

Self-operated Temperature Regulators

Temperature Regulator Type 1

with unbalanced single-seated globe valve with flanges

ANSI version

Application

Temperature regulator for heating installations · With control thermostats for set points from -15 °F to $+480\text{ °F}$ (-10 °C to $+250\text{ °C}$) · Nominal sizes NPS $\frac{1}{2}$ to 2 · Nominal pressures Class 125 to 300 · For temperatures up to 660 °F (350 °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 an unbalanced valve and a control thermostat, comprising a temperature sensor, a set point adjustment head with an excess temperature safety device, a capillary tube and an operating element.

Special features

- Low-maintenance P-regulators requiring no auxiliary energy
- Wide set point range and easy adjustment of set point indicated on a dial
- Unbalanced, single-seated globe valves, applicable for liquids, gases and vapors, especially for heat transfer fluids, such as water, oil and steam
- Valve body optionally made of cast iron, carbon steel or stainless carbon steel
- Versions with double adapter are available for attachment of a temperature limiter or a second control thermostat. Refer to Data Sheet T 2036 EN for further details.

Versions

Temperature Regulator Type 1 · With Type 2111 Valve with flanges according to ANSI · Nominal sizes NPS $\frac{1}{2}$ to 2 · Class 125 to 300 · Face-to-face dimensions according to ASME/ANSI B 16.10 · Type 2231 to Type 2235 Control Thermostats.

For details on the application of the thermostats, see Information Sheet T 2010 EN.

Type 2111/2231 (Fig. 1) · With Type 2231 Control Thermostat for liquids · Set points from 15 °F to 300 °F (-10 °C to $+150\text{ °C}$) · Set point adjustment at the sensor.

Type 2111/2232 (Fig. 3) · With Type 2232 Control Thermostat for liquids and steam · Set points from 15 °F to 480 °F (-10 °C to $+250\text{ °C}$) · Separate set point adjustment.

Type 2111/2233 · (Fig. 2) · With Type 2233 Control Thermostat for liquids, air and other gases · Set points from 15 °F to 300 °F (-10 °C to $+150\text{ °C}$) · Set point adjustment at the sensor.

Type 2111/2234 · With Type 2234 Control Thermostat for liquids, air and other gases · Set points from 15 °F to 480 °F (-10 °C to $+250\text{ °C}$) · Separate set point adjustment.

Type 2111/2235 · With Type 2235 Control Thermostat for air-heated storerooms, drying, climatic and heating cabinets · Set points from 15 °F to 480 °F (-10 °C to $+250\text{ °C}$) · Separate set point adjustment and a sensor tube which can be installed by the user.

