

## Type 8 Temperature Regulator

Unbalanced three-way valve · Flange connections

### Application

Temperature regulators with mixing or diverting valve designed for plants that are heated or cooled using liquids  
Control thermostats for set points from **-10 to +150 °C**  
Three-way valves **DN 15 to 50** · Nominal pressure **PN 16**  
Suitable for temperatures up to **150 °C**

### Note

Temperature regulators (TR), safety temperature monitors (STM), and safety temperature limiters (STL) tested according to DIN EN 14597 are available.



The regulators consist of an unbalanced three-way 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
- Three-way valve, optionally available with a plug arrangement to mix or divert liquids
- Flow rate across the port AB almost independent of the valve plug position
- Cast iron valve body
- Versions with double adapter for temperature limiters or attachment of a second control thermostat.

### Versions

**Type 8 Temperature Regulator with three-way valve** · With Type 2118 Valve · Valve body made of cast iron EN-JL1040  
Nominal size DN 15 to 50 · PN 16 · Type 2231 to 2235 Control Thermostat

Three-way valves with optional plug arrangements for either mixing or diverting service. Further details on the application of thermostats can be found in Information Sheet ▶ T 2010.

**Type 2118/2231** (Fig. 1) · With Type 2118 Valve and Type 2231 Control Thermostat · Suitable for liquids and steam  
Set points from -10 to +150 °C · Set point adjustment at sensor

**Type 2118/2232** (Fig. 2) · With Type 2118 Valve and Type 2232 Control Thermostat · Suitable for liquids and steam  
Set points from -10 to +150 °C · Separate set point adjustment

**Type 2118/2233** · With Type 2118 Valve and Type 2233 Control Thermostat · Suitable for liquids, air, and other gases  
Set points from -10 to +150 °C · Set point adjustment at sensor

**Type 2118/2234** · With Type 2118 Valve and Type 2234 Control Thermostat · Suitable for liquids, air, and other gases  
Set points from -10 to +150 °C · Separate set point adjustment

**Type 2118/2235** · With Type 2118 Valve and Type 2235 Control Thermostat · Installation in air-heated storerooms as well as drying, climatic and heating cabinets · Set points from -10 to +150 °C · Separate set point adjustment and a sensor tube to be installed on site

