Self-operated Differential Pressure and Flow Regulators as well as Combined Regulators

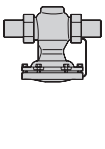
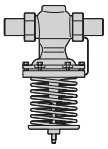
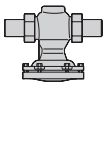
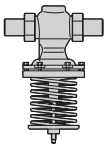
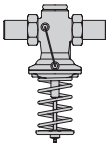
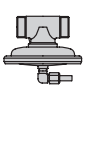
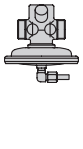
Series 45, 46, 47, 48 and 49

PN 10, PN 16 and PN 25
G 3/8 to G 2
DN 15 to DN 50
Up to 150 °C

Edition April 2006

Information Sheet **T 3120 EN**

Table 1 · Differential Pressure and Flow Regulators

Valve	Usable for	Water and other liquids	•	•	•	•	•	•	•	
		Oil	• [1]	•	• [1]	•	•			
		Air, non-flammable gases	•	•	•	•				
	Nominal size		DN 15 to DN 50					DN 15		
	Nominal pressure		PN 16 [2]/25	PN 25	PN 16 [2]/25	PN 25		PN 10		
	Connection		Welding ends · Optionally with threaded ends or flanges					G ¾ B thread [4]		
	Body material		CC491K (red brass, Rg 5)							
	Perm. temperature in °C	Max.	Liquids up to 130 °C (PN 16) or 150 °C · Non-flamm. gases up to 80 °C					110 °C · 80 °C		
Application	Diff. press. Δp	Control	•	•	•	•	•	•	•	
		Limitation								
	Flow rate V̇	Control								
		Limitation								
	Installation in	Flow pipe	•	•			Short circuit/ bypass	•		
		Return flow pipe			•	•			•	
	Set point	Fixed	•		•			•	•	
		Adjustable		•		•	•			
	Δp in bar	Min.	0.1	0.2 [3]	0.1	0.1 [3]	0.1 [3]	0.15		
		Max.	0.5	4	0.5	4	4	0.3		
			 Type 45-1	 Type 45-2	 Type 45-3	 Type 45-4	 Type 45-6	 Type 45-1N	 Type 45-3N	
For details, see Data Sheet ...			T 3124 EN				T 3126 EN	T 3140 EN		

[1] PN 16 not suitable for oil
[2] For DN 15 to 25 only
[3] For valve sizes DN 32 to DN 50, the initial value of the set point range is 0.2 bar
[4] For connecting threaded ends, welding ends or soldering ends

Table 2 · Combined Regulators for Differential Pressure, Flow and Temperature

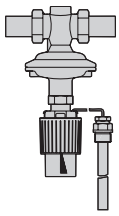
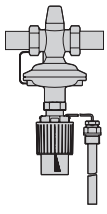
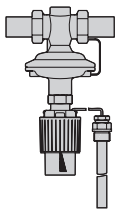
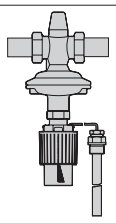
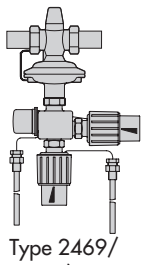
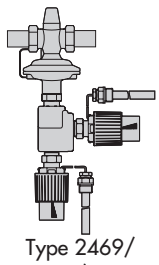
Type		2468/...	2469/...	2478/...	2479/...	2469/...	2469/...
Type 2430 K Control Thermostat		Adjustable set point from 0 to 35 °C · 25 to 70 °C · 75 to 100 °C or 100 to 120 °C					
Safety thermo-stat	Type 2403 K					•	
		Safety temperature monitor (STM) with limit values from 60 to 75 °C · 75 to 100 °C or 100 to 120 °C					
	Type 2439 K						•
		Safety temperature limiter (STL) with limit values from 40 to 95 °C or 70 to 120 °C					
		 Type 2468/2430 K	 Type 2469/2430 K	 Type 2478/2430 K	 Type 2479/2430 K	 Type 2469/2430 K/2403 K	 Type 2469/2430 K/2439 K
See Data Sheet ...		T 3132 EN					

