

OEM miniature resistance thermometer Models TR31-3 and TR31-K, thread-mounted

WIKA data sheet TE 60.31

Applications

- Machine building, plant and vessel construction
- Propulsion technology, hydraulics
- General applications

Special features

- Very compact design, high vibration resistance and fast response time
- With direct sensor output (Pt100, Pt1000 in 2-, 3- or 4-wire connection) or integrated transmitter with 4 ... 20 mA output signal
- Integrated transmitter is individually parameterisable with free-of-charge WIKAsoft-TT PC configuration software
- Sensor element with accuracy class A in accordance with IEC 60751
- EMC conformity in accordance with NAMUR NE21

Description

Resistance thermometers of this series are used as universal thermometers for the measurement of liquid and gaseous media in the range -50 ... +250 °C.

They can be used for pressures up to 140 bar with 3 mm sensor diameters and up to 270 bar with 6 mm sensor diameters, depending on the instrument version. All electrical components are protected against moisture (IP 67 or IP 69K) and are designed to be vibration resistant (20 g, depending on instrument version).

The resistance thermometer is available with direct sensor output or with integrated transmitter, which can be individually parameterised over the WIKAsoft-TT PC configuration software. Measuring range, damping, fault signal in accordance with NAMUR NE43 and TAG No. can be set.

Insertion length, process connection, sensor and connection method can each be selected for the respective application from the order information. The model TR31 resistance



Fig. left: Resistance thermometer with M12 x 1, model TR31-3

Fig. centre: Resistance thermometer with directly connected cable, model TR31-K

Fig. right: M12 x 1 adapter to DIN EN 175301-803 angular connector

thermometer consists of a thermowell with a fixed process connection and is screwed directly into the process. The electrical connection depends on the design and is made with an M12 x 1 circular connector or via a directly connected cable. For the M12 x 1 circular connector, an adapter for electrical connection with angular connector per DIN EN 175301-803 form A is optionally available (patent, property right applied for under No. 001370985). As a special feature, the miniature OEM resistance thermometer is also available in customer-specific designs.

Sensor

The sensor is located in the tip of the thermometer.

The resistance thermometers of the series TR31 are designed for direct installation into the process. Using it in an additional thermowell is not advisable.

Sensor diameter in mm	Process connection						
	G ¼ B	G ¾ B	G ½ B	¼ NPT	½ NPT	M12 x 1.5	M20 x 1.5
3	x	x	x	x	x	x	x
6	x	x	x	x	x	x	x

other process connections on request

Sensor diameter in mm	Sensor tube length Insertion length U ₁ in mm									
	50	75	100	120	150	200	250	300	350	400
3	x	-	-	-	-	-	-	-	-	-
6	x	x	x	x	x	x	x	x	x	x

Specifications

Thermometer with transmitter and 4 ... 20 mA output signal (model TR31-x-x-TT)	
Temperature range	without neck tube -50 ... +150 °C (-58 ... +302 °F) with neck tube -50 ... +250 °C (-58 ... +482 °F) ^{1) 2)}
Measuring element	Pt1000
Connection method	2-wire
Tolerance value of the measuring element per IEC 60751	Class A ³⁾
Measuring deviation of the transmitter per IEC 60770	±0.25 K
Total measuring deviation in accordance with IEC 60770	Measuring deviation of the measuring element + the transmitter
Measuring span	minimum 20 K, maximum 300 K
Basic configuration	Measuring range 0 ... 150 °C (32 ... 302 °F), other measuring ranges are adjustable
Analogue output	4 ... 20 mA, 2-wire
Linearisation	Linear to temperature per IEC 60751
Linearisation error	±0.1 % ⁴⁾
Switch-on delay, electrical (time before the first measured value)	max. 4 s
Warming-up period	After approx. 4 minutes, the instrument will function to the specifications (accuracy) given in the data sheet.
Current signal for fault signal	configurable in accordance with NAMUR NE43 downscale ≤ 3.6 mA upscale ≥ 21.0 mA
Sensor short-circuit	not configurable, in accordance with NAMUR NE43 downscale ≤ 3.6 mA
Sensor current	< 0.3 mA (self-heating can be ignored)
Load R _A	$R_A \leq (U_B - 10 \text{ V}) / 23 \text{ mA}$ with R _A in Ω and U _B in V
Effect of load	±0.05 % / 100 Ω
Power supply U _B	DC 10 ... 30 V
Max. permissible residual ripple	10 % generated by U _B < 3 % ripple of the output current
Power supply input	protected against reverse polarity
Power supply effect (depending on the power supply U _B)	±0.025 % / V
Influence of the ambient temperature	0.1 % of span / 10 K T _{amb}
Electromagnetic compatibility (EMC) ⁶⁾	2004/108/EC, EN 61326 emission (group 1, class B), and interference immunity (industrial application) ⁵⁾ , configuration at 20 % of the full measuring range
Temperature units	configurable °C, °F, K
Info data	TAG No., description and user message can be stored in transmitter
Configuration and calibration data	permanently stored
Electrical connection	<ul style="list-style-type: none"> ■ M12 x 1, 4-pin circular connector ■ Directly connected cable

