

# Gas-actuated thermometer with electrical output signal

## Stainless steel version

### Models TGT73.100 and TGT73.160

WIKA data sheet TV 17.10



for further approvals  
see page 6

**intelliTHERM®**

#### Applications

- Chemical, petrochemical industry
- Oil and gas industry
- Power engineering, renewable energy
- Machine building, plant and vessel construction

#### Special features

- Cost-effective “2 in 1” temperature measurement
- Compact design
- Application ranges from -200 ... +700 °C
- “Plug-and-play”, thus no transmitter configuration necessary



Fig. left: Lower mount (radial)

Fig. right: Back mount (axial)

#### Description

Wherever the process pressure has to be indicated on-site and, at the same time, a signal transmission to the central control or remote centre is desired, the model TGT73 intelliTHERM® can be used.

Through the combination of a mechanical measuring system and electronic signal processing, the process temperature can be read reliably, even if the voltage supply is lost.

Due to the wide variety of possible designs, the model TGT73 gas-actuated thermometers can be perfectly adapted to any process connection or location. With the adjustable stem and dial version, the case can be adjusted precisely to the desired viewing angle.

With the contact bulb version (without direct contact with the medium), the temperature can be measured and controlled even when the pipe diameter is extremely small.

The electronic WIKA transmitter, integrated into the high-quality mechanical temperature measuring instrument, combines the advantages of electrical signal transmission with the advantages of a local mechanical display.

The measuring span (electrical output signal) is adjusted automatically with the mechanical display, i.e. the scale over the full scale range corresponds to 4 ... 20 mA.

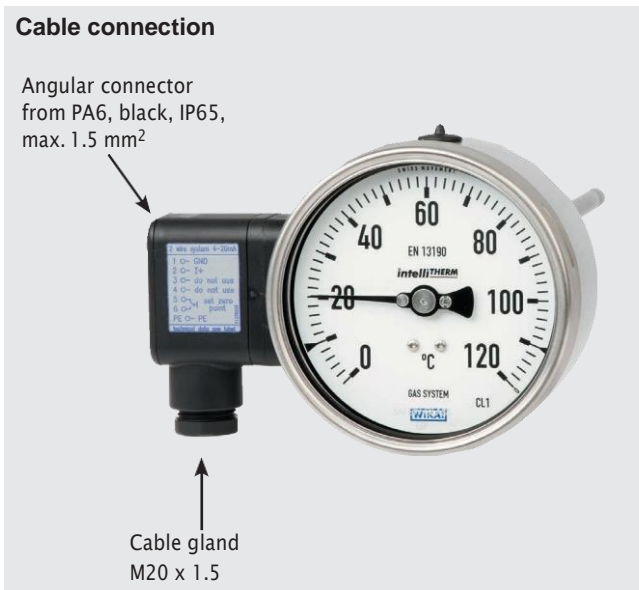
A 4 ... 20 mA version is available for use in hazardous areas.

## Specifications

Gas-actuated thermometer, model TGT73	
Measuring element	Inert gas expansion system
Nominal size in mm	<ul style="list-style-type: none"> <li>■ 100</li> <li>■ 160</li> </ul>
Instrument version	<ul style="list-style-type: none"> <li>■ Back mount (axial)</li> <li>■ Lower mount (radial)</li> <li>■ Back mount (adjustable stem and dial)</li> <li>■ Instruments with capillaries</li> </ul>
Connection design	<ul style="list-style-type: none"> <li>■ 5 Standard (male threaded connection)</li> <li>■ 1 Plain stem (without thread)</li> <li>■ 2 Male nut</li> <li>■ 3 Union nut</li> <li>■ 4 Compression fitting (sliding on stem)</li> <li>■ 5 Union nut and loose threaded connection</li> <li>■ 6 Compression fitting (can be adjusted on either capillary or spiral protective sleeve)</li> <li>■ 7 Compression fitting at the case</li> </ul>
Unit (scale range)	°C Option: <ul style="list-style-type: none"> <li>■ °F</li> <li>■ °C/°F (dual scale)</li> </ul>
Process connection	<ul style="list-style-type: none"> <li>■ Plain, without thread</li> <li>■ G ½ B</li> <li>■ ½ NPT</li> <li>■ G ½ female</li> <li>■ ½ NPT female</li> <li>■ M20 x 1.5</li> <li>■ M24 x 1.5 female</li> <li>others on request</li> </ul>
Accuracy class	Class 1 per EN 13190 at 23 °C ±10 °C ambient temperature
Rated operating ranges and conditions	EN 13190
Stem diameter	8 mm Option: <ul style="list-style-type: none"> <li>■ 6 mm</li> <li>■ 10 mm</li> <li>■ 12 mm</li> </ul> others on request
Working range	
Continuous load (1 year)	Measuring range (EN 13190)
Short time (max. 24 h)	Scale range (EN 13190)
Window	Laminated safety glass
Contact bulb	120 x 22 x 12 mm Stainless steel 1.4571
Adjustable stem and dial	Stainless steel Swivelling 90° 360° rotatable
Capillary	Ø 2 mm, stainless steel 1.4571, bending radius no less than 6 mm Standard capillary: max. 60 m Capillary with spiral protective sleeve: max. 40 m Capillary with PVC coating: max. 20 m Length to customer specification Option: Armoured coating for capillary (Ø 7 mm spiral protective sleeve, flexible or PVC-coated)

Gas-actuated thermometer, model TGT73	
<b>Mounting types for instruments with capillary</b>	<ul style="list-style-type: none"> <li>■ Surface mounting flange, stainless steel</li> <li>■ Instrument mounting bracket, aluminium die-casting</li> <li>■ Panel mounting flange, stainless steel</li> </ul>
<b>Dampening (option)</b>	With liquid dampening
<b>Reverse polarity protection</b>	Yes
<b>Wetted materials</b>	
Process connection	Stainless steel 304SS
Stem	Stainless steel 316SS
<b>Non-wetted materials</b>	
Case, ring	Stainless steel 304SS
Dial	Aluminium, white, black lettering
Pointer	Aluminium, black, adjustable pointer
<b>Ingress protection per IEC/EN 60529</b>	IP65
<b>Permissible temperatures</b>	
Ambient	-20 ... +60 °C [-4 ... +140 °F] without/with liquid dampening
Storage and transport	
Without liquid dampening	-50 ... +70 °C [-58 ... +158 °F]
With liquid dampening	-40 ... +70 °C [-40 ... +158 °F]
<b>Permissible operating pressure at the stem</b>	max. 25 bar, static
<b>Electrical connection</b>	Angular connector