Table continued from previous page

	•	•	•	•	•	•	•	•	•
	• [1]	• [1]	• [1]	• [1]	• [1]	• [1]	• [1]		•
	•	•	•	•	•	•	•	•	•
	DN 15 to 50							DN 15	
	PN 16 [2]/25							PN 10	
	Welding ends · Optionally with threaded ends or flanges							G ¾ B thread [5]	
	CC491K (red brass, Rg 5)								
	Liquids up to 130 °C (PN 16) or 150 °C (PN 25) · Non-flammable gases up to 80 °C							110 °C · 80 °C	
				•	•	•	•		
		•	•						•
	•			•	•	•	•	•	
		•	•						•
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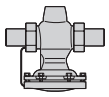
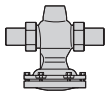
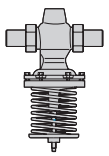
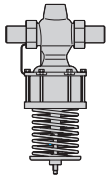
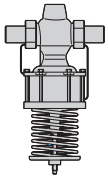
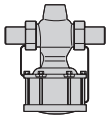
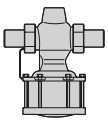
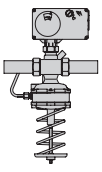
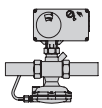
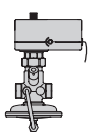
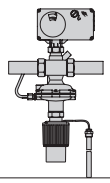
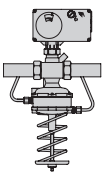
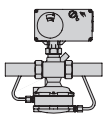
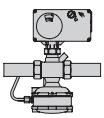
		•				•	•	•	•
	•		•	•	•				
	– [4]	0.2	0.2	0.1 [3]	0.1 [3]	0.2	0.2	– [6]	0.2
	– [4]	0.5	2	2	2	0.5	0.5	–	0.5
									
	Type 45-9	Type 46-5	Type 46-6	Type 46-7	Type 47-1	Type 47-4	Type 47-5	Type 45-9N	Type 46-5N
	T 3128 EN	T 3130 EN		T 3131 EN				T 3138 EN	T 3134 EN

[1] PN 16 not suitable for oil · [2] For DN 15 to 25 only · [3] For sizes DN 32 to DN 50, the initial value of the set point range is 0.2 bar · [4] Flow control of water from 0.01 to 15 m³/h · [5] For connecting threaded ends, welding ends or soldering ends · [6] Flow rate limitation for water from 0.02 to 1 m³/h

Table 3 · Combined Differential Pressure, Flow and Temperature Regulators with additional electric actuator

Regulator	**Type**	**2487/582...**	**2488/582...**	**2488 N/5856**	**2489/582...**	**2491/582...**	**2494/582...**	**2495/582...**
Diff. pressure control Δp		•				•	•	•
Flow control $\dot{V}$		•	•	•	•	•	•	•
Temperature control					•			
Installation in	Flow pipe		•	•	•	•	•	
	Return pipe	•	•	•	•			•
Set point	Fixed						•	•
Δp	Adjustable	•	•		•	•		
	bar Min.	0.1				0.1	0.2	0.2
	bar Max.	2.0				2.0	0.5	0.5
$\dot{V}$	Adjustable	•	•	•	•	•	•	•
Type 2430 K Control Therm.					•			
Type 5824 Electric Actuator		•	•	Type 5857 Electric Actuator	•	•	•	•
Type 5825 Electric Actuator with fail-safe action		•	•		•	•	•	•
								
See Data Sheet ...		T 3135 EN		T 3136 EN	T 3135 EN			

Design and principle of operation

The Series 45, 46, 47, 48 and 49 Regulators are proportional regulators operated by the medium. Each deviation from the adjusted set point is assigned to a certain valve plug position.

The differential pressure Δp to be controlled produces a force F_m at the diaphragm surface of the actuator. This force, which is proportional to the controlled variable, is compared with the spring force F_S at the plug stem. The spring force corresponds with the set point. It can be either adjusted at the set point adjuster or it is fixed. If the differential pressure Δp and the force F_m change, the plug stem is moved until $F_m = F_S$.

The flow rate is controlled according to the differential pressure method.

The control accuracy and stability of the control loop depend on the disturbances occurring. The regulators are designed to keep the effect of these disturbances relatively small. This is also achieved by pressure-balancing the plug to eliminate the forces created by the upstream pressure or the differential pressure, which would act on the plug.

The regulators can be designed to function as

- Differential pressure regulators
- Flow regulators
- Differential pressure and flow regulators
- Differential pressure regulators and flow limiters
- Differential pressure, flow and temperature regulators
- Combined differential pressure and flow regulators with additional electric actuators

Fig. 1.1

Differential pressure regulator with a closing actuator which closes the valve when the adjusted differential pressure set point is exceeded. The top of the diagram shows a closing actuator with an adjustable set point and at the bottom, an actuator with a fixed set point, whose integral set point spring determines the set point.

Fig. 1.2

Differential pressure regulator with an opening actuator which opens the valve as the differential pressure rises. When the differential pressure $\Delta p = 0$, the valve is closed.

Fig. 1.3

Differential pressure regulator controlling the flow rate according to the differential pressure method. The differential pressure $\Delta p_{restriction}$ created at the restriction (orifice) is transferred to the diaphragm surface of the actuator. The difference in force between the force acting on the diaphragm and the force of the positioning spring causes the plug to move. There is the following correlation between the flow rate $\dot{V}$, the differential pressure $\Delta p_{restriction}$ created at the restriction and the force F_m acting on the diaphragm:

$$\dot{V} = K \times \sqrt{\Delta p_{restriction}} \mathrel{\hat{=}} K \times \sqrt{F_m} \quad \text{or} \quad \dot{V}^2 = K' \times \Delta p \mathrel{\hat{=}} K' \times F_m$$

$$\Delta p_{restriction} = \frac{F_m}{A}$$

$\dot{V}$ = Flow rate

F_m = Force acting on the diaphragm surface

$\Delta p_{restriction}$ = Differential pressure created at the restriction to measure the flow rate

K, K′ = Constants

A = Diaphragm area

Fig. 1.4

These flow regulators have a restriction at which the set point can be adjusted. They are especially suitable for district heating systems.

