

Self-operated Temperature Regulators

Temperature Regulator Type 4

with balanced single-seated globe valve



Application

Temperature regulator for heating installations with control thermostats for set points from $-10\text{ }^{\circ}\text{C}$ to $+250\text{ }^{\circ}\text{C}$ · Nominal sizes DN 15 to DN 250 · Nominal pressure PN 16 to PN 40 · Suitable for temperatures up to $350\text{ }^{\circ}\text{C}$
The valve **closes** when the temperature rises.

Note

Typetested temperature regulators (TR), temperature limiters (TL), safety temperature monitors (STM), and safety temperature limiters (STL) are available.



The regulators consist of a balanced globe valve with flanged connections (DN 15 to 250) and a control thermostat with temperature sensor, set point adjustment head with an excess temperature safety device, capillary tube and operating element.

Special features

- Low-maintenance P regulators requiring no auxiliary energy
- Wide set point range and easy adjustment of the set point indicated on a dial
- Single-seated valves balanced by a bellows or a diaphragm (DN 125 to 250)
- Suitable for liquids, gases and vapors, especially for heat transfer fluids such as water, oil and steam
- Valve body optionally made of cast iron, spheroidal graphite iron, cast steel or cast stainless steel
- Versions with double adapter or manual override for attachment of a second control thermostat. For details, refer to Data Sheet T 2036 EN.

Versions

Type 4 Temperature Regulator · Type 2114 Valve with flanged connections in nominal sizes DN 15 to 250 · PN 16 to 40 · Balanced by a bellows (DN 15 to 250) · Balanced by a diaphragm (DN 125 to 250) · Types 2231 to 2235 Control Thermostats · For details on the application of the thermostats, refer to Information Sheet T 2010 EN.

Type 2114/2231 (Fig. 1) · With Type 2114 Valve and Type 2231 Control Thermostat for liquids · Set point adjustment at the sensor · Set points from -10 to $+150\text{ }^{\circ}\text{C}$

Type 2114/2232 (Fig. 3) · With Type 2114 Valve and Type 2232 Control Thermostat for liquids and steam · Separate set point adjustment · Set points from -10 to $+250\text{ }^{\circ}\text{C}$

Type 2114/2233 · With Type 2114 Valve and Type 2233 Control Thermostat for liquids, air, and other gases · Set points from -10 to $+150\text{ }^{\circ}\text{C}$, set point adjustment at the sensor

Type 2114/2234 · With Type 2114 Valve and Type 2234 Control Thermostat for liquids, air, and other gases · Set point adjustment at the sensor · Set points from -10 to $+250\text{ }^{\circ}\text{C}$

Type 2114/2235 · With Type 2114 Valve and Type 2235 Control Thermostat for air-heated storerooms as well as drying, climatic, and heating cabinets · Separate set point adjustment and a sensor tube to be installed by the operator · Set points from -10 to $+250\text{ }^{\circ}\text{C}$

