

T 3135 EN

Type 2488/... and Type 2489/... Pressure-independent Control Valve Combined Regulators



Application

Pressure-independent control valve (PICV), e.g. for flow rate and temperature control in district heating systems or extended heating or 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.

Nominal size **DN 15 to 50** · Pressure rating **PN 16 and 25** · Flow set point ranges from **0.03 to 15 m³/h** · Suitable for treated water up to **150 °C** and non-flammable gases up to **80 °C**

Nominal sizes DN 15 to 50 · Pressure rating 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 outdoor-temperature-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 (see Fig. 2)

Valve body 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 5827-A Electric Actuator tested according to DIN EN 14597 are available for temperature control and safeguarding purposes.

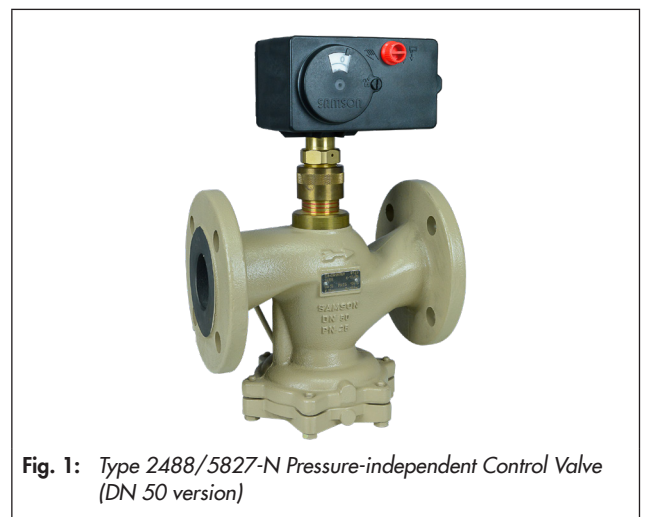


Fig. 1: Type 2488/5827-N Pressure-independent Control Valve (DN 50 version)

Version **not** tested according to DIN EN 14597 are available with Type 5827-N1 and Type 5857 Actuators for valves up to DN 25. For nominal sizes DN 32 and larger, the Type 5827-N2 Actuator must be used.

Valves up to DN 25 can also be used together with a TROVIS 5757-3 or TROVIS 5757-7 Electric Actuator with Process Controller.

The TROVIS 5724-3 or TROVIS 5724-8 Actuator must be used for valves in DN 32 and larger.

Versions tested with electric actuator with process controller according to DIN EN 14597 can only be combined with a TROVIS 5725-3 or TROVIS 5725-8 Actuator for all nominal sizes.

Type 2489 Flow Regulator with an additional thermostat connection

By additionally attaching a Type 2430 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, in this case a Type 2403 can be connected as a safety temperature monitor to safeguard the controlled temperature.

