

# MEDENUS



Gas Pressure Regulation



## Safety Shut-Off Valve S 50

Product information



EN



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### ATTENTION

Observe the following publications in relation to installation, start-up and maintenance:  
 DVGW - work sheets G 491 and G 600  
 Operating and Maintenance Instructions S50

## List of abbreviations and formula symbols

AC	Accuracy class	$p_{ds\ o}$	Upper SSV response pressure	$W_{ds\ o}$	Upper spring adjustment range (SSV)
$AG_o$	Upper response pressure group	$p_{ds\ u}$	Lower SSV response pressure	$W_{ds\ u}$	Lower spring adjustment range (SSV)
$AG_u$	Lower response pressure group	$p_{f,max}$	Maximum closing pressure	$\Delta p$	Pressure difference from inlet pressure to outlet pressure
BV	Breather valve	PS	Maximum allowable pressure	$\Delta p_{wo}$	Min. re-engagement difference between upper response pressure and normal operating pressure
GPR	Gas pressure regulator	$p_u$	Inlet pressure	$\Delta p_{wu}$	Min. re-engagement difference between lower response pressure and normal operating pressure
HDS	High-pressure spindle	$Q_n$	Standard volumetric flow rate	$\rho_n$	Gas density
$K_G$	Valve flow rate coefficient	RE	Diaphragm assembly		
$p$	Pressure	RSD2	Throttle valve		
$p_d$	Outlet pressure	SSV	Safety shut-off valve		
$p_{df}$	SRV closing pressure	SRV	Safety relief valve		
$p_{do}$	SRV opening pressure	SG	Closing pressure group		
$p_{ds}$	Setpoint of the response pressure	$t_{Gas}$	Gas inlet temperature		
		VS	Valve seat		
		$w_d$	Outlet gas velocity		
		$w_u$	Inlet gas velocity		

# Application, Characteristics, Technical Data

## Application

Safety shut-off valve (SSV), direct-acting (operating without auxiliary power), for systems acc. to DVGW work sheets G 491 (A) and G 600 (A) (TRGI)

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 version (IS)
- High flow rate capacity
- Open-air model

## Type of models / Options (see page 10)

- with BV breather valve
- with electric position indicator SSV 'Closed' via inductive proximity initiator or via reed contact
- with SSV electromagnetic remote release when power is applied or in case of power failure
- with SSV manual release
- oxygen model
- hydrogen model

## Response pressure groups

Lower response pressure $AG_u$ in command area $w_{dsu}$	$AG_u$
10 mbar to 50 mbar	20
> 50 mbar	10

Upper response pressure group $AG_o$ in command area $w_{dso}$	$AG_o$
50 mbar to 500 mbar	10
> 500 mbar	5

## Technical data

<b>Type</b>	S 50
<b>Model</b>	Integral pressure-tight (IS)
<b>Max. allowable pressure PS</b>	3 bar
<b>Nominal width</b>	Rp 1" (DN 25), Rp 1½" (DN 40), Rp 2" (DN 50) (NPT thread on request)
<b>Standard volumetric flow rate <math>Q_{n,max}</math></b>	Rp 1": 100m³/h, Rp 1½": 300m³/h, Rp 2": 300m³/h
<b>Type of connection</b>	Internal thread acc. to EN 10226-1
<b>Material</b>	
Housing / actuator housing/ Control device housing	Al cast alloy DIN EN 1706-AC-42100 ST6
<b>Corrosivity category</b>	DIN EN ISO 12944-2
C1 to C5-I	without additional coatings
C5-M	an epoxy resin coating is recommended (see page10)
<b>Temperature range, Class 2</b> (operating/ambient temperature)	-20°C to +60°C
<b>Function, strength and tightness</b>	DIN EN 14382
<b>CE mark acc. to PED/ PIN number</b>	CE-0085-BS0420
<b>Ex protection</b>	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 safety shut-off valves (SSV) 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 S50

