Self-operated Temperature Regulators

Temperature Regulator Type 8

with unbalanced three-way valve

Application

Temperature regulator with either mixing or flow-diverting valve for installations which are heated or cooled with liquids, with control thermostats for **set points** from **–10 °C** to **+250 °C** · **Three-way valves** in **nominal sizes DN 15** to **DN 100** · **Nominal pressures PN 16** to **PN 40** and **temperatures** up to **350 °C**

Conversion of valve sizing coefficients:
C_V (in U.S.-gallons/min) = 1.17 · K_{VS} (in m^3/h)
K_{VS} (in m^3/h) = 0.86 · C_V (in U.S.-gallons/min)

Note

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

The regulators consist of an unbalanced three-way 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.

Specifal features

- Low-maintenance P-regulators requiring no auxiliary energy
- Wide set point range and easy set point adjustment
- Three-way valve, optionally with a plug arrangement for mixing or diverting of liquids
- Flow rate across the cross-sectional area AB is practically independent of the position of the valve plug
- Valve body optionally made of cast iron, cast steel or stainless cast steel
- Versions with double adapter are available for attachment of a temperature limiter or a second control thermostat. For details, see Data Sheet T 2036 E.

Versions

Temperature Regulator Type 8 · With Type 2118 Three-way Valve · DN 15 to DN 100 · PN 16 to PN 40 · Type 2231 to Type 2235 Control Thermostats.

Three-way valves optionally with plug arrangement for mixing or flow-diverting service. The versions in sizes DN 15 to DN 25 are applicable for both mixing and flow-diverting services.
For details on the application of the thermostats, see Information Sheet T 2010 E.

Type 2118/2231 (Fig. 1) · With Type 2231 Control Thermostat · For liquids and steam · Set points from –10 to +150 °C · Set point adjustment at the sensor.

Type 2118/2232 (Fig. 2) · With Type 2232 Control Thermostat · For liquids · Set points from –10 to +250 °C · Separate set point adjustment.

Type 2118/2233 · With Type 2233 Control Thermostat · For liquids, air and other gases · Set points from –10 to +150 °C · Set point adjustment at the sensor.

Type 2118/2234 · With Type 2234 Control Thermostat · For liquids, air and other gases · Set points from –10 to +250 °C · Separate set point adjustment.

Type 2118/2235 · With Type 2235 Control Thermostat · For air-heated storerooms, drying, climatic and heating cabinets · Set points from –10 to +250 °C · Separate set point adjustment and a sensor tube which can be installed by the user.

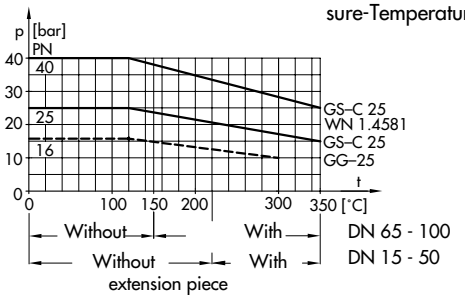
ANSI version available on request.

Fig. 1 · Type 8 Temperature Regulator with Type 2231 Thermostat

Fig. 2 · Type 8 Temperature Regulator with Type 2232 Thermostat, version with separate set point adjustment

Pressure-Temperature Diagram

The operating pressures specified are limited by the Pressure-Temperature Diagram.



Principle of operation (Figs. 3 and 4)

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 to move and as a result also the plug stem (5) of the control valve with the attached plug (3).

The position of the plug determines the flow rate of the heat transfer medium across the free area 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).

In mixing valves in sizes DN 15 to DN 100 (acc. to Fig. 4 with plug arrangement I), the process media to be mixed flow through the valve ports A and B. The combined stream leaves at common port AB. The rate of flow from valve ports A or B to common valve port AB depends on the free area of flow between the seats (2) and the valve plugs (3), and in this way on the position of the plug stem (5). When the temperature rises, port A opens and port B closes.

In flow-diverting valves, in contrast, the process medium flows through common valve port AB, and the partial streams leave at valve ports A or B. The rate of flow from AB to A or B depends on the position of the plug stem.

