

# Thermocouples

## Model TCD20, Flameproof Enclosure

WIKA Data Sheet TE 65.60



### Applications

- Chemical industry
- Petrochemical industry
- Offshore

### Special Features

- Type test certificate (ATEX)
- Measuring insert exchangeable
- Suitable for many thermowell designs



**Thermocouple, Flameproof Enclosure Model TCD20  
(Fig. with optional thermowell)**

### Description

Thermocouples in this series can be combined with a large number of thermowell designs. Operation without thermowell is not allowed.

An extensive range of sensors, connection heads, insertion lengths, neck lengths, thermowell connections etc. are available for these thermometers, so that they are suitable for almost every thermowell design.

The models of the TCD20 series are provided with a type test certificate for "flameproof enclosure" type of protection according to directive 94/9/EC (ATEX), EEx-d, for gases and dusts.

Measuring insert, connection head (flameproof) and integrated flame path guarantee a safe operation. Thermowells in different dimensions and materials provide the use in zone 0, 1 or 2.

# Sensor

## Sensor type

Type	Thermocouple
K	NiCr-Ni
J	Fe-CuNi
E	NiCr-CuNi
T	Cu-CuNi
N	NiCrSi-NiSi

The application range of these thermometers is limited by the permissible max. temperature of the thermocouple as well as the max. temperature of the thermowell material.

**Please take the maximum permissible temperature values of the "Explosion protection" table, page 6, into account as well!**

Listed sensor types are available both as simplex or duplex thermocouples.

The measuring point (hot junction) of the probe is supplied as ungrounded unless specified otherwise.

### Sensor limiting error

A cold junction temperature of 0 °C is taken as basis with the definition of the sensor limiting error of thermocouples.

### Type K

Class	Temperature range	Limiting error
<b>DIN EN 60 584 part 2</b>		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +1000 °C	± 0.0040 •  t  <sup>1)</sup>
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +1200 °C	± 0.0075 •  t  <sup>1)</sup>
<b>ISA-MC96.1-1982</b>		
Standard	0 °C ... +1250 °C	± 2.2 °C or <sup>2)</sup> ± 0.75 %
Special	0 °C ... +1250 °C	± 1.1 °C or <sup>2)</sup> ± 0.4 %

### Type J

Class	Temperature range	Limiting error
<b>DIN EN 60 584 part 2</b>		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +750 °C	± 0.0040 •  t  <sup>1)</sup>
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +750 °C	± 0.0075 •  t  <sup>1)</sup>
<b>ISA-MC96.1-1982</b>		
Standard	0 °C ... +750 °C	± 2.2 °C or <sup>2)</sup> ± 0.75 %
Special	0 °C ... +750 °C	± 1.1 °C or <sup>2)</sup> ± 0.4 %

### Type E

Class	Temperature range	Limiting error
<b>DIN EN 60 584 part 2</b>		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +800 °C	± 0.0040 •  t  <sup>1)</sup>
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +900 °C	± 0.0075 •  t  <sup>1)</sup>

### Type T

Class	Temperature range	Limiting error
<b>DIN EN 60 584 part 2</b>		
1	-40 °C ... +125 °C	± 0.5 °C
1	+125 °C ... +350 °C	± 0.0040 •  t  <sup>1)</sup>
2	-40 °C ... +133 °C	± 1.0 °C
2	+133 °C ... +350 °C	± 0.0075 •  t  <sup>1)</sup>