CE EAC

## Structure and function

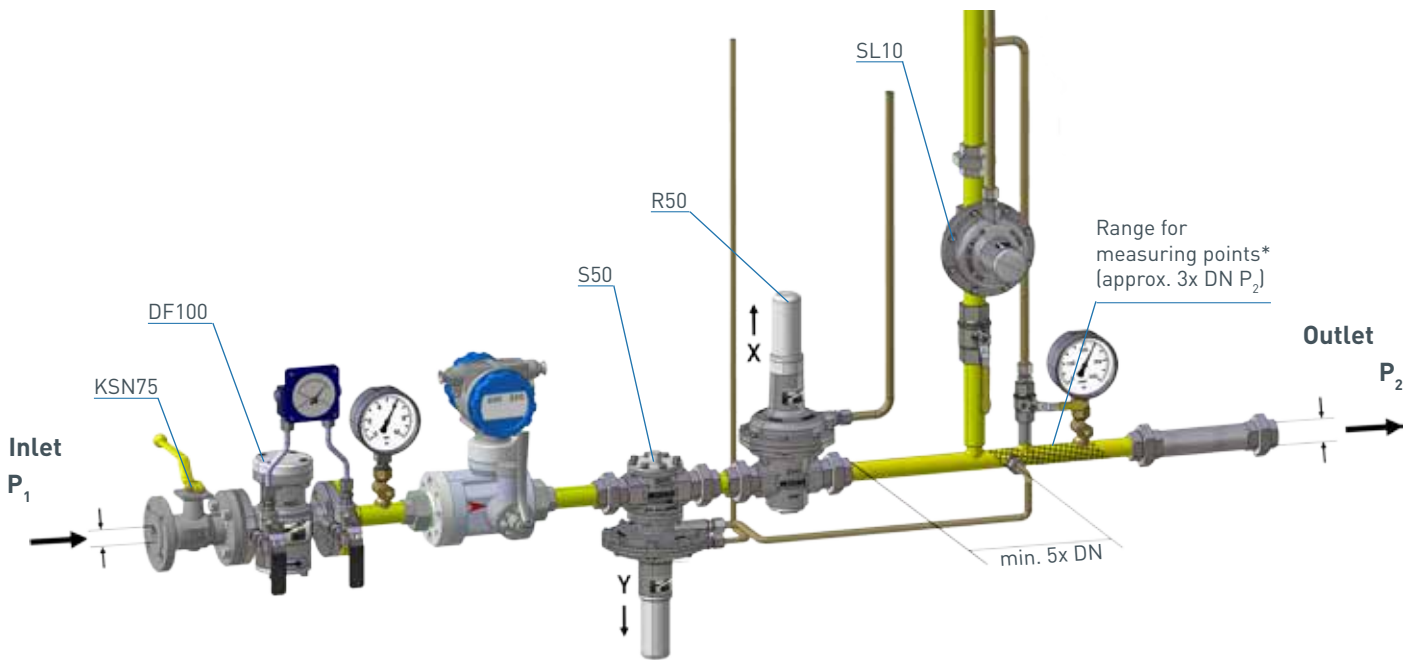
The safety shut-off valve S 50 shuts off the gas flow when the outlet pressure in the regulation section exceeds or falls below a certain response pressure. To this end, the outlet pressure to be monitored is passed on to the SSV control device via a separate measurement line. As a function of the change in pressure, the diaphragm in the control device is raised or lowered. When the outlet pressure in the regulation section falls below the lower switch-off point or exceeds the upper switch-off point, the switch socket connected to the SSV diaphragm will move to the corresponding disengaging position, the balls of the engaging mechanism will release the SSV screw spindle, and the closing spring will press the SSV valve plate against the valve seat. The SSV actuator shuts off the gas flow gas-tight.

The SSV can only be opened by hand and engaged in the open position. To do so, the outlet pressure at the measuring point must be lowered below the upper response pressure or raised above the lower response pressure by at least the re-engaging differential amount ( $\Delta p$ ).

The SSV can, except where otherwise stipulated in specific national legislation, be used in either functional class A (with diaphragm rupture protection) or B (without diaphragm rupture protection).

There is also the option of using a remote display for the SSV position "CLOSED" and a manual and remote release when power is applied or in case of power failure.

## Installation example



\*) Recommended max. velocity at the measurement line port 25 m/s



## SSV setpoint spring table - control device

S50: Rp 1"-2"

Spring data		MD**				MD-R			
		to $W_{ds\ o}$ 300 mbar		Upper response pressure		to $W_{ds\ o}$ 3500 mbar		Upper response pressure	
Spring no.	Color [RAL]	$W_{ds\ u}$ [mbar]	$\Delta p_{wu}$ [mbar]	$w_{dso}$ [mbar]	$\Delta p_{wo}$ [mbar]	$W_{ds\ u}$ [mbar]	$\Delta p_{wu}$ [mbar]	$w_{dso}$ [mbar]	$\Delta p_{wo}$ [mbar]
FE 900	1028	1 - 8	20			35 - 50	50		
FE 901 VA	2002	6 - 17	20			50 - 80*	50		
FE 902 VA	6010	12 - 24*	20			70 - 105	50		
FE 903	5015	22 - 40	20			100 - 140	50		
FE 904 VA	9005	30 - 50	20			110 - 160	50		
FE 905 VA	9010	45 - 70	20			150 - 205	50		
FE 906	4002	65 - 100	20			200 - 300	50		
FD 910	1028			20 - 40	20			90 - 125	50
FD 911	2002			35 - 70	20			120 - 210	50
FD 912	6010			65 - 110	20			200 - 330	50
FD 913	5015			100 - 160	20			285 - 460	50
FD 914	9005			150 - 235	20			450 - 680	50
FD 915	9010			225 - 300	20			640 - 1040	50
FD 916	3020							1030 - 1480	50
FD 917	5010							1450 - 2200	50
FD 918	9006							1900 - 3500	50
FD 919	4002								

