Self-operated Temperature Regulators

Type 1u Temperature Regulator

Version according to ANSI

Application

Temperature regulators for cooling plants · **Control thermostats** for **set points**[1] from **15** to **480 °F** (–10 to 250 °C) · Valves in **NPS** ½ to **2** · Pressure ratings **Class 125** to **300** · For **gases** up to **175 °F** (80 °C) and **liquids** up to **300 °F** (150 °C)

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

The regulators consist of an unbalanced valve and a control thermostat with temperature sensor, set point adjuster with overtemperature 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 on a scale
- Single-seated valves with unbalanced plug suitable for liquids, particularly for cooling media such as cooling water and cooling brine

Versions

Type 1u Temperature Regulator · With Type 2121 Valve with flanged connection · NPS ½ to 2 · Class 125 to 300 · Type 2231 to 2234 Control Thermostat · Unbalanced valve · Opening

Refer to Information Sheet T 2010 EN for details on the application of control thermostats.

Type 2121/2231 · With Type 2231 Control Thermostat for liquids · Set point adjustment at the sensor · Set points[1] from 15 to 300 °F (–10 to +150 °C)

Type 2121/2232 (Fig. 1) · With Type 2232 Control Thermostat for liquids and steam · Separate set point adjustment · Set points[1] from 15 to 480 °F (–10 to +250 °C)

Type 2121/2233 · With Type 2233 Control Thermostat for liquids, air and other gases · Set point adjustment on the sensor Set points from 15 to 300 °F (–10 to +150 °C)

Type 2121/2234 · With Type 2234 Control Thermostat for liquids, steam, air and other gases · Separate set point adjustment Set points from 15 to 480 °F (–10 to +250 °C)

Fig. 1 · Type 1u Temperature Regulator with Type 2232 Control Thermostat with separate set point adjustment

Special versions

- Capillary tube 16, 33 or 50 ft (5, 10 or 15 m)
- Sensor of CrNiMo steel
- Capillary tube of CrNiMo steel or plastic-coated copper
- Version with minimum flow rate
- Plug with PTFE seal
- Valve free of non-ferrous metal
- Valve completely of corrosion-resistant material
- Version for oil at max. permissible temperature of 430 °F (220 °C)

[1] Special versions for set points from –40 to 160 °F (–40 to 60 °C)

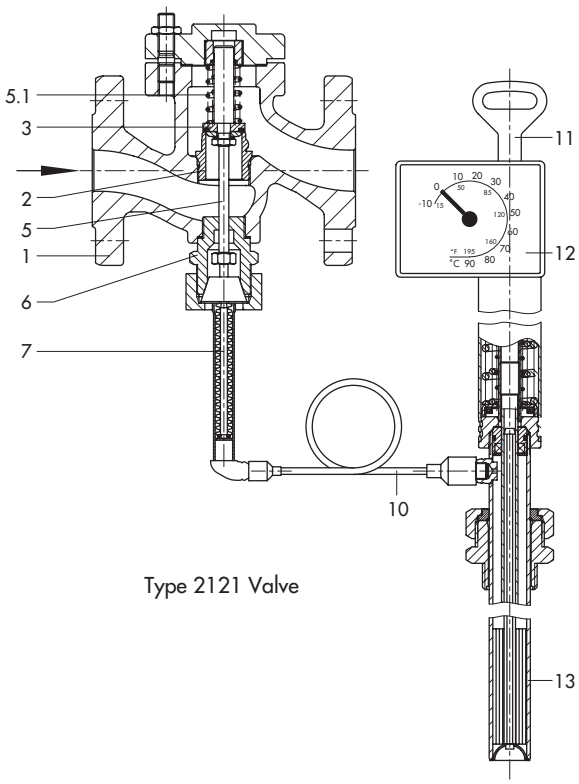
Principle of operation (see Fig. 2)

The regulators operate according to the liquid expansion principle.

Temperature sensor (13), capillary tube (10) and operating element (7) are filled with an expansion liquid.

The liquid changes its volume depending on the temperature, causing the operating element (7) and thus the valve's plug stem (5) with the plug (3) to move. The position of the plug determines the flow rate of the heat transfer medium across the area released between the plug and seat (2).

