DATA SHEET

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*

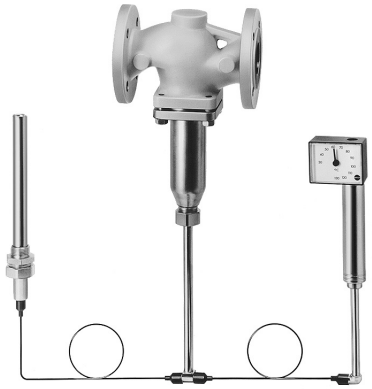

Fig. 2: *Type 2232 Control Thermostat, version with separate set point adjustment*

- **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

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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.

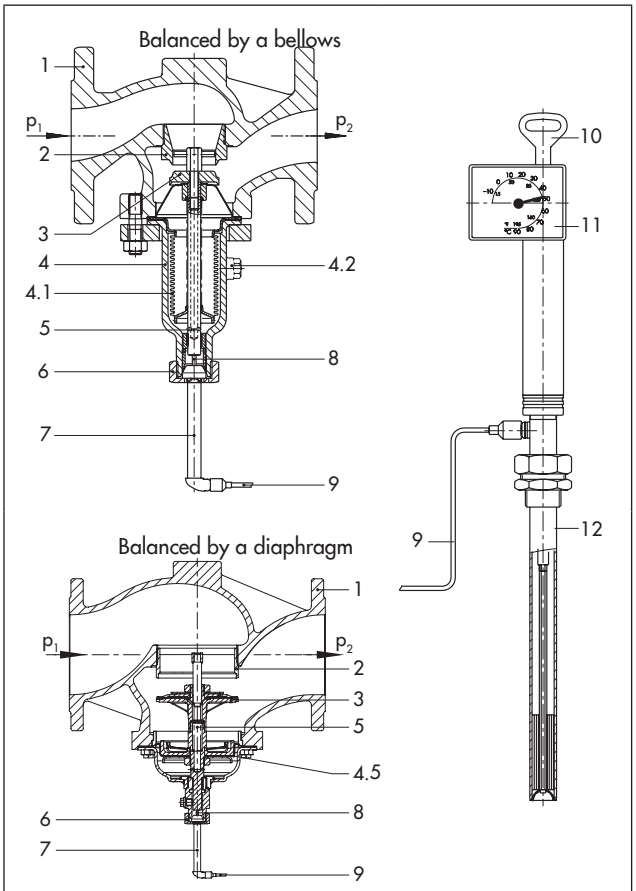
– **Thermowell**

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.



Valve

1	Valve body
2	Seat (exchangeable)
3	Plug
4	Bellows housing
4.1	Balancing bellows
4.2	Screw plug (NPS 6 and larger)
4.5	Balancing diaphragm
5	Plug stem with spring

Control thermostat

6	Thermostat connection (threaded nipple with coupling nut)
7	Operating element with operating bellows
8	Pin of operating element
9	Capillary tube
10	Set point adjustment key
11	Set point dial
12	Temperature sensor (bulb sensor)

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**	½	¾	**1**	**1½**	**2**	**2½**	**3**	**4**	**6**
C_V coefficients	US gal/min	5	7.5	9.4	23	37	60	94	145	330
K_{VS} coefficients	m³/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								

Table 1.2: *Type 2422 Valve · Balanced by a diaphragm* [1]

Nominal size	**NPS**	**2½**	**3**	**4**
C_V coefficients	US gal/min	60	94	145
K_{VS} coefficients	m³/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	175		145
	bar	12		10
Permissible valve temperature		Max. 300 °F/150 °C · See pressure-temperature diagram in ▶ T 2010		
Conformity		CE		

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)

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		1.4571
	NPS 6	1.4301 · Plug with PTFE seal		1.4571
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	CrNiMoTi steel
	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.