Readings in % refer to the measuring span

For a correct determination of the overall measuring error, both sensor and transmitter measuring deviations have to be considered.

1) The temperature transmitter should therefore be protected from temperatures over 85 °C (185 °F).

2) Version with mineral-insulated sheathed cable can be used up to 300 °C (572 °F).

3) Class accuracy A only valid in the temperature range -30 ... +150 °C (-22 ... +302 °F) or -30 ... +250 °C (-22 ... +482 °F), otherwise class B

4) ±0.2 % for measuring ranges with a lower limit less than 0 °C (32 °F)

5) Use resistance thermometers with shielded cable, and ground the shield on at least one end of the lead, if the lines are longer than 30 m or leave the building. The instrument must be operated grounded.

6) During interference consider an increased measuring deviation of up to 2 %.

Thermometer with direct sensor output with Pt100 (model TR31-x-x-Px) and Pt1000 (model TR31-x-x-Sx)

Temperature range	without neck tube -50 ... +150 °C (-58 ... +302 °F) with neck tube -50 ... +250 °C (-58 ... +482 °F) ⁷⁾
Temperature at connector or at the directly connected cable	max. 85 °C (185 °F)
Measuring element	■ Pt100 (measuring current: 0.1 ... 1.0 mA) ■ Pt1000 (measuring current: 0.1 ... 0.3 mA)
Connection method	■ 2-wire The lead resistance is recorded as an error in the measurement. ■ 3-wire With a cable length of 30 m or longer, measuring errors can occur. ■ 4-wire The lead resistance can be ignored.
Tolerance value of the measuring element per IEC 60751	■ Class A ⁸⁾ ■ Class B at 2-wire
Electrical connection	■ M12 x 1, 4-pin circular connector ■ Directly connected cable

For detailed specifications for Pt sensors, see Technical information IN 00.17 at www.wika.com.

Housing

Material	Stainless steel
Ingress protection	
■ Housing with connected connector or directly connected cable	IP 67 and IP 69K per IEC 60529/EN 60529 The stated ingress protection only applies when plugged in using mating connectors that have the appropriate ingress protection.
■ Coupler connector, not connected	IP 67 per IEC 60529/EN 60529
Weight in kg	approx. 0.2 ... 0.7 (depending on version)
Dimensions	see "Dimensions in mm"

Ambient conditions

Ambient temperature range	■ M12 x 1, 4-pin circular connector -50 ... +85 °C (-58 ... +185 °F) ⁷⁾ ■ Directly connected cable -20 ... +80 °C (-4 ... +176 °F)
Storage temperature range	■ M12 x 1, 4-pin circular connector -40 ... +85 °C (-40 ... +185 °F) ■ Directly connected cable -20 ... +80 °C (-4 ... +176 °F)
Climate class per IEC 60654-1	■ M12 x 1, 4-pin circular connector Cx (-50 ... +85 °C or -58 ... +185 °F, 5 ... 95 % relative humidity) ■ Directly connected cable Cx (-20 ... +80 °C or -4 ... +176 °F, 5 ... 95 % relative humidity)
Maximum permissible humidity per IEC 60068-2-30 var. 2	relative humidity 100 %, condensation allowed
Maximum operating pressure ^{9) 10)}	140 bar with 3 mm sensor diameter 270 bar with 6 mm sensor diameter
Vibration per IEC 60751	10 ... 2,000 Hz, 20 g ⁹⁾
Shock	IEC 60068-2-27
Salt fog	IEC 60068-2-11

