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Resistance Thermometers
Model TR200, for Additional Thermowell

Applications

- Machinery, plant and tank construction
- Energy and power plant technology
- Chemical industry
- Food and beverage industry
- Sanitary, heating and air-conditioning technology

Special Features

- Application ranges from -200 °C to +600 °C
- Suitable for all standard thermowell designs
- Measuring insert exchangeable
- Intrinsically safe versions (ATEX)

Resistance Thermometer for Additional Thermowell Model TR200

Description

Resistance thermometers in this series can be combined with a large number of thermowell designs. Operation without thermowell is only recommended for specific applications.

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 all thermowell dimensions and applications.

Intrinsically safe designs are available for applications in hazardous areas. The models of the TR200 series are provided with a type test certificate for "intrinsically safe" type of protection according to directive 94/9/EC (ATEX). Manufacturer's Declarations in accordance with EN 50 020 are also available.

Optionally we can fit analogue or digital transmitters from the WIKA range into the connection head of the TR200.

Thermocouple for addtional thermowell	*Model TC200*	*see data sheet TE 65.10*
Resistance thermometer with thread	*Model TR201*	*see data sheet TE 60.15*
Thermocouple with thread	*Model TC201*	*see data sheet TE 65.15*

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Sensor

The sensor is located in the measuring insert, which is exchangeable 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 1/3 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 measurement resistances 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:

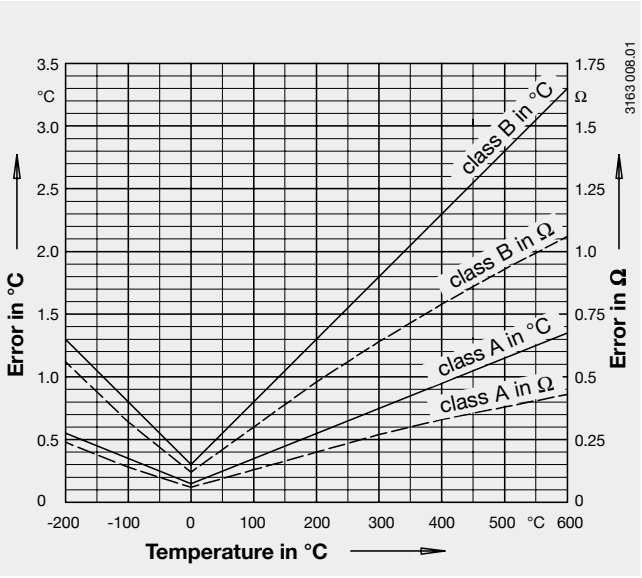
$$\alpha = 3.85 \cdot 10^{-3}\ °C^{-1}$$

The relationship between the temperature and the electrical resistance is characterised by polynomials 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|

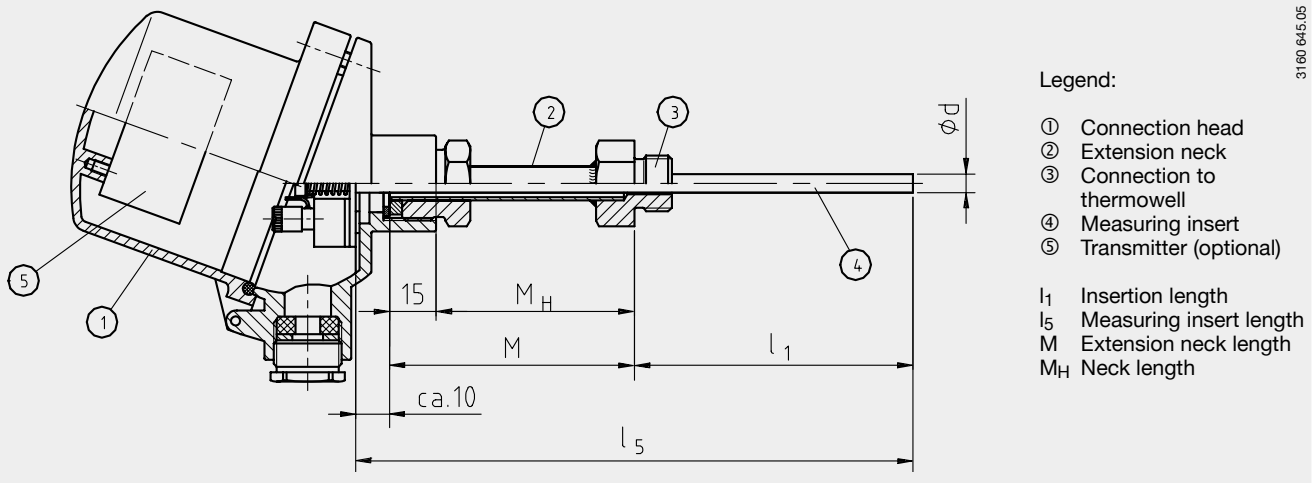
1) |t| is the value of the temperature in °C without consideration of the sign

