DATA SHEET

T 2111 EN

Type 1 Temperature Regulator

Self-operated Temperature Regulators · Flanges

Application

Temperature regulators for heating installations · Control thermostats for set points from **–10 to +250 °C** · Nominal sizes **DN 15 to 50** · Pressure rating **PN 16 to 40** · Suitable for temperatures up to **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 [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 DN 15 to 25 (PN 25 to 40) · DN 32 to 50 (PN 16 to 40) · Types 2231 to 2234 Control Thermostat (see Fig. 1)
Further details on the application of thermostats can be found in Information Sheet ▶ T 2010.

Type 2111/2231 · With Type 2111 Valve and Type 2231 Control Thermostat · Set points from –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 –10 to +250 °C · Separate set point adjustment · With clamping gland for larger immersion depths

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

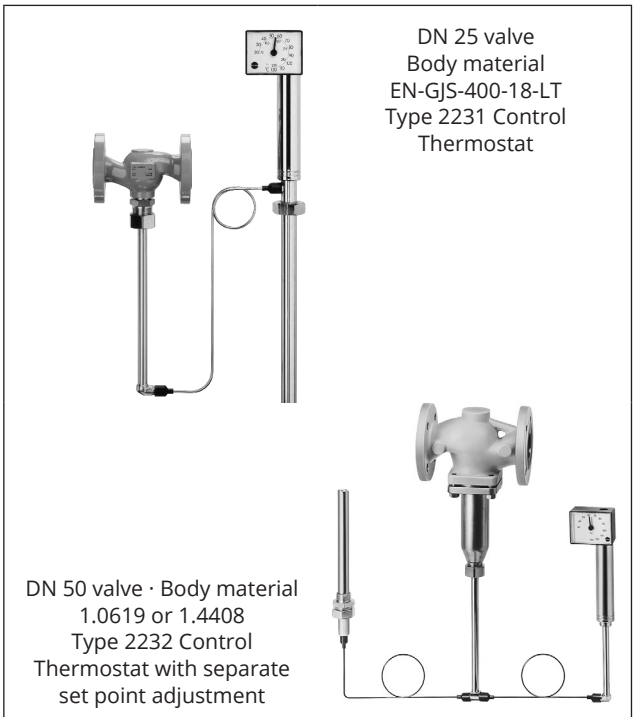

Fig. 1: *Versions of Type 1 Temperature Regulator with single-seated globe valve and control thermostat*

Special version

- 10 and 15 m capillary tube lengths
- Sensor of CrNiMoTi steel
- Capillary tube, copper with plastic coating
- Valve free of non-ferrous metal
- Stainless steel valve version
- Dimensions and materials according to ANSI (▶ T 2115)

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

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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 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 50 mm.

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.

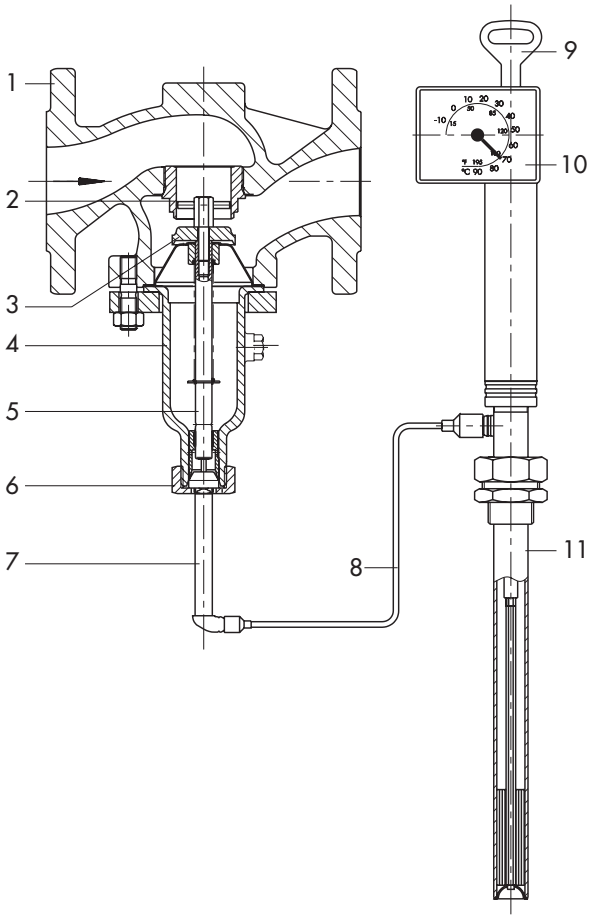
Only the combination of the same kind of materials is permitted, e.g. a stainless steel heat exchanger with thermowells made of stainless steel 1.4571.

