

T 2025 EN

Self-operated Temperature Regulators · Type 4 Temperature Regulator

With balanced single-seated globe valve · ANSI version



Application

Temperature regulator for heating installations · Control thermostats for set points from **15 to 480 °F (-10 to +250 °C)** · Nominal sizes **NPS ½ to 6** · Pressure rating **Class 125 to 300** · Suitable for temperatures up to **660 °F (350 °C)**

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

The regulators consist of a balanced 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 valves with a plug balanced by a stainless steel bellows or a balancing diaphragm (NPS 2½ to 6)
- Suitable for liquids, gases and vapors, especially for heat transfer media, such as water, oil and steam
- Valve body optionally available in cast iron, cast steel or cast stainless steel
- Versions with double adapter for temperature limiters or attachment of a second control thermostat · Details ▶ T 2036

Versions

Type 4 Temperature Regulator · Type 2422 Valve with flanged connections and face-to-face dimensions according to ANSI · Balanced by a bellows (NPS ½ to 6), balanced by a diaphragm (NPS 2½ to 4) · Class 125 to 300 · Type 2231 to 2234 Control Thermostat · Further details on the application of thermostats can be found in Information Sheet ▶ T 2010.

- **Type 2422/2231** (Fig. 1) · With Type 2422 Valve and Type 2231 Control Thermostat · Mainly suitable for liquids · Set points from 15 to 300 °F (-10 to +150 °C) · Set point adjustment at the sensor
- **Type 2422/2232** (Fig. 2) · With Type 2422 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 · With clamping gland for larger immersion depths

Type 4 Temperature Regulators with ...



Fig. 1: Type 2231 Control Thermostat



Fig. 2: Type 2232 Control Thermostat, version with separate set point adjustment

- **Type 2422/2234** · With Type 2422 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

Special versions

- 33 or 50 ft (10 or 15 m) capillary tube length
- Sensor of CrNiMo steel
- Capillary tube, copper with plastic coating
- Valve entirely of stainless steel
- Reduced C_V/K_{VS} coefficient
- Valve with flow divider 1 for noise reduction with steam and non-flammable gases
- Set point range 210 to 390 °F/300 to 480 °F (100 to 200 °C/150 to 250 °C)

Principle of operation (Fig. 3)

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 operating bellows in 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 (3).

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

Installation

- Valve

The thermostat connection (6) must face downwards. Other mounting positions on request.

Make sure the direction of flow complies with the required service type, i.e. mixing or diverting service.

- Capillary tube

The capillary tube must be run in such a way that the ambient temperature range cannot be exceeded, any deviations in temperature cannot occur and that the tube cannot be damaged. The smallest permissible bending radius is 2"/50 mm.

- Temperature sensor

The temperature sensor can be installed in any position as required. 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.

