

# Combined Regulators

## Type 2488/... Pressure-independent Control Valve

## Type 2489/... Pressure-independent Control Valve with an additional thermostat connection



### Application

Pressure-independent control valves (PICV), e.g. for controlling the flow rate and temperature in district heating supply plants and extended heating/cooling networks. Combined with an electric actuator used to transmit the control signal of an electric control device as well as optional connection of a thermostat.



Valve sizes **DN 15 to 50** · Nominal pressure **PN 16/25**  
Suitable for liquids up to **150 °C**

The **Type 2488/2489** Regulators close when the flow rate rises or when the output signal issued by the electric control device increases.

These combined regulators consist of a valve, a diaphragm actuator and an adjustable orifice (with an electric actuator connected to it). A maximum flow rate can also be adjusted mechanically at the orifice.

The **Type 2489** Regulator additionally has a connection to attach a thermostat.

### Special features

- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy
- Compact design
- Single-seated valve with a balanced valve plug provides high accuracy of the adjusted maximum flow rate
- Control quality independent of the network differential pressure, for example for temperature control with weather-compensated control equipment
- Suitable for water and other liquids, provided these do not cause the materials used to corrode
- The additional attachment of a thermostat in Type 2489 allows emergency operation to continue controlling the temperature even if the electric control device fails

### Versions (Fig. 1 and Fig. 2)

Valve body made of red brass with screwed ends DN 15 to 50  
DN 32 to 50 also available with flanged body made of spheroidal graphite iron

### Type 2488 Flow Regulator

Versions with Type 5825 Electric Actuator tested according to DIN EN 14597 are available for temperature control and safeguarding purposes.

Version **not** tested according to DIN EN 14597 are available with Type 5824 and Type 5857 Actuators for valves up to DN 25. For valves in sizes DN 32 and larger, the Type 5824 Actuator must be used.



**Fig. 1:** Type 2488/5824 Pressure-independent Control Valve (DN 15 to 25)

Valves up to DN 25 can also be used together with a TROVIS 5757 or TROVIS 5757-7 Electric Actuator with Process Controller.

Valves in sizes DN 32 and larger can also be used together with TROVIS 5724 Electric Actuator with Process Controller.

Versions tested with electric actuator with process controller according to DIN EN 14597 can only be combined with a TROVIS 5725 for all nominal sizes.

### Type 2489 Flow Regulator

By additionally attaching a Type 2430 K Thermostat, for example, the temperature being controlled can be kept at a higher temperature than in normal operation in case the electric control device fails. In place of Type 2430 K, a Type 2403 can be connected as a safety temperature monitor to safeguard the controlled temperature.

