Series 45 Self-operated Regulators

Differential Pressure Regulators with closing actuator

Type 45-1 · Type 45-2 · Installation in the high-pressure line

Type 45-3 · Type 45-4 · Installation in the low-pressure line

ANSI version

Application

Differential pressure set points (Δp) from **1.5** to **145 psi** (0.1 to 10 bar) · Valves in **NPS ½** to **2** (DN 15 to 50) · Pressure rating **Class 150/250** (PN 16/25) · Suitable for liquids up to **300 °F** (150 °C) as well as nitrogen and air up to **300 °F** (150 °C) [1]

The valve **closes** when the differential pressure rises.

Differential pressure regulators for district heating systems, extended piping systems and industrial applications

The regulators mainly consist of a globe valve and an actuator. They regulate the differential pressure to the adjusted set point.

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Only one control line needs to be installed on mounting the regulator since each regulator has its own permanent connection to the actuator
- Suitable for water and other liquids or gases, provided these do not cause the materials used to corrode
- Single-seated valve with balanced plug
- Particularly suitable for district heating plants according to DIN 4747-1 (AGFW requirements for components of domestic installations)

Versions (Figs. 1 to 3)

Differential pressure regulators with closing actuator · Valves NPS ½ to 2 (DN 15 to 50) made of red brass · Welding ends (special versions with threaded ends or screwed-on flanges) Balanced plug

Regulators for installation in high-pressure lines, e.g. flow pipe

Type 45-1 · Fixed set point of 1.5, 3.0, 4.5, 6.0 or 7.5 psi (0.1, 0,2, 0.3, 0.4 or 0.5 bar)

Type 45-2 · Set point adjustable between 1.5 and 60 psi (0.1 and 4 bar) · With set point indication (NPS ½ to 1¼ only, set point range between 1.5 and 15 psi or 1.5 and 7.5 psi/DN 15 to 32 only, set point range between 0.1 and 1 bar or 0.1 and 0.5 bar)

Regulators for installation in low-pressure lines, e.g. return flow pipe

Type 45-3 (Fig. 1) · Fixed set point of 1.5, 3.0, 4.5, 6.0 or 7.5 psi (0.1, 0,2, 0.3, 0.4 or 0.5 bar) · With internal overload protection (excess pressure limiter) in the actuator

Type 45-4 (Fig. 2) · Set point adjustable between 1.5 and 60 psi (0.1 and 4 bar) · With set point indication (NPS ½ to 1¼ only, set point range 1.5 to 15 psi or 1.5 to 7.5 psi/DN 15 to 32 only, set point range 0.1 to 1 bar or 0.1 to 0.5 bar) · With internal overload protection (excess pressure limiter) in the actuator

[1] Diaphragm and seals made of FPM (FKM) · Class 250 version only

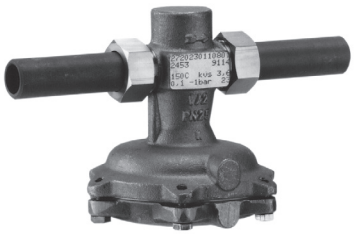


Fig. 1: *Type 45-3 Differential Pressure Regulator*

Fig. 2: *Type 45-4 Differential Pressure Regulator*

Special version

- Special K_{VS} coefficients for NPS ½ (DN 15)
- Internal parts made of FPM (FKM), e.g. for use with mineral oils (Class 250 only), other oils on request
- Combinations with other devices from SAMSON on request

Principle of operation (Fig. 3)

The medium flows through the valve (1) as indicated by the arrow. The position of the valve plug (3) determines the differential pressure Δp over the cross-sectional area released between the plug and seat (2).

The differential pressure to be controlled is transferred to the operating diaphragm (7) where it is transformed into a positioning force.

The valves have a balanced plug to eliminate the forces at the valve plug caused by the differential pressure.

In **Types 45-1 and 45-2**, the pressure in the valve outlet (high pressure) acts on the high-pressure chamber of the operating diaphragm (7) over the attached control line (11). The low pressure (return flow pipe) is transferred to the other side of the operating diaphragm over the external control line (11.1). The regulators are designed for installation in high-pressure lines.