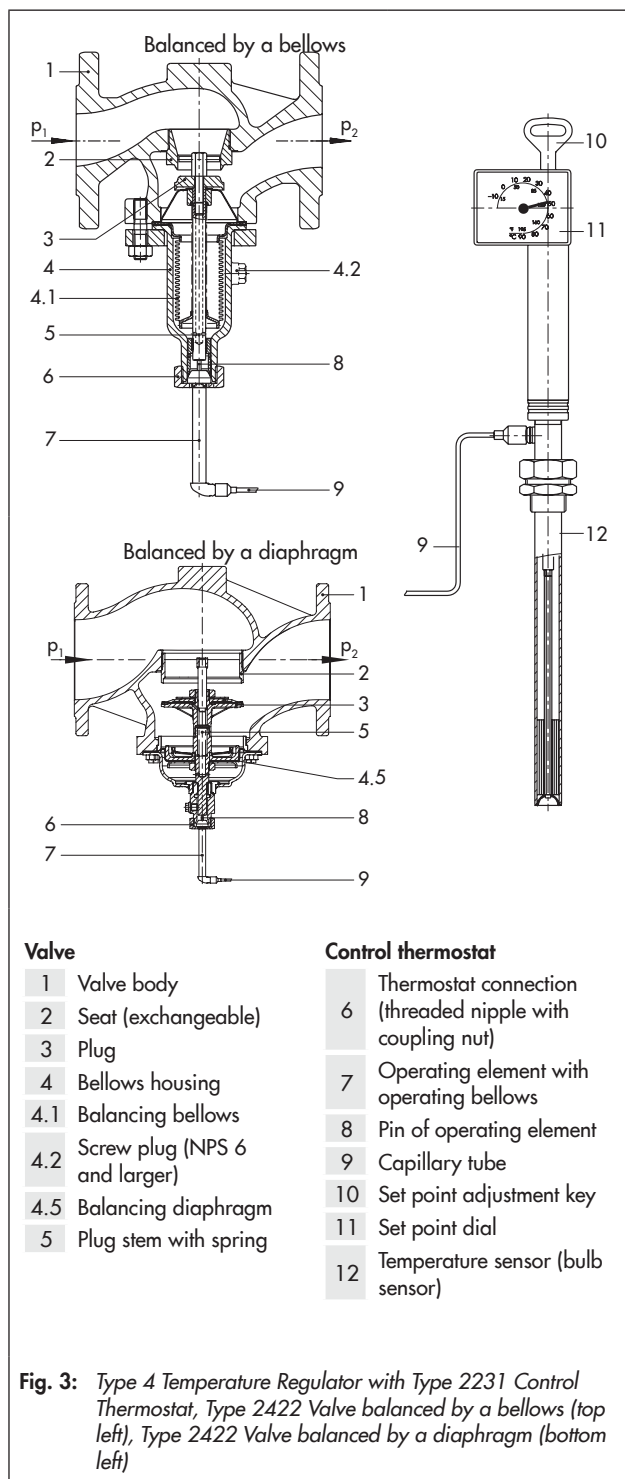


Fig. 3: Type 4 Temperature Regulator with Type 2231 Control Thermostat, Type 2422 Valve balanced by a bellows (top left), Type 2422 Valve balanced by a diaphragm (bottom left)

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.

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 · Type 2422 Valve · All pressures (gauge) in psi and bar

Table 1.1: Type 2422 Valve · Balanced by a bellows

| Nominal size | NPS | 1/2 | 3/4 | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 4 | 6 |
|--|-------------------|---|-----|-----|-------|----|-------|-----|---|-----|
| C _V coefficients | US gal/min | 5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| K _{VS} coefficients | m ³ /h | 4 | 6.3 | 8 | 20 | 32 | 50 | 80 | 125 | 280 |
| Leakage class according to ANSI/FCI 70-2 | | Metal seal: ≤0.05 % of C _V /K _{VS} | | | | | | | Soft seal: ≤0.01 % of C _V /K _{VS} | |
| Max. perm. differential pressure Δp | psi | 360 | | | | | 290 | | 230 | 175 |
| | bar | 25 | | | | | 20 | | 16 | 12 |
| Special version | C _V | 3; 5; 7.5 | | 5 | 9.4 | 20 | 23 | 37 | 94 | – |
| | K _{VS} | 2.5; 4; 6.3 | | | 8 | 16 | 20 | 32 | 80 | – |
| Max. perm. differential pressure Δp | psi | 360 | | | | | | 290 | 230 | – |
| | bar | 25 | | | | | | | 16 | – |
| Permissible valve temperature | | Max. 660 °F/350 °C · See pressure-temperature diagram in ► T 2010 | | | | | | | | |
| Conformity | | CE · EAC | | | | | | | | |

Table 1.2: Type 2422 Valve · Balanced by a diaphragm ¹⁾

| Nominal size | NPS | 2 1/2 | 3 | 4 |
|--|-------------------|---|----|-----|
| C _V coefficients | US gal/min | 60 | 94 | 145 |
| K _{VS} coefficients | m ³ /h | 50 | 80 | 125 |
| Leakage class according to ANSI/FCI 70-2 | | ≤0.01 % of C _V (K _{VS}) coefficient | | |
| Max. perm. differential pressure Δp | psi | 150 | | |
| | bar | 10 | | |
| Permissible valve temperature | | Max. 300 °F/150 °C · See pressure-temperature diagram in ► T 2010 | | |
| Conformity | | CE · EAC | | |

¹⁾ Only version with travel = 0.9" (22 mm)

Table 2: Technical data · Control thermostats

| Type 2231 to 2234 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 and 2234 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 and 2234 also 100 to 200 °C, 150 to 250 °C | |
| Perm. ambient temperature at the set point adjustment | –40 to +175 °F/–40 to +80 °C | |
| Perm. temperature at the sensor | 100 K above the adjusted set point | |
| Permissible pressure at the sensor | Type 2231 ¹⁾ 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) | |
| Conformity | EAC | |