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



Type 2121 Valve

Type 2231 Control Thermostat

Fig. 2 · Type 1u Temperature Regulator, ANSI version

Valve

1 Valve body
2 Seat (replaceable)
3 Plug
5 Plug stem
5.1 Spring
6 Threaded nipple with coupling nut

Control thermostat

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

Table 1 · Technical data · All pressures as gauge pressures

Type 2121 Valve		**Flanged connection**				
Pressure rating		Class 125/150/300				
Valve size	NPS	½	¾	1	1½	2
C_V and K_{VS}[1)]	C_V (US gal/min)	5	7.5	9.4	23	37
	K_{VS} (m³/h)	4	6.3	8	20	32
Permissible differential pressure Δp_{max}		145 psi · 10 bar			45 psi · 3 bar	
Leakage rate		≤ 0.05 % of C_V (K_{VS})				
Permissible temperature at the valve		Liquids: 300 °F · 150 °C / Gases: 175 °F · 80 °C				
Types 2231 to 2234 Control Thermostats · Size 150						
Set point ranges (set point span 100 K each)	Type 2231/2233	15 to 195 °F, 70 to 250 °F, 120 to 300 °F · –10 to 90 °C, 20 to 120 °C, 50 to 150 °C				
	Type 2232/2234	–40 to 140 °F (special version), 15 to 195 °F, 70 to 250 °F, 120 to 300 °F, 210 to 390 °F, 300 to 480 °F · –40 to 60 °C (special version), –10 to 90 °C, 20 to 120 °C, 50 to 150 °C, 100 to 200 °C or 150 to 250 °C				
Permissible temperature at set point adjuster		–40 to 80 °C · –40 to 175 °F				
Permissible temperature at sensor		100 K above adjusted set point				
Permissible pressure at sensor (Types 2231/2232/2233/2234)		With/without thermowell: Class 300 · Version with flanges or other pressure ratings on request				
Length of capillary tube		10 ft (special version with 16, 33 or 50 ft) · 3 m (special version with 5, 10 or 15 m)				

1) Special version with minimum flow rate available on request

Table 2 · Materials · Material designations according to ASTM and DIN EN

Type 2121 Valve				
Pressure ratings		**Class 125**	**Class 150**	**Class 300**
Valve size		**NPS 1, 1½, 2**	**NPS ½ to 2**	
Body		Cast iron A 126 B (EN-JL1040)	A 216 WCC (1.0619)	
Seat		Stainless steel 1.4101		
Plug		Stainless steel 1.4101 with EPDM soft seal, max. perm. temperature 300 °F (150 °C) · With PTFE soft seal, max. perm. temperature 430 °F (220 °C)		
Sealing ring		Graphite with metal core		
Lower part		Steel with CrNi bushing · With brass bushing		
Distance piece		Brass (for sealing) · Stainless steel 1.4301(for version free of non-ferrous metal)		
Types 2231, 2232, 2233, 2234 Control Thermostats		Standard version	Special version	
Operating element		Nickel-plated brass		
Sensor	Types 2231, 2232	Nickel-plated brass	Stainless steel 1.4571	
	Types 2233, 2234	Nickel-plated copper		
Capillary tube		Nickel-plated copper	Plastic-coated copper or stainless steel 1.4571	
Thermowell				
Threaded connection G 1				
Immersion tube		Nickel-plated bronze · Steel	Stainless steel 1.4571	
Threaded nipple		Nickel-plated brass		
Flanschanschluss				
Immersion tube		Steel	Plastic-coated steel or PTFE[1)]	Stainless steel 1.4571
Flange		Steel, plastic-coated sealing surface		

[1)] Plastic coating (up to 150 °F/80 °C): PVC or PPH coating · PTFE version: immersion tube of PTFE · Flange: steel with PTFE sleeve

Installation

Valve

Install the valve in a horizontal pipeline. Make sure the direction of flow corresponds to the arrow on the body. The operating element must be suspended.

If necessary, the operating element can also be installed to point up (see EB 2111/... 2123 EN).

Temperature sensor

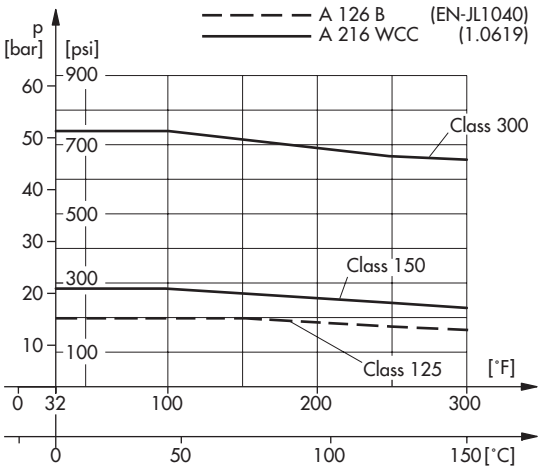
The temperature sensor can be installed in any desired position. Make sure, however, that its entire length is immersed in the process medium. Choose a place of installation where neither overheating nor considerable idle times occur.

Capillary tube

Install the capillary tube so that it is not exposed to considerable temperature fluctuations and cannot be damaged. Make sure the permissible ambient temperature range (approx. ambient temperature of 70 °F/20 °C) is not exceeded. The smallest permissible bending radius is 2" (50 mm).

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.

