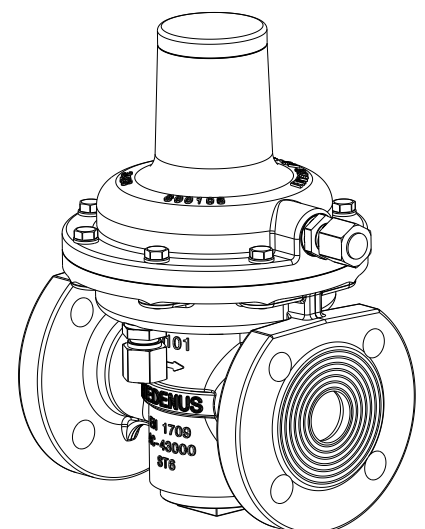


### Option: breather valve



Breather valve BV

### Option: external impulse tap



## Application, Features , Technical Data

### $K_G$ \* value and diaphragm assemblies

Nominal width	Valve seat $\emptyset$ (mm)	$K_G$ * value ((m <sup>3</sup> /h)/bar)	Diaphragm assembly $\emptyset$ (mm)
DN 25	16,5	175	160

### Diaphragm assembly setpoint spring table

Diaphragm assembly $\emptyset$ (mm)	Spring data		
	Spring no.	Wire $\emptyset$ [mm]	Colour [RAL]
160			
26 - 50	FG100	2,0	9005
50 - 90	FG101	2,3	5015
75 - 165	FG102	2,6	6018
130 - 345	FG103	3,2	3020
220 - 670	FG104	4,0	5010
525 - 1185	FG105**	4,5	6010
850 - 2070	FG106***	5,3	7035
1580 - 3900	FG107***	6,0	1028

\*)  $K_G$  value for natural gas:  $d = 0.64$  ( $\rho_n = 0.83$  kg/m<sup>3</sup>),  $t_u = 15^\circ$  C and external measurement port. With an internal measuring line, the maximum AC flow rate is limited to 100 <sup>3</sup>/h.

\*\* ) with high-pressure spring plate (HD1)

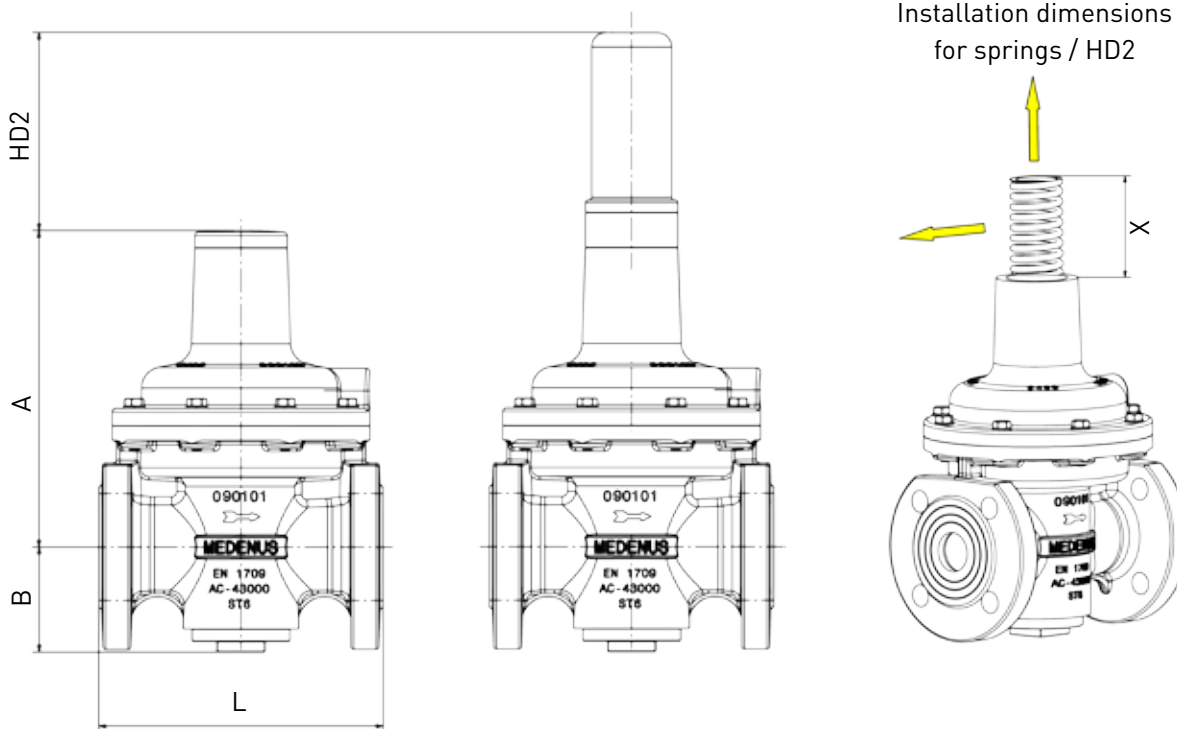
\*\*\* ) with high-pressure screw spindle (HD2)