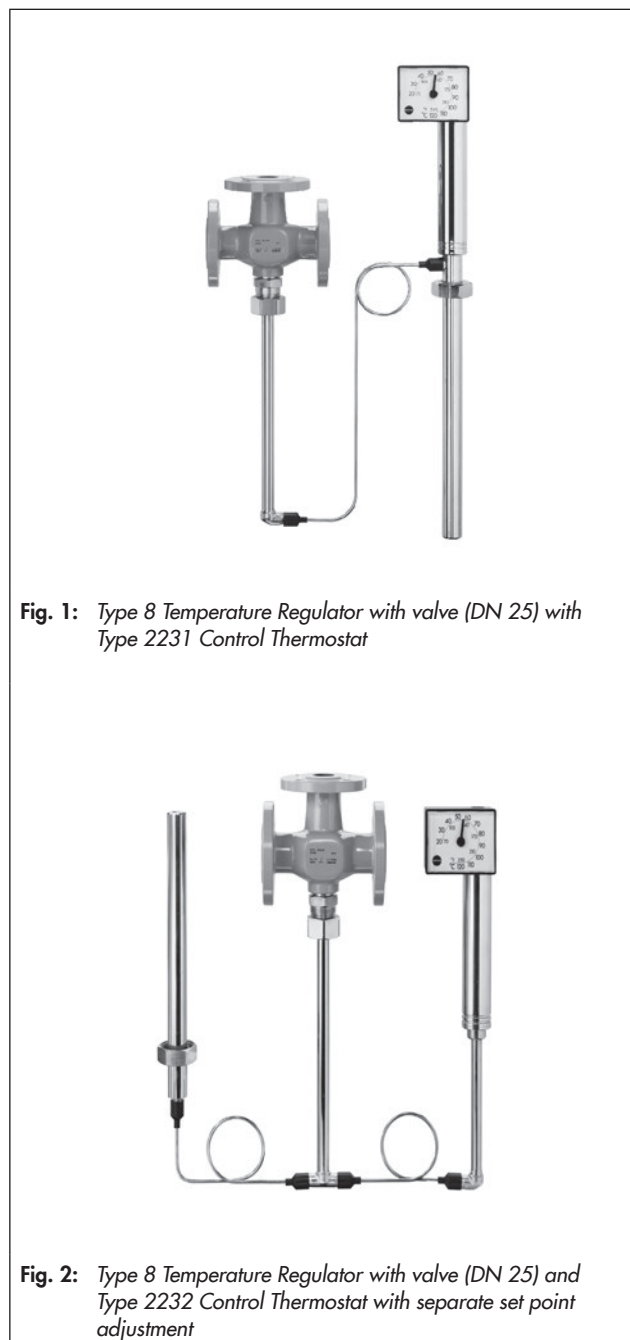


Fig. 1: Type 8 Temperature Regulator with valve (DN 25) with Type 2231 Control Thermostat

Fig. 2: Type 8 Temperature Regulator with valve (DN 25) and Type 2232 Control Thermostat with separate set point adjustment

## Special versions

- 5, 10 or 15 m capillary tube length
- Sensor of CrNiMo steel
- Capillary tube made of CrNiMo steel or plastic-coated copper

## Principle of operation (see Fig. 3 and Fig. 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 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 (9) to a value which can be read off from the dial (10).

In mixing valves (see Fig. 3 with plug arrangement I), the process media to be mixed enter at valve ports A and B. The combined flow exits the valve at port AB. The flow rate from A or B to AB is determined by the area released between the seats (2) and plugs (3), i.e. by the position of the plug stem (5). When the temperature rises, port A opens and port B closes.

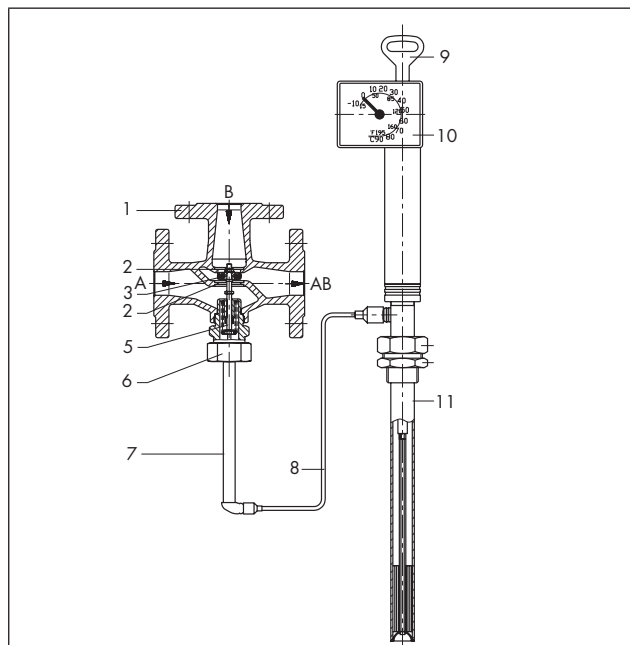
In diverting valves (see Fig. 4 with plug arrangement II), in contrast, the process medium enters at the valve port AB and the partial flows exit at ports A or B. The flow rate from AB to A or B is determined by the position of the plug stem.