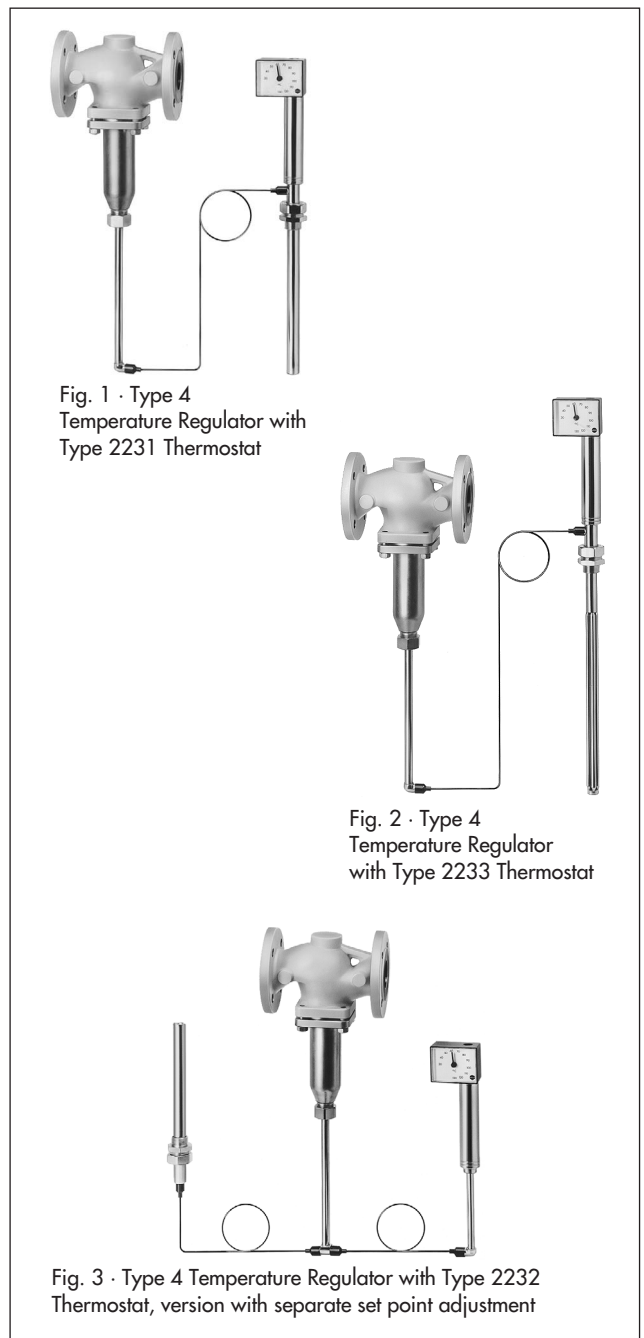


Fig. 1 · Type 4 Temperature Regulator with Type 2231 Thermostat

Fig. 2 · Type 4 Temperature Regulator with Type 2233 Thermostat

Fig. 3 · Type 4 Temperature Regulator with Type 2232 Thermostat, version with separate set point adjustment

Special version

- Capillary tube of either 5 m, 10 m or 15 m
- Sensor made of CrNiMo steel
- Capillary tube made of CrNiMo steel or plastic-coated copper
- Valve made completely of stainless steel
- Reduced K_{VS} coefficient
- Valve with flow divider I for noise reduction when handling steam and non-flammable gases
- Set point range from 100 to 200 °C/150 to 250 °C
- ANSI version (see Data Sheet T 2025 EN)

Principle of operation (Fig. 4)

The regulators operate according to the liquid expansion principle.

The temperature sensor (12), capillary tube (9), and operating element (7) are filled with an expansion liquid. The temperature-dependent change in volume of this liquid causes the bellows in the operating element (7) to move and, as a result, also moves the plug stem (5) with the attached plug (3).

The position of the plug determines the flow rate of the heat transfer medium across the area released between the seat (2) and plug.

The set point is adjustable with a key (10); the adjusted value can be read off the dial (11).

Valve

- 1 Valve body
- 2 Seat (exchangeable)
- 3 Plug
- 4 Bellows housing
- 4.1 Balancing bellows
- 4.2 Vent screw (DN 125 and larger)
- 5 Plug stem with spring
- 6 Connection for operating element (coupling nut)

Control thermostat

- 7 Operating element with bellows
- 8 Pin of operating element
- 9 Capillary tube
- 10 Key for set point adjustment
- 11 Set point dial
- 12 Temperature sensor (bulb sensor)