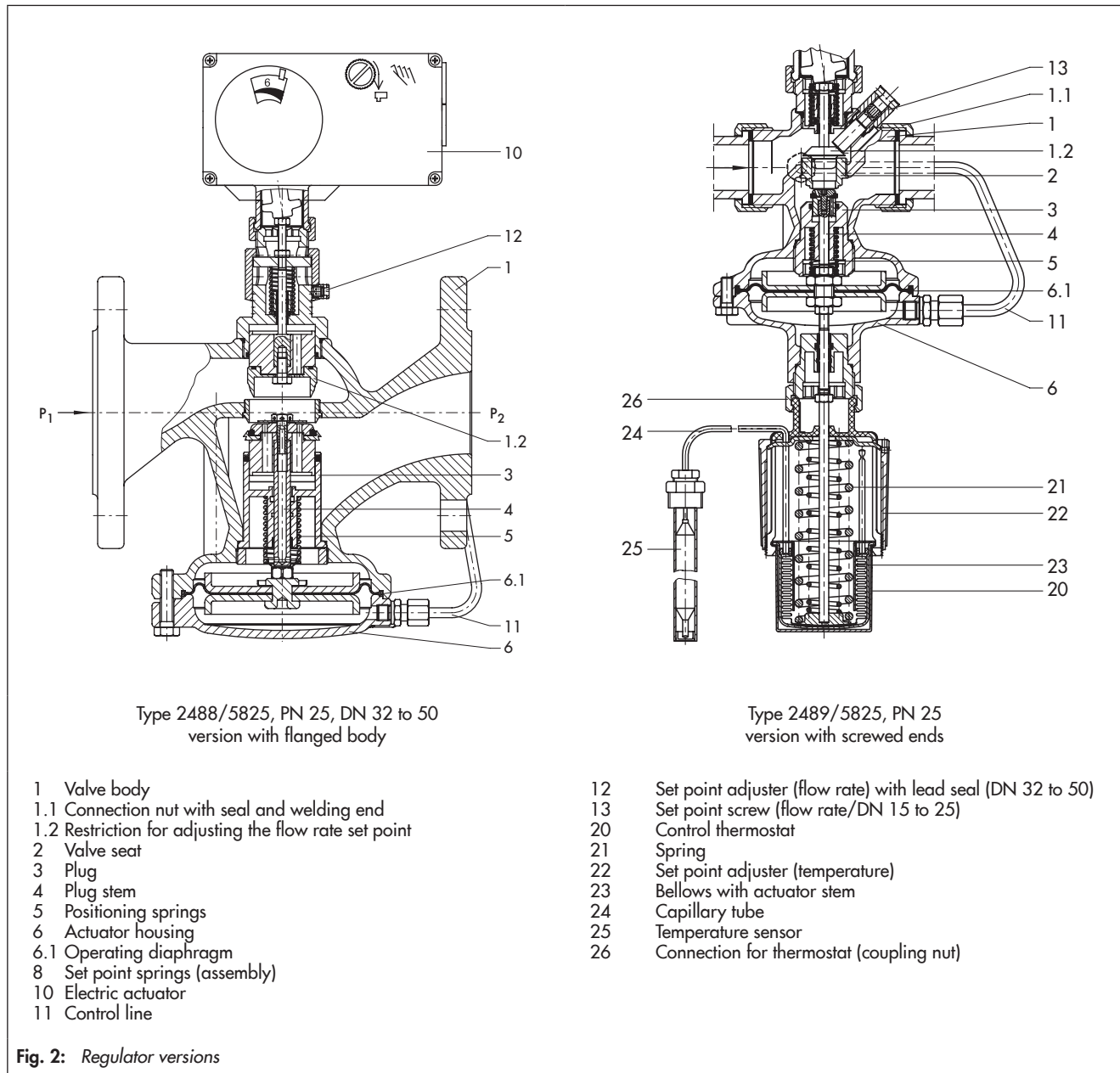
## Principle of operation

The medium flows through the valve of the combined Type 2488 (2489)/... Regulator in the direction indicated by the arrow on the body. The areas released by the orifice (1.2) and the valve plug (3) determine the flow rate.

A differential pressure  $\Delta p_{\text{restriction}}$  is created at the restriction (orifice) by the medium flow. This differential pressure is transmitted over the control line (11) and the hole in the valve plug to the operating diaphragm (6.1) where it is converted into a positioning force. The diaphragm actuator controls the  $\Delta p_{\text{restriction}}$  at the restriction (orifice) as well as the flow rate determined by the restriction setting by ensuring that the forces between the plug spring force and the actuator force remain in equilibrium. The maximum flow rate is adjusted at the set point adjuster (12), which adjusts the maximum orifice opening. If a slower flow rate is needed in the plant than the maximum flow rate adjusted, the electric actuator positions the orifice accordingly.

As the differential pressure across the orifice (restriction) has to be kept constant even when the network pressure drop changes, the valve (based on the electrically operated orifice) has a valve authority of 1. As a result, for example, the control quality of weather-compensated temperature control equipment is not affected by the pressure drop across the network.

