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Thread Mounted Resistance Thermometers Model TR201, with Fabricated 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
- Fabricated thermowell included
- Measuring insert exchangeable
- Intrinsically safe versions (ATEX)

Thread Mounted Resistance Thermometer with Thermowell in Build-up Construction, Model TR201

Description

Resistance thermometers in this series are designed for direct screw fitting into the process, mainly in tanks and pipelines.

These thermometers are suitable for fluid and gaseous media under moderate mechanical load and normal chemical stress. The thermowell made of stainless steel is fully welded and screw-fitted into the connection head. The interchangeable measuring insert can be dismantled without removing the complete probe from the process. This makes inspection and, when servicing is necessary, replacement possible during operation and while the plant is running. Selection of normal or standard lengths enables short delivery time and the possibility of stocking spare components.

Insertion length, process connection, design of thermowell, connection head as well as type and number of sensors, accuracy and method of connection can be selected individually for the respective application.

Intrinsically safe designs are available for applications in hazardous areas. The models of the TR201 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 TR201.

Measuring inserts	*Model TR002*	*see data sheet TE 60.01*
Resistance thermometer for additional thermowell	*Model TR200*	*see data sheet TE 60.10*
Flange resistance thermometer	*Model TR401*	*see data sheet TE 60.25*

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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)
- ⅓ DIN B at 0 °C

It makes no sense to combine 2 wire connection with class A or 2 wire connection with ⅓ 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 Pt100 sensors is 100 Ω at 0 °C. The temperature coefficient α can be stated simply to be between 0 °C and 100 °C with:

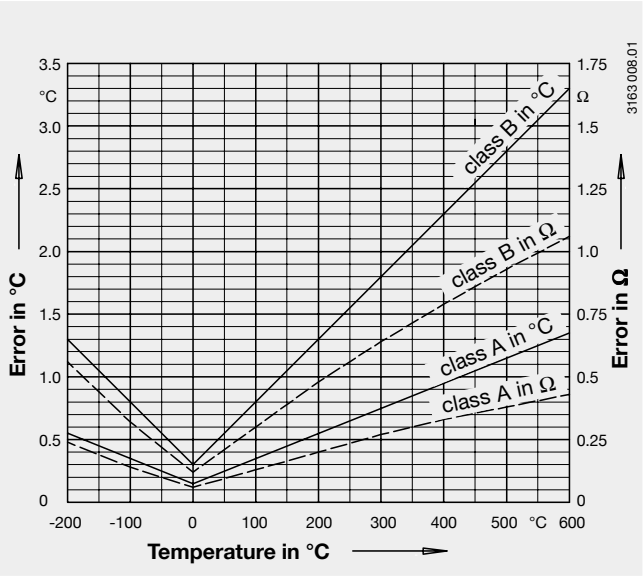
$$\alpha = 3.85 \cdot 10^{-3}\ °C^{-1}$$

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|

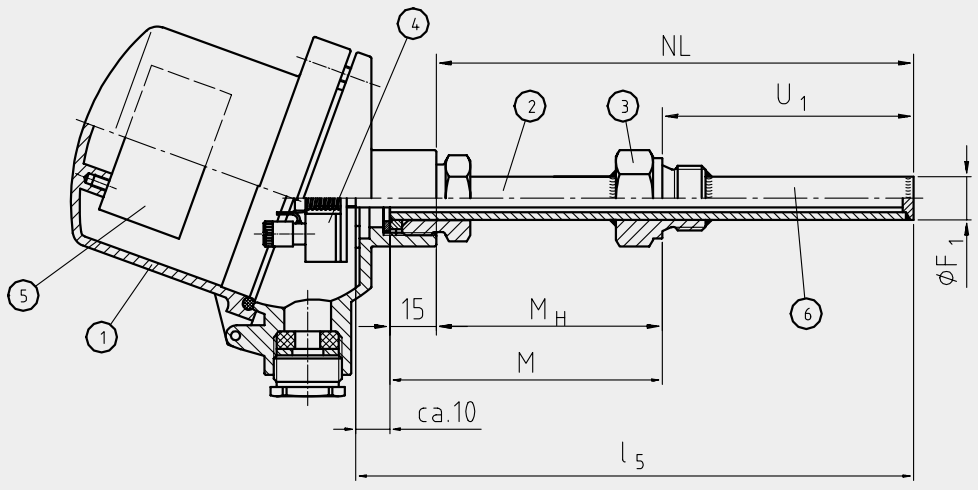
1) |t| is the value of the temperature in °C without consideration of the sign