## Detailed views

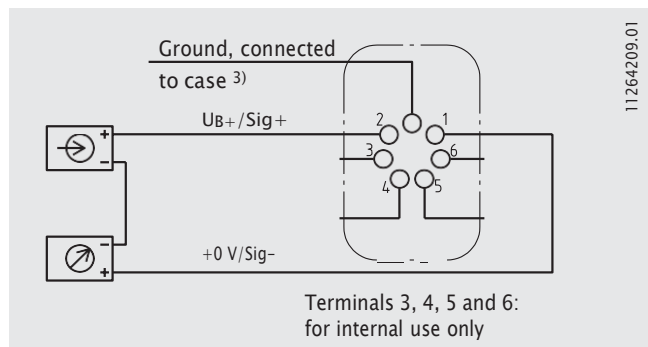


Electrical data	intelliTHERM® models TGT73.100 and TGT73.160			
<b>Power supply <math>U_B</math></b> 4 ... 20 mA 4 ... 20 mA (Ex version) 0 ... 10 V	DC $12 \leq U_B \leq 30$ V DC $14 \leq U_B \leq 30$ V DC $15 \leq U_B \leq 30$ V			
<b>Influence of power supply</b>	$\leq 0.1$ % of full scale/10 V			
<b>Permissible residual ripple</b>	$\leq 10$ % ss			
<b>Permissible max. load <math>R_A</math></b>	$R_A \leq (U_B - 12 \text{ V})/0.02$ A with $R_A$ in $\Omega$ and $U_B$ in V, however max. 600 $\Omega$			
<b>Effect of load</b>	$\leq 0.1$ % of full scale			
<b>Output signal (variant I)</b>	4 ... 20 mA, 2-wire, passive, per NAMUR NE43			
<b>Output signal (variant III)</b>	0 ... 10 V, 3-wire			
<b>Safety-related maximum values (variant II)</b> Power supply $U_i$ Short-circuit current $I_i$ Power $P_i$ Internal capacitance $C_i$ Internal inductance $L_i$	max. DC 30 V max. 100 mA max. 0.72 W 12 nF negligible			
<b>Impedance at voltage output</b>	0.5 $\Omega$			
<b>Load capacity at voltage output</b>	2 ... 100 k $\Omega$			
<b>Sampling rate sensor</b>	600 ms			
<b>Linear error</b>	$\leq 1.0$ % of span (terminal method)			
<b>Output signal accuracy</b>	0.2 % of full scale value (only electronics)			
<b>Resolution</b>	0.15 % of full scale (10 bit resolution at 360°)			
<b>Refresh rate (measuring rate)</b>	$> 1/s$			
<b>Input signal, angle of rotation</b>	0 ... 270 $\text{°}$			
<b>Long-term stability of electronics</b>	$< 0.3$ % of full scale/a			
<b>Temperature error of electronics</b>	$< 0.3$ % of full scale value/10 K (in overall temperature range)			
<b>Warm-up time</b>	$\leq 5$ min			
<b>Electrical connection</b>	Via angular connector, 180° rotatable, max. 1.5 mm <sup>2</sup> , cable protection, M20 x 1.5 cable gland, cable outer diameter 7 ... 13 mm, incl. strain relief			
<b>Designation of connection terminals dependent on the output signal version</b>	Terminal Type	Variant I 4 ... 20 mA	Variant II (Ex version) 4 ... 20 mA	Variant III 0 ... 10 V
	1	GND	GND	GND
	2	$I_+$	$I_+$	$U_{B+}$
	3	reserved	reserved	$U_{out}$
	4	reserved	reserved	reserved
	5	reserved	reserved	reserved
	6	reserved	reserved	reserved

**Scale ranges, measuring ranges <sup>1)</sup>, error limits (EN 13190)**  
**Scale graduation per WIKA standard**







Scale range in °C	Measuring range in °C	Scale spacing in °C	Error limit ±°C
-80 ... +60	-60 ... +40	2	2
-60 ... +40	-50 ... +30	1	1
-40 ... +60	-30 ... +50	1	1
-30 ... +50	-20 ... +40	1	1
-20 ... +60	-10 ... +50	1	1
-20 ... +80	-10 ... +70	1	1
-20 ... +120	0 ... 100	2	3
-20 ... +140	0 ... 120	2	3
0 ... 60	10 ... 50	1	1
0 ... 80	10 ... 70	1	1
0 ... 100	10 ... 90	1	1
0 ... 120	10 ... 110	2	2
0 ... 160	20 ... 140	2	2
0 ... 200	20 ... 180	2	2
0 ... 250	30 ... 220	5	2.5
0 ... 300	30 ... 270	5	5
0 ... 400	50 ... 350	5	5
0 ... 500	50 ... 450	5	5
0 ... 600	100 ... 500	10	10
0 ... 700	100 ... 600	10	10

**Designation of connection terminals <sup>2)</sup>**



- 1) The measuring range is indicated on the dial by two triangular marks. Only within this range is the stated error limit valid per EN 13190.
- 2) For 3-wire connection (see operating instructions)
- 3) This connection must not be used for equipotential bonding. The instrument must be incorporated in the equipotential bonding via the process connection.