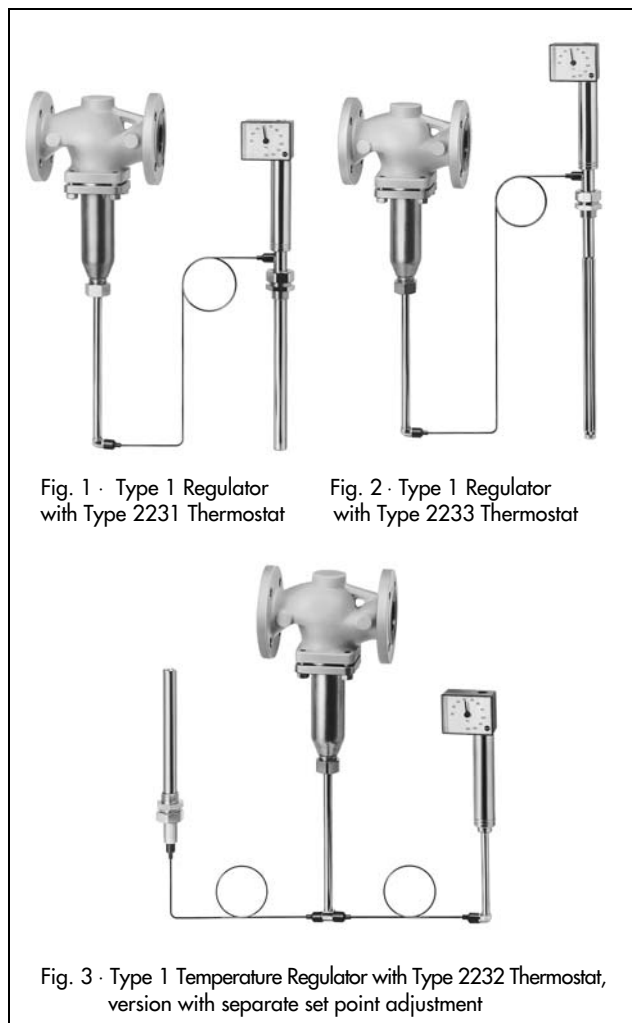


Fig. 1 · Type 1 Regulator with Type 2231 Thermostat

Fig. 2 · Type 1 Regulator with Type 2233 Thermostat

Fig. 3 · Type 1 Temperature Regulator with Type 2232 Thermostat, version with separate set point adjustment

Special version

- Capillary tube of either 16 ft (5 m), 33 ft (10 m), 50 ft (15 m)
- Sensor made of CrNiMo steel
- Capillary tube made of CrNiMo steel/Cu, plastic-coated
- Valve free of non-ferrous metal
- Stainless valve version (only valve with flanges)

Principle of operation (Fig. 4)

The regulators operate according to the liquid expansion principle. The temperature sensor (11), capillary tube (8) and operating element (7) are filled with an expansion liquid. The temperature-dependent change in volume of this liquid causes the operating element (7) to move and as a result also 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 free area between the seat (2) and plug.

The temperature set point is adjustable with a key (9) to a value which can be read off from the dial (10).

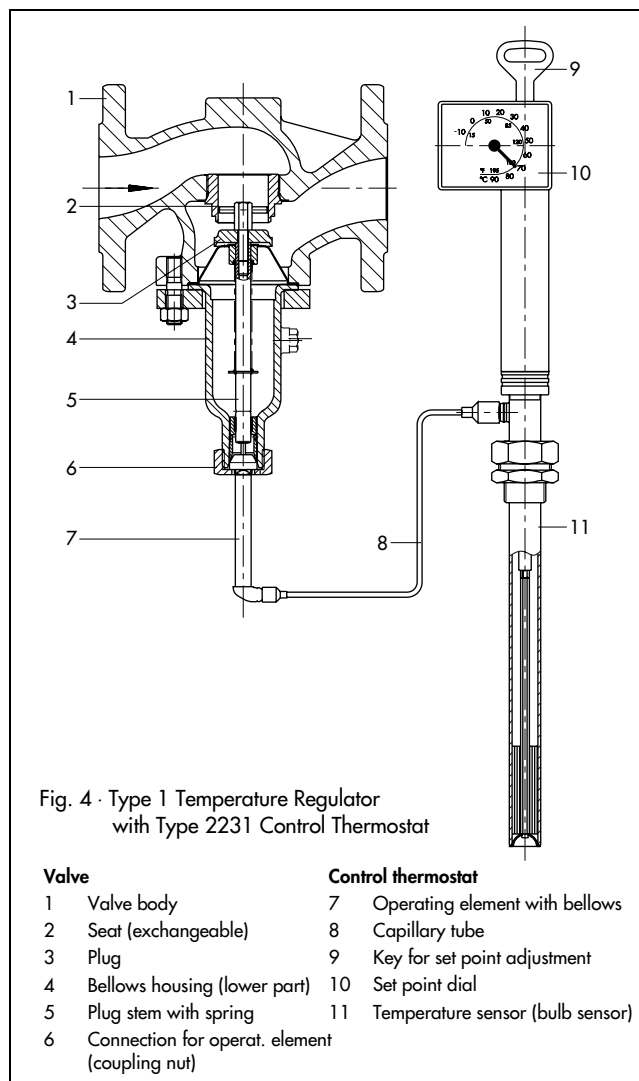


Fig. 4 · Type 1 Temperature Regulator with Type 2231 Control Thermostat

Valve		Control thermostat	
1	Valve body	7	Operating element with bellows
2	Seat (exchangeable)	8	Capillary tube
3	Plug	9	Key for set point adjustment
4	Bellows housing (lower part)	10	Set point dial
5	Plug stem with spring	11	Temperature sensor (bulb sensor)
6	Connection for operat. element (coupling nut)		