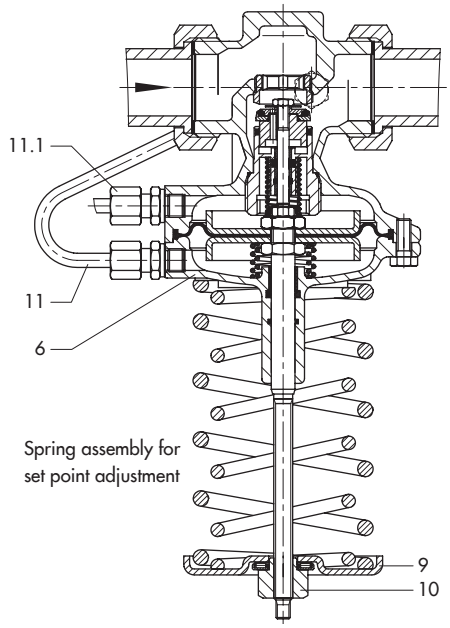
In **Types 45-3 and 45-4**, the pressure in the valve inlet (low pressure) acts on the low-pressure chamber of the operating diaphragm (7) through a hole (12) in the valve body (1). The high pressure (flow pipe) is transferred to the bottom diaphragm chamber over the external control line (11.1).

The regulators are designed for installation in low-pressure lines.

The set point springs (5) installed in the valves of **Type 45-1 and Type 45-3** determine the set point. The set point of Type 45-2 and Type 45-4 is adjustable and can be lead-sealed at the set point adjuster (10). The resulting positioning force in all regulators moves the valve plug depending on the fixed or adjustable set point.

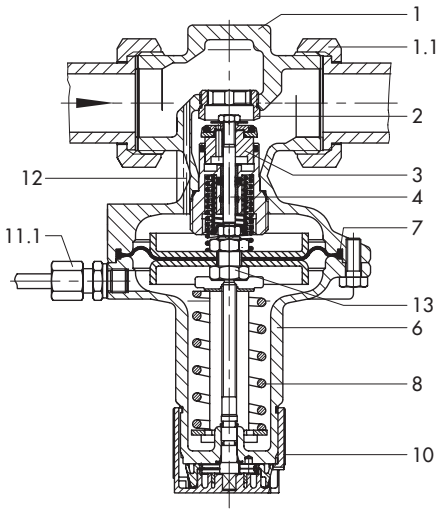
Type 45-3 and Type 45-4 feature an overload protection (excess pressure limiter) (13) in the actuator to protect the seat and plug from overload during exceptional operating conditions that could lead to valve or plant damage.

Regulator for installation in the high-pressure line



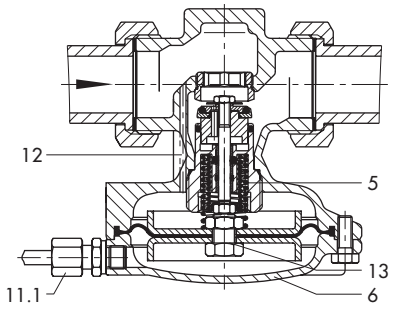
Type 45-2 · Standard version (7.5 to 30 psi/15 to 60 psi · 0.5 to 2 bar/1.0 to 4.0 bar) · NPS 1½ and 2 (DN 40 and 50), all set point ranges

Regulator for installation in the low-pressure line



Type 45-4 · Standard version (NPS ½ to 1¼/1.5 to 7.5 psi and 1.5 to 15 psi (DN 15 to 32/0.1 to 0.5 bar and 0.1 to 1 bar) with set point indication and set point adjuster

1	Valve body	8	Set point spring (adjustable set point)
1.1	Connection nut with seal	9	Spring plate
2	Seat (exchangeable)	10	Set point adjuster
3	Plug (piston plug), balanced	11	Control line for Type 45-1 and Type 45-2
4	Plug stem	11.1	External control line
5	Set point springs (fixed set point)	12	Hole (Type 45-3 and Type 45-4 only)
6	Actuator	13	Internal excess pressure limiter (overload protection) for Types 45-3 and 45-4
7	Operating diaphragm		



