

# Series 46 Self-operated Regulators

## Differential Pressure and Flow Limiters

### Type 46-5 · Type 46-6



#### Application

Differential pressure and flow limitation for district heating systems with indirect connection, extended piping systems, and industrial applications

With valves DN 15 to 50 · PN 16 and 25 · Suitable for liquids up to 150 °C and gases up to 80 °C

The valve closes when the differential pressure rises. The flow rate is limited.



The regulator consists of a globe valve with adjustable restriction at the valve body and an actuator with operating diaphragm.

#### Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Only one control line needs to be installed on mounting the regulator.
- Suitable for water and other liquids or gases, provided these do not cause corrosion.
- Single-seated valve with balanced plug
- Particularly suitable for district heating plants according to DIN 4747-1 (AGFW requirements for components in house substations)
- With internal overload protection (excess pressure limiter) in the actuator

#### Versions

Series 46 Differential Pressure Limiters

Valves DN 15 to 50 with connection nuts and welding ends

Valves in DN 32, 40, and 50 also with flanged body made of spheroidal graphite iron

- Integrated restriction for adjusting the flow rate limitation
- For installation in the low-pressure line, e.g. return flow pipe
- Closing actuator with integrated low-pressure connection through a hole in the plug

**Type 46-5** (Fig. 1) · Differential pressure and flow limiter  
Fixed differential pressure set point, adjusted to  $\Delta p = 0.2, 0.3, 0.4,$  or  $0.5$  bar

**Type 46-6** (Fig. 2) · Differential pressure and flow limiter  
Differential pressure set point  $\Delta p$  from  $0.2$  to  $2$  bar adjustable at an adjusting screw · DN 15 to 32, set point range  $0.2$  to  $1$  bar with set point adjustment at a manual adjuster



Fig. 1: Type 46-5 with fixed set point



Fig. 2: Type 46-6 with adjustable set point

### Further versions

- DN 15 to 50 with threaded ends or screw-on flanges
- PN 25 version: with internal parts made of FKM, e.g. for use with mineral oils
- Special  $K_{VS}$  coefficient in DN 15

### Principle of operation


The medium flows through the valve in the direction indicated by the arrow. The areas released by the restriction (1.2) and the valve plug (3) determine the flow rate and the differential pressure  $\Delta p$ . The high pressure of the plant is transmitted to the bottom diaphragm chamber of the actuator (6). The pressure downstream of the restriction (1.2) (not the low pressure of the plant) acts from the top on the operating diaphragm (6.1) through a hole in the plug (3). The resulting differential pressure is converted into a positioning force. This force moves the plug according to the force of the valve spring (5) or set point spring (8).

In Type 46-5, the springs (5) in the valve determines the set point. In Type 46-6, the set point can be adjusted at the set point adjuster (10).

The maximum flow rate (flow limitation) is adjusted at the restriction (1.2). The cross-section of the valve is changed in such a way that the differential pressure and the differential pressure created at the restriction are identical when the required maximum flow rate exists.

An overload protection (excess pressure limiter; 16) in the actuator protects the seat and plug from overload during exceptional operating conditions that could lead to valve or plant damage.

**Table 1: Technical data**

Nominal size	DN	15	20	25	32 <sup>1)</sup>	40 <sup>1)</sup>	50 <sup>1)</sup>
$K_{VS}$ coefficient	Standard	2.5	6.3	8	12.5	16	20
	Special version	0.4 · 1 · 4	-				
	Flanged body	-			12.5	20	25
$x_{FZ}$ value	Standard	0.6		0.55		0.5	0.45
	Flanged body	-			0.45	0.45	0.4
Nominal pressure		PN 16/25			PN 25		
Max. permissible differential pressure $\Delta p$ across the valve		10 <sup>2)</sup> /20 bar				16 bar	
Max. permissible temperature		For liquids 130 °C <sup>2)</sup> /150 °C · For air and non-flammable gases 80 °C					
Pressure above adjusted differential pressure at which internal excess pressure limiter responds		0.5 bar					
Compliance							
<b>Differential pressure set point ranges</b>							
Types 46-6 · Continuously adjustable set point		0.2 to 1 bar · 0.5 to 2 bar					
Type 46-5 · Fixed set point		0.2 bar · 0.3 bar · 0.4 bar · 0.5 bar					