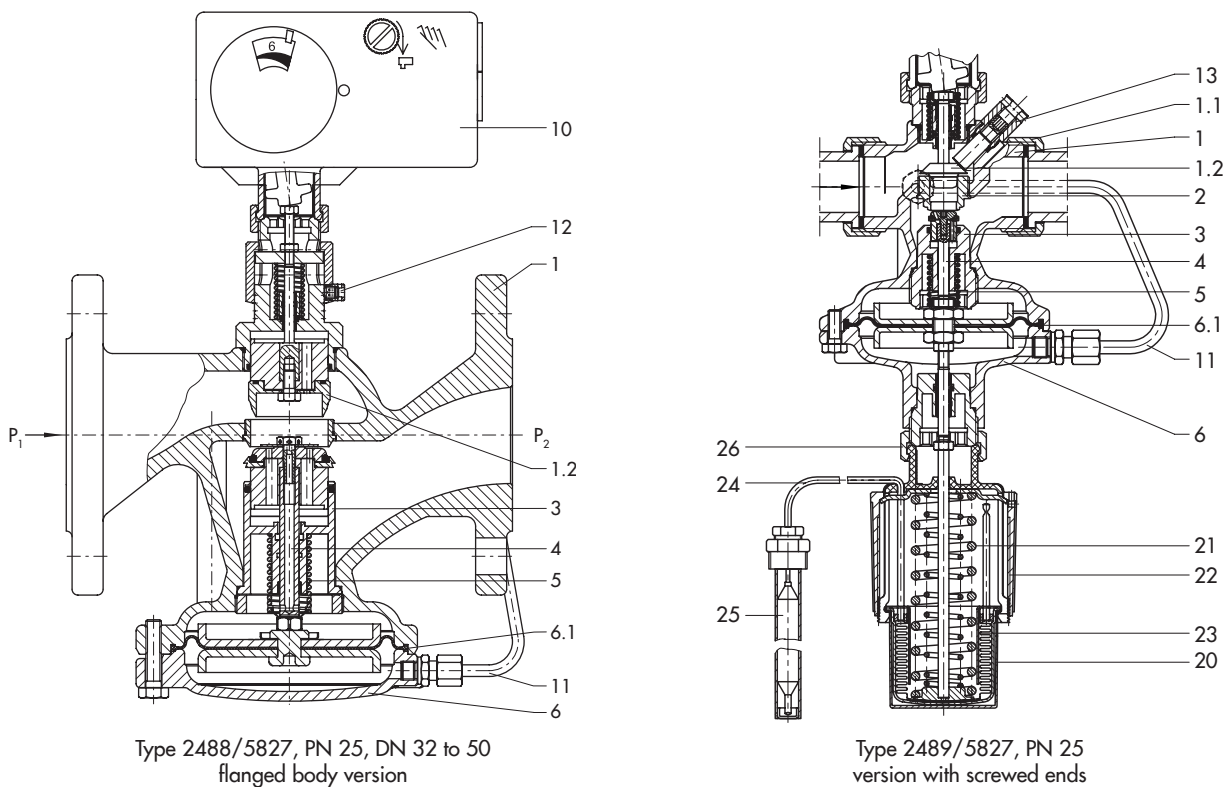
Principle of operation

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 (6.1) 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, the control quality of outdoor-temperature-controlled temperature control equipment is not affected by the pressure drop across the network, for example.

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.



- 1 Valve body
- 1.1 Connection nut with seal and welding end
- 1.2 Restriction for adjusting the flow rate set point
- 2 Valve seat
- 3 Plug
- 4 Plug stem
- 5 Set point spring
- 6 Actuator housing
- 6.1 Operating diaphragm
- 8 Set point springs (assembly)
- 10 Electric actuator

- 11 Control line
- 12 Set point adjuster (flow rate) with lead-seal (DN 32 to 50)
- 13 Set point screw (flow rate) (DN 15 to 25)
- 20 Control thermostat
- 21 Spring
- 22 Set point adjuster (temperature)
- 23 Bellows with actuator stem
- 24 Capillary tube
- 25 Temperature sensor
- 26 Connection for thermostat (coupling nut)

Fig. 2: Regulator versions

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 nominal 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.
- The direction of flow must match the direction indicated by the arrow on the valve body.
- Install the regulator preferably in the return flow pipe of the plant.
- Before 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!

More details in ► EB 3135-1.

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 Δp_{\min} across the valve is calculated as follows:

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

Δp_{\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 ³ /h
K_{VS}	Valve flow coefficient in m ³ /h