In contrast to Type 2488, Type 2489 Regulators have an additional connection for a thermostat. The temperature of the controlled medium creates a pressure in the sensor (25) which is proportional to the measured temperature. This pressure is transmitted over a capillary tube (24) to the bellows (23) of the control thermostat (20) where it is converted into a positioning force. This force acts on the valve plug over the actuator stem of the control thermostat (20) and affects the valve position and flow rate with it.



## Installation

- Install a SAMSON strainer (e.g. Type 1 N or 2 N) upstream of the regulator.  
DN 15 to 25: 0.5 mm mesh size  
DN 32 to 50: 0.75 mm mesh size
- The regulators in DN 32 to 50 are only suitable for installation in horizontal pipelines. Regulators in sizes DN 15 to 25 may also be installed in vertical pipelines.
- When installed in horizontal pipes, the electric actuator must always be located above the valve body.
- Make sure the direction of flow corresponds to the arrow on the valve body.
- Install the regulator preferably in the return flow pipe of the plant.
- Prior to assembling the actuator and valve: retract the actuator stem.
- When the valve is insulated, use an intermediate insulating piece. The insulating limit is in this case approx. 25 mm above the top of the valve body. Do not insulate the actuator and the coupling nut as well.
- Observe the maximum permissible ambient temperature range.

Refer to ► EB 3135-1 EN for more details.

## Version with control thermostat

- The temperature sensor may be installed in any position. Its entire length must be immersed in the medium.
- It must be installed in a location where overheating or considerable idling times cannot occur.
- The capillary tube must be run in such a way that the ambient temperature range cannot be exceeded, any deviations in temperature cannot occur and that the tube cannot be damaged. The smallest permissible bending radius is 50 mm.

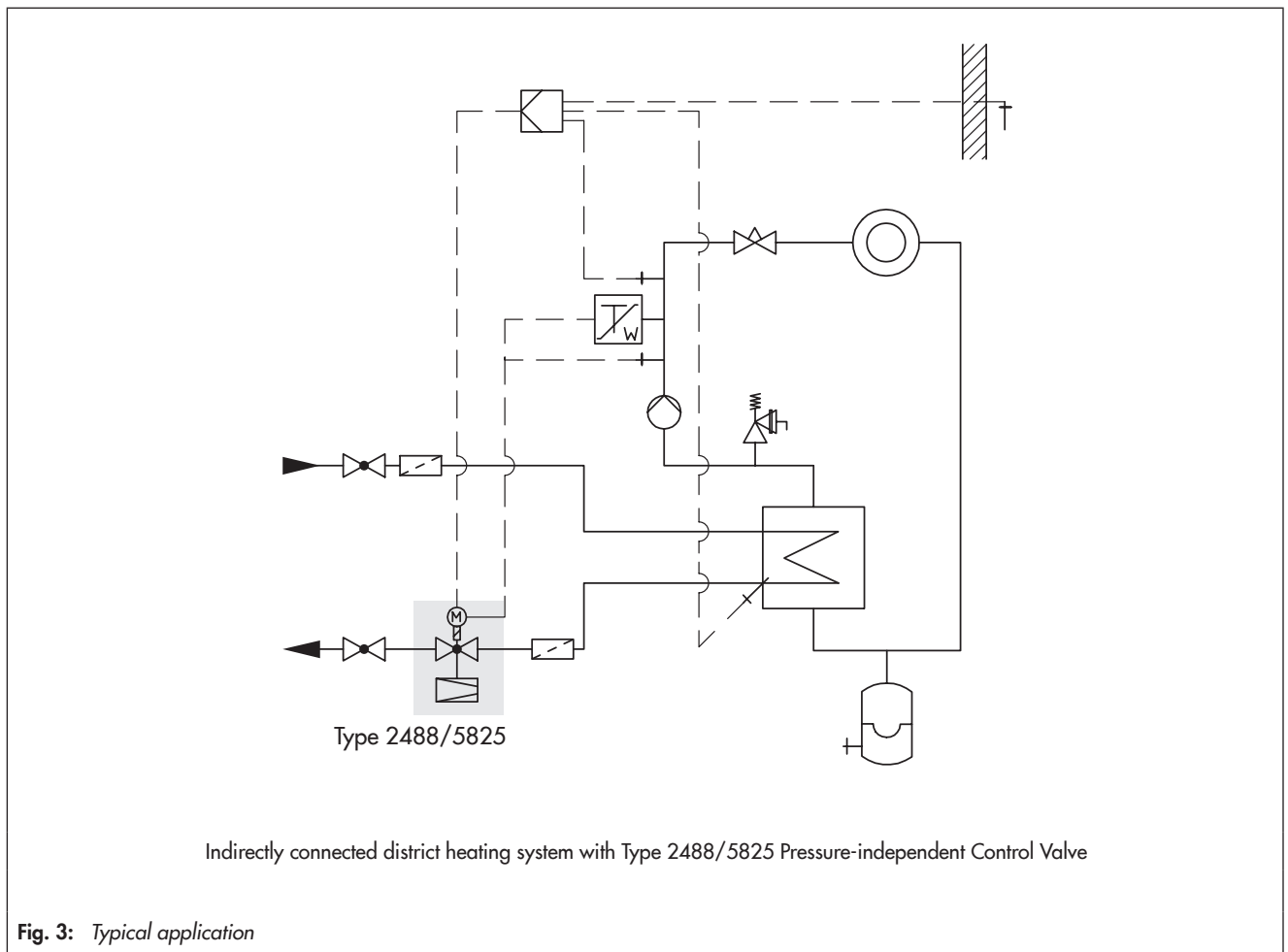
## Differential pressure across the valve