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



TR201 components

Fig. with parallel thread, conical thread see page 4



Legend:

① Connection head
② Neck tube
③ Process connection
④ Measuring insert
⑤ Transmitter (optional)
⑥ Thermowell

NL Nominal length
l_5 Measuring insert length
U_1 Insertion length
F_1 Thermowell diameter
M_H Neck length
M Extension neck length

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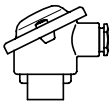
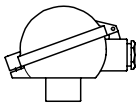
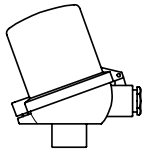
Connection head



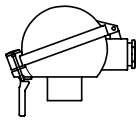
BS



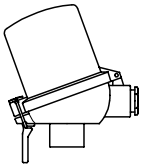
BSZ
BSZ-K



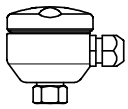
BSZ-H
BSZ-HK



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 (head mount).

- 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	T31	T32	T42	T5350
BS	–	o	o	o	–	–	o
BSZ / BSZ-K	o	o	o	o	o	o	o
BSZ-H / BSZ-HK	●	●	●	●	●	●	●
BSS	o	o	o	o	o	o	o
BSS-H	●	●	●	●	●	●	●
BVA	o	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
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

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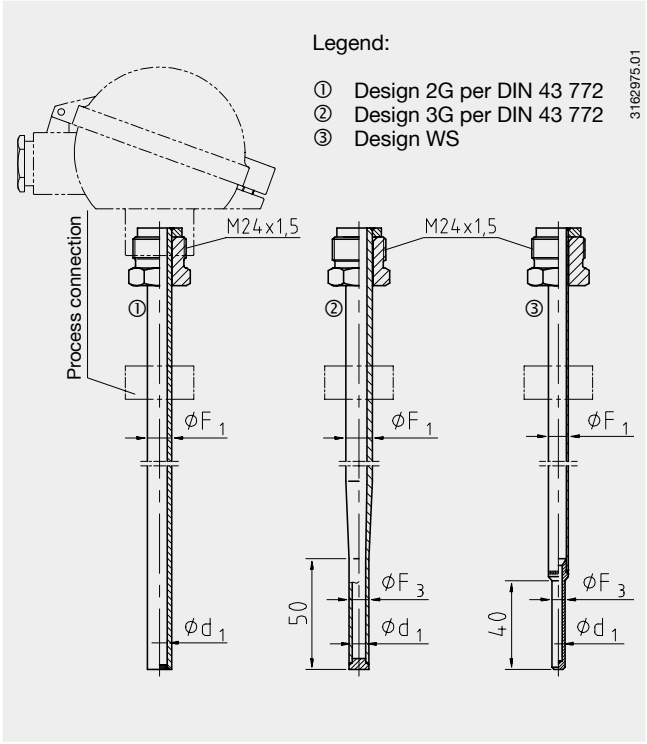
Thermowell

The thermowell is made of drawn tube with welded bottom and screwed into the connection head. The cable entry of the connection head can be aligned.
The process connection is welded onto the thermowell in the factory to customer's own specifications. This also determines the insertion length. Preference is to be given to insertion lengths to DIN Standards, respectively.

Designs to DIN Standards as well as special designs (for example, with tapered thermowell, reinforced extension neck, etc.) are available in stainless steel 1.4571 or special materials on request.

Design of thermowell



Dimensions in mm

Versions according to DIN 43 772

Design	Insertion length	Process connection	Thermowell outer Ø F_1	Thermowell outer Ø at tip F_3	Thermowell inner Ø at tip d_1	Neck length M_H
Form 2G	160	G ½ B, G 1 B	9, 11, 12, 14	-	-	130
Form 2G	250	G ½ B, G 1 B	9, 11, 12, 14	-	-	130
Form 2G	400	G ½ B, G 1 B	9, 11, 12, 14	-	-	130
Form 3G	160	G ½ B, G 1 B	12	9 + 0.2	6 + 0.1 / - 0.05	132
Form 3G	220	G ½ B, G 1 B	12	9 + 0.2	6 + 0.1 / - 0.05	132
Form 3G	280	G ½ B, G 1 B	12	9 + 0.2	6 + 0.1 / - 0.05	132
Form 3G	160	G ½ B, G 1 B	14	11 + 0.2	8 + 0.1 / - 0.05	132
Form 3G	220	G ½ B, G 1 B	14	11 + 0.2	8 + 0.1 / - 0.05	132
Form 3G	280	G ½ B, G 1 B	14	11 + 0.2	8 + 0.1 / - 0.05	132

Above types are also available with process connection ½ NPT. These do not correspond, however, to the DIN 43 772.