Temperature (ITS 90) °C	Basic value Ω	Limiting error DIN EN 60 751 Class A °C	Class A Ω	Class B °C	Class B 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



TR200 components

Fig. with parallel thread, conical thread see page 5



Legend:

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

l_1 Insertion length
l_5 Measuring insert length
M Extension neck length
M_H Neck length

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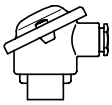
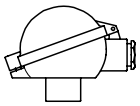
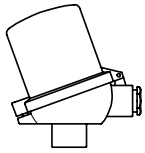
Connection head



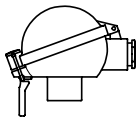
BS



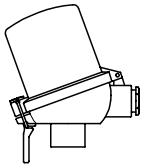
BSZ
BSZ-K



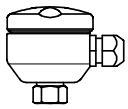
BSZ-H
BSZ-HK



BSS



BSS-H



BVA

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
BS	aluminium	M20 x 1.5	IP65	cap with 2 screws	silver bronze, painted
BSZ	aluminium	M20 x 1.5	IP65	flap cap with screw	silver bronze, painted
BSZ-K	plastic	M20 x 1.5	IP65	flap cap with screw	blank
BSZ-H	aluminium	M20 x 1.5	IP65	flap cap with screw	silver bronze, painted
BSZ-HK	plastic	M20 x 1.5	IP65	flap cap with screw	blank
BSS	aluminium	M20 x 1.5	IP65	flap cap with clip	silver bronze, painted
BSS-H	aluminium	M20 x 1.5	IP65	flap cap with clip	silver bronze, painted
BVA	stainless steel	M20 x 1.5	IP65	screw cover	blank

Connection head with digital indicator (option)

As an optional alternative to the standard connection head the thermometer may be equipped with the digital indicator DIH10. The connection head used in this case is similar to the head model BSZ-H. For operation a 4 ... 20 mA transmitter is necessary, which is mounted to the measuring insert. The scale range of the indicator is configurated identical to the measuring range of the transmitter.
Intrinsically safe versions, explosion protection type EEx (i), are also available.

Fig. Connection head with digital indicator, Model DIH10

Transmitter (option)

Depending on used connection head a transmitter can be mounted into the thermometer.

- o mounted instead of terminal block
- ● mounted within the cap of the connection head
- – mounting not possible

Mounting of two transmitters on request.

Connection head	Transmitter					
	T12	T19	T24	T32	T42	T5350
BS	–	o	o	–	–	o
BSZ / BSZ-K	o	o	o	o	o	o
BSZ-H / BSZ-HK	●	●	●	●	●	●
BSS	o	o	o	o	o	o
BSS-H	●	●	●	●	●	●
BVA	o	o	o	o	o	o

Model	Description	Explosion protection	Data sheet
T19	Analogue transmitter, configurable	without	TE 19.01
T24	Analogue transmitter, PC configurable	optional	TE 24.01
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

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Extension neck

The extension neck is screwed to the connection head. The usual size to industrial standards is M 24 x 1.5 mm. The length of the extension neck depends on the application. Generally the extension neck serves for the bridging of an 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.

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 to give a standard length for the thermometer's measuring insert. This has the advantage that a measuring insert of the standard series can be used.