Sample application

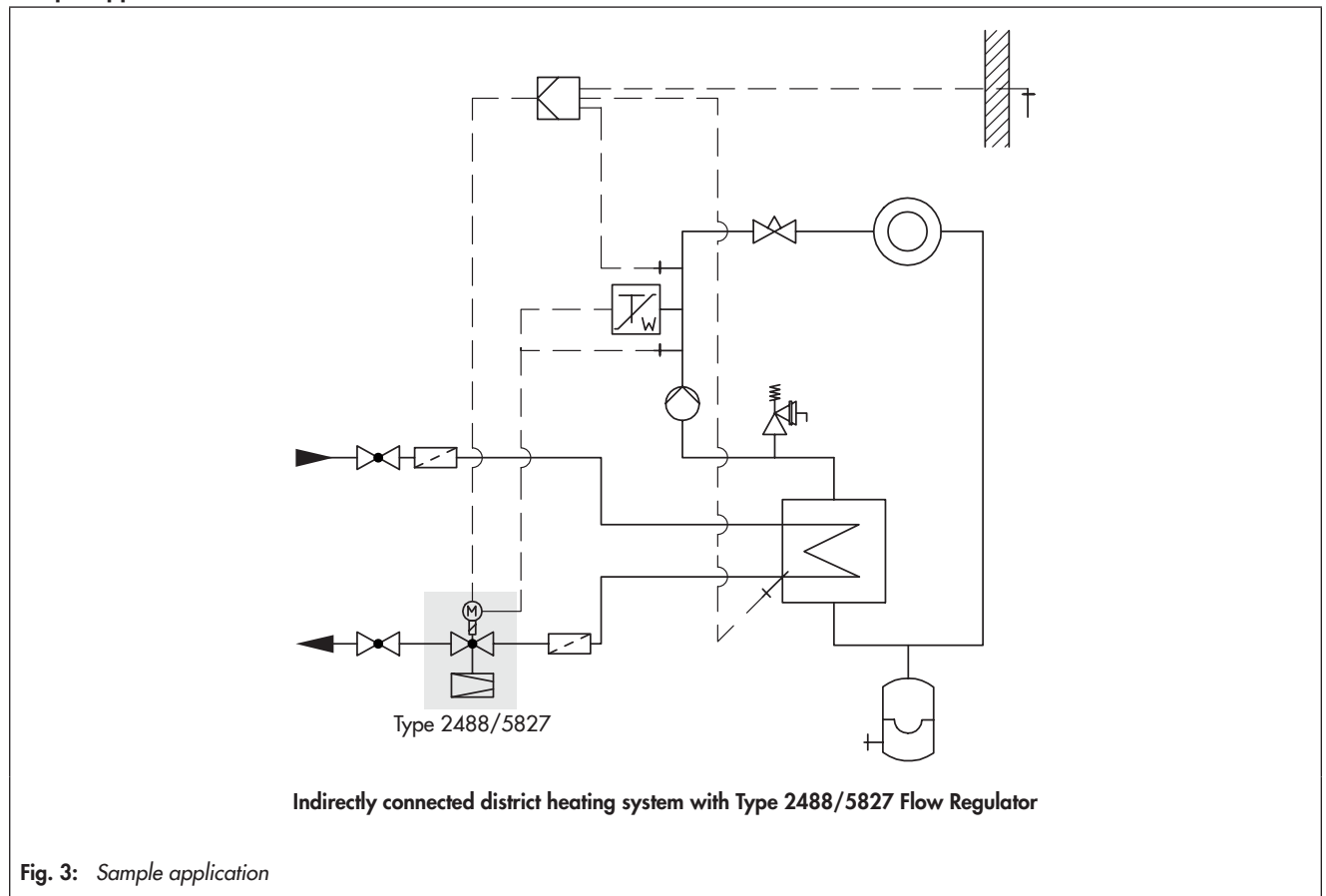


Fig. 3: Sample application

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

Nominal size DN		15/20/25			15	20	25	32 ²⁾	40 ²⁾	50 ²⁾
K _{VS} coefficient	Body with screwed ends	0.4 ¹⁾	1.0 ¹⁾	2.5	4.0 ¹⁾	6.3	8.0	12.5	16	20
	Flanged body	–						12.5	20	25
x _{FZ} value	Body with screwed ends	0.6						0.5		0.45
	Flanged body	–						0.45		0.4
Pressure rating		PN 16 ³⁾ /PN 25						PN 25		
Max. permissible differential pressure Δp across the valve		10 bar ⁴⁾ /20 bar						16 bar		
Max. permissible temperature		For liquids 130 °C (PN 16)/150 °C ⁷⁾ (PN 25) · For air and non-flammable gases 80 °C								
Leakage class according to IEC 60534-4 (percent of K _{VS})		≤0.05 %	≤0.01 %	≤0.05 %			≤0.01 %			
Conformity		CE EAC								
Flow rate set point ranges for water in m³/h										
Flow rate set point range/ limitation for water with 0.2 bar differential pressure at the restriction		0.03 to 0.2	0.12 to 0.64	0.2 to 1.2	0.6 to 1.3 ⁵⁾	0.8 to 2.3 ⁵⁾	0.8 to 3.5 ⁵⁾	2 to 5.8 ⁵⁾	3 to 9.1 ⁵⁾	4 to 14.1 ⁵⁾
					0.6 to 2.5	0.8 to 3.6	0.8 to 4.2 ⁶⁾	2 to 10	3 to 12.5	4 to 15

1) Special version

2) Additional version: valve with flanged body made of spheroidal graphite iron EN-GJS-400-18-LT

3) Not for Type 2489

4) For PN 16 version

5) An increase in noise level can be expected when the specified flow rates are exceeded, even if cavitation does not occur (see AGFW (German District Heating Association) document FW 514).

