

Self-operated Temperature Regulators

Temperature Regulator Type 4



with balanced single-seated globe valve

ANSI version

Application

Temperature regulator for heating installations with control thermostats for **set points** from **15 °F to 480 °F** (–10 °C to +250 °C) · **Nominal sizes NPS 1/2 to 10** · **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 a balanced 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
- Single-seated globe valves with plug balancing by means of a metal bellows
- 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. For details, see Data Sheet T 2036 EN.

Versions

Temperature Regulator Type 4 · Type 2114 Valve with flanges and face-to-face dimensions according to ANSI · Nominal sizes NPS 1/2 to 10 · Class 125 to 300 · **Type 2231 to Type 2235** Control Thermostats · For details on the application of the thermostats, see Information Sheet T 2010 EN.

Type 2114/2231 (Fig. 1) · With Type 2231 Control Thermostat mainly for liquids · Set points from 15 °F to 300 °F (–10 to +150 °C), set point adjustment at the sensor.

Type 2114/2232 (Fig. 3) · With Type 2232 Control Thermostat for liquids and steam · Set points from 15 °F to 480 °F (–10 to +250 °C), separate set point adjustment.

Type 2114/2233 (Fig. 2) · With Type 2233 Control Thermostat for liquids, air and other gases · Set points from 15 °F to 300 °F (–10 to +150 °C), set point adjustment at the sensor.

Type 2114/2234 · With Type 2234 Control Thermostat for liquids, air and other gases · Set points from 15 °F to 480 °F (–10 to +250 °C), separate set point adjustment.

Type 2114/2235 · With Type 2235 Control Thermostat for air-heated storerooms, drying, climatic and heating cabinets · Set points from 15 °F to 480 °F (–10 to +250 °C), separate set point adjustment and a sensor tube which can be installed by the user.

For versions featuring a valve plug balanced by a diaphragm, refer to Data Sheet T 2650 EN.

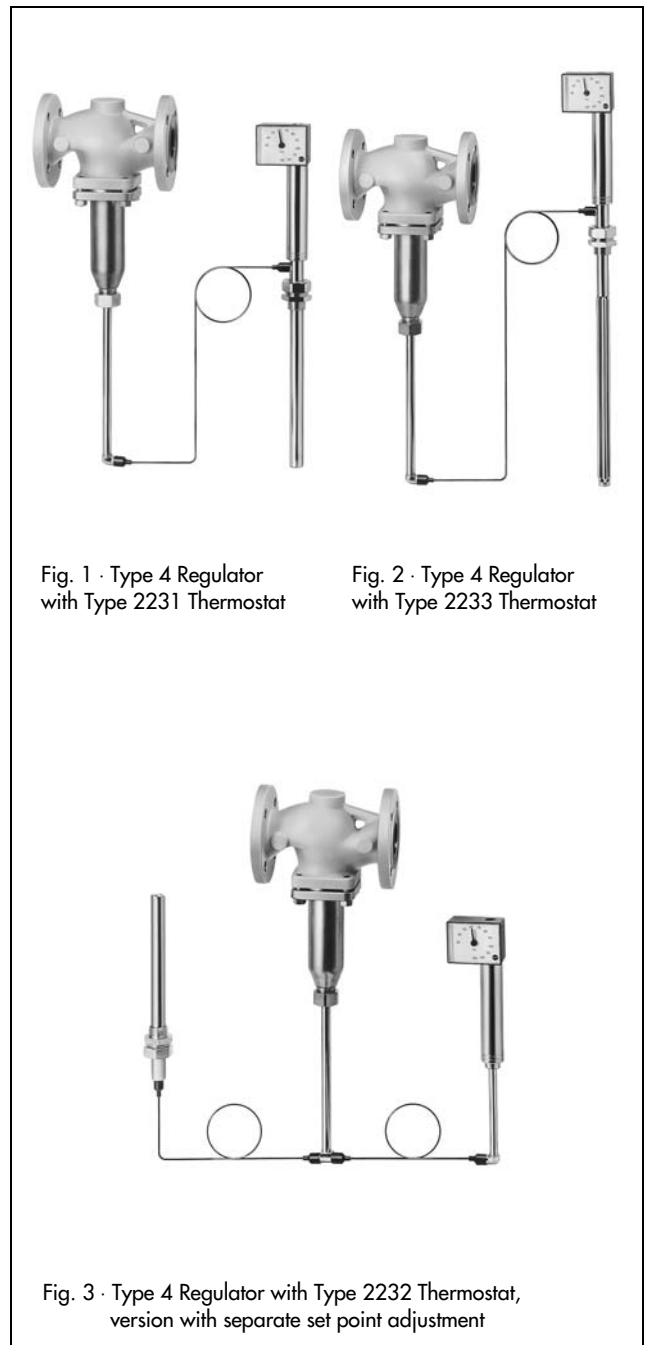


Fig. 1 · Type 4 Regulator with Type 2231 Thermostat

Fig. 2 · Type 4 Regulator with Type 2233 Thermostat

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

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 inside 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 (3).

