Thread Mounted Resistance Thermometers Model TR201, with Fabricated Thermowell

WIKA Data Sheet TE 60.15

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)

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 replacement when servicing is necessary, during operation possible while the plant is running. Selection of normal or standard length 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.



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

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 guideline 94/9/EC (ATEX). ATEX-Manufacturer-Declaration of Conformity in accordance with EN 50 020 is also available.

Optionally we can fit analogue or digital transmitters from the WIKA range into the connection head of the TR201.

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Measuring inserts

Resistance thermometer for additional thermowell Weld-in resistance thermometer with thermowell Flange resistance thermometer Model TR002 Model TR200 Model TR302 Model TR401 see data sheet TE 60.01 see data sheet TE 60.10 see data sheet TE 60.21 see data sheet TE 60.25



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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 60751
- class A to DIN EN 60751
- 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 measuring resistors are laid down in DIN EN 60751.

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:

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

The relationship between the temperature and the electrical resistance is described by polynomes which are defined in DIN EN 60751. Furthermore, this standard lays down the basic values in °C stages.

Class	Limiting error in °C
Α	$0.15 + 0.002 \cdot t ^{1}$
В	0.3 + 0.005 • t

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

TR201 components

Temperature	Basic value	Limitin	g error DI	N EN 60	751
(ITS 90)		Class A	A	Class E	3
°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	± 0.09	± 0.55	± 0.21
0	100	± 0.15	± 0.06	± 0.3	± 0.12
50	119.40	± 0.25	± 0.09	± 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





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Connection head

- Thermowell
- Process connection
- Measuring insert
 - Transmitter (optional) Neck
- NL Nominal length
- Insertion length
- Thermowell diameter M_H Neck length
- Extension neck length

Connect	ion head	\frown		\frown		\bigcap	
BS	BSZ	BSZ-H	BSS	BSS-H	BSK	BSK-H	BVA
		BSZ-HK					
Model	Material	Cable entry	Ingress prote	ction Cap		Surface fin	ish
BS	aluminium	M20 x 1.5	IP54	cap with	n 2 screws	silver bronz	e, painted
BSZ	aluminium	M20 x 1.5	IP65	flap cap	with screw	silver bronz	e, painted
BSZ-H	aluminium	M20 x 1.5	IP65	flap cap	with screw	silver bronz	e, painted
BSZ-HK	plastic	M20 x 1.5	IP65	flap cap	with screw	blank	
BSS	aluminium	M20 x 1.5	IP65	screw w	vith clip	silver bronz	e, painted
BSS-H	aluminium	M20 x 1.5	IP65	screw w	vith clip	silver bronz	e, painted
BSK	plastic	M20 x 1.5	IP54	screw c	over	blank	
BSK-H	plastic	M20 x 1.5	IP54	screw c	over	blank	
BVA	stainless steel	M20 x 1.5	IP65	screw c	over	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.

Transmitter (option)

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

- o mouted instead of connection socket
- mounted within the cap of the connection head
- mounting not possible
- **x** mounted in the cap of the connection head, using a mounting bracket

Mounting of two transmitters on request.

Connection head	Transmitter							
	T12	T19	T24	T31	T32	T42		
BS	_	0	0	0	_	-		
BSZ	0	0	0	0	0	0		
BSZ-H / BSZ-HK	•	•	•	•	•	•		
BSS	0	0	0	0	0	0		
BSS-H	•	•	•	•	•	•		
BSK	-	0	0	0	-	-		
BSK-H	x	x	x	x	x	x		
BVA	0	0	0	0	0	0		

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 1/2 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 1/2 B, G 1 B, 1/2 NPT	9, 11, 12	6	3.5	130
Form WS	220	G 1/2 B, G 1 B, 1/2 NPT	9, 11, 12	6	3.5	130
Form WS	250	G 1/2 B, G 1 B, 1/2 NPT	9, 11, 12	6	3.5	130
Form WS	280	G 1/2 B, G 1 B, 1/2 NPT	9, 11, 12	6	3.5	130
Form WS	400	G 1/2 B, G 1 B, 1/2 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



Process connection	Thermow 9 mm	vell Ø 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	G1B
	1⁄2 NPT	1/2 NPT	1⁄2 NPT	1⁄2 NPT
Compression fitting	-	-	G ½ B	-
	-	-	1⁄2 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	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

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

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

Explosion protection (option)

Resistance thermometers TR201 are available with a type test certificate for "intrinsic safety" type of ignition protection (TÜV 02 ATEX 1793 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. Built-in transmitters have their own type test certificate.