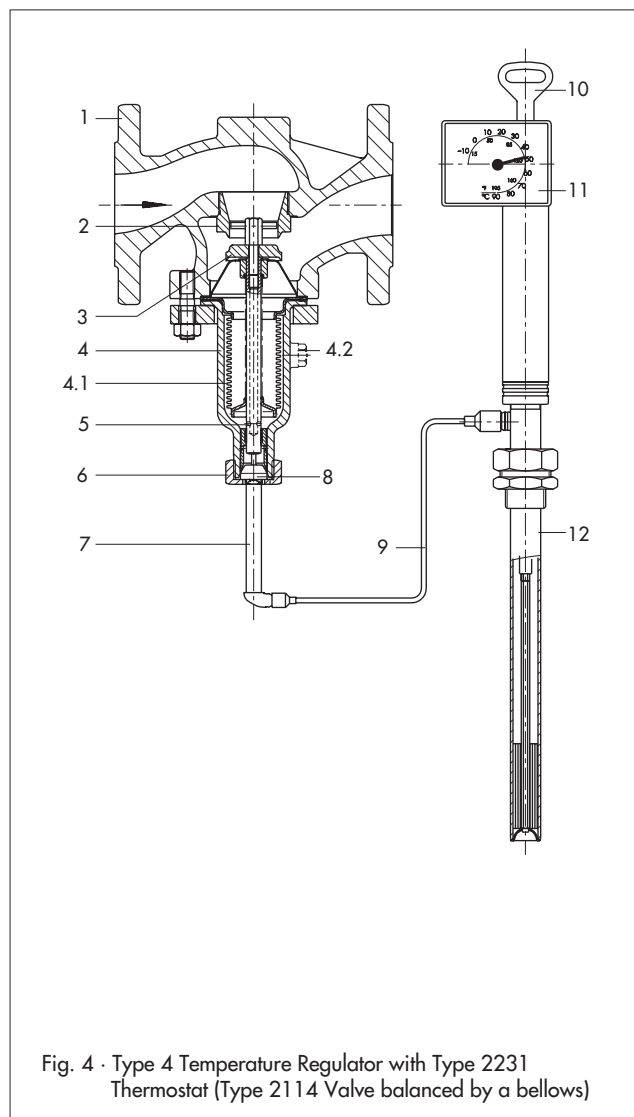


Fig. 4 · Type 4 Temperature Regulator with Type 2231 Thermostat (Type 2114 Valve balanced by a bellows)

Table 1 · Technical data of valve · All pressures in bar (gauge)

Type 2114 Valve · Balanced by a bellows															
Nominal pressure		PN 16 to 40													
Nominal size	DN	15	20	25	32	40	50	65	80	100	125	150	200	250	
K_{VS} coefficient in m ³ /h		4	6.3	8	16	20	32	50	80	125	190	280	420	500	
Leakage rate		≤ 0.05 % of K_{VS}													
Max. perm. differential pressure Δp		25					20		16		12		10		
Special version															
K_{VS} coefficient in m ³ /h		2.5, 4, 6.3			6.3	8	16	20	32	50	-				
Max. perm. differential pressure Δp		25									16		-		
Permissible valve temperature		See pressure-temperature diagram													
Type 2114 Valve · Balanced by a diaphragm															
Nominal pressure		PN 16 to 40													
Nominal size	DN	125			150			200			250				
K_{VS} coefficient in m ³ /h		190			290			550			600				
Leakage rate		≤ 0.05 % of K_{VS}													
Max. perm. differential pressure Δp		12						10							

Table 2 · Technical data · Control thermostats

Types 2231 to 2235 Thermostats	Size 150 (DN 15 to 150)	Size 250 ¹⁾ (DN 200/250)
Set point ranges	-10 to +90 °C, 20 to 120 °C or 50 to 150 °C For Types 2232, 2234, 2235 also 100 to 200 °C or 150 to 250 °C	0 to 70 °C 30 to 100 °C 50 to 120 °C 80 to 150 °C
Permissible ambient temperature at the set point adjustment head	-40 to +80 °C	-20 to +80 °C
Permissible temperature at the sensor	100 K above the adjusted set point	30 K above the set point
Permissible pressure at the sensor	Type 2231/2232 Without thermowell: PN 40 · With thermowell: PN 40/PN 100 With thermowell with flange: PN 40/PN 100	PN 16 (without thermowell) PN 40 (with thermowell)
	Type 2233/2234 Without thermowell: PN 40 · With flange: PN 6/PN 40	
Length of the capillary tube	3 m (special version: 5 m, 10 m or 15 m)	

