Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

omnigrad M TR 47, TR 48

Hygienic RTD temperature sensor assembly for weld-in installation With or without thermowell and M.I. replaceable insert PCP (4...20 mA), HART® or PROFIBUS-PA® electronic safety

The Omnigrad M type TR 47 and TR 48 temperature sensors are resistance thermometers especially designed for hygienic applications (food, pharmaceutical and fine chemicals industry).
They are made up of a measurement probe, with (TR 47) or without (TR 48) a protection well and a housing, which may contain the transmitter for the conversion of the measured variable.
The units are installed by welding, which is carried out on the (TR 47) thermowell or on a spherical process connection (TR 48).

Features and benefits

- 3-A® certification
- SS 316L/1.4435 for "wetted" parts (BN 2 compliance on request)
- Customized immersion length (TR 48)
- Fast response time
- High pressure resistance
- Surface finishing down to Ra < 0.4 µm, with or without electropolishing
- Stainless steel, aluminum or plastic housing, all of which are easily cleanable and a minimum of IP65 (IP68 available)
- Replaceable mineral insulated insert (TR 47), which when installed inside the thermowell, avoids plant shut down during the substitution or the verification of the instrument
- PCP (4...20 mA, also with enhanced accuracy), HART® and PROFIBUS-PA® 2-wire transmitters
- Pt 100 sensing element with class A and 1/3 DIN B accuracy (DIN EN 60751)
- Double Pt 100, for redundancy or validation purposes
- ATEX 1 or 1/2 GD EEx ia certification (TR 47)
- Material certification (3.1.B, ...)
- EA calibration certificate
- Ferrite content determination
- TR 47 supplied with or without thermowell

3-A® 74-02

TI247T/02/en
N° 60018849

Endress+Hauser
People for Process Automation

Areas of application

- Food industry: milk, beer, fruit juice, syrup, chocolate, oils/fats, powders, auxiliary services, storage tanks/silos, CIP/SIP systems
- Biotechnology industry: fermenters, auxiliary services, CIP/SIP systems
- Pharmaceutical industry: fluids, acids, purified water, auxiliary services, CIP/SIP systems
- Fine chemicals industry: cosmetics, auxiliary services, CIP/SIP systems

Function and system design

Measuring principle

In the Platinum RTD(Resistance Temperature Detector) thermometers the sensing element consists of an electrical resistance with value of 100 Ω at 0°C (called Pt100, 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.

Equipment architecture

The Omnigrad M TR 47 and TR 48 temperature sensors are made up of a measurement probe, with (TR 47) or without (TR 48) a protection well, and a housing (head), which may contain a transmitter or the terminals for the electrical connection.
In the TR 47, the probe is a sensing insert, which is placed inside the thermowell and spring loaded to its base in order to improve heat transfer.
As in the TR 48, the sensing element (Pt 100) is positioned close to the tip of the probe.
The thermowell (TR 47) is manufactured from a solid stainless steel bar, which when welded correctly to the plant, is able to withstand very high operating pressures. The final (sensing) part of the well is reduced (stepped).
The sheath of the probe in the TR 48 is obtained from a 6 mm pipe, which tapers to 4.5 mm in the last 18 mm of the stem.

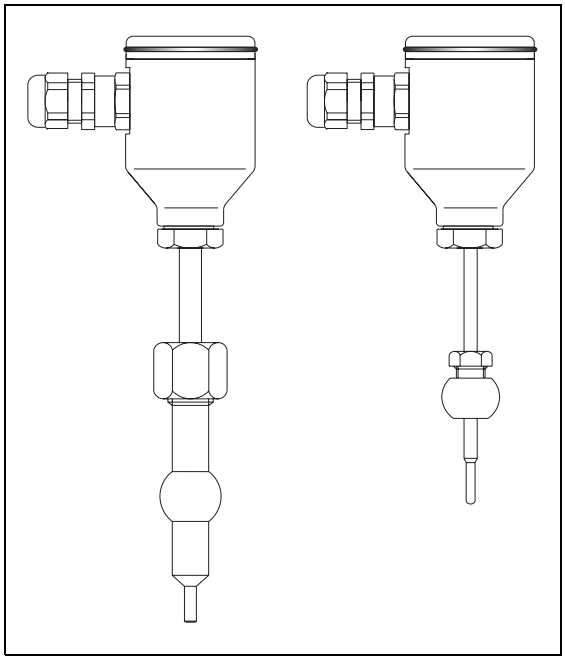


Fig. 1: TR 47 (left) and TR 48 (right)

The process connection in the TR 48 is a fixed position compression fitting and its external spherical surface must be welded onto the plant. The press-fit effect is obtained via an internal sealing ring (sleeve).
Both TR 47 and TR 48 are built to 3-A® design criteria, which allow the sensor to withstand any stress caused by CIP (Cleaning In Place) and SIP (Sterilization In Place) processes.
The electrical structure of the instruments always complies with DIN EN 60751 standard rules.
The housing can be of different types and materials (plastic, painted aluminium, stainless steel). The way in which it fits to the rest of the probe and the gland for the cable entry ensures a minimum grade of IP65 (Ingress Protection).
The TR 47 is supplied with or without the thermowell. This option is particularly important when the well must be mounted on the plant prior to the purchase of the measuring instruments.

Material

Wetted parts in SS 316L/1.4435.

Weight

From 0.5 to 2.5 kg for standard options.