The minimum required differential pressure  $p_{\Delta_{\min}}$  across the valve is calculated as follows:

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

$\Delta p_{\min}$	Minimum differential pressure across the valve in bar
$\Delta p_{\text{restriction}}$	Differential pressure created at the restriction for measuring the flow rate in bar
$\dot{V}$	Flow rate, adjusted in m <sup>3</sup> /h
$K_{VS}$	Valve flow coefficient in m <sup>3</sup> /h

## Typical application



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

Nominal size DN		15/20/25			15	20	25	32 <sup>2)</sup>	40 <sup>2)</sup>	50 <sup>2)</sup>	
K <sub>VS</sub>	Body with screwed ends	0.4 <sup>1)</sup>	1 <sup>1)</sup>	2.5	4 <sup>1)</sup>	6.3	8	12.5	16	20	
	Flanged body	–						12.5	20	25	
x <sub>FZ</sub>	Body with screwed ends	0.6						0.5		0.45	
	Flanged body	–						0.45		0.4	
Nominal pressure		PN 16 <sup>3)</sup> /PN 25						PN 25			
Max. permissible differential pressure Δp across the valve		10 <sup>4)</sup> /20 bar						16 bar			
Max. perm. temperature		For liquids 130 °C (PN 16)/150 °C <sup>7)</sup> (PN 25) · For air and non-flammable gases 80 °C									
Compliance		<b>CE · EAC</b>									
<b>Flow rate set point ranges for water in m<sup>3</sup>/h</b>											
Flow rate set point range/limitation for water with a diff. pressure at the restriction of 0.2 bar		0.03 to 0.2	0.12 to 0.64	0.2 to 1.2	0.6 to 1.3 <sup>5)</sup> 0.6 to 2.5	0.8 to 2.3 <sup>5)</sup> 0.8 to 3.6	0.8 to 3.5 <sup>5)</sup> 0.8 to 4.2 <sup>6)</sup>	2 to 5.8 <sup>5)</sup> 2 to 10	3 to 9.1 <sup>5)</sup> 3 to 12.5	4 to 14.1 <sup>5)</sup> 4 to 15	

1) Special version

2) Additional version: Valve with flanged body made of spheroidal graphite iron (EN-JS1049)

