Self-operated Temperature Regulators **Temperature Regulator Type 4**

with balanced single-seated globe valve



Application

Temperature regulator for heating installations with control thermostats for set points from -10 °C to +250 °C · Nominal sizes DN 15 to DN 250 Nominal pressures PN 16 to PN 40 · For temperatures up to 350 °C

The valve closes when the temperature rises.

Note

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



The regulators consist of a balanced valve and a control thermostat, comprising a temperature sensor, a set point adjustment head with an excess temperature safety device, a capillary tube, and an operating element.

Special features

- Low-maintenance P regulators requiring no auxiliary energy
- Wide set point range and easy adjustment of the set point indicated on a dial
- Single-seated globe valves with plug balancing by means of a metal bellows, applicable for liquids, gases, and vapors, especially for heat transfer fluids such as water, oil, and steam
- Valve body optionally made of cast iron, spheroidal graphite iron, cast steel, or stainless cast steel
- Versions with double adapter or manual override available for attachment of a second control thermostat. For details, refer to Data Sheet T 2036 EN.

Versions

Type 4 Temperature Regulator · With Type 2114 Valve for sizes DN 15 to DN 250 · PN 16 to PN 40 · Types 2231 to 2235 Control Thermostats · For details on the application of the thermostats, refer to Information Sheet T 2010 EN.

Type 2114/2231 (Fig. 1) · With Type 2114 Valve and Type 2231 Control Thermostat for liquids Set points from -10 to +150 °C, set point adjustment at the sensor

Type 2114/2232 (Fig. 3) · With Type 2114 Valve and Type 2232 Control Thermostat for liquids and steam · Set points from -10 to +250 °C, separate set point adjustment

Type 2114/2233 · With Type 2114 Valve and Type 2233 Control Thermostat for liquids, air, and other gases · Set points from -10 to +150 °C, set point adjustment at the sensor

Type 2114/2234 · With Type 2114 Valve and Type 2234 Control Thermostat for liquids, air, and other gases . Set points from -10 to +250 °C, separate set point adjustment

Type 2114/2235 · With Type 2114 Valve and Type 2235 Control Thermostat for air-heated storerooms as well as drying, climatic, and heating cabinets · Set points from -10 to +250 °C separate set point adjustment and a sensor tube to be installed by the operator

For ANSI versions, refer to Data Sheet T 2025 EN.

For version with a valve plug balanced by a diaphragm, refer to Data Sheet T 2650 EN.



Associated Information Sheet

T 2010 EN

Edition June 2006

Data Sheet

Special version

- Capillary tube of either 5 m, 10 m, or 15 m
- Sensor made of CrNiMo steel
- Capillary tube made of CrNiMo steel or plastic-coated Cu
- Valve made completely of stainless steel
- Reduced Kvs
- Valve with flow divider I for noise reduction when handling steam and non-flammable gases
- Set point range from 100 to 200 °C/150 to 250 °C
- ANSI version (see Data Sheet T 2025 EN)

Principle of operation (Fig. 4)

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 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.

The set point is adjustable with a key (10); the adjusted value can be read off the dial (11).

Valve

- 1 Valve body
- 2 Seat (exchangeable)
- 3 Plug
- 4 Bellows housing
- 4.1 Balancing bellows
- 4.2 Vent screw (DN 125 and larger)
- 5 Plug stem with spring6 Connection for operating
- element (coupling nut)
- 7 Operating element with bellows

Control thermostat

- 8 Pin of operating element
- 9 Capillary tube
- 10 Key for set point adjustment
- Set point dial
 Temperature sensor
 - (bulb sensor)



Table 1 · **Technical data** · All pressures in bar (gauge). The specified permissible pressures and differential pressures are limited by the values given in the pressure-temperature diagram and the nominal pressure ratings.