Electronics

The required type of output signal can be obtained by choosing the right head-mounted transmitter.
Endress + Hauser supplies state-of-the-art transmitters (iTEMP® series) built in 2-wire technology and with 4…20 mA, HART® or PROFIBUS-PA® output signal. All the transmitters are easily programmable with a personal computer through the ReadWin® 2000 public domain software (for 4…20 mA and HART® transmitters) or CommuWin II software (for PROFIBUS-PA® transmitters).
HART® transmitters can be programmed also with the DXR 275 (Universal HART® Communicator) hand-held operating module.
A PCP (4…20 mA) model (TMT 180) with enhanced accuracy is available and is particularly suitable for hygienic applications.
E+H recommends the use of PROFIBUS dedicated connectors in the case of PROFIBUS-PA® transmitters. The Weidmüller type (Pg 13.5 – M12) is provided as standard option.
For detailed information regarding transmitters, please refer to the relevant documentation (see TI codes at the end of this document).
If a head-mounted transmitter is not employed, the sensor probe can be connected through the terminal block to a remote converter (i.e. DIN rail transmitter).

Performance

Operating conditions

Ambient temperature (housing without head-mounted transmitter):
- metal housings –40÷130°C
- plastic housings –40÷85°C

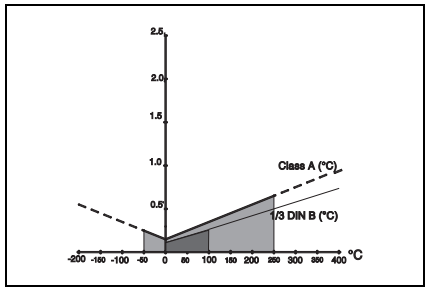
Ambient temperature (housing with head-mounted transmitter) –40÷85°C
Ambient temperature (housing with display) –20÷70°C
Process temperature
Same of measurement range (see below)
Maximum process pressure:
- TR 47
  - – 17 MPa (170 bar) at 20°C
  - – 13 MPa (130 bar) at 150°C
- TR 48
  - – PTFE sleeve 7.5 MPa (75 bar) at 20°C
  - – Peek sleeve 14 MPa (140 bar) at 20°C
  - – SS sleeve 10 MPa (100 bar) at 20°C

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

Shock and vibration resistance
- – According to DIN EN 60751 2,8 g peak / 10÷500 Hz

Accuracy

Probe maximum error
- cl. A
  $3\sigma = 0.15+0.0020|t|$ –50…250°C
- cl. 1/3 DIN B
  $3\sigma = 0.10+0.0017|t|$ 0…100°C
  $3\sigma = 0.15+0.0020|t|$ –50...0 / 100...250°C
  (|t| = absolute value of temperature in °C)



Transmitter maximum error
See relevant documentation (codes at the end of this document).

Display maximum error 0.1% of the set span + 1 digit
The "4 wires" configuration ensures no additional errors in case of long connecting cables (without head-mounted transmitter). Generally speaking, there is a higher guarantee of accuracy in the "4 wires" configuration.

Measurement range

- TR 47 –50…250°C
- TR 48 –50…200°C

Response time

Test in water at 0.4 m/s (according to DIN EN 60751; 23 to 33°C step changes)

Sensor type	Response time	Without thermoconductive paste	With thermoconductive paste
TR 47	t_{50}	5 s	4 s
	t_{90}	13 s	11 s
TR 48	t_{50}	3 s	-
	t_{90}	10 s	-

Insulation

Insulation resistance between terminals and probe sheath (according to DIN EN 60751, test voltage 250 V)
more than 100 MΩ at 25°C
more than 10 MΩ at 250°C

Self heating

Negligible when E+H iTEMP® transmitters are employed.

Installation

Omnigrad M TR 47 and TR 48 can be mounted on the wall of pipes or vessels.
With regard to TR 47, the thermowell must be welded on the plant along its cylindrical side wall or on an optional spherical connection that has already been welded on the well.
In the TR 48, it is the spherical bushing which has to be welded on the pipe or vessel. Subsequently the threaded part of the connection must be tightened with a torque of 10 Nm.
Care should be taken by the user in the execution of the welding on the process side (suitable weld material, welding radius > 3,2 mm, absence of pits, folds, crevices, …). As a general rule, the sensors should be installed in such a way that does not adversely affect their cleanability (3-A® requirements must be adhered to).
In the case of ATEX-certified components (transmitter, insert), please refer to the relevant documentation (code at the end of this document).
In both sensors the immersion depth may have an effect on the accuracy of the measurement. If the immersion is too low, an error may be generated in the recorded temperature due to the lower temperatures of the process fluid near the walls and heat transfer, which takes place through the sensor stem. The incidence of such an error can be not negligible if there is a big difference between the process and the ambient temperature. To avoid this source of inaccuracy, the immersion length (L) should be, if possible, at least 80 mm. In pipes with a small diameter, the axis line of the duct must be reached, and even slightly exceeded, by the tip of the probe (refer to figures 2 and 3).