Non-standardised versions

Design	Insertion length	Process connection	Thermowell outer Ø F_1	Thermowell outer Ø at tip F_3	Thermowell inner Ø at tip d_1	Neck length M_H
Form WS	160	G ½ B, G 1 B, ½ NPT	9, 11, 12	6	3.5	130
Form WS	220	G ½ B, G 1 B, ½ NPT	9, 11, 12	6	3.5	130
Form WS	250	G ½ B, G 1 B, ½ NPT	9, 11, 12	6	3.5	130
Form WS	280	G ½ B, G 1 B, ½ NPT	9, 11, 12	6	3.5	130
Form WS	400	G ½ B, G 1 B, ½ NPT	9, 11, 12	6	3.5	130

Process connection

Design:
- Male thread, welded with thermowell
- Compression fitting, with thermowell diameter 12 mm preferably
  (Compression fittings allow simple adaptation to the required insertion length at the installation point. After tightening, the compression fitting can no longer be moved on the thermowell.)
- Union nut

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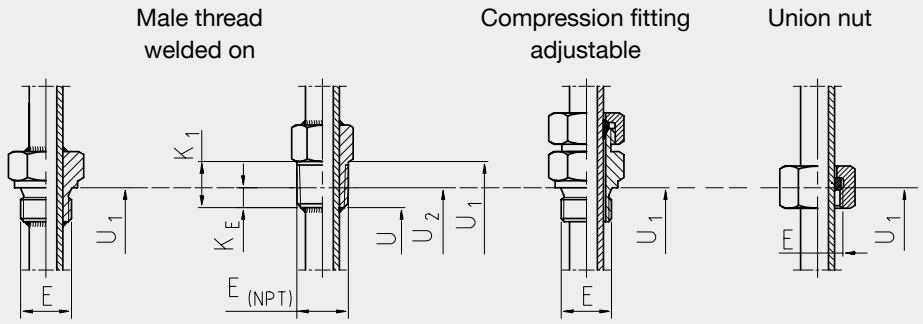

Legend:

Parallel thread:
U_1 Insertion length
E Thread

Conical thread:
U_2 Insertion length
U_1 Length of probe tip to end of thread
U Length of probe tip to top of thread
E Thread
K_1 Thread length
K_E Screw-in length by hand, with ½ NPT approx. 8.1 mm

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Design of process connection	Thermowell Ø 9 mm	11 mm	12 mm	14 mm
Male thread	G ½ B	G ½ B	G ½ B	G ½ B
	-	G 1 B	G 1 B	G 1 B
	½ NPT	½ NPT	½ NPT	½ NPT
Compression fitting	-	-	G ½ B	-
	-	-	½ NPT	-
Union nut	G ½ B	G ½ B	G ½ B	G ½ B

Measuring insert

The measuring insert is made of a vibration-resistant sheathed measuring cable (MI cable). In order to ensure that the measuring insert is firmly pressed down on the thermowell bottom the insert is spring-loaded (spring travel: max 10 mm). The standard material used for the measuring insert sheath is stainless steel. Other materials may be offered on inquiry.

If service is required, please pay attention to the following: 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.

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

Explosion protection (option)

Resistance thermometers of the Model series TR201 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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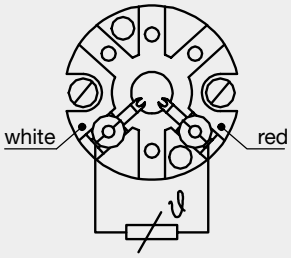
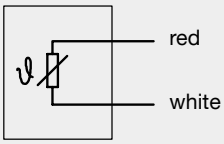
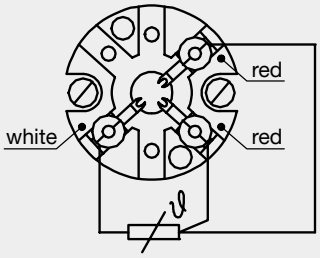
Electrical connection