Thermowell

Type 2231
The sensor of the control thermostat can be used with or without a thermowell. The standard length of the thermowell is 290 mm.

Type 2232
The sensor of the control thermostat can be used with or without a thermowell. The standard length of the thermowell is 235 mm.
The version with clamping gland can be used for larger immersion depths (max. 990 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 460 mm.



Valve

1	Valve body
2	Seat (exchangeable)
3	Plug
4	Bottom section (only in combination with 1.0619 and 1.4408)
5	Plug stem with spring

Control thermostat

6	Connection for operating element (coupling nut)
7	Operating element with operating bellows
8	Capillary tube
9	Set point adjustment key
10	Set point dial
11	Temperature sensor (bulb sensor)

Fig. 2: *Type 1 Temperature Regulator with single-seated globe valve DN 50, valve body material 1.0619 or 1.4408 and Type 2231 Control Thermostat*

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

The listed permissible pressures and differential pressures are restricted by the specifications in the pressure-temperature diagram and the pressure rating (according to DIN EN 12516-1).

Type 2111 Valve							
Standard version DN		15	20	25	32	40	50
Pressure rating		PN 25 to 40					
Standard version	K_{VS} coefficient	4	6.3	8	16	20	32
	Differential pressure Δp_{max} bar	25 [1]	16 [1]	14	6	6 [2]	4
Special version	K_{VS} coefficient	2.5 · 1.0 · 0.4 · 0.1		4.0 [1] · 1.0 0.4 · 0.1	6.3 [3]	8	16
	Differential pressure $\Delta p_{max.}$ bar	25			16	14	6
Leakage class according to IEC 60534-4		≤0.05 % of K_{VS} coefficient					
Permissible valve temperature		Max. 350 °C · See pressure-temperature diagram in ▶ T 2010					
Type 2231 to 2234 Thermostat		Size 150					
Set point range (set point span 100 K)		–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					
Permissible ambient temperature at the set point adjustment		–40 to +80 °C					
Permissible temperature at sensor		100 K above the adjusted set point					
Permissible pressure at the sensor	Type 2231 [4] · Type 2232 [4] [5]	Without/with thermowell: PN 40 · Thermowell with flange: PN 40					
	Type 2234	Without thermowell: PN 40 · With flange on request					
Capillary tube length		5 m (10 or 15 m as special version)					

1) With EN-GJS-400-18-LT: $\Delta p_{max.}$ = 14 bar
2) In combination with Type 2212 STL: 4 bar
3) Only with cast steel 1.0619 or cast stainless steel 1.4408
4) Other pressure ratings for thermowell/flange on request
5) The version with clamping gland can be used for larger immersion depths (max. 990 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 DIN EN*

Type 2111 Valve					
Nominal size DN		40 and 50	15 to 50		
Pressure rating		PN 16	PN 25	PN 40	
Body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT	Cast steel 1.0619	Cast stainless steel 1.4408
Seat and plug		1.4305		1.4104 · 1.4112	1.4404
Plug stem · Spring		CrNiMoTi steel			
Bottom section		1.8935 [1] · 1.0460 [1]			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 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					
G 1 threaded connection	Immersion tube	Bronze, steel, copper [2]		CrNiMoTi steel	
	Threaded nipple	Brass · Steel			
Flange connection	Immersion tube	Steel		CrNiMoTi steel	
	Threaded nipple	Steel			