7) Version with mineral-insulated sheathed cable can be used up to 300 °C (572 °F).

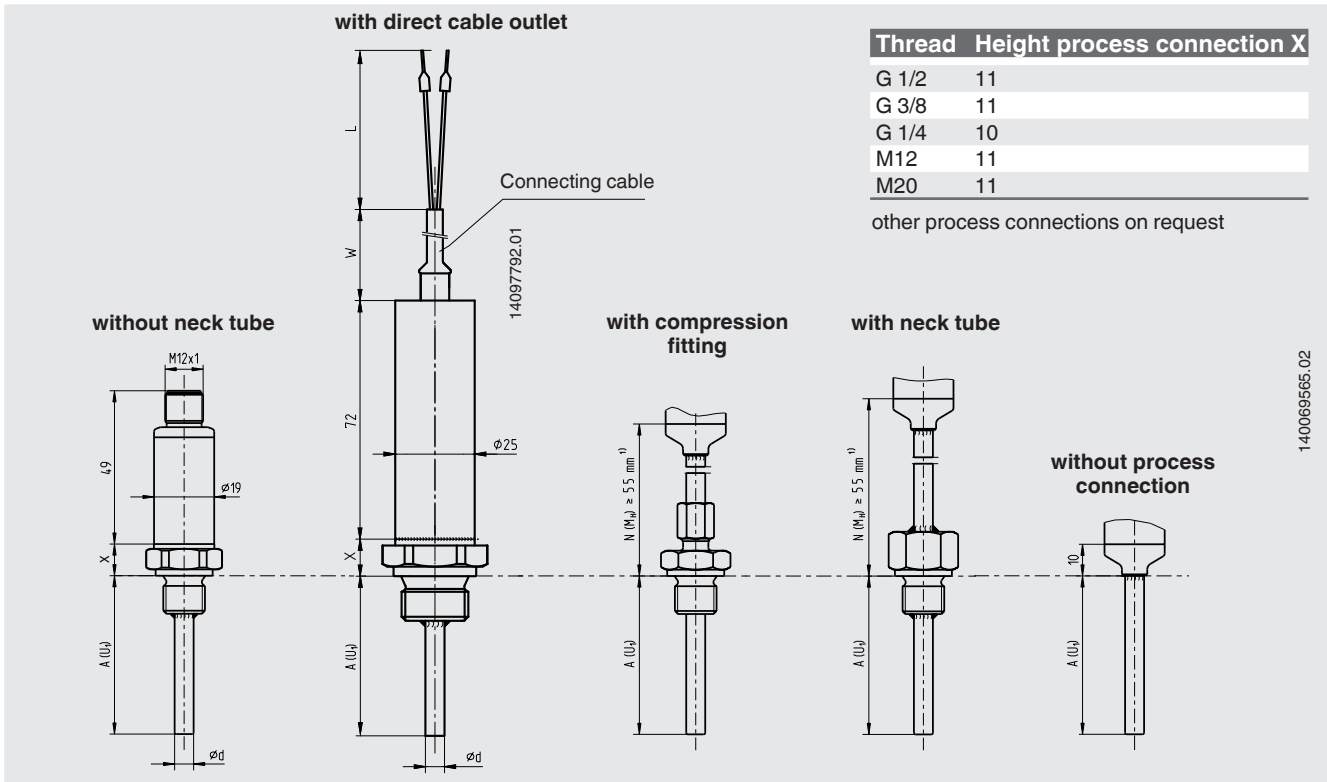
8) Class accuracy A only valid in the temperature range -30 ... +150 °C (-22 ... +302 °F) or -30 ... +250 °C (-22 ... +482 °F), otherwise class B