Conversion of valve sizing coefficients:

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

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

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

Type 2111 Valve		Class 125 to 300				
Nominal size	NPS	1/2	3/4	1	1 1/2	2
Cv value (standard version)	Cv (US gal/min)	5	7.5	9.4	23	37
Kvs value	Kvs (m ³ /h)	4	6.3	8	20	32
Leakage rate		≤ 0.05% of the Cv (Kvs) value				
Differential pressure Δp	psi	360	230	200	90	60
	bar	25	16	14	6	4
Special version Cv and Kvs values	Cv (US gal/min)	3; 1.2; 0.5; 0.2	5; 3; 1.2; 0.5; 0.2	7.5; 5; 3; 1.2; 0.5; 0.2	9.4	20
	Kvs (m ³ /h)	2.5; 1; 0.4; 0.16	4; 2.5; 1; 0.4; 0.16	6.3; 4; 2.5; 1; 0.4; 0.16	8	16
Differential pressure Δp	psi	360	360	230 360	200	90
	bar	25	25	16 25	14	6
Permissible temperature at the valve		See pressure-temperature diagram				
Type 2231 to Type 2235 Thermostats		Size 150				
Set point range, Set point span, 100 K each	°F	15 to +195 °F, 70 to 250 °F or 120 to 300 °F For Types 2232, 2234, 2235 also 210 to 390 °F, 300 to 480 °F				
	°C	-10 to +90 °C, 20 to 120 °C or 50 to 150 °C For Types 2232, 2234, 2235 also 100 to 200 °C, 150 to 250 °C				
Perm. ambient temperature at the set point adjustment head		-40 to +175 °F (-40 to +80 °C)				
Perm. temperature at the sensor		100 K above the adjusted set point				
Perm. pressure at sensor (Type 2231/..32/..33/..34)		With/without thermowell: Class 300 · Version with flanges or other nom. pressure on request				
Length of the capillary tube		10 ft (special version 16, 33 or 50 ft) · 3 m (special version 5, 10 or 15 m)				

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

Type 2111 Valve			
Nominal size	NPS	1, 1½ and 2	½ to 2
Nominal pressure		Class 125	Class 150 and 300
Body		Cast iron A 126 Class B	Carbon steel A 216 WCC
Seat and plug		1.4006	
Plug stem/spring		1.4301/1.4310	
Bellows housing		1.0425 (St 35.8)	1.4571
Body gasket		Graphite on metal core	
Extension piece/ distance piece		Brass (special version: stainless steel 1.4301)	

Types 2231, 2232, 2233, 2234 and 2235 Thermostat			
		Standard version	Special version
Operating element		Brass, nickel-plated	
Sensor	Types 2231/2	Bronze, nickel-plated	Stainless steel 1.4571
	Types 2233/4	Copper, nickel-plated	
	Type 2235	Copper	
Capillary tube		Copper, nickel-plated	Copper, plastic-coated

Thermowell with threaded connection NPT 1			
Immersion tube		Bronze, nickel-plated	Copper
Threaded nipple		Brass, nickel-plated	Copper
... with flanges			
Immersion tube		Steel	Plastic-coated or PTFE ¹⁾
Flange		Steel	

¹⁾ Plastic coating (for temperatures up to 175 °F/80 °C) · PVC or PPH coating. PTFE version · Immersion tube: PTFE · Flange: Steel with PTFE bushing

Installation

Only the same kind of materials should be combined, for example thermowells made of stainless steel 1.4571 can be installed into heat exchangers made of stainless steel.

Temperature sensor

The temperature sensor may be installed in any desired position. Its whole length must be immersed in the medium to be controlled. It should be installed in a location where overheating or considerable idle times will not occur.



Valve

Install the valves in horizontal pipelines. The medium must flow through the valve in the direction indicated by the arrow on the body. The operating element of the thermostat must be vertically suspended.

Capillary tube

The capillary tube must be laid in such a way that it is not exposed to large temperature fluctuations and cannot be damaged. The ambient temperature should not exceed the permissible limits (approx. temperature: 70 °F (20 °C)).

The smallest permissible bending radius is 2" (50 mm).