## Approvals

Logo	Description	Country
 	<b>EU declaration of conformity</b> <ul style="list-style-type: none"> <li>■ EMC directive EN 61326 emission (group 1, class B) and immunity (industrial application)</li> <li>■ RoHS directive</li> <li>■ ATEX directive (option) Hazardous areas               <ul style="list-style-type: none"> <li>- Ex ia Zone 1 gas [II 2G Ex ia IIC T6/T5/T4 * Gb]</li> <li>Zone 21 dust [II 2D Ex ia IIIB T85°C/T95°C/T100°C/T135°C * Db]</li> </ul> </li> </ul>	European Union
	<b>IECEX (option)</b> Hazardous areas <ul style="list-style-type: none"> <li>- Ex ia Zone 1 gas [Ex ia IIC T6/T5/T4 * Gb]</li> <li>Zone 21 dust [Ex ia IIIB T85°C/T95°C/T100°C/T135°C * Db]</li> </ul>	International
	<b>EAC (option)</b> <ul style="list-style-type: none"> <li>■ EMC directive</li> <li>■ Hazardous areas</li> </ul>	Eurasian Economic Community
	<b>GOST (option)</b> Metrology, measurement technology	Russia
-	<b>MTSCHS (option)</b> Permission for commissioning	Kazakhstan
	<b>BelGIM (option)</b> Metrology, measurement technology	Belarus

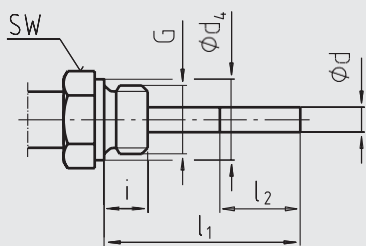
## Certificates (option)

- 2.2 test report
- 3.1 inspection certificate
- DKD/DAkKS calibration certificate

Approvals and certificates, see website

## Connection designs

### Standard design (male threaded connection) <sup>1)</sup>

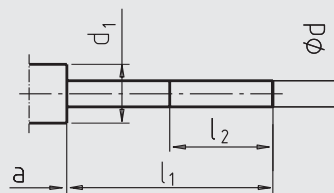


Standard insertion length  $l_1 = 63, 100, 160, 200, 250$  mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	d <sub>4</sub>	Ø d
100, 160	G ½ B	14	27	26	8
	G ¾ B	16	32	32	8
	½ NPT	19	22	-	8
	¾ NPT	20	30	-	8

1) Not applicable to version with capillary

### Design 1, plain stem (without thread)

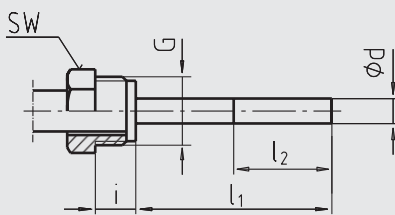


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Standard insertion length  $l_1 = 100, 140, 200, 240, 290$  mm  
Basis for design 4, compression fitting

Nominal size	Dimensions in mm			
	d <sub>1</sub> <sup>1)</sup>	Ø d	a for axial	a for adjustable stem and dial
100, 160	18	8	15	25

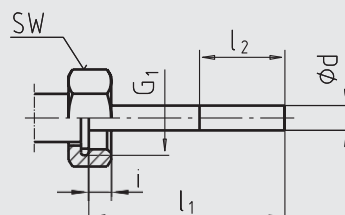
### Design 2, male nut



Standard insertion length  $l_1 = 80, 140, 180, 230$  mm

Nominal size	Process connection		Dimensions in mm	
	G	i	SW	Ø d
100, 160	G ½ B	20	27	8
	M20 x 1.5	15	22	8

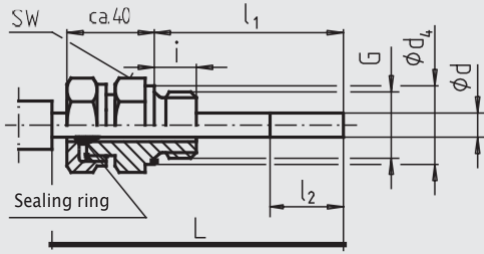
### Design 3, union nut



Standard insertion length  $l_1 = 89, 126, 186, 226, 276$  mm

Nominal size	Process connection		Dimensions in mm	
	G	i	SW	Ø d
100, 160	G ½ B	8.5	27	8
	G ¾ B	10.5	32	8
	M24 x 1.5	13.5	32	8

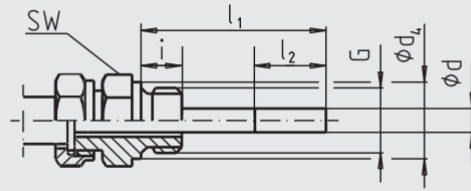
**Design 4, compression fitting (sliding on stem)**



Insertion length  $l_1$  = variable  
 Length  $L = l_1 + 40$  mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	d <sub>4</sub>	Ø d
100, 160	G ½ B	14	27	26	8
	G ¾ B	16	32	32	8
	M18 x 1.5	12	24	23	8
	½ NPT	19	22	-	8
	¾ NPT	20	30	-	8

**Design 5, union nut and loose threaded connection**



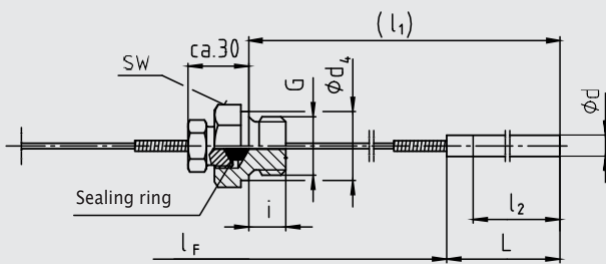
Standard insertion length  $l_1 = 63, 100, 160, 200, 250$  mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	d <sub>4</sub>	Ø d
100, 160	G ½ B	14	27	26	8
	G ¾ B	16	32	32	8
	M18 x 1.5	12	24	23	8
	½ NPT	19	22	-	8
	¾ NPT	20	30	-	8

**Option:** Connection with union nut M24 x 1.5  
 and loose threaded connection M18 x 1.5

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	d <sub>4</sub>	Ø d
100, 160	M18 x 1.5	12	32	23	8

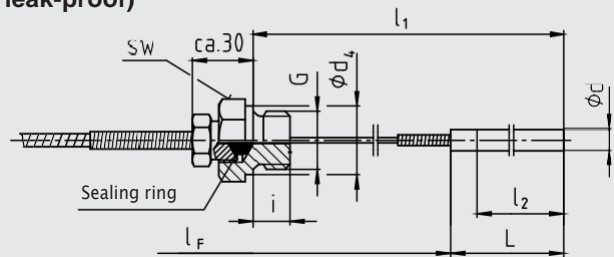
**Design 6.1, compression fitting sliding on capillary (compression fitting is leak-proof)**



Insertion length  $l_1$  = variable  
 Probe length L: Standard 200 mm with Ø d = 6 mm  
 Standard 170 mm with Ø d = 8 mm  
 Standard 100 mm with Ø d ≥ 10 mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	d <sub>4</sub>	Ø d
100, 160	G ½ B	14	27	26	8
	G ¾ B	16	32	32	8
	½ NPT	19	22	-	8
	¾ NPT	20	30	-	8

