MEDENUS

Gas Pressure Regulation

MADE IN GERMANY

100% Wasserstoff geeignet

H_2

100% Hydrogen ready

Safety Shut-Off Valve S 50

Product information

EN

Table of Contents

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

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 AV breather valve
- with electric position indicator SSV 'Closed' 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

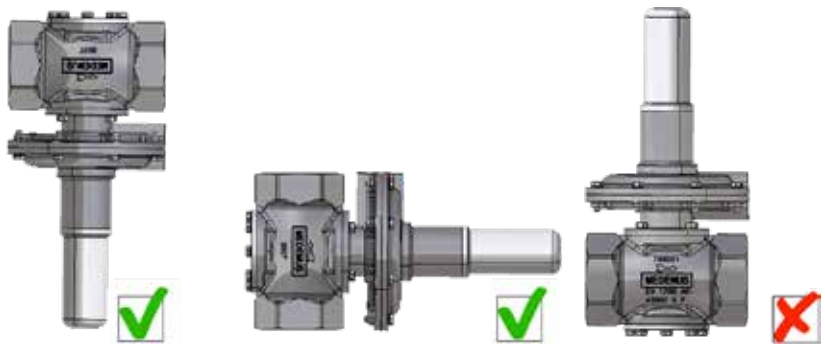
Upper response pressure group AG_o in command area w_{dso}	AG_o
50 mbar to 500 mbar	10
> 500 mbar	5

Technical data

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

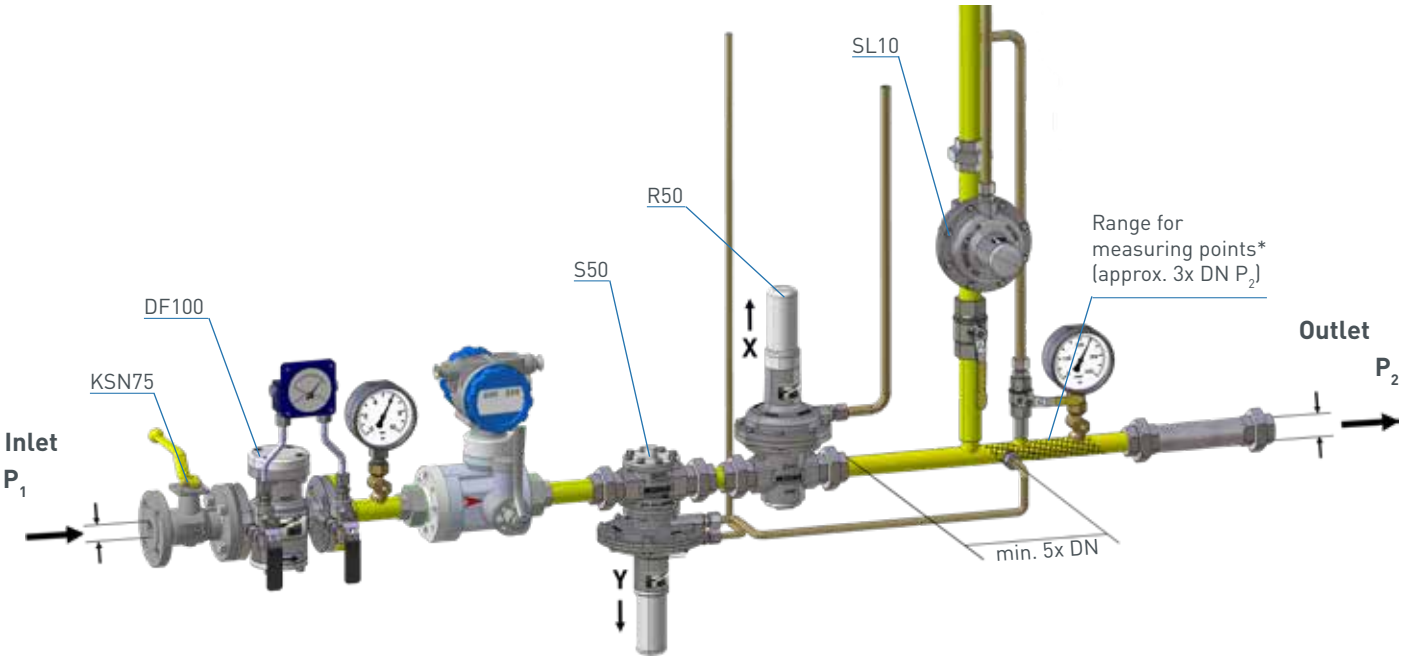
Note: Observe the following documents in relation to installation, start-up, and maintenance:

- DVGW - work sheets G 491 and G 600
- Operating and Maintenance Instructions S50

