

Resistance Thermometers without Thermowell • Model TR200

Electronic Temperature Measurement

Services intended

- Machinery, plant and tank construction
- Energy and power station engineering
- Process industry
- Food and beverage industry
- Heating, air conditioning and ventilation industry

General

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

The respective design of the thermometer – extension neck, connection to thermowell, measuring insert, etc. – has to be matched with the design of the thermowell onto which it will be installed. Extensive combinations of the different thermometer components are possible.

Designs with extension neck are particularly suitable for

- combinations with solid material thermowells
(for example: data sheet TM 90.01 , TM 90.03 , TM 90.04)
- for quick response temperature probes
(with welding measuring insert or operation without thermowell, see data sheet TE 60.40)
- for allowing installation through various insertion lengths
(with compression fitting or compression fitting with flange)

Designs without extension neck are used for

- combinations with thermowells of fabricated construction
- for quick response temperature probes
(with compression fitting on the measuring insert, for operation without thermowell, see data sheet TE 60.40)

Particular attention must be paid to the dimensions of the measuring insert when combined with a thermowell. Adequate heat transfer between thermowell and measuring insert is only ensured when the measuring insert is of correct length and diameter. Choice of normal or standard length has a favourable effect on the delivery time and possible stocking of spare parts.

Intrinsically safe designs are available for applications in hazardous areas. The model series TR200 are provided with a conformity certificate for "intrinsically safe" type of protection to EEx ib IIC T6. Manufacturer's certifications to NAMUR NE 24 or in accordance with DIN VDE 0165, respectively, are also available.

Optional installation of analog or digital transmitters completes the range of applications.

(- analog, fixed measuring ranges:

Model T20 to data sheet TE 20.01 ,

- analog, measuring range selectable with soldered bridges:

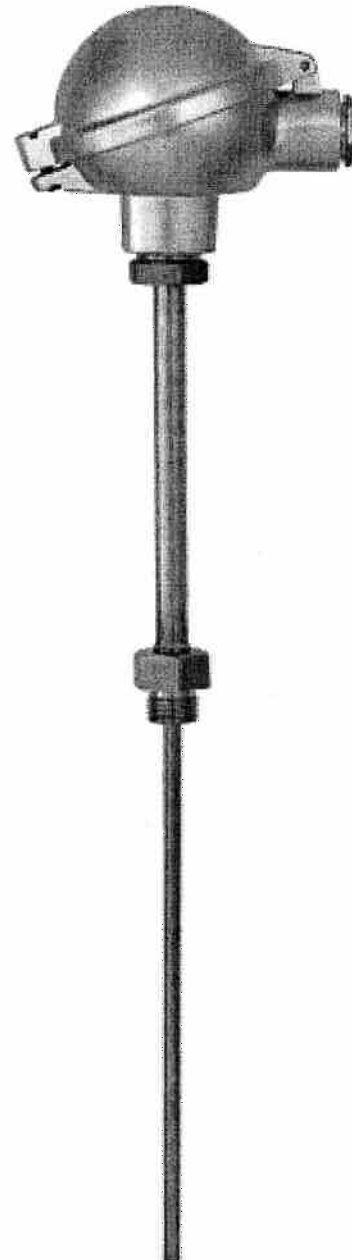
Model T21 to data sheet TE 21.01 ,

- analog, process industry series:

Model T31 to data sheet TE 31.01 ,

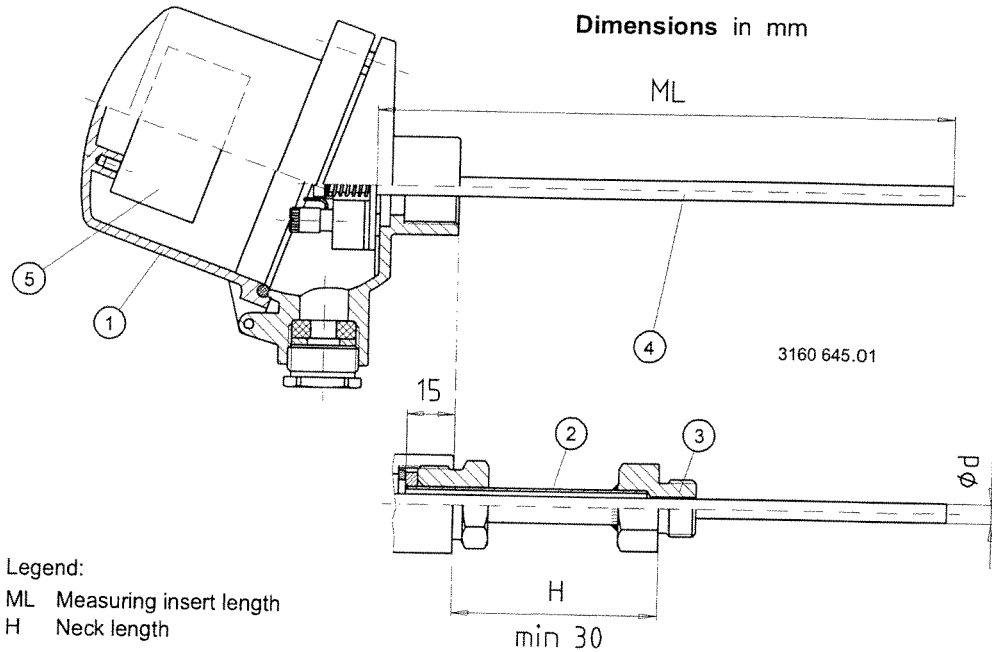
- digital, Model T12 to data sheet TE 12.01 ,

- digital, with HART® Protocol: Model T32 to data sheet TE 32.01)



TR200 components

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



Connection head

Model	Material	Cable entry		Degree of protection	Cover closure	Surface finish
		standard	with adapter			
BS	Aluminium	Pg 16	Pg 13.5 ½ NPT	IP 54	cover with 2 screws	silver bronze, painted
BSZ	Aluminium	Pg 16	Pg 13.5 ½ NPT	IP 65	flap cover with screw	silver bronze, painted
BSZ-H	Aluminium	Pg 16	Pg 13.5 ½ NPT	IP 65	flap cover with screw	silver bronze, painted
BSS	Aluminium	Pg 16	Pg 13.5 ½ NPT	IP 65	flap cover with clip	silver bronze, painted
BSS-H	Aluminium	Pg 16	Pg 13.5 ½ NPT	IP 65	flap cover with clip	silver bronze, painted
BSK	Plastic	Pg 16	Pg 13.5 ½ NPT	IP 54	screw cover	black
BSK-H	Plastic	Pg 16	Pg 13.5 ½ NPT	IP 54	screw cover	black
BVA	stainless steel	Pg 16	Pg 13.5 ½ NPT	IP 65	screw cover	blank
BUK-H	Polyamide	Pg 13.5		IP 65	flap cover with screw	beige, black (only for explosion protection)

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.