The flow-diverting valves in sizes DN 15 to DN 25 are supplied with plug arrangement I as shown in Fig. 3. In this case, port A opens and port B closes also in flow-diverting services when the temperature at the sensor rises.

Plug arrangement II (Fig. 4) is only used in DN 32 to DN 100 flow-diverting valves. In these valves, port A closes and port B opens when the temperature rises.

Three-way valve
1 Valve body
2 Seat (exchangeable)
3 Plug
4 Bellows housing
5 Plug stem with spring
6 Threaded nipple with coupling nut

Control thermostat
7 Operating element
8 Capillary tube
9 Key for set point adjustment
10 Set point dial
11 Temperature sensor (bulb sensor)

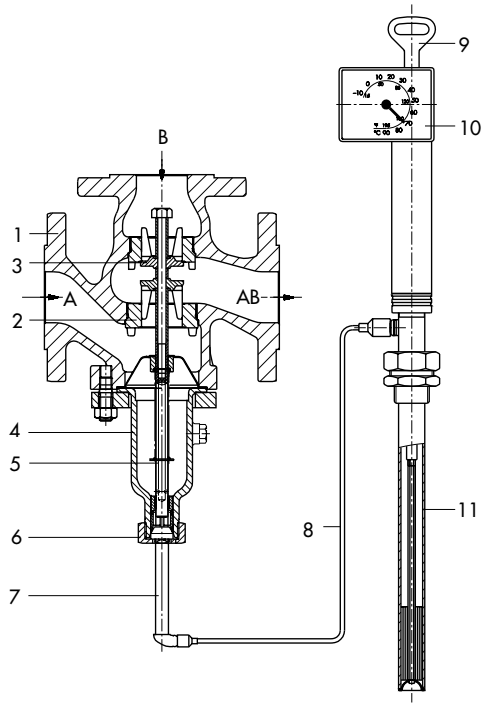


Fig. 3 · Type 8 Temperature Regulator with Type 2231 Thermostat and three-way valve with plug arrangement I, arrows indicate mixing service

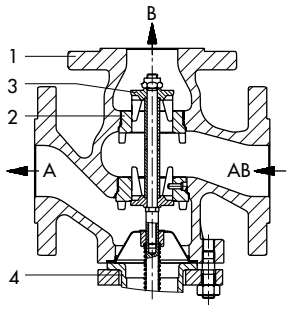


Fig. 4 · Three-way valve with plug arrangement II, arrows indicate flow-diverting service

Table 1 · Technical data · All pressures in bar (gauge). The permissible pressures and differential pressures specified are limited by the data given in the Pressure-Temperature Diagram and the pressure ratings (according to DIN 2401).

Type 2118 Three-way valve	Nominal pressure	PN 16 to PN 40								
K_{VS} values and maximum permissible differential pressures Δp[1]										
Connection	DN	15	20	25	32	40	50	65	80	100
Mixing valve	K_{VS} value	4	6.3	8	16	20	32	50	80	125
For p in B > p in A	Δp	10			3			1		
For p in A > p in B	Δp	1.2			0.5			0.3		
Flow-diverting valve	K_{VS}	4	6.3	8	10	16	26	40	64	100
	Δp	1.2			0.5			0.3		
Permissible valve temperature		See Pressure-Temperature Diagram								
Type 2231 to Type 2235 Thermostats		Size 150								
Set point range (set point span, each 100 °C)		–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								
Perm. ambient temperature at the set point adjustment		–40 to +80 °C								
Permissible temperature at the sensor		100 °C above the adjusted set point								
Perm. pressure at the sensor	Types 2231/2232	Without thermowell: PN 40, with thermowell: PN 40 (version of copper PN 16) or PN 63 With thermowell with flange: PN 40/DN 32 or PN 100/DN 40								
	Types 2233/2234	Without thermowell: PN 40 With flange: PN 6 (140 external Ø) or PN 40/DN 32								
Length of capillary tube		3 m (special version: 5, 10 or 15 m)								

[1] For liquids, the differential pressure equals the pressure head of the pump

Tabelle 2 · Materials (WN = Material Number acc. to DIN)

