

T 2115 EN

Type 1 Temperature Regulator

Self-operated Temperature Regulators · ANSI version



Application

Temperature regulator with single-seated globe valve (unbalanced) for heating installations · Control thermostats for set points from **15 to 480 °F**/-10 to +250 °C · Valve sizes **NPS ½ to 2** · Pressure rating **Class 125 to 300** · Suitable for temperatures up to **660 °F**/350 °C

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

Note

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

The regulators consist of an unbalanced valve and a control thermostat with temperature sensor, set point adjuster with excess temperature protection, capillary tube and operating element.

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Wide set point range and convenient set point adjustment with a dial
- Single-seated globe valve without pressure balancing, suitable for liquids, gases and vapors, especially for heat transfer media, such as water, oil and steam
- Valve body optionally available in cast iron, spheroidal graphite iron, cast steel or cast stainless steel
- Versions with double adapter for temperature limiters or attachment of a second control thermostat. Refer to Data Sheet ▶ T 2036.

Versions

Type 1 Temperature Regulator with Globe Valve

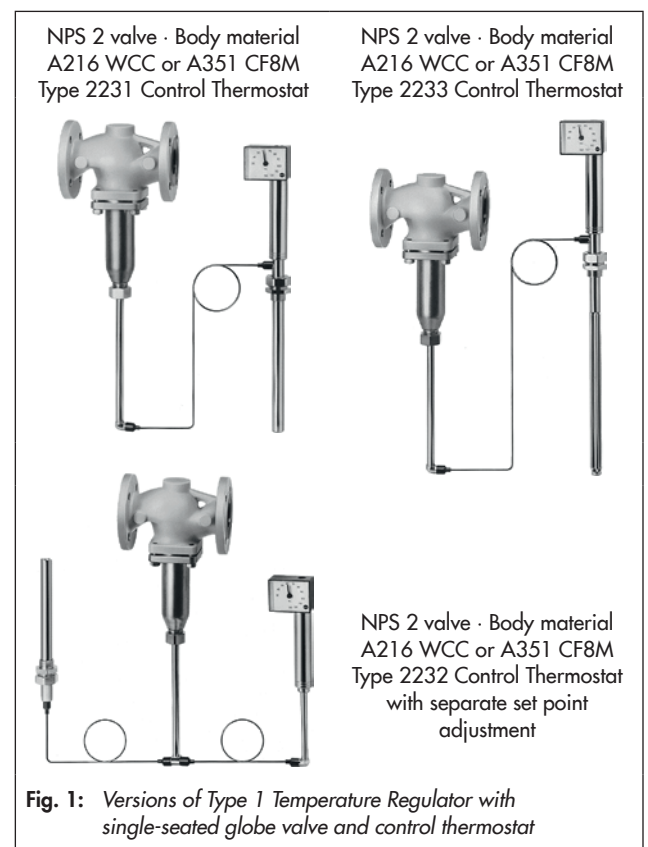
Valve size NPS ½ to 2 · Class 125 to 300 · Face-to-face dimension according to ANSI B16.10 · Type 2231 to 2235 Control Thermostat (see Fig. 1)

Further details on the application of control thermostats can be found in Information Sheet ▶ T 2010.

Type 2111/2231 · With Type 2111 Valve and Type 2231 Control Thermostat · Set points from 15 to 300 °F/-10 to +150 °C · Set point adjustment at the sensor

Type 2111/2232 · With Type 2111 Valve and Type 2232 Control Thermostat · Suitable for liquids and steam · Set points from 15 to 480 °F/-10 to +250 °C · Separate set point adjustment

Type 2111/2233 · With Type 2111 Valve and Type 2233 Control Thermostat · Suitable for liquids, air and other gases · Set points from 15 to 300 °F/-10 to +150 °C · Set point adjustment at the sensor



Type 2111/2234 · With Type 2111 Valve and Type 2234 Control Thermostat · Suitable for liquids, air and other gases · Set points from 15 to 480 °F/-10 to +250 °C · Separate set point adjustment

Type 2111/2235 · With Type 2111 Valve and Type 2235 Control Thermostat · Installation in air-heated storerooms as well as drying, climatic and heating cabinets · Set points from 15 to 480 °F/-10 to +250 °C · Separate set point adjustment and a sensor tube to be installed on site

Special version

- 33 or 50 ft/10 or 15 m capillary tube
- Sensor of CrNiMoTi steel
- Valve free of non-ferrous metal
- Stainless steel valve version

Principle of operation (Fig. 2)

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 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 (9) to a value which can be read off from the dial (10).

