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Resistance Thermometers
Model TRD20, Flameproof Enclosure

Applications

- Chemical industry
- Petrochemical industry
- Offshore

Special Features

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

**Resistance Thermometers, Flameproof Enclosure
Model TRD20 (Fig. with optional thermowell)**

Description

Resistance thermometers 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 TRD20 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.

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Sensor

The sensor is located in the measuring insert, which is interchangeable and spring loaded.

Sensor method of connection

- 2 wire
- 3 wire
- 4 wire

With 2 wire connection the lead resistance of the measuring insert compounds the error.

Sensor limiting error

- class B to DIN EN 60 751
- class A to DIN EN 60 751 (-50 °C ... +450 °C)
- 1/3 DIN B at 0 °C

It makes no sense to combine 2 wire connection with class A or 2 wire connection with A DIN B, because the lead resistance of the measuring insert over-rides the higher sensor accuracy.

Basic values and limiting errors

Basic values and limiting errors for the platinum measuring resistors are laid down in DIN EN 60 751.
The nominal value of Pt 100 sensors is 100 Ω at 0 °C. The temperature coefficient α can be stated simply to be between 0 °C and 100 °C with:

$$\alpha = 3.85 \cdot 10^{-3}\ °C^{-1}$$

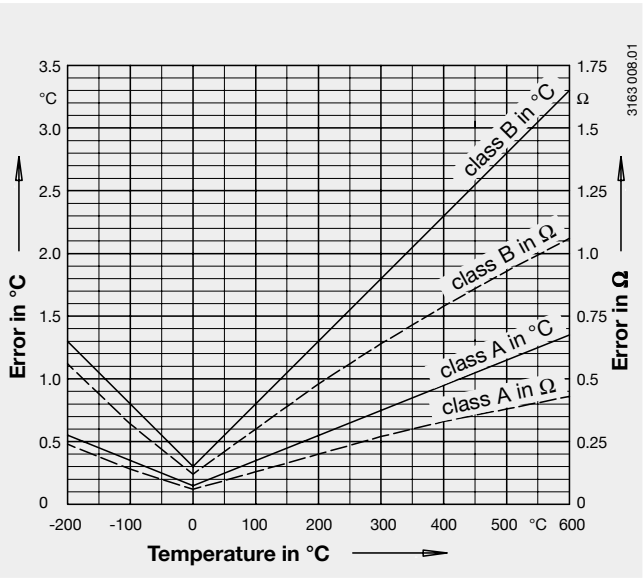
The relationship between the temperature and the electrical resistance is described by polynomes which are defined in DIN EN 60 751. Furthermore, this standard lays down the basic values in °C stages.