Fig. 1.5

Differential pressure regulators with flow limitation have a restriction for adjusting the set point for the maximum flow rate. The set point is adjusted to a flow rate that should not be exceeded.

The pressure downstream of the restriction (not the low pressure of the plant) and the high pressure of the plant act on the diaphragm. On sizing the plant, it is therefore important to take into consideration that the plant differential pressure is a sum of the pressure drop across the restriction and the pressure drop across the fully opened plant:

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

$\Delta p_{set\ point}$ = Differential pressure set point

Δp_{plant} = Pressure drop across the fully opened plant

$\Delta p_{restriction}$ = Differential pressure created at the restriction to measure the flow rate

Differential pressure regulators with flow limitation are especially suitable for use in the primary circuit of an indirectly connected district heating supply network.

Fig. 1.6

Differential pressure and flow regulators are equipped with two diaphragms. The flow rate is controlled by the top diaphragm and the differential pressure by the bottom diaphragm. The largest signal is always used to actuate the valve.

Depending on the application, the regulators are equipped with the necessary control lines.

The top of the diagram shows a closing actuator with an adjustable set point and at the bottom, an actuator with a fixed set point.

Fig. 1.7

In differential pressure and temperature regulators, the largest signal is used to move the plug.

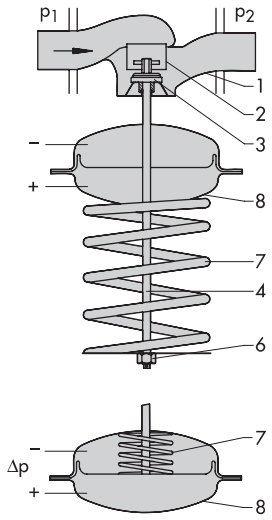


Fig. 1.1
Differential pressure regulator with closing actuator and adjustable set point (top)/fixed set point (bottom)

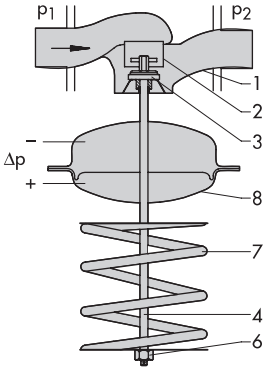


Fig. 1.2
Differential pressure regulator with opening actuator and adjustable set point

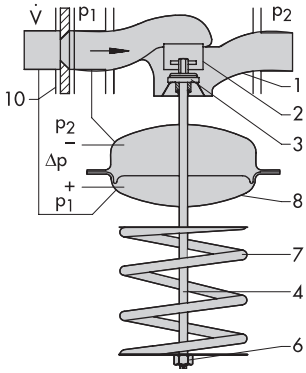


Fig. 1.3
Flow control with differential pressure regulator

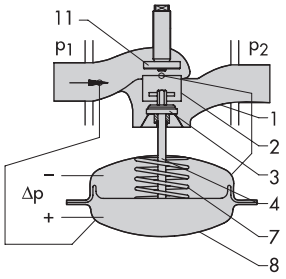


Fig. 1.4
Flow regulator

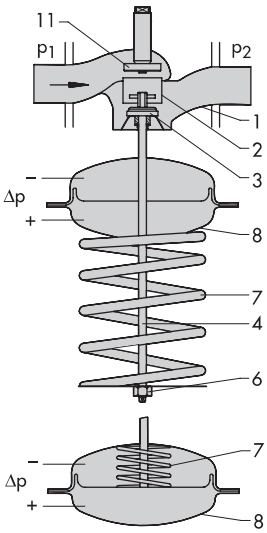


Fig. 1.5
Differential pressure regulator with flow limitation

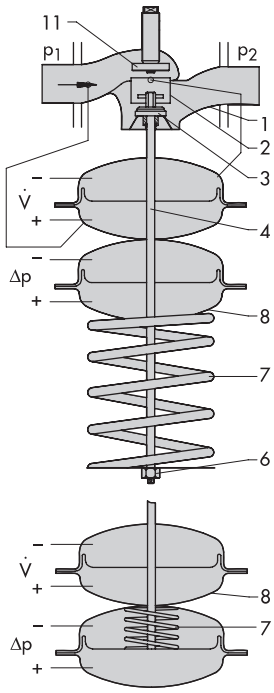


Fig. 1.6
Differential pressure and flow regulator with adjustable set point (top)/ fixed set point (bottom)

