

# Self-operated Temperature Regulators



## Type 1 Temperature Regulator

With single-seated globe valve, unbalanced · Flanged end connections

### Application

Temperature regulator for heating installations · Control thermostats for set points from  $-10$  to  $+250$  °C · Valve 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 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

Valve size DN 15 to 25 · PN 25 to 40 · DN 32 to 50

PN 16 to 40 · Types 2231 to 2235 Control Thermostat (see Fig. 1)

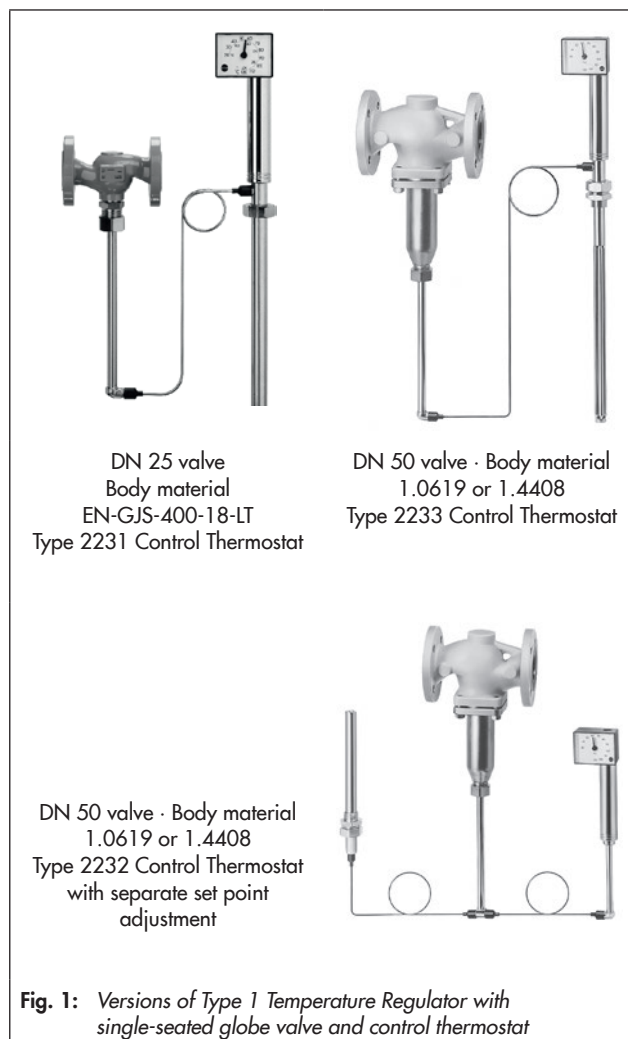
Further details on the application of thermostats can be found in Information Sheet ▶ T 2010.

**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

**Type 2111/2233** · With Type 2111 Valve and Type 2233 Control Thermostat · Suitable for liquids, air and other gases · Set points from  $-10$  to  $+150$  °C · Set point adjustment at the sensor

**Type 2111/2234** · With Type 2111 Valve and Type 2234 Control Thermostat · Suitable for liquids, air and other



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

gases · Set points from  $-10$  to  $+250$  °C · Separate set point adjustment

**Type 2111/2235** · With Type 2111 Valve and Type 2235 Control Thermostat · Installation in 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 on site

### Special version

- 5, 10 or 15 m capillary tube
- Sensor of CrNiMo steel
- Capillary tube made of CrNiMo steel or plastic-coated copper
- Valve free of non-ferrous metal
- Stainless steel valve version
- Dimensions and materials according to ANSI (▶ T 2115)