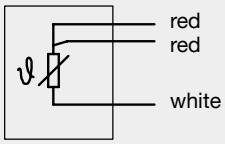
1 x Pt100, 2 wire



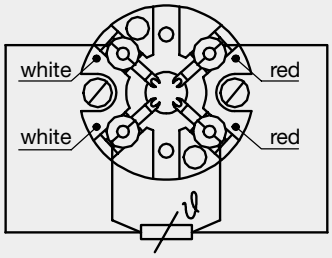


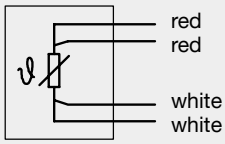
1 x Pt100, 3 wire





1 x Pt100, 4 wire





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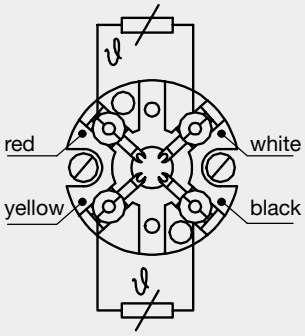
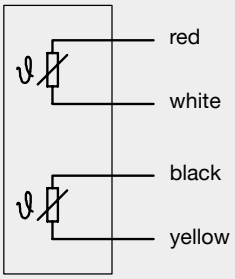
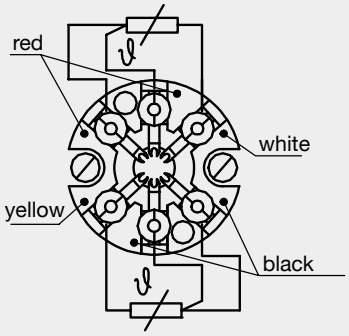
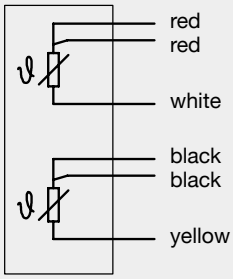
2 x Pt100, 2 wire



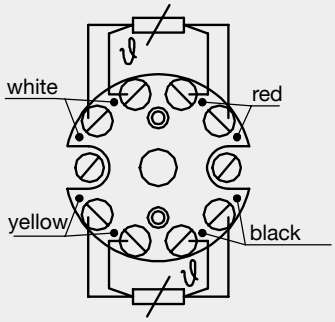


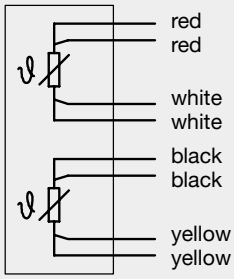
2 x Pt100, 3 wire





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*
			Process connection	
		GD	G ½ B	
		GF	G 1 B	
		ND	½ NPT	
5		**??**	other	*please state as additional text*
			Design of process connection	
		G	male thread	
		K	compression fitting	*preferably with thermowell diameter 12 mm*
6		**?**	other	*please state as additional text*
			Thermowell material	
		1	stainless steel 1.4571	
7		**?**	other	*please state as additional text*
			Thermowell outer diameter	
		3	6 mm	*not with sensor 2 x Pt100 with method of connection 4 wire*
		4	9 mm	*form 2G accordig to DIN 43772*
		6	11 mm	*form 2G accordig to DIN 43772*
		7	12 mm	*form 2G accordig to DIN 43772*
		B	9 mm, tapered to 6 mm (with weld on tip)	
		C	11 mm, tapered to 6 mm (with weld on tip)	
		G	12 mm, tapered to 9 mm (with hammered tip)	*form 3G accordig to DIN 43772*
8		**?**	other	*please state as additional text*
			Insertion length	
		0160	160 mm	*form 2G accordig to DIN 43772*
		0250	250 mm	*form 2G accordig to DIN 43772*
		0400	400 mm	*form 2G accordig to DIN 43772*
		0220	220 mm	*form 3G accordig to DIN 43772*
		0280	280 mm	*form 3G accordig to DIN 43772*
9			length in mm, e.g. 0850 for 850 mm	
			Neck length	
		2	130 mm	*standard neck tube for straight thermowells, form 2G per DIN 43772*
		E	132 mm	*standard neck tube for thermowells with hammered tip, form 3G per DIN 43772*
10		**?**	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	
		H	BSZ-H with digital temperature indicator DIH10	*only without explosion protection,*
		J	BSZ-H with digital temperature indicator DIH10-	*for use a transmitter (4...20 mA) in Ex-version is required*
11		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
12		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
		TA	mounted on the measuring insert	
13		TB	mounted in the cap of the connection head	

Additional order info				
	YES	NO		
14	T	Z	quality certificates	*see price list*
15	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	15
TR201 -		-					-				-								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.

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