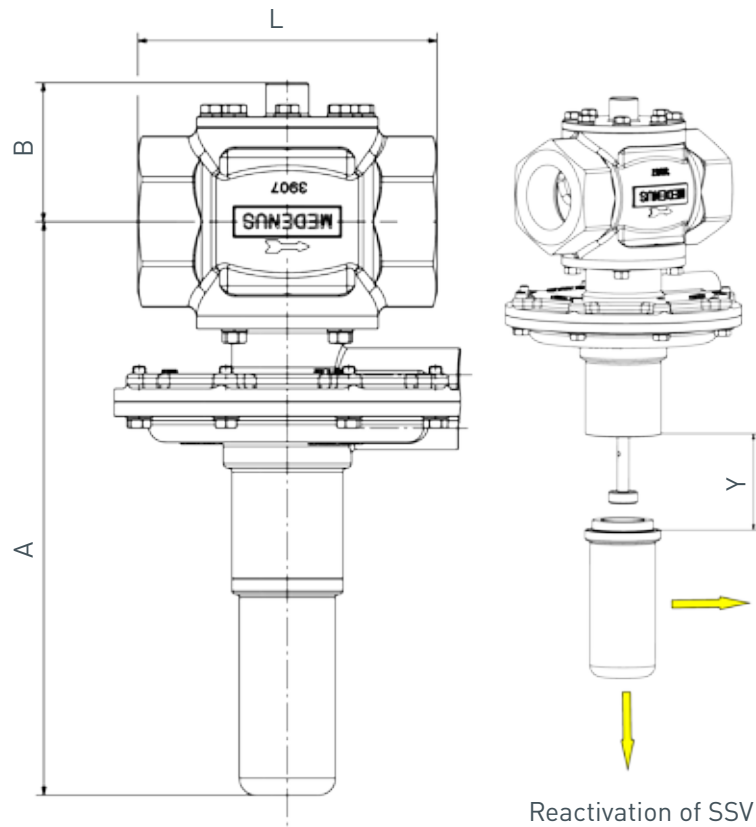
\*) Standard spring

\*\*) If the control device is set up for simultaneous monitoring of upper and lower response pressures, the difference between the setpoints for the upper and lower response pressures ( $p_{dso}$  and  $p_{dsu}$ ) should be at least 10% greater than the total of values given for  $\Delta p_{wo}$  and  $\Delta p_{wu}$ .



# Dimensions, Connection, and Weight

## Dimensional drawing



## Dimensions and weight

Nominal width \ Dimensions	Nominal width		
	DN 25 Rp 1"	DN 40 Rp 1 1/2"	DN 50 Rp 2"
A [mm]	261	268	268
B [mm]	59	65	65
L [mm]	100	140	160
Y [mm]	100	100	100
Weight [kg]	2.5	3.5	4.0

## Connection of the measuring lines and breather lines

Nominal width	Measurement line	Breather line
DN 025 Rp 1"	Connection* for: tube 12 x 1.5 (thread G 1/4)	
DN 040 Rp 1 1/2"		
DN 050 Rp 2"		

## Types of Models / Options

### BV breather valve

The BV breather valve is used as for securing 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).

It also serves as a substitute for an expensive and complex installation of breather lines.



BV breather valve

**(Option not available for hydrogen version H<sub>2</sub>)**

### Reed contact / inductive transmitter

Reed contacts and inductive transmitters are used to monitor the position (closed or open position) of the safety shut-off valve via remote display.



Signal transmitter



Inductive transmitter

### SSV manual and remote release

The direct-acting safety solenoid valve is used as electromagnetic remote release for closing the safety shut-off valve when power is applied or in case of power failure.