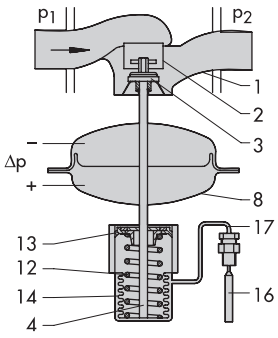


Fig. 1.7
Differential pressure and temperature regulator

1	Valve body
2	Seat
3	Plug
4	Plug stem
6	Set point adjuster
7	Set point spring
8	Actuator
10	Orifice plate
11	Adjustable restriction
12	Spring
13	Set point adjuster
14	Positioning bellows
15	Control thermostat
16	Temperature sensor
17	Capillary tube

Fig. 1 · Schematic diagrams of regulators

Differential pressure and flow regulators - Principle of operation -

A self-operated differential pressure and flow regulator consists of a valve and an actuator which closes or opens the valve as the differential pressure/flow rate increases.

The medium flows through the valve in the direction indicated by the arrow. The differential pressure/flow rate varies with the change in size of the free area released by the valve plug.

The Type 45-4 is used to illustrate how differential pressure control works and Type 45-9 serves to demonstrate the principle of flow control.

Type 45-4 Differential Pressure Regulator

The differential pressure regulator is designed to maintain the differential pressure between the high pressure pipe and the low pressure pipe at the adjusted set point. It is intended to be installed in the low pressure pipe (return flow pipe) of the plant.

The valve closes as the differential pressure increases.

The pressure upstream of the valve (low pressure) is transmitted to the low pressure side of the diaphragm over the internal hole (12). The high pressure from the flow pipe is transmitted to the high pressure side of the actuator diaphragm via an external control line (11).

The differential pressure generates a positioning force at the operating diaphragm, which is used to position the plug (3) according to the spring rate of the set point springs (8) and the set point adjusted at the set point adjuster (10).

Type 45-9 Flow Regulator

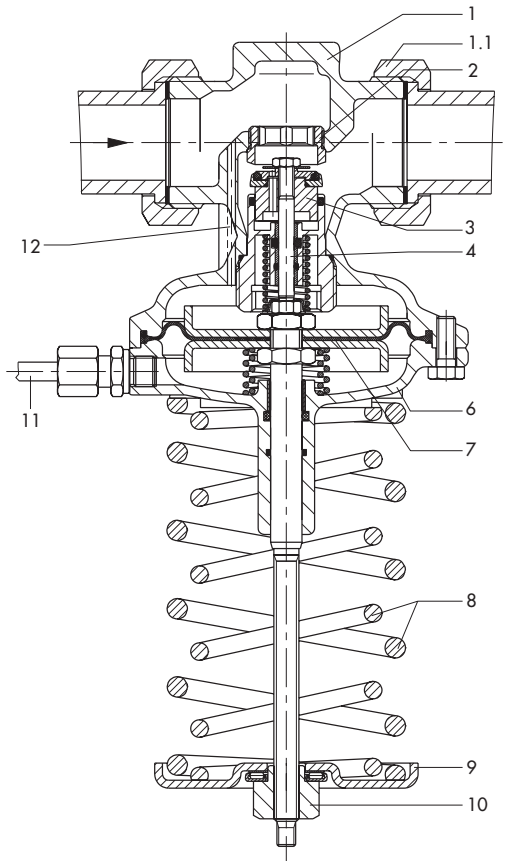
The flow rate is determined according to the differential pressure method.

The flow rate varies with the change in size of the free area between the restriction (1.2) and the plug (3). The high pressure upstream of the restriction is transmitted to the high pressure side of the actuator through the control line (11). The low pressure downstream of the restriction acts on the low pressure side of the operating diaphragm through a bore in the valve plug.

If the pressure difference applied across the operating diaphragm (7) exceeds the differential pressure set point of the positioning spring (5), the flow rate increases and the diaphragm connected to the plug stem (4) and the plug (3) moves. The free area is reduced until the pressure drop created across the restriction is equal to the predetermined differential pressure.

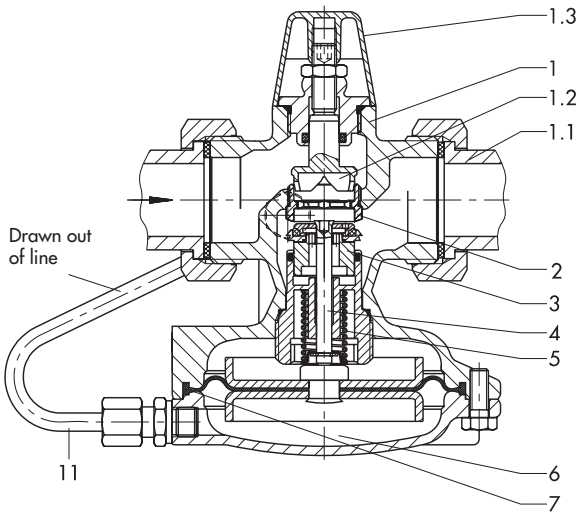
1 Valve (body)
1.1 Connection nut with seal and welding end
1.2 Restriction for adjustment of the flow set point
1.3 Cover cap for the set point adjuster (restriction)
2 Seat
3 Plug
4 Plug stem
5 Set point spring
6 Actuator
7 Operating diaphragm with diaphragm plate
8 Set point springs (spring assembly)
9 Spring plate
10 Set point adjuster
11 Control line
12 Internal hole for high pressure