### 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.

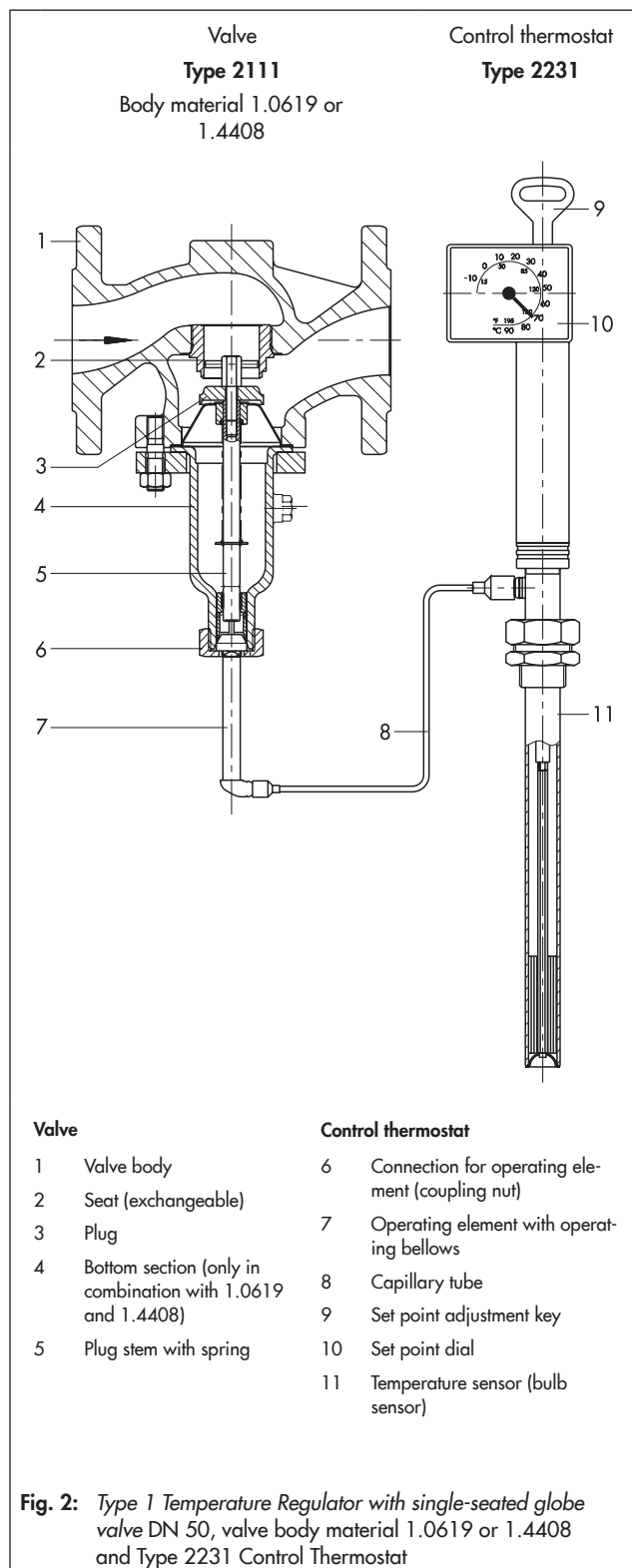


Fig. 2: Type 1 Temperature Regulator with single-seated globe valve DN 50, valve body material 1.0619 or 1.4408 and Type 2231 Control Thermostat

**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 nominal pressure (according to DIN EN 12516-1).

Type 2111 Valve							
Pressure rating	PN 16 to 40						
K <sub>V5</sub> coefficients, leakage class and max. permissible differential pressures Δp in bar							
Standard version	DN	15	20	25	32	40	50
K <sub>V5</sub> coefficient		4	6.3	8	16	20	32
Differential pressure Δp <sub>max.</sub>	bar	25 <sup>1)</sup>	16 <sup>1)</sup>	14	6	6 <sup>2)</sup>	4
Leakage class according to IEC 60534-4	≤0.05 % of K <sub>V5</sub> coefficient						
Special version	DN	15	20	25	32	40	50
K <sub>V5</sub> coefficient		2.5 · 1.0 · 0.4 · 0.1		4.0 <sup>1)</sup> · 1.0 · 0.4 · 0.1	6.3 <sup>1)</sup>	8	16
Differential pressure Δp <sub>max.</sub>	bar	25			16	14	6
Permissible valve temperature	Max. 350 °C · See pressure-temperature diagram in ► T 2010						
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, 2235 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 2231/2232	Without thermowell PN 40 · With thermowell PN 40 or 100 With thermowell with flange: PN 40 · PN 100					
	Type 2233/2234	Without thermowell: PN 40 · With flange: PN 6 · PN 40					
Capillary tube length	3 m (5, 10 or 15 m as special version)						

