# DATA SHEET

## 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** · Nominal sizes **NPS ½ to 2** · Pressure rating **Class 150 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.

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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 [1] 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**

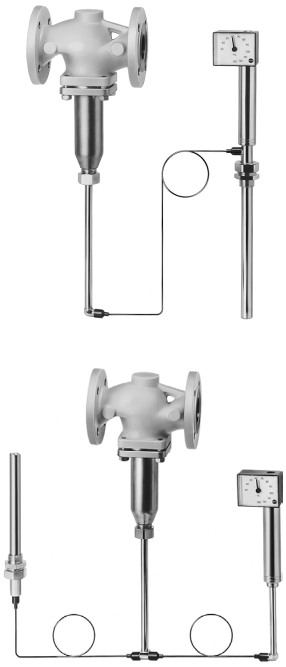
**Type 1 Temperature Regulator with Globe Valve**

Nominal size NPS ½ to 2 · Class 150 to 300 · Face-to-face dimension according to ANSI B16.10 · Type 2231 to 2234 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, Type 2232 Control Thermostat and thermowell suitable for liquids and steam · Set points from 15 to 480 °F/–10 to +250 °C · Separate set point adjustment · With clamping gland for larger immersion depths



NPS 2 valve · Body material A216 WCC or A351 CF8M
Type 2231 Control Thermostat

NPS 2 valve · Body material A216 WCC or A351 CF8M
Type 2232 Control Thermostat with separate set point adjustment

**Fig. 1:** *Versions of Type 1 Temperature Regulator with single-seated globe valve and control thermostat*

**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

[1] Field of applications are the control of Group II fluids according to Pressure Equipment Directive 2014/68/EU.

**Special version**

- 33 and 50 feet (10 and 15 m) capillary tube lengths
- Sensor of CrNiMo steel
- Capillary tube, copper with plastic coating
- 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.

– **Thermowell**

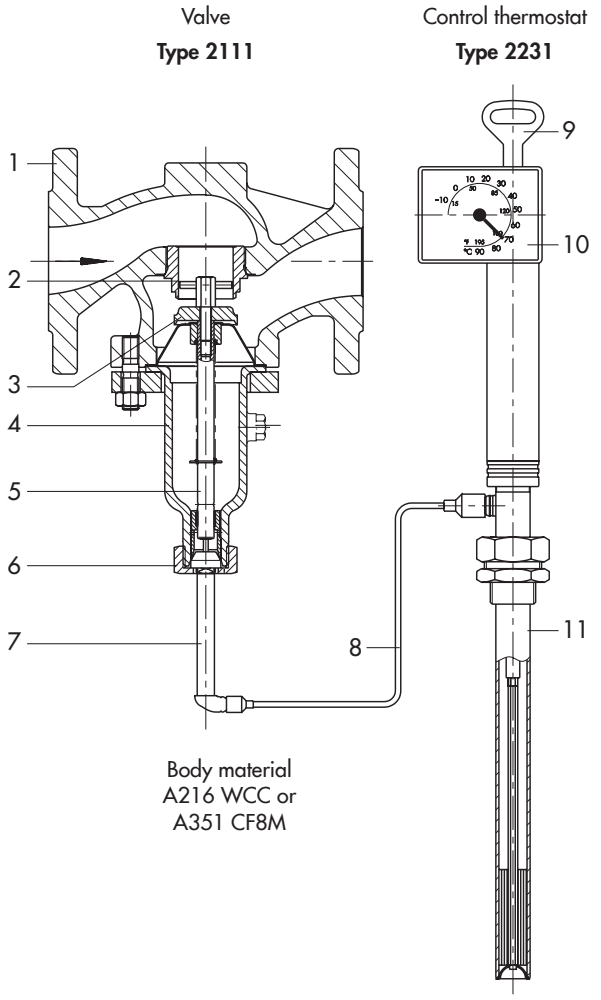
**Type 2231**

The sensor of the control thermostat can be used with or without a thermowell. The standard thermowell length is 11.4"/290 mm.

**Type 2232**

The sensor of the control thermostat can be used with or without a thermowell. The standard thermowell length is 9.3"/235 mm.

The version with clamping gland can be used for larger immersion depths (max. 23.6"/600 mm possible with SAMSON thermowells). It is also possible to use non-SAMSON thermowells provided on site with different immersion depths. In this case, the immersion depth of the sensor can be varied as required depending on the length of the capillary tube.




| Valve | | Control thermostat | |
|---|---|---|---|
| 1 | Valve body | 6 | Connection for operating element (coupling nut) |
| 2 | Seat (exchangeable) | 7 | Operating element with operating bellows |
| 3 | Plug | 8 | Capillary tube |
| 4 | Bottom section (only with A216 WCC and A351 CF8M) | 9 | Set point adjustment key |
| 5 | Plug stem with spring | 10 | Set point dial |
| | | 11 | Temperature sensor (bulb sensor) |

**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*

For reasons of safety and because the function to seal the sensor is missing, the use of the clamping gland is only permitted with a thermowell.