Installation

Valve

Install the valves in horizontal pipelines. The control thermostat connection must face downwards and the direction of flow must correspond with the arrow on the valve body.

Capillary tube

The capillary tube must be run in such a way that any large deviations in ambient temperature cannot occur and the ambient temperature range cannot be exceeded. Avoid mechanical damage. The smallest permissible bending radius is 2".

Temperature sensor

The bulb sensor can be installed in any position. However, its entire length must be immersed in the medium. It must be installed in a location where overheating or considerable idling times cannot occur.

Only the combination of the same kind of materials is permitted, e.g. a stainless steel heat exchanger with thermowells made of stainless steel 1.4571.

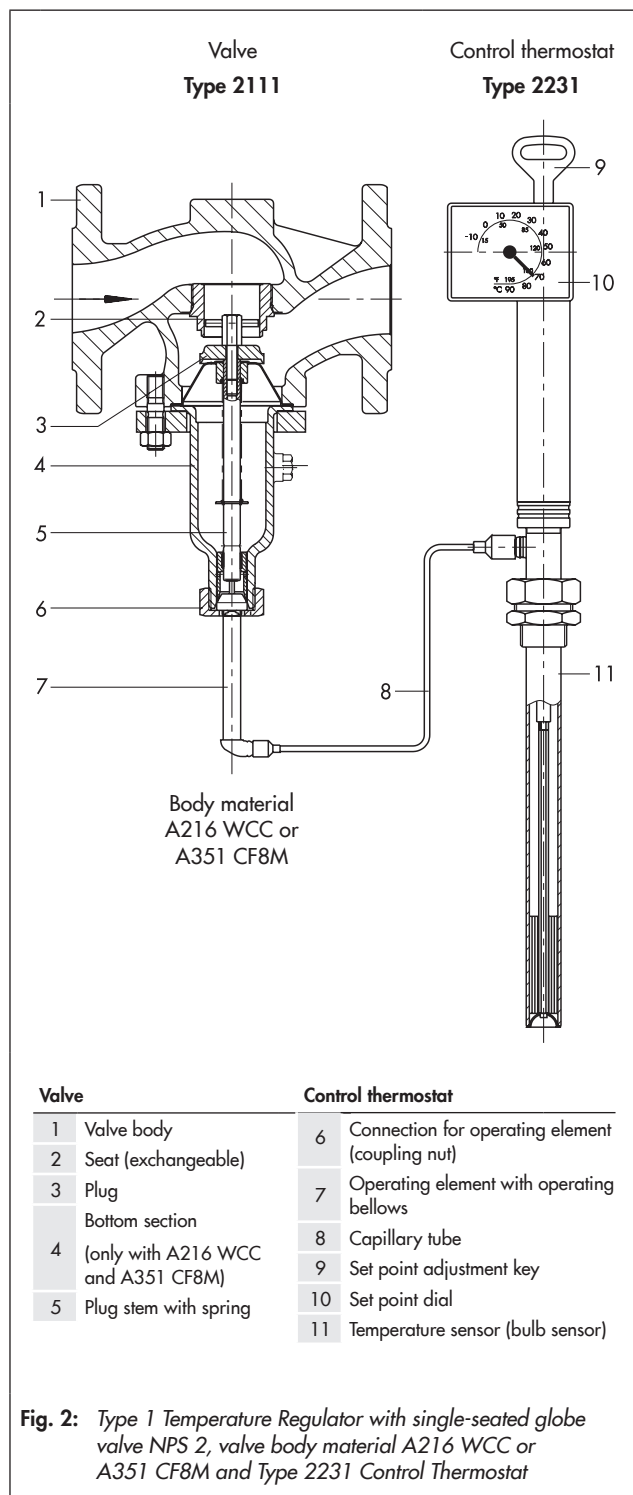


Fig. 2: Type 1 Temperature Regulator with single-seated globe valve NPS 2, valve body material A216 WCC or A351 CF8M and Type 2231 Control Thermostat