Class	Limiting error in °C
A	0.15 + 0.002 • |t| [1]
B	0.3 + 0.005 • |t|

1) \|t\| is the value of the temperature in °C without consideration of the sign

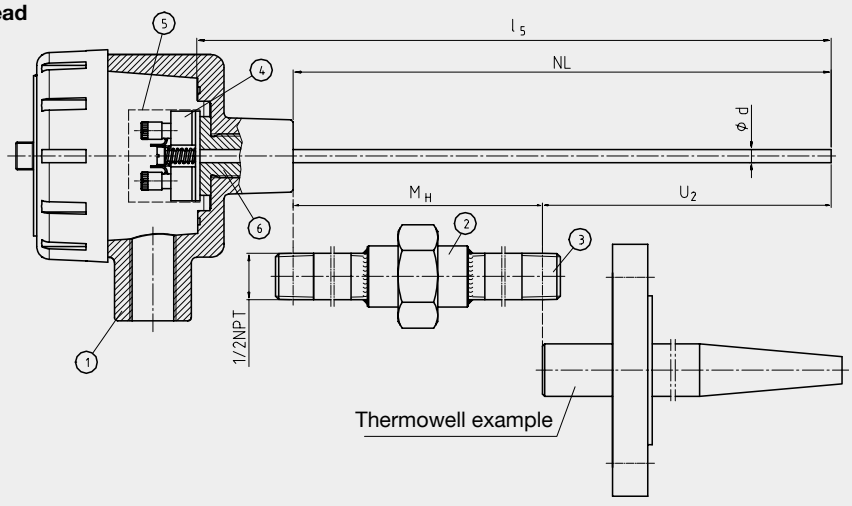
Temperature (ITS 90)	Basic value	Limiting error DIN EN 60 751 Class A		Class B	
°C	Ω	°C	Ω	°C	Ω
-200	18.52	± 0.55	± 0.24	± 1.3	± 0.56
-100	60.26	± 0.35	± 0.14	± 0.8	± 0.32
-50	80.31	± 0.25	± 0.10	± 0.55	± 0.22
0	100	± 0.15	± 0.06	± 0.3	± 0.12
50	119.40	± 0.25	± 0.10	± 0.55	± 0.21
100	138.51	± 0.35	± 0.13	± 0.8	± 0.30
200	175.86	± 0.55	± 0.2	± 1.3	± 0.48
300	212.05	± 0.75	± 0.27	± 1.8	± 0.64
400	247.09	± 0.95	± 0.33	± 2.3	± 0.79
500	280.98	± 1.15	± 0.38	± 2.8	± 0.93
600	313.71	± 1.35	± 0.43	± 3.3	± 1.06

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



TRD20 components

Conical thread



Legend:

① Connection head
② Extension neck
③ Connection to thermowell
④ Measuring insert
⑤ Transmitter (optional)
⑥ Flame path

U_2 Insertion length
l_5 Measuring insert length
d Measuring insert diameter
NL Nominal length
M_H Neck length

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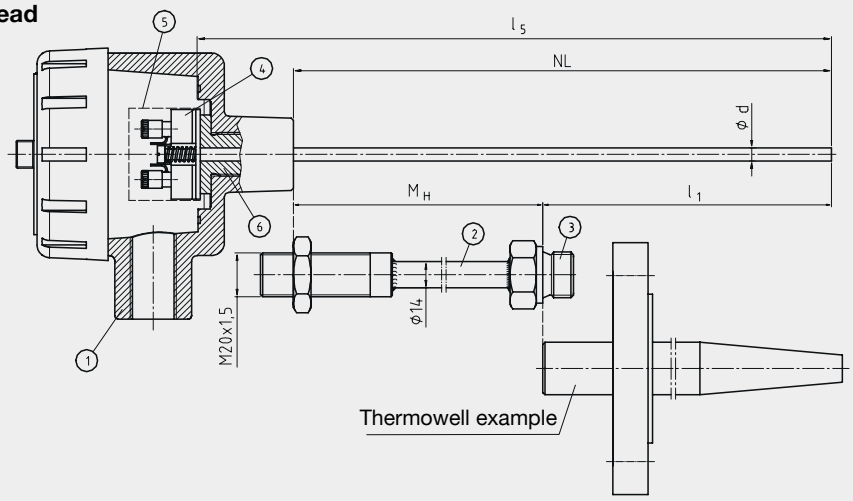
Parallel thread



Legend:

① Connection head
② Extension neck
③ Connection to thermowell
④ Measuring insert
⑤ Transmitter (optional)
⑥ Flame path

l_1 Insertion length
l_5 Measuring insert length
d Measuring insert diameter
NL Nominal length
M_H Neck length

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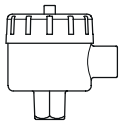
Connection head



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 ≤ 5.5 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 TRD20 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 TRD02

Extension neck (option)

The extension neck is screwed to the connection head.
Connection to head: M20 x 1.5 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.

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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).