**Type 2234**

The sensor of the control thermostat can only be used without a thermowell. The maximum sensor length is 18.1"/460 mm.

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

| | | | | | | |
|---|---|---|---|---|---|---|
| **Type 2111 Valve** | | | | | | |
| Pressure rating | | Class 150 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 | m³/h | 4 | 6.3 | 8 | 16 | 32 |
| Differential pressure $\Delta p_{max.}$ | 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 | 9.4 | 20 |
| $K_{VS}$ coefficient | m³/h | 2.5 · 1.0 · 0.4 · 0.1 | | 4.0 · 1.0 · 0.4 · 0.1 | 6.3 | 16 |
| Differential pressure $\Delta p_{max.}$ | 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 2234 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<br>For Types 2232 and 2234 also 210 to 390 °F, 300 to 480 °F | | | | |
| | | −10 to +90 °C, 20 to 120 °C or 50 to 150 °C<br>For Types 2232 and 2234 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 [1]<br>Type 2232 [1] [2] | Without/with thermowell: Class 300 · Thermowell with flange: Class 300 | | | | |
| | Type 2234 | Without thermowell: Class 300 · With flange: on request | | | | |
| Capillary tube length | | 16 feet (33 or 50 feet as special version/5 m (10 or 15 m as special version) | | | | |

1) Other pressure ratings for thermowell/flange on request

2) The version with clamping gland can be used for larger immersion depths (max. 23.6″/600 mm possible with SAMSON thermowells). It is also possible to use non-SAMSON thermowells provided on site with different immersion depths. In this case, the immersion depth of the sensor can be varied inside the thermowell as required.

**Table 2: Materials** · *Material numbers according to ASTM*

| | | | |
|---|---|---|---|
| **Type 2111 Valve** | | | |
| Nominal size | **NPS** | **½ to 2** | |
| Pressure rating | | Class 150 and 300 | Class 150 and 300 |
| Body | | Cast steel A216 WCC | Cast stainless steel A351 CF8M |
| Seat and plug | | 1.4104 · 1.4112 | 1.4404 |
| Plug stem · Spring | | CrNiMoTi steel | |
| Bottom section | | 1.8935 · 1.0460 | 1.4571 |
| Seal | | Graphite on metal core | |
| Extension piece · Separating piece | | Brass (for version free of non-ferrous metal: CrNi steel) | 1.4301 |
| **Types 2231, 2232 and 2234 Control Thermostats** | | | |
| Version | | **Standard version** | **Special version** |
| Operating element | | Nickel-plated brass | |
| Sensor | Type 2231 | Bronze | — |
| | Type 2232 | Bronze | CrNiMoTi steel |
| | Type 2234 | Copper | |
| Capillary tube | | Copper | Plastic-coated copper |
| **Thermowell** | | | |
| ... with **threaded connection (1 NPT)** | | | |
| Immersion tube | | Bronze, steel, copper [1] | CrNiMoTi steel |
| Threaded nipple | | Brass · Steel | |
| **... with flanges** | | | |
| Immersion tube | | Steel | CrNiMoTi steel |
| Threaded nipple | | 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 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 [1])

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

Available The registration number is available on request.

Temperature regulators (TR) with a Type 2231, 2232 or 2234 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 in s | |
|---|---|---|---|
| | | Without Thermowell | With Thermowell |
| Liquid expansion | 2231 | 70 | 120 |
| | 2232 | 65 | 110 |
| | 2234 | 15 | —[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 … feet,
Optionally, special version …
Accessories …

[1] Field of applications are the control of Group II fluids according to Pressure Equipment Directive 2014/68/EU.

**Table 4:** *Dimensions and weights*

| **Type 2111 Valve** | **NPS** | ½ | ¾ | 1 | 1½ | 2 |
|---|---|---|---|---|---|---|
| Length L | 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 | | | | |
| H1 With Extension piece | | 14.4″/365 mm | | | | |
| H Without Extension piece | | 20.3″/515 mm | | | | |
| H With Extension piece | | 25.8″/655 mm | | | | |
| Weight | approx. lb | 10.2 | 11.4 | 14 | 25.3 | 34.2 |
| | approx. kg | 4.6 | 5.2 | 6.3 | 11.5 | 15.5 |

| **Control thermostat** | **Type** | **2231** | **2232** | **2234** |
|---|---|---|---|---|
| Immersion depth T | in | 11.4 [1] | 9.25 [1] | 18.1 |
| | mm | 290 [1] | 235 [1] | 460 |
| Weight | approx. lb | 7.0 | 8.8 | 8.1 |
| | approx. kg | 3.2 | 4.0 | 3.7 |