Structure and function

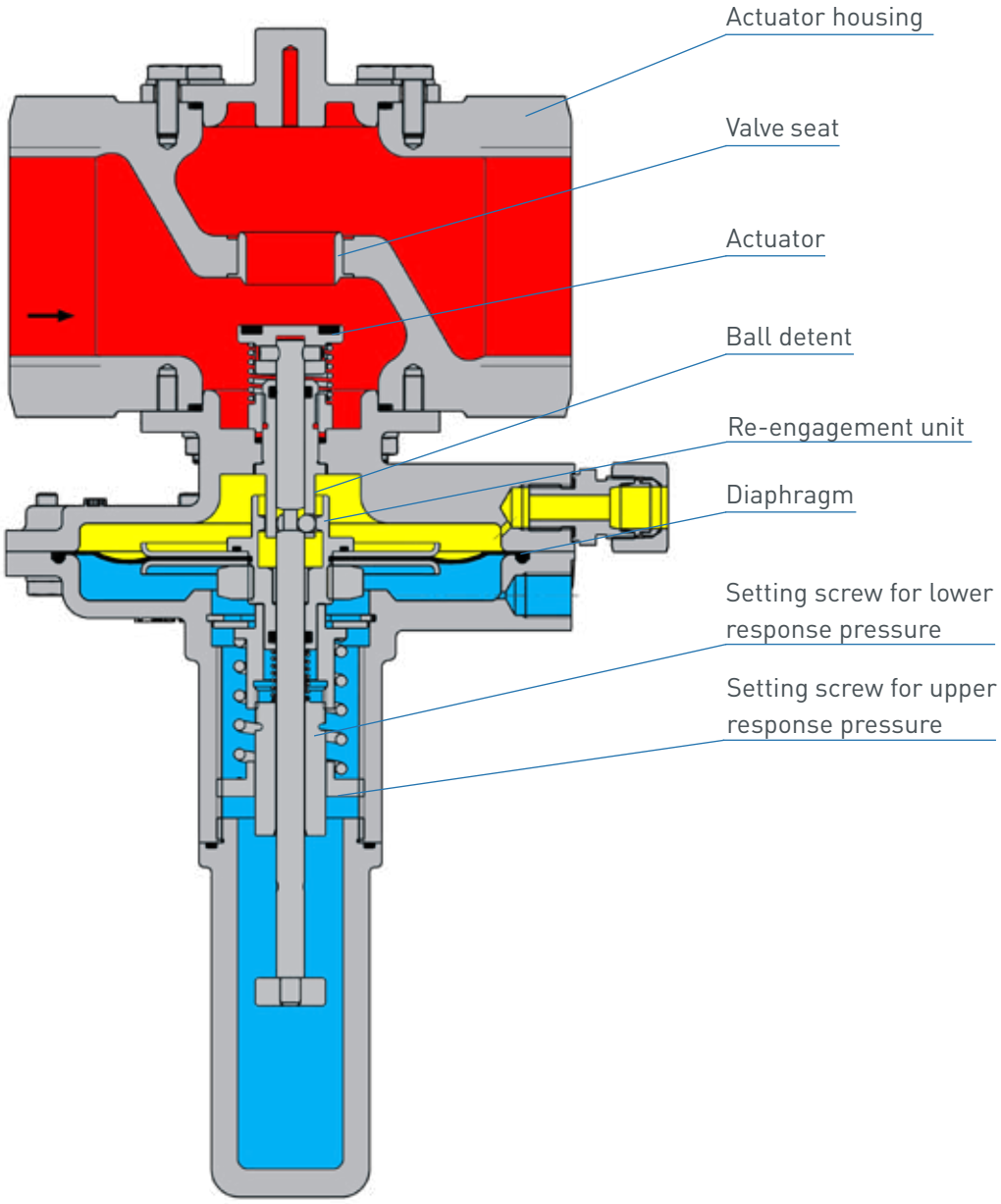
The safety shut-off valve S 50 shuts off the gas flow when the outlet pressure in the regulation section exceeds or falls below a certain response pressure. To this end, the outlet pressure to be monitored is passed on to the SSV control device via a separate measurement line. As a function of the change 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 (Δp).
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