Standard measuring insert length

Measuring insert Ø in mm	Standard measuring insert length in mm										
3	275	315		375		435					
6	275	315	345	375	405	435	525	555	585	655	735
8	275	315	345	375	405	435	525	555	585	655	735

The lengths specified in this table correspond to the standard lengths. Intermediate lengths or excess lengths are possible without any problems.

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 24 x 1.5
	G ¾ B	-	G ¾ B	M 24 x 1.5
	M 14 x 1.5	-	-	M 24 x 1.5
	M 18 x 1.5	-	M 18 x 1.5	M 24 x 1.5
	½ NPT	-	½ NPT	M 24 x 1.5
	¾ NPT	-	¾ NPT	M 24 x 1.5
Union nut	G ½	-	G ½	M 24 x 1.5
	M 27 x 2	-	M 27 x 2	M 24 x 1.5
Swivel nut	G ½ B	-	G ½ B	M 24 x 1.5
Extension neck without thread	-	-	-	M 24 x 1.5
Extens. neck with compression fitting	-	G ½ B	G ½ B	M 24 x 1.5
	-	M 27 x 2	M 27 x 2	M 24 x 1.5

Explosion protection (option)

Resistance thermometers of the Model series TR200 are available with a type test certificate for "intrinsically safe" ignition protection (TÜV 02 ATEX 1793 X). These thermometers comply with the requirements of directive 94/9/EC (ATEX), EEx-i, for gases and dust. Manufacturer's Declarations in accordance with EN 50 020 are also available.

The classification / suitability of the instrument (permissible power P max., minimum neck length and permissible ambient temperature) for the respective category can be seen on the type test certificate and in the operating instructions.

The responsibility for using suitable thermowells rests with the user.
The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter approval.