<sup>1)</sup> With EN-GJS-400-18-LT: Δp<sub>max.</sub> = 14 bar

<sup>2)</sup> In combination with Type 2212 STM: 4 bar

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

Type 2111 Valve				
Valve size	DN	32 to 50	15 to 50	
Nominal pressure		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 1.4571
Plug stem · Spring		1.4301 · 1.4310		
Bottom section		1.0425 <sup>1)</sup>		1.4571
Gasket		Graphite on metal core		
Extension piece · Separating piece		Brass (special version: stainless steel 1.4301)		1.4301
Types 2231, 2232, 2233, 2234 and 2235 Thermostat				
Version		Standard version		Special version
Operating element		Brass		
Sensor	Type 2231/2232	Bronze		Stainless steel 1.4571
	Type 2233/2234	Copper		
	Type 2235	Copper		-
Capillary tube		Copper		Plastic-coated copper

<sup>1)</sup> EN-GJL-250 and EN-GJS-400-18-LT with brass bushing

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

Thermowell		
Version	Standard version	Special version
... with G 1 threaded connection		
Immersion tube	Bronze · Steel	Stainless steel 1.4571
Threaded nipple	Brass · Steel	
... with flanges		
Immersion tube · Flange	Steel	Stainless steel 1.4571

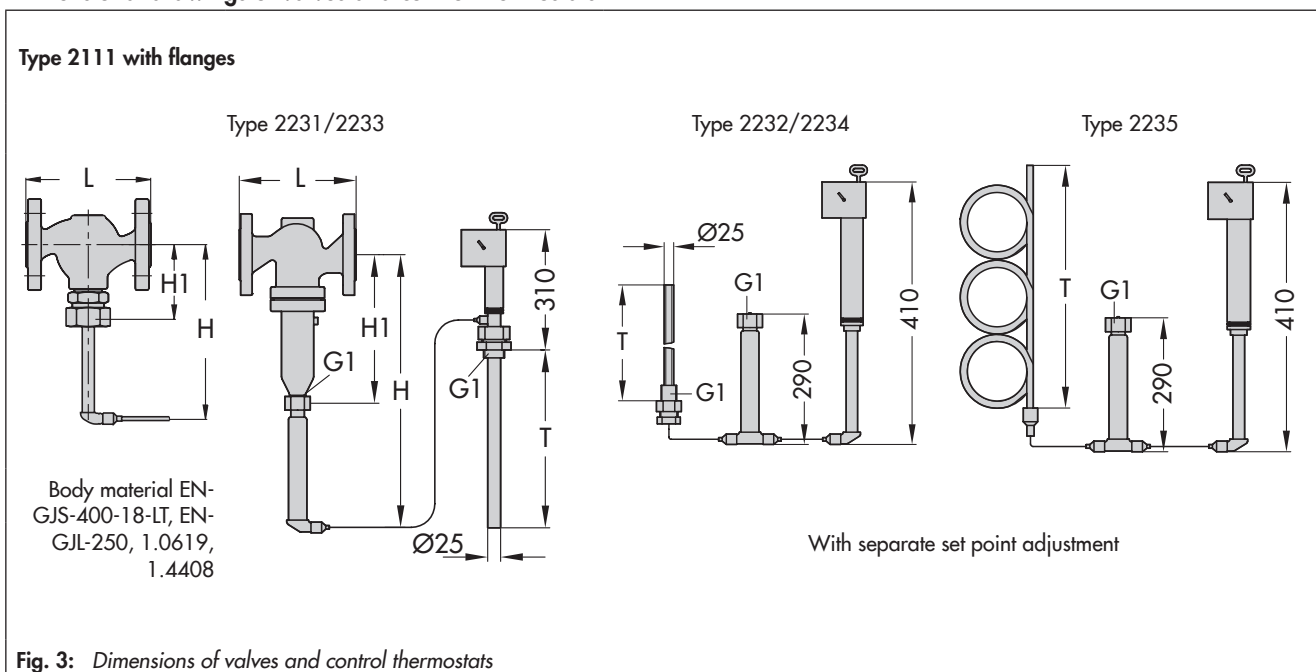
**Table 3: Dimensions and weights**

Type 2111 Valve	DN	15	20	25	32	40	50