### Type N

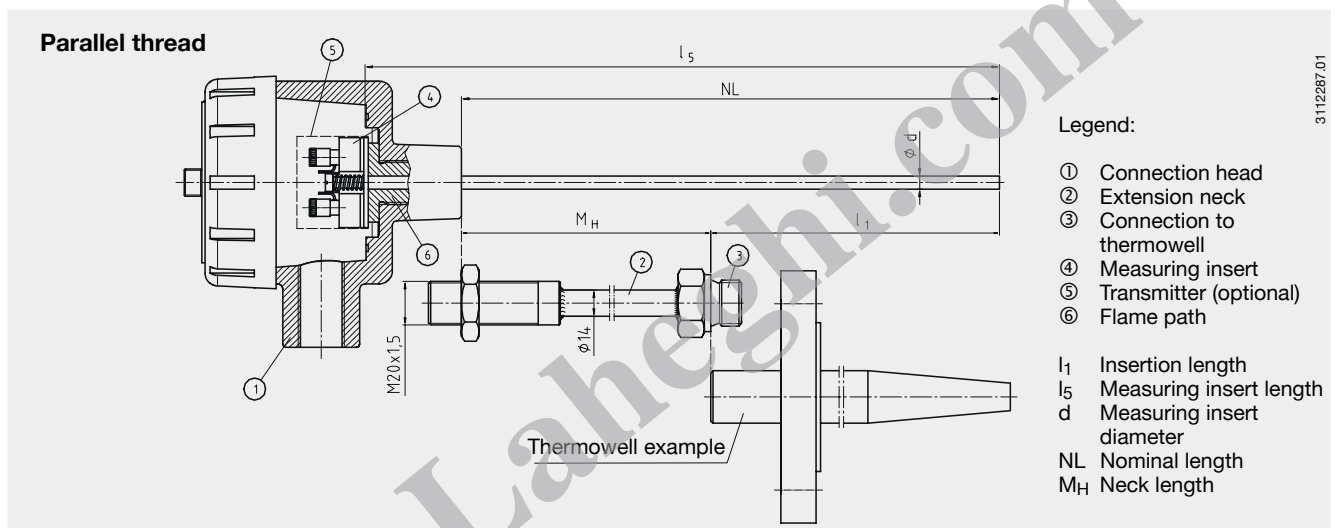
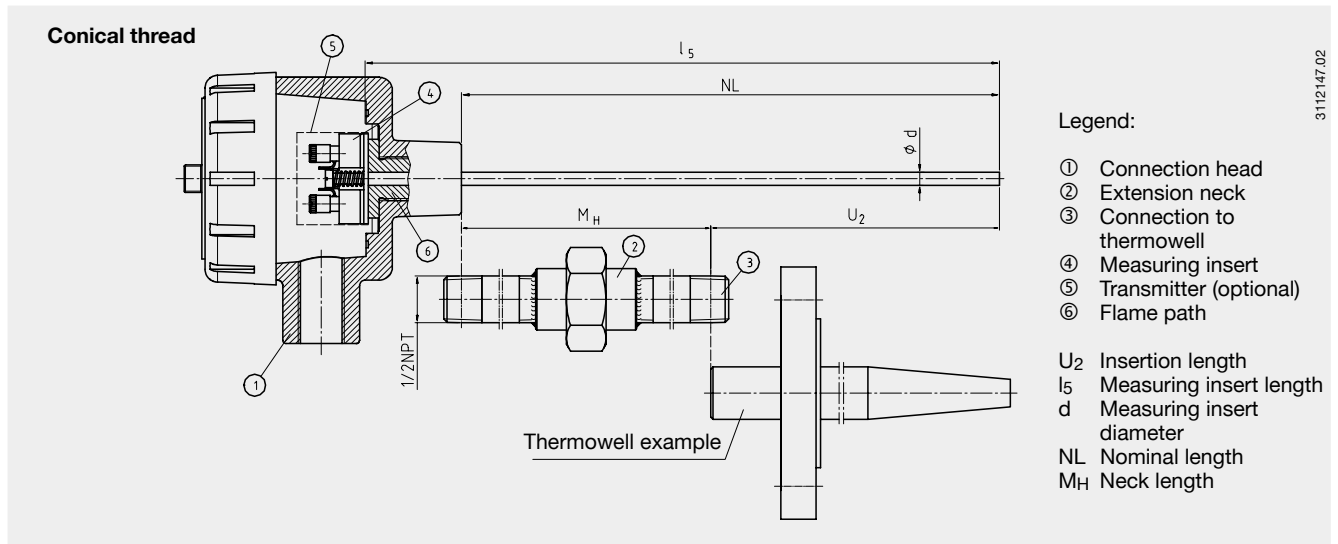
Class	Temperature range	Limiting error
<b>DIN EN 60 584 part 2</b>		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +1000 °C	± 0.0040 •  t  <sup>1)</sup>
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +1200 °C	± 0.0075 •  t  <sup>1)</sup>

1) |t| is the value of the temperature in °C without consideration of the sign  
2) Whichever is larger.