6) 5 m³/h with 0.3 bar differential pressure at the restriction (special version)

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

Table 2: Technical data · Electric actuators

Electric actuator		Type 5827-N... / TROVIS 5724-... ¹⁾		Type 5827-A... / TROVIS 5725-... / 5725-7 ¹⁾		TROVIS 5757 / 5757-7 ¹⁾	Type 5857
		Without fail-safe action		With fail-safe action		Without fail-safe action	
		1x	2x	1x	2x	–	
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 ²⁾	70 s ²⁾	35 s ²⁾	70 s ²⁾	20 s	
Transit time for fail-safe action		–		4 s	8 s	–	
Thrust		700 N		–		300 N	
Nominal thrust of safety spring		–		500 N		–	
Supply voltage		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	
Handwheel		Yes		Possible ³⁾		Yes	
Permissible ambient temperature		0 to +50 °C					
Perm. medium temperature		0 to +135 °C/150 °C ⁴⁾				0 to +120 °C/150 °C ⁴⁾	
Degree of protection (installed upright, according to EN 60529)		IP 54				IP 42	IP 42
Conformity		CE EAC					
Data sheets		T 5724/T 5827/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 Control Thermostat

Type 2430 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-GJS-400-18-LT ¹⁾
Seat		Stainless steel 1.4305
Plug	PN 25	Brass, resistant to dezincification, with EPDM soft seal ²⁾
	PN 16	Brass, resistant to dezincification and plastic with EPDM soft seal
Diaphragm case	PN 25	Red brass CC499K (Rg 5) · Spheroidal graphite iron EN-GJS-400-18-LT ¹⁾
	PN 16	Stainless steel 1.4301
Valve spring		Stainless steel 1.4310
Restriction		Brass, free of dezincification
Operating diaphragm		EPDM ²⁾ with fabric reinforcement
Seals		EPDM ²⁾
Type 5827-N, Type 5827-A, Type 5857 and TROVIS 5757 Electric Actuators		
Body		Plastic (PPO with glass fiber reinforcement)
Coupling nut		Brass
Type 2430 Control Thermostat		
Sensor and capillary tube		Copper
Thermowell		Copper or stainless steel 1.4571

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

²⁾ Special version, e.g. for mineral oils: FKM

Table 5: Dimensions in mm and weights in kg

Nominal size	DN 15	DN 20	DN 25	DN 32 ¹⁾	DN 40 ¹⁾	DN 50 ¹⁾
Pipe Ø d	21.3	26.9	33.7	42.4	48.3	60.3
Thread size R	G ¾	G 1	G 1¼	G 1¾	G 2	G 2½
Width across flats SW	30	36	46	59	65	82
Length L	65	70	75	100	110	130
Height H ⁴⁾	155 · 158 ⁵⁾			216 · 219 ⁵⁾		
Height H3	122 ⁴⁾			–		
Height H1	Type 2488	85		105	140	
	Type 2489	245		265	295	
Version with welding ends						
Length L1	210	234	244	268	294	330
Weight ³⁾ , approx. kg	Type 2488	3.0	3.1	3.2	4.4	7.4
	Type 2489	3.9	4.0	4.1	5.2	8.4
Special versions						
With threaded ends						
Length L2	129	144	159	192	206	228
Male thread A	G ½	G ¾	G 1	G 1¼	G 1½	G 2
Weight ³⁾ , approx. kg	Type 2488	3.0	3.1	3.2	4.4	7.4
	Type 2489	3.9	4.0	4.1	5.2	8.4
With screwed-on flanges ²⁾ (PN 16/25) or with flanged body (DN 32 to 50)						
Length L3	130	150	160	180	200	230
Weight ³⁾ , approx. kg	Type 2488	4.4	5.1	5.7	7.6	12.4
	Type 2489	5.3	6.0	6.6	8.4	13.4

1) Additional version: valve with flanged body

2) Flanges are already mounted on valves in DN 40 and 50

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

4) With intermediate insulating piece +80 mm

5) for Type 5827-... Actuator

Ordering text

Pressure-independent Control Valve (PICV)

Type 2488/5827-N (5827-A), Type 2488/5724 (5725),

Type 2488/5857, Type 2488/5757,

Type 2489/5827-N (5827-A), Type 2489/5724 (5725)

With Type ... Valve

PN ...