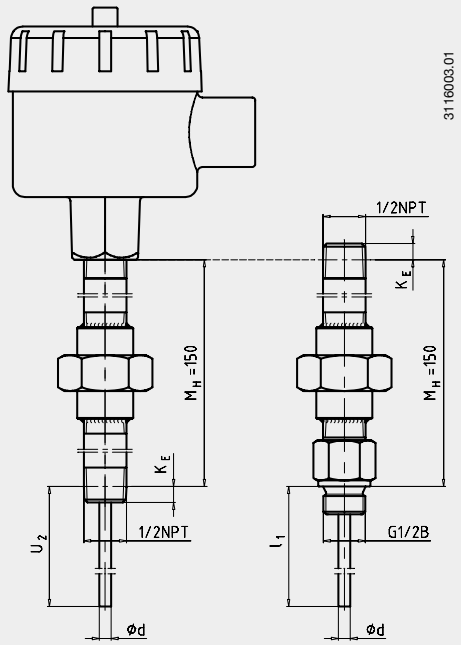
The thermometer has to be operated with a power limitation circuit that limits P_{max} in category 1 applications with a two fault safety and in category 2 applications with a one fault safety (e.g. intrinsically safe circuits of ia resp.ib).

Model	Description	Explosion protection	Data sheet
T19	Analogue transmitter, configurable	without	TE 19.01
T24	Analogue transmitter, PC configurable	optional	TE 24.01
T31	Analogue transmitter, fixed range	optional	TE 31.01
T12	Digital transmitter, PC configurable	optional	TE 12.01
T32	Digital transmitter, HART protocol	optional	TE 32.01
T42	Digital transmitter, PROFIBUS PA	optional	TE 42.01
T5350	Digital transmitter FOUNDATION Fieldbus and PROFIBUS PA	standard	TE 53.01

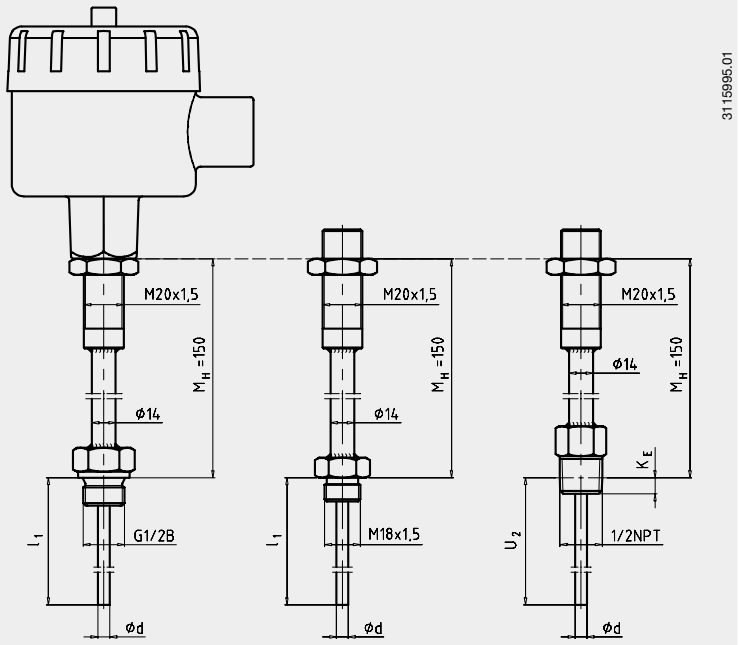
Connection to thermowell

Many possible designs ensure that the resistance thermometer, Model TRD20, 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
Ø d	Measuring insert Ø
K_E	Screw-in length by hand, with ½ NPT approx. 8.1 mm with ¾ NPT approx. 8.6 mm

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Possible combinations of measuring insert diameter, number of sensors and sensor method of connection

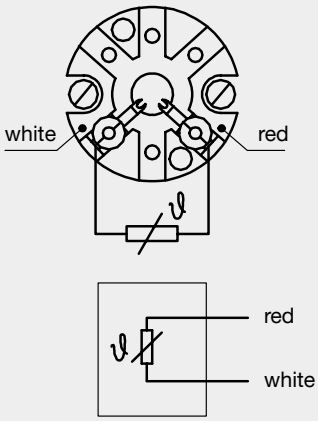
Measuring insert Ø in mm	Sensor / sensor method of connection 1 x Pt100			Sensor / sensor method of connection 2 x Pt100		
	2 wire	3 wire	4 wire	2 wire	3 wire	4 wire
3	x	x	x	x	x	-
6	x	x	x	x	x	x
8	x	x	x	x	x	x