Type 45-3 · Standard version

Fig. 3: *Functional diagrams of the differential pressure regulators*

Table 1: *Technical data · All pressures in psi/bar (gauge)*

Valve size	NPS	½	¾	1	1¼	1½	2
	DN	15	20	25	32	40	50
C_V coefficient	C_V	3	7.5	9.4	15	20	23
K_{VS} coefficient	K_{VS}	2.5	6.3	8	12.5	16	20
Special version	C_V	0.5 · 1.2 · 5.0	–				
	K_{VS}	0.4 · 1.0 · 4.0					
x_{FZ} value		0.6		0.55			0.45
Pressure rating	Types 45-2 and 45-4	Class 250					
	Types 45-1 and 45-3	Class 250 and Class 150			Class 250		
Max. permissible differential pressure Δp across the valve	psi	300/150[1]				240	
	bar	20/10[1]				16	
Max. permissible valve temperature		Liquids: 300 °F/265 °F [1] (150 °C/130 °C) · Air and nitrogen: 300 °F [2] (150 °C)					
Pressure above adjusted set point at which internal excess press. limiter responds (Types 45-3 and 45-4)		7.5 psi · 0.5 bar					
Differential pressure set point ranges							
Types 45-1 and 45-3, fixed set point	psi	1.5 · 3.0 · 4.5 · 6.0 or 7.5					
	bar	0.1 · 0.2 · 0.3 · 0.4 or 0.5					
Types 45-2 and 45-4, continuously adjustable set point	psi	1.5 to 15 · 1.5 to 7.5					3 to 15
		7.5 to 30 · 15 to 60					
	bar	0.1 to 1 · 0.1 to 0.5					0.2 to 1
		0.5 to 2 · 1 to 4					

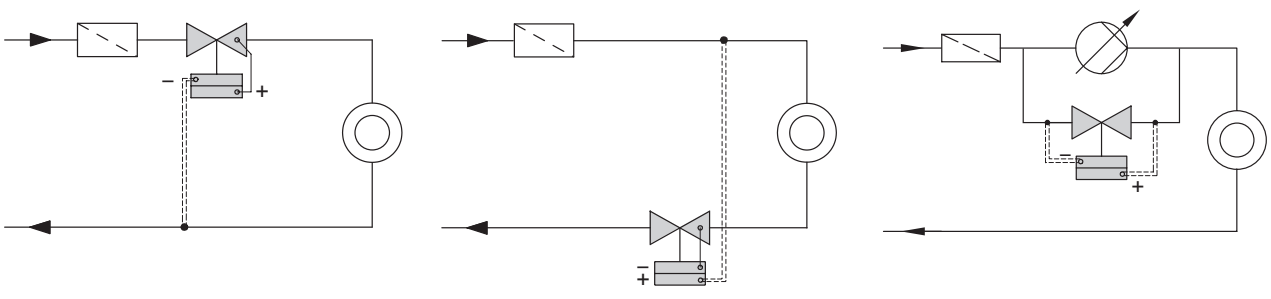
[1] Class 150 version only
[2] Diaphragm and seals made of FPM (FKM) · Class 250 version only

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

Types 45-1, 45-2, 45-3 and 45-4		
Body		Red brass CC491K/CC499K (Rg 5)/C83600
Seat		Stainless steel 1.4305
Plug	Class 250	Brass, resistant to dezincification, with EPDM soft seal [1] [2]
	Class 150	Brass, resistant to dezincification, and plastic with EPDM soft seal
Upper section	Class 250	Red brass CC491K/CC499K (Rg 5)/C83600
	Class 150	DC 01
Valve spring		Stainless steel 1.4310
Operating diaphragm		EPDM with fabric reinforcement
Seals		EPDM [1]

[1] Special version, e.g. for mineral oils: FPM (FKM)
[2] For C_V = 0.5 and 1.2 (K_{VS} = 0.4 and 1): Plug made of 1.4305

Application



Differential pressure control with Types 45-1 and 45-2, installation in high-pressure line

Differential pressure control with Types 45-3 and 45-4, installation in low-pressure line

Special version with two control lines or two external connections for control lines