Differential pressure control



Type 45-4
Differential pressure regulator with closing actuator

Flow control



Type 45-9
Flow regulator with restriction for adjusting the flow rate

Fig. 2 · Sectional drawings

Series 45, 46 and 47 Self-operated Regulators

Differential pressure and flow regulators

Self-operated differential pressure and flow regulators use the energy provided by the medium to perform control tasks. The difference between the set point and the actual value (set point ≠ actual value) produces a force which causes the plug to move.

The regulators are suitable for industrial, public and domestic installations, especially for district heating systems. They comply with the special requirements of AGFW (German District Heating Association).

- Low-maintenance, self-operated proportional regulators
- Body made of red brass
- Suitable for water and other liquids or gases, provided that they do not cause corrosion
- Single-seated valve with balanced plug
- Special version for oil
- End connections with flat gaskets and welding ends, optionally with threaded ends or flanges

Series 45 Self-operated Regulators

Differential pressure regulators

Type 45-1 · Type 45-2 · For installation in flow pipes
Type 45-3 · Type 45-4 · For installation in return flow pipes

- Differential pressure regulator with closing actuator
- Only one control line is required on mounting on site

Technical data	**Data Sheet T 3124 EN**
Nominal size	DN 15 to 50 [1]
Nominal pressure	PN 16/25
Set point ranges	
Type 45-1, 45-3	0.1 · 0.2 · 0.3 · 0.4 · 0.5 bar fixed
Type 45-2, 45-4	Adjustable between 0.1 and 4 bar
Temperature ranges	
Liquids	Up to 150 °C
Gases	Up to 80 °C

[1] DN 32 to DN 50: Additional version, flanged valve body made of spheroidal graphite iron (EN-JS 1049)

Type 45-6 · For installation in short-circuit or bypass pipes

- Differential pressure regulator with opening actuator
- Does not require any control line on mounting on site
- Diaphragm is replaceable

Technical data	**Data Sheet T 3226 EN**
Nominal size	DN 15 to 50 [1]
Nominal pressure	PN 25
Set point range	Adjustable between 0.1 to 4 bar
Temperature ranges	
Liquids	Up to 150 °C
Gases	Up to 80 °C

[1] DN 32 to DN 50: Additional version, flanged valve body made of spheroidal graphite iron (EN-JS 1049)

Flow regulator

Type 45-9 · For installation in flow or return flow pipes

- Flow regulator with closing actuator
- Does not require any control line on mounting on site
- Diaphragm replaceable

Technical data	**Data Sheet T 3128 EN**
Nominal size	DN 15 to 50 [1]
Nominal pressure	PN 16/25
Flow set point range with an upper differential range value 0.2/0.3 bar	0.01 to 15 m^3/h
Temperature ranges	
Liquids	Up to 150 °C
Air and non-flammable gases	Up to 80 °C

[1] DN 32 to DN 50: Additional version, flanged valve body made of spheroidal graphite iron (EN-JS 1049)

Type 45-3 Differential Pressure Regulator with closing actuator

Type 45-6 Differential Pressure Regulator with opening actuator

Type 45-9 Flow Regulator with closing actuator

Fig. 3 · Series 45 Regulators

Series N

The regulators are especially suitable for local heat supply and large heating networks.

- Low-maintenance, self-operated proportional regulators
- Body made of red brass
- G ¾ B connecting thread on both sides
- Single-seated valve with soft-sealed unbalanced plug
- Suitable for treated water and non-flammable gases

Differential pressure regulators

Type 45-1 N · For installation in flow pipes
Type 45-3 N · For installation in return flow pipes

- Differential pressure regulator with closing actuator
- Fixed set point

Technical data	Data Sheet T 3140 EN
Nominal size	DN 15
Nominal pressure	PN 10
Set point range	0.15 or 0.3 bar fixed
Temperature ranges for	
Treated water	Up to 110 °C
Non-flammable gases	Up to 80 °C

Flow regulator

Type 45-9 N · For installation in flow or return flow pipes

- Flow regulator with closing actuator
- Further set point range can be adjusted according to a diagram
- No external control line required

Technical data	Data Sheet T 3138 EN
Nominal size	DN 15
Nominal pressure	PN 10
Set point range for water	
With differential pressure at the restriction of 0.2 bar	0.05 to 1 m^3/h
Special version	0.02 to 0.5 m^3/h
Temperature range for	
Treated water	Up to 110 °C
Non-flammable gases	Up to 80 °C