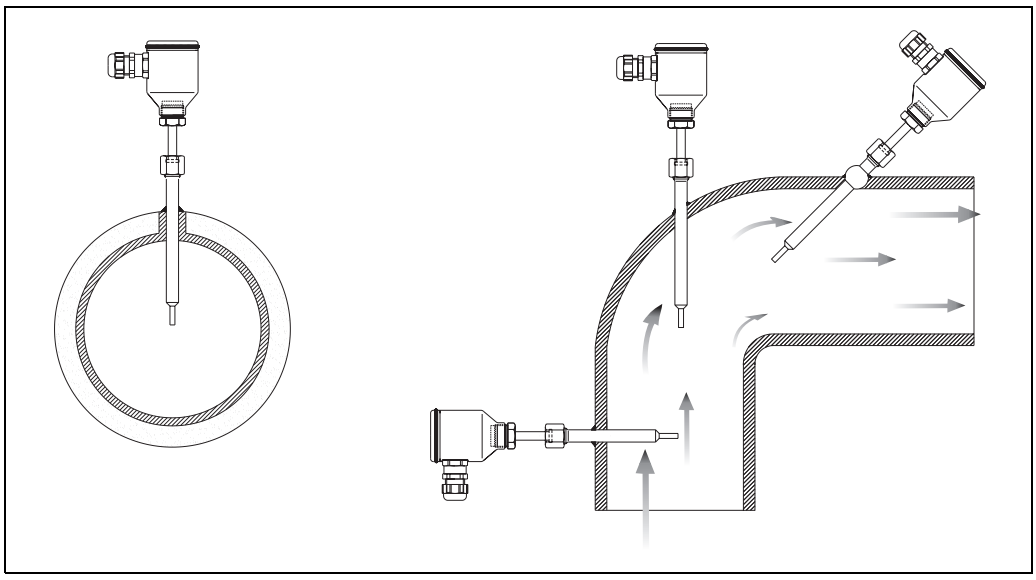


Fig. 2: General installation solutions for TR 47

Insulation on the outer part of the sensor reduces the effect of the low immersion. Another solution could be a tilted installation (see figures 2 and 3).

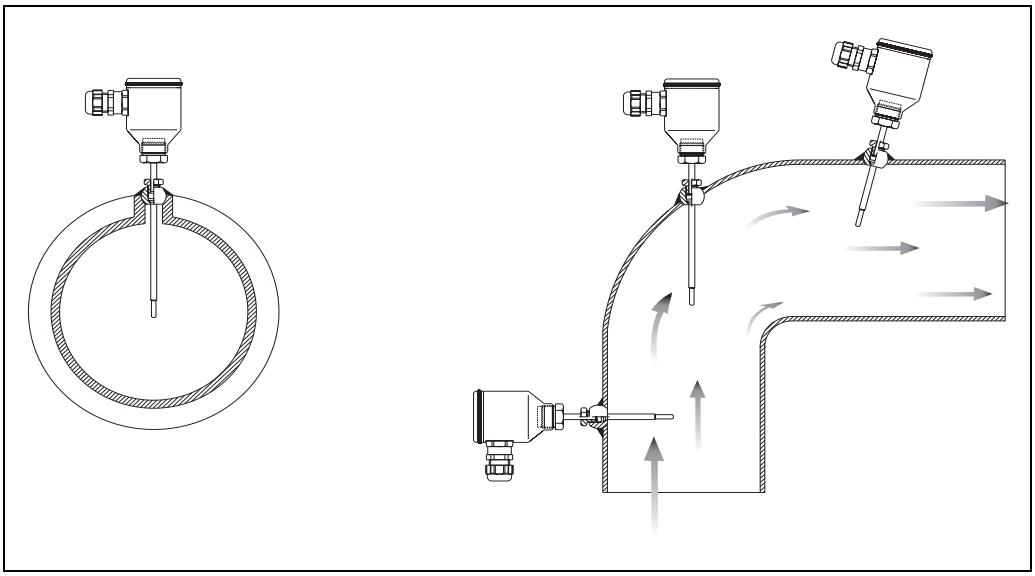


Fig. 3: General installation solutions for TR 48

Attention should be paid to the choice of measurement point in the case of two-phase flows since it may cause fluctuations in the detected temperature value.
With regard to corrosion, the base material of the wetted parts (SS 316L/1.4435) is capable of tolerating common corrosive media up to high temperatures. Besides the sleeves included in TR 48 process connection are resistant to a wide variety of aggressive substances. For further information on specific applications, please contact the E+H Service Department.
When disassembling the sensors, new gaskets equivalent to the originals and definite torques must be employed in the re-assembling procedure. This will ensure the stated IP (Ingress Protection) grade of the enclosures. When the ambient has a high humidity rate and the process is at low temperature, a plastic housing is recommended (i.e. model TA20B) to avoid problems due to condensation.

System components

Housing

The housing, which contains the electric terminals or the transmitter, is available in different types and materials, e.g. plastic, painted aluminium and stainless steel.
The way in which it fits to the rest of the probe and the gland for the cable entry ensures generally a minimum IP65 grade (also refer to figure 4).
All available heads have internal geometry according to DIN 43729 standard (form B), and thermometer connection M24x1.5. Head type TA20A is the basic E+H aluminium housing for temperature sensors. It is supplied in the E+H corporate colours and without any extra charge in the version IP66/IP67.
Head TA20B is a black of white polyamide housing, sometimes referred to as the BBK in the "Temperature" market. A screw cap is employed in TA21E and is joined to the head body by a chain.
The TA20D head type (aluminium, only for TR 47), also referred to as BUZH, is able to contain a terminal block and a transmitter or two transmitters at the same time.
The TA20J head (only for TR 47) is a stainless steel housing in the E+H corporate design and can be also supplied with an LCD display (4 digits), operating with 4…20 mA transmitters.
The E+H Temperature division recommends the TA20R head for hygienic applications because it comes in stainless steel and because of its "clean" design. Due to the weight of the TA20R, it should only be used for the TR48 where there is no vibration on the plant.
The TA20W (BUS type, only for TR 47) is a round grey coloured head made of aluminium, with a clip for the cap closure.
The TA20L (aluminium, only for TR 48) is the so called "mignon" head, because of its small size. It cannot contain transmitters.
A polyamide (50x65x45) rectangular grey head can be used in the TR 48 (see figure 8).
The cable glands M20x1.5 and Pg 16 supplied with the housings, accept cable diameters from 7 to 12 mm (2 to 6 mm for Pg 9)