Type 2118 Three-way valve			
Connection	DN 15 to DN 100		
Nominal pressure	PN 16	PN 25/40	
Body[1]	Cast iron GG-25 WN 0.6025	Cast steel GS-C 25 WN 1.0619	Stainless cast steel WN 1.4581
Seat and plug	Stainless steel WN 1.4006		WN 1.4571
Plug stem/spring	WN 1.4301/WN 1.4310		
Bellows housing	St 35.8 (WN 1.0305)		WN 1.4571
Body gasket	Graphite on metal core		
Extension piece/ distance piece	Brass (special version: stainless steel WN 1.4301)		WN 1.4301
Types 2231, 2232, 2233, 2234 and 2235 Thermostat[2]			
	Standard version	Special version	
Operating elements	Brass, nickel-plated		
Sensor Types 2231/2	Bronze, nickel-plated	–	Stainless steel WN 1.4571
Sensor Types 2233/4	Copper, nickel-plated		
Sensor Type 2235	Copper		
Capillary tube	Copper, nickel-plated	Cu, plastic-coated	
Thermowell with threaded connection			
Immersion	Bronze, nickel-plated	Copper	WN 1.4571
Threaded nipple	Brass, nickel-plated	Copper	WN 1.4571
... with flange			
Immersion tube	Steel	Plastic-coated or PTFE[1]	WN 1.4571
Flange	Steel		WN 1.4571

[1] Plastic coating - for temperatures up to 80 °C - · PVC or PPH coating. PTFE version · Immersion tube: PTFE · Flange: Steel with PTFE bushing

[2] Type 2235 is not available as stainless steel version.

Flow diagram of water

The values shown apply to a fully open valve.

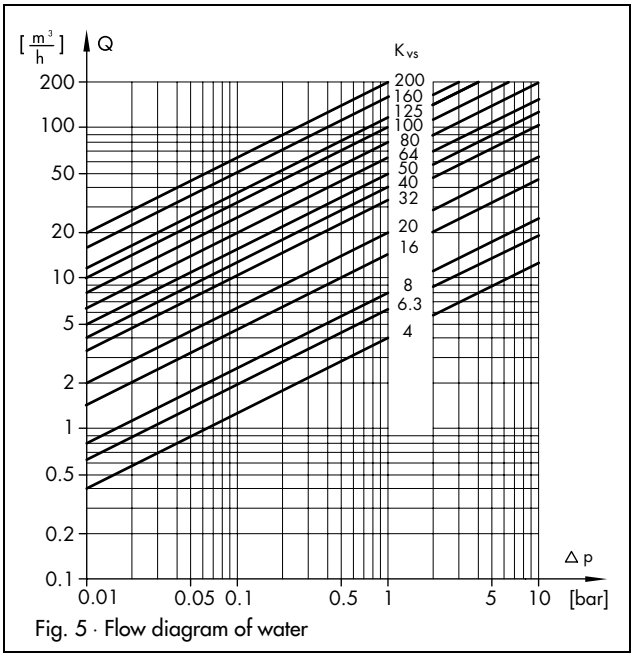


Fig. 5 · Flow diagram of water

Ordering text

Temperature Regulator Type 8/..., DN ..., PN ...
Mixing or flow-diverting valve, body material ...
With Thermostat Type ..., set point range ...°C, capillary tube ... m
Optional special version ..., optional accessories ...

Typetetsted safety devices

The register number is available on request. Available are:

Temperature Regulators (TR) with a Type 2231, 2232, 2233, 2234 or 2235 Control Thermostat and a Type 2118 Three-way Valve, in sizes DN 15 to DN 100, for which the maximum operating pressure should not exceed the maximum permissible differential pressure specified in the "Technical data".
Sensor without thermowell: Applicable up to 40 bar.
With thermowell: Only use SAMSON version, G1, of bronze and WN 1.4571 up to 40 bar, of copper up to 16 bar.

Temperature Limiters (TL) with a thermostat and a three-way valve as specified above and a double adapter DoL (see Data Sheet T 2036 E).
For further details on the selection and application of typetested devices, see Information Sheet T 2040 E.

