Technical Information
TI 272T/02/en
60021665

RTD Temperature Sensor
omnigrad T TR 470

RTD sensor with Pt 100, class A
Process connection threaded or with compression fitting

Application
The Omnigrad T type TR 470 gauge is used for measuring temperatures from -50 to 200°C.
The typical applications are:
- tanks and pipes
- factory utilities
- HVAC
- machinery.

Features and benefits
- Small design
- M12 plug-in connector
- Various insertion lengths
- Optional: reduced gauge tip for quick response times
- Completely made of stainless steel, components in contact with the process in SS 316L
- Pt 100 accuracy class A (DIN EN 60751)

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Function and system design

Measuring principle

In the RTD (Resistance Temperature Detector) thermometers the sensing element consists of an electrical resistance with value of 100 Ω at 0°C (called Pt 100, in compliance with standard DIN EN 60751), which increases at higher temperatures according to a coefficient characteristic of the resistor material (platinum). In industrial thermometers that comply with the DIN EN 60751 standard, the value of this coefficient is $\alpha = 3.85*10^{-3}$ °C^{-1}, calculated between 0 and 100°C.

Input values

Measured variable

Temperature

Measuring range

-50...200°C

Output values

Output signal

Analogue, Ω

Supply

Electrical connection

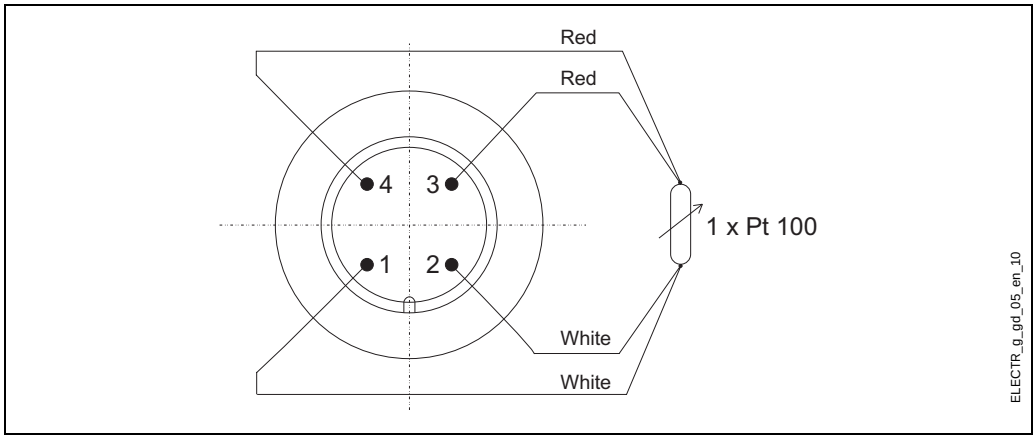


Fig. 1: Electrical connection of the sensor (viewed from above), M12 plug, 4-pin

Accuracy

Measuring error

- Class A tolerance as per DIN EN 60751, with operating temperature range of -50...200°C
- Measuring error in °C = 0.15 + 0.002 · |t|

|t| = numerical value of the temperature in °C, unsigned.

Sensor response time

As per DIN EN 60751 in water flowing at 0.4 m/s:

Sensor tip	t_{50}	t_{90}
∅ 6 mm	≤ 3.0 s	≤ 8.0 s
∅ 4 mm	≤ 2.5 s	≤ 5.0 s

Installation conditions

Installation instructions

Mounting location

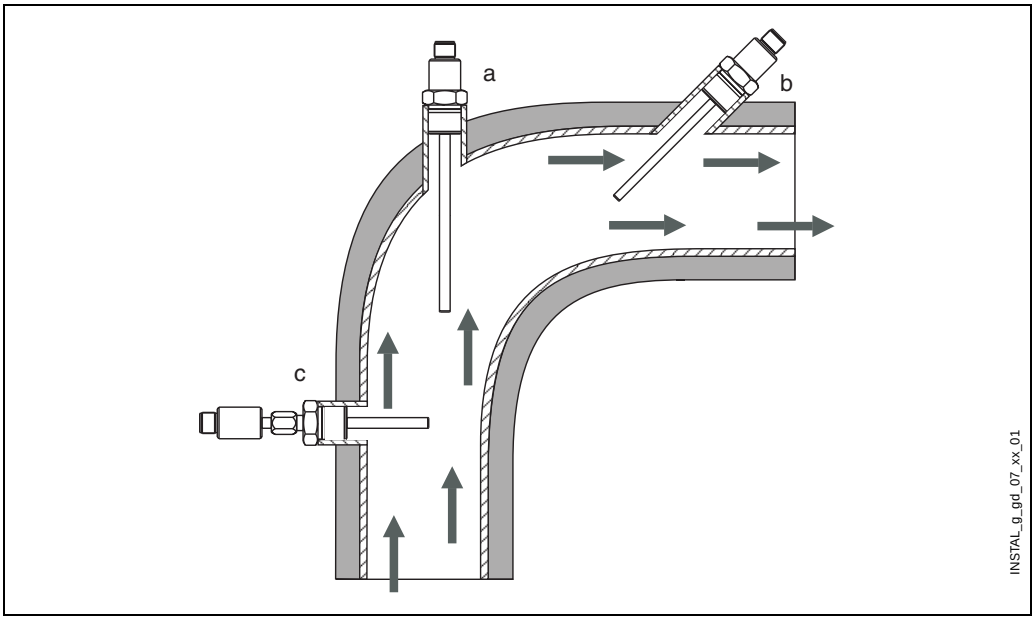


Fig. 2: Pipe installation of the sensor

a At angle sections, against the direction of flow
b In smaller pipes, turned against the direction of flow
c Perpendicular to the direction of flow, with a compression fitting

Environmental conditions

Ambient temperature limits

90°C max for the M12 connector

Degree of protection

IP67

Shock resistance

4g / 2...150 Hz as per IEC 60068-2-6

Vibration resistance

See 'Shock resistance'

Condensation

Permitted

Process

Process temperature limits

-50...200 °C

Process pressure limits

With a limited flow velocity, the maximum tolerated pressures are the following:
- 5 MPa (50 bar) at 20°C
- 3.5 MPa (35 bar) at 200°C.

Flow velocity limits

The highest flow velocity tolerated by the sensor stem diminishes with increasing lengths of the probe exposed to the stream of fluid.

Mechanical construction

Design, dimensions

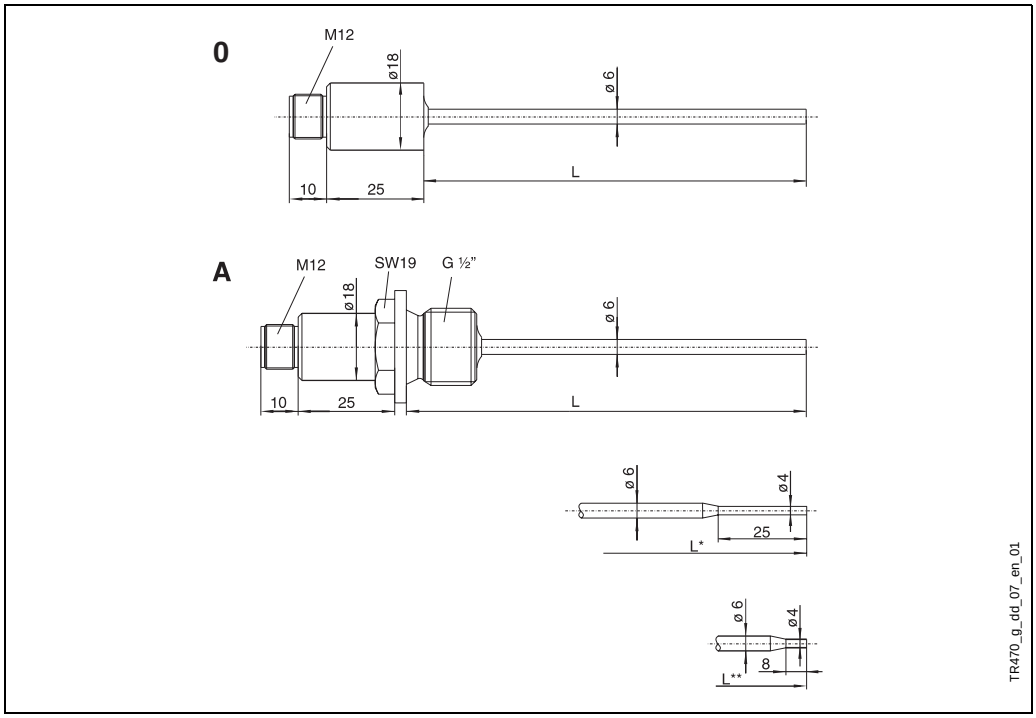


Fig. 3: Item 0: without process connection: Item A: with process connection

– L version in 50, 100, 150, 200 mm
– L version in 100, 150, 200 mm*
*– L** version in 50 mm*

Version A (with process connection) contents a sealing ring (Cu) in the scope of delivery.

Weight

L in mm	50	100	150	200
TR470-0	approx. 45 g	approx. 50 g	approx. 55 g	approx. 60 g
TR470-A	approx. 75 g	approx. 80 g	approx. 85 g	approx. 90 g

Material

Stainless steel; components in contact with the process fluid: SS 316L, $R_a \leq 0.8$ µm.