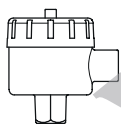
Limiting error with selected temperatures in °C for thermocouples type K and type J

Temperature (ITS 90) °C	Limiting error DIN EN 60 584	
	Class 1 °C	Class 2 °C
0	± 1.5	± 2.5
100	± 1.5	± 2.5
200	± 1.5	± 2.5
300	± 1.5	± 2.5
400	± 1.6	± 3
500	± 2	± 3.75
600	± 2.4	± 4.5
700	± 2.8	± 5.25
800	± 3.2	± 6
900	± 3.6	± 6.75
1000	± 4	± 7.5
1100	± 4.4	± 8.25
1200	± 4.8	± 9

## TCD20 components



## Connection head



EEx-D

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
EEx-D	aluminium	½ NPT, ¾ NPT or M20 x 1.5	IP65	screw cover	painted, blue

## Measuring insert

The measuring insert is made of a vibration-resistant sheathed measuring cable (MI cable). The diameter of the measuring insert shall be approx. 1 mm smaller than the hole diameter of the thermowell.

Gaps of more than 0.5 mm between thermowell and measuring insert will have a negative effect on the heat transfer, and they will result in an unfavourable response behaviour of the thermometer.

When fitting the measuring insert with a thermowell, it is very important to determine the correct insertion length (= thermowell length with bottom thicknesses of < 6 mm). In this connection the fact that the measuring insert is spring-loaded (spring travel: max. 10 mm) has to be taken into account in order to ensure that the measuring insert presses against the bottom of the thermowell. Furthermore we recommend that a neck length be selected so that a standard length measuring insert can be used. Measuring inserts for TCD20 are produced with a fit below the terminal block.

This guarantees a defined gap between measuring insert and integrated flame path according to the certificate.

**Due to the use of a flame path and its fit tolerances it is not permissible to use standard measuring inserts as replacement parts!**

**Replacement measuring insert with type test certificate:  
Model TCD02**

## Transmitter (option)

An optional transmitter can be mounted inside the connection head. (Note: Only on connection plate of the measuring insert).

A certification of the built-in transmitter is not necessary. (Use in accordance with EN 50 018 and in accordance with intended use).

The thermometer has to be operated with a power limitation circuit that limits  $P_{max}$  in category 1 applications with a two fault safety and in category 2 applications with a one fault safety (e.g. intrinsically safe circuits of ia resp. ib).

## Extension neck (option)

The extension neck is screwed to the connection head.

Connection to head: M 20x1.5 or 1/2 NPT

The length of the extension neck depends on the application. The extension neck generally serves for bridging insulation. In many applications it is also used as a part cooling element between connection head and medium in order to protect any head mount transmitters from high medium temperatures.

Standard material of the extension neck is stainless steel.

Necks with NPT threads are also available with zinc-galvanised surface.

Other extension neck designs and materials on request.

### Possible combinations of design, extension neck diameter and connection thread

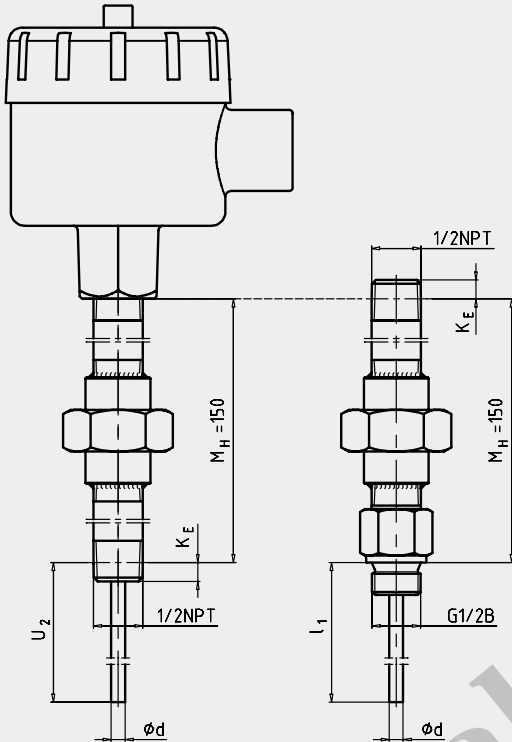
Design of the screw connection at the extension neck	Connection thread at extension neck			Connection thread to the head
	Ø 11 mm	Ø 12 mm	Ø 14 mm	
<b>Male thread</b>	G ½ B	G ½ B	-	M 20 x 1.5 / ½ NPT
	G ¾ B	G ¾ B	-	M 20 x 1.5 / ½ NPT
	M 14 x 1.5	-	-	M 20 x 1.5 / ½ NPT
	M 18 x 1.5	M 18 x 1.5	-	M 20 x 1.5 / ½ NPT
	½ NPT	½ NPT	½ NPT	M 20 x 1.5 / ½ NPT
	¾ NPT	¾ NPT	¾ NPT	M 20 x 1.5 / ½ NPT