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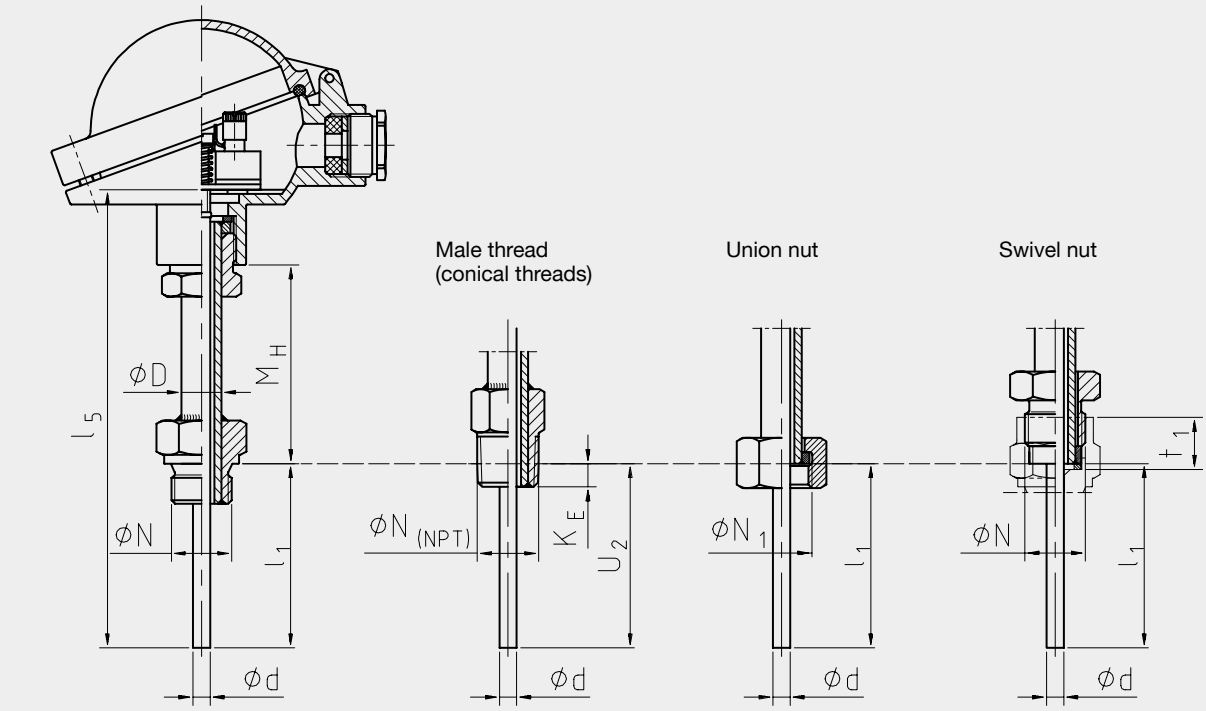
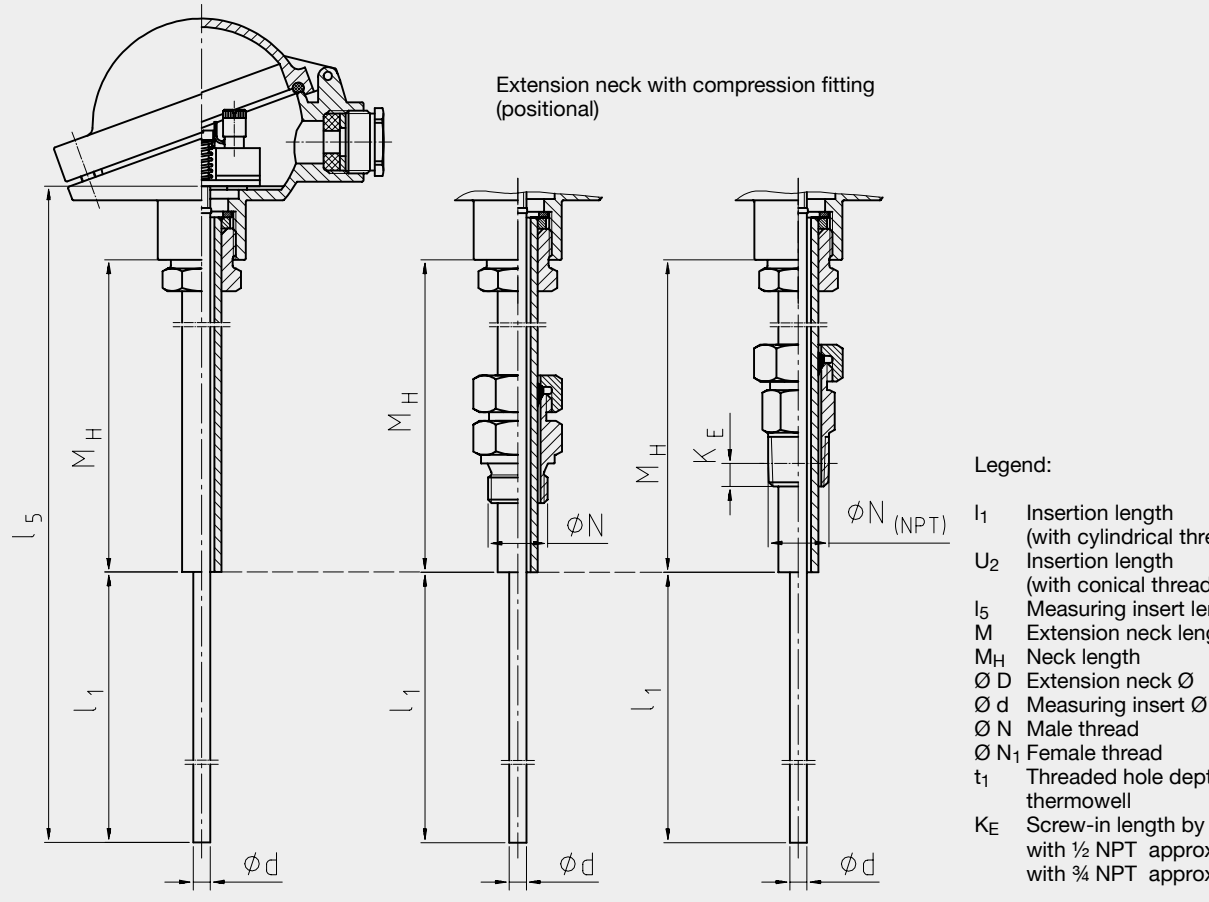
Connection to thermowell

The many possible designs ensure that the resistance thermometer, Model TR200, can be combined with almost all feasible thermowells. The most usual designs of connection are shown in the following drawings. Others are available on request.