### Three-way valve

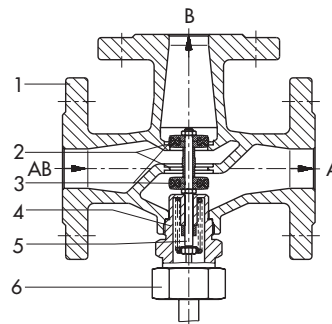
- 1 Valve body
- 2 Seat
- 3 Plug
- 4 Bottom section
- 5 Plug stem with spring
- 6 Thermostat connection (threaded nipple with coupling nut)

### Control thermostat

- 7 Operating element
- 8 Capillary tube
- 9 Set point adjustment key
- 10 Set point dial
- 11 Temperature sensor (bulb sensor)



**Fig. 3:** Type 8 Temperature Regulator with Type 2231 Control Thermostat and three-way valve with plug arrangement I (the arrows indicate mixing service)



**Fig. 4:** Three-way valve with plug arrangement II (the arrows indicate diverting service)

## Installation

### Valve

The thermostat connection (6) must face downwards. Other mounting positions are possible 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 50 mm.

### Temperature sensor

The temperature sensor may be installed in any position. 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.

**Table 1: Technical data** · All pressures in bar (gauge). The listed permissible pressures and differential pressures are restricted by the specifications in the pressure-temperature diagram and the nominal pressure.

Type 2118 Three-way Valve							
Nominal pressure	PN 16						
K <sub>VS</sub> coefficients and max. permissible differential pressures Δp in bar							
Connection	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	
Mixing valve	K <sub>VS</sub> coefficient	4	6.3	10	16	20	32
When p in B > p in A	Δp	4			1.7	1.1	
When p in A > p in B	Δp	4			1.7	1.1	
Diverting valve (when AB to A or B)	K <sub>VS</sub> coefficient	4	6.3	10	16	20	32
	Δp	4			1.7	1.1	
Permissible temperature of the valve	150 °C · See pressure-temperature diagram in ► T 2010						
Compliance							
Type 2231 to 2235 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, 2234 and 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 sensor	100 K above the adjusted set point						
Permissible pressure at sensor	Type 2231/2232	Without/with thermowell: PN 40 · Thermowell with flange: PN 40					
	Type 2233/2234	Without thermowell: PN 40 · With flange on request					
Capillary tube length	3 m (5, 10 or 15 m as special version)						

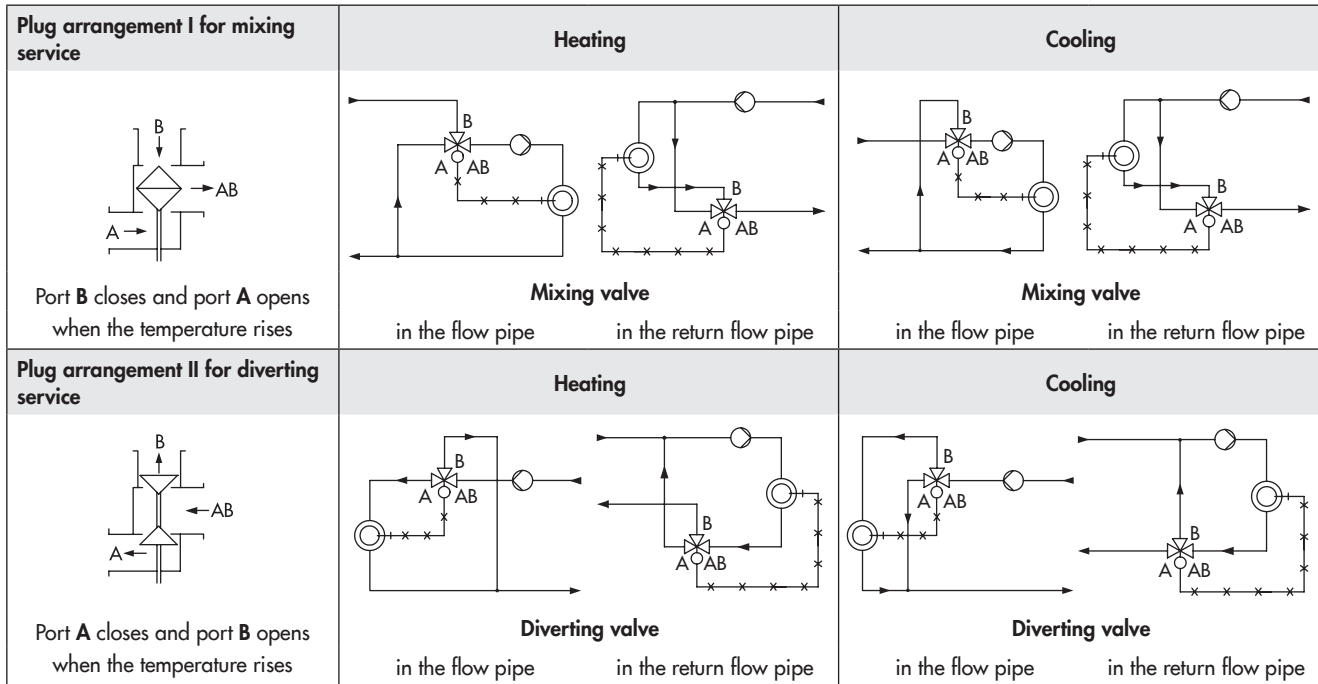
**Table 2: Materials** · Material numbers according to DIN EN

