

# Self-operated Regulators Series 46/47



## Flow and Differential Pressure Regulators Type 46-7 and Type 47-5

Installation in return flow pipes

## Flow and Differential Pressure or Pressure Regulators

### Type 47-1 and Type 47-4

Installation in flow pipes

#### Application

Flow rate and differential pressure control or flow rate and pressure control in district heating supply networks and industrial plants · Valve sizes **DN 15** to **DN 50** · **PN 16/25**  
Suitable for liquids up to **150 °C** and gases up to **80 °C**

The valve **closes** as the flow rate/differential pressure increases

The regulators consist of a globe valve with adjustable restriction (orifice) and an actuator with two diaphragms.

They control the flow rate according to the set point adjusted at the restriction as well as the differential pressure or downstream pressure according to the set point adjusted at the actuator. The largest signal is always used to actuate the valve.

#### Special features

- Low-maintenance P-regulators requiring no auxiliary energy
- Suitable for water and other non-flammable liquids and gases, provided they do not cause the materials used to corrode
- Single-seated valve with a balanced plug
- Particularly suitable for district heating plants conforming to DIN 4747 (requirements stipulated by AGFW (German District Heating Association) concerning components in substations)

#### Versions (Figs. 1 to 3)

Flow and differential pressure regulators · Valves in DN 15 to DN 50 · With welding ends (special version with threaded ends or screwed-on flanges) · DN 32, 40 and 50 also available with flanged valve body made of spheroidal graphite iron.

Standard version with integrated restriction (orifice) for adjusting the flow rate set point (Fig. 2), special version with external scaled cap (Fig. 1) for adjusting the flow rate set point.

Flow and differential pressure regulator for installation in low-pressure pipes, e.g. in the return flow pipe of a district heating substation:

**Type 46-7** · With adjustable flow rate and differential pressure set points · With internal overload protection (excess pressure limiter) in the actuator

**Type 47-5** · With fixed differential pressure set point · Adjustable flow rate set point · With internal overload protection (excess pressure limiter) in the actuator

Flow and differential pressure regulator for installation in high-pressure pipes, e.g. in the flow pipe of a district heating substation:

**Type 47-1** · With adjustable flow rate and differential pressure or pressure set points

**Type 47-4** · With fixed differential pressure set point · Adjustable flow rate set point

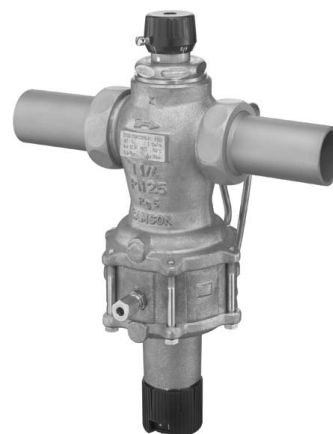


Fig. 1 · Type 47-1 Flow and Differential Pressure or Pressure Regulator, DN 15 to 32, version with manual adjuster for differential pressure set point adjustment and scaled cap for flow rate set point adjustment, version with welding ends



Fig. 2 · Type 46-7 Flow and Differential Pressure Regulator, version with flanged body (DN 32 to DN 50)

## Principle of operation

The medium flows through the valve in the direction indicated by the arrow. The flow rate and the differential pressure  $\Delta p$  or the downstream pressure  $p_2$  are determined by the free area available between the orifice (1.2) and plug (3).

The differential pressure  $\Delta p$  is converted into a positioning force at the first diaphragm (6.1), and the differential pressure at the restriction, dependent on the flow rate, is also converted into a positioning force at the second diaphragm (6.3). The largest signal is always used to actuate the valve.

If, for example,  $\Delta p$  rises, the force acting on the first diaphragm (6.1) also rises. This change in force causes the actuator stems (6.2 and 6.4) and the plug (3) to move in the closing direction. If the flow rate increases, the differential pressure increases at the orifice (1.2) and the pressure increases at the second diaphragm (6.3). This change in differential pressure at the restriction only causes the second actuator stem (6.4) and the plug (3) to move in the closing direction until the adjusted flow set point is reached.