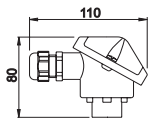
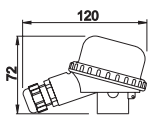
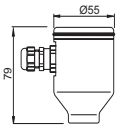
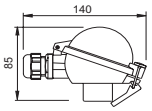
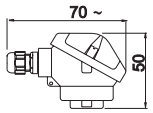
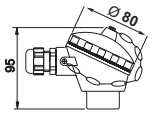
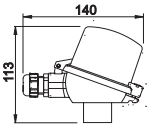
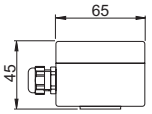
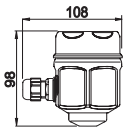
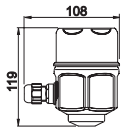
Housing type	IP	Housing type	IP	Housing type	IP	Housing type
TA20A 	66 67 68	TA20B 	65	TA20R 	66 67	TA20W 
TA20L 	55 (*)	TA21E 	65	TA20D 	66 (**)	Head PA 
TA20J (without display) 	66 67 (**)	TA20J (with display) 	66 67 (**)	NOTE: (*) to be utilised with TR 48 only (**) to be utilised with TR 47 only		

Fig. 4: Housing protection grade (IP)

Head transmitter

The head-mounted transmitters available are (see also the "Electronics" section):

- TMT 180 — PCP 4…20 mA
- TMT 181 — PCP 4…20 mA
- TMT 182 — Smart HART®
- TMT 184 — PROFIBUS-PA®

TMT 180 and TMT 181 are PC Programmable transmitters. TMT 180 can be supplied in a version with improved accuracy (0.1°C vs. 0.2°C) in the bandwidth -50…250°C, and a model with a fixed measurement range (specified by the customer in the order phase) is also available.
TMT 182 output consists of 4…20 mA and HART® superimposed signals.
For TMT 184, with PROFIBUS-PA® output signal, the communication address can be set via software or by means of a mechanical dip-switch. The customer may specify the desired configuration in the order phase.

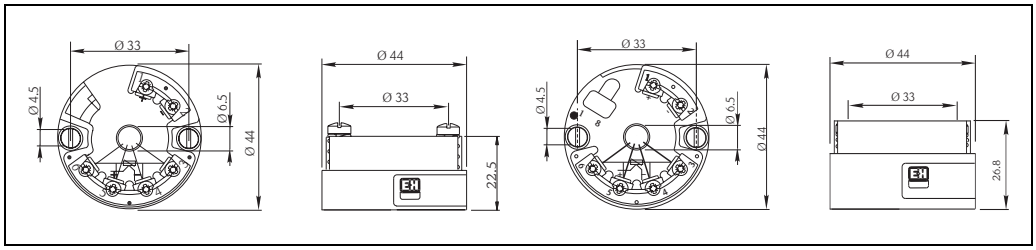


Fig. 5: TMT 180, 181, 182 (left), TMT 184 (right)

Extension neck

In the TR 47, the extension neck (part between the thermowell and the housing) is made of stainless steel, and threaded onto the adjacent components. The connection on the thermowell side is G 3/8".
In the TR 48 the extension neck is an integral part of the probe stem and therefore its diameter is 6 mm.
The upper connection of the neck permits adjustments to the orientation of the sensor head (except for TR 48 with TA20L or PA housings).

Process connection

With regard to the TR 47, when installing the sensor on the process, the welding can be executed directly on the side wall of the thermowell or on a spherical connection supplied alreday welded to the well (refer to figure 8).
The TR 48 is supplied with a spherical bushing, which must previously be welded onto the plant. The spherical connection contains a sealing ring (sleeve), which comes into contact with the process medium.

The material (PTFE, Peek or stainless steel) used in the manufacture of the sleeve, complies with CFR Title 21, § 177.1550 or § 177.2415 (FDA).
Please note that the spherical process connection utilised in the TR 48, is different from the accessory TA 55 and it is built in three different models.

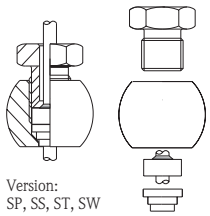
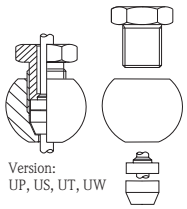
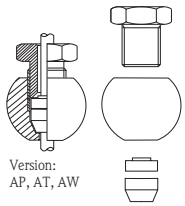
Spherical welding	Universal spherical welding	Adjustable spherical welding
 Version: SP, SS, ST, SW	 Version: UP, US, UT, UW	 Version: AP, AT, AW

Fig. 6: TR 48 process connections

Probe

In the TR 47 the measuring probe is made up of a mineral insulated insert positioned inside the thermowell. For its replacement, the insert length (IL) must be selected according to the length (TL+T) of the thermowell. When selecting a spare part, please refer to the following table:

Sensor	Immersion length	Inset	Insert diameter	Extensio neck	Insert length (mm)
TR 47	TL = 70 mm	TPR 100	3 mm	T = 50 mm	IL = 145
TR 47	TL = 100 mm	TPR 100	3 mm	T = 35 mm	IL = 160
TR 47	TL = 150 mm	TPR 100	3 mm	T = 40 mm	IL = 215
TR 47	TL = 200 mm	TPR 100	3 mm	T = 50 mm	IL = 275
TR 47	TL	TPR 100	3 mm	T	IL = TL + T + 26

In the TR 48, the protection well and the sensing part cannot be separated. The immersion length is available in some standard values or it can be selected "customized" within a range (please refer to the product structures at the end of this document).
The starting material for the wetted parts can be supplied in compliance with the Basler Norm 2 (BN2), which imposes a limited ferrite content and consequently enhances corrosion resistance, on request. In some sensor configurations, the compliance with the requirements of BN2 can also be assured after the welding and machining operations, that is in the finished product.
The surface roughness (Ra) of the wetted parts is supplied down to 0.4 mm level. Surface roughness below 0.4-0.5 mm has not been proven to be advantageous in hygienic applications.
Electro-polishing is the electrolytic treatment of the metal surfaces, which results in cleaning, levelling and passivity.
In the TR 47, it can be specified that a thermically conductive compound be applied inside the thermowell. This improves the heat transfer between the well and the internal sensing insert.
The compound should not be used at temperatures higher than 200°C.