Type 2114 Valve	Nominal pressure	PN 16 to PN 40												
Kvs, leakage rate, and max. permissible differential pressures Δp^{1} in bar														
Standard version	Connection DN	15	20	25	32	40	50	65	80	100	125	150	200	250
Kvs		4	6.3	8	16	20	32	50	80	125	190	280	420	500
Leakage rate		≤ 0.05 % of K _{VS}												
Differential pressure Δp		25						20		16		12	10	
Special version	Connection DN	15 20 25			32	40	50	65	80	100	125	150	200	250
K _{VS}		2	5, 4, 6.	3	6.3	8	16	20	32	50	-	-	-	-
Diff. pressure	Δp	25 16									-	-		
Permissible valve temperature		See pressure-temperature diagram												
Types 2231 to 2235 Thermostats		Size 150										Size 250 ²⁾		
Set point range		–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									0 to 70, 30 to 100, 50 to 120, 80 to 150 °C			
Permissible ambient temperature at the set point adjustment head		−40 to +80 °C										−20 to +80 °C		
Permissible temperature at the sensor		100 K above the adjusted set point									30 K above the set point			
Permissible pressure	Туре 2231/2232	Without thermowell: PN 40 · With thermowell: PN 40/PN 100 (version of copper PN 16) With thermowell with flange: PN 40/DN 32 or PN 100/DN 40									PN 16 ³⁾			
at the sensor	Туре 2233/2234	With flange PN 6 (external Ø 140) or PN 40/DN 32												
Length of the capillary tube		3 m (special version: 5 m, 10 m, or 15 m)												

1) The differential pressure corresponds to the pressure head of the pump for liquids \cdot 2) Only Types 2231 and 2232

³⁾ Version with flanges or other pressure ratings on request

Type 2114 Valve										
Connection DN 15 to DN 250										
Nominal pressure	PN 16	PN 1	6 · PN 25 ¹⁾		PN 25 · I	PN 25 · PN 40				
Body	Cast iron EN-JL1040 (GG-25)	Spheroide EN (GC	al graphite iron -JS1049 GG-40.3)	Cast steel ²⁾ 1.0 (GS-C 25)	619	Stainless cast steel ²⁾ 1.4581				
Seat and plug ³⁾	Steel	1.4006 (1.4	301 for DN 125 to	Stainless steel 1.4571						
Plug stem/spring			Steel 1.4301/1.4310							
Balancing bellows			Stainless steel 1.4571							
Bellows housing		Stee	el 1.0425			Stainless steel 1.4301				
Body gasket Graphite on metal core										
Extension piece/ distance piece	Brass (version fr	ree of non-fe	rrous metal: stainl	tal: stainless steel 1.4301) Stainless						
Types 2231, 2232, 2233	, 2234, and 2235 Thermosta	ats								
	Standard version		Special version							
Operating element		Brass, nic	nickel-plated							
Туре 2231/2232	Bronze, nickel-plated	ł								
Sensor Type 2233/2234 Copper, nickel-plated		d	Stainless steel 1.4571							
Туре 2235	Copper									
Capillary tube	Copper, nickel-plate	d	Plastic-coated copper or stainless steel 1.4571							
Thermowell with threaded	connection	· · ·								
Immersion tube	Bronze, nickel-plated · S	Steel	Suthan 1 (57)							
Threaded nipple	Brass, nickel-plated			el 1.437 I						
with flange										
Immersion tube Steel			Plastic-coated s	iteel or PTFE ^{4) 5)}	C1					
Flange	Ste	el, plastic-co	ated facing							

Table 2 · Materials · Material numbers according to DIN EN

¹⁾ Max. DN 150 · PN 25: up to DN 150 · PN 16: DN 100 to DN 150

²⁾ PN 25: DN 200 to DN 250; PN 16: DN 100 to DN 250

³⁾ Optionally, soft-sealing plug with PTFE ring for temperatures up to 220 °C or with EPDM ring for temperatures up to 150 °C

⁴⁾ Plastic coating (for temperatures up to 80 °C) of PVC or PPH

⁵⁾ PTFE version · Immersion tube: PTFE · Flange: steel with PTFE bushing

Flow diagram of water



Pressure-temperature diagram - acc. to DIN EN 12516-1 -



Typetested safety devices

The register number is available on request. The following versions are available:

Temperature Regulators (TR) with a Type 2231, 2232, 2233, 2234¹), or Type 2235¹) Thermostat and a Type 2114 Valve in sizes DN 15 to DN 250, for which the max. operating pressure must not exceed the max. permissible differential pressure Δp specified under "Technical data."

Sensor without thermowell: applicable up to 40 bar

Sensor with thermowell: only use SAMSON G1 version made of bronze, steel, and stainless steel 1.4571 in PN 40 $\,$

Thermowell for flammable gases typetested by DVGW (German Technical and Scientific Association on Gas and Water), G1 threaded connection, PN 100

Temperature Limiters (TL) with a thermostat and value as specified above as well as a double adapter Do (see Data Sheet T 2036 EN)

For details on the selection and application of typetested devices, refer to Information Sheet T 2040 EN.