**Design 6.2, compression fitting sliding on capillary with spiral protective sleeve (compression fitting is leak-proof)**

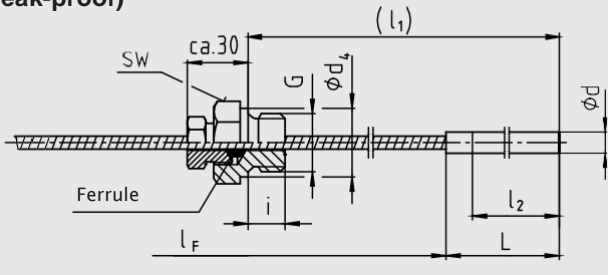


Insertion length  $l_1$ : ≥ 300 mm with Ø d = 6 or 8 mm  
 ≥ 200 mm with Ø d ≥ 10 mm  
 Probe length L: Standard 200 mm with Ø d = 6 mm  
 Standard 170 mm with Ø d = 8 mm  
 Standard 100 mm with Ø d ≥ 10 mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	d <sub>4</sub>	Ø d
100, 160	G ½ B	14	27	26	8
	G ¾ B	16	32	32	8
	½ NPT	19	22	-	8
	¾ NPT	20	30	-	8



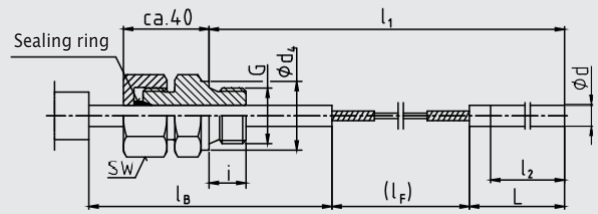
**Design 6.3, compression fitting sliding on spiral protective sleeve (compression fitting is not leak-proof)**



Insertion length  $l_1$  = variable  
 Probe length L: Standard 200 mm with  $\varnothing d = 6$  mm  
 Standard 170 mm with  $\varnothing d = 8$  mm  
 Standard 100 mm with  $\varnothing d \geq 10$  mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	$d_4$	$\varnothing d$
100, 160	G 1/2 B	14	27	26	8
	G 3/4 B	16	32	32	8
	1/2 NPT	19	22	-	8
	3/4 NPT	20	30	-	8

**Design 7, compression fitting at the case**



Insertion length  $l_1$ :  $\geq 400$  mm  
 Probe length L: Standard 200 mm with  $\varnothing d = 6$  mm  
 Standard 170 mm with  $\varnothing d = 8$  mm  
 Standard 100 mm with  $\varnothing d \geq 10$  mm  
 $l_B$  = standard 100 mm (others on request)

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	$d_4$	$\varnothing d$
100, 160	G 1/2 B	14	27	26	8
	G 3/4 B	16	32	32	8
	1/2 NPT	19	22	-	8
	3/4 NPT	20	30	-	8

**Note for designs 6.1, 6.2, 6.3 and 7:**

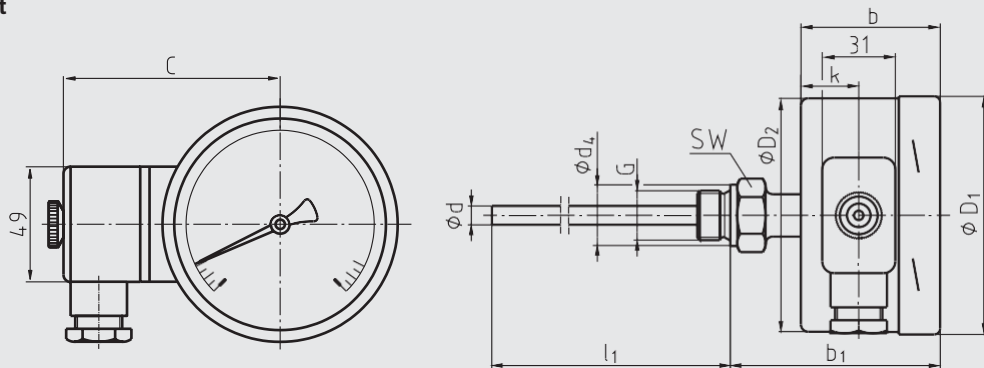
With some combinations, the active length  $l_2$  can correspond to the probe length L.  
 If an additional compression fitting is desired, the probe length L increases by at least 60 mm.

**Legend:**

- G Male thread
- G<sub>1</sub> Female thread
- i Thread length (incl. collar)
- a Distance to the case/articulated joint
- $\varnothing d_4$  Diameter of the sealing collar
- SW Spanner width
- $\varnothing d$  Stem diameter
- $l_1$  Insertion length
- $l_2$  Active length

## Dimensions in mm

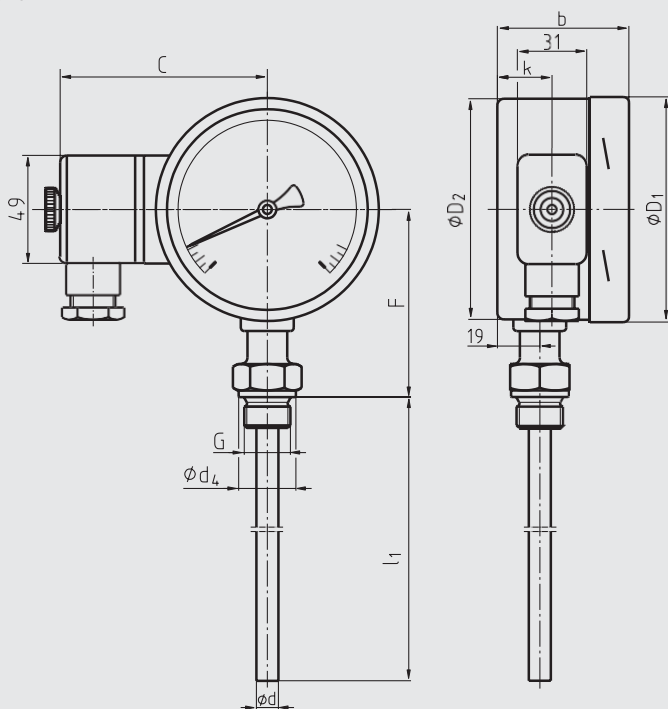
### Back mount



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Nominal size	Dimensions in mm										Weight in kg
	NS	b <sup>1)</sup>	b <sub>1</sub> <sup>1)</sup>	C	Ø d	Ø d <sub>4</sub>	Ø D <sub>1</sub>	Ø D <sub>2</sub>	G	k	
100	60/68	92/100	94	8 <sup>2)</sup>	26	101	99	G ½ B	25	27	1.3
160	66/70	99/103	122	8 <sup>2)</sup>	26	161	159	G ½ B	32	27	1.5