Type 2118 Three-way Valve		
Connection size	DN 15 to 50	
Nominal pressure	PN 16	
Body	Cast iron EN-JL1040	
Seat	Cast iron EN-JL1040	
Plug	1.4305 and brass with EPDM (Shore 70)	
Plug stem	1.4305	
Spring	1.4310	
Connecting nipple	Brass	
Seal	EPDM O-ring	
Accessories		
Intermediate piece	Brass	
Types 2231, 2232, 2233, 2234, and 2235 Thermostat <sup>1)</sup>		
	Standard version	Special version
Operating element	Nickel-plated brass	
Sensor	Type 2231/2232	Bronze
	Type 2233/2234	Copper
	Type 2235	Copper
Capillary tube	Nickel-plated copper	Plastic-coated copper or stainless steel 1.4571
Thermowell		
With G 1 threaded connection		
Thermowell	Bronze, steel, copper <sup>2)</sup>	
Threaded nipple	Brass	
With flanges		
Thermowell	Steel	
Flange	Steel	

<sup>1)</sup> Type 2235 not available in stainless steel version

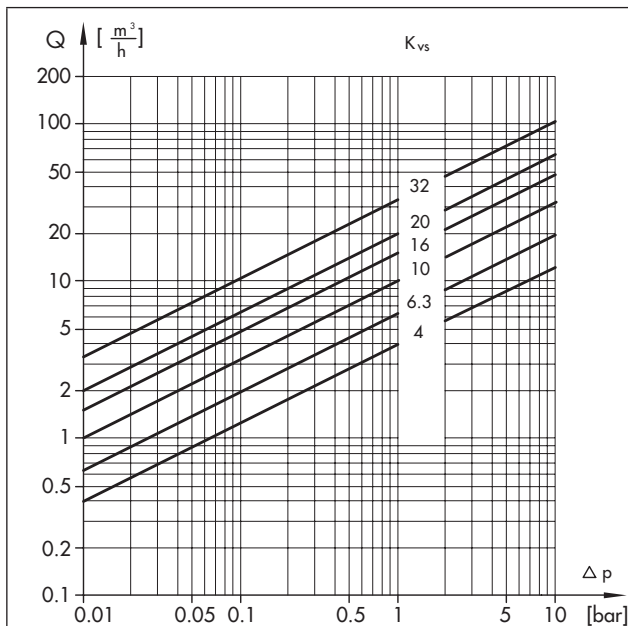
<sup>2)</sup> Only for nominal pressure PN 16

## Arrangement of temperature regulators with three-way valves (depending on the plug arrangement in valve) · Schematics



### Flow rate diagram for water

The specifications apply to a fully open valve



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

Fig. 5: Flow rate diagram for water

### Typetested safety devices

The register number is available on request.