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

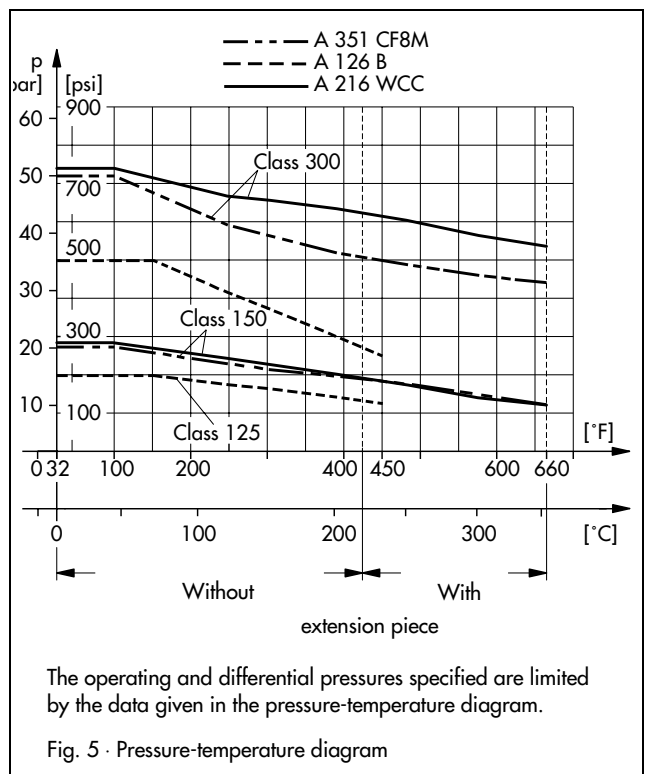
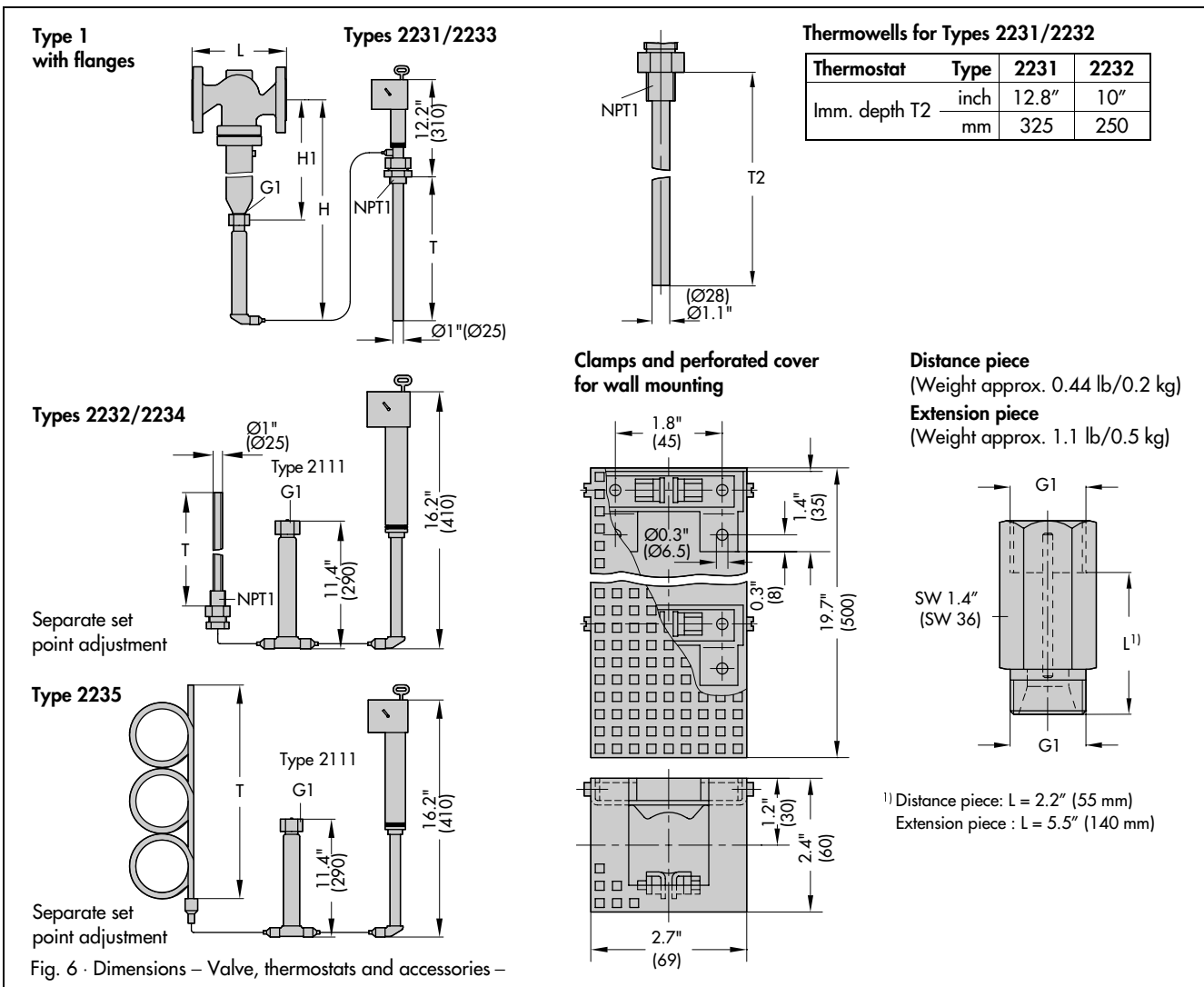