### Lower mount



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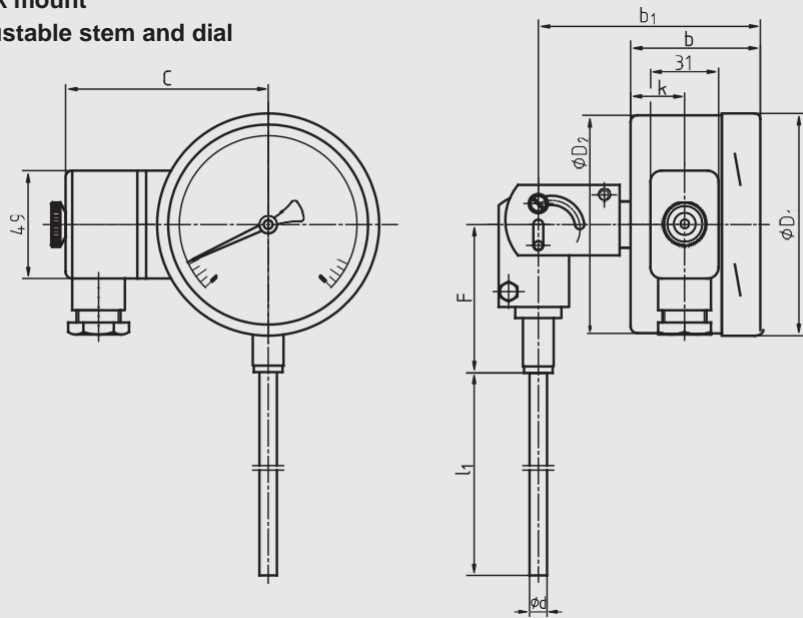
Nominal size	Dimensions in mm										Weight in kg
	NS	b <sup>1)</sup>	b <sub>1</sub> <sup>1)</sup>	C	Ø d	Ø d <sub>4</sub>	Ø D <sub>1</sub>	Ø D <sub>2</sub>	F <sup>3)</sup>	G	
100	60/68	92/100	94	8 <sup>2)</sup>	26	101	99	85	G ½ B	25	1.3
160	66/70	99/103	122	8 <sup>2)</sup>	26	161	159	114	G ½ B	32	1.5

1) Dependent on required measuring system

2) Option: Stem diameter 6, 10, 12 mm

3) With scale ranges ≥ 0 ... 300 °C the dimensions increase by 40 mm

**Back mount**  
**Adjustable stem and dial**



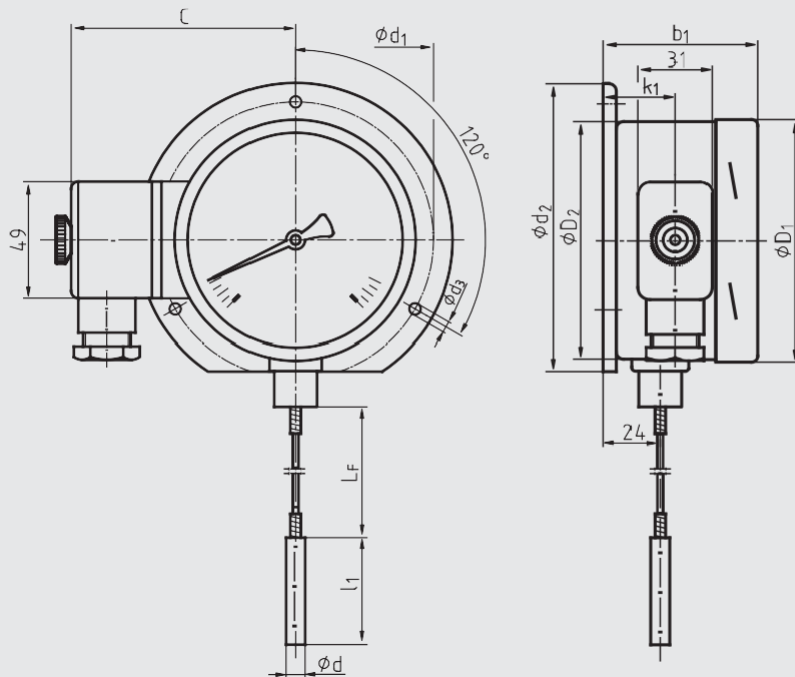
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Nominal size	Dimensions in mm							
NS	b <sup>1)</sup>	b <sub>1</sub> <sup>1)</sup>	C	d	D <sub>1</sub>	D <sub>2</sub>	F	k
100	60/68	104/112	94	8 <sup>2)</sup>	101	99	68	25
160	66/70	110/114	122	8 <sup>2)</sup>	161	159	68	32

1) Dependent on required measuring system  
2) Option: Stem diameter 6, 10, 12 mm