Terminals

M12 plug-in connector (see Chap. Supply).

Certificates and approvals

PED approval

The Pressure Equipment Directive (97/23/CE) is respected.
As paragraph 2.1 of article 1 is not applicable to these types of instruments, the CE mark is not requested for the TR 470 destined for general use.

Other standards and guidelines

EN 60529:
Degrees of protection by housing (IP-Code).

Further details

Maintenance

The Omnigrad M thermometers do not require any specific maintenance.

Delivery time

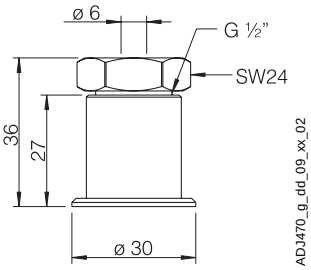
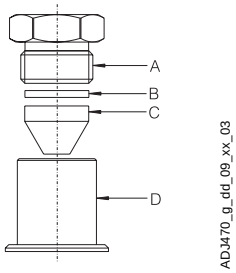
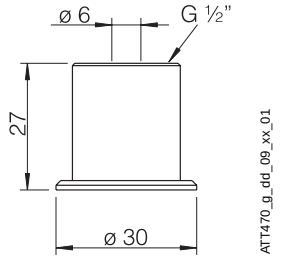
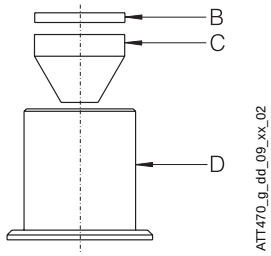
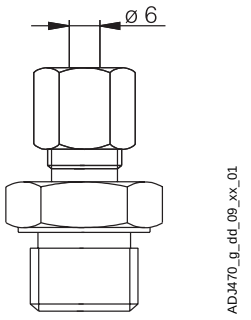
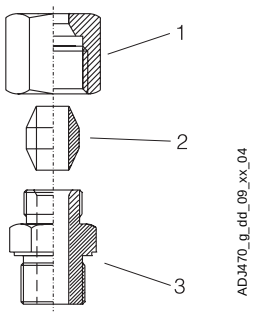
For small quantities (5÷10 units) and standard options, between 2 and 5 days depending on the configuration required.

Ordering information

Product structure

TR470-	**TR 470 RTD Thermometer** Thermometer with M12 plug-in connector, and with optional threaded process connection. Designed for general applications. Pt 100 4 wires; temperature range -50...200°C.									
	Process connection									
	0	No process connection								
	A	G ½" process connection								
		Neck length L (material stainless steel)								
		1	25 mm neck length							
			Immersion length L							
			B	50 mm immersion length L						
			C	100 mm immersion length L						
			D	150 mm immersion length L						
			E	200 mm immersion length L						
				Probe diameter D and material						
				A	6 mm = D, SS 316L/1.4404					
					Tip design					
					S	Straight tip				
					R	Tapered/reduced tip				
						RTD type				
						3	1 Pt 100 TF class A			
							Housing			
							0	No housing		
								Terminal type		
								A	M12 male output connector	
									Additional options	
									0	Additional options not required
TR470-		**1**		**A**		**3**	**0**	**A**	**0**	⇐ **Order code (complete)**

Accessories

Designation	Dimensions in mm	Details/Material
Flange welding boss, TSM470-A. Seal, adjustable terminal screw connection, material of components in contact with the process: SS 316L. Order code: **51004751**		 *Pos A: Clamping screw (stainless steel)* *Pos B: Washer (stainless steel)* *Pos C: Sealing cone (PEEK)* *Pos D: Flange welding boss (316L)*
Flange welding boss, TSM470-B. Material of components in contact with the process: SS 316L. Order code: **51004752**		 *Pos B: Washer (stainless steel)* *Pos C: Sealing cone (PEEK)* *Pos D: Flange welding boss (316L)*
Threaded compression fitting, TSM470-A. Seal, adjustable terminal screw connection, material of components in contact with the process: SS 316. Order code: **TA50-..**		 *Pos. 1: Clamping nut (stainless steel)* *Pos. 2: Sealing cone (SS or PTFE)* *Pos. 3: Thread socket (316)*

Supplementary documentation

- ❑ TA Fittings & Sockets - omnigrad TA50, TA55, TA60, TA70, TA75 — TI 091T/02/en
- ❑ E+H Thermolab - Calibration certificates for industrial thermometers. RTD and thermocouples. — TI 236T/02/en

Subject to modification

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