Differential pressure and flow limiter

Type 46-5 N · For installation in return flow pipes

- Differential pressure and flow limiter with closing actuator

Technical data	Data Sheet T 3134 EN
Nominal size	DN 15
Nominal pressure	PN 10
Flow set point range for water	
With differential pressure at the restriction of 0.2 bar	0.1 to 1 m^3/h
Special version	0.12 to 0.5 m^3/h
Differential pressure set point, optionally	0.2, 0.3 or 0.5 bar
Temperature ranges for	
Treated water	Up to 110 °C
Non-flammable gases	Up to 80 °C

Type 45-1 N Differential Pressure Regulator

Type 45-3 N Differential Pressure Regulator

Type 45-9 N Flow Regulator

Type 46-5 N Differential Pressure and Flow Limiter

Fig. 4 · Series 45 N/46-5 N Regulators

Series 46 and 47 Self-operated Regulators

Flow and differential pressure regulators or pressure regulators

Type 46-7 · For installation in return flow pipes
Type 47-1 · For installation in flow pipes

- Closing actuator with two diaphragms for flow and differential pressure control
- Differential pressure set point adjustable

Type 47-5 · For installation in return flow pipes
Type 47-4 · For installation in flow pipes

- Closing actuator with two diaphragms for flow and differential pressure or pressure control
- Differential pressure set point fixed

Technical data	**Data Sheet T 3131 EN**
Nominal size	DN 15 to 50 [1]
Nominal pressure	PN 16/25
Differential pressure set point ranges	
Type 46-7, 47-1	0.1 to 2 bar adjustable
Type 47-4, 47-5	0.2 · 0.3 · 0.4 · 0.5 bar fixed
Flow set point range	
At upper diff. pressure range value of 0.2 bar	0.01 to 15 m^3/h
Temperature ranges for	
Liquids	Up to 150 °C
Air, non-flammable gases	Up to 80 °C

[1] DN 32 to DN 50: Additional version, flanged valve body made of spheroidal graphite iron (EN-JS 1049)

Differential pressure regulator with flow limitation

Type 46-5 · Type 46-6 · For installation in return flow pipes

- Differential pressure and flow limiter with closing actuator
- Restriction for adjusting the flow limitation

Technical data	**Data Sheet T 3130 EN**
Nominal size	DN 15 to 50 [1]
Nominal pressure	PN 16/25
Differential pressure set point ranges	
Type 46-6	0.1 to 2 bar adjustable
Type 46-5	0.2 · 0.3 · 0.4 · 0.5 bar fixed
Flow set point range	
At upper diff. pressure range value of 0.2 bar	0.01 to 15 m^3/h
Temperature ranges for	
Liquids	Up to 150 °C
Air, non-flammable gases	Up to 80 °C

[1] DN 32 to DN 50: Additional version, flanged valve body made of spheroidal graphite iron (EN-JS 1049)

Type 46-7 Flow and Differential Pressure or Pressure Regulator

Type 46-5 Differential Pressure Regulator with flow limitation

Type 46-6 Differential Pressure Regulator with flow limitation

Type 47-1 Flow and Differential Pressure Regulator with manual adjuster (DN 15 to DN 32)

Fig. 5 · Series 46 and 47 Regulators

Differential pressure, flow and temperature regulators

These regulators consist of:

– A valve
– An actuator and
– A control thermostat with a set point adjuster, a capillary tube and a temperature sensor

In versions with a double adapter, the valve is locked as soon as the temperature reaches the limit value adjusted at the second control thermostat.

In versions with a safety temperature monitor (STM) and a safety temperature limiter (STL), the safety thermostat closes the valve when a fault occurs or when the temperature exceeds the limit value. In addition, the safety temperature limiter (STL) locks the valve.

Differential pressure and temperature regulators

Type 2468/2430 K · For installation in return flow pipes

Type 2478/2430 K · For installation in flow pipes

- Differential pressure and temperature regulator with a Type 2430 K Control Thermostat for adjusting the temperature set point
- Differential pressure set point fixed

Flow and temperature regulator

Type 2469/2430 K · For installation in flow or return flow pipes

- Flow and temperature regulator with a Type 2430 K Control Thermostat for adjusting the temperature set point
- Flow set point is continuously adjustable at the integrated restriction

Differential pressure and temperature regulator with flow limitation

Type 2479/2430 K · For installation return flow pipes

- Differential pressure regulator with flow limitation and temperature regulator with a Type 2430 K Control Thermostat for adjusting the temperature set point
- Differential pressure set point fixed
- Flow limitation is continuously adjustable

Flow and temperature regulator and safety temperature limiter

Type 2469/2430 K/2439 K · For installation in flow or return pipes

- Flow and temperature regulator with a Type 2430 K Control Thermostat for adjusting the temperature set point
- Differential pressure set point fixed
- Flow limitation continuously adjustable
- Type 2439 K Safety Thermostat closes and locks the valve when the adjusted limit value is reached