1) EN-GJS-400-18-LT with brass bushing
2) PN 16 only

Table 3: *Dimensions and weights*

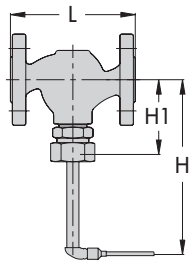
Type 2111 Valve	**DN**	**15**	**20**	**25**	**32**	**40**	**50**
Overall length L		130	150	160	180	200	230
Body material EN-GJS-400-18-LT, EN-GJL-250							
H1		82			152		
H		372			442		
Weight	kg (approx.)	4.6			11.5	10.0 [2]	
Body material 1.0619, 1.4408							
H1 Without extension piece		225					
H1 With extension piece		365					
H Without extension piece		515					
H With extension piece		655					
Weight	kg (approx.)	4.6	5.2	6.3	11.5	12.1	15.5
Control thermostat	**Type**	**2231**		**2232**		**2234**	
Immersion depth T	mm	290		235 [1]		460	
Weight	kg (approx.)	3.2		4.0		3.7	

[1] Larger immersion depths on request
[2] PN 16 body; +15 % for PN 25/40

Dimensional drawings of valves and control thermostats

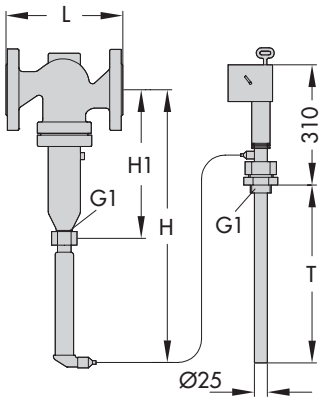
Type 2111 with flanges

Valve



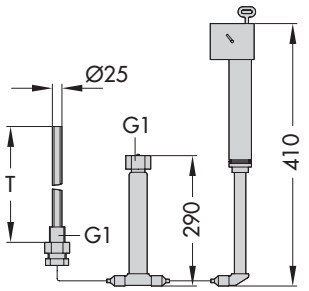
Body material EN-GJS-400-18-LT, EN-GJL-250

Valve with Type 2231 Control Thermostat



Body material 1.0619, 1.4408

Type 2232/2234 Control Thermostat



With separate set point adjustment

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

Accessories (see Fig. 5)

Thermowells with threaded or flanged connections for Types 2231 and 2232 Bulb Sensors · G 1 threaded connection, PN 40, made of bronze, steel or CrNiMo steel · Flanged connection, DN 32, PN 40, with thermowell made of CrNiMo steel/steel · Thermowell made of PTFE, PN 6 (flange PN 40)

Thermowell for flammable gases **typetested by DVGW**, G 1 threaded connection, PN 100

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 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 or spheroidal graphite iron together with Type 2212 Safety Temperature Limiter or Type 2213 Safety Temperature Monitor, an extension piece is required for temperatures over 150 °C.

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. The separating piece is made of brass (for water and steam) or CrNi steel (for water and oil [1])

In addition, it prevents the medium from leaking while the control thermostat is being replaced.

Additionally, the following are 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 are 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, DN 15 to 50.

Sensor without thermowell: can be used up to 40 bar, test pressure max. 60 bar.
Sensor with thermowell: only use SAMSON G 1 version made of bronze or stainless steel 1.4571 up to 40 bar.

Thermowell for flammable gases **typetested by DVGW**, G 1 threaded connection, PN 100.

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

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

Dynamic behavior of control thermostats

The dynamics of the regulator are mainly determined by the response of the sensor with its characteristic time constant.

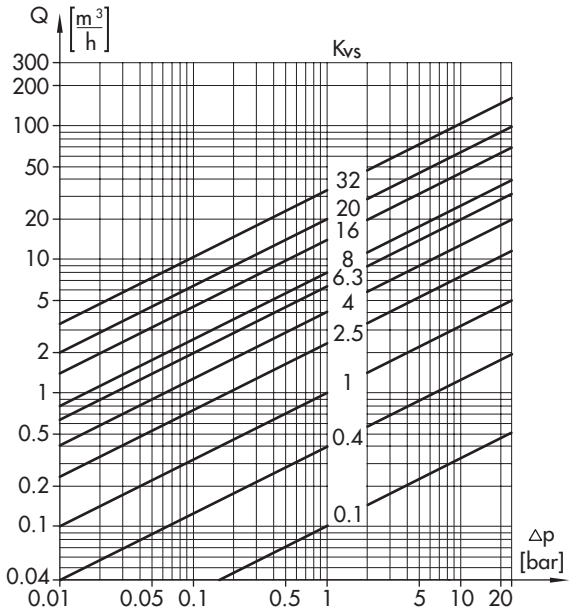
Table 4 lists the response times of SAMSON control thermostats operating according to different principles measured in water.