¹⁾ Only Types 2231 and 2232

Table 3 · Materials · Material numbers according to DIN EN

Type 2114 Valve · Balanced by a bellows				
Nominal pressure	PN 16	PN 16 · PN 25 ¹⁾	PN 16 · PN 25 · PN 40	
Valve body	Cast iron EN-JL1040	Spheroidal graphite iron EN-JS1049	Cast steel 1.0619 ²⁾	Cast stainless steel 1.4408 ²⁾
Seat and plug ³⁾	Up to DN 100	Stainless steel 1.4006 or 1.4104		
	DN 125 to 250	Steel 1.4301 · Plug with PTFE seal		1.4571
Plug stem/spring	1.4301/1.4310			
Balancing bellows	1.4571			
Bellows housing	Steel 1.0425			1.4301
Body gasket	Graphite on metal core			
Extension piece/distance piece	Brass (version free of non-ferrous metal: stainless steel 1.4301)			1.4301
Type 2114 Valve · Balanced by a diaphragm				
Nominal pressure	PN 16	PN 16 · PN 25	PN 16 · PN 25 · PN 40	
Valve body	Cast iron EN-JL1040	Spheroidal graphite iron EN-JS1049	Cast steel 1.0619	Cast stainless steel 1.4408
Seat	Red brass (CC491K/CC499K)			
Plug	Red brass (CC491K/CC499K) with EPDM soft seal, max. 150 °C			
Pressure balancing	Balancing cases of sheet steel DD11 · EPDM balancing diaphragm, max. 150 °C			
Flat gasket	Graphite on metal core			

Types 2231, 2232, 2233, 2234 and 2235 Control Thermostats		Standard version	Special version
Operating element		Nickel-plated brass	
Sensor	Type 2231 Type 2232	Nickel-plated bronze	Stainless steel 1.4571
	Type 2233 Type 2234	Nickel-plated copper	
	Type 2235	Copper	
	Capillary tube	Nickel-plated copper	Copper with plastic jacketing or stainless steel 1.4571
Thermowell			
Threaded connection G 1			
Immersion tube		Nickel-plated bronze · Nickel-plated steel	Stainless steel 1.4571
Threaded nipple		Nickel-plated brass	
Flanged connection			
Immersion tube		Steel	Stainless steel 1.4571
Flange		Steel	

¹⁾ Max. DN 150 · PN 25: up to DN 150 · PN 16: DN 100 to 150

²⁾ PN 25: DN 200 to 250 · PN 16: DN 100 to 250

³⁾ Optionally, soft-seated plug with PTFE ring for temperatures up to 220 °C or with EPDM ring for temperatures up to 150 °C

Typetested safety devices

The register number is available on request. The following versions are available:

Temperature Regulators (TR) with a Type 2231, 2232, 2233, 2234 ¹⁾, or Type 2235 ¹⁾ Thermostat and a Type 2114 Valve in sizes DN 15 to 250, for which the max. operating pressure must not exceed the max. permissible differential pressure Δp specified in the technical data.

Sensor without thermowell: applicable up to 40 bar

Sensor with thermowell: only use SAMSON G 1 version made of bronze, steel or stainless steel 1.4571 in PN 40

Thermowell for flammable gases typetested by DVGW (German Technical and Scientific Association on Gas and Water), G1 threaded connection, PN 100

For details on the selection and application of typetested devices, refer to Information Sheet T 2040 EN.

Additionally, the following versions are available:

Safety Temperature Monitors (STM) and **Safety Temperature Limiters (STL)**. For details, refer to Data Sheets T 2043 EN and T 2046 EN.

¹⁾ Types 2234 and 2235 Thermostats only up to DN 150

Accessories

Thermowells with threaded or flanged connection for Types 2231 and 2232 Bulb Sensors · G 1 threaded connection, PN 40, made of bronze, steel or CrNiMo steel · Flange DN 32, PN 40, with immersion tube made of steel or CrNiMo steel PTFE immersion tube, PN 6 (flange PN 40)

Thermowell typetested by DVGW for flammable gases, threaded connection G 1, PN 100

Mounting parts for Types 2233 and 2234 · Clamps for wall mounting · Perforated cover for thermostat

Distance piece made of brass (for water, steam) or CrNiMo steel (for water, oil or steam)

A distance piece is used to seal off between the thermostat and the valve. To guarantee that all wetted parts are free of non-ferrous metals, a distance piece made of CrNiMo steel must be used.