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 3: Materials · Material numbers according to ASTM and DIN EN**Table 3.1: Type 2422 Valve · Balanced by a bellows**

| Nominal size | NPS 1 to 6 | NPS ½ to 6 | |
|----------------------------------|---|----------------------------------|--------------------------------|
| Pressure rating | Class 125 | Class 150 and 300 | |
| Body | Cast iron A126B | Cast steel A216 WCB/WCC | Cast stainless steel A351 CF8M |
| Seat and plug ¹⁾ | Up to NPS 4 | Stainless steel 1.4006 or 1.4104 | |
| | NPS 6 | 1.4301 · Plug with PTFE seal | |
| Plug stem/spring | 1.4301/1.4310 | | |
| Metal bellows | 1.4571 | | |
| Bellows housing | 1.0425 | | 1.4571 |
| Seal | Graphite on metal core | | |
| Extension piece/separating piece | Brass (special version: stainless steel 1.4301) | | 1.4301 |

¹⁾ Special version 1.4409

Table 3.2: Type 2422 Valve · Balanced by a diaphragm

| Nominal size | NPS 2½ to 4 | |
|------------------------------|---|---------------------|
| Pressure rating | Class 125 | Class 150 |
| Max. permissible temperature | 300 °F · 150 °C | |
| Body | Cast iron A126B | Cast steel A216 WCC |
| Seat | Red brass ¹⁾ | |
| Plug (standard version) | Red brass ¹⁾ · With EPDM soft seal | |
| Pressure balancing | Balancing cases made of sheet steel DD11 · EPDM balancing diaphragm | |
| Seal | Graphite on metal core | |

¹⁾ Special version 1.4409

Table 3.3: Type 2231, Type 2232 and Type 2234 Control Thermostats

| Control thermostat version | Standard version | Special version |
|--|-------------------------------------|-----------------------|
| Operating element | Nickel-plated brass | |
| Sensor | Type 2231 | Bronze |
| | Type 2232 | Bronze |
| | Type 2234 | Copper |
| Capillary tube | Copper | Plastic-coated copper |
| Thermowell | | |
| 1 NPT threaded connection | | |
| Thermowell | Bronze, steel, copper ¹⁾ | CrNiMoTi steel |
| Threaded nipple | Brass · Steel | |
| Flange connection ²⁾ | | |
| Thermowell | Steel | CrNiMoTi steel |
| Threaded nipple | Steel | |

¹⁾ PN 16 only

²⁾ On request

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 · NPS 1½ flanged connection, Class 300, with thermowell made of CrNiMo 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 thermostat
- **Extension piece or separating piece** · 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** (for valves **balanced by a bellows**) 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 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 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 thermostat is being replaced.

- **Do2 double adapter** for second thermostat · DoS with electric signal transmitter
- **Manual adjuster Ma** with travel indicator · MaS with electric signal transmitter
- **Type 2231 and Type 2232 Sensor** · Thermowells with threaded connection
- **Type 2234 Sensor** · Clamps and perforated cover for wall mounting

Typetested safety devices

The register number is available on request.

The following versions are available:

- **Temperature regulators (TR)** with a Type 2231, Type 2232 or Type 2234 Thermostat and a Type 2422 Valve in NPS ½ to 10 (Type 2234 only up to NPS 6/DN 150), for which the maximum operating pressure must not exceed the maximum permissible differential pressure Δp specified in the technical data.
Sensors without thermowell: applicable up to 600 psi (40 bar), test pressure max. 870 psi (60 bar)
Sensors with thermowell: only use SAMSON 1 NPT version made of bronze or steel 1.4571 up to Class 300.
- **Thermowell for flammable gases typetested by DVGW**, 1 NPT threaded connection, Class 600.
- **Safety temperature monitors (STM) and safety temperature limiters (STL)**: details can be found in Data Sheets ▶ T 2043 and ▶ T 2046.

Further details on the selection application of typetested equipment can be found in Information Sheet ▶ T 2040.

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

Table 4: Time constants of SAMSON thermostats

| Principle of operation | Control thermostat | Time constant [s] | |
|------------------------|--------------------|--------------------|-----------------|
| | | Without thermowell | With thermowell |
| Liquid expansion | Type 2231 | 70 | 120 |
| | Type 2232 | 65 | 110 |
| | Type 2234 | 15 | – ¹⁾ |
| | Type 2213 | 70 | 120 |
| Adsorption | Type 2212 | – ¹⁾ | 40 |

¹⁾ Not permissible

Dimensional drawings: Type 2422 Valve · Balanced by a bellows · With connection for Type 2231 to Type 2234 Thermostat