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 (PN 16 body)	kg (approx.)	4			10 <sup>1)</sup>		
Body material 1.0619, 1.4408							
H1	Without extension piece	225					
	With extension piece	365					
H	Without extension piece	515					
	With extension piece	655					
Weight	kg (approx.)	4	4.5	5.5	10 <sup>1)</sup>	10.5 <sup>1)</sup>	13.5 <sup>1)</sup>
<b>Control thermostat</b>	<b>Type</b>	<b>2231</b>	<b>2232</b>	<b>2233</b>	<b>2234</b>	<b>2235</b>	
Immersion depth T	mm	290 <sup>2)</sup>	235 <sup>2)</sup>	430	460	3460	
Weight	kg (approx.)	3.2	4.0	3.4	3.7	3.6	

<sup>1)</sup> PN 16 body; +15 % for PN 25/40

<sup>2)</sup> Larger immersion depths on request

**Dimensional drawings of valves and control thermostats**



**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 2233 and 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).

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, 2233, 2234 or 2235 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.

### Dynamic behavior of control thermostats

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

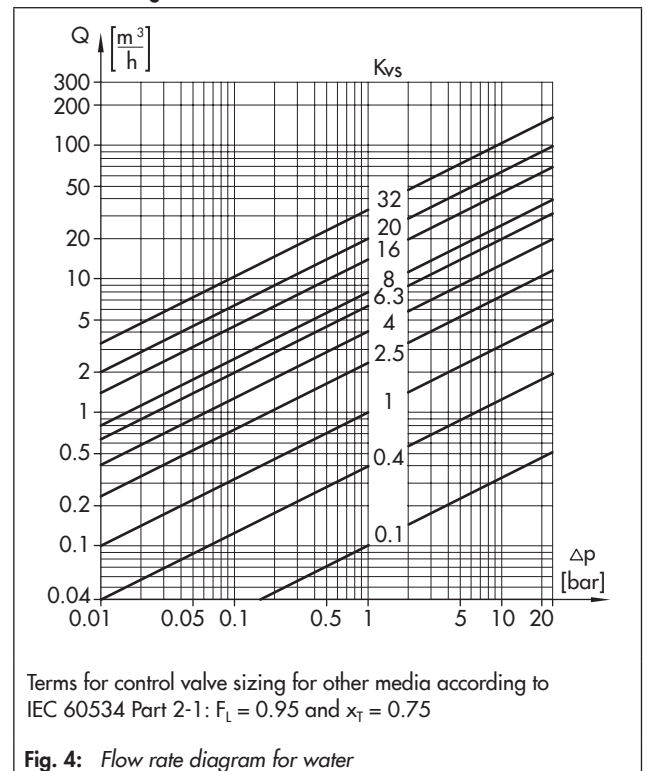
Table 4 lists the response times of SAMSON control thermostats operating according to different principles measured in water.