The following versions are available:

**Temperature regulators (TR)** with a Type 2231, 2232, 2233, 2234 or Type 2235 Thermostat and a Type 2118 Three-way Valve in sizes DN 15 to 50, for which the maximum operating pressure must not exceed the maximum permissible differential pressure  $\Delta p$  specified in the technical data.

Sensors without thermowell: applicable up to 40 bar

Sensors with thermowell: only use SAMSON G 1 version made of bronze, steel or stainless steel up to 40 bar, copper up to 16 bar.

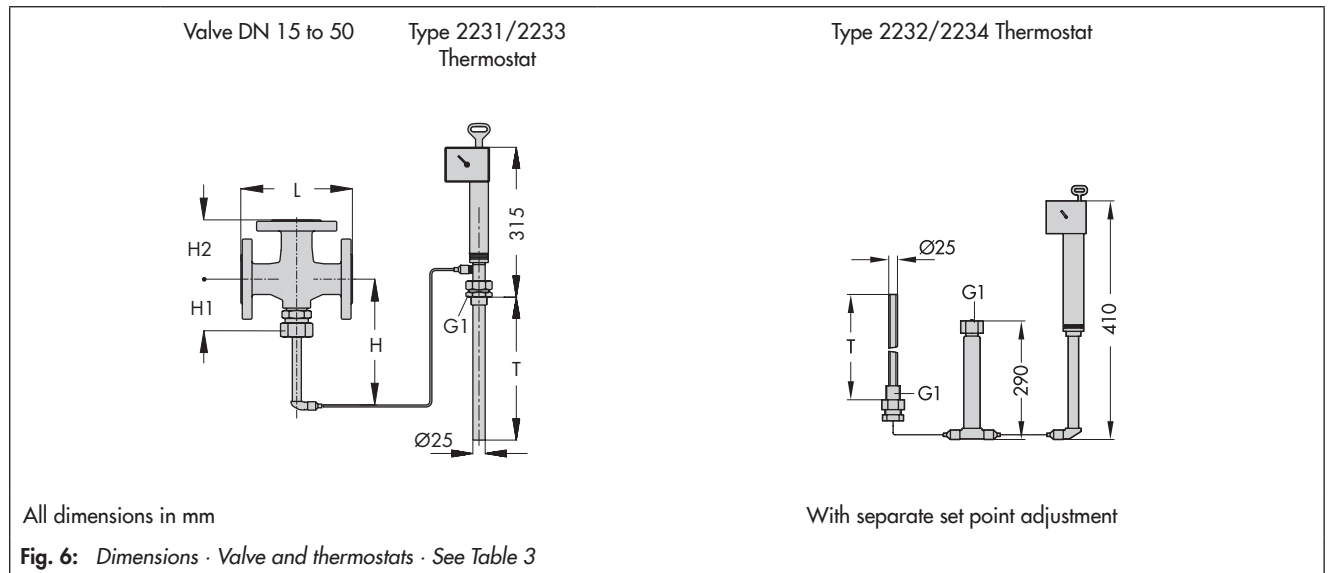
Thermowell for flammable gases typetested by DVGW, G 1 threaded connection, PN 100.

**Temperature limiters (TL)** with thermostat and three-way valve according to above listed specifications and a Do2 double adapter (see Data Sheet ▶ T 2036).

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

**Additionally, the safety temperature monitors (STM) and safety temperature limiters (STL) are available.** Details can be found in data sheets ▶ T 2043 and ▶ T 2046.

## Dimensions · Type 2118 Three-way Valve with thermostat



**Table 3:** Dimensions in mm and weights

Type 2118 Three-way Valve	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50
Length L	130	150	160	180	200	230
H2	70	80	85	100	105	120
H1	78			88		
H	370			380		
Weight, approx. kg	5	6.5	8	12.5	14.5	17

Thermostat	Type 2231	Type 2232	Type 2233	Type 2234	Type 2235
Immersion depth T	290 <sup>1)</sup>	235 <sup>1)</sup>	430	460	3460
Weight, approx. kg	3.2	4.0	3.4	3.7	3.6

<sup>1)</sup> Larger immersion depths on request

### Dynamic behavior of the thermostats

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

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

### Ordering text

Type 8 Temperature Regulator/...