## Connection to thermowell

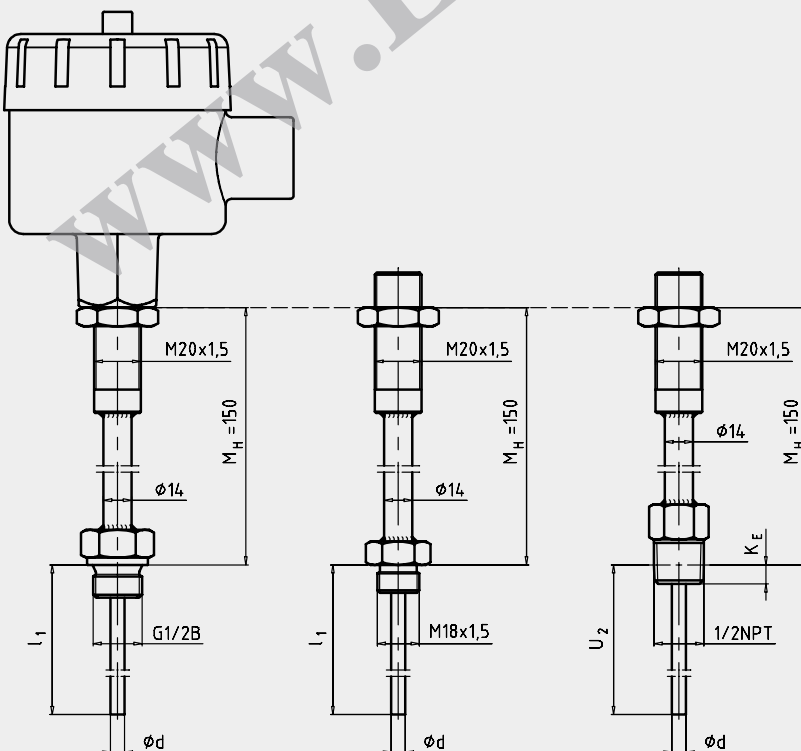
Many possible designs ensure that the thermocouple, Model TCD20, can be combined with almost all thermowells. The most common designs of connection are shown in the following drawings.

Others are available on request.

### TRD20 with neck design "NIPPLE-UNION-NIPPLE"



### TRD20 with fabricated neck



#### Legend:

- $l_1$  Insertion length (with cylindrical threads)
- $U_2$  Insertion length (with conical threads)
- $M_H$  Neck length
- $\phi d$  Measuring insert  $\phi$
- $K_E$  Screw-in length by hand, with  $1/2$  NPT approx. 8.1 mm with  $3/4$  NPT approx. 8.6 mm

## Explosion protection

Thermocouples TCD20 are available with a type test certificate for "flameproof enclosure" type of ignition protection (TÜV 02 ATEX 1858 X). These thermometers comply with the requirements of directive 94/9/EC (ATEX).

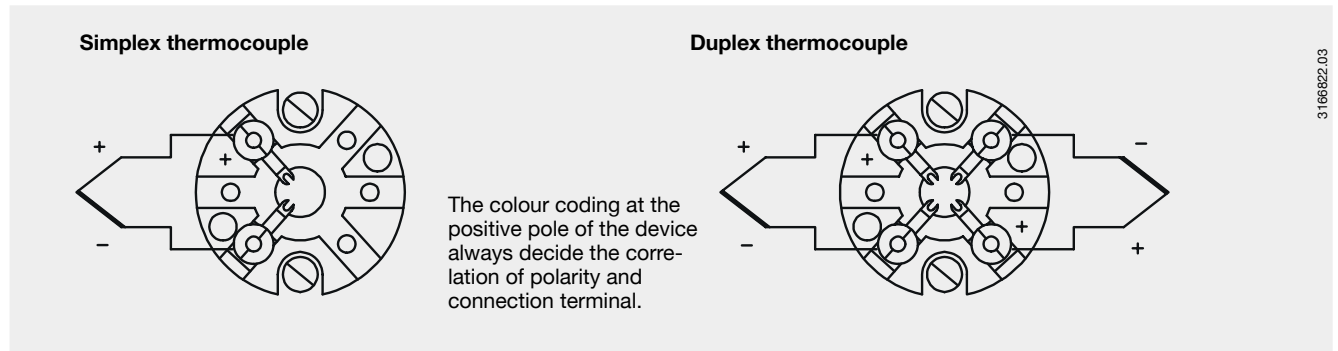
The classification / suitability of the instrument for the respective category can be seen from the table. The responsibility for using suitable thermowells rests with the user.