[1] Larger immersion depths on request

## Dimensional drawings of valves and control thermostats

**Type 2111 with flanges**

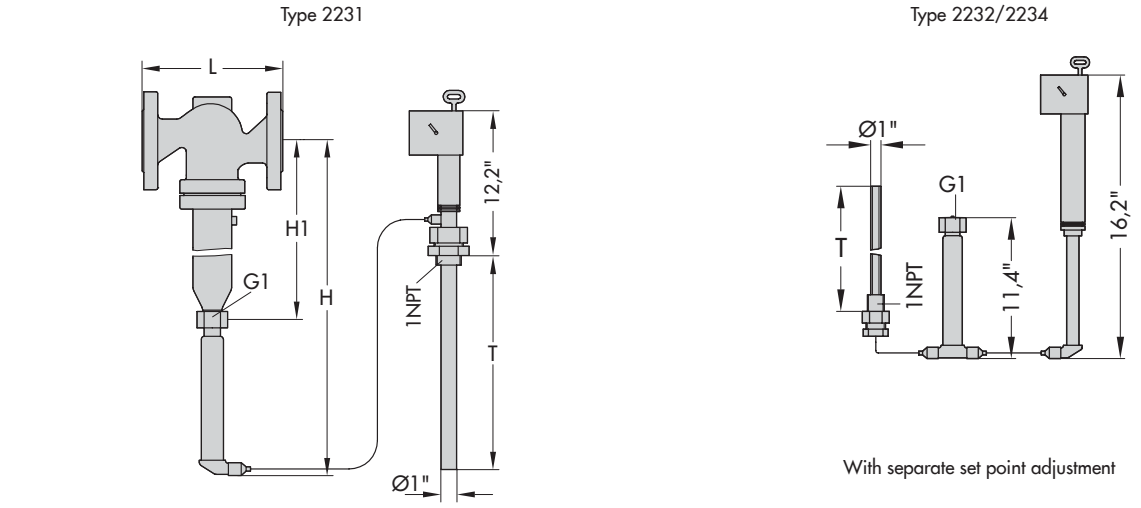
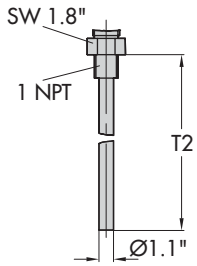



**Fig. 3:** *Dimensions of valves and control thermostats*

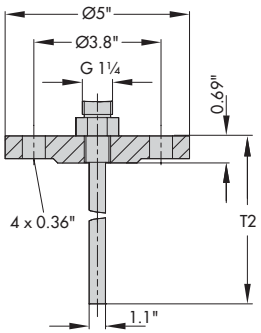
## Dimensional drawings of accessories

### Thermowells for Type 2231/2232

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

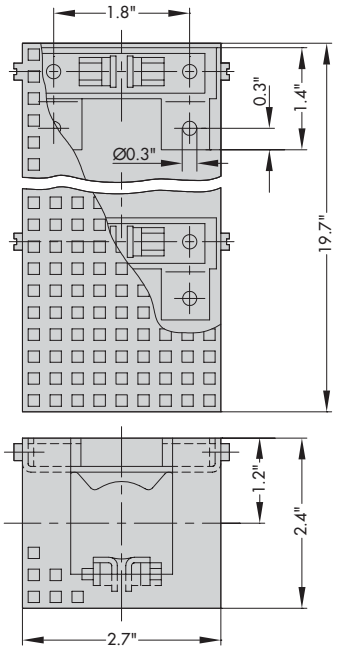



Thermowell with threaded connection 1 NPT/Class 150



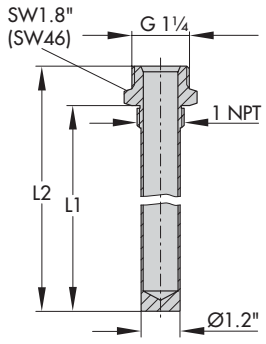

Thermowell with flanges 1½ NPS/Class 150

### Clamps and perforated cover for wall mounting



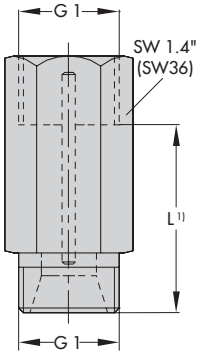

### Thermowells for flammable gases (Class 600)

| 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*