Table 1: Technical data · All pressure stated as gauge pressure in psi

Type 2111 Valve						
Pressure rating	Class 125 to 300					
C _V /K _{VS} coefficients, leakage class and max. permissible differential pressures Δp in psi/bar						
Standard version	NPS	½	¾	1	1½	2
C _V coefficient	US gal/min	5	7.5	9.4	23	37
K _{VS} coefficient	m ³ /h	4	6.3	8	16	32
Differential pressure Δp _{max.}	psi	360	230	200	90	60
	bar	25	16	14	6	4
Leakage class according to ANSI/FCI 70-2		≤0.05 % of C _V coefficient				
Special version	NPS	½	¾	1	1½	2
C _V coefficient	US gal/min	3.0 · 1.2 · 0.5 · 0.2		5.0 · 1.2 · 0.5 · 0.2		20
K _{VS} coefficient	m ³ /h	2.5 · 1.0 · 0.4 · 0.1		4.0 · 1.0 · 0.4 · 0.1		16
Differential pressure Δp _{max.}	psi	360			230	90
	bar	25			16	6
Permissible valve temperature		Max. 660 °F/350 °C · See pressure-temperature diagram in ► T 2010				
Types 2231 to 2235 Control Thermostat						
Size 150						
Set point range (set point span 100 K)		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 -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				
Permissible ambient temperature at the set point adjustment		-40 to +175 °F/-40 to +80 °C				
Permissible temperature at sensor		100 K above the adjusted set point				
Permissible pressure at the sensor	Type 2231/2232	Without thermowell: Class 300 · With thermowell: Class 300 ¹⁾ · Thermowell with flange: Class 300 ¹⁾				
	Type 2233/2234	Without thermowell: Class 300 · Thermowell with flange: Class 300 ¹⁾				
Capillary tube length		16 ft (33 or 50 ft as special version)/5 m (10 or 15 m as special version)				

¹⁾ Other pressure ratings for thermowell/flange on request

Table 2: Materials · Material numbers according to ASTM

Type 2111 Valve			
Valve size	NPS	1 to 2	½ to 2
Pressure rating		Class 125	Class 150 and 300
Body		Cast iron A126 Class B	Cast steel A216 WCC
Seat and plug		1.4305	1.4104 · 1.4112
Plug stem · Spring		1.4301 · 1.4310	
Bottom section		1.0425	1.4571
Gasket		Graphite on metal core	
Extension piece · Separating piece		Brass (special version: stainless steel 1.4301)	1.4301
Types 2231, 2232, 2233, 2234 and 2235 Control Thermostats			
Version		Standard version	Special version
Operating element		Nickel-plated brass	
Sensor	Type 2231/2232	Bronze	CrNiMoTi steel
	Type 2233/2234	Copper	—
	Type 2235	Copper	
Capillary tube		Copper	
Thermowell			
... with threaded connection (1 NPT)			
Immersion tube		Bronze · Steel · Copper ¹⁾	CrNiMoTi steel
Threaded nipple		Brass · Steel	
... with flanges			
Immersion tube · Flange		Steel	CrNiMoTi steel

¹⁾ PN 16 only

Accessories

Thermowells with threaded or flanged connections for Types 2231 and 2232 Bulb Sensors · 1 NPT threaded connection, Class 150, made of bronze/steel or CrNiMo steel
NPS 1½ flanged connection, Class 150, with thermowell made of CrNiMo steel/steel

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

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

To protect the operating element from inadmissible operating conditions, an **extension piece or separating piece** must be installed between the valve and the operating element.

An **extension piece** is needed for temperatures over 430 °F/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 valves made of cast iron together with Type 2212 Safety Temperature Limiter or Type 2213 Safety Temperature Monitor, an extension piece is required for temperatures over 300 °F/150 °C.

Separating piece made of brass (for water and steam) or CrNi steel (for water and oil).

A separating piece must be used when a seal between control 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 control thermostat is being replaced.

The following versions are also available:

Safety temperature monitors (STM) and **safety temperature limiters (STL)**. Details can be found in data sheets ► T 2043 and ► T 2046.