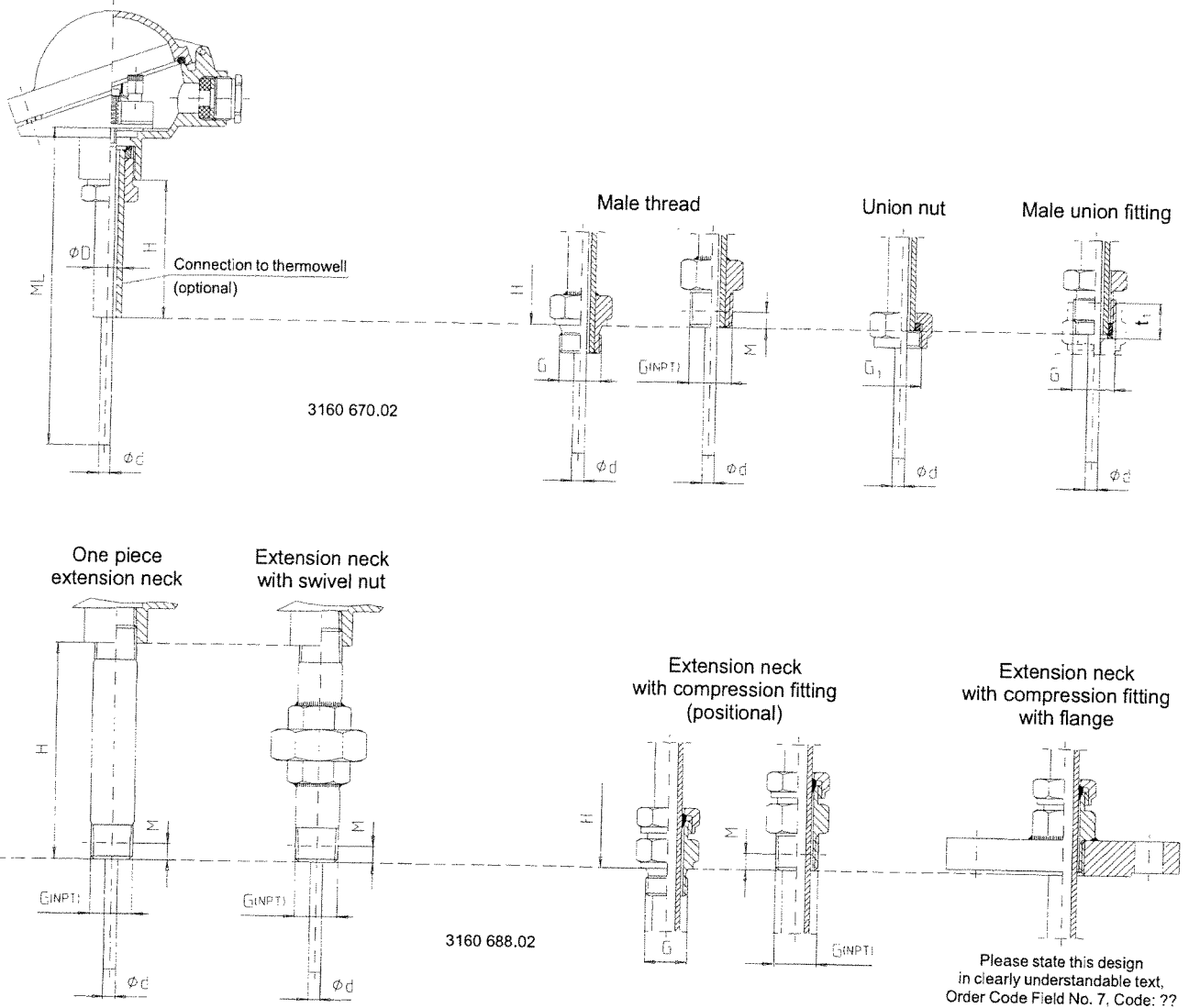
It is important that, when fitting with a thermowell the length of the neck (measurement H), length of thermowell and length of measuring insert all match. Adequate heat transfer between thermowell and measuring insert, and as a result safe, reliable measuring is only ensured when the dimensions are correct. When determining these lengths you must be aware that the measuring insert is spring loaded (spring travel: 0 to 10 mm) 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 measuring insert. This has the advantage that the measuring insert complies with the standards.

$$\text{extension neck length} = \text{neck length (measurement H)} + 15 \text{ mm}$$

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:

ØD	Extension neck diameter	G	Male thread
Ød	Measuring insert diameter	G ₁	Female thread
H	Neck length	t ₁	Threaded hole depth in thermowell
ML	Measuring insert length	M	Screw-in length by hand,
			- with ½ NPT approx. 8.1 mm
			- with ¾ NPT approx. 8.6 mm

Possible combinations: design / extension neck diameter / connection thread

Design	Ext. neck dia. 11 mm	Ext. neck dia. 14 mm
	Connection thread	
Male thread	G ½ A	G ½ A
	G ¾ A	G ¾ A
	M 14 x 1.5	—
	M 18 x 1.5	M 18 x 1.5
	M 20 x 1.5	M 20 x 1.5
	½ NPT	½ NPT
	¾ NPT	¾ NPT
Union nut	G ½	G ½
	M 24 x 1.5	M 24 x 1.5
	M 27 x 2	M 27 x 2
Male union fitting	G ½ A	G ½ A

Design	Extension neck diameter 22 mm	
	Connection thread	
One piece extension neck	½ NPT	
Extension neck with swivel nut	½ NPT	

Design	Ext. neck dia. 12 mm	Ext. neck dia. 14 mm
	Connection thread	
Extension neck	without thread	without thread
Extension neck with compression fitting	G ½ A	G ½ A
	½ NPT	½ NPT

Sensor

The diameter of the measuring insert should be approx. 1 mm less than the diameter of the thermowell hole in which the measuring insert is to be fitted. Gaps greater than 0.5 mm between hole and measuring insert have a negative effect on the heat transfer and lead to inaccuracies.