The set point is adjustable with a key (10) to a value which can be read off from a dial (11).

Valve	Control thermostat
1 Valve body	7 Operating element with bellows
2 Seat	8 Pin of operating element
3 Plug	9 Capillary tube
4 Bellows housing	10 Key for set point adjustment
4.1 Balancing bellows	11 Set point dial
4.2 Vent screw (for NPS 6 and larger)	12 Temperature sensor (bulb sensor)
5 Plug stem with spring	
6 Connection for operating element of the thermostat	

Conversion of valve sizing coefficients:

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

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

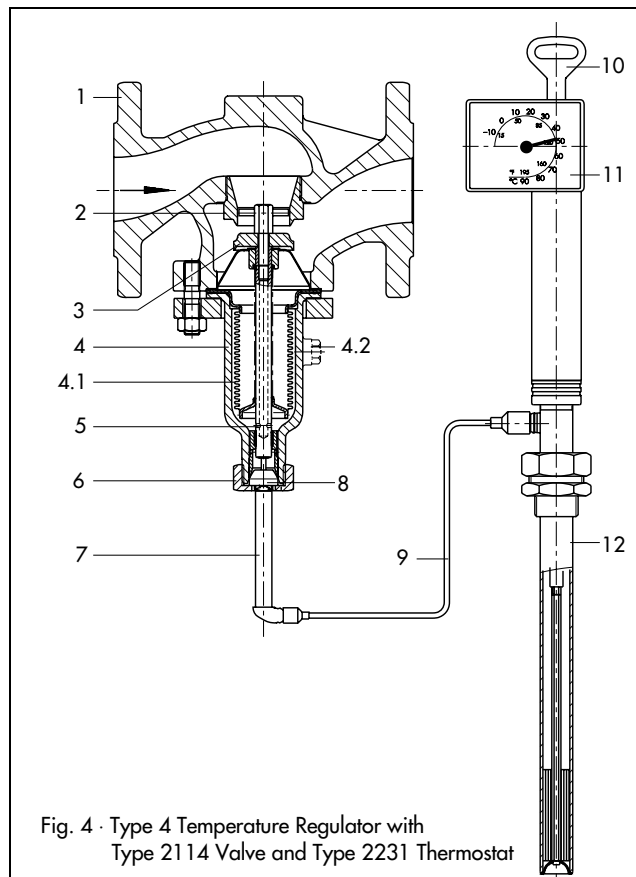


Fig. 4 · Type 4 Temperature Regulator with Type 2114 Valve and Type 2231 Thermostat

Table 1 · Technical data · All pressures in psi or bar (gauge). The permissible pressures and differential pressures specified are limited by the data given in the pressure-temperature diagram.

Type 2114 Valve												
Nominal size	NPS	1/2	3/4	1	1 1/2	2	2 1/2	3	4	6	8	10
C _v values	US gal/min	5	7.5	9.4	23	37	60	94	145	330	490	590
K _{vs} values	m ³ /h	4	6.3	8	20	32	50	80	125	280	420	500
Max. permissible differential pressure Δp	psi	360					290		230	175	145	
	bar	25					20		16	12	10	
Special version	C _v values	3	3; 4.5	5; 7	9.4; 18	20; 30	23; 45	37; 70	60; 110	245	370	440
	K _{vs} values	2.5	2.5; 3.8	4; 6	8; 15	16; 25	20; 38	32; 60	50; 95	210	315	375
Max. permissible differential pressure Δp	psi	360					300		240	175	145	145
	bar	25					20		16	12	10	10
Permissible valve temperature	See pressure-temperature diagram											
Type 2231 to Type 2235 Thermostats												
Size 150												
Set point ranges (standard version)	ANSI	15 to 195, 70 to 250 or 120 to 300 °F For Types 2232, 2234, 2235 also 210 to 390, 300 to 480 °F										Size 250
	DIN	-10 to +90, 20 to 120 or 50 to 150 °C For Types 2232, 2234, 2235 also 100 to 200, 150 to 250 °C										0 to 70, 30 to 100, 50 to 120, 80 to 150 °C
Perm. ambient temperature at the set point adjustment head	-40 to +150 °F (-40 to +80 °C)										-5 to +175 °F (-20 to +80 °C)	
Perm. temperature at the sensor	100 K above the adjusted set point										85 °F (30 °C) above set point	
Perm. pressure at the sensor of Types 2231, 2232, 2233 and 2234	With or without thermowell: Class 300 · Version with flanges or other nominal pressures on request											
Length of capillary tube	ANSI	10 ft (special version: 16 ft, 33 ft or 50 ft)										
	DIN	3 m (special version: 5 m, 10 m or 15 m)										

