

RTD Temperature Sensor *omnigrad M TR 10*

*RTD assembly with threaded process connection
With thermowell and replaceable insert
PCP (4...20 mA), HART® or PROFIBUS-PA® electronics*



The TR 10 Omnigrad M range temperature sensors are resistance thermometers designed for use in the fine chemicals industry but also suitable for general applications.

They are made up of a measurement probe with a protection well, and a housing, which may contain the transmitter for conversion of the variable measured.

Thanks to its modular configuration and the structure defined by the DIN 43772 standard (form 2G/3G), the TR 10 is suitable for almost all industrial processes.

Features and benefits

- SS 316L/1.4404, SS 316Ti/1.4571 and Hastelloy C for the "wetted" parts
- The most common threaded process connections as standard; others are available upon request
- Customized immersion length
- Surface finishing down to $R_a < 0.8 \mu\text{m}$

- Tip of the thermowell with a reduced diameter or tapered for a faster response time
- Stainless steel, aluminium or plastic housing, with protection grade from IP65 to IP67
- Replaceable mineral insulated insert
- PCP (4...20 mA, also with enhanced accuracy), HART® and PROFIBUS-PA® 2-wire transmitters
- Pt 100 sensing element with class A accuracy (DIN EN 60751) or 1/3 DIN B
- Pt 100 wire wound (-200...600°C) or thin film (-50...400°C)
- Double Pt 100, for redundancy purposes
- Pt 100 with 4 wires connection, double Pt 100 with 3 wires
- ATEX 1 GD EEx ia certification
- Material certification (3.1.B)
- Pressure test
- EA calibration certificate

Endress + Hauser

The Power of Know How



Areas of application

- Fine chemicals industry
- Light energy industry
- Food industry
- General industrial services

Function and system design

Measuring principle

In the RTD (Resistance Temperature Detector) thermometers the sensing element consists of an electrical resistance with value of $100\ \Omega$ 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 $\alpha = 3.85 \cdot 10^{-3}\ ^\circ\text{C}^{-1}$, calculated between 0 and 100°C .

Equipment architecture

The Omnigrad M TR 10 temperature sensor is made up of a measurement probe, with a protection well and a housing (head), which may contain a transmitter or the terminals on the ceramic block for electrical connection. Construction of the sensor is based on the following standards: DIN 43729 (housing), 43772 (thermowell) and 43735 (probe), and can therefore guarantee a good level of resistance to the most typical and common industrial processes.

The measurement probe (replaceable insert) is placed inside the thermowell; the insert is spring loaded to its base in order to improve heat transfer. The sensing element (Pt 100) is positioned close to the tip of the probe.

The thermowell is made from a tube with a diameter of 9, 11 or 12 mm. The final part can be straight, tapered (i.e. with a gradual reduction of the stem achieved thanks to a swaging procedure), or reduced (stepped).

The TR 10 can be fitted onto the plant (tube or tank) through the use of a threaded connection, which can be chosen from the most common models (see the section "Structure of the components").