## Dimensions, connection and weight

### Dimensions and weight

Nominal width DN	RE (mm)	A (mm)	B (mm)	L (mm)	HD2 (mm)	X (mm)	Weight (kg)	Weight HD2 (kg)
25	160	178	59	160	112	180	3,6	0,4

### Dimensional drawing



### Example:

R51/025/160 with HD2

Weight (Regulator + HD2):  $3,6\text{kg} + 0,4\text{kg} = 4\text{kg}$

Dimensions (A + HD2):  $178\text{mm} + 112\text{mm} = 290\text{mm}$

### Connection of test leads and breathing lines

Nominal width	Regulating device	
	external measuring line	breathing line
DN 25	Connection* for: Pipe 10 x 1.5 (G 1/4)	Connection* for: Pipe 10 x 1.5 (G 1/4)

### Note

For installation, start-up and maintenance, the following documents must be observed:

DVGW - Code of Practice G 491 and G 600

Operating and Maintenance Instructions R 51

The gas pressure regulators R 51 shall be installed in the pipeline preferably in horizontal position with vertical position of the diaphragm assembly spring cap. For all nominal widths, the direction of flow is indicated by an arrow on the housing.

\*) Pipe connections according to DIN EN ISO 8434-1 (DIN 2353)

# Design

## Calculation of the required $K_G$ value

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

The  $K_G$  value refers to natural gas of density  $0.83 \text{ kg/m}^3$  at  $15^\circ\text{C}$ . For other gases, a flow rate equivalent to that of natural gas is to be expected.

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

$$p_d / p_u > 0,5$$

$K_G$  value at a subcritical pressure ratio

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

$$p_d / p_u \leq 0,5$$

$K_G$  value at a supercritical pressure ratio

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

Note: all calculated pressures are absolute pressures.

## Device selection

The device is selected on the basis of its  $K_G$  value from the table of flow rate coefficients (page 6)

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

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

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

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

Recommended max. gas velocity at the outlet flange:  
100 - 200 m/s Lower value for reducing sound emission

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

## Example:

$$\begin{array}{ll} p_{u \text{ min}} & 5,0 \text{ bar} & / & p_{u \text{ max}} & 8,0 \text{ bar} \\ p_{d \text{ min}} & 0,2 \text{ bar} & / & p_{d \text{ max}} & 0,5 \text{ bar} \\ Q_{n \text{ min}} & 150 \text{ m}^3/\text{h} & / & Q_{n \text{ max}} & 200 \text{ m}^3/\text{h} \end{array}$$

$$1,5 \text{ bar} / 6 \text{ bar} = 0,25 < 0,5$$

→ supercritical pressure ratio

$$K_G = 2 \cdot 200 / 6 = 67 \text{ (m}^3/\text{h)/bar}$$

R 51 DN 25 VS 16,5  
 $K_G$  - value: 175 (m<sup>3</sup>/h)/bar

Inlet and outlet nominal width of the pipeline according to the selected device: 25 mm  
Selected widening of the outlet pipeline: 50 mm

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

$$w_d = 380 \cdot 200 / (25^2 \cdot 1,5) = 81 \text{ m/s}$$

$$w_{\text{Impuls}} = 380 \cdot 200 / (50^2 \cdot 1,5) = 20 \text{ m/s}$$

The device selected in the example of nominal width DN 25 can be operated under these conditions.