3) Not for Type 2489

4) For PN 16 version

5) When the specified flow rates are exceeded, the noise level will increase, even with non-cavitating flow

6) 5 m<sup>3</sup>/h with a differential pressure at the restriction of 0.3 bar (special version)

7) With intermediate insulating piece (item no. 1992-3132)

**Table 2: Technical data · Electric actuators**

Electric actuator		Type 5824-.../ TROVIS 5724-... <sup>1)</sup>		Type 5825-.../ TROVIS 5725-.../5725-7 <sup>1)</sup>		TROVIS 5757 TROVIS 5757-7 <sup>1)</sup>	Type 5857
		Without fail-safe action		With fail-safe action		Without fail-safe action	
		10	20	10	20	–	
Rated travel	Valve DN 15 to 25	6 mm	–	6 mm	–	6 mm	
	Valve DN 32 to 50	–	12 mm	–	12 mm	–	
Transit time for rated travel		35 s <sup>2)</sup>	70 s <sup>2)</sup>	35 s <sup>2)</sup>	70 s <sup>2)</sup>	20 s	
Transit time for fail-safe action		–		4 s	8 s	–	
Actuating force		700 N		–		300 N	
Nominal thrust of safety spring		–		500 N		–	
Power supply		230 V, 50 Hz (24 V, 50/60 Hz; 24 V DC)					
Power consumption		Approx. 3 VA		Approx. 3 VA +1 VA		Approx. 3 VA	
Manual override		Yes		Possible <sup>3)</sup>		Yes	
Permissible ambient temperature		0 to +50 °C					
Perm. temperature at connecting stem		0 to +135 °C/150 °C <sup>4)</sup>				0 to +120 °C/150 °C <sup>4)</sup>	
Degree of protection (installed upright, according to EN 60529)		IP 54				IP 42	IP 42
Compliance		<b>CE · EAC</b>					
Data sheets		▶ T 5724 · ▶ T 5824 · ▶ T 5725-7				▶ T 5757 ▶ T 5757-7	▶ T 5857

1) TROVIS 57xx only with 230 V/50 Hz

2) Shorter transit times on request

3) Manual override using 4 mm Allen key (after removing the cover); actuator always returns to fail-safe position after release.

4) With intermediate insulating piece (item no. 1992-3132)

**Table 3: Technical data · Type 2430 K Control Thermostat**

Type 2430 K Control Thermostat	
Set point range	Continuously adjustable: 0 to 35 °C, 25 to 70 °C, 40 to 100 °C, 50 to 120 °C, 70 to 150 °C
Ambient temperature	-20 to +80 °C
Permissible temperature at sensor	Max. 50 K above the adjusted set point
Pressure at the sensor	Max. 40 bar
Capillary tube	2 m (5 m as special version)

**Table 4: Materials · Material numbers according to DIN EN**

Body		Red brass CC499K (Rg 5) · Spheroidal graphite iron EN-JS1049 <sup>1)</sup>
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, with EPDM soft seal
Upper section	PN 25	Red brass CC499K (Rg 5) · Spheroidal graphite iron EN-JS1049 <sup>1)</sup>
	PN 16	Stainless steel 1.4301
Valve spring		Stainless steel 1.4310
Orifice plate		Brass, free of dezincification
Operating diaphragm		EPDM <sup>2)</sup> with fabric reinforcement
Seals		EPDM <sup>2)</sup>
Type 5824, Type 5825, Type 5857 and Type 5757 Electric Actuators		
Housing		Plastic (PPO with glass fiber reinforcement)
Coupling nut		Brass
Type 2430 K Control Thermostat		
Sensor and capillary tube		Copper
Thermowell		Copper or stainless steel 1.4571

<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, e.g. for mineral oils: FPM (FKM)