Permissible temperature ...°C,

K_{VS} ...,

With welding ends, threaded ends, flanges or flanged body

Differential pressure at the restriction ... bar,

With **Type 5827-.../Type 5857/TROVIS 5724/**

TROVIS 5725/TROVIS 5757/TROVIS 5757-7 Electric

Actuator

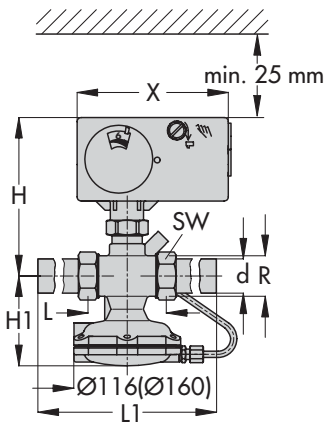
With **Type 2430** Control Thermostat

Set point range ...°C

Optionally, accessories ...

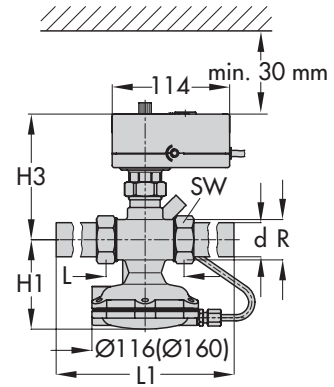
Special version ...

Dimensions and weights

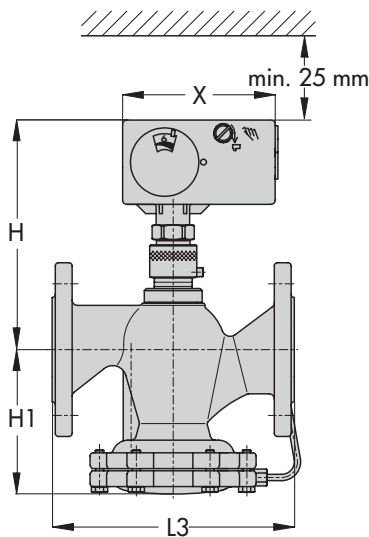


Type 2488/5827 or TROVIS 5724 (5725)
with welding ends

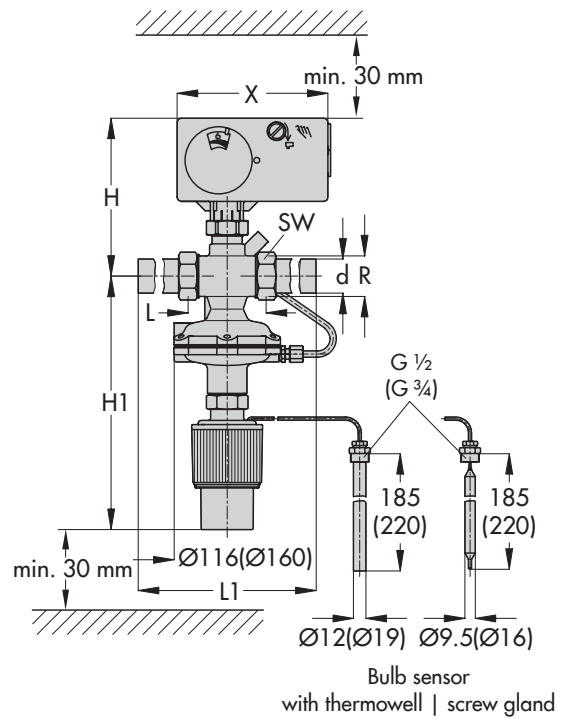
Type ... Electric Actuator	Dimension X
5725-...	146
5827-...	154



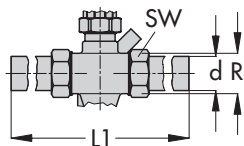
Type 2488/5827 or TROVIS 5757
with welding ends



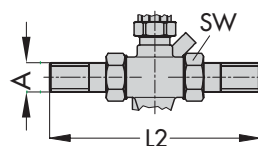
Type 2488/5827 or Type 5724 (5725)
with flanged body (DN 32 to 50 only)



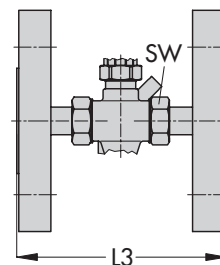
Type 2489/5827 or Type 2489/5724 (5725)
with welding ends



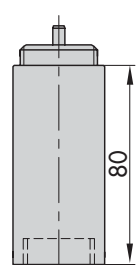
With welding ends



With threaded ends



With screw-on flanges



With intermediate insulating piece

Fig. 4: Dimensions of the regulators

Dimensions in parentheses for DN 40 and 50

