

Self-operated Temperature Regulators

Temperature Regulator Type 1u



Application

Temperature regulators for cooling installations · Control thermostats for set points ¹⁾ from **-10 to 250 °C** · **G ½ to G 1** or **DN 15 to 50** · Nominal pressure **PN 25** · Suitable for liquids up to **150 °C** and non-flammable gases up to **80 °C**

The valve **opens** as the temperature rises.

Conversion of valve sizing coefficients

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

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

The regulators consist of a globe valve with female thread (G ½ to G 1) or flanged body (DN 15 to 50) and a control thermostat, comprising a temperature sensor, set point adjuster with excess temperature protection, capillary tube and operating element.

Special features

- Low-maintenance P regulators requiring no auxiliary energy
- Wide set point range and convenient set point adjustment indicated on a dial
- Globe valves with plug balanced by a bellows (DN 32 to 50)
- Suitable for liquids, particularly for cooling media, e.g. cooling water and brine

Versions

Type 1u Temperature Regulators · Type 2121 Valve with G ½ to G 1 female thread, PN 25, unbalanced or Type 2121 Valve with flange DN 15 to 50, PN 25, balanced DN 32 to 50
Type 2231 to 2234 Control Thermostat

For details on the application of the control thermostats, refer to Information Sheet T 2010 EN.

Type 2121/2231 (Fig. 1) · With Type 2121 Valve and Type 2231 Control Thermostat for liquids · Set point adjustment at the sensor · Set points from **-10 to +150 °C**

Type 2121/2232 (Fig. 2) · With Type 2121 Valve and Type 2232 Control Thermostat for liquids and steam · Separate set point adjustment · Set points from **-10 to +250 °C**

Type 2121/2233 · With Type 2121 Valve and Type 2233 Control Thermostat for liquids, air and gases · Set point adjustment at the sensor · Set points from **-10 to +150 °C**

Type 2121/2234 · With Type 2121 Valve and Type 2234 Control Thermostat for liquids, steam, air and gases · Separate set point adjustment · Set points from **-10 to +250 °C**

Special version

- Capillary tube 5 m, 10 m, 15 m
- Sensor made of CrNiMo steel
- Capillary tube made of CrNiMo steel or plastic-coated copper

¹⁾ Special version for set points from **-40 to +60 °C**

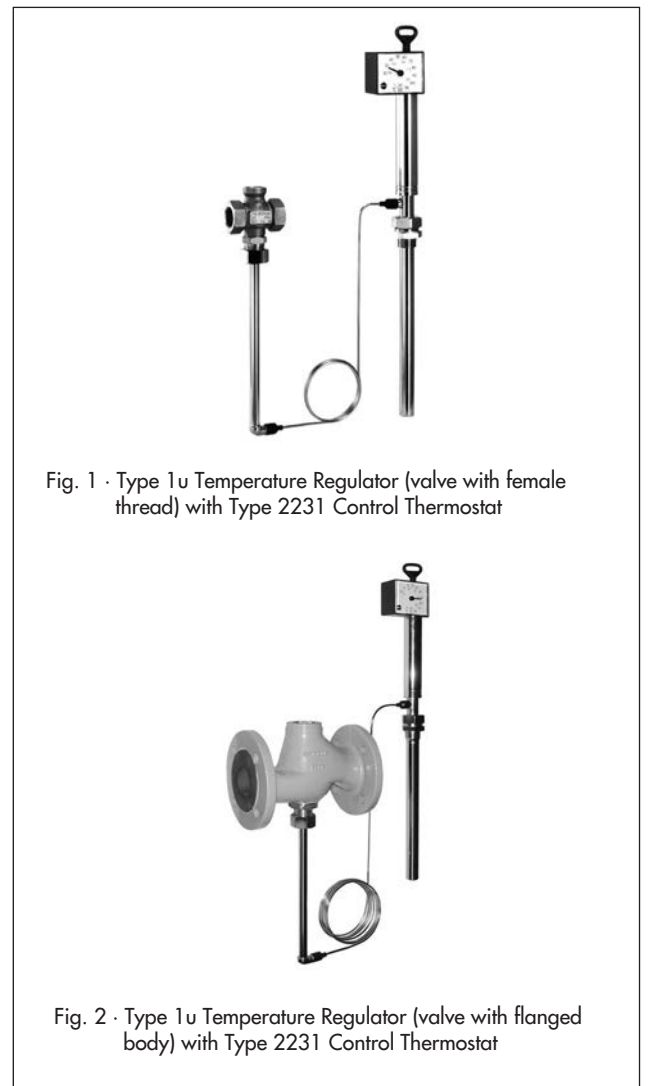


Fig. 1 · Type 1u Temperature Regulator (valve with female thread) with Type 2231 Control Thermostat