Measuring insert dia. in mm	Sensor / Sensor method of connection						
	1 x Pt 100			2 x Pt 100			3 x Pt 100
	2 wire	3 wire	4 wire	2 wire	3 wire	4 wire	2 wire
3	x	x	x	x	—	—	—
6	x	x	x	x	x	x ¹⁾	x
8	x	x	x	x	x	x ¹⁾	x

1) always measuring insert model TR002, sheathed cable design

Sensor limiting error

- Class A to DIN EN 60 751 (only with 3 wire or 4 wire method of connection)
- Class B to DIN EN 60 751
- ½ DIN B at 0 °C

Measuring insert length

The following relationship should be applied to determine the necessary length of measuring insert:

$$\text{measuring insert length} = (\text{thermowell length} - M \text{ or } t_1) + \text{neck length} + 25 \text{ mm}$$

Tip thickness of thermowells in excess of 5 mm must be considered when determining the length of the measuring insert.

Measuring insert dia. in mm	Standard length in mm											
	145	205	275	315	375	405	435	525	555	655	735	1025
3												
6			275	315	375	405	435	525	555	655	735	1025
8			275	315	375	405	435	525	555	655	735	1025

special lengths are possible

Explosion protection

- Temperature probes to DIN EN 50 014 / DIN EN 50 020 in accordance with CENELEC with a conformity certificate for "intrinsically safe" type of protection to EEx ib IIC T6 are approved for use in Zone 1. The use of suitable thermowells is the responsibility of the user. The thermowell separates Zone 0 from Zone 1. This pre-supposes thermowells comply with the plant design regulations with regards to corrosion resistance, mechanical strength and wall thickness. Fitted transmitters have their own conformity certificate.
- Temperature probes with measuring insert to NAMUR NE 24 are certified with a manufacturer's certification for Ex i application. The suitability of the thermowell for the appropriate explosion zone is not covered in NAMUR NE 24.
- Temperature probes deviating in design from the conformity certificate can then be certified with a manufacturer's certification for Ex i application if these probes fulfil the requirements to DIN VDE 0165/2.91. Such certified probes must only be used in Zones 1 and 2.

Order example

Model TR200, design in accordance with
Order code: TR200-Z-1B233A341211ZZZZ-Z

Instrument design

Explosion protection: **without**

Type and number of sensors:

1 x Pt 100 application range -50 ... +250 °C

Sensor limiting error: **Class B to DIN EN 60 751**

Sensor method of connection: **3 wire**

Measuring insert diameter: **6 mm**

Measuring insert length: **375 mm**

Connection to thermowell / Extension neck diameter:

male thread G ½ A / diameter 14 mm

Extension neck length: **165 mm equivalent to neck length 150 mm**

Extension neck material: **stainless steel 1.4571**

Connection head: **model BSZ**

Connection from connection head to extension neck: **M 24 x 1.5**

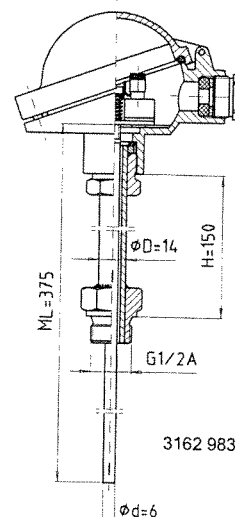
Cable entry to connection head: **Pg 16**

Transmitter: **without**

Transmitter measuring range: **without**

Quality Assurance Documentation: **without**

Dimensions in mm (for order example)



Legend:

Ø D Extension neck dia.

Ø d Measuring insert dia.