Terms for valve sizing according to DIN EN 60534 Part 2-1: $F_L = 0.95$ $X_T = 0.75$

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

Type 2114 Valve			
Nominal size	NPS 1 to 10	NPS ½ to 10	
Nominal pressure	Class 125	Class 150 and 300	
Body	Cast iron A 126 B	Carbon steel A 216 WCB/WCC	Stainless carbon steel A 351 CF 8M
Seat and plug	Stainless steel 1.4006		1.4571
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)		1.4301
Types 2231, 2232, 2233, 2234 and 2235 Thermostats			
	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 for Type 2231 and Type 2232			
Connection thread NPT 1			
	Immersion tube	Bronze, nickel-plated	Copper
	Threaded nipple	Brass, nickel-plated	Copper
With flange on request			

Installation

– **Valve**

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



– **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 smallest permissible bending radius is 2”.

– **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.

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

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

The operating and differential pressures specified are limited by the pressure-temperature diagram.

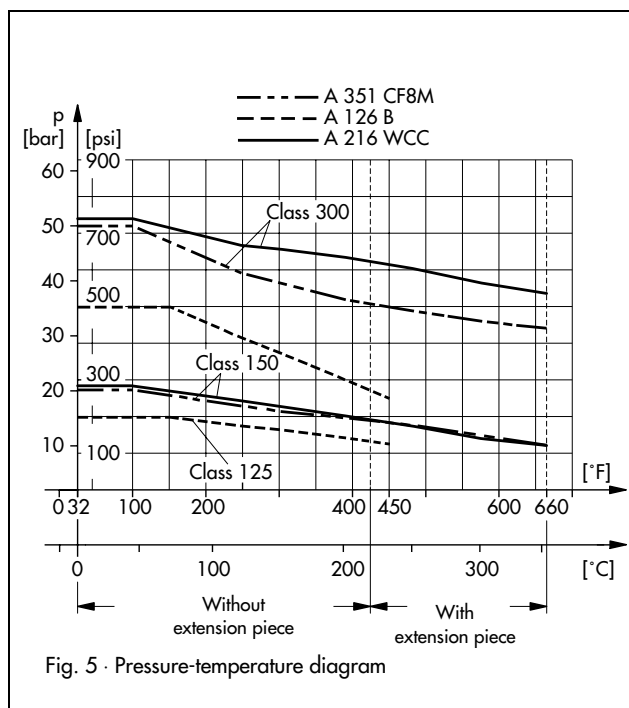


Fig. 5 · Pressure-temperature diagram

Dimensions

Table 3 · Dimensions and weights

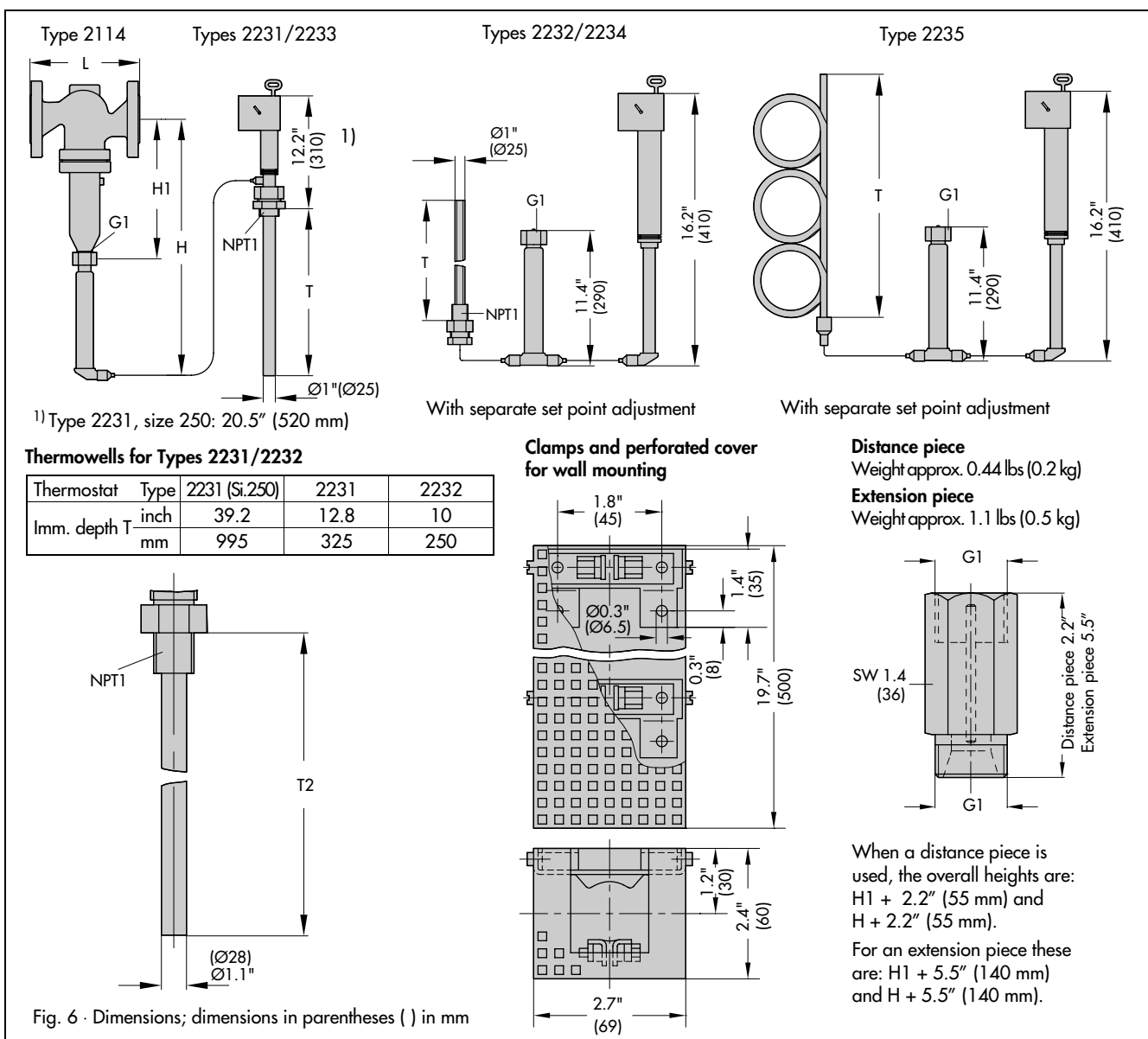
Type 2114 Valve													
Nominal size	NPS	1/2	3/4	1	1 1/2	2	2 1/2	3	4	6	8 ³⁾	10 ³⁾	
Length L	Class 125	inch	–	–	7.25	8.75	10	10.9	11.75	13.9	17.75	21.4	26.5
		mm	–	–	184	222	254	276	298	352	451	543	673
	Class 150	inch	7.25	7.25	7.25	8.75	10	10.9	11.75	13.9	17.75	21.4	26.5
		mm	184	184	184	222	254	276	298	352	451	543	673
	Class 300	inch	7.5	7.6	7.75	9.25	10.5	11.5	12.5	14.5	18.6	22.4	27.9
		mm	191	194	197	235	267	292	318	368	473	568	708