Fig. 2 · Type 1u Temperature Regulator (valve with flanged body) with Type 2231 Control Thermostat

- Version with minimum flow rate
- Plug with PTFE sealing ring
- Valve free of non-ferrous metal
- Version for oil at max. permissible temperature of 220 °C
- ANSI version on request (see Data Sheet T 2114 EN)

Principle of operation (see Fig. 3)

The regulators operate according to the liquid expansion principle.

The temperature sensor (13), capillary tube (10), and operating element (7) are filled with an expanding liquid. The liquid changes its volume depending on the temperature, causing the operating element (7) and thus the plug stem (5) with the plug (3) of the valve to move.

The position of the plug determines the flow rate of the heat transfer medium across the area released between the plug (3) and seat (2).

The temperature set point can be adjusted with a key (11) to a value that can be read off the dial (12).

Valve

- 1 Valve body
- 2 Valve seat (replaceable)
- 3 Valve plug
- 5 Plug stem
- 5.1 Spring
- 5.2 Balancing bellows
- 6 Threaded nipple with coupling nut

Control thermostat

- 7 Operating element
- 10 Capillary tube connection to the sensor
- 11 Key for set point adjustment
- 12 Set point dial
- 13 Temperature sensor (bulb sensor)

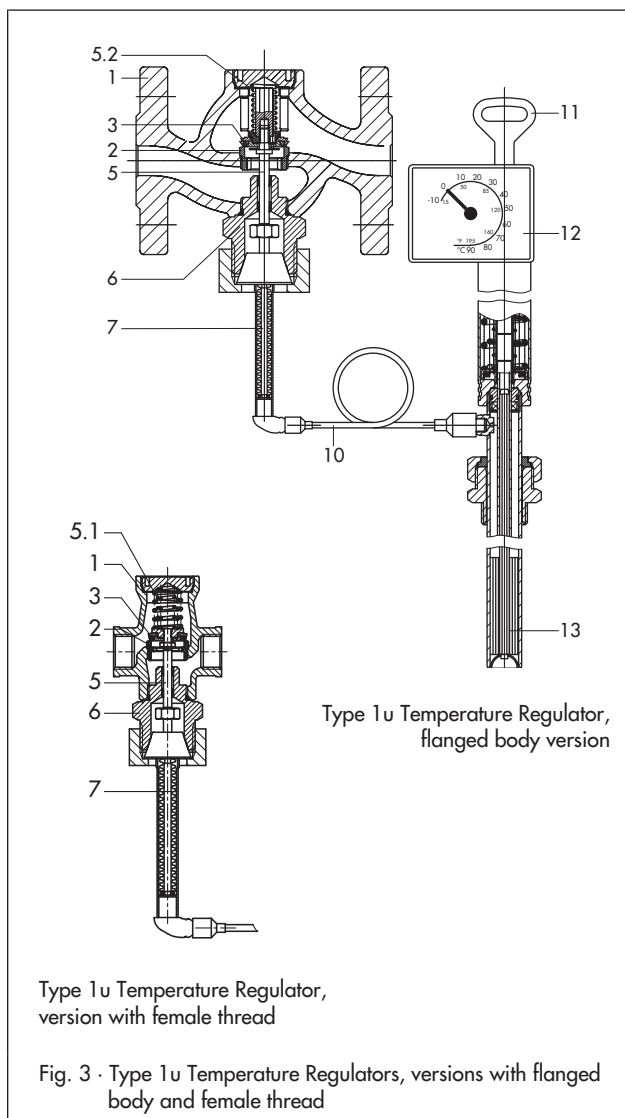


Table 1 · Technical data · All pressures in bar (gauge)