H Neck length

ML Measuring insert length

Field No.	Code	Instrument design
Explosion protection		
1	Z	without
	X	EEx ib IIC T6 to PTB No. Ex-97.D.2006 X
	B	intrinsically safe with manufacturer's certification to NAMUR NE 24
	C	intrinsically safe with manufacturer's certification, DIN VDE 0165
Type and number of sensors		
2	1	1 x Pt 100 application range -50 ... +250 °C
	2	2 x Pt 100 application range -50 ... +250 °C
	3	1 x Pt 100 application range -200 ... +600 °C
	4	2 x Pt 100 application range -200 ... +600 °C
	5	1 x Pt 100 enhanced vibration protection, application range -50 ... +400 °C
	6	2 x Pt 100 enhanced vibration protection, application range -50 ... +400 °C
	?	other
Sensor limiting error		
3	A	Class A to DIN EN 60751
	B	Class B to DIN EN 60751
	C	1/3 DIN B at 0 °C
	?	other
Sensor method of connection		
4	1	2 wire <i>not with sensor limiting error, Class A</i>
	2	3 wire
	3	4 wire
Measuring insert diameter		
5	1	3 mm
	3	6 mm
	4	8 mm <i>tubing</i>
	?	other
Measuring insert length		
6	1	275 mm
	2	315 mm
	3	375 mm
	4	405 mm
	5	435 mm
	6	525 mm
	7	555 mm
	8	655 mm
	?	other
Connection to thermowell / Extension neck diameter		
7	A1	male thread G 1/2 A / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	B1	male thread M 14 x 1.5 / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	C1	male thread M 18 x 1.5 / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	D1	male thread 1/2 NPT / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	A3	male thread G 1/2 A / diameter 14 mm
	C3	male thread M 18 x 1.5 / diameter 14 mm
	D3	male thread 1/2 NPT / diameter 14 mm
	E1	union nut M 27 x 2 / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	F1	union nut G 1/2 / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	E3	union nut M 27 x 2 / diameter 14 mm
	F3	union nut G 1/2 / diameter 14 mm
	G1	male union fitting G 1/2 A / diameter 11 mm <i>not useable with measuring insert diameter 8 mm</i>
	G3	male union fitting G 1/2 A / diameter 14 mm
	H2	extension neck without thread / diameter 12 mm
	K2	extension neck with compression fitting G 1/2 A, stainless steel / diameter 12 mm
	L4	1/2 NPT, one piece extension neck / diameter 22 mm
	M4	1/2 NPT, extension neck with swivel nut / diameter 22 mm
	??	other
Extension neck length		
8	2	145 mm <i>equivalent to neck length H = 130 mm</i>
	4	165 mm <i>equivalent to neck length H = 150 mm</i>
	?	other
Extension neck material		
9	1	stainless steel 1.4571
	?	other

Field No.	Code	Instrument design
		Connection head
	1	model BS
	2	model BSZ
	3	model BSZ-H
	4	model BSS
	5	model BSS-H
	6	model BSK
	7	model BSK-H
	8	model BVA
10		? other
		Connection from connection head to extension neck
	1	M 24 x 1.5
	4	1/2 NPT <i>only with extension neck dia. 22 mm, not with connection head model: BSK, BSK-H, BUK-H</i>
11		? other
		Cable entry to connection head
	1	Pg 16
	2	Pg 13.5
	3	1/2 NPT
12		? other
		Transmitter
	ZZ	without
	A0	model T20, without explosion protection <i>sensor method of connection 4 wire is not connectable</i>
	A2	model T20, with explosion protection EEx ia <i>sensor method of connection 4 wire is not connectable</i>
	A4	model T20, with explosion protection EEx ib <i>sensor method of connection 4 wire is not connectable</i>
	B0	model T21, without explosion protection <i>sensor method of connection 4 wire is not connectable</i>
	C2	model T31, with explosion protection EEx ia <i>sensor method of connection 4 wire is not connectable</i>
	C4	model T31, with explosion protection EEx ib <i>sensor method of connection 4 wire is not connectable</i>
	D0	model T12, without explosion protection <i>configured to customer specification</i>
	D2	model T12, with explosion protection EEx ia <i>configured to customer specification</i>
	D4	model T12, with explosion protection EEx ib <i>configured to customer specification</i>
	E0	model T32, without explosion protection <i>configured to customer specification</i>
	E2	model T32, with explosion protection EEx ia <i>configured to customer specification</i>
	E4	model T32, with explosion protection EEx ib <i>configured to customer specification</i>
13		?? other
		Transmitter measuring range
	ZZ	without
	KK	customer's specification <i>only transmitter model: T12, T32 please use sheet "help to order"</i>
		standard range <i>only transmitter model: T20, T21, T31 code see price list</i>
14		?? special range <i>only transmitter model: T20, T21, T31 please state as additional text</i>
		Quality Assurance Documentation
	Z	without
15		1 with <i>Please state in clearly understandable text !</i>
		Additional order details
	YES	NO
16	T	Z
		additional text <i>Please state in clearly understandable text !</i>

Order code for Model TR200

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
TR200	-		-												-	

Additional text: _____

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



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