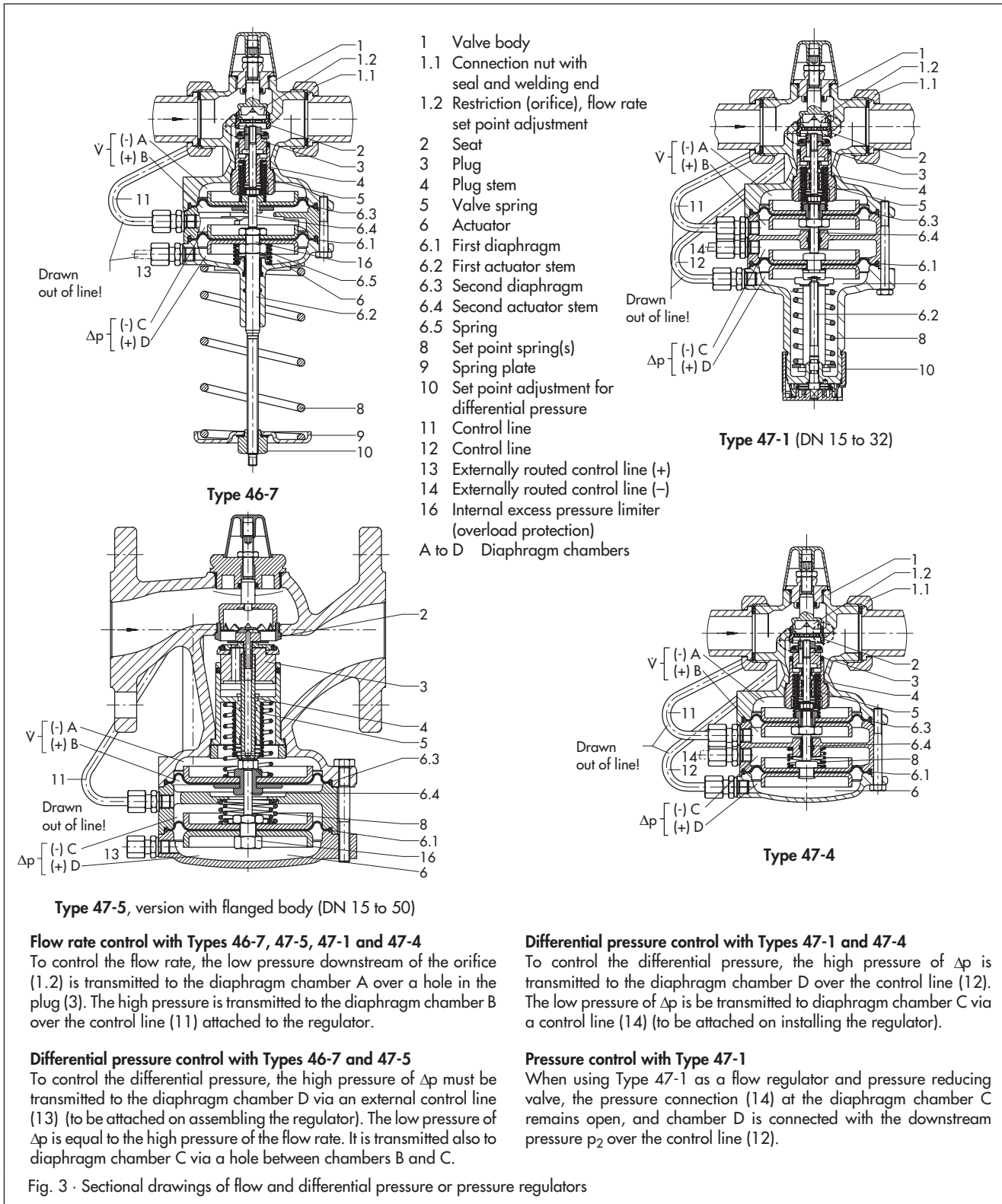


Fig. 3 · Sectional drawings of flow and differential pressure or pressure regulators

In **Types 46-7** and **47-5**, an internal excess pressure limiter functioning as an overload protection (16) protects seat and plug from overload during exceptional operating conditions that could lead to valve or plant damage.

In **Types 47-1** and **46-7** (DN 15 to 32 with set point ranges 0.2 to 0.6 bar and 0.2 to 1 bar) the differential pressure set point is adjusted using a manual adjuster with guide scale. The required differential pressure can be adjusted with sufficient precision (see EB 3131 EN) with the aid of a differential pressure set point diagram, yet without pressure gauge equipment.