### 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 version O<sub>2</sub>

Hydrogen version H<sub>2</sub> (with helium leak test)



# Design

## Checking the gas velocities

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

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 SSV

## Example:

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

$$Q_n = 70 \text{ m}^3/\text{h} \quad p_u / (p_d) = 5 \text{ bar}$$

$$w_u = 380 \cdot 70 / (25^2 \cdot 6) = 7.1 \text{ m/s}$$

## Determining the upper response pressure

Outlet pressure $P_d$ (mbar)	Upper response pressure $W_{dso}$
$\leq 200$	$P_d + 100 \text{ mbar}$
$> 200 - \leq 800$	$P_d \times 1.5$
$> 800 - \leq 1600$	$P_d \times 1.3$
$> 1600$	$P_d + 500 \text{ mbar}$

## Pressure loss formula

Calculation pressure absolute ( $p_u + 1 \text{ bar}$ ) =  $p_{u,abs}$

$$\Delta p = \left( \frac{Q_n}{K_G} \right)^2 \times \frac{1000}{p_{u,abs}}$$

## Properties of Gases

- for natural gas ( $\rho_n = 0.83 \text{ kg/m}^3$ ;  $t = 15^\circ\text{C}$ )
- f - natural gas conversion factor- L

Gas	f	Hs,n [kWh/m <sup>3</sup> ]	Gas	f	Hs,n [kWh/m <sup>3</sup> ]
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% CH <sub>4</sub> )		0.86	Hydrogen	3.04	13.43
Helium	2.15	-			

# Order Data

## Example:

Safety shut-off valve: S50/Rp1"/MD-R/left/BV/N/H/WAZ/So

Order code:	S50	Rp1"	MD-R	-	left	BV	N	H	WAZ	So
<b>Order selection</b>	<b>Designation</b>									
<b>Type</b>										
S50	S50	S50								
<b>DN - Nominal width</b>	Table p. 9	Rp1"								
<b>SSV</b>										
with control device MD	MD									
with control device MD-R	MD-R		MD-R							
<b>SSV functional class</b>										
A	-			-						
B	B									
<b>Direction of flow</b>										
Right (from left to right)	-									
Left (from right to left)	left				left					
<b>SSV valve accessories</b>	Fig. p. 10									
without SSV valve accessories	-									
Breather valve	BV					BV				
<b>Electrical position indicator, SSV "Closed"</b>	Fig. p. 10									
without electrical position indicator	-									
with ... , via proximity switch	N						N			
with ... , via Reed contact	R									
<b>SSV release</b>	Fig. p. 10									
without release	-									
with manual release	H							H		
with electromagnetic remote release, when power is supplied	SG									
with electromagnetic remote release, in case of power failure	SA									
<b>Acceptance test certificate to EN 10204/3.1</b>										
without acceptance test certificate	-									
with acceptance test certificate	WAZ								WAZ	
<b>Special model</b>	So									So
- Coating with epoxy resin in RAL colors										
- Oxygen model										

### DN - Nominal width

Type	Rp 1"	Rp 1½"	Rp 2"
S50	X	X	X

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



## Contact



Management  
ALEXANDER CHRISTIANI

Phone: +49 (0) 2761 / 82788-18  
Mail: a.christiani@medenus.de



Technical Inside Sales Department  
MINDAUGAS PECKAITIS

Phone: +49 (0) 2761 / 82788-23  
Mail: m.peckaitis@medenus.de



Head of Sales & Marketing  
FRANZ FEICHTNER

Phone: +49 (0) 2761 / 82788-26  
Mobile phone: +49 (0) 151 / 51002711  
Mail: f.feichtner@medenus.de



Inside Sales Department  
SEBASTIAN HUCKESTEIN

Phone: +49 (0) 2761 / 82788-11  
Mail: s.huckestein@medenus.de



Head of Inside Sales Department  
MANUEL SCHEPP

Phone: +49 (0) 2761 / 82788-20  
Mobile phone: +49 (0) 170 / 6355309  
Mail: m.schepp@medenus.de



Inside Sales Department  
STEFANIE MÜLLER

Phone: +49 (0) 2761 / 82788-13  
Mail: s.mueller@medenus.de



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**MEDENUS**  
Gas-Druckregeltechnik GmbH

Im Langen Feld 3  
D-57462 Olpe  
Phone: +49 (0)2761 82788-0  
Fax: +49 (0)2761 82788-9  
Mail: [info@medenus.de](mailto:info@medenus.de)  
**Internet: [www.medenus.de](http://www.medenus.de)**



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**MEDENUS** Gas-Druckregeltechnik GmbH

Phone +49 (0)2761 82788-0

Fax +49 (0)2761 82788-9

Im Langen Feld 3 / D-57462 Olpe

[info@medenus.de](mailto:info@medenus.de)

[www.medenus.de](http://www.medenus.de)

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