9) Dependent on the instrument version

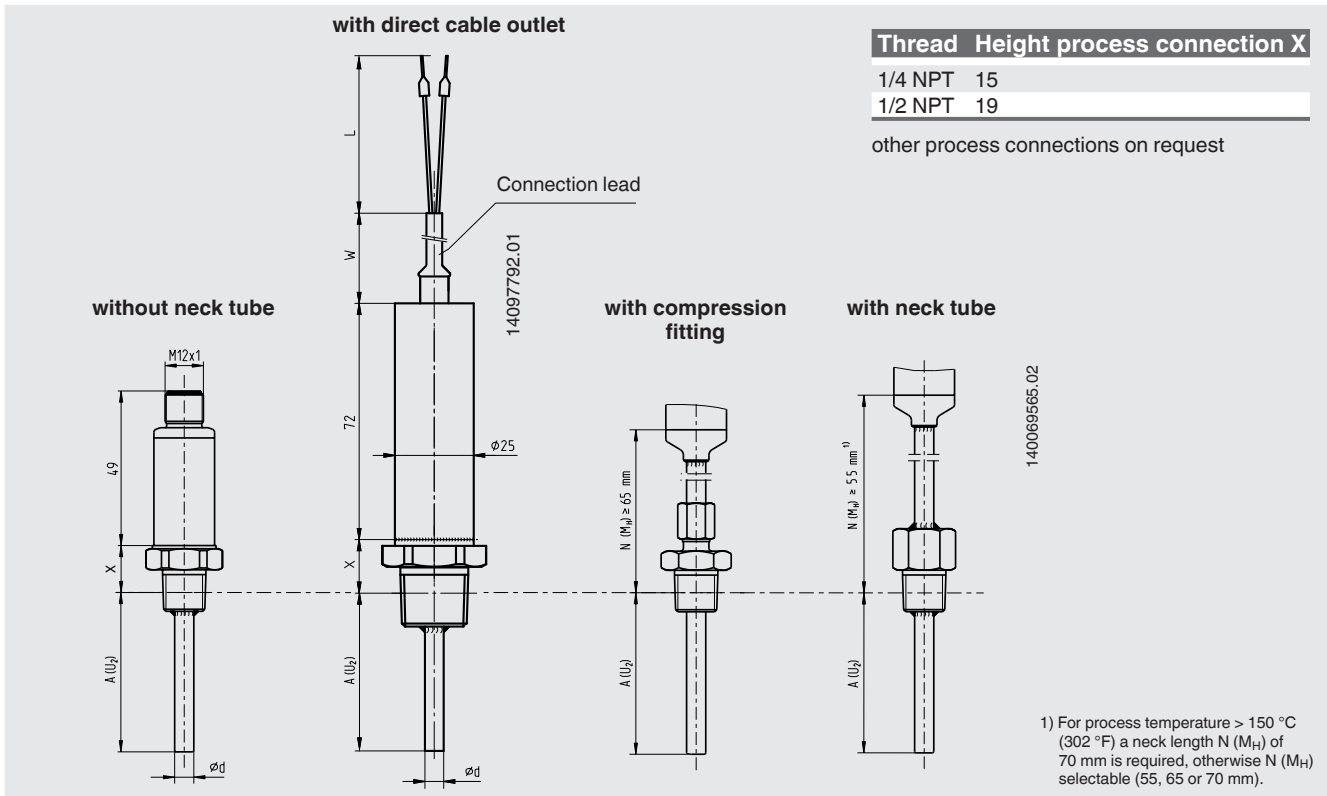
10) Reduced operating pressure when using a compression fitting: Stainless steel: max. 100 bar
PTFE: max. 8 bar

Dimensions in mm

Process connection with parallel threads (or without process connection)