## Dimensions and weights

**Table 5:** Dimensions and weights in kg

Nominal size	DN 15	DN 20	DN 25	DN 32 <sup>1)</sup>	DN 40 <sup>1)</sup>	DN 50 <sup>1)</sup>	
Pipe Ø d	21.3 mm	26.9 mm	33.7 mm	42.4 mm	48.3 mm	60.3 mm	
Thread size R	G ¾	G 1	G 1¼	G 1¾	G 2	G 2½	
Width across flats SW	30 mm	36 mm	46 mm	59 mm	65 mm	82 mm	
Length L	65 mm	70 mm	75 mm	100 mm	110 mm	130 mm	
Height H	155 mm			216 mm			
Height H3	122 mm			-			
Height H1	Type 2488	85 mm		105 mm	140 mm		
	Type 2489	245 mm		265 mm	295 mm		
<b>Version with welding ends</b>							
Length L1	210 mm	234 mm	244 mm	268 mm	294 mm	330 mm	
Weight <sup>3)</sup>	Type 2488	3.0 kg	3.1 kg	3.2 kg	4.4 kg	6.9 kg	7.4 kg
	Type 2489	3.9 kg	4.0 kg	4.1 kg	5.2 kg	7.9 kg	8.4 kg
<b>Special versions</b>							
<b>With threaded ends</b>							
Length L2	129 mm	144 mm	159 mm	192 mm	206 mm	228 mm	
Male thread A	G ½	G ¾	G 1	G 1¼	G 1½	G 2	
Weight <sup>3)</sup>	Type 2488	3.0 kg	3.1 kg	3.2 kg	4.4 kg	6.9 kg	7.4 kg
	Type 2489	3.9 kg	4.0 kg	4.1 kg	5.2 kg	7.9 kg	8.4 kg
<b>With screwed-on flanges<sup>2)</sup> (PN 16/25) or with flanged body (DN 32 to 50)</b>							
Length L3	130 mm	150 mm	160 mm	180 mm	200 mm	230 mm	
Weight <sup>3)</sup>	Type 2488	4.4 kg	5.1 kg	5.7 kg	7.6 kg	10.9 kg	12.4 kg
	Type 2489	5.3 kg	6.0 kg	6.6 kg	8.4 kg	11.9 kg	13.4 kg

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

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

<sup>3)</sup> Type 2489/582 ...: Weights for version with bulb sensor and thermowell. Minus 0.2 kg for version with thermowell

## Ordering text

Pressure-independent Control Valve:

Type 2488/5824 (5825); Type 2488/5724 (5725); Type 2488/5857; Type 2488/5757

Type 2489/5824 (5825), Type 2489/5724 (5725)

With valve DN ..., PN ...

Permissible temperature ...°C, K<sub>VS</sub> ...

With welding ends/threaded ends/flanges

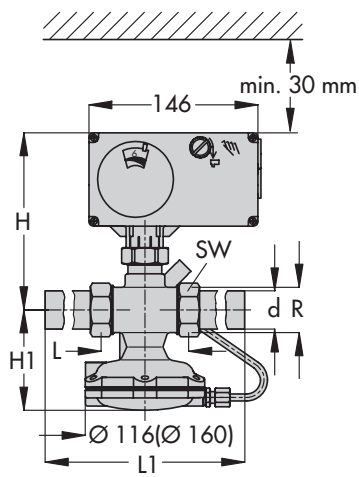
With flanged body

Differential pressure at the restriction ... bar

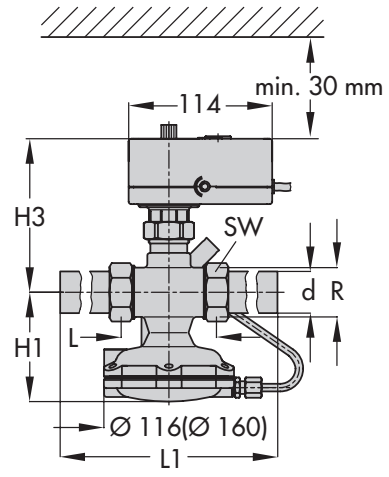
With Type 5824-.../Type 5825-.../Type 5857/TROVIS 5724/TROVIS 5725/TROVIS 5757/TROVIS 5757-7 Electric Actuator