Typetested safety devices

The registration number is available on request.

Temperature regulators (TR) with a Type 2231, 2232, 2233, 2234 or 2235 Control Thermostat and a Type 2111 Valve, NPS ½ to 2

Sensor

Without thermowell: can be used up to 600 psi/40 bar, test pressure max. 870 psi/60 bar.

With thermowell: only use SAMSON 1 NPT version made of bronze or stainless steel 1.4571 up to Class 300

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

More details on typetested devices in Data Sheet ► T 2040.

Dynamic behavior of control 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 control thermostats operating according to different principles measured in water.

Table 3: *Dynamic behavior of SAMSON control thermostats*

Principle of operation	Control thermostat Type	Time constant [s]	
		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

Type 2111 / ... Temperature Regulator

NPS ...,

Class ...,

Body material ...

With Type 223... Control Thermostat

Set point range ...°F,

Capillary tube ... ft,

Optionally, special version ...

Accessories ...

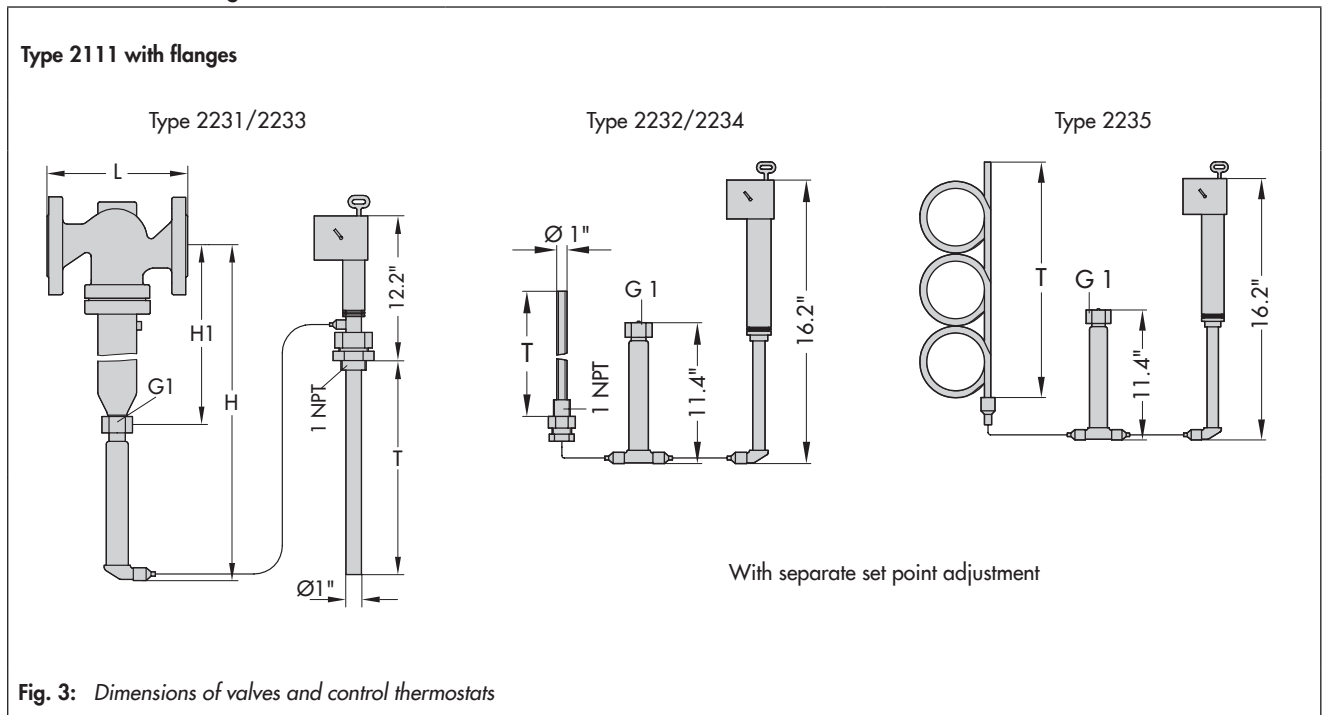
Table 4: Dimensions and weights

Type 2111 Valve		NPS	1/2	3/4	1	1 1/2	2
Length L	Class 125		—	—	7.25"/184 mm	8.75"/222 mm	10"/254 mm
	Class 150		7.25"/184 mm	7.25"/184 mm	7.25"/184 mm	8.75"/222 mm	10"/254 mm
	Class 300		7.5"/191 mm	7.62"/194 mm	7.75"/197 mm	9.25"/235 mm	10.5"/267 mm
H1	Without extension piece		8.9"/225 mm				
	With extension piece		14.4"/365 mm				
H	Without extension piece		20.3"/515 mm				