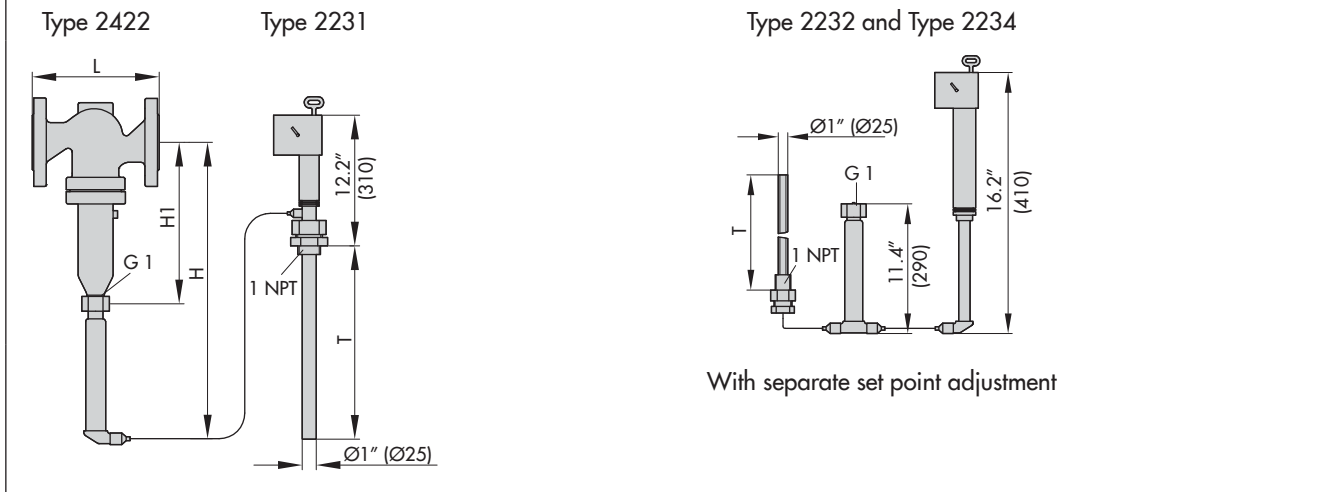


Table 5: Dimensions and weights · Type 2422 Valve

Table 5.1: Type 2422 Valve · Balanced by a bellows

| Nominal size | | NPS | 1/2 | 3/4 | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 4 | 6 |
|--------------------------------|---------------------------------------|----------------|-----------|----------|-----------|-----------|----------------|---------|---------|----------------|-----------------|
| Length L | Class 125 | inch | – | – | 7.25 | 8.75 | 10 | 10.9 | 11.75 | 13.9 | 17.75 |
| | | mm | – | – | 184 | 222 | 254 | 276 | 298 | 352 | 451 |
| | Class 150 | inch | 7.25 | 7.25 | 7.25 | 8.75 | 10 | 10.9 | 11.75 | 13.9 | 17.75 |
| | | mm | 184 | 184 | 184 | 222 | 254 | 276 | 298 | 352 | 451 |
| Class 300 | inch | 7.5 | 7.6 | 7.75 | 9.25 | 10.5 | 11.5 | 12.5 | 14.5 | 18.6 | |
| | mm | 191 | 194 | 197 | 235 | 267 | 292 | 318 | 368 | 473 | |
| H1 | Without extension piece ¹⁾ | 8.9" (225 mm) | | | | | 11.8" (300 mm) | | | 14" (355 mm) | 23.2" (590 mm) |
| | With extension piece ¹⁾ | 14.4" (365 mm) | | | | | 17.3" (440 mm) | | | 19.5" (495 mm) | 28.7" (730 mm) |
| H | Without extension piece ¹⁾ | 20.3" (515 mm) | | | | | 23.2" (590 mm) | | | 25.4" (645 mm) | 34.6" (880 mm) |
| | With extension piece ¹⁾ | 25.8" (655 mm) | | | | | 28.7" (730 mm) | | | 30.9" (785 mm) | 40.2" (1020 mm) |
| Weight ²⁾ (approx.) | 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) | |

| Type ... Thermostat | 2231 | 2231 Size 250 | 2232 | 2234 |
|-----------------------------|--------------------------|---------------|--------------------------|------------|
| Immersion depth T inch (mm) | 11.4 (290) ³⁾ | 38.6 (980) | 9.25 (235) ³⁾ | 18.1 (460) |
| Weight, approx. lbs (kg) | 7.1 (3.2) | 14.3 (6.5) | 9 (4) | 8.2 (3.7) |