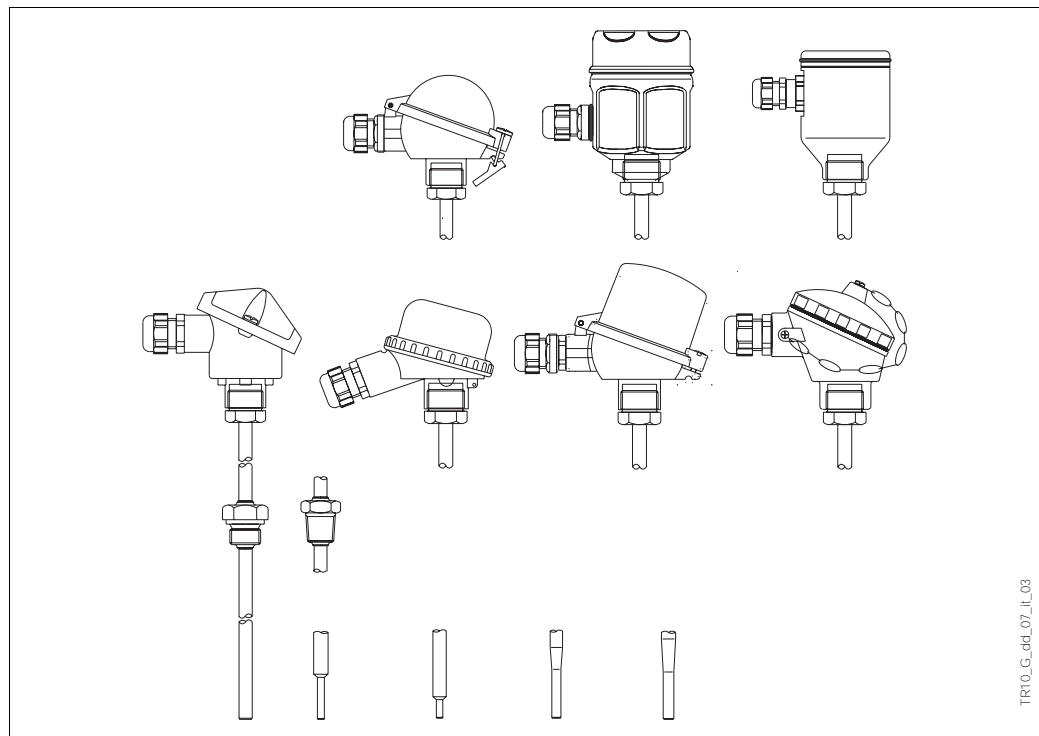


Fig. 1: TR 10 with the various types of heads, process connections and end parts of the thermowell

The electrical structure of the thermometer always complies with DIN EN 60751 standard rules. The sensing element is available in two versions with a thin film (TF) or wire wound (WW), the latter with a large measuring and accuracy range.

The housing can be of different types and materials (plastic, painted aluminium alloy, stainless steel). The way in which it fits to thermowell and the cable gland ensure a minimum grade of IP65 (Ingress Protection).

| | |
|-----------------|---|
| Material | Wetted parts in SS 316L/1.4404, SS 316Ti/1.4571 or Hastelloy C. |
|-----------------|---|

| | |
|---------------|--|
| Weight | From 0.5 to 2.5 kg for standard options. |
|---------------|--|

Electronics

The required type of output signal can be obtained by choosing the correct head-mounted transmitter.

Endress+Hauser supplies "state-of-the-art" transmitters (the iTEMP® series) built in 2-wire technology and with 4...20 mA output signal, HART® or PROFIBUS-PA®. All of the transmitters can be easily programmed using a personal computer through the ReadWin® 2000 public domain software (for transmitters 4...20 mA and HART®) or the Commuwin II software (for PROFIBUS-PA® transmitters). The HART® transmitters can also be programmed with the hand-held operating module DXR 275 (Universal HART® Communicator).

A PCP (4...20 mA, TMT 180) model with enhanced accuracy is available.

In the case of PROFIBUS-PA® transmitters, E+H recommends the use of PROFIBUS® dedicated connectors. The Weidmüller type (Pg 13.5 - M12) is provided as a standard option.

For detailed information about transmitters, please refer to the relevant documentation (refer to TI codes at the end of the document).

If a head-mounted transmitter is not employed, the sensor probe may 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

The pressure values to which the thermowell can be subjected at the various temperatures are illustrated by the drawings in figures 2 and 3. For 9 mm diameter pipes, with a limited flow velocity, the maximum tolerated pressures are the following:

- 50 bar at 20°C
- 33 bar at 250°C
- 24 bar at 400°C.

Maximum flow velocity

The highest flow velocity tolerated by the thermowell diminishes with increasing lengths of the well/probe exposed to the stream of the fluid. Some information may be taken from the graphs in figures 2 and 3.