	With extension piece		25.8"/655 mm				
Weight (based on Class 125) ¹⁾	approx. lb		8.8	9.9	12.1	22	29.7
	kg (approx.)		4.0	4.5	5.5	10	13.5
Control thermostat		Type	2231	2232	2233	2234	2235
Immersion depth T	in		11.4 ²⁾	9.25 ²⁾	16.9	18.1	136.2
	mm		290 ²⁾	235 ²⁾	430	460	3460
Weight	approx. lb		7.0	8.8	7.5	8.1	7.9
	kg (approx.)		3.2	4.0	3.4	3.7	3.6

¹⁾ Body Class 150/300: +15 %

²⁾ Larger immersion depths on request

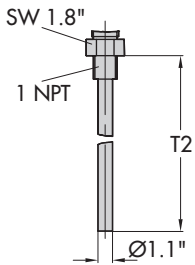
Dimensional drawings of valves and control thermostats



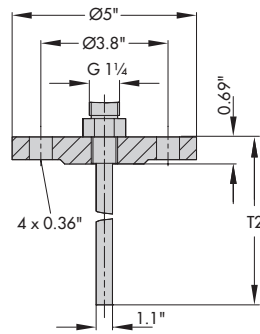
Dimensional drawings of accessories

Thermowells for Type 2231/2232

Control thermostat	Type	2231	2232
Immersion depth T2	in	12.6	9.7
	mm	321	246

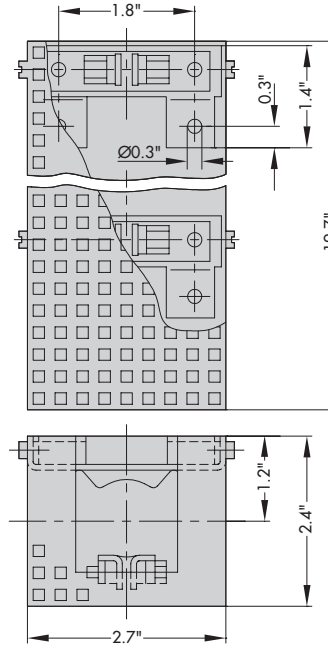


Thermowell with threaded connection
1 NPT/Class 150



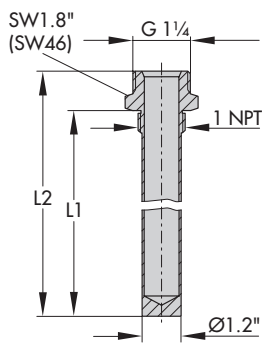
Thermowell with flanges
1½ NPS/Class 150

Clamps and perforated cover for wall mounting



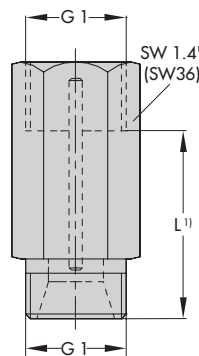
Thermowells for flammable gases (Class 600)

Control thermostat	Type	2231	2232
Length L1	in	12.4	10
	mm	314	254
Length L2	in	13.4	11
	mm	340	280



Thermowell for flammable gases
(1 NPT/Class 600)

Extension piece/separating piece



Extension piece

L = approx. 5.5"/140 mm, approx. 1.1 lb/0.5 kg

With bellows seal (special version),
L = approx. 7.1"/180 mm, approx. 1.3 lb/0.6 kg

Separating piece with seals,

L = approx. 2.1"/55 mm, approx. 0.4 lb/0.2 kg

1) Add the dimension L to H and H1 when these accessories are used.

Fig. 4: Dimensions and weights of accessories