In addition, the distance piece prevents the medium from leaking while the thermostat is being replaced.

Extension piece for higher permissible temperatures, made of brass, CrNi steel or CrNiMo steel with metal bellows seal for water and oil/heat transfer oil.

Double adapter Type Do2 for second thermostat · Type DoS with electric signal transmitter

Manual override Hv with travel indication · HvS with electric signal transmitter

Dynamic behavior of the thermostat

The dynamics of the regulator mainly depends on the dynamic behavior of the associated sensor with its characteristic time constant.

Table 4 lists the time constants of SAMSON thermostats operating according to different functional principles when measuring in water.

Table 4 · Time constants of SAMSON thermostats

Functional principle	Type ... Control Thermostat	Time constant in seconds	
		Without thermowell	With thermowell
Liquid expansion	2231	70	120
	2232	65	110
	2233	25	-1)
	2234	15	-1)
	2235	10	-1)
Adsorption	2213	70	120
	2213	-1)	40

¹⁾ Not permissible

Installation

• Valve

The valves are to be installed in horizontal pipelines with the operating element vertically suspended. The process medium must flow through the valve in the direction indicated by the arrow on the body.

• Temperature sensor

The bulb sensor can be installed in any desired position.

Its entire length must be immersed in the process medium. Choose a place of installation where neither overheating nor considerable idle times occur.

Only use the same kind of materials together, for example thermowells made of stainless steel 1.4571 can be installed in stainless steel heat exchangers.

• Capillary tube

The capillary tube must be installed such that it is not exposed to large temperature fluctuations and cannot be damaged. The smallest possible bending radius is 50 mm.

Flow diagram of water

Control valve sizing for other media according to
DIN EN 60534
Parts 2-1 and 2-2, using the terms: $F_L = 0.95$ and $X_T = 0.75$
The values apply to a fully opened valve.

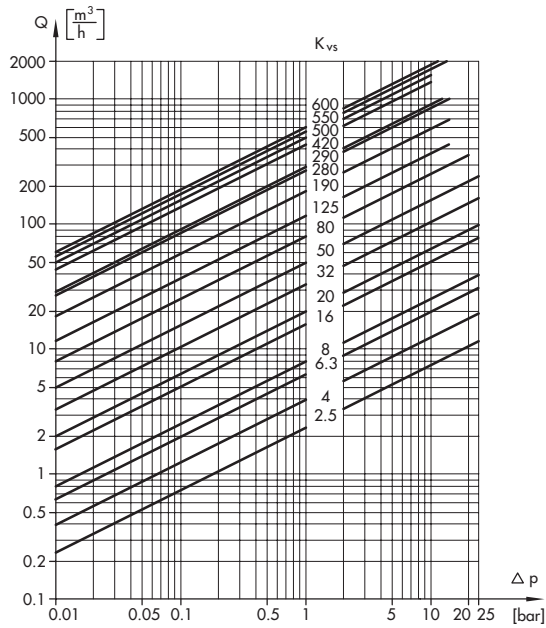


Fig. 5 · Flow diagram of water

Pressure-temperature diagram – acc. to DIN EN 12516-1 –

The pressures specified in the technical data are limited by the values given in the pressure-temperature diagram.