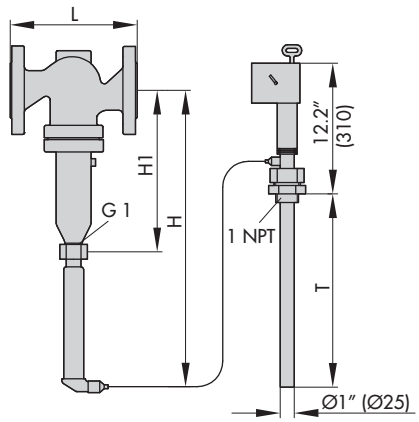
Table 4: *Time constants of SAMSON thermostats*

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

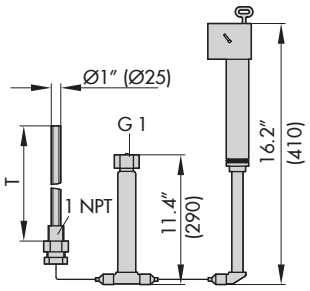
[1] Not permissible

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

Type 2422 Type 2231



Type 2232 and Type 2234



With separate set point adjustment

Table 5: *Dimensions and weights · Type 2422 Valve*

Table 5.1: *Type 2422 Valve · Balanced by a bellows*

Nominal size		NPS	½	¾	1	1½	2	2½	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

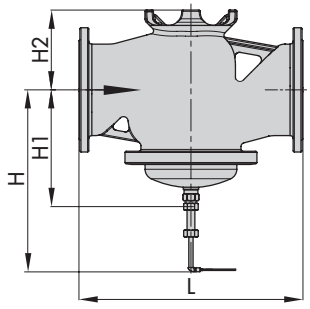


Table 5.2: *Type 2422 Valve · Balanced by a diaphragm*

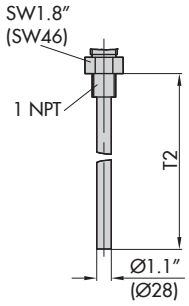
Nominal size	NPS	2½	3	4
Length L	Class 125/150	10.9″ · 276 mm	11.75″ · 298 mm	13.9″ · 352 mm
	Class 300	11.5″ · 292 mm	12.5″ · 318 mm	14.5″ · 368 mm
Height H (approx.)		23.2″ · 589 mm	23.3″ · 590 mm	24.7″ · 626 mm
Height H2 (approx.)		3.86″ · 98 mm		4.65″ · 118 mm
Weight [1]	(approx.) kg	68.5 lb · 31 kg	85 lb · 38.5 kg	101.5 lb · 46 kg

[1] +10 % for A216 WCC/Class 150

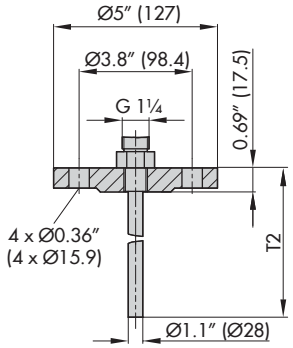
Thermowells for Type 2231 and Type 2232

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



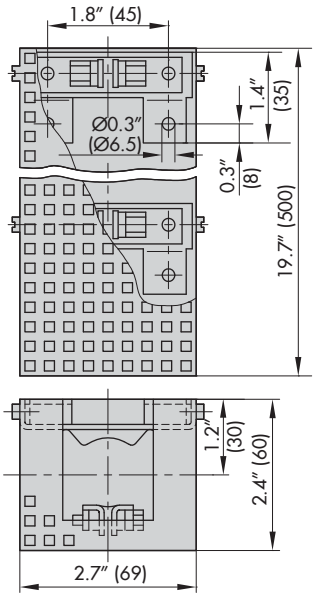
Thermowell
1 NPT/Class 300



Flanges
NPS 1½/Class 300

Mounting parts for Type 2234 [2]

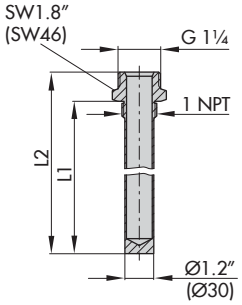
Clamps and perforated cover for wall mounting



Thermowells for Type 2231 and Type 2232

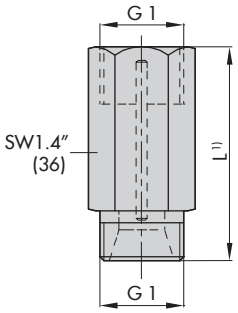
Table 7: *Thermowells for flammable gases (Class 600)*

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