Process connection with tapered thread


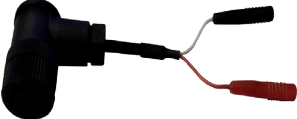

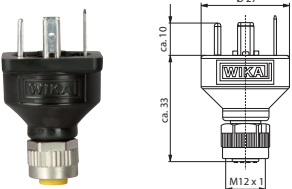
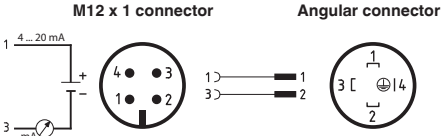
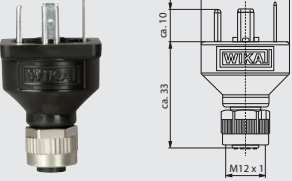
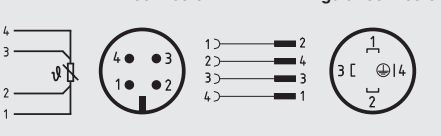


Legend:

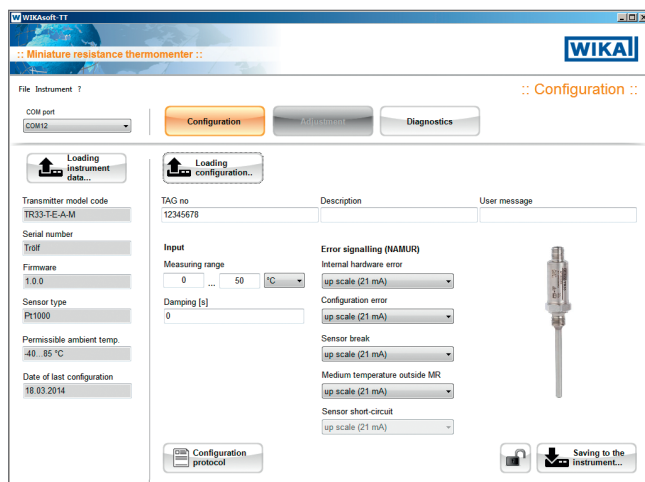
- A (U₁) Insertion length (parallel thread)
- A (U₂) Insertion length (tapered thread)
- N (M_H) Neck length
- X Height process connection
- Ød Sensor diameter
- W Length of the directly connected cable
- L Length of the free wire ends