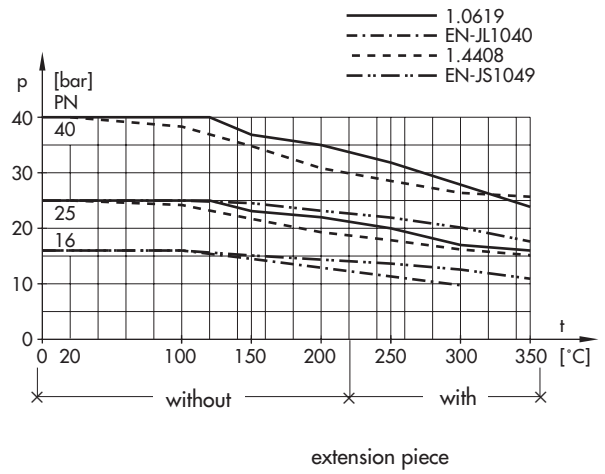
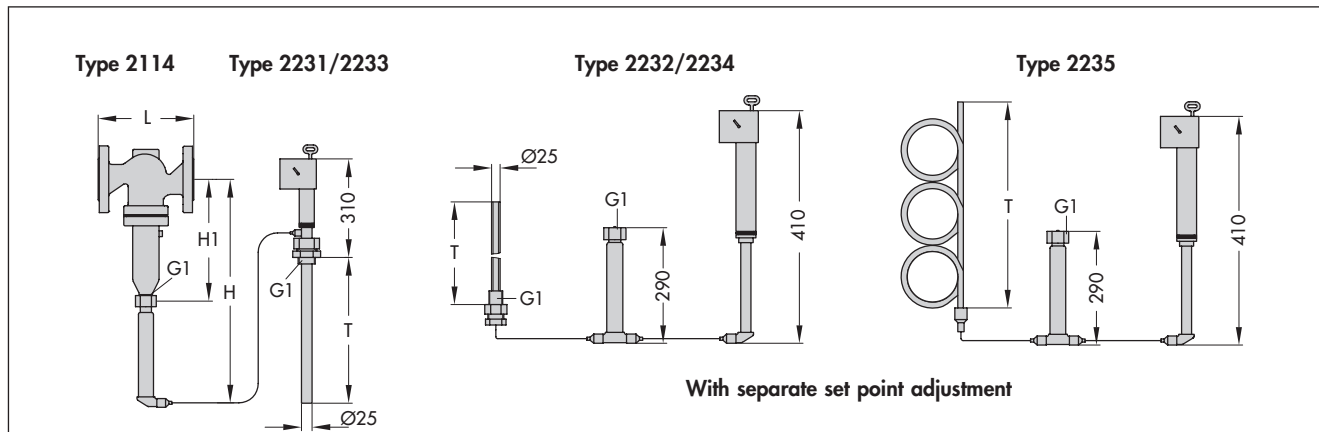


Fig. 6 · Pressure-temperature diagram

Dimensions with Type 2114 Valve - Balanced by a bellows



Dimensions in mm and weights

Type 2114 Valve - Balanced by a bellows															
Nominal size	DN	15	20	25	32	40	50	65	80	100	125	150	200 ¹⁾	250 ¹⁾	
Length L		130	150	160	180	200	230	290	310	350	400	480	600	730	
H	Up to 220 °C (without extension piece)	225						300		355	460	590	730		
T	Up to 350 °C (with extension piece)	365						440		495	600	730	870		
H	Up to 220 °C (without extension piece)	515						590		645	750	880	1020		
	Up to 350 °C (with extension piece)	655						730		785	890	1020	1160		
Weight ²⁾ , approx. kg		5	5.5	6.5	13	13.5	16	27	32	40	70	113	255	300	

¹⁾ Only with Type 2231 and Type 2232 Thermostat in size 250 · ²⁾ For PN 16, +15 % for PN 25 and 40

Type 2231 to Type 2235 Control Thermostat

Control thermostat	Type 2231	Type 2231/2232 Size 250	Type 2232	Type 2233	Type 2234	Type 2235
Immersion depth T	290 ¹⁾	≈ 980	235 ¹⁾	430	460	3460
Weight, approx. kg	3.2	6.5	4	3.4	3.7	3.6

¹⁾ Larger immersion depths available on request

Fig. 7 · Dimensions of Type 2114 Valve balanced by a bellows with Type 2231 to Type 2235 Thermostat