<sup>1)</sup> Additional version: Valve with flanged body made of spheroidal graphite iron

<sup>2)</sup> PN 16 version

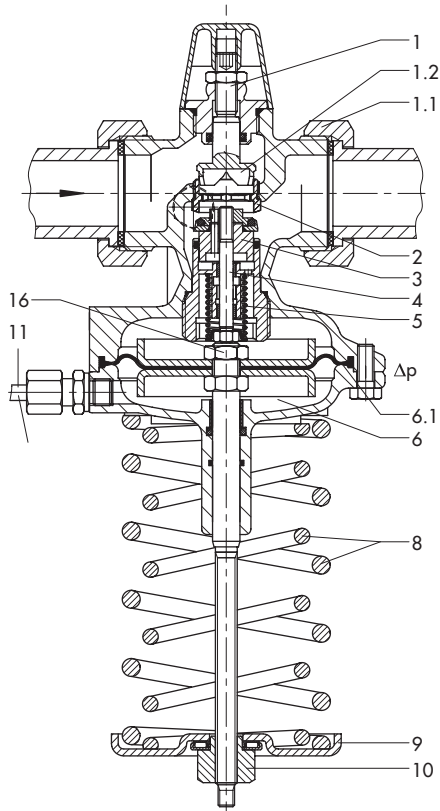
**Table 2: Materials · Material numbers according to DIN EN**

Valve body	Red brass CC491K/CC499K (Rg 5) · Spheroidal graphite iron EN-GJS-400-18-LT <sup>1)</sup>	
Cover	Red brass CC491K/CC499K (Rg 5)	
Seat	Stainless steel 1.4305	
Plug	PN 25	Brass, resistant to dezincification, with EPDM soft seal <sup>2)</sup>
	PN 16	Brass, resistant to dezincification, and plastic with EPDM soft seal <sup>2)</sup>
Valve springs	Stainless steel 1.4310	
Restriction	Brass, free of dezincification	
Operating diaphragm	EPDM with fabric reinforcement <sup>2)</sup>	
Seals	EPDM <sup>2)</sup>	

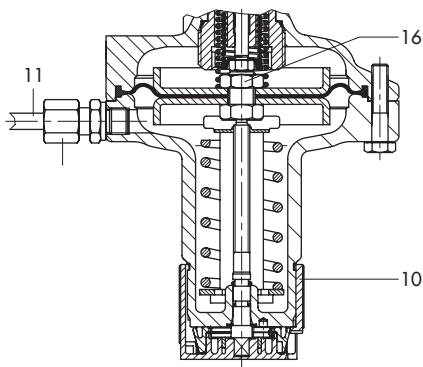
<sup>1)</sup> Additional version in DN 32, 40, and 50: valve with flanged body made of spheroidal graphite iron

<sup>2)</sup> Special version in PN 25, e.g. for mineral oils: FKM

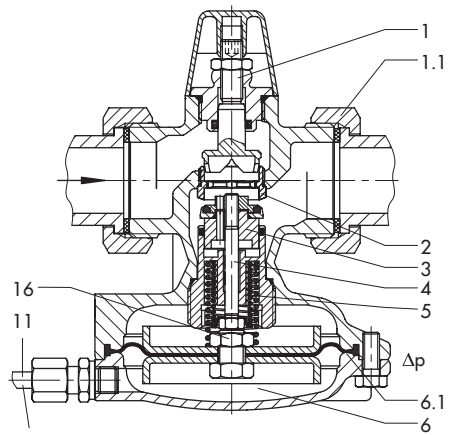
**Note on Fig. 3 to Fig. 6:** the control line is turned into the plane of projection.