Legend:

l_1	Insertion length (with cylindrical threads)
U_2	Insertion length (with conical threads)
l_5	Measuring insert length
M	Extension neck length
M_H	Neck length
Ø D	Extension neck Ø
Ø d	Measuring insert Ø
Ø N	Male thread
Ø N_1	Female thread
t_1	Threaded hole depth in thermowell
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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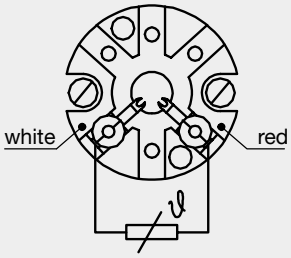
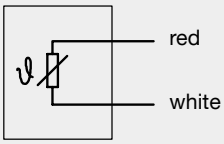
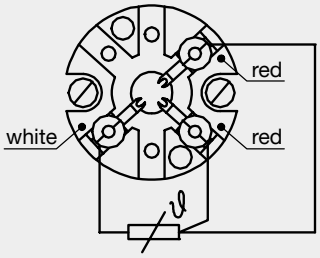
Electrical connection

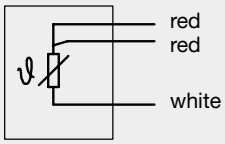
1 x Pt100, 2 wire



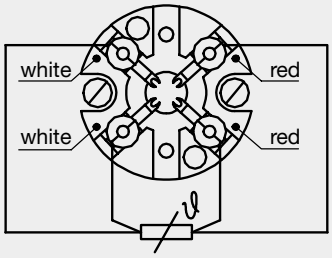


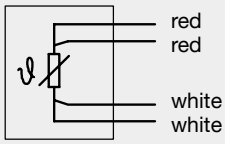
1 x Pt100, 3 wire





1 x Pt100, 4 wire





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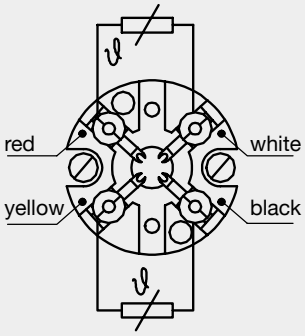
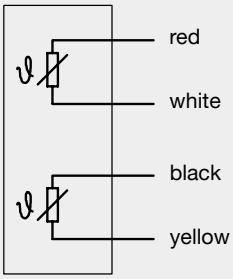
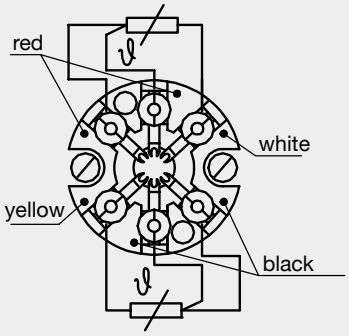
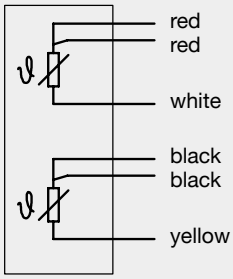
2 x Pt100, 2 wire