Possible combinations of design, extension neck diameter and connection thread

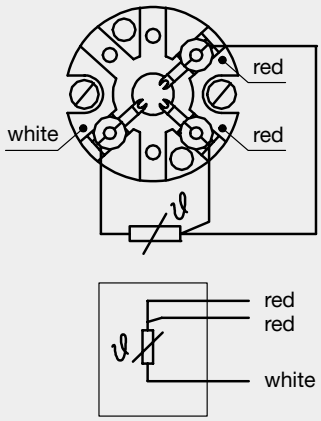
Design of the screw connection at the extension neck	Connection thread at extension neck			Connection thread to the head
	Ø 11 mm	Ø 12 mm	Ø 14 mm	
Male thread	G ½ B	G ½ B	-	M 20 x 1.5 / ½ NPT
	G ¾ B	G ¾ B	-	M 20 x 1.5 / ½ NPT
	M 14 x 1.5	-	-	M 20 x 1.5 / ½ NPT
	M 18 x 1.5	M 18 x 1.5	-	M 20 x 1.5 / ½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

Electrical connection

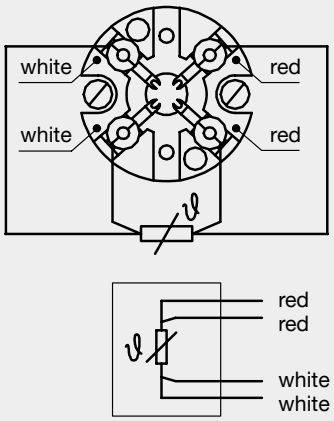
1 x Pt100, 2 wire



1 x Pt100, 3 wire



1 x Pt100, 4 wire



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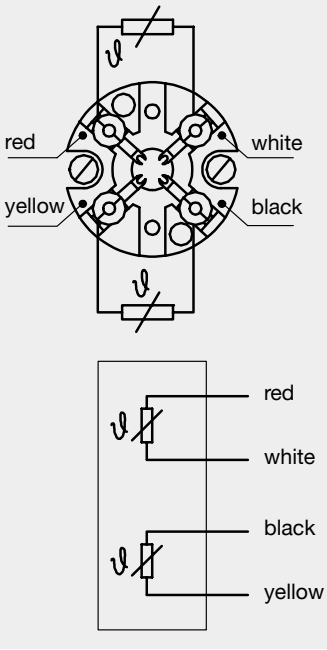
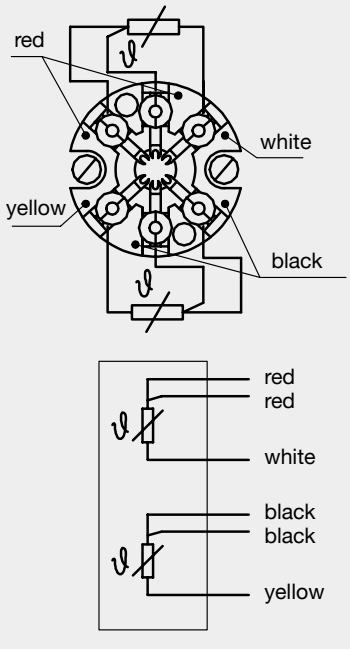
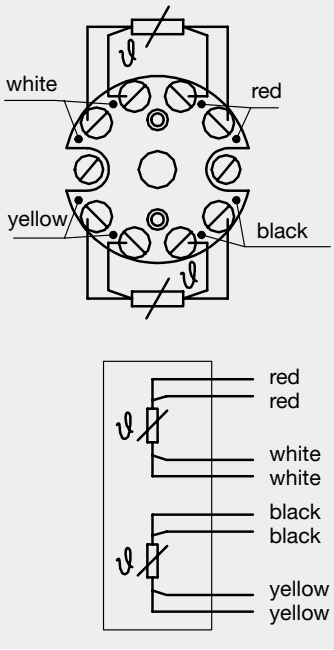
2 x Pt100, 2 wire