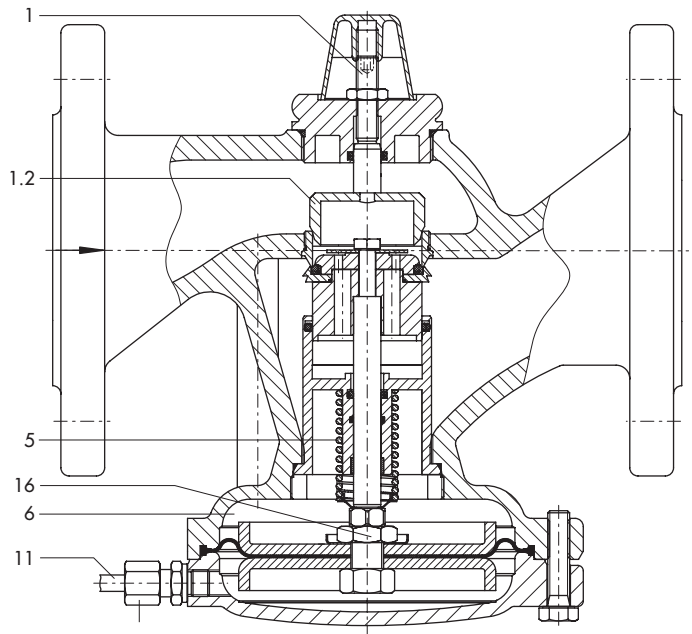
**Fig. 3:** Type 46-6 · Differential pressure set point adjustable from 0.2 to 2 bar



**Fig. 4:** Type 46-6 · Differential pressure set point adjustment with manual adjuster, DN 15 to 32, set point range 0.2 to 1 bar



**Fig. 5:** Type 46-5 · Fixed differential pressure set point



**Fig. 6:** Type 46-5 · With flanged valve body (DN 32 to 50)

- |     |   |     |  |
|-----|---|-----|--|
| 1   | Adjustment of the flow rate limitation with cover cap | 6   | Actuator   |
| 1.1 | Connection nut with seal and welding end              | 6.1 | Operating diaphragm                                    |
| 1.2 | Restriction for adjusting the flow rate limitation    | 8   | Set point spring                                       |
| 2   | Seat  | 9   | Spring plate   |
| 3   | Plug (balanced)                                       | 10  | Set point adjustment for differential pressure         |
| 4   | Plug stem   | 11  | Control line for high pressure                         |
| 5   | Valve spring  | 16  | Internal excess pressure limiter (overload protection) |

**Table 3:** Flow rate set points for water in m<sup>3</sup>/h

$\Delta p_{\text{set point}}$	$\Delta p_{\text{plant}}$	$\Delta p_{\text{restriction}}$	DN	15				20	25	32 <sup>1)</sup>	40 <sup>1)</sup>	50 <sup>1)</sup>
			$K_{VS}$	0.4	1	2.5	4	6.3	8	12.5	16/20 <sup>1)</sup>	20/25 <sup>1)</sup>
			$\dot{V}$ Min.	0.01	0.12	0.2	0.5	0.8	0.8	2	3	4
0.2 bar	0.1 bar	0.1 bar	$\dot{V}$ Max.	0.14	0.45	0.85	1.8	2.6	3.0	7.1	8.9	10.7
0.5 bar	0.3 bar	0.2 bar	$\dot{V}$ Max.	0.2	0.65	1.2	2.5	3.6	4.2	10	12.5	15
				–	–	–	1.3 <sup>2)</sup>	2.3 <sup>2)</sup>	3.5 <sup>2)</sup>	5.8 <sup>2)</sup>	9.1 <sup>2)</sup>	14.1 <sup>2)</sup>

1) Additional version: Valve with flanged body made of spheroidal graphite iron

2) An increase in noise level can be expected when the specified flow rates are exceeded, even if cavitation does not occur.