Shock and vibration resistance

According to DIN EN 60751

3 g peak / 10÷500 Hz

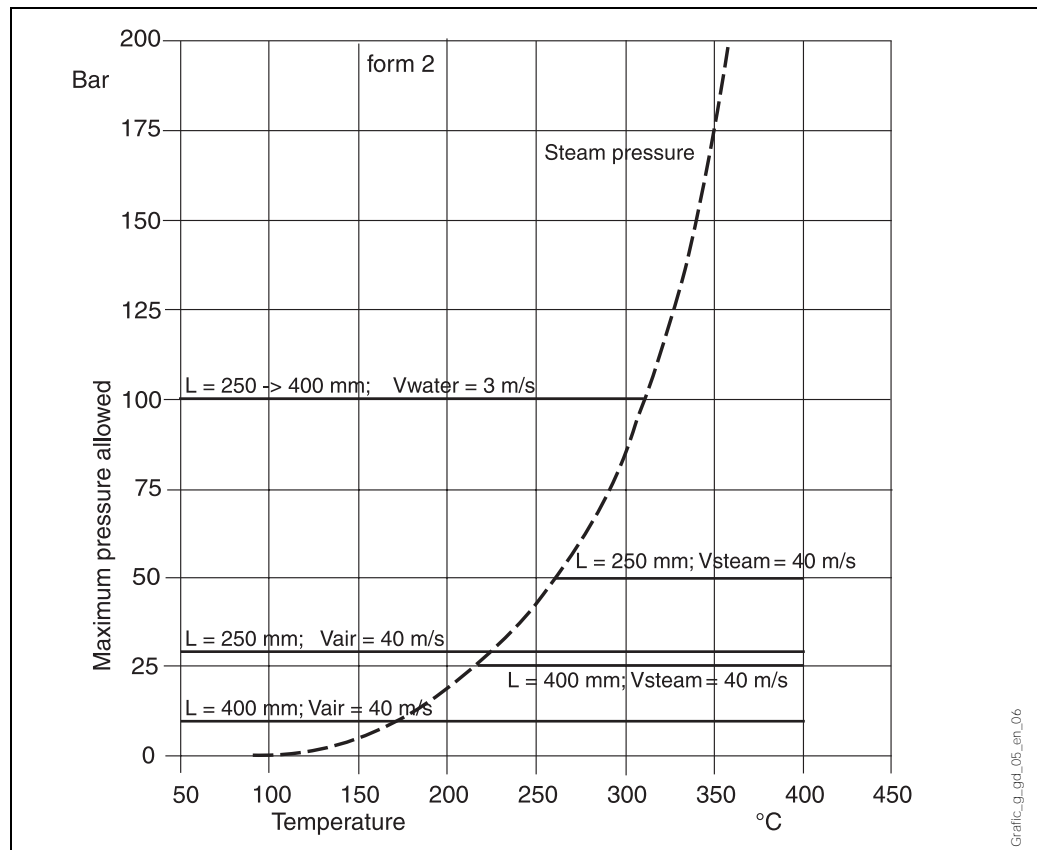


Fig. 2: Pressure drawing/temperature for thermowell with straight tube Ø 11 mm in SS 316Ti/1.4571