Table 3 · Dimensions and weights

Type 2111 Valve		Nominal size NPS	1/2	3/4	1	1 1/2	2
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	7.62	7.75	9.25	10.5	
	mm	191	194	197	235	267	
H1	Without Extension piece ¹⁾		8.9" / 225 mm				
	With		14.4" / 365 mm				
H	Without Extension piece ¹⁾		20.3" / 515 mm				
	With		25.8" / 655 mm				
Weight, approx. (body Class 125/PN 16) ²⁾	lb		8.8	9.9	12.1	22	29.7
	kg		4	4.5	5.5	10	13.5
Thermostat		Type	2231	2232	2233	2234	2235
Immersion depth T	in		11.4	9.25	16.9	18.1	136.2
	mm		290	235	430	460	3460
Weight, approx.	lb		7.0	8.8	7.5	8.1	7.9
	kg		3.2	4.0	3.4	3.7	3.6

¹⁾ See pressure-temperature diagram ²⁾ +15% for Class 150/300 (PN 25/40)



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 · Flanged connection NPS 1½, Class 300, with steel or CrNiMo steel immersion tube · Immersion tube made of steel with PVC/PPH coating, NPS 1½, Class 300 · Immersion tube made of PTFE, Class 50, flange Class 300

Thermowells typetested by DVGW (German gas & water association) for flammable gases, 1 NPT threaded connection, Class 600

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

Extension piece / distance piece made of brass (for water, steam) or CrNiMo steel (for water, oil, steam)

A distance piece is used in the stainless steel version to separate the non-ferrous metals of the operating element from the process medium flowing through the valve. In addition, it prevents the medium from leaking when the thermostat is replaced. The distance piece is installed between the valve and thermostat.

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

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

In addition, the following types are available:

Safety temperature monitor (STM) and **safety temperature limiter (STL)**. For further information, refer to the Data Sheets T 2043 EN and T 2046 EN.

Typetested safety devices

The register number is available on request.

The following devices are available:

Temperature Regulators (TR) with a Type 2231, 2232, 2233, 2234 or 2235 Control Thermostat and a Type 2111 Globe Valve, in sizes NPS ½ to 2, for which the maximum operating pressure should not exceed the maximum permissible differential pressure Δp specified in the "Technical data" section.

Sensor without thermowell: applicable up to Class 300.

With thermowell: only use SAMSON version, NPT 1, of bronze and 1.4571 up to Class 300.

Temperature Limiters (TL) with a thermostat and a three-way valve as specified above and a double adapter Do1 (see Data Sheet T 2036 EN).

For further details on the selection and application of type-tested devices, see Information Sheet T 2040 EN.

Dynamic behavior of thermostats

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

Table 4 lists the response times of SAMSON thermostats operating according to different principles and measured in water.

Table 4 · Response time of SAMSON thermostats

Operating 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 1

NPS ...

Class ..., body material ...

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

Optional special version ...

Accessories...

Specifications subject to change without notice.



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