**Table 1 · Technical data**

Nominal size	DN	15				20	25	32 <sup>2)</sup>	40 <sup>2)</sup>	50 <sup>2)</sup>	
K <sub>VS</sub> coefficient		0.4 <sup>1)</sup>	1 <sup>1)</sup>	2.5	4 <sup>1)</sup>	6.3	8	12.5	16/20 <sup>2)</sup>	20/25 <sup>2)</sup>	
z value		0.6					0.55	0.55/0.45 <sup>2)</sup>		0.45/0.4 <sup>2)</sup>	
Nominal pressure	PN	16/25						25			
Max. perm. differential pressure Δp across the valve		10 <sup>3)</sup> /20 bar							16 bar		
Max. perm. temperature		Liquids: 130 °C <sup>3)</sup> /150 °C · Air and non-flammable gases: 80 °C									
Pressure above the adjusted diff. pressure set point at which the internal excess pressure limiter (46-7/47-5)		0.5 bar									
<b>Differential pressure set point ranges</b>											
Types 46-7 and 47-1, continuously adjustable		0.2 to 0.6 · 0.2 to 1 · 0.5 to 2 bar							0.2 to 0.5 · 0.2 to 1 0.5 to 2 bar		
Types 47-4 and 47-5, fixed		0.2 · 0.3 · 0.4 · 0.5 bar									
<b>Flow rate set point ranges for water in m<sup>3</sup>/h</b>											
Upper differential pressure at the restriction: 0.2 bar	m <sup>3</sup> /h	–	–	–	0.6 to 1.3 <sup>4)</sup>	0.8 to 2.3 <sup>4)</sup>	0.8 to 3.5 <sup>4)</sup>	2 to 5.8 <sup>4)</sup>	3 to 9.1 <sup>4)</sup>	4 to 14.1 <sup>4)</sup>	
	m <sup>3</sup> /h	0.01 to 0.2	0.12 to 0.64	0.2 to 1.2	0.6 to 2.5	0.8 to 3.6	0.8 to 5	2 to 10	3 to 12.5	4 to 15	

<sup>1)</sup> Special versions

<sup>2)</sup> Additional version: Valve with flanged body made of spheroidal graphite iron (EN-JS 1049)

<sup>3)</sup> For PN 16 version

<sup>4)</sup> An increase in noise level can be expected when the specified flow rates are exceeded, even if cavitation does not occur.

The minimum required differential pressure Δp<sub>min</sub> across the valve is calculated as follows:

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

Δp<sub>min</sub> Minimum differential pressure in bar across the valve

Δp<sub>restriction</sub> Differential pressure at the restriction in bar (differential pressure created at the restriction (orifice) to measure the flow rate)

$\dot{V}$  Adjusted flow rate in m<sup>3</sup>/h

K<sub>VS</sub> Valve flow coefficient in m<sup>3</sup>/h

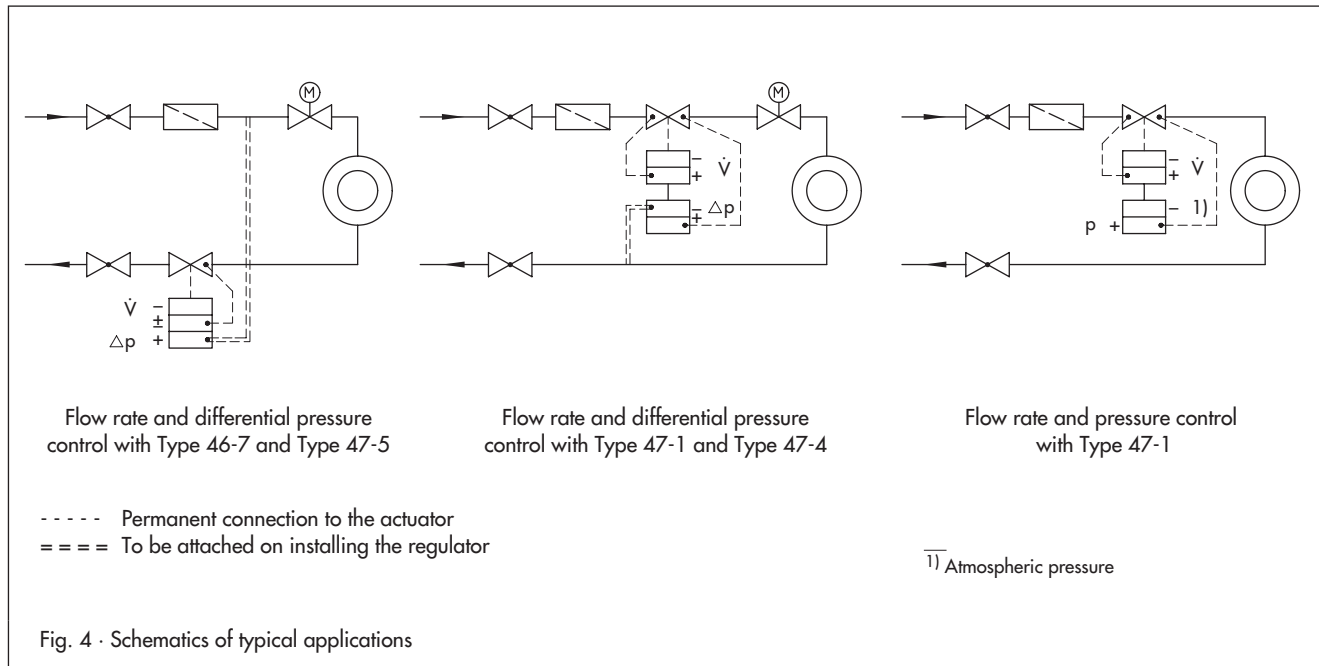
**Table 2 · Material** · Material number acc. to DIN EN