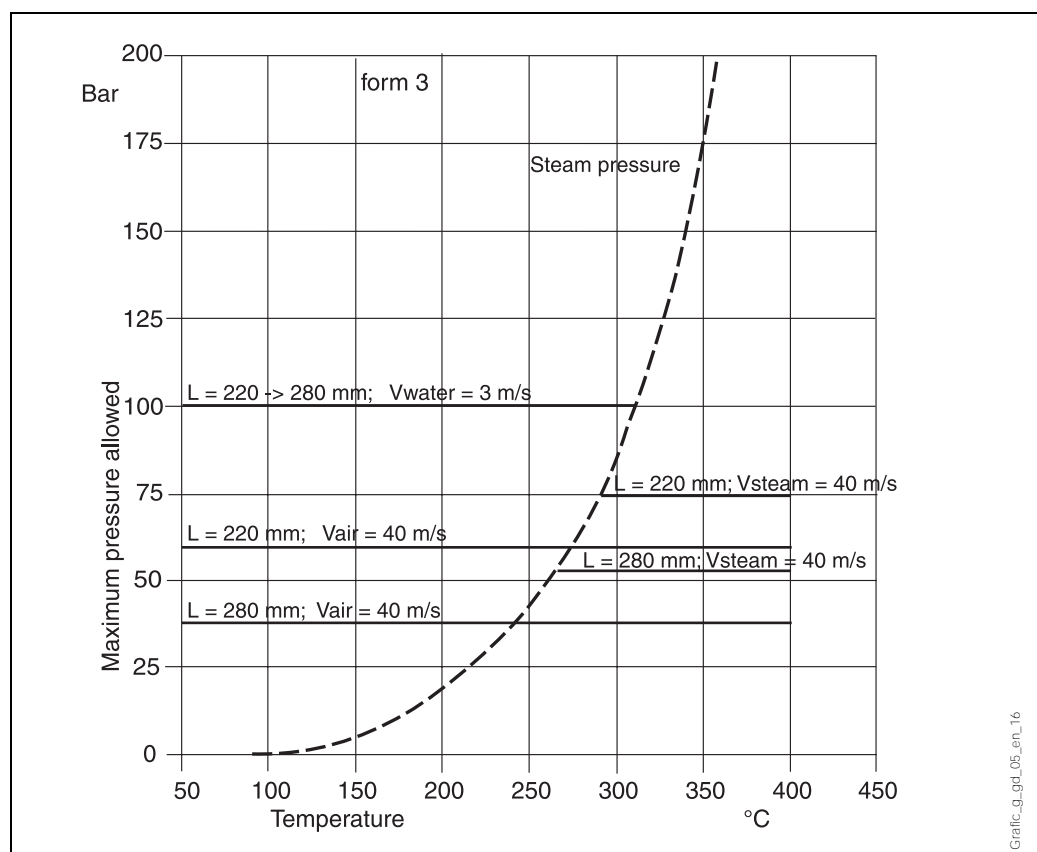


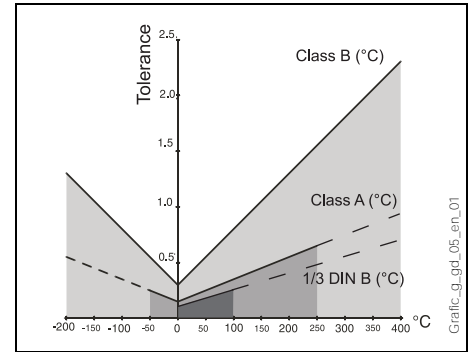
Fig. 3: Pressure drawing/temperature for thermowell with tapered tube Ø 12 mm in SS 316Ti/1.4571

Accuracy

Probe maximum error (type TF)

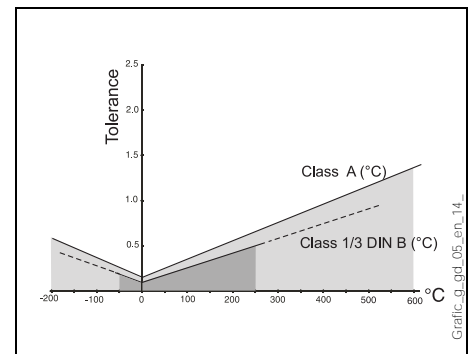
- cl. A
 $3\sigma = 0.15 + 0.0020|t|$ -50...250°C
 $3\sigma = 0.30 + 0.0050|t|$ 250...400°C
- cl. 1/3 DIN B
 $3\sigma = 0.10 + 0.0017|t|$ 0...100°C
 $3\sigma = 0.15 + 0.0020|t|$ -50...0 / 100...250°C
 $3\sigma = 0.30 + 0.0050|t|$ 250...400°C

($\pm 3\sigma$ = range including 99.7% of the readings,
 $|t|$ = absolute value of the temperature in °C)



Probe maximum error (type WW)

- cl. A
 $3\sigma = 0.15 + 0.0020|t|$ -200...600°C
- cl. 1/3 DIN B
 $3\sigma = 0.10 + 0.0017|t|$ -50...250°C
 $3\sigma = 0.15 + 0.0020|t|$ -200...-50 / 250...600°C



Transmitter maximum error

See the corresponding documentation
(codes at the end of the document).