Type 2121 Valve	Female thread			Flanged body										
	PN 25													
Nominal pressure	PN 25													
Connection	G ½	G ¾	G 1	DN 15		DN 20	DN 25	DN 32		DN 40		DN 50		
Kvs coefficient ¹⁾	3.6 ³⁾	5.7	7.2	1.0	2.5	4.0	6.3	8.0	8.0	16 ⁴⁾	8.0	20 ⁴⁾	8.0	32 ⁴⁾
Perm. differential pressure Δp_{max} bar	12			20	10	12	12		8					
Leakage rate acc. to IEC 60534-4	≤ 0.05 % of Kvs coefficient													
Permissible valve temperature	Liquids 150 °C · Non-flammable gases 80 °C													
Types 2231 to 2234 Thermostats		Size 150												
Set point ranges	Type 2231/2233	-10 to 90 °C, 20 to 120 °C or 50 to 150 °C												
(set point span 100 K)	Type 2232/2234	-40 to 60 °C (special version) ²⁾ , -10 to 90 °C, 20 to 120 °C, 50 to 150 °C Types 2232, 2234, 2235 also with 100 to 200 °C or 150 to 250 °C												
Permissible temperature at set point adjustment head	-40 to 80 °C													
Permissible temperature at sensor	100 K above adjusted set point													
Permissible pressure at sensor	Type 2231/2233	Without thermowell: PN 40 · With thermowell: PN 40/PN 100 With thermowell with flange: PN 40/PN 100												
	Type 2232/2234	Without thermowell: PN 40 · With flange PN 6/PN 40												
Length of capillary tube	3 m (special version 5, 10 or 15 m)													

¹⁾ Special version with minimum flow rate available on request · ²⁾ Type 2231 and Type 2232 only · ³⁾ Reduced Kvs 0.4, 1 and 2.5 on request
⁴⁾ Kvs 16, 20 and 32 with valve balanced by a bellows

Table 2 · Materials · Material numbers according to DIN EN

Type 2121 Valve	Threaded connection	Flanged body version
Connection	G ½ to G 1	DN 15 to DN 50
Body	CC491K/CC499K (red brass, Rg 5)	EN-JS1049
Seat	Stainless steel 1.4104	Stainless steel 1.4301
Plug	1.4305 and brass with EPDM soft sealing	CW602N (CuZn36Pb2As) with EPDM soft sealing ¹⁾
Spring	Stainless steel 1.4310K	
Body gasket	–	Graphite on metal core
Separating piece	Brass (special version of stainless steel 1.4305)	
Threaded and guide nipples, plugs, and sleeves	CW602N (CuZn36Pb2As)	

¹⁾ Special version: steel 1.4305 with EPDM or FPM soft sealing, or with metal sealing

Types 2231, 2232, 2233, 2234 Control Thermostats	Standard version	Special version
Operating element	Nickel-plated brass	
Sensor	Type 2231 Type 2232	Nickel-plated bronze
	Type 2233 Type 2234	Nickel-plated copper
	Type 2235	Copper
		–
Capillary tube	Nickel-plated copper	Plastic-coated copper or stainless steel 1.4571
Thermowell		
Threaded connection G1		
Immersion tube	Nickel-plated bronze · Nickel-plated steel	Stainless steel 1.4571
Threaded nipple	Nickel-plated brass · Nickel-plated steel	
Flange connection		
Immersion tube	Steel	Stainless steel 1.4571
Flange	Steel	

Installation

• Valve

Install the valves in horizontal pipelines. The direction of flow must correspond with the arrow on the body. The connecting element must be vertically suspended.



• Temperature sensor

The temperature sensor can be installed in any desired position. Nevertheless, 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; thermowells made of stainless steel 1.4571, for example, can be installed in stainless steel heat exchangers.

• Capillary tube

Install the capillary tube such that it is not exposed to considerable temperature fluctuations and cannot be damaged. Make sure the permissible ambient temperature range (approx. ambient temperature: 20 °C) is not exceeded. The smallest possible bending radius is 50 mm.

Flow rate diagram for water

Valve sizing for other media according to IEC 60534, with the terms: $F_L = 0.95$ and $x_T = 0.75$. The values apply to a fully opened valve.