Marking	Temperature maximum in °C at the thermowell / measuring insert Power P <sub>max</sub> at the sensor: 1)				Neck length minimum M <sub>H</sub> 2)	Temperature range ambient T <sub>amb</sub> 3)
	50 mW	100 mW	250 mW	500 mW		
<b>Two fault safety (e.g. with sensor supply circuit "ia")</b>						
II 1/2 GD EEx d IIC T80 °C IP65 bzw. II 1/2 G EEx d IIC T6	63	61	56	46		-20 °C ... 55 °C
II 1/2 GD EEx d IIC T95 °C IP65 bzw. II 1/2 G EEx d IIC T5	75	73	68	58		-20 °C ... 70 °C
II 1/2 GD EEx d IIC T130 °C IP65 bzw. II 1/2 G EEx d IIC T4	103	101	96	86	20 mm	-20 °C ... 100 °C
II 1/2 GD EEx d IIC T195 °C IP65 bzw. II 1/2 G EEx d IIC T3	155	153	148	138	50 mm	-20 °C ... 100 °C
II 1/2 GD EEx d IIC T290 °C IP65 bzw. II 1/2 G EEx d IIC T2	231	229	224	214	100 mm	-20 °C ... 100 °C
II 1/2 GD EEx d IIC T440 °C IP65 bzw. II 1/2 G EEx d IIC T1	351	349	344	334	100 mm	-20 °C ... 100 °C
<b>One fault safety with power reduction (e.g. with sensor supply circuit "ib")</b>						
II 1/2 GD EEx d IIC T80 °C IP65 bzw. II 1/2 G EEx d IIC T6	56	46				-20 °C ... 55 °C
II 1/2 GD EEx d IIC T95 °C IP65 bzw. II 1/2 G EEx d IIC T5	68	58				-20 °C ... 70 °C
II 1/2 GD EEx d IIC T130 °C IP65 bzw. II 1/2 G EEx d IIC T4	96	86			20 mm	-20 °C ... 100 °C
II 1/2 GD EEx d IIC T195 °C IP65 bzw. II 1/2 G EEx d IIC T3	148	138			50 mm	-20 °C ... 100 °C
II 1/2 GD EEx d IIC T290 °C IP65 bzw. II 1/2 G EEx d IIC T2	224	214			100 mm	-20 °C ... 100 °C
II 1/2 GD EEx d IIC T440 °C IP65 bzw. II 1/2 G EEx d IIC T1	344	334			100 mm	-20 °C ... 100 °C
<b>One fault safety (e.g. with sensor supply circuit "ib")</b>						
II 2 GD EEx d IIC T80 °C IP65 bzw. II 2 G EEx d IIC T6	78	75	68	59		-20 °C ... 55 °C
II 2 GD EEx d IIC T95 °C IP65 bzw. II 2 G EEx d IIC T5	93	90	83	74		-20 °C ... 70 °C
II 2 GD EEx d IIC T130 °C IP65 bzw. II 2 G EEx d IIC T4	128	125	118	109	20 mm	-20 °C ... 100 °C
II 2 GD EEx d IIC T195 °C IP65 bzw. II 2 G EEx d IIC T3	193	190	183	174	50 mm	-20 °C ... 100 °C
II 2 GD EEx d IIC T290 °C IP65 bzw. II 2 G EEx d IIC T2	288	285	278	269	100 mm	-20 °C ... 100 °C
II 2 GD EEx d IIC T440 °C IP65 bzw. II 2 G EEx d IIC T1	438	435	428	419	100 mm	-20 °C ... 100 °C

Further information see Ex operating instructions

- 1) When using multiple sensor resistors (or several single resistors) and operating them simultaneously, the sum of the individual power values must not exceed the value of the max. permissible power specified in the table.
- 2) The minimum neck length is to be defined as the distance between the lower edge of the connection head and the heat-emitting surface.
- 3) When using a transmitter, the permissible ambient temperature range is to be taken from the corresponding approval.