Flow and temperature regulator and safety temperature monitor

Type 2469/2430 K/2403 K · For installation in flow or return flow pipes

- Flow and temperature regulator with a Type 2430 K Control Thermostat for adjusting the temperature set point
- Differential pressure set point fixed
- Flow limitation continuously adjustable
- Type 2403 K Safety Thermostat closes the valve when the adjusted limit value is reached

Technical data	**Data Sheet T 3132 EN**
Nominal size	DN 15 to 50
Nominal pressure	PN 25
Differential pressure set point ranges	
Type 2468/...	0.1 or 0.2 bar fixed
Type 2479/...	0.2 bar fixed
Flow set point range	
Upper diff. press. range value of 0.2 bar	
Type 2469/...	0.01 to 15 m^3/h
Temperature ranges	
Liquids	Up to 150 °C
Air, non-flammable gases	Up to 80 °C

Type 2478/2430 K Differential Pressure and Temperature Regulator

Type 2469/2430 K Flow and Temperature Regulator

Fig. 6 · Combined differential pressure, flow and temperature regulators - Series 46 and 47 -

Combined regulators for differential pressure, flow and temperature with additional electrical actuator

These regulators consist of

– A valve
– A diaphragm actuator and
– An additional electric actuator.

The regulators are equipped with either a Type 5825 Electric Actuator with fail-safe action or a Type 5824 Electric Actuator or a Type 5856 Electric Actuator both without fail-safe action. The Type 2489/582... Version is additionally equipped with a Type 2430 K Control Thermostat with a set point adjuster, a capillary tube and a temperature sensor.
The largest signal is always used to actuate the valve.

Differential pressure and flow regulator

Type 2487/582... · For installation in return flow pipes

- Differential pressure and flow set points adjustable
- Type 5824 or Type 5825 Electric Actuator
- Type 46-7 in basic version

Flow regulator

Type 2488/582... · For installation in flow or return flow pipes

- Flow set point adjustable
- Type 5824 or Type 5825 Electric Actuator
- Type 45-9 in basic version

Flow regulator

Type 2488 N/5857 · For installation in flow or return flow pipes

- Flow set point is adjustable
- Type 5857 Electric Actuator
- Type 45-9 N in basic version

Flow regulator with control thermostat

Type 2489/582.../2430 K · For installation in flow or return flow pipes

- Flow set point is adjustable
- Temperature control with Type 2430 K Control Thermostat
- Type 5824 or Type 5825 Electric Actuator
- Type 2469/2430 K in basic version

Flow and differential pressure or pressure regulator

Type 2491/582... · For installation in flow pipes

- Flow and differential pressure set points adjustable
- Type 5824 or Type 5825 Electric Actuator
- Type 47-1 in basic version

Flow and differential pressure or pressure regulator

Type 2494/582... · For installation in flow pipes
Type 2495/582... · For installation in return flow pipes

- Flow set point adjustable
- Differential pressure or pressure set points fixed
- Type 5824 or Type 5825 Electric Actuator
- Type 47-4 or Type 47-5 in basic version

Typetested control equipment available according to DIN 32730

Technical data	**Data Sheet T 3135 EN**
Nominal size	DN 15 to 50 [1]
Nominal pressure	PN 16/25
Differential pressure set point ranges	
Type 2494/95/...	0.2 · 0.3 · 0.4 · 0.5 bar fixed
Type 2487/91/...	0.1 to 2 bar adjustable
Flow set point range	
At upper differential pressure range value of 0.2 bar	0.01 to 15 m³/h
Temperature set point range	0 to 150 °C
Temperature range	
Liquids	Up to 150 °C [1]

[1] Type 2488 N; liquids: up to 110 °C · Non-flammable gases: up to 80 °C

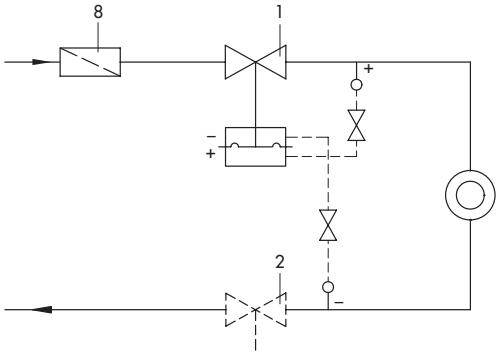
Electric actuators	**Type 5825**	**Type 5824 · Type 5856**
Fail-safe action	With	Without
Electrical connection	230 V, 50 Hz	
Perm. ambient temperature	0 to 50 °C	