DN ...

Mixing or diverting valve with Type ... Thermostat

Set point range ...°C, capillary tube length ... m

Optionally, special version ...

Optionally, accessories ...

**Table 4:** Dynamic behavior of SAMSON thermostats

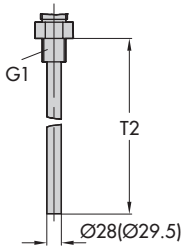
Functional principle	Type ... Control Thermostat	Time constant [s]	
		Without Thermowell	With Thermowell
Liquid expansion	2231	70 s	120 s
	2232	65 s	110 s
	2233	25 s	– <sup>1)</sup>
	2234	15 s	– <sup>1)</sup>
	2235	10 s	– <sup>1)</sup>
Adsorption	2213	70 s	120 s
	2212	– <sup>1)</sup>	40 s

<sup>1)</sup> Not permissible

## Dimensions of accessories

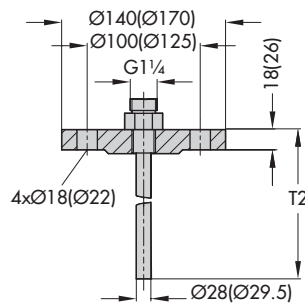
### Thermowells for Type 2231/2232 (thread/flange)

Thermostat	Type 2231	Type 2232
T2	325 mm	250 mm



#### With threaded connection

G 1 for PN 40, PN 100 (dimensions for PN 100 in parentheses), thermowell made of copper: PN 16

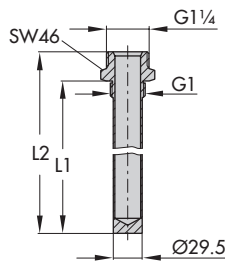


#### With flanges

DN 32 for PN 40  
DN 40 for PN 100 (dimensions in parentheses)

### Thermowells for flammable gases (G 1/PN 100)

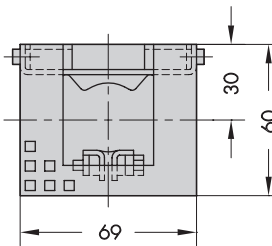
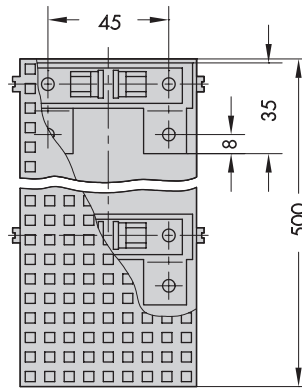
Thermostat	Type 2231	Type 2232
Length L1	315 mm	255 mm
Length L2	340 mm	280 mm



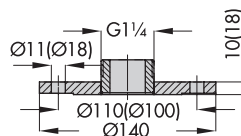
All dimensions in mm

Fig. 7: Dimensions of accessories

### Clamps and perforated cover for wall mounting

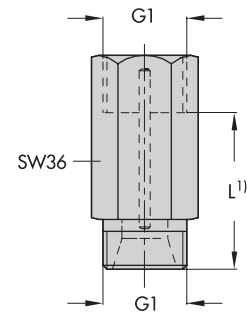


### Flange for Type 2233 and Type 2234 (steel/CrNiMo steel)



Flanged connection PN 6; 140 outside Ø  
Flange PN 40/DN 32 (dimensions in parentheses)

### Extension piece/separating piece



#### Extension piece

Standard version  
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.

## Accessories

**Thermowells** with threaded or flanged connections for Types 2231 and 2232 Bulb Sensors · G 1 threaded connection, made of bronze, steel or CrNiMo steel (PN 40) or made of copper (PN 16) · 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 Types 2233 and 2234 · Clamps for wall mounting · Perforated cover for 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.

Specifications subject to change without notice

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.

**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



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