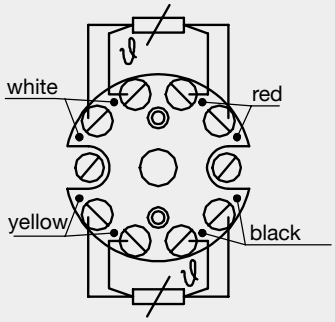


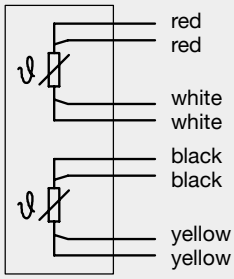
2 x Pt100, 3 wire





2 x Pt100, 4 wire





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Ordering information

Field No.		Code	Features	
			Explosion protection	
		Z	without	
		Y	according to directive 94/9/EC (ATEX) EEx-i G for gases [1]	
1		**H**	according to directive 94/9/EC (ATEX) EEx-i GD for gases and dusts [1]	
			Type and number of sensors	
		1	1 x Pt100 application range -50 °C ... +250 °C	
		2	2 x Pt100 application range -50 °C ... +250 °C [2]	
		R	1 x Pt100 application range -50 °C ... +450 °C	
		S	2 x Pt100 application range -50 °C ... +450 °C [2]	
		5	1 x Pt100 application range -200 °C ... +450 °C	
		6	2 x Pt100 application range -200 °C ... +450 °C [2]	
		3	1 x Pt100 application range -200 °C ... +600 °C	
		4	2 x Pt100 application range -200 °C ... +600 °C [2]	
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 EN 60751 (-50 °C ... +450 °C)	*not with 2-wire connection*
		C	1/3 DIN B at 0 °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	
		4	8 mm	*tubing*
5		**?**	other	*please state as additional text*
			Insertion length	
		0110	110 mm	*results in combination with neck length 140 mm in a standard model*
		0140	140 mm	*results in combination with neck length 150 mm in a standard model*
		0170	170 mm	*results in combination with neck length 150 mm in a standard model*
		0200	200 mm	*results in combination with neck length 150 mm in a standard model*
		0230	230 mm	*results in combination with neck length 150 mm in a standard model*
		0260	260 mm	*results in combination with neck length 150 mm in a standard model*
		0350	350 mm	*results in combination with neck length 150 mm in a standard model*
		0410	410 mm	*results in combination with neck length 150 mm in a standard model*
6			length in mm, e.g. 0850 for 850 mm	
			Neck length	
		4	140 mm	
		5	150 mm	
7		**?**	other	*please state as additional text*
			Connection to thermowell / Extension neck diameter	
		C1	male thread M 18 x 1.5 / diameter 11 mm	*not with measuring insert-Ø 8 mm*
		B1	male thread M 14 x 1.5 / diameter 11 mm	*not with measuring insert-Ø 8 mm*
		A1	male thread G 1/2 B / diameter 11 mm	*not with measuring insert-Ø 8 mm*
		A3	male thread G 1/2 B / diameter 14 mm	
		C3	male thread M 18 x 1.5 / diameter 14 mm	
		E1	union nut M 27 x 2 / diameter 11 mm	*not with measuring insert-Ø 8 mm*
		F1	union nut G 1/2 / diameter 11 mm	*not with measuring insert-Ø 8 mm*
		E3	union nut M 27 x 2 / diameter 14 mm	
		F3	union nut G 1/2 / diameter 14 mm	
		G1	swivel nut G 1/2 B / diameter 11 mm	*not with measuring insert-Ø 8 mm*
		G3	swivel nut G 1/2 B / diameter 14 mm	
		H2	extension neck without thread / diameter 12 mm	
		K2	extension neck with compression fitting G 1/2 B, stainless steel / diameter 12 mm	
8		**??**	other	*please state as additional text*
			Connection from connection head to extension neck	
		1	M24 x 1,5	
9		**?**	other	*please state as additional text*

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Ordering information, continued

Field No.		Code	Features	
			Connection head	
		1	model BS (aluminium)	*only transmitter T19/T24/T31 as option possible*
		2	model BSZ (aluminium)	
		3	model BSZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
		T	model BSZ-K (plastic)	
		S	model BSZ-HK (plastic)	*mounting of an optional transmitter in the cap possible*
		4	model BSS (aluminium)	
		5	model BSS-H (aluminium)	*mounting of an optional transmitter in the cap possible*
		8	model BVA (stainless steel)	
		H	BSZ-H with digital temperature indicator DIH10 (set to transmitter range)	*only without explosion protection, for use a transmitter (4...20 mA) is required*
		J	BSZ-H with digital temperature indicator DIH10-Ex (set to transmitter range)	*for use a transmitter (4...20 mA) in Ex-version is required*
10		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
11		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
		TA	mounted on the measuring insert	
12		TB	mounted in the cap of the connection head	

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

1) Please observe the operating instructions and the type examination certificate.
2) 2xPt100 in combination with 2 transmitters on request.

Order code:

	1	2	3	4		5	6	7	8	9	10	11	12		13	14
TR200 -		-				-								ZZ -		

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

9029338 01/2005 GB