- 1) Only with Type 2231 Thermostat
 2) Class 150 +10 %; Class 300 +15 %
 3) Larger immersion depths on request

Dimensional drawing: Type 2422 Valve · Balanced by a diaphragm · With connection for Type 2231 to Type 2234 Thermostat

Table 5.2: Type 2422 Valve · Balanced by a diaphragm

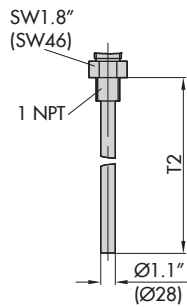
| Nominal size | NPS | 2 1/2 | 3 | 4 |
|----------------------|---------------|-----------------|-----------------|------------------|
| Length L | Class 125/150 | 10.9" · 276 mm | 11.75" · 298 mm | 13.9" · 352 mm |
| | Class 300 | 11.5" · 292 mm | 12.5" · 318 mm | 14.5" · 368 mm |
| Height H (approx.) | | 23.2" · 589 mm | 23.3" · 590 mm | 24.7" · 626 mm |
| Height H2 (approx.) | | 3.86" · 98 mm | | 4.65" · 118 mm |
| Weight ¹⁾ | (approx.) kg | 68.5 lb · 31 kg | 85 lb · 38.5 kg | 101.5 lb · 46 kg |

1) +10 % for A216 WCC/Class 150

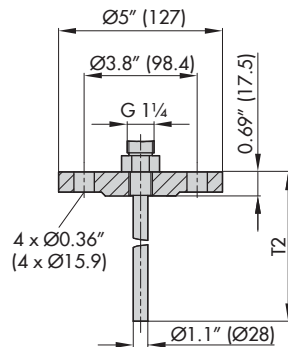
Thermowells for Type 2231 and Type 2232

Table 6: Thermowells for Type 2231 and Type 2232

| Control thermostat | Type 2231 | Type 2232 |
|-----------------------|-----------|-----------|
| Immersion depth T2 in | 12.6 | 9.7 |
| Length L1 mm | 321 | 246 |



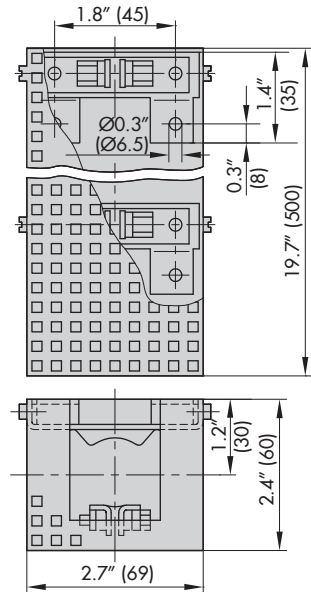
Thermowell
1 NPT/Class 300



Flanges
NPS 1½/Class 300

Mounting parts for Type 2234²⁾

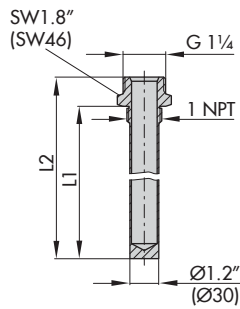
Clamps and perforated cover for wall mounting



Thermowells for Type 2231 and Type 2232

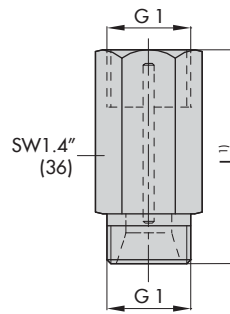
Table 7: Thermowells for flammable gases (Class 600)

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



Thermowells for flammable gases
1 NPT/Class 600

Extension piece/separating piece



| Extension piece (standard) | | |
|-------------------------------------|----|-----|
| L (approx.) | in | 5.5 |
| | mm | 140 |
| Weight, approx. | lb | 1.1 |
| | kg | 0.5 |
| With bellows seal (special version) | | |
| L (approx.) | in | 7.1 |
| | mm | 180 |
| Weight, approx. | lb | 1.3 |
| | kg | 0.6 |
| Separating piece with seals | | |
| L (approx.) | in | 2.1 |
| | mm | 55 |
| Weight, approx. | lb | 0.4 |
| | kg | 0.2 |

- 1) Add the dimension L to H and H1 when these accessories are used.
- 2) Mounting position of sensor: pointing down

Ordering text

Type 4 Temperature Regulator

NPS ... (DN ...)

Class ..., body material ...

With Type ... Thermostat,

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

Optionally, special version ...

Optionally, accessories ...