H 1	Without Extension	8.9" (225 mm)					11.8" (300 mm)		14" (355 mm)	23.2" (590 mm)	28.7" (730 mm)		
	With piece ¹⁾	14.4" (365 mm)					17.3" (440 mm)		19.5" (495 mm)	28.7" (730 mm)	34.3" (870 mm)		
H	Without Extension	20.3" (515 mm)					23.2" (590 mm)		25.4" (645 mm)	34.6" (880 mm)	40.2" (1020 mm)		
	With piece ¹⁾	25.8" (655 mm)					28.7" (730 mm)		30.9" (785 mm)	40.2" (1020 mm)	45.7" (1160 mm)		
Weight, approx. ²⁾	lbs (kg)	12.5 (5.5)	12.23 (6)	15.4 (7)	30.9 (14)	37.5 (17)	62 (28)	73 (33)	90 (41)	254 (115)	562 (255)	661 (300)	

Thermostat	Type	2231	2231 Size 250	2232	2233	2234	2235
Imm. depth T	in (mm)	11.4" (290)	38.6" (980)	9.25" (235)	17" (430)	18.1" (460)	136.2" (3460)
Weight, approx.	lbs (kg)	7.1 (3.2)	14.3 (6.5)	9 (4)	7.5 (3.4)	8.2 (3.7)	8 (3.6)

¹⁾ See pressure-temperature diagram

²⁾ Class 150 +10%; Class 300 +15%

³⁾ Only with Type 2231 Thermostat, Size 250



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 immersion tube with PVC/PPH coating · 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

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.

Extension piece for higher permissible temperatures. The following versions are available: made of brass, made of CrNi steel and made of CrNi steel with bellows seal for water and oil/heat transfer oil.

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

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 2114 Valve, in sizes NPS ½ to 10, 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 4

NPS ...

Class ...

Body material ...

With Thermostat Type ...

Set point range ... °F (°C), length of capillary tube ... ft (m)

Optional special version ...

Optional accessories ...

Specifications subject to change without notice.



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