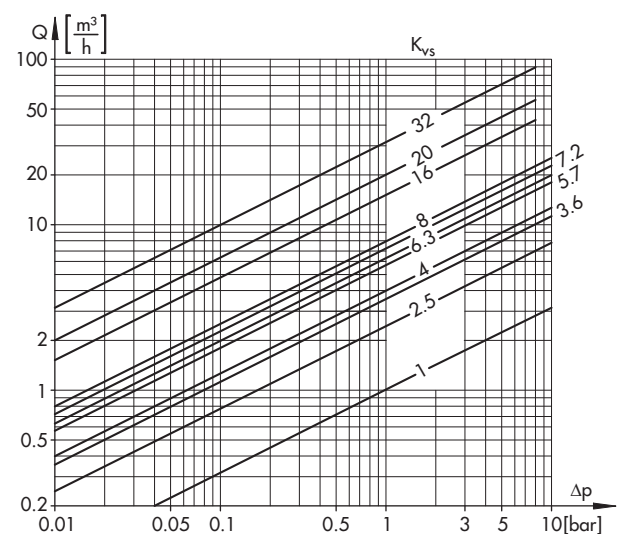
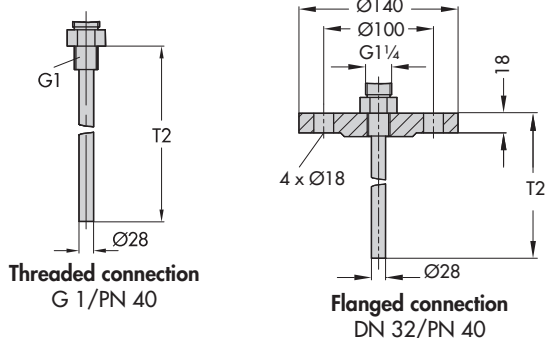


Fig. 4 · Flow rate diagram for water

Thermowells for Types 2231/2232

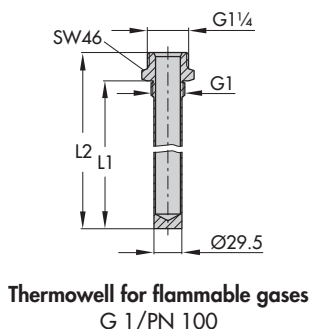
Thermowells with threaded and flanged connections

Control thermostat	Type 2231	Type 2232
Immers. depth T2 in mm	325	250



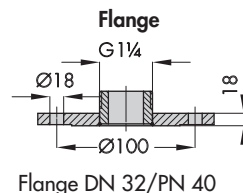
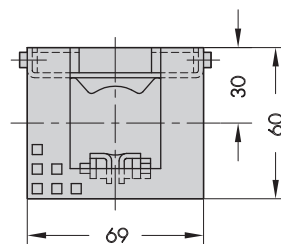
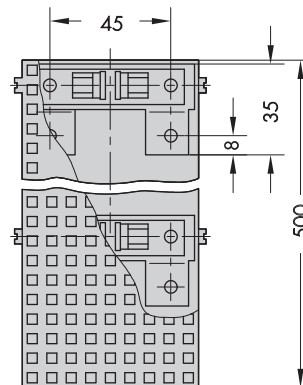
Thermowells for flammable gases (PN 100/PN 63)

Control thermostat	Type 2231	Type 2232
Length L1	mm 315	255
Length L2	mm 340	280



Mounting parts for Types 2233/2234

Clamps and perforated cover for wall mounting



Extension piece/separating piece

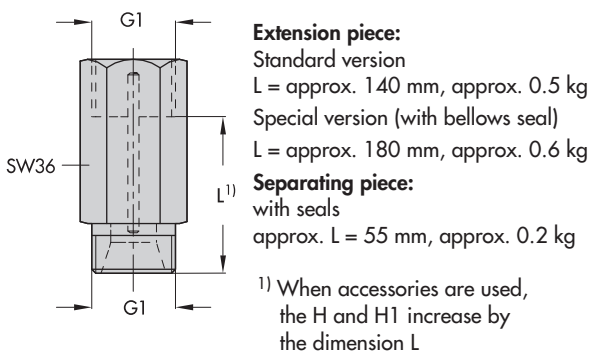


Fig. 5 · Accessories, dimensions

Accessories

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

Thermowells typetested by **DVGW** (German gas & water assoc.) for flammable gases, G 1 threaded connection, PN 100