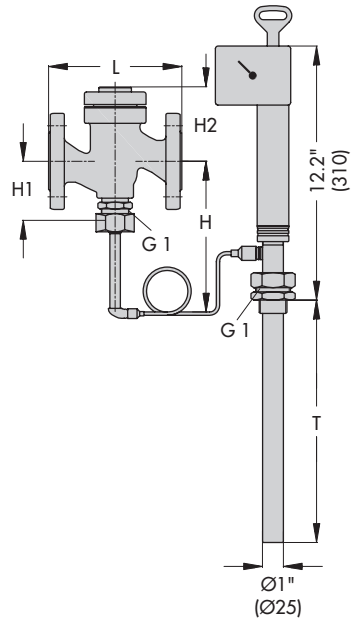
Pressure-temperature diagram acc. to DIN EN 12516-1



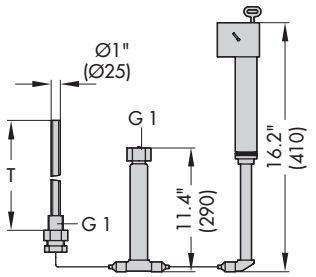
Specifications apply to the valve body.

Fig. 3 · Pressure-temperature diagram

Type 1u Temperature Regulator with Type 2231 or 2233 Control Thermostat



Types 2232/2234 Control Thermostats



Type 2121 Valve

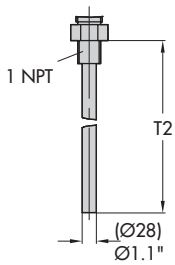
Valve size		NPS	½	¾	1	1½	2
		DN	15	20	25	40	50
Face-to-face length L	Class 125	in	–	–	7.25	8.75	10
		mm	–	–	184	222	254
	Class 150	in	7.25	7.25	7.25	8.75	10
		mm	184	184	184	222	254
	Class 300	in	7.5	7.6	7.75	9.25	10.5
		mm	191	194	197	235	267
Height H		in	14.4			15.6	
		mm	365			395	
Height H1		in	3.0		4.1		
		mm	75		105		
Height H2		in	3.4		3.8		
		mm	87		97		
Approx. weight		lb	9.9	11	13.2	25.3	30.8
		kg	4.5	5	6	11.5	14

Dimensions and weights

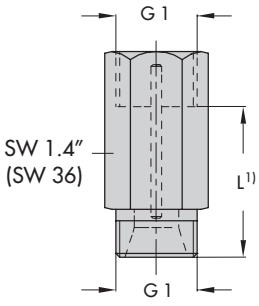
Type … Control Thermostat		2231	2232	2233	2234
Immersion depth T	in	11.4	9.3	16.9	18.1
	mm	290[1)]	235[1)]	430	460
Approx. weight	lb	7	8.8	7.5	8.1
	kg	3.2	4	3.4	3.7

[1)] Greater immersion depths available on request

Thermowell



Extension piece or distance piece



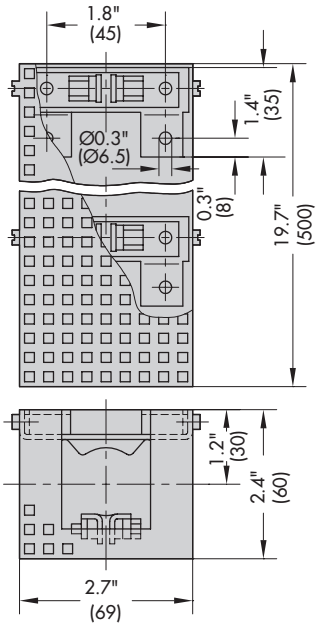
Weight

Extension piece: approx. 1.1 lb/0.5 kg

Distance piece: approx. 0.44 lb/0.2 kg

[1)] Extension piece L = 5.5″ (140 mm)
Distance piece: L = 2.2″ (55 mm)

Clamp and perforated cover for wall mounting



Thermowells for Types 2231/2232

Type … Control Thermostat	2231	2232
Immersion depth T2	12.8″	10″
	325 mm	250 mm

Fig. 4 · Dimensions of control thermostats, valves and accessories

Accessories

Thermowells with threaded or flanged connections for Types 2231 and 2232 Bulb Sensors · 1 NPT threaded connection, Class 300, made of bronze/steel or CrNiMo steel · 1½" flanged connection, Class 300, with immersion tube of steel with PVC/PPH coating, immersion tube of PTFE, Class 50 (flange Class 300)

Thermowells typetested by DVGW for flammable gases, 1 NPT threaded connection, Class 600

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, steam)

Use a distance piece in the stainless steel version to separate the non-ferrous metals of the operating element from the process medium. A distance piece must also be used if a seal between the valve and (brass) thermostat is required. Install the distance piece between the valve and thermostat.

Extension piece for higher permissible temperatures, made of brass, CrNi steel and CrNi steel with sealing bellows for water and oil/heat transfer oil

Double adapter Type Do1 for second thermostat · Type DoS with electric signal transmitter

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

Types 2231 and 2232 Bulb Sensors: thermowells with threaded connection

Types 2233 and 2234 Bulb Sensors: clamps and perforated cover for wall mounting

Ordering text

Type 1u Temperature Regulator
NPS ...

Body in Class … with flanged connection

Body material ...

With Type … Control Thermostat, set point range ... °F (°C), capillary tube length ... ft (m)

Optionally, special version ...

Optionally, accessories ...

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 measured in water of SAMSON thermostats that operate according to different principles.

Table 3 · Response times of SAMSON thermostats

Functional principle	Type … 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

Specifications subject to change without notice.

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