Additionally, the following versions are available:

Safety Temperature Monitors (STM) and **Safety Temperature Limiters (STL)**. For details, refer to Data Sheets T 2043 EN and T 2046 EN.

¹⁾ Types 2234 and 2235 Thermostats only up to DN 150

Accessories

Thermowells with threaded or flange connection for Types 2231 and 2232 Bulb Sensors · G1 threaded connection, PN 40, made of bronze, steel, or CrNiMo steel · Flange DN 32, PN 40, with steel immersion tube with PVC or PPH coating · PTFE immersion tube, PN 6 (flange PN 40)

Thermowell typetested by DVGW for flammable gases, G1 threaded connection, PN 100

Mounting parts for Types 2233 and 2234 \cdot Clamps for wall mounting \cdot Perforated cover for thermostat

Distance piece made of brass (for water, steam) or CrNiMo steel (for water, oil, steam)

A distance piece is used in the stainless steel version to separate the non-ferrous metals of the operating element from the process medium flowing through the valve. In addition, it prevents the medium from leaking when the thermostat is replaced. The distance piece is installed between the valve and thermostat.

Extension piece for higher permissible temperatures, made of brass, CrNi steel, and CrNi steel with metal bellows seal for water and oil/heat transfer oil.

Double adapter Type Do1 for second thermostat \cdot Type DoS with electric transducer

 $\ensuremath{\text{Manual override}}$ Hv with travel indication \cdot HvS with electric transducer

Dynamic behavior of the thermostat

The dynamics of the regulator mainly depends on the dynamic behavior of the associated sensor with its characteristic time constant.

Table 3 lists the time constants of SAMSON thermostats operating according to different functional principles when measuring in water.

Functional principle	Type Control Thermostat	Time constant in seconds Without With thermowell						
	2231	70	120					
	2232	65	110					
Liquid	2233	25	_1)					
expansion	2234	15	_1)					
	2235	10	_1)					
	2213	70	120					
Adsorption	2213	_1)	40					

¹⁾ Not permissible

Installation

• Valve

The valves are to be installed in horizontal pipelines with the operating element vertically suspended. The process medium must flow through the valve in the direction indicated by the arrow on the body.



Other mounting positions are possible on request.

• Capillary tube

The capillary tube must be installed such that it is not exposed to large temperature fluctuations and cannot be damaged. The smallest possible bending radius is 50 mm.

• Temperature sensor

The bulb sensor can be installed in any desired position. Its entire length must be immersed in the process medium. Choose a place of installation where neither overheating nor considerable idle times occur.

Only use the same kind of materials together, for example thermowells made of stainless steel 1.4571 can be installed in stainless steel heat exchangers.

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Type 2	114 Valve	DN	15	20	25	32	40	50	65	80	100	125	150	200 ¹⁾	250 1)
Length L			130	150	160	180	200	230	290	310	350	400	480	600	730
ыı	Up to 220 °C (without extension piece)			225					300		355	460	590) 730	
	Up to 350 °C (with extension piece)			365					4	40	495	600	730	87	70
н	Up to 220 °C (without exte	Up to 220 °C (without extension piece)			515					90	645	750	880	10	20
	Up to 350 °C (with extension piece)			655					7:	30	785	890	1020	11	60
Weight (body PN 16) ²⁾ Approx. kg			5	5.5	6.5	13	13.5	16	27	32	40	70	113	255	300
Thermostat Type 223		2231	2231/2232 DN 250		50	2232		2233			2234		2235		
Immersion depth T 2		290 ³⁾	≈ 980			235 ³⁾		430			460		3460		
Weight Approx. kg		3.2	6.5			4.0		3.4			3.7		3.6		

Table 3 · Dimensions in mm and weights

¹⁾ Only with Types 2231 and 2232 Thermostats in DN 250 \cdot ²⁾ +15 % for PN 25/PN 40 \cdot ³⁾ Greater immersion depths available on request

Dimensions



Ordering text

Temperature Regulator Type 4/... DN ..., PN ... Body material ... With Thermostat Type ... Set point range ... °C Length of capillary tube ... m Optionally, special version ... Accessories ...

Conversion of valve sizing coefficients:

Specifications subject to change without notice.