Body	Red brass CC491K (Rg 5) · Spheroidal graphite iron EN-JS 1049 <sup>1)</sup>	
Seat	Stainless steel 1.4305	
Plug	PN 25	Brass, free of dezincification, with EPDM soft sealing <sup>2)</sup>
	PN 16	Brass, free of dezincification, and plastic with EPDM soft sealing
Valve springs	Stainless steel 1.4310	
Orifice	Brass, free of dezincification	
Operating diaphragm <sup>2)</sup>	EPDM with fabric reinforcement	
Seals <sup>2)</sup>	EPDM	

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

<sup>2)</sup> Special version for mineral oil: FPM (FKM)

## Typical applications



## Installation

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

Regulators in sizes DN 32 and larger may only be installed horizontal pipes with the actuator pointing downwards.

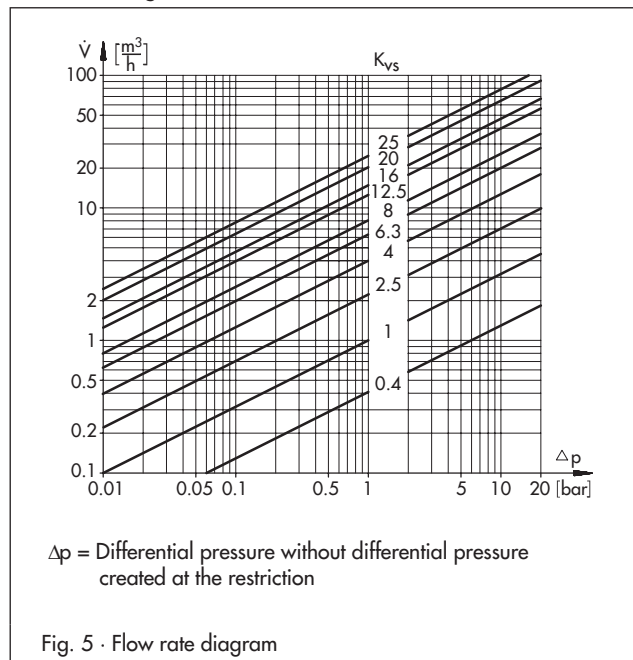
The following points must be observed:

- The medium must flow through the valve in the direction indicated by the arrow on the valve body.
- Install a strainer (e.g. SAMSON Type 1 NI) upstream of the valve, if possible.

Further details can be found in EB 3131 EN.



## Flow rate diagram for water



## Ordering text

Flow and Differential Pressure Regulator Type 46-7 / 47-1 / 47-4 / 47-5

DN ..., PN ...

Permissible temperature ... °C

$K_{VS}$  ...