## Note:

**For a more detailed interpretation of our gas pressure control devices, the configurator is available on our homepage [medenus.de](http://medenus.de). ([Medenus.de/en/service/konfigurator.html](http://Medenus.de/en/service/konfigurator.html))**



## Ordering data

### Example:

Gas Pressure Regulator: R51/025/160/16,5/links/BV/ext/WAZ/So

		Order code:								
		R51	025	160	16,5	links	BV	ext	WAZ	So
<b>Order selection</b>	<b>Title</b>									
Type										
R51	R51	R51								
DN - Nominal width			025							
RE - Regulating device	160			160						
Valve seat diameter	16,5				16,5					
Flow direction										
right (from left to right)	-									
left (from right to left)	links					links				
Equipment										
without equipment	-									
Breathing valve	BV						BV			
Measuring 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 version	So*									So

Only one option can be selected in each selection group.

So\*) for example:

- Oxygen model
- with Breather valve BV

## Contact

If you want to know more about solutions from MEDENUS for the gas industry, please contact your local contact person or go to our internet site at [www.medenus.de](http://www.medenus.de)

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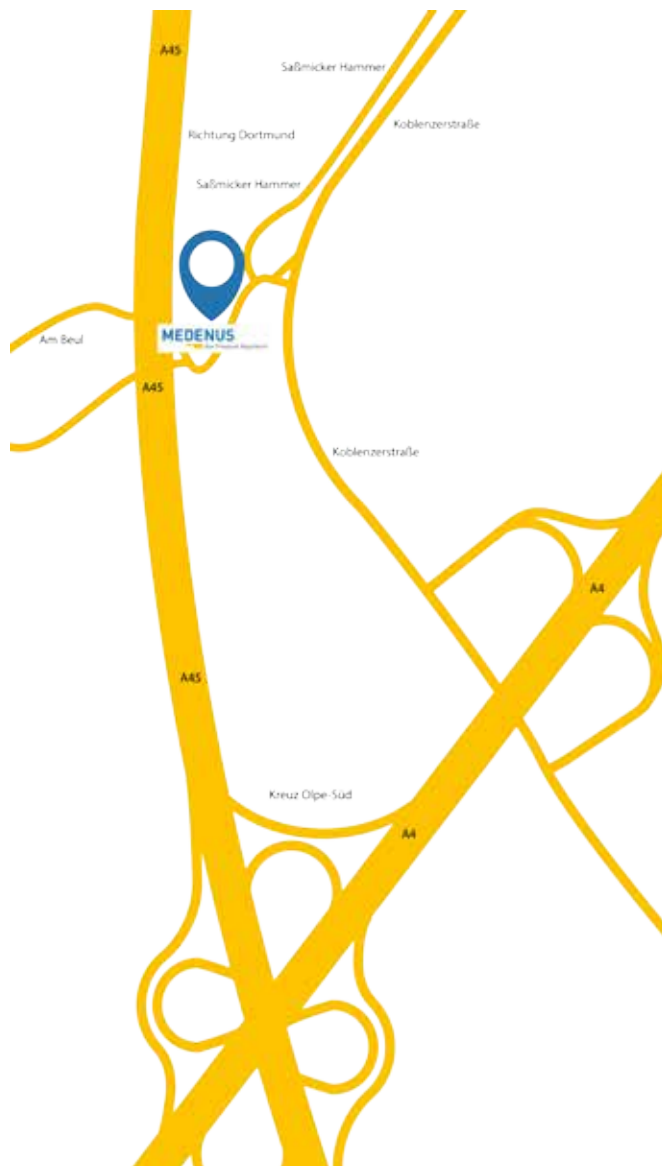
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Our worldwide distributors can be found on our website at <http://medenus.de/de/kontakt.html>



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## Notes

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