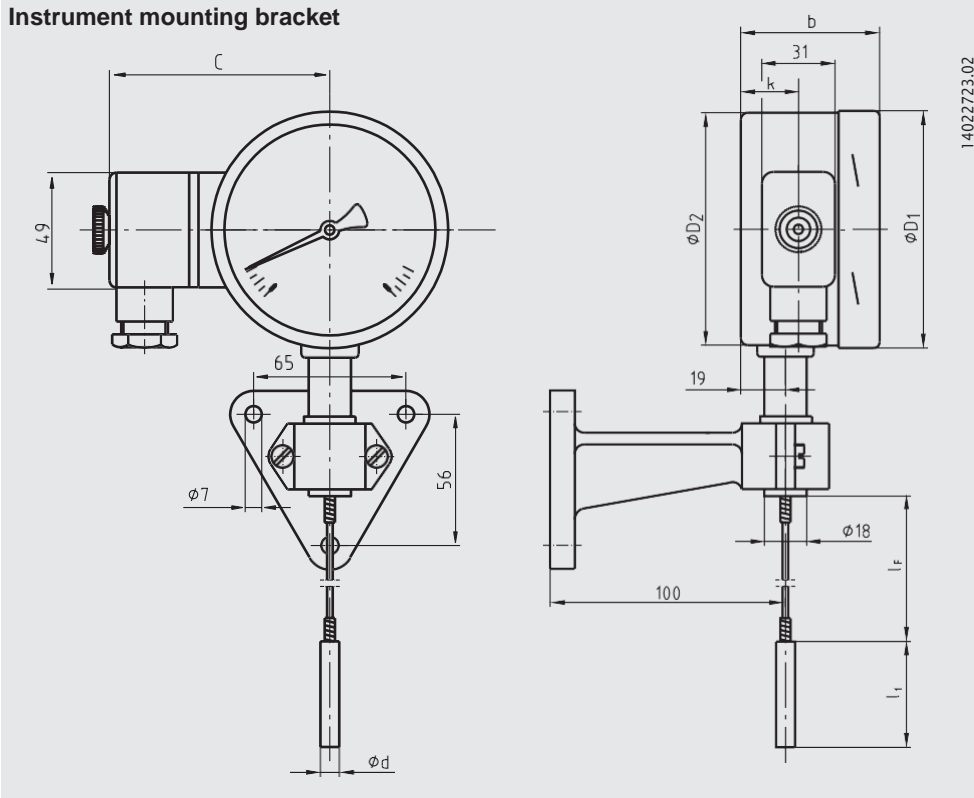
**Dimensions in mm for instruments with capillary**

**Surface mounting flange**

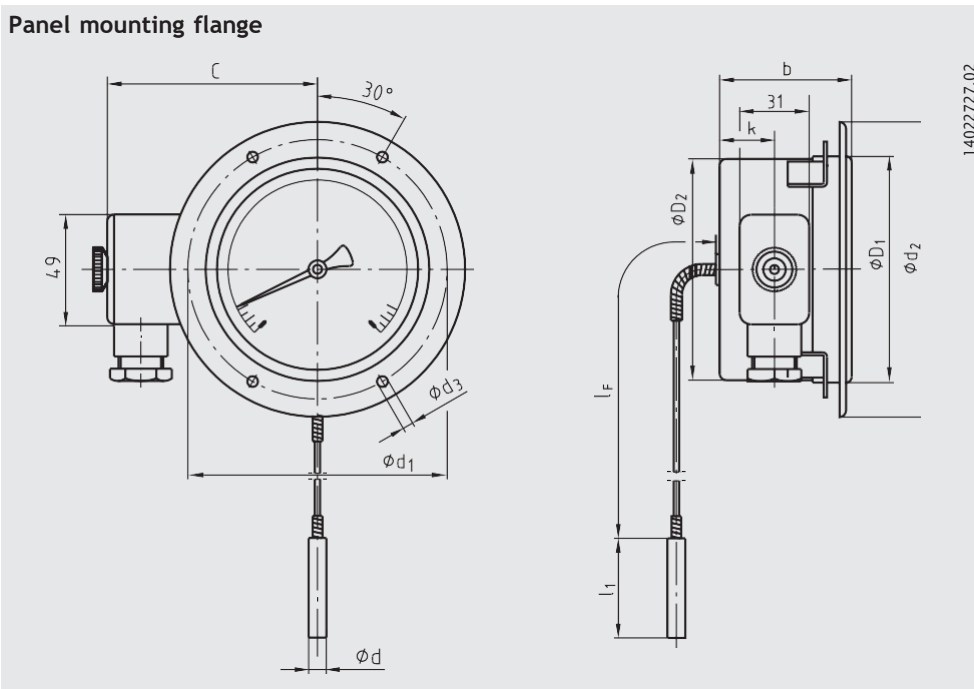


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### Instrument mounting bracket



### Panel mounting flange

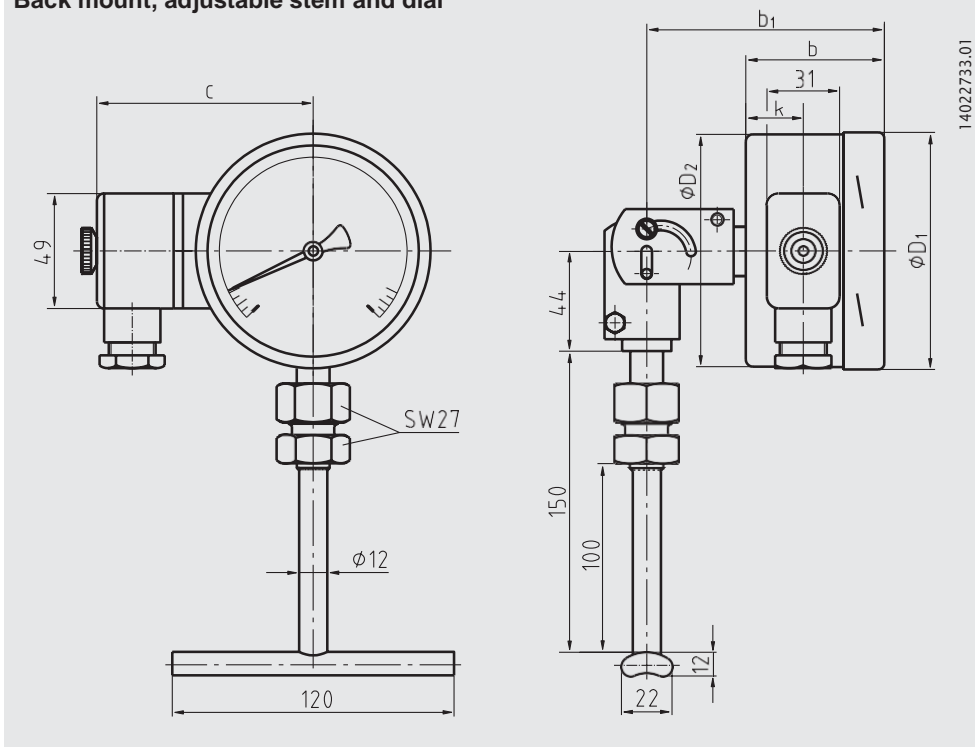


Nominal size	Dimensions in mm										
NS	b <sup>1)</sup>	b <sub>1</sub> <sup>1)</sup>	C	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	D <sub>1</sub>	D <sub>2</sub>	k	k <sub>1</sub>
100	60/68	65/73	94	g <sup>2)</sup>	116	132	4.8	101	99	25	30
160	66/70	72/76	122	g <sup>2)</sup>	178	196	5.8	161	159	32	37