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

Set point / Set point range ... bar

Upper differential pressure ... bar

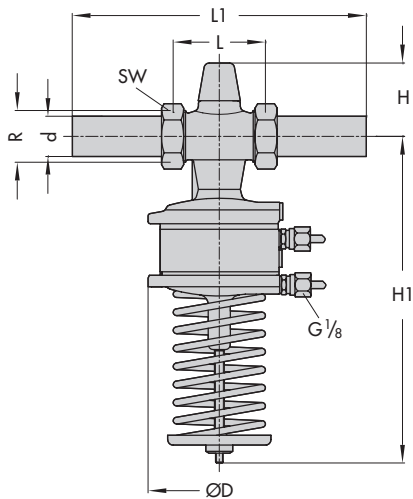
On option, special version

## Special version

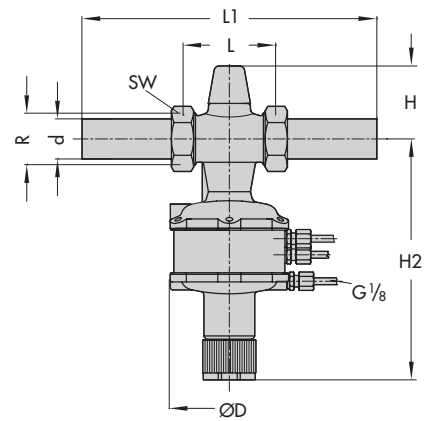
Special  $K_{VS}$  coefficient with DN 15 · With internal parts resistant to mineral oil (not version in PN 16) · With scaled cap (with DN 15 to 25 only) · ANSI version

## Accessories

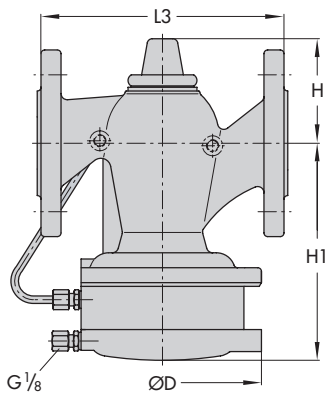
Intermediate insulating piece for particularly well-insulated pipelines



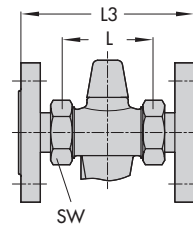
Type 46-7/47-1 with connection nuts and welding ends



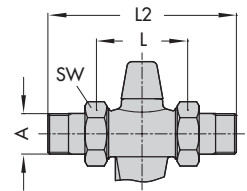
Type 46-7/47-1, DN 15 to 32, set point ranges 0.2 to 0.6 and 0.2 to 1 bar



Type 47-4/47-5 with flanged body



Version with flanges



Version with threaded ends

**Dimensions in mm**

Nominal size DN	15	20	25	32 <sup>1)</sup>	40 <sup>1)</sup>	50 <sup>1)</sup>
Pipe Ø d	21.3	26.8	32.7	42	48	60
Width across flats SW	30	36	46	59	65	82
Length L	65	70	75	100	110	130
H <sup>2)</sup>	65			85		
Height H1	46-7	248	265	415		
	47-1	265	285	425		
	47-4	122	140	192		
	47-5	108	125	175		
Height H2	46-7	185	205	-		
	47-5	200	220			
Ø D	116				160	

1) Additional version: Valve with flanged body

2) Version with scaled cap: H + 10 mm

The dimensions and weights of valves with flanged bodies (DN 32, DN 40 and DN 50) are identical to those valves with screwed-on flanges!

**Dimensions in mm and weights in kg · Incl. connections**

Nominal size DN	15	20	25	32	40	50
<b>With welding ends</b>						
L1	210	234	244	268	294	330
Weight, approx. in kg	46-7	2.6	2.7	2.8	4	12
	47-1					12.5
	47-4	2.2	2.3	2.4	3.5	6.2
47-5					6.7	
<b>With threaded ends</b>						
L2	129	144	159	180	196	228
Male thread A	G 1/2	G 3/4	G 1	G 1 1/4	G 1 1/2	G 2
Weight, approx. in kg	46-7	2.6	2.7	2.8	4	12
	47-1					12.5
	47-4	2.2	2.3	2.4	3.5	6.2
47-5					6.7	
<b>With flanges<sup>1), 2)</sup> or with flanged body (DN 32 to 50)</b>						
L3	130	150	160	180	200	230
Weight, approx. in kg	46-7	4.0	4.7	5.3	7.2	16.0
	47-1					17.5
	47-4	3.6	4.3	4.9	6.7	10.2
47-5					11.7	

1) PN 16/25

2) Valves in DN 40 and DN 50 already have flanges mounted

Fig. 6 · Dimensions

Specifications subject to change without notice.

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**T 3131 EN**

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