Display maximum error

0.1% FSR + 1 digit

The "4 wires" configuration, provided as a standard connection for the single Pt 100s, excludes additional errors in every condition (eg. deep immersion lengths, long connecting cables without head-mounted transmitters, ...). Generally speaking, in the "4 wires" configuration there is a higher guarantee of accuracy.

The "2 wires" connection, used in the version of the ATEX certified insert, may create an additional error due to the resistance of the copper conductors of the mineral insulated cable; such resistance is added to the value of the Pt 100. The incidence of this source of inaccuracy increases with the increase of the insertion length.

Measurement range

- Type TF -50...400°C
- Type WW -200...600°C

Response time

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

| Diameter of the stem (mm) | Pt 100 type | Response time | Reduced tip | Tapered tip | Straight tip |
|---------------------------|-------------|-----------------|-------------|-------------|--------------|
| 9 | TF / WW | t ₅₀ | 7.5 | 11 | 18 |
| | | t ₉₀ | 21 | 37 | 55 |
| 11 | TF / WW | t ₅₀ | 7.5 | - | 18 |
| | | t ₉₀ | 21 | - | 55 |
| 12 | TF / WW | t ₅₀ | - | 10 | 38 |
| | | t ₉₀ | - | 24 | 125 |

Insulation

Insulation resistance between terminals and probe sheath
(according to DIN EN 60751, test voltage 250 V)

above 100 MΩ at 25°C
above 10 MΩ at 300°C

Self heating

Negligible when the E+H ITEMP® transmitters are employed.

Installation

The Omnigrad M TR 10 thermometers can be mounted on the wall of pipes or vessels or other plant parts that may be necessary.

The interface components for the connection to the process and the relative gaskets are not normally provided with the sensors and are customer's responsibility.

In the case of ATEX-certified components (transmitter, insert), please refer to the relevant documentation (refer to the code at the end of this document).

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 temperature recorded due to the lower temperature of the process fluid near to 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 temperature and the ambient temperature. In order to avoid this source of inaccuracy, the thermowell should have a small diameter and the immersion length (L) should be, if possible, at least $80 \div 100$ mm.

In pipes of a small section the axis line of the duct must be reached and if possible slightly exceeded by the tip of the probe (refer to fig. 4A-4B). Insulation of the outer part of the sensor reduces the effect produced by a low immersion. Another solution may be a tilted installation (see fig. 4C-4D). For use in the food industry, it is best to follow the rule $h \leq d/2$.