Marking	Standard value	Temperature at the therr	re maximum nowell / me	in °C asuring inse	rt	Neck length minimum	Temperature range ambient
	t norm	Power Pma	x at the sens	or:		Мн	Tamb
Supply circuit ia		50 mW	100 mW	250 mW	500 mW		
II 1/2 G EEx ia IIC T6	85 °C	62	59	54	46		-20°C 55 °C
II 1/2 G EEx ia IIC T5	100 °C	74	71	66	58		-20°C 70 °C
II 1/2 G EEx ia IIC T4	135 °C	102	99	94	86	50 mm	-20°C 100 °C
II 1/2 G EEx ia IIC T3	200 °C	154	151	146	138	50 mm	-20°C 100 °C
II 1/2 G EEx ia IIC T2	300 °C	230	227	222	214	100 mm	-20°C 100 °C
II 1/2 G EEx ia IIC T1	450 °C	350	347	342	334	100 mm	-20°C 100 °C
Supply circuit ib		50 mW	100 mW				
II 1/2 G EEx ib IIC T6	85 °C	54	46				-20°C 55 °C
II 1/2 G EEx ib IIC T5	100 °C	66	58				-20°C 70 °C
II 1/2 G EEx ib IIC T4	135 °C	94	86			50 mm	-20°C 100 °C
II 1/2 G EEx ib IIC T3	200 °C	146	138			50 mm	-20°C 100 °C
II 1/2 G EEx ib IIC T2	300 °C	222	214			100 mm	-20°C 100 °C
II 1/2 G EEx ib IIC T1	450 °C	342	334			100 mm	-20°C 100 °C
Supply circuit ib		50 mW	100 mW	250 mW	500 mW		
II 2 G EEx ib IIC T6	85 °C	77	74	67	58		-20°C 55 °C
II 2 G EEx ib IIC T5	100 °C	92	89	82	73		-20°C 70 °C
II 2 G EEx ib IIC T4	135 °C	127	124	117	108	50 mm	-20°C 100 °C
II 2 G EEx ib IIC T3	200 °C	192	189	182	173	50 mm	-20°C 100 °C
II 2 G EEx ib IIC T2	300 °C	287	284	277	268	100 mm	-20°C 100 °C
II 2 G EEx ib IIC T1	450 °C	437	434	427	418	100 mm	-20°C 100 °C

Further information see Ex operating instructions

Electrical connection



2 x Pt 100, 2 wire







2 x Pt 100, 3 wire









Ordering information

Field	No.	Code	Features
			Explosion protection
		Z	without
1		Y	according to directive 94/9/EG (ATEX) EEx(i) 1) 2)
			Type and number of sensors
		1	1 x Pt 100 application range -50 °C +250 °C
		2	2 x Pt 100 application range -50 °C +250 °C ²⁾
		R	1 x Pt 100 application range -50 °C +450 °C
		S	2 x Pt 100 application range -50 °C +450 °C ²⁾
		5	1 x Pt 100 application range -100 °C +450 °C
		6	2 x Pt 100 application range -100 °C +450 °C ²⁾
		3	1 x Pt 100 application range -50 °C +600 °C
		4	2 x Pt 100 application range -50 °C +600 °C ²⁾
		7	1 x Pt 100 application range -200 °C +200 °C
		8	2 x Pt 100 application range -200 °C +200 °C ²⁾
2		?	other please state as additional text
	L L		Sensor method of connection
		2	2 wire
		3	3 wire
3		4	4 wire
		•	Sensor limiting error
		В	class B per DIN EN 60751
		Α	class A per DIN EN 60751 (max. 450 °C) not with 2-wire connection
		С	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	1/2 NPT
5		??	other please state as additional text
			Design of process connection
		G	male thread
		к	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 Pt 100 with method of connection 3- or 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
		В	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	1280 mm form 3G accordig to DIN 43772
9			ופחקנה וה mm, e.g. 0850 for 850 mm
		2	130 mm standard neck tube for straight thermowells, form 2G per DIN 43772
			132 mm standard neck tube for thermowells with hammered tip, form 3G per DIN 43772
10		2	please state as additional text

Ordering information, continued

Field N	0.	Code	Feature	s						
			Connec	tion head						
		1	model B	S (aluminium)	only transmitter T19/T24/T31 as option possible					
		2	model B	SZ (aluminium)	· · · · · · · · · · · · · · · · · · ·					
		3	model B	SZ-H (aluminium)	mounting of an optional transmitter in the cap possible					
		S	model B	SZ-HK (plastic)	mounting of an optional transmitter in the cap possible					
		4	model B	SS (aluminium)						
		5	model B	SS-H (aluminium)	mounting of an optional transmitter in the cap possible					
		6	model B	SK (plastic)	only without explosion protection					
		7	model B	SK-H (plastic)	only without explosion protection					
		8	model B	VA (stainless steel)						
			BSZ-H v	vith digital temperature indicator DIH10	only without explosion protection,					
		п	(set to tr	ansmitter range)	for use a transmitter (420 mA) is required					
		J	BSZ-H v (set to tr	vith digital temperature indicator DIH10-Ex ansmitter range)	for use a transmitter (420 mA) in Ex-version is required					
11		?	other		please state as additional text					
			Cable e	ntry to connection head						
		4	M20 x 1	5						
12		?	other		please state as additional text					
		_	Transm	itter						
		ZZ	without							
		TA	mounted	I on the measuring insert						
13		TB	mounted	I in the cup of the connection head						
		Additio	nal order	info						
		YES	NO -							
14		$+$ $\overline{-}$	Z	quality certificates	see price list					
15		T	Z	additional text	Please state as clearly understandable text!					

Please pay attention to the table of exclusions, see price list.
Designs with explosion protection: The combination of 2xPt100 / transmitter is permissible only with connection head BSZ-H, BSZ-HK or BSS-H.

Order code:



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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