## Electrical connection



## Ordering information

Field No.	Code	Features
1	G	<b>Explosion protection</b>
		according to directive 94/9/EG (ATEX) EEx-d
		<b>Type and number of sensors</b>
		<b>A</b> 1 x type K (NiCr-Ni)
		<b>B</b> 2 x type K (NiCr-Ni)
2	?	<b>C</b> 1 x type J (Fe-CuNi)
		<b>D</b> 2 x type J (Fe-CuNi)
		other <span style="float: right;"><i>please state as additional text</i></span>
		<b>Sensor limiting error</b>
		<b>2</b> class 2 per DIN EN 60 584
3	?	<b>1</b> class 1 per DIN EN 60 584
		<b>8</b> ISA standard to MC96.1-1982
		<b>9</b> ISA special to MC96.1-1982
		other <span style="float: right;"><i>please state as additional text</i></span>
		<b>Measuring insert diameter</b>
4	?	<b>1</b> 3 mm
		<b>3</b> 6 mm
		<b>4</b> 8 mm
		<b>Insertion length</b>
5	?	<b>0110</b> 110 mm
		<b>0140</b> 140 mm
		<b>0145</b> 145 mm
		<b>0170</b> 170 mm
		<b>0200</b> 200 mm
		<b>0205</b> 205 mm
		<b>0230</b> 230 mm
		<b>0245</b> 245 mm
		<b>0260</b> 260 mm
		<b>0295</b> 295 mm
		<b>0305</b> 305 mm
		<b>0345</b> 345 mm
		<b>0350</b> 350 mm
		<b>0395</b> 395 mm
		<b>0410</b> 410 mm
<b>0445</b> 445 mm		
<b>0545</b> 545 mm		
6	?	length in mm, e.g. 0850 for 850 mm
		<b>Neck length</b>
		<b>0</b> without (female thread in the connection head)
6	?	<b>5</b> 150 mm
		other <span style="float: right;"><i>please state as additional text</i></span>

## Ordering information, continued

Field No.	Code	Features
		<b>Neck tube</b>
	<b>ZZ</b>	without
	<b>N1</b>	1/2 NPT (head), 1/2 NPT (thermowell), nipple/union/nipple, Ø = 22 mm, stainless steel
	<b>N2</b>	1/2 NPT (head), G 1/2 B (thermowell), nipple/union/nipple, Ø = 22 mm, stainless steel
	<b>K0</b>	M20 x 1.5 (head), 1/2 NPT (thermowell), diameter 14 mm, stainless steel
	<b>K1</b>	M20 x 1.5 (head), G 1/2 B (thermowell), diameter 14 mm, stainless steel
	<b>K3</b>	M20 x 1.5 (head), M18x1.5 (thermowell), diameter 14 mm, stainless steel
7	<input type="checkbox"/>	<b>??</b> other <span style="float: right;"><i>please state as additional text</i></span>
		<b>Connection from connection head to extension neck</b>
	<b>4</b>	1/2 NPT
8	<input type="checkbox"/>	<b>2</b> M20 x 1.5
		<b>Cable entry to connection head</b>
	<b>3</b>	1/2 NPT
	<b>6</b>	3/4 NPT
9	<input type="checkbox"/>	<b>4</b> M20 x 1.5
		<b>Transmitter</b>
	<b>ZZ</b>	without
10	<input type="checkbox"/>	<b>TA</b> mounted on the measuring insert <span style="float: right;"><i>only one transmitter possible</i></span>
		<b>Additional order info</b>
	<b>YES</b>	<b>NO</b>
11	<input type="checkbox"/>	<b>T</b> <b>Z</b> quality certificates <span style="float: right;"><i>see price list</i></span>
12	<input type="checkbox"/>	<b>T</b> <b>Z</b> additional text <span style="float: right;"><i>Please state as clearly understandable text!!</i></span>

### Order code:

	1	2	3	4	5	6	7	8	9	10	11	12
TCD20 -	<input type="text"/>	<input type="text"/>	<input type="text"/>	1 -	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

### Additional text:

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Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing. Modifications may take place and materials specified may be replaced by others without prior notice.



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