### Differential pressure across the valve

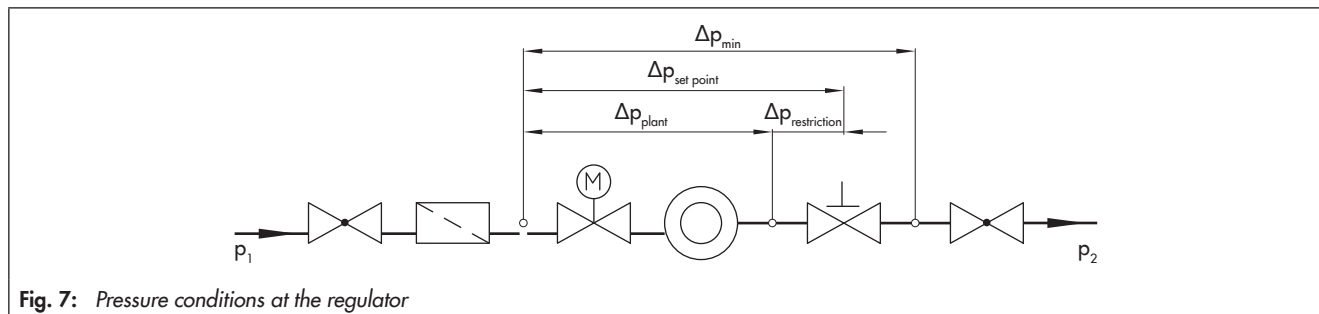
When selecting the differential pressure set point or set point range, make sure that the differential pressure  $\Delta p_{\text{set point}}$  is the sum of the pressure drop in the fully open plant  $\Delta p_{\text{plant}}$  and the pressure drop across the restriction  $\Delta p_{\text{restriction}}$ .

From experience, the differential pressure at the restriction  $\Delta p_{\text{restriction}}$  is assumed to be 0.2 bar. The flow rates at a differential pressure across the restriction of 0.1 bar and 0.2 bar are specified in Table 3.

$$\Delta p_{\text{set point}} = \Delta p_{\text{plant}} + \Delta p_{\text{restriction}}$$

The minimum required differential pressure  $\Delta p_{\text{min}}$  between the flow and return flow pipe is calculated as follows:

$$\Delta p_{\text{min}} = \Delta p_{\text{set point}} + \left( \frac{\dot{V}}{K_{VS}} \right)^2$$



- $\Delta p_{\text{min}}$  Minimum differential pressure between the flow and return pipes in bar
- $\Delta p_{\text{restriction}}$  Pressure drop in bar across the restriction
- $\Delta p_{\text{set point}}$  Differential pressure set point in bar
- $\Delta p_{\text{plant}}$  Differential pressure (pressure loss) when the plant is completely open in bar
- $\dot{V}$  Adjusted flow rate in m<sup>3</sup>/h
- $K_{VS}$  Valve flow coefficient in m<sup>3</sup>/h

## Installation

The regulator is suitable for installation into horizontal pipes as well as vertical pipes.

Regulators in DN 32 or larger must only be installed horizontal pipes (with the actuator facing down).

Installation conditions:

- The direction of flow must match the direction indicated by the arrow on the body
- Connect the external control line at the side or on top at the high-pressure pipe.
- If possible, install a strainer (e.g. SAMSON Type 1 NI) upstream of the valve, e.g. upstream of the transfer station.

Further details can be found in

► EB 3130.



## Ordering text

Types 46-5 and 46-6 Differential Pressure and Flow Limiters  
DN ..., PN ...

Permissible temperature ... °C

Kvs ...

With welding ends, threaded ends, flanges or flanged valve body in DN 32, 40, and 50

Differential pressure set point or set point range ... bar

Optionally, special version ...