Sectional view



SSV setpoint spring table - control device

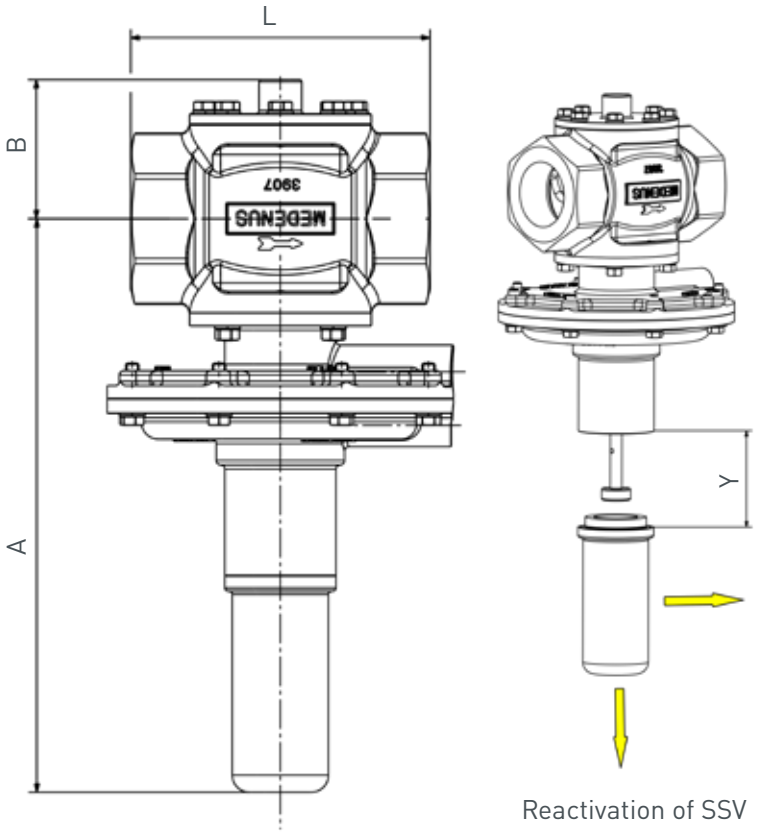
		S50: Rp 1“-2“							
		MD**				MD-R**			
		to $W_{ds\,o}$ 300 mbar				to $W_{ds\,o}$ 3500 mbar			
Spring data		Lower response pressure		Upper response pressure		Lower response pressure		Upper response pressure	
Spring no.	Color [RAL]	$W_{ds\,u}$ [mbar]	Δp_{wu} [mbar]	w_{dso} [mbar]	Δp_{wo} [mbar]	$W_{ds\,u}$ [mbar]	Δp_{wu} [mbar]	w_{dso} [mbar]	Δp_{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 simultaneously for the upper and lower set pressure (functional class A) the difference between the setpoints of the upper and lower response pressure (p_{dso} and p_{dsu}) and the outlet pressure pd must be at least “Δp_{wo} + 10%” or “Δp_{wu} + 10%”. Otherwise it cannot be guaranteed that the control device will re-engage.

Dimensions, Connection, and Weight

Dimensional drawing



Reactivation of SSV

Dimensions and weight

Nominal width / Dimensions	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 1½"		
DN 050 Rp 2"		

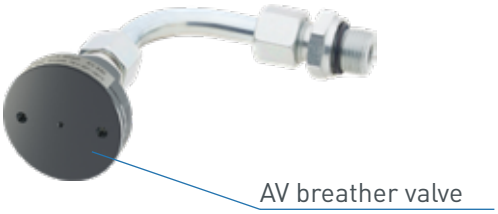
Types of Models / Options

AV breather valve

The AV 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.

(Option not available for hydrogen version H_2)



Reed contact

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

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_2

Hydrogen version H_2 (with helium leak test)

Design

Checking the gas velocities

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

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

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
$Q_n = 70 m^3/h$ $p_u / (p_d) = 5$ bar

$w_u = 380 \bullet 70 / (25^2 \bullet 6) = 7.1$ m/s

Determining the upper response pressure

Outlet pressure P_d (mbar)	Upper response pressure W_{dso}
⩽200	P_d +100 mbar
>200 - ⩽800	P_d x 1.5
>800 - ⩽1600	P_d x 1.3
>1600	P_d +500 mbar

Pressure loss formula

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

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

Properties of Gases

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

Gas	f	Hs,n [kWh/m³]	Gas	f	Hs,n [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:

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

Order code:		S50	Rp1"	MD-R	-	left	BV	N	H	WAZ	So
Order selection	**Designation**										
Type											
S50	S50	S50									
DN - Nominal width	Table p. 9		Rp1"								
SSV											
with control device MD	MD										
with control device MD-R	MD-R			MD-R							
SSV functional class											
A	-				-						
B	B										
Direction of flow											
Right (from left to right)	-										
Left (from right to left)	left					left					
SSV valve accessories	Fig. p. 10										
without SSV valve accessories	-										
Breather valve	BV						BV				
Electrical position indicator, SSV "Closed"	Fig. p. 10										
without electrical position indicator	-										
with ... , via Reed contact	R							R			
SSV release	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										
Acceptance test certificate to EN 10204/3.1											
without acceptance test certificate	-										
with acceptance test certificate	WAZ									WAZ	
Special model	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.

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