Type 2488 N/5857 Flow Regulator with additional electric actuator

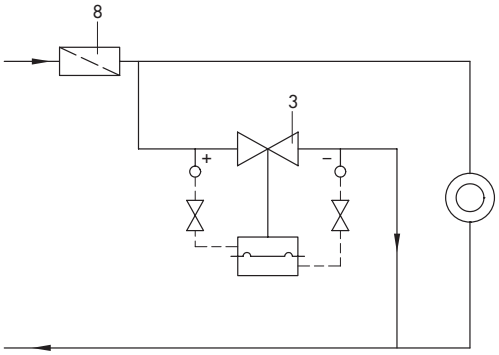
Type 2488/5824 Flow Regulator with additional electric actuator

Type 2495/5825 Flow and Differential Pressure or Pressure Regulator with additional electric actuator

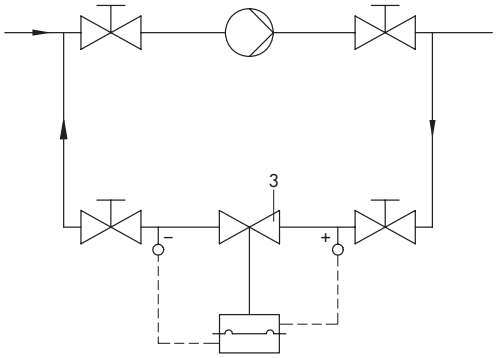
Fig. 7 · Combined Series 48 and 49 regulators with additional electric actuators



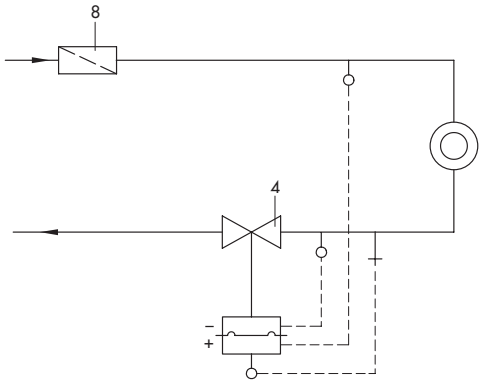
Differential pressure control in the flow or return flow pipe for a cooling system



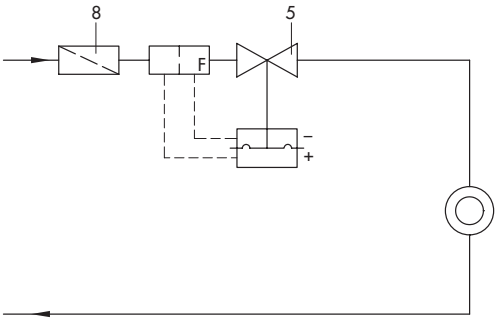
Differential pressure control in the bypass pipe of a heating or cooling system (not for district heating)



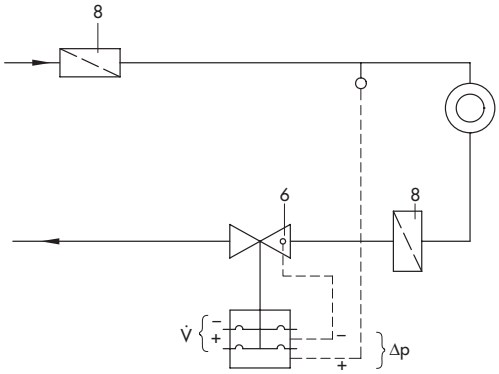
Differential pressure control in the bypass pipe of a rotary pump



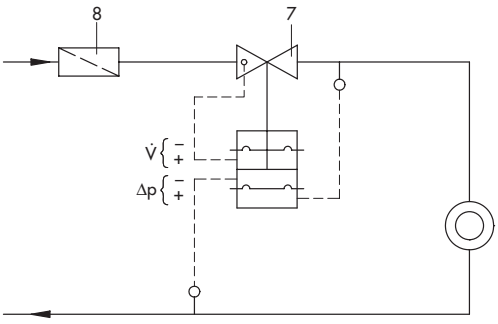
Differential pressure and temperature control



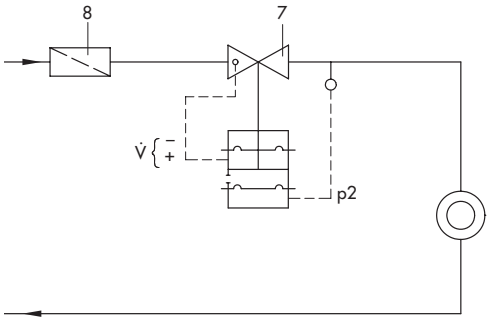
Flow control with external orifice



Combined flow and differential pressure control in the return pipe for a heating or cooling system



Combined flow and differential pressure control in the flow pipe of a heating or cooling system



Combined flow and pressure control

1 Type 45-1/-2
2 Type 45-3/-4
3 Type 45-6
4 Type 2468/2430 K
5 Type 45-1/-2
6 Type 46-7/47-5
7 Type 47-1/-4
8 SAMSON strainer

Fig. 8 · Typical applications

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