Table 4: *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

Flow rate diagram for water



Terms for control valve sizing for other media according to IEC 60534 Part 2-1: F_L = 0.95 and x_T = 0.75

Fig. 4: *Flow rate diagram for water*

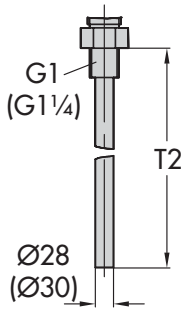
Ordering text

Type 2111/... Temperature Regulator
DN ...
PN ...
Body material ...
With Type 223... Control Thermostat
Set point range ...°C
Capillary tube ... m,
Optionally, special version ...
Accessories ...

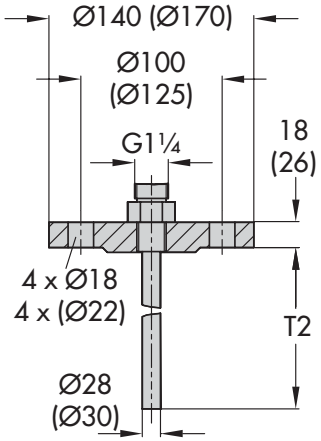
Dimensional drawings of accessories

Thermowells for Type 2231/2232

Control thermostat	Type	2231	2232
Immersion depth T2	mm	325	250

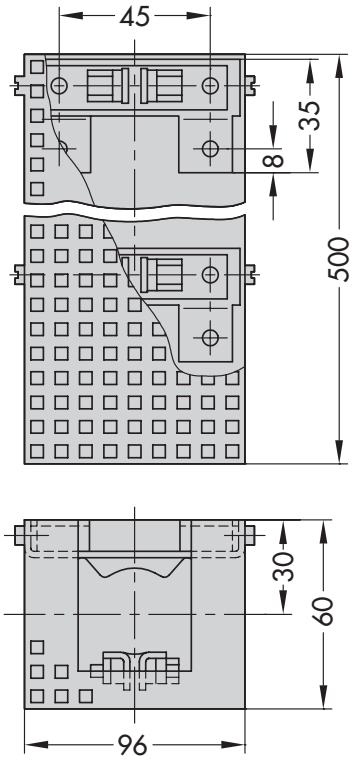


Thermowell with threaded connection
G 1/PN 40 or PN 100 [1]



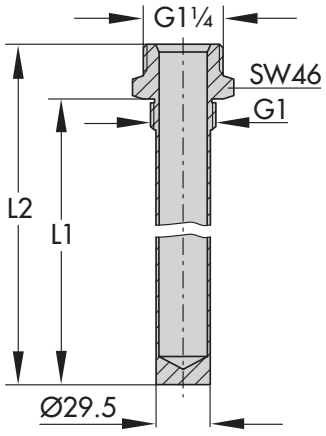
Thermowell with flanges DN 32 for PN 40 · DN 40 for PN 100 [1]

Clamps and perforated cover for wall mounting (Type 2234) [2]



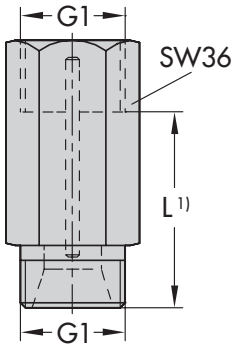
Thermowells for flammable gases (PN 100)

Control thermostat	Type	2231	2232
Length L1	mm	315	255
Length L2	mm	340	280



Thermowell for flammable gases (G 1/PN 100)

Extension piece/separating piece



Extension piece

L = approx. 140 mm, approx. 0.5 kg

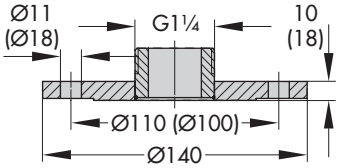
With bellows seal (special version),
L = approx. 180 mm, approx. 0.6 kg

Separating piece with seals,

L = approx. 55 mm, approx. 0.2 kg

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

Flange for Type 2234



Flange PN 6; 140 mm outer diameter

Flange PN 40/DN 32 (dimensions in parentheses)

Fig. 5: *Dimensions and weights of accessories*

1) Dimensions in brackets
2) Mounting position of sensor: pointing down