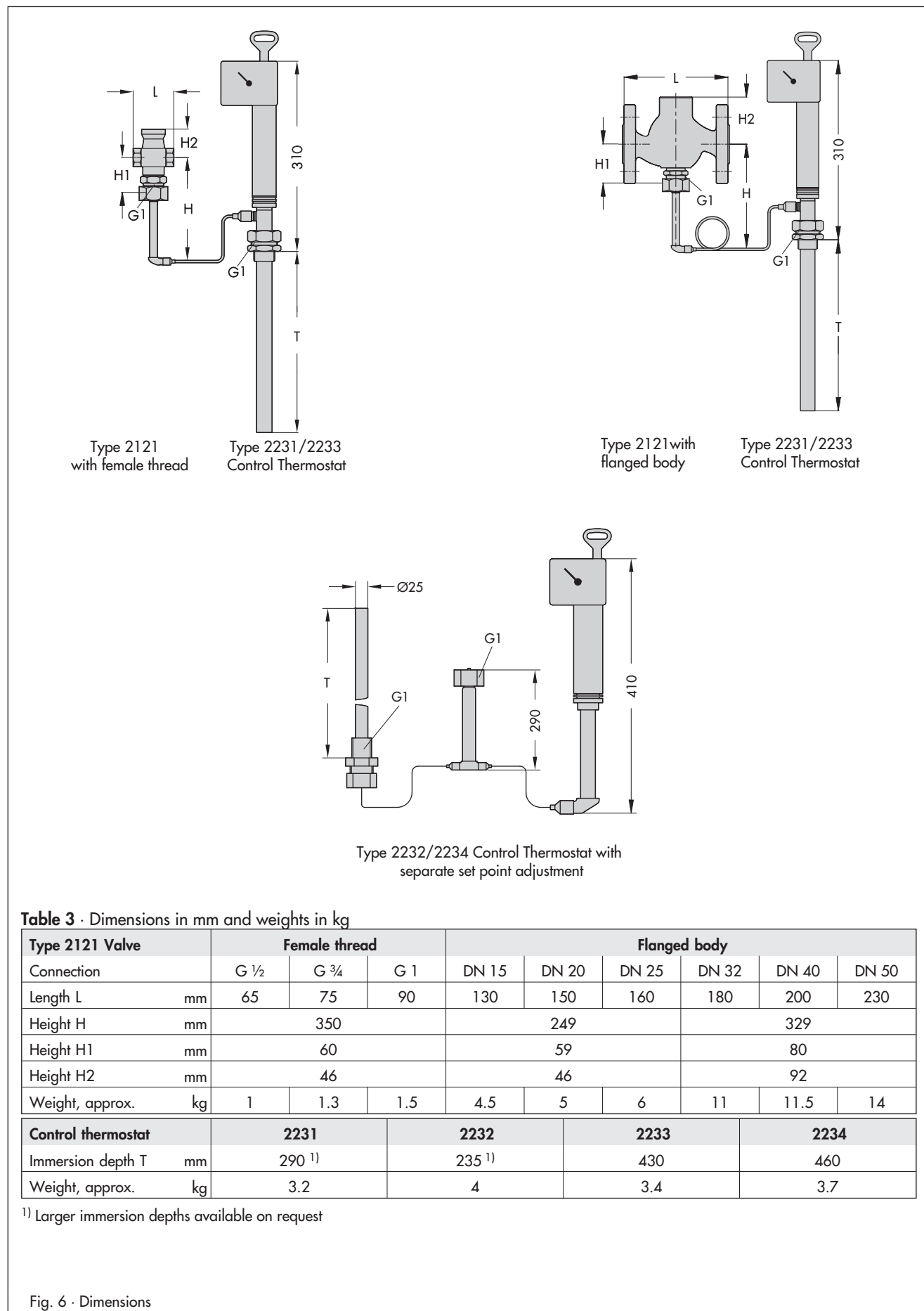
Mounting parts for Type 2233 and Type 2234 · Clamps for wall mounting · Perforated cover for thermostat

To protect the operating element against impermissible operating conditions, an extension piece or separating piece is mounted between the valve and operating element.

An **extension piece** is needed for temperatures over 220 °C. The standard version does not have sealing. The special version of the extension piece is made of stainless steel and has a bellows seal. It additionally acts as a separating piece.

In combinations with Type 2212 Safety Temperature Limiter or Type 2213 Safety Temperature Monitor, an extension piece is required for temperatures over 150 °C.

Dimensions



A **separating piece** is made of brass (for water and steam) or CrNi steel (for water and oil).

A separating piece must be used when a seal between thermostat and valve is required. Separating pieces made of CrNi steel must be used when all wetted parts are to be free of non-ferrous metals.

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

Manual adjuster Ma with travel indicator · MaS with electric signal transmitter

Dynamic behavior of the thermostats

The dynamics of the regulator are mainly determined by the response of the sensor with its characteristic time constant.

Table 3 lists the response times of SAMSON sensors operating on different principles when tested in water.

Table 3 · Dynamic response 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)
	2213	70	120
Adsorption	2212	-1)	40

1) Not permissible

Ordering text

Temperature Regulator Type 1u

DN ... / G ..., PN 25

With flanged body/female thread

Body material

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

Capillary tube ... m,

Special version or accessories, if required

Specifications subject to change without notice.