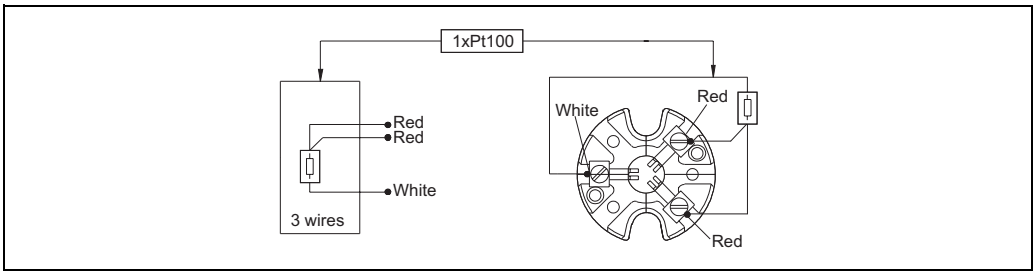


Fig. 7: Standard wiring (3-wires)

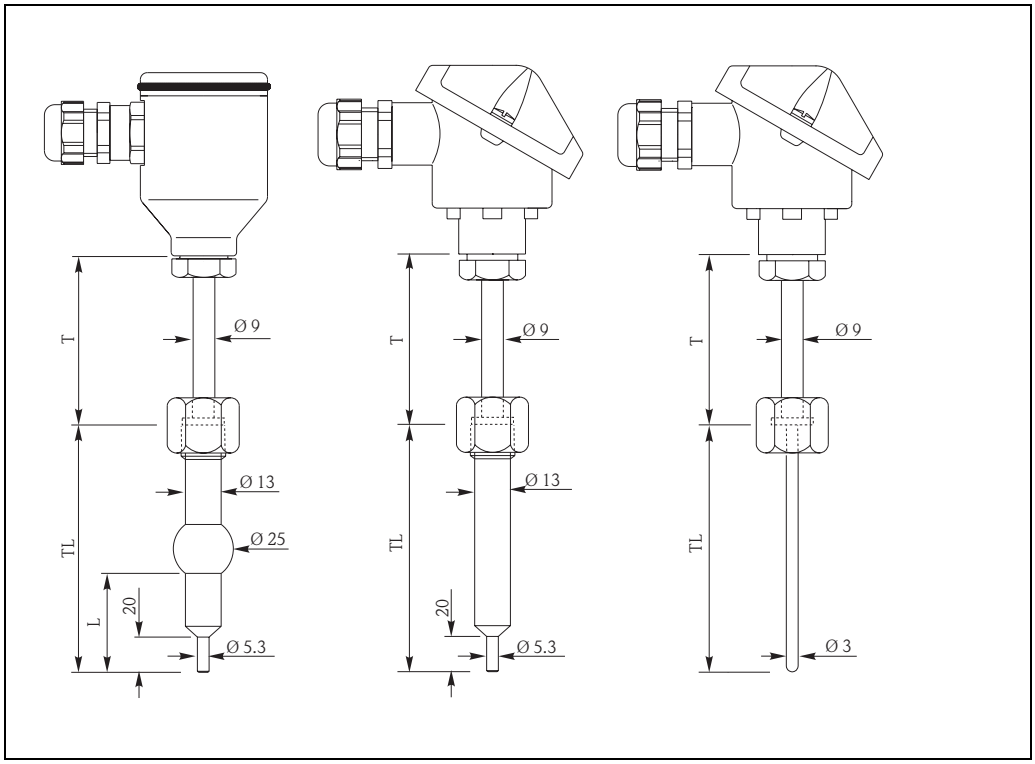


Fig. 8: TR 47 sensing part (thermowell + insert)

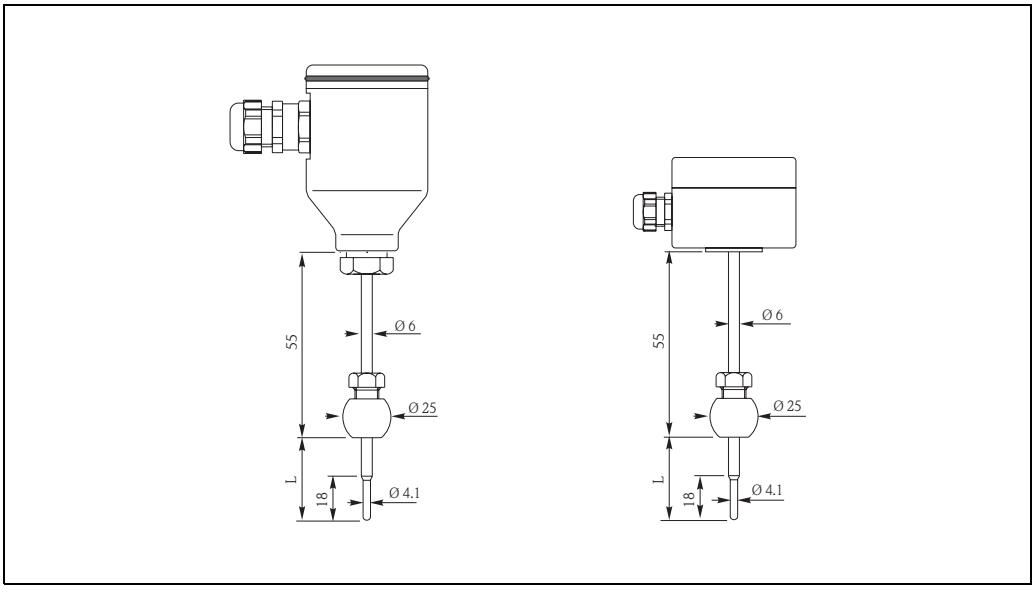


Fig. 9: TR 48 probe (housing in SS or in PA)

Certificates & Approvals

Sanitary compability

3-A® Authorization no. 1144 for the declaration of compliance with standard 74-02.