With Type 2430 K Control Thermostat, set point range ... °C

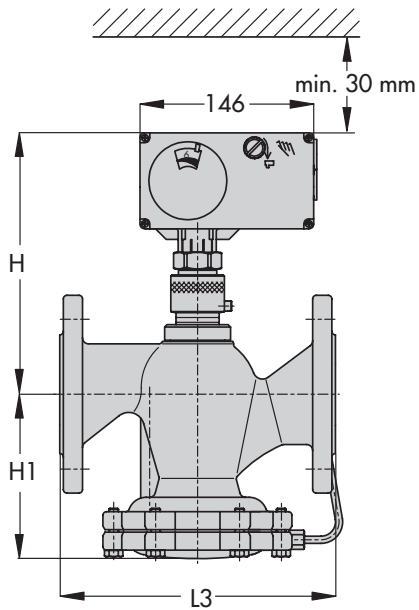
Optionally, special version .../ accessories ...



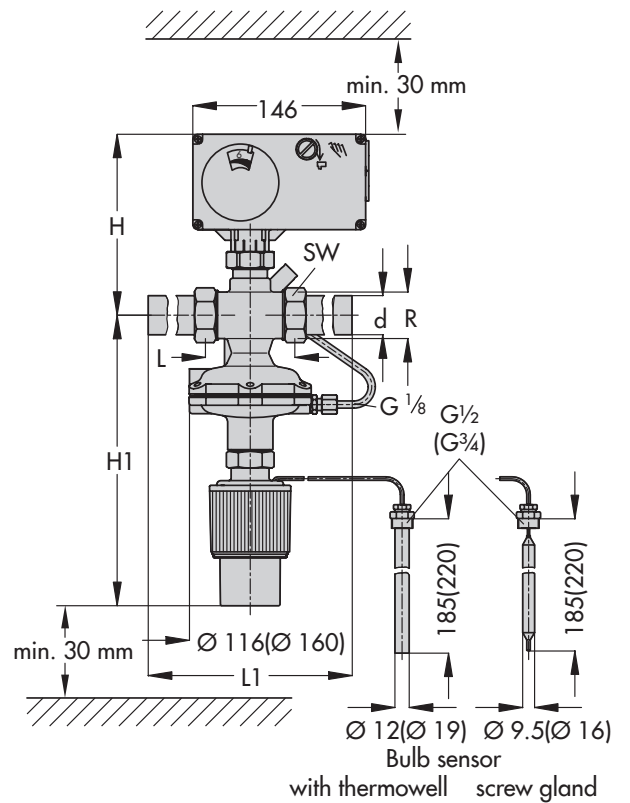
**Type 2488/5824 (5825) or Type 2488/5724 (5725)**  
with welding ends



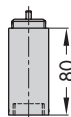
**Type 2488/5857 or Type 2488/5757**  
with welding ends



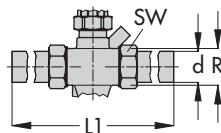
**Type 2488/5824 (5825) or Type 2488/5724 (5725)**  
with flanged body (DN 32 to 50 only)



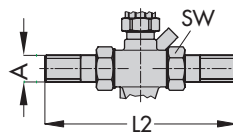
**Type 2489/5824 (5825) or Type 2489/5724 (5725)**  
with welding ends



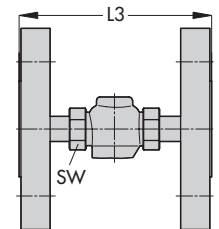
Intermediate insulating piece



With welding ends



With threaded ends



With screw-on flanges

**Fig. 4:** Dimensions of the regulators

Specifications subject to change without notice



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