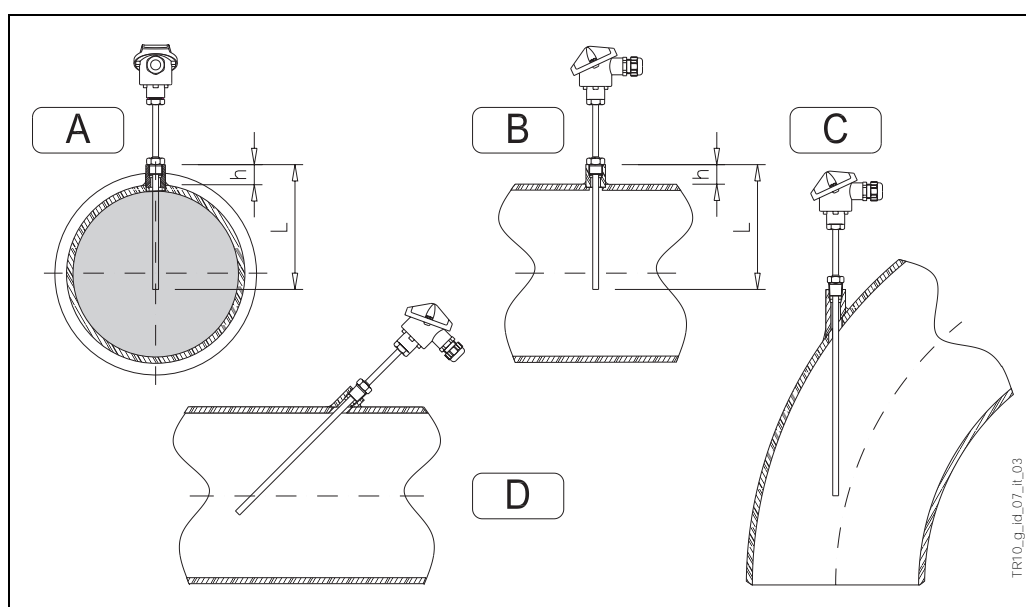


Fig. 4: Installation examples

In the case of two-phase flows, pay special attention to the choice of measurement point, as there may be fluctuations in the value of the detected temperature.

With regard to corrosion, the base material of the wetted parts (SS 316L/1.4404, SS 316Ti/1.4571, Hastelloy C) can tolerate the common corrosive media right up to even the highest temperatures. For further information on specific applications, please contact the E+H Customer Service Department.

In the case that the sensor components are disassembled, in the following reassembly procedure the definite torques must be employed. This will assure the housings with the IP grade defined. When the surrounding environment 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.

In the case of vibrations the thin film sensing element (TF) may offer advantages, but the behaviour depends on the intensity, the direction and the dominating frequency in the vibration mode. The wire wound Pt 100 (WW), besides having a larger measurement and accuracy range, guarantees greater long term stability.

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 alloy and stainless steel. The coupling method with the rest of the probe and the gland for the cable entry ensures a minimum IP65 grade (refer also to fig. 5).

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, without any extra charge.

Head TA20B is a black 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), also referred to as BUZH, is able to contain a terminal block and a transmitter, or two transmitters at the same time. The order of the double transmitter must be carried out by choosing the option "flying leads" in the sales structure, and two transmitters in a separate position (THT1, see the table at the end of the document).

The TA20J head is a stainless steel housing used in other instruments made by E+H and can be provided with a LCD display (4 digits), which operates with 4...20 mA transmitters.

The TA20R is normally recommended by the Temperature division of E+H for hygienic applications.

The TA20W (BUS type) is a round blue/grey coloured head made of aluminium, with a clip for the cap closure.

The cable gland M20x1.5 provided with the housings, is compatible with cables of a diameter between 5 and 9 mm.

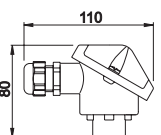
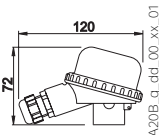
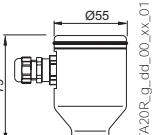
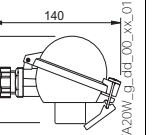
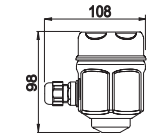
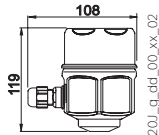
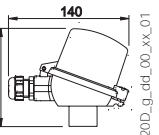
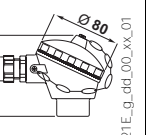
| Housing Type | IP | Housing Type | IP | Housing Type | IP | Housing Type | IP |
|--|----------|--|----------|--|----------|--|----|
| TA20A  | 66 67 | TA20B  | 65 | TA20R  | 66 67 | TA20W  | 66 |
| TA20J  | 66 67 | TA20J (display)  | 66 67 | TA20D  | 66 | TA21E  | 65 |

Fig. 5: Housings and relative IP grade

Head transmitter

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

| | |
|-----------|---------------|
| • TMT 180 | PCP 4...20 mA |
| • TMT 181 | PCP 4...20 mA |
| • TMT 182 | Smart HART® |
| • TMT 184 | PROFIBUS-PA® |

The TMT 180 and the TMT 181 (see fig. 6) are PC Programmable transmitters.