Ex approval

ATEX certificate KEMA 01 ATEX1169 X (1 or 1/2 GD IIC EEx ia T6...T1 T85...450°C) for TR 47.

Material certification

The 3.1.B material certificate (according to standard EN 10204), is selectable directly from the sale structure of the product. Other types of material certifications can be requested separately.
The "standard" one is a simplified and cost-effective version of the certificate, in which the documentation that specifies the origin of the materials utilised, refers to each individual sensor.
The "labelled" version also has a specific marking that relates to the wetted parts of the sensor and ensures that the relevant data are placed in the archives by means of the serial number of the thermometer.

Test report & calibration

Regarding testing and calibration, the "inspection test report" consists of a declaration of conformity with the essential points in standard DIN EN 60751.
The "Factory calibration" is carried out in the E+H EA (European Accreditation) accredited laboratory for temperature calibrations by following an internal procedure. A calibration performed according to an EA accredited procedure (SIT calibration) can be requested separately. The calibration is executed on the thermometer insert, when that has been installed in the sensor. A minimum immersion length is needed for precise calibration.
With the Sensor Matching Calibration, a preliminary Factory calibration of the sensor is executed and subsequently the output curve of the transmitter is adjusted in order to minimize any measurement error. In this way, some of the sensor errors (probe or "loop" probe+transmitter) are compensated for through the transmitter.

Further details

Maintenance

Omnigrad M thermometers do not require specific maintenance.
The integrity of the sealing ring should be checked regularly in models supplied that include seals (TR 48) and these must be substituted when necessary.
In the case of ATEX-certified components (transmitter, insert), please refer to the specific relevant documentation (refer to the code at the end of this document).

Delivery time

For small quantities (approx. 10 units) and standard options generally 10 days.

Ordering information

Product structure

TR47-	Weld-in thermometer with neck separated from thermowell, for use in food and pharma industry. Fast response time and high pressure resistance. Replaceable mineral insulated inset with Pt100. Wetted part built from same material. Temperature range: from -50 to 400°C.

Selection of combination

1	Complete assembly
2	Thermometer without thermowell

Lengths: TL (70-250 mm), L and T, option to be choosen in all the cases

A	TL = 70 mm	cylindrical (T=50mm)
B	TL = 100 mm,	cylindrical (T=35mm)
C	TL = 150 mm,	cylindrical (T=40mm)
D	TL = 200 mm,	cylindrical (T=50mm)
N	TL = 70, L=25 mm,	weld.sphere (T=50mm)
P	TL = 100, L=50 mm,	weld.sphere (T=35mm)
Q	TL = 150, L=100 mm,	weld.sphere (T=40mm)
R	TL = 200, L=150 mm,	weld.sphere (T=50mm)
Y	Special version	

Tip design

0	Thermometer without thermowell
R	Reduced tip (tapered)
Q	Reduced tip + thermoconductive paste
Y	Special version

Material and finishing of wetted parts

0	Thermometer without thermowell
1	SS 316L/1.4435, Ra <= 0.8 µm
3	SS 316L/1.4435, Ra <= 0.4 µm
4	SS 316L/1.4435, Ra <= 0.4 µm, electropolishing
9	Special version

Terminal type

2	Flying leads
3	Ceramic terminal block

RTD type and wiring diagram

H	1 Pt100 class A,	3-wire
L	2 Pt100 class A,	3-wire
M	1 Pt100 class A,	4-wire
P	1 Pt100 1/3 DIN B,	3-wire
Q	2 Pt100 1/3 DIN B,	3-wire
R	1 Pt100 1/3 DIN B,	4-wire
Y	Special version	

Housing material, cable entry, IP grade

A	TA20A	Alu., M20x1.5 conduit	IP66/IP67
3	TA20A	Alu., Pg16,	IP66/IP68
4	TA20A	Aluminium, PROFIBUS® connector,	IP66
B	TA20B	Polyamide white, Pg16,	IP65
C	TA20B	Polyamide black, Pg16,	IP65
7	TA20B	Polyamide , M20x1.5,	IP65
E	TA21E	Aluminium, screw cap., M20x1.5	IP65
D	TA20D	Aluminium, high lid, Pg16,	IP67
5	TA20D	Aluminium, high lid, PROFIBUS® connector	IP66
6	TA20D	Aluminium, high lid, M24x1.5, M20x1.5	IP66
J	TA20J	SS316L, M20x1.5,	IP66/IP67
K	TA20J	SS316L, M20x1.5, + display	IP66/IP67
M	TA20J	SS316L, PROFIBUS® connector	IP66/IP67
R	TA20R	SS316L, screw cap , M20x1.5,	IP66/IP67
S	TA20R	SS316L, screw cap , PROFIBUS® connector	IP66/IP67
W	TA20W	Aluminium, round lid, clip, Pg16	IP66
Y	Special	version	