2 x Pt100, 3 wire



2 x Pt100, 4 wire



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Explosion protection

Resistance thermometers TRD20 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_{max} at the sensor: 1)				Neck length minimum M_H 2)	Temperature range ambient T_{amb} 3)
Two fault safety (e.g. with sensor supply circuit "ia")	**50 mW**	**100 mW**	**250 mW**	**500 mW**		
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
One fault safety with power reduction (e.g. with sensor supply circuit "ib")	**50 mW**	**100 mW**				
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
One fault safety (e.g. with sensor supply circuit "ib")	**50 mW**	**100 mW**	**250 mW**	**500 mW**		
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.

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Ordering information

Field No.		Code	Features	
			Explosion protection	
1		G	according to directive 94/9/EC (ATEX) EEx-d	
			Type and number of sensors	
		R	1 x Pt 100 application range -50 °C ... +450 °C	
		S	2 x Pt 100 application range -50 °C ... +450 °C	
		5	1 x Pt 100 application range -200 °C ... +450 °C	
		6	2 x Pt 100 application range -200 °C ... +450 °C	
		3	1 x Pt 100 application range -200 °C ... +600 °C	
		4	2 x Pt 100 application range -200 °C ... +600 °C	
2		?	other	*please state as additional text*
			Sensor method of connection	
		2	2 wire	
		3	3 wire	
3		4	4 wire	
			Sensor limiting error	
		B	class B per DIN EN 60751	
		A	class A per DIN 60751 (-50 °C ... +450 °C)	*not with 2-wire connection*
4		?	other	*please state as additional text*
			Measuring insert diameter	
		1	3 mm	*not with sensor 2 x Pt 100 with method of connection 4-wire*
		3	6 mm	
5		4	8 mm	
			Insertion length	
		0110	110 mm	
		0140	140 mm	
		0145	145 mm	
		0170	170 mm	
		0200	200 mm	
		0205	205 mm	
		0230	230 mm	
		0245	245 mm	
		0260	260 mm	
		0295	295 mm	
		0305	305 mm	
		0345	345 mm	
		0350	350 mm	
		0395	395 mm	
		0410	410 mm	
		0445	445 mm	
		0545	545 mm	
6			length in mm, e.g. 0850 for 850 mm	
			Neck length	
		0	without (female thread in the connection head)	
		5	150 mm	
7		?	other	*please state as additional text*
			Neck tube	
		ZZ	without	
		N1	1/2 NPT (head), 1/2 NPT (thermowell), nipple/union/nipple, Ø = 22 mm, stainless steel	
		N2	1/2 NPT (head), G 1/2 B (thermowell), nipple/union/nipple, Ø = 22 mm, stainless steel	
		K0	M20 x 1.5 (head), 1/2 NPT (thermowell), diameter 14 mm, stainless steel	
		K1	M20 x 1.5 (head), G 1/2 B (thermowell), diameter 14 mm, stainless steel	
		K3	M20 x 1.5 (head), M18x1.5 (thermowell), diameter 14 mm, stainless steel	
8		??	other	*please state as additional text*

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Ordering information, continued

Field No.		Code	Features	
			Connection from connection head to extension neck	
		4	1/2 NPT	
9		2	M20 x 1.5	
			Cable entry to connection head	
		3	1/2 NPT	
		6	3/4 NPT	
10		4	M20 x 1.5	
			Transmitter	
		ZZ	without	
11		TA	mounted on the measuring insert	*only one transmitter possible*

		Additional order info			
		YES	NO		
12		T	Z	quality certificates	*see price list*
13		T	Z	additional text	*Please state as clearly understandable text!!*

Order code:

	1	2	3	4	5	6	7	8	9	10	11	12	13
TRD20 -		-				-				**C**			-	

Additional text: _____

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.

WIKA Alexander Wiegand GmbH & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Phone (+49) 93 72/132-0
Fax (+49) 93 72/132-406
E-Mail info@wika.de
www.wika.de

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