Accessories

Configuration set

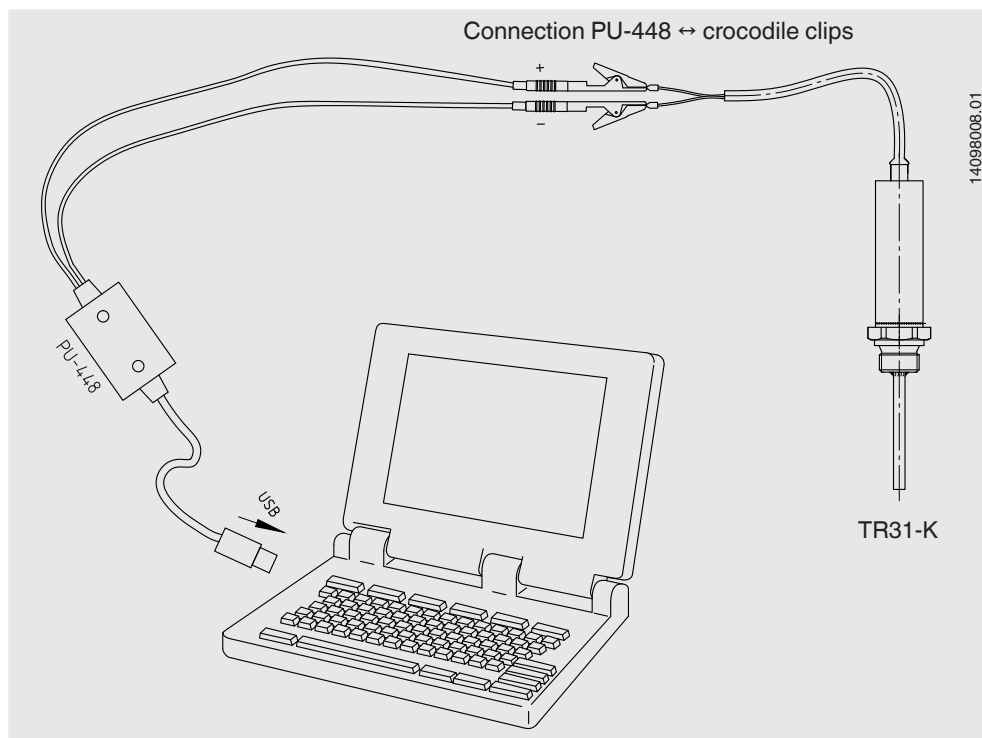
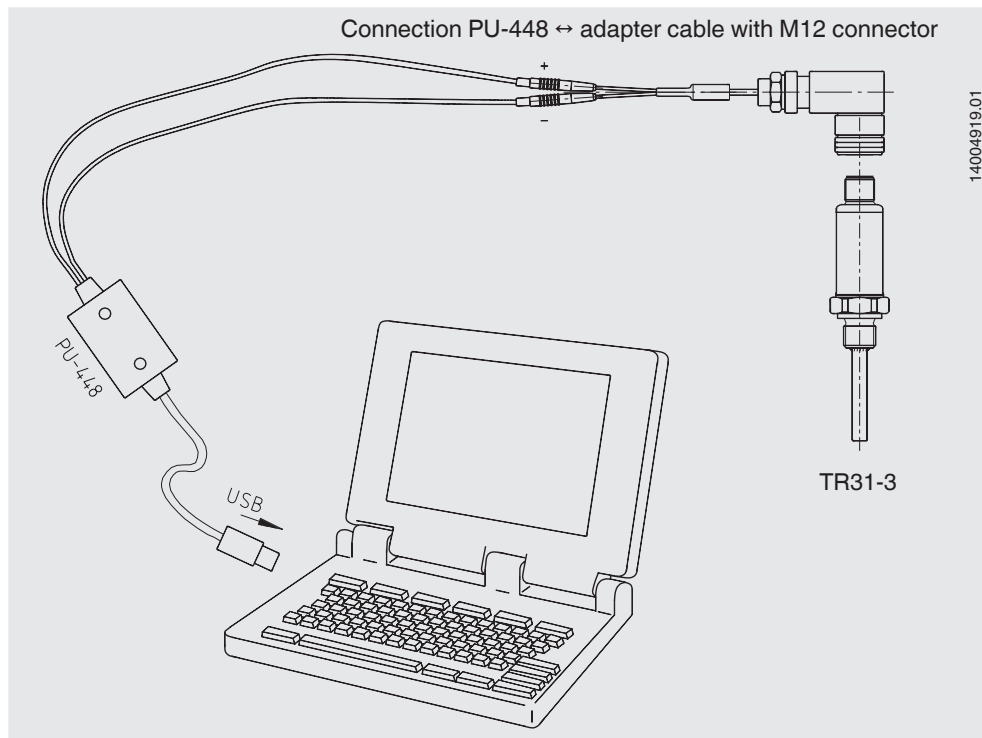
Model	Special features	Order no.
Programming unit Model PU-448 	<ul style="list-style-type: none"> Easy to use LED status displays Compact design No further power supply is needed for either the programming unit or for the transmitter 	11606304
Adapter cable M12 to PU-448 	Adapter cable for the connection of model TR31 resistance thermometer to the model PU-448 programming unit	14003193
Crocodile clip set 	Crocodile clips for the connection of the model TR31-K resistance thermometer with direct cable connection with the model PU-448 programming unit	14097967
M12 x 1 transmitter adapter to angular connector DIN EN 175301-803 (yellow female connector element) 	Adapter for the connection of a resistance thermometer with a DIN EN 175301-803 form A angular connector with a 4 ... 20 mA output signal (data sheet AC 80.17)  <p>Housing: PA Ambient temperature: -40 ... +115 °C Union nut: Zinc diecast Contacts: Copper-zinc alloy, tin-plated Dielectric strength: 500 V Ingress protection: IP 65</p>	14069503
M12 x 1 Pt adapter to angular connector DIN EN 175301-803 (black female connector element) 	Adapter for the connection of a resistance thermometer with a DIN EN 175301-803 form A angular connector with direct resistance output signal (data sheet AC 80.17)  <p>Housing: PA Ambient temperature: -40 ... +115 °C Union nut: Zinc diecast Contacts: Copper-zinc alloy, tin-plated Dielectric strength: 500 V Ingress protection: IP 65</p>	14061115