= = = To be attached on installing the regulator in the pipeline

——— Permanent connection to actuator

Fig. 4: *Schematic drawings showing typical applications*

Table 3: *Dimensions and weights*

Valve size	NPS	½	¾	1	1¼	1½	2
	DN	15	20	25	32	40	50
Pipe Ø d	inch	0.8	1.1	1.3	1.7	1.9	2.4
	mm	21.3	26.8	32.7	42	48	60
Connection R	G	¾	1	1¼	1¾	2	2½
Width across flats SW	inch	1.2	1.4	1.8	2.3	2.6	3.2
	mm	30	36	46	59	65	82
Length L	inch	2.6	2.7	2.9	3.9	4.3	5.1
	mm	65	70	75	100	110	130
H	inch	1.3			1.8		
	mm	32			45		
H1	inch	9.1			9.8	15	
	mm	230			250	380	
H2	inch	6.3			7.1	–	
	mm	160			180	–	
H3	inch	3.4			4.1	5.5	
	mm	85			105	140	
ØD	inch	4.6				6.3	
	mm	116				160	
Standard version with welding ends							
L1 with welding ends	inch	8.3	9.2	9.6	10.6	11.6	13
	mm	210	234	244	268	294	330
Weight, approx. Type 45-2/-4	lb	4.4	4.6	4.9	18.7	19.8	20.9
	kg	2.0	2.1	2.2	8.5	9.0	9.5
Weight, approx. Type 45-1/-3	lb	3.3	3.5	3.9	10.5	11.7	13.2
	kg	1.5	1.6	1.8	4.8	5.3	6.0
Special version with threaded ends							
L2 with threaded ends	inch	5.1	5.7	6.3	7.1	7.7	9
	mm	129	144	159	180	196	228
Thread A	NPT	½	¾	1	1¼	1½	2
Weight, approx. Type 45-2/-4	lb	4.4	4.6	4.9	18.7	19.8	20.9
	kg	2.0	2.1	2.2	8.5	9.0	9.5
Weight, approx. Type 45-1/-3	lb	3.3	3.5	3.9	10.5	11.7	13.2
	kg	1.5	1.6	1.8	4.8	5.3	6.0

Installation

The regulator in NPS ½ to 1 (DN 15 to 25) is suitable for installation in horizontal pipes as well as vertical pipes.

Regulators in NPS 1¼ (DN 32) or larger must 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.
- If possible, install a strainer (e.g. SAMSON Type 1 NI) upstream of the valve.

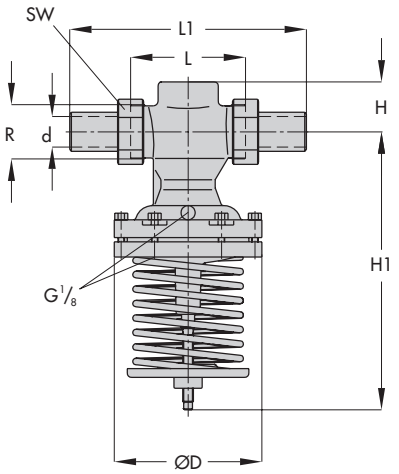
Further details can be found in EB 3124 EN.

Ordering text

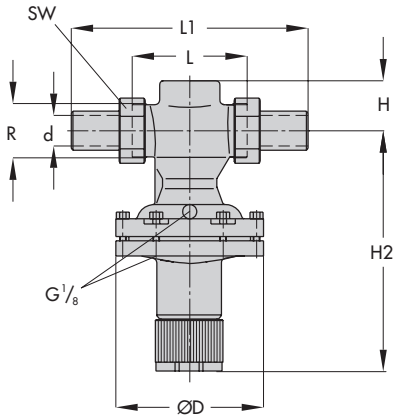
Type 45-1/45-2/45-3/45-4 Differential Pressure Regulator
in ANSI version
NPS ... (DN ...), Class ..., perm. temperature ... °F (°C ...)
C_V (K_{VS}) coefficient ....
With welding ends/threaded ends
Set point/set point range ... psi (bar)
Optionally, special version ...

Specifications subject to change without notice

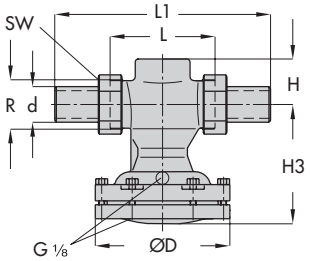
Dimensions



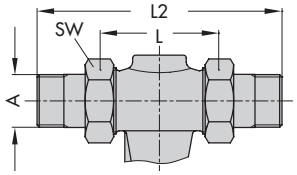
Type 45-2 · With welding ends
Type 45-4 same as Type 45-2, except G 1/8 connection on diaphragm case
NPS ½ to 1¼ (DN 15 to 32), set point range 7.5 to 30 psi (0.5 to 2 bar) and 15 to 60 psi (1 to 4 bar), NPS 1½ and 2 (DN 40 and 50), all set point ranges



Type 45-2 · With welding ends
Type 45-4 same as Type 45-2, except G 1/8 connection on diaphragm case with set point adjuster and set point indication
NPS ½ to 1¼ (DN 15 to 32), set point ranges 1.5 to 7.5 psi (0.1 to 0.5 bar) and 1.5 to 15 psi (0.1 to 1 bar)



Type 45-1 · With welding ends, Class 250
Type 45-3 same as Type 45-1, except G 1/8 connection on diaphragm case



Special version with threaded ends

Fig. 5: *Dimensions*

SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · 60314 Frankfurt am Main · Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
Internet: http://www.samson.de