Dimensions with Type 2114 Valve - Balanced by a diaphragm

Dimensions in mm and weights

Type 2114 Valve - Balanced by a diaphragm					
Nominal size	DN	125	150	200	250
Length L		400	480	600	730
H1	Up to 220 °C (without extension piece)	575	600	670	
	Up to 350 °C (with extension piece)	715	740	810	
H2		145	175	260	
Weight, approx. kg		52	72	217	227

Refer to Fig. 7 for data concerning Type 2231 to 2235 Control Thermostat

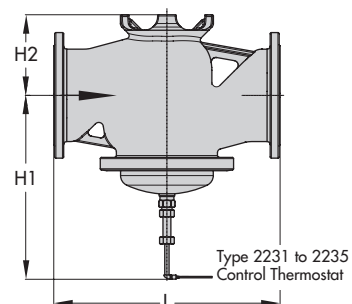
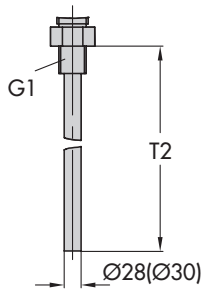


Fig. 8 · Dimensions of Type 2114 Valve balanced by a diaphragm with Type 2231 to Type 2235 Thermostat

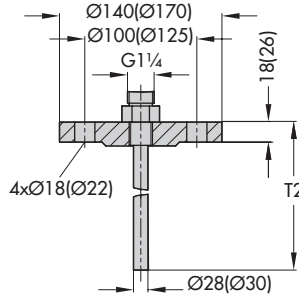
Thermowells for Type 2231/2232

Thermowells with threaded or flanged connection

Thermostat Type	2231	2231/2232 Size 250	2232
Imm. depth T2	mm	325	≈ 995



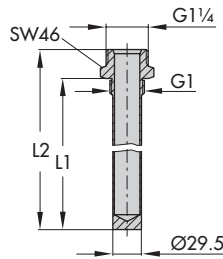
Threaded connection
G 1/PN 40/PN 100
Dimensions for PN 100 in parentheses



Flanged connection
DN 32/PN 40,
DN 40/PN 100
(dimensions in parentheses)

Thermowells for flammable gases (PN 100)

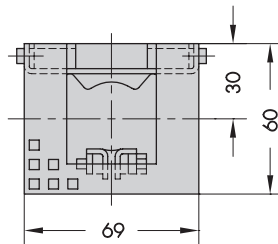
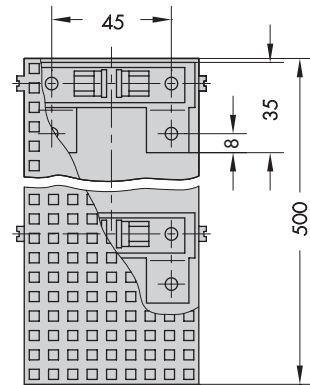
Control thermostat	Type 2231	Type 2232
Length L1	mm	315
Length L2	mm	280



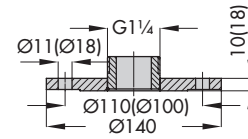
Thermowell for flammable gases
G 1/PN 100

Mounting parts for Type 2233/2234

Clamps and perforated cover for wall mounting

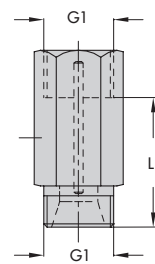


Flange of steel/CrNiMo steel
Flange PN 6, outer Ø 140



Flange DN 32/PN 40,
dimensions in parentheses

Distance piece/extension piece



Weight approx. 0.2/0.5 kg

¹⁾ Distance piece: L = 55 mm
Extension piece: L = 140 mm

Fig. 9 · Dimensions of accessories

Ordering text

Temperature Regulator Type 4/...

DN ..., PN ...

Body material ...

With Thermostat Type ...

Set point range ... °C

Length of capillary tube ... m

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

Conversion of valve sizing coefficients:

$$C_V \text{ (in U.S. gallons/min)} = 1.17 \cdot K_{VS} \text{ (in m}^3\text{/h)}$$

$$K_{VS} \text{ (in m}^3\text{/h)} = 0.86 \cdot C_V \text{ (in U.S. gallons/min)}$$

Specifications subject to change without notice.



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