1) Dependent on required measuring system  
 2) Option: Stem diameter 6, 10, 12 mm



### Back mount, adjustable stem and dial

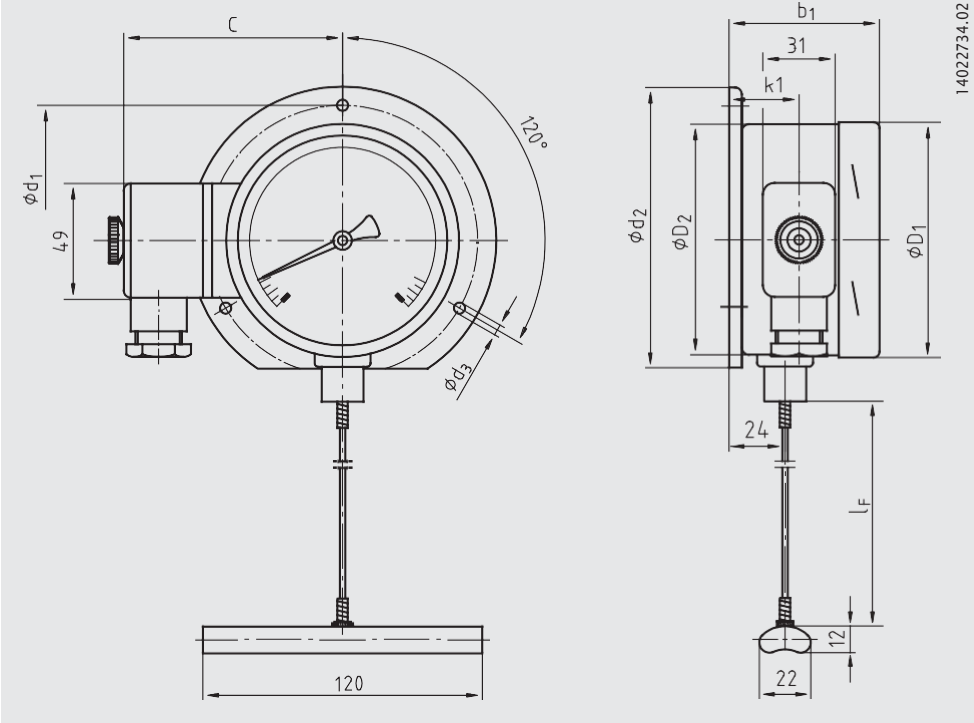


Connection location	Nominal size	Dimensions in mm					
		NS	b <sup>1)</sup>	b <sub>1</sub> <sup>1)</sup>	C	D <sub>1</sub>	D <sub>2</sub>
Back mount	100	60/68	104/112	94	101	99	25
	160	66/70	110/114	122	161	159	32
Lower mount	100	60/68	104/112	94	101	99	25
	160	66/70	110/114	122	161	159	32
Adjustable stem and dial	100	60/68	104/112	94	101	99	25
	160	66/70	110/114	122	161	159	32

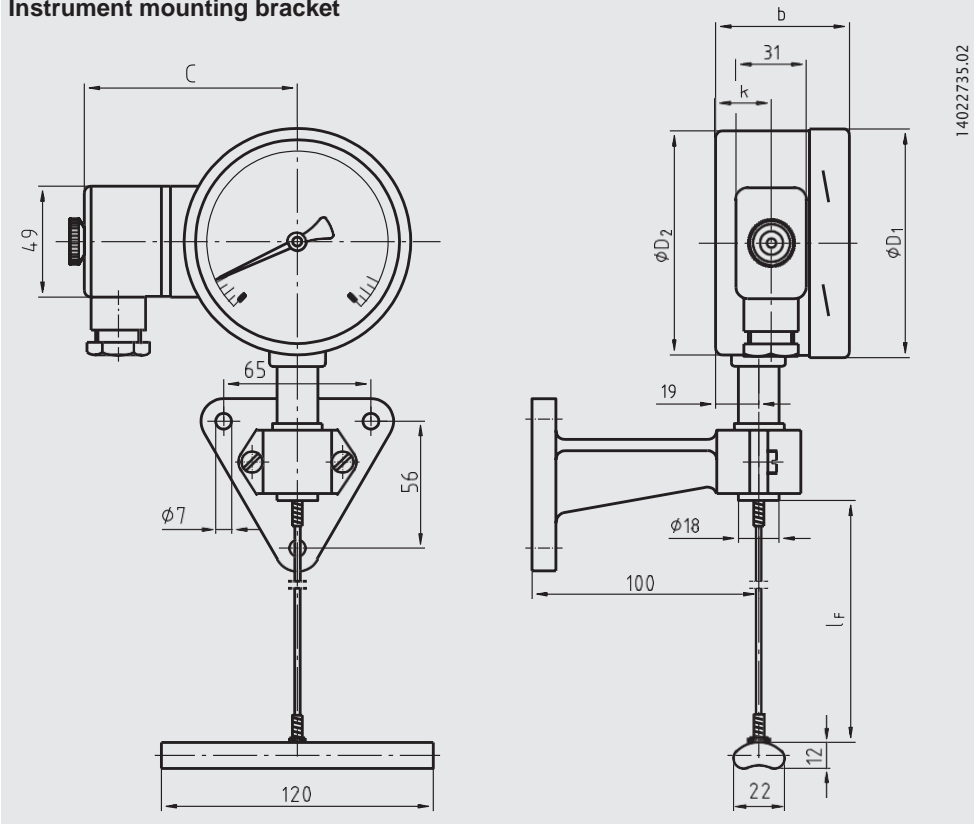
1) Dependent on required measuring system