Safety Temperature Monitors (STM) and **Safety Temperature Limiters (STL)** are also available. For details, see Data Sheets T 2043 E and T 2046 E.

Arrangement of temperature regulators with a three-way valve
- depending on the plug arrangement in the valve -

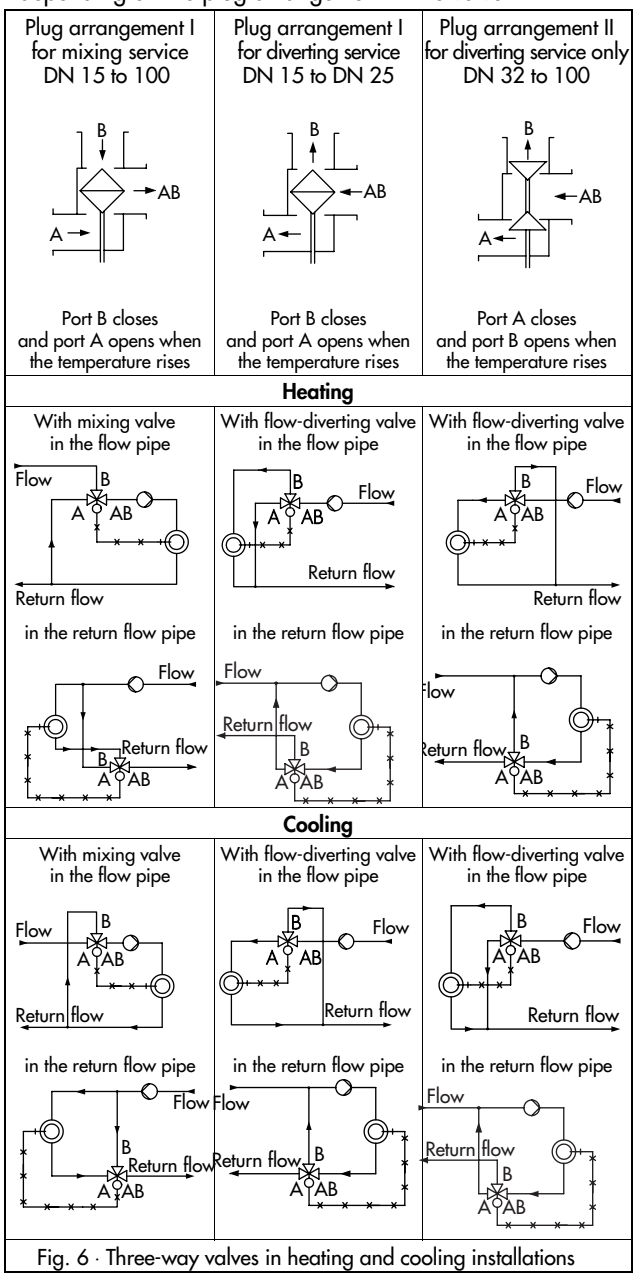


Fig. 6 · Three-way valves in heating and cooling installations

Table 3 · Dimensions in mm and weights

Type 2118 Three-way Valve	DN	15	20	25	32	40	50	65	80	100
Length L		130	150	160	180	200	230	290	310	350
H2		70	80	85	100	105	120	130	140	150
H1	Up 220 °C	285			280			205		
	Up 350 °C	425			420			345		
H	Up 220 °C	575			570			495		
	Up 350 °C	715			710			635		
Weight (body PN 16)[1]	approx. kg	5	6.5	8	12.5	14.5	17	29	44	66

Thermostat	Type	2231	2232	2233	2234	2235
Immersion depth T		290	235	430	460	3460
Weight	approx. kg	3.2	4.0	3.4	3.7	3.6