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

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

<sup>1)</sup> Not permissible

### Flow rate diagram for water



### Ordering text

Type 2111/ ... Temperature Regulator

DN ..., PN ...,

Body material ...,

With Type 223... Control Thermostat, set point range ... °C,

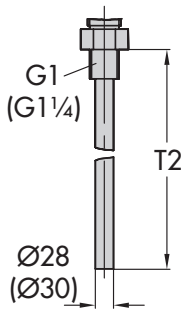
Capillary tube ... m,

Optionally, special version ..., accessories ...

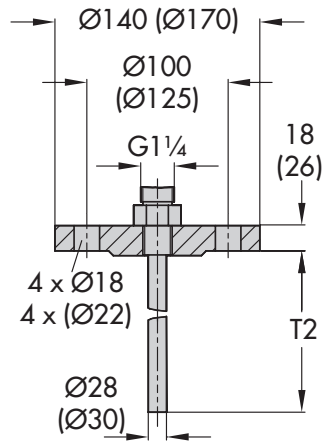
Dimensional drawings of accessories

Thermowells for Type 2231/2232

Control thermostat	Type	2231	2232
Immersion depth T2	mm	325	250

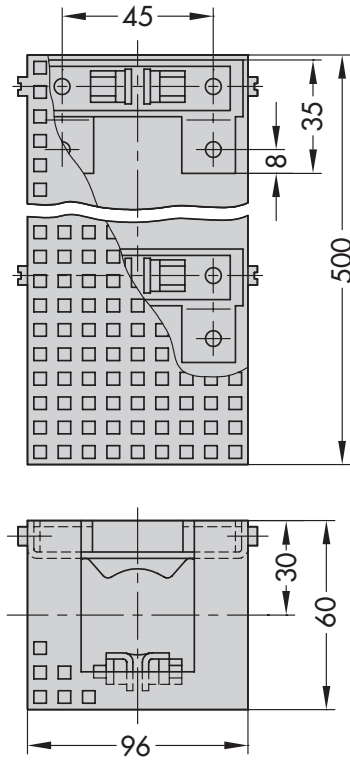


Thermowell with threaded connection  
G 1/PN 40 or PN 100 <sup>1)</sup>



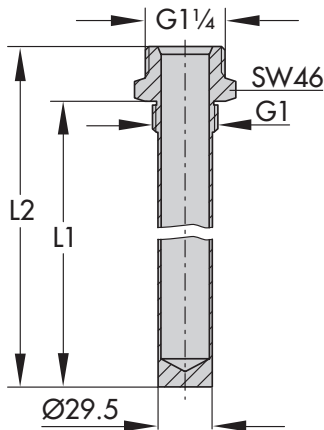
Thermowell with flanges  
DN 32 for PN 40  
DN 40 for PN 100 <sup>1)</sup>

Clamps and perforated cover for wall mounting



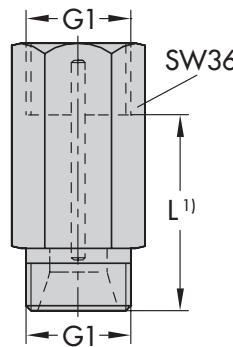
Thermowells for flammable gases (PN 100)

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

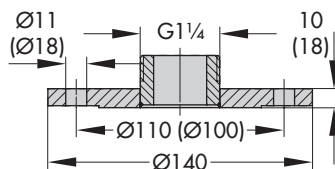
L = approx. 140 mm, approx. 0.5 kg  
With bellows seal (special version),  
L = approx. 180 mm, approx. 0.6 kg

Separating piece with seals,

L = approx. 55 mm, approx. 0.2 kg

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

Flange for Type 2233 and Type 2234



Flange PN 6; 140 mm outer diameter  
Flange PN 40/DN 32 (dimensions in parentheses)

Fig. 5: Dimensions and weights of accessories

<sup>1)</sup> Dimensions in brackets

Specifications subject to change without notice



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