## Application

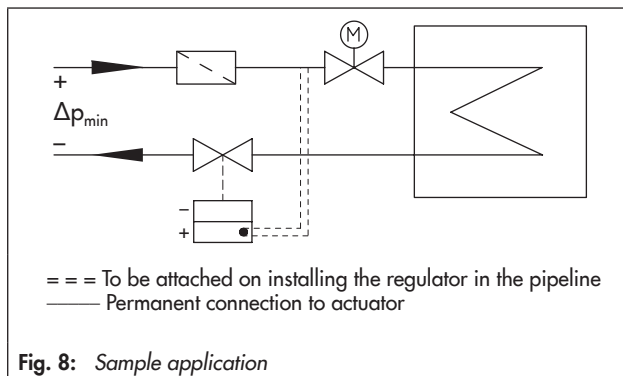


Fig. 8: Sample application

## Flow rate diagram for water

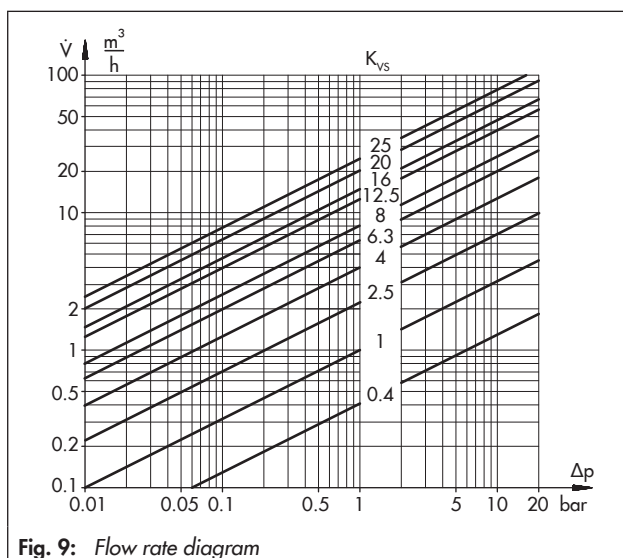
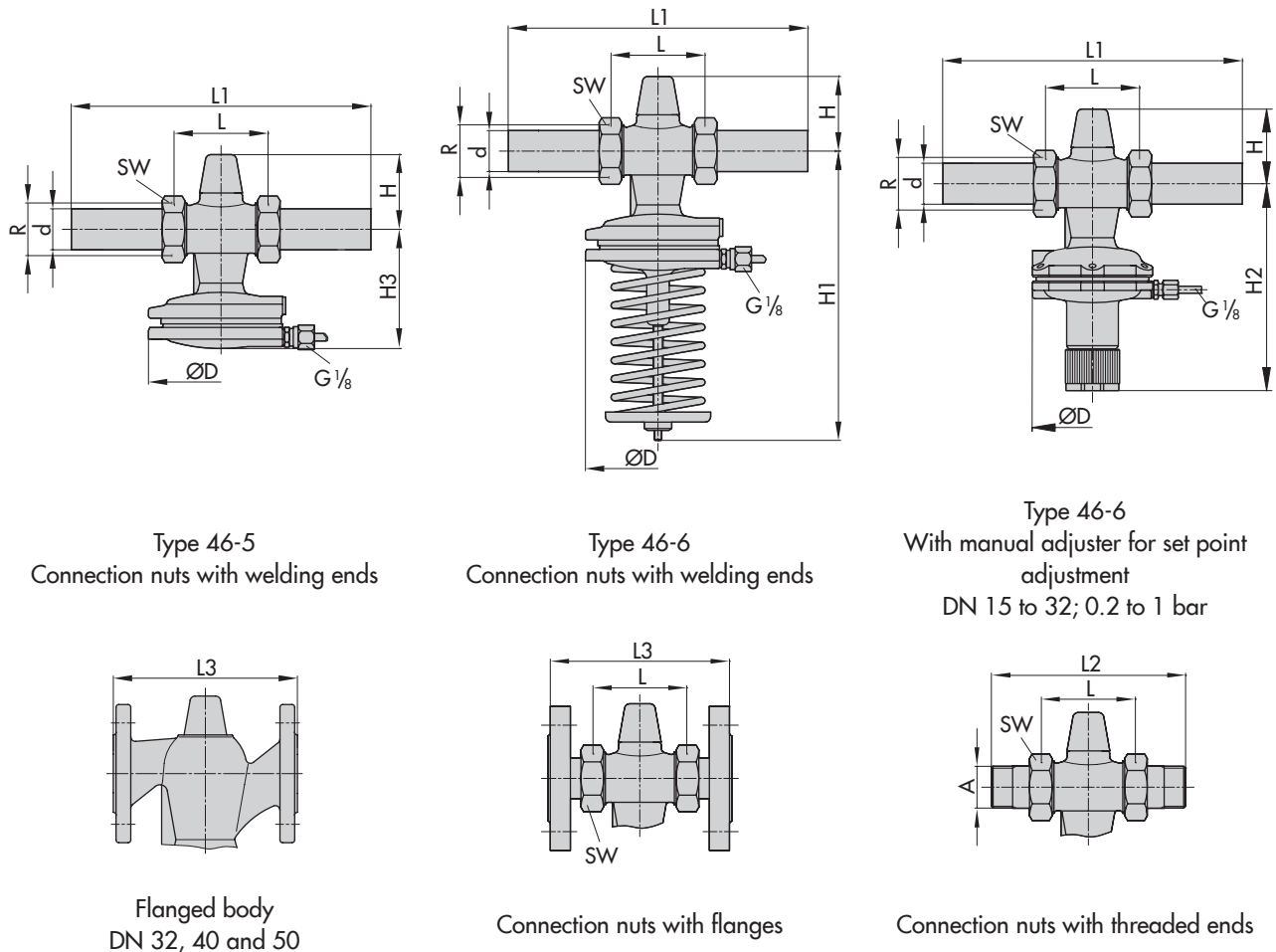