[1] +15% for PN 25/40

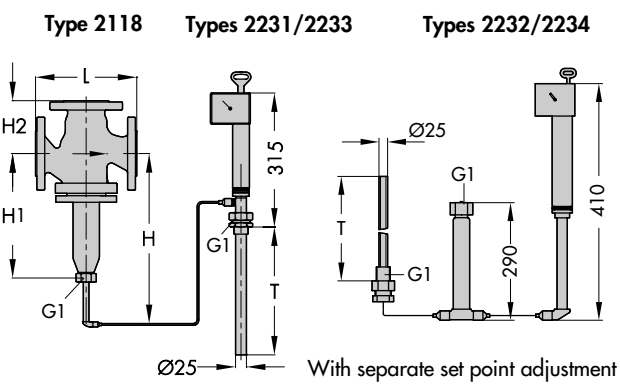


Fig. 7 · Dimensions - Valve and thermostats -

Installation

- Installation in horizontal pipelines with the valve bonnet, including the operating element, suspended vertically. The direction of medium flow must coincide with the arrow on the body.
- The capillary tube must be laid in such a way that it is not exposed to large temperature fluctuations and cannot be damaged. Minimum bending radius = 50 mm.
- The bulb sensor may be installed in any desired position. Its whole length must be immersed in the medium to be controlled. It should be installed in a location where overheating or considerable idle times cannot occur.
- Only the same kind of materials should be combined, for example thermowells of stainless steel WN 1.4571 can be installed into heat exchangers of stainless steel.

Accessories

Extension piece and/or **distance piece.** This has to be mounted between the three-way valve and the operating element when the operating conditions affect the reliability of the operating element.

The **extension piece** is needed for temperatures above 220 °C (see Pressure-Temperature Diagram).

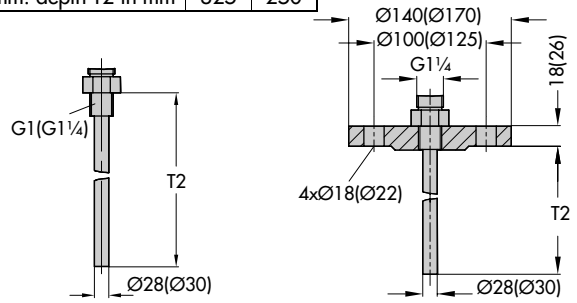
The **distance piece** is used for the stainless steel version to isolate the non-ferrous metal parts of the operating element from the medium flowing through the valve. In addition, it prevents medium leakage when the thermostat is exchanged.

For Type 2231 and Type 2232 Control Thermostats: Thermowells with threaded connection or flange**.**

For Type 2233 and Type 2234 Control Thermostats: Clamps and perforated cover for wall mounting.

Thermowells for Types 2231/2232

Thermostat Type	2231	2232
Imm. depth T2 in mm	325	250

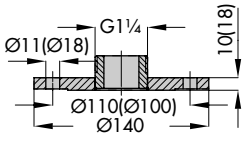


Threaded connection
G1 for PN 40 (version of copper PN 16)
G1¼ for PN 63

Flanges
DN 32 for PN 40

DN 40 for PN 100
Dimensions in parentheses ()

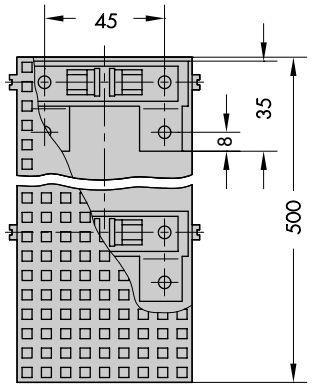
Flange for Type 2233 and Type 2234

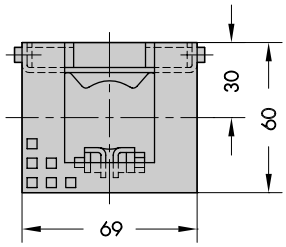


Flange PN 6; 140 external Ø

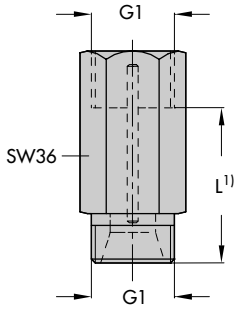
Flange PN 40/DN 32
Dimensions in parentheses ()

Clamps and perforated cover for wall mounting





Distance piece
(Weight approx. 0.2 kg)
Extension piece
(Weight approx. 0.5 kg)



[1] Distance piece: L = 55 mm
Extension piece L = 140 mm

Fig. 8 · Dimensions - Accessories -

Specifications subject to change without notice.

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