												Built-in head transmitter	
												0	Without built-in transmitter
												2	TMT180-A21, accuracy 0.2 K, span limit: -200...650°C, fixed range, from...to...°C
												3	TMT180-A22, accuracy 0.1 K, span limit: -50...250°C, fixed range, from...to...°C
												4	TMT180-A11, accuracy 0.2 K, span limit: -200...650°C, fixed range, from...to...°C
												5	TMT180-A12, accuracy 0.1 K, span limit: -50...250°C, fixed range, from...to...°C
												P	TMT181-A, PCP, 2-wire, isolated, programmable, from...to...°C
												Q	TMT181-B, PCP ATEX, 2-wire, isolated, programmable, from...to...°C
												R	TMT182-A, HART® 2-wire, isolated, programmable, from...to...°C
												T	TMT182-B, HART® ATEX, 2-wire, isolated, programmable, from...to...°C
												S	TMT184-A, PROFIBUS-PA® 2-wire, isolated, programmable, from...to...°C
												V	TMT184-B, ROFIBUS-PA® ATEX, 2-wire, isolated, programmable, from...to...°C
												1	Built in transmitter THT1,separate position
												9	Special version
													Material certificate (wetted parts)
													0 Certificates not required
													C 3.1.B EN10204, short form certificate
													E 3.1.B EN10204, roughness short form
													G 3.1.B EN10204, certificate for wetted parts
													H 3.1.B EN10204, roughness certificate
													J 3.1.B EN10204, roughness + ferrite content
													L 3.1.B EN10204, ferrite content certificate
													Tests and calibration on inset
													0 Tests and calibration not required
													1 Inspection test report (TZC135-A), sensor
													2 Inspection test report (TZC135-D), loop
													A Factory calibration, single RTD, 0-100°C
													B Factory calibr., loop single RTD, 0-100°C
													C Factory calibration, double RTD, 0-100°C
													E Factory calibr., single RTD, 0-100-150°C
													F Factory. calibr., loop single RTD, 0-100-150°C
													G Factory calibr., double RTD, 0-100-150°C
													Additional options
													0 Additional options not required
													A ATEX II 1 GD EEx iA IIC certified inset
TR47-													⇐ Order code

Ordering information

Product structure

TR48-	Weld-in thermometer for use in food and pharma industry, with spherical fitting. Probe in direct contact with processmedium. Very fast response time and high pressure resistance. The temperature range depends on the sleeve. Temperature range: from -50 to 200°C.

Process connection (The material is the same of the pipe)

AP	Adjustable spherical welding connection Peek sleeve (locking screw M12x1.5)
AT	Adjustable spherical welding connection Teflon® sleeve (locking screw M12x1.5)
AW	Whitout adjustable spherical welding connection and sleeve
SP	Spherical welding conn., Peek sleeve (locking screw G"1/4)
SS	Spherical welding conn., SS sleeve (locking screw G"1/4)
ST	Spherical welding conn., Teflon® sleeve
SW	Without spherical welding connection and sleeve (locking screw G"1/4)
UP	Universal spherical welding connection Peek sleeve (locking screw M12x1.5)
US	Universal spherical welding connection SS sleeve (locking screw M12x1.5)
UT	Universal spherical welding connection Teflon® sleeve (locking screw M12x1.5)
UW	Whitout universal spherical welding connection and sleeve (locking screw M12x1.5)
YY	Special version

Immersion length L (20-250 mm)

A	20	mm	immersion length L
B	60	mm	immersion length L
C	100	mm	immersion length L
X	.....	mm	immersion length L to specify
Y	.....	mm	special immersion length

Material and finishing of wetted parts

1	SS 316L/1.4435, Ra <= 0.8 µm
3	SS 316L/1.4435, Ra <= 0.4 µm
4	SS 316L/1.4435, Ra <= 0.4 µm, electropolishing.
9	Special version

Terminal type

2	Flying leads
3	Ceramic terminal block

RTD type and wiring diagram

H	1 Pt100 class A,	3-wire
L	2 Pt100 class A,	2-wire
P	1 Pt100 1/3 DIN B,	3-wire
Y	Special version	

Housing material, cable entry, IP grade

L	TA20L	Alu., Pg9, "mignon type",	IP55
A	TA20A	Alu., M20x1.5 conduit	IP66/IP67
3	TA20A	Alu., Pg16,	IP66/IP68
4	TA20A	Aluminium, PROFIBUS® connector,	IP66
B	TA20B	Polyamide white, Pg16,	IP65
C	TA20B	Polyamide black, Pg16,	IP65
7	TA20B	Polyamide , M20x1.5,	IP65
E	TA21E	Aluminium, screw cap., M20x1.5	IP65
R	TA20R	SS316L, screw cap , M20x1.5,	IP66/IP67
S	TA20R	SS316L, screw cap , PROFIBUS® connector	IP66/IP67
Q	Head	in PA, W50xD65xH45 mm, Pg9	
Y	Special	version	

Built-in head transmitter

0	Without built-in transmitter
2	TMT180-A21, accuracy 0.2 K, span limit: -200...650°C, fixed range, from...to...°C
3	TMT180-A22, accuracy 0.1 K, span limit: -50...250°C, fixed range, from...to...°C
4	TMT180-A11, accuracy 0.2 K, span limit: -200...650°C, fixed range, from...to...°C
5	TMT180-A12, accuracy 0.1 K, span limit: -50...250°C, fixed range, from...to...°C
P	TMT181-A, PCP, 2-wire, isolated, programmable, from...to...°C
Q	TMT181-B, PCP ATEX, 2-wire, isolated, programmable, from...to...°C
R	TMT182-A, HART® 2-wire, isolated, programmable, from...to...°C