Configuration software WIKAsoft-TT



Configuration software (multilingual) as a download from www.wika.com

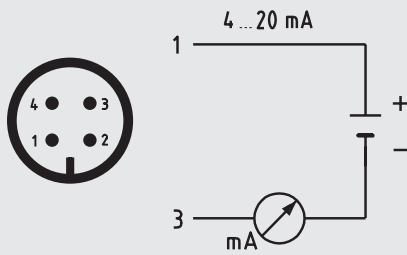
Connecting PU-448 programming unit



Electrical connection

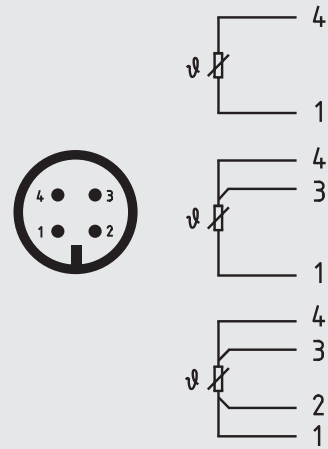
■ Circular connector M12 x 1, 4-pin

Output signal 4 ... 20 mA



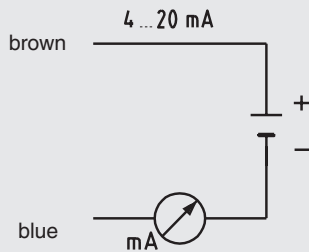
Pin	Signal	Description
1	L+	10 ... 30 V
2	VQ	not connected
3	L-	0 V
4	C	not connected

Output signal Pt100 and Pt1000



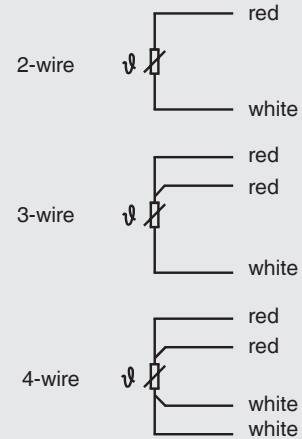
■ Directly connected cable

Output signal 4 ... 20 mA



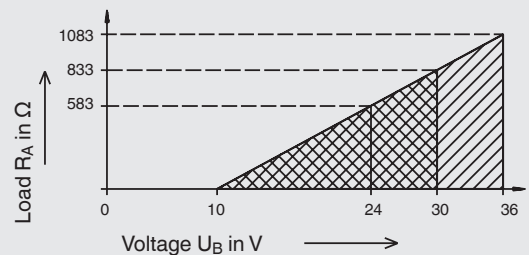
Pin	Signal	Description
Brown	L+	10 ... 30 V
Blue	L-	0V

Output signal Pt100 and Pt1000



Load diagram

The permissible load depends on the loop supply voltage. For communication with the instrument, programming unit PU-448, a max. load of 350 Ω is admissible.



CE conformity

EMC directive 1)

2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (industrial application)

1) Only for built-in transmitter

Certificates (option)

Certification type	Measuring accuracy	Material certificate
2.2 test report	x	x
3.1 inspection certificate	x	x
DKD/DAkkS calibration certificate	x	-

The different certifications can be combined with each other.

Patents, property rights

M12 x 1 adapter to angular connector DIN EN 175301-803, registered under No. 001370985

Approvals and certificates, see website

Ordering information

Model / Design / Output signal / Transmitter temperature unit / Process temperature / Transmitter initial value / Transmitter end value / Process connection / Sensor diameter / Insertion length A (U₁) or A (U₂) / Neck length N (M_H) / Accessories / Certificates

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