# Dimensions in mm for instruments with contact bulb and capillary

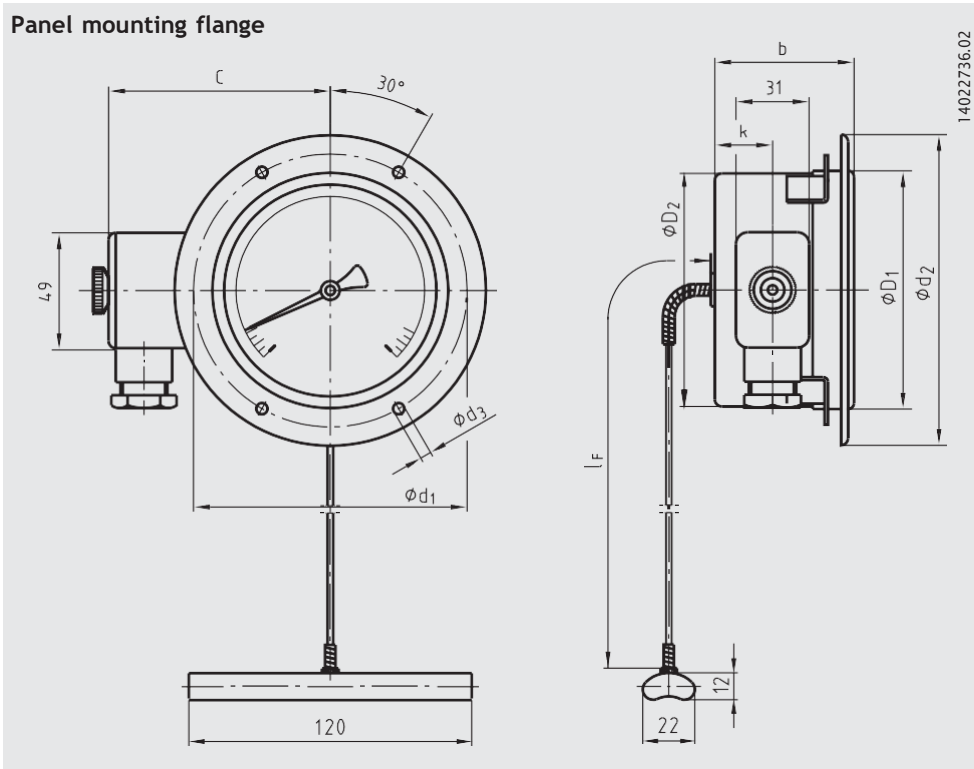
## Surface mounting flange



## Instrument mounting bracket



## Panel mounting flange



Nominal size	Dimensions in mm												Weight in kg
	b <sup>1)</sup>	b <sub>1</sub> <sup>1)</sup>	C	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	h	k	k <sub>1</sub>	
100	60/68	65/73	94	116	132	4.8	101	99	107	107	25	30	1.6
160	66/70	72/76	122	178	196	5.8	161	159	166	172	32	37	2.0

1) Dependent on required measuring system



# Mounting instructions for contact bulb

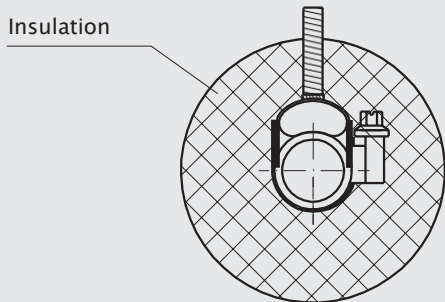
## General information

The contact bulb has been designed for mounting on pipes or tanks. When mounting this thermometer version, it must be ensured that the contact bulb is in contact with the measuring point over its complete length. The basic requirements to ensure a perfect measuring result is to retain good thermal contact between the contact bulb and the outside wall of the pipe or tank with minimal heat loss to the environment from the contact bulb and measuring point.

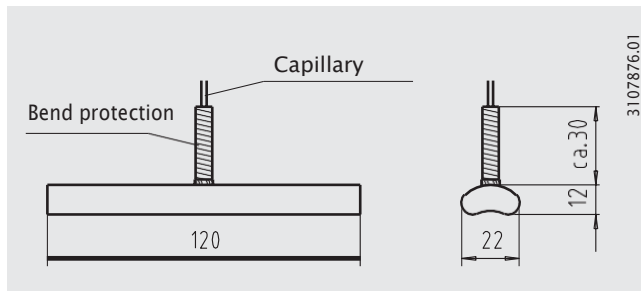
### ■ Mounting on pipes

The geometry of the contact bulb has been designed for pipes with external diameters between 20 and 160 mm. For fixing the contact bulb to the pipe, pipe clamps are sufficient. The contact bulb should have direct metallic contact with the measuring point and have firm contact with the surface of the pipe. Where temperatures under 200 °C are expected, a thermal compound can be used to optimise the heat transfer between contact bulb and pipe. Insulation must be applied at the mounting point to avoid error due to heat loss. This insulation must have sufficient temperature resistance and is not included in the scope of delivery.

#### Pipe clamp mounting



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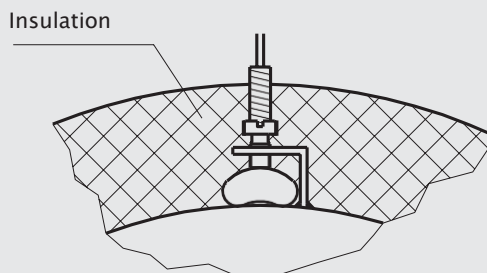


### ■ Mounting on tanks

The geometry of the contact bulb has been designed for tanks with an external radius up to 80 mm. If the mounting point of the contact bulb on the tank has an external radius greater than 80 mm, we recommend the use of an intermediate piece designed for the respective tank diameter, made of a material with good thermal conductivity. The contact bulb can be fastened to the tank by means of an angle bracket with clamping screws, or any similar method. The contact bulb should have direct metallic contact with the measuring point and have firm contact with the surface of the tank.

A thermal compound can be used to optimise the heat transfer between contact bulb and tank, if temperatures under 200 °C are expected. Insulation must be applied at the mounting point to avoid error due to heat loss. This insulation must have sufficient temperature resistance and is not included in the scope of delivery.

#### Angle bracket mounting



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## Thermowell

In principle, the operation of a mechanical thermometer is possible without a thermowell with low process-side loading (low pressure, low viscosity and low flow velocities).

However, in order to enable exchanging the thermometer during operation (e.g. instrument replacement or calibration) and to ensure a better protection of the measuring instrument and also the plant and the environment, it is advisable to use a thermowell from the extensive WIKA thermowell portfolio.

For further information on the wake frequency calculation, see Technical information IN 00.15.