								T	TMT182-B, HART® ATEX, 2-wire, isolated, programmable, from...to...°C			
								S	TMT184-A, PROFIBUS-PA® 2-wire, isolated, programmable, from...to...°C			
								V	TMT184-B, PROFIBUS-PA® ATEX, 2-wire, isolated, programmable, from...to...°C			
								1	Built-in transmitter THT1, separate position			
								9	Special version			
									Material certification (wetted part)			
								0	Certificates not required			
								C	3.1.B EN10204, short form certificate			
								G	3.1.B EN10204, certificate for wetted parts			
								E	3.1.B EN10204, roughness short form			
								H	3.1.B EN10204, roughness certificate			
								L	3.1.B EN10204, ferrite content certificate			
								J	3.1.B EN10204,roughness + ferrite content certificate			
										Tests and calibration		
									(Minimum imm. length for factory colibration L = 100 mm, minimum immersion length for evaluation report L = 50 mm)			
									J	Evaluatin report, single RTD, 0-100°C		
									K	Evaluatin report, single RTD, 0-100-140°C		
									0	Tests and calibration not required		
									1	Inspection test report (TZC135-A), sensor		
									2	Inspection test report (TZC135-D), loop		
									A	Factory calibration, single RTD, 0-100°C		
									B	Factory calibr., loop single RTD, 0-100°C		
									C	Factory calibration, double RTD, 0-100°C		
									E	Factory calibr., single RTD, 0-100-150°C		
									F	Factory. calibr., loop single RTD, 0-100-150°C		
									G	Factory calibr., double RTD, 0-100-150°C		
											Additional options	
											0	Additional options not required
TR48-												⇐ Order code

Built-in head transmitter

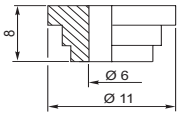
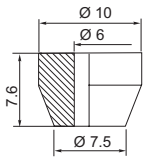
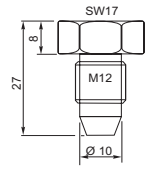
Structure

THT1-	Model and version of the head transmitter						
	A11	TMT180-A11	accuracy 0.2 K,	span limit: -200...650°C, programmable		from...to...°C	
	A12	TMT180-A12	accuracy 0.1 K,	span limit: -50...250°C, programmable		from...to...°C	
	A21	TMT180-A21	accuracy 0.2 K,	span limit: -200...650°C, fixed range		from...to...°C	
	A22	TMT180-A22	accuracy 0.1K,	span limit: -50...250°C, fixed range		from...to...°C	
	F11	TMT181-A	PCP	2-wire, isolated	programmable	from...to...°C	
	F21	TMT181-B	PCP	ATEX	2-wire, isolated	programmable	from...to...°C
	F22	TMT181-C	PCP	FM IS	2-wire, isolated	programmable	from...to...°C
	F23	TMT181-D	PCP	CSA	2-wire, isolated	programmable	from...to...°C
	F24	TMT181-E	PCP	ATEX II3G EEx-nA	2-wire, isolated	programmable	from...to...°C
	F25	TMT181-F	PCP	ATEX II3D	2-wire, isolated	programmable	from...to...°C
	L11	TMT182-A	HART®	2-wire, isolated	programmable	from...to...°C	
	L21	TMT182-B	HART®	ATEX	2-wire, isolated	programmable	from...to...°C
	L22	TMT182-C	HART®	FM IS	2-wire, isolated	programmable	from...to...°C
	L23	TMT182-D	HART®	CSA	2-wire, isolated	programmable	from...to...°C
	L24	TMT182-E	HART®	ATEX II3G EEx-nA	2-wire, isolated	programmable	from...to...°C
	L25	TMT182-F	HART®	ATEX II3D	2-wire, isolated	programmable	from...to...°C
	K11	TMT184-A	PROFIBUS-PA®	2-wire, isolated	programmable	from...to...°C	
	K21	TMT184-B	PROFIBUS-PA®	ATEX	2-wire, isolated	programmable	from...to...°C
	K22	TMT184-C	PROFIBUS-PA®	FM IS	2-wire, isolated	programmable	from...to...°C
	K23	TMT184-D	PROFIBUS-PA®	CSA	2-wire, isolated	programmable	from...to...°C
	K24	TMT184-E	PROFIBUS-PA®	ATEX II3G EEx-nA	2-wire, isolated	programmable	from...to...°C
	K25	TMT184-F	PROFIBUS-PA®	ATEX II3D	2-wire, isolated	programmable	from...to...°C
	YYY	Special transmitter					

		Application and services
	1	Assembled into position
	9	Special version

THT1-			⇐ Order code

Accessories

Set of sleeves (no. 5) for TR 48-G"1/4: – material: PTFE, complying with FDA CFR Title 21, § 177.1550 max temperature: 200°C – material: Peek, complying with FDA CFR Title 21, § 177.2415 max temperature: 200°C – material: SS 316L/1.4435 max temperature: 200°C	– mat. nr.: 60018913 – mat. nr.: 60018914 – mat. nr.: 60018915	
Set of sleeves (no. 5) for TR 48-M12x1.5: – material: PTFE, complying with FDA CFR Title 21, § 177.1550 max temperature: 200°C – material: Peek, complying with FDA CFR Title 21, § 177.2415 max temperature: 200°C – material: SS 316L/1.4435 max temperature: 200°C	– mat. nr.: 60020743 – mat. nr.: 60020744 – mat. nr.: 60020745	
Blind plug threaded M12x1.5 for TR 48-M12x1.5: – material: SS 316L/1.4435 max temperature: 200°C	– mat. nr.: 60021194	

Supplementary documentation

❑ RTD thermometers Omnigrad TST – General information	TI 088T/02/en
❑ Terminal housings Omnigrad TA 20	TI 072T/02/en
❑ Temperature head transmitter iTEMP® Pt TMT 180	TI 088R/09/en
❑ Temperature head transmitter iTEMP® PCP TMT 181	TI 070R/09/en
❑ Temperature head transmitter iTEMP® HART® TMT 182	TI 078R/09/en
❑ Temperature head transmitter iTEMP® PA TMT 184	TI 079R/09/en
❑ Pt 100 inset – Omnigrad TET 105	TI 103T/02/en
❑ Thermowell for temperature sensor – Omnigrad M TW 47	TI 253T/02/en
❑ Safety instructions for use in hazardous areas	XA 003T/02/z1
❑ E+H Thermolab – Calibration certificates for industrial thermometers and working standards RTD's and thermocouples	TI 236T/02/en

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