Fig. 9: Flow rate diagram

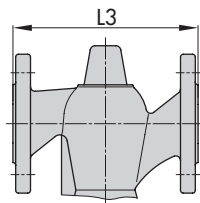
## Dimensional drawings



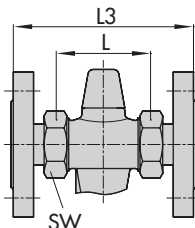
Type 46-5  
Connection nuts with welding ends

Type 46-6  
Connection nuts with welding ends

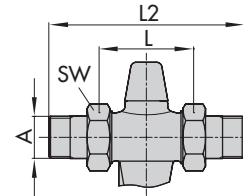
Type 46-6  
With manual adjuster for set point  
adjustment  
DN 15 to 32; 0.2 to 1 bar



Flanged body  
DN 32, 40 and 50



Connection nuts with flanges



Connection nuts with threaded ends

**Table 4:** Dimensions in mm · Regulators without connecting parts

Nominal size DN	15	20	25	32 <sup>1)</sup>	40 <sup>1)</sup>	50 <sup>1)</sup>
Connection R	G ¾	G 1	G 1¼	G 1¾	G 2	G 2½
Pipe Ød	21.3	26.8	32.7	42	48	60
Width across flats SW	30	36	46	59	65	82
L	65	70	75	100	110	130
H	65		85			
H1	230		250	380		
H2	160		180	-		
H3	85		105	140		
ØD	116			160		

<sup>1)</sup> Additional version: valve with flanged body

The dimensions and weights of valves with flanged bodies (DN 32, 40, and 50) are the same as valves with screwed-on flanges.

**Table 5:** Dimensions in mm and weights in kg · Including connecting parts

Nominal size DN	15	20	25	32	40	50
<b>With welding ends</b>						
L1	210	234	244	268	294	330
Weight	Type 46-5	1.6	1.7	1.8	3	5.5
	Type 46-6	2.0	2.1	2.2	3.2	10
<b>With threaded ends</b>						
L2	129	144	159	180	196	228
Male thread A	G ½	G ¾	G 1	G 1¼	G 1½	G 2
Weight	Type 46-5	1.6	1.7	1.8	3	5.5
	Type 46-6	2.0	2.1	2.2	3.2	10
<b>With flanges<sup>1) 2)</sup> or with flanged body (DN 32 to 50)</b>						
L3	130	150	160	180	200	230
Weight	Type 46-5	3.0	3.7	4.3	6.2	9.5
	Type 46-6	3.4	4.1	4.7	6.4	14

<sup>1)</sup> PN 16/25

<sup>2)</sup> Flanges are already mounted on valves in DN 40 and 50.

Specifications subject to change without notice



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