The TMT 180 is also available in a version with enhanced accuracy (0.1°C vs. 0.2°C) in the temperature range -50...250°C, and in a version with a fixed measurement range (specified by the customer in the order phase).

The TMT 182 output consists of 4...20 mA and HART® superimposed signals.

For the TMT 184 (see fig. 7), with PROFIBUS-PA® output signal, the communication address may be set via software or via mechanical dip-switch. The customer may specify the configuration desired during the order phase.

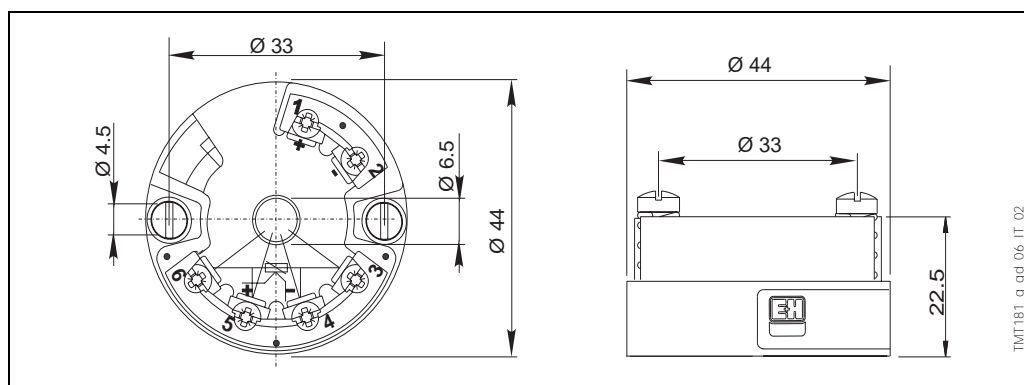


Fig. 6: TMT 180-181-182

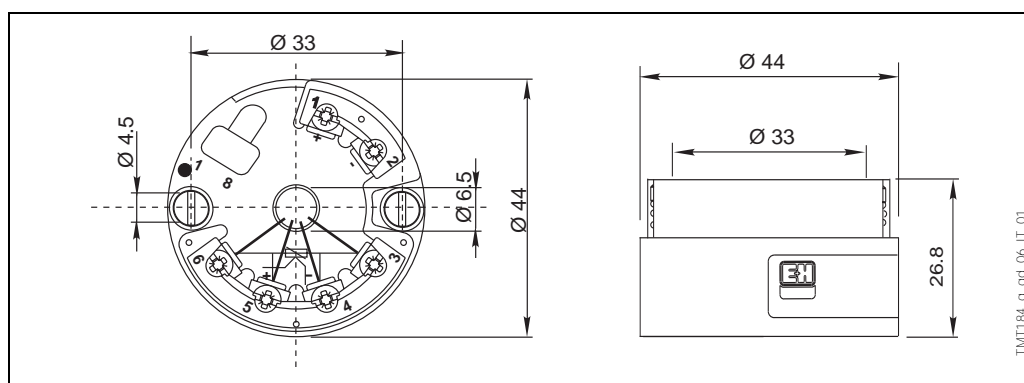


Fig. 7: TMT 184

Extension neck

The extension neck is the part between the process connection and the housing. It is normally made of a tube with dimensional and physical characteristics (diameter and material) which are the same of the tube under the connection.

The standard lengths of the neck are 80 or 145 mm, according to the selected option. In accordance with the norm DIN 43772, in the case of a thermowell with a diameter of 12 mm and a tapered tip (form 3G), the extension neck will be respectively 82 or 147 mm.

The connection situated in the upper part of the neck allows for orientation of the sensor head. As illustrated by the drawing in figure 8, the length of the extension neck may influence the temperature in the head. It is necessary that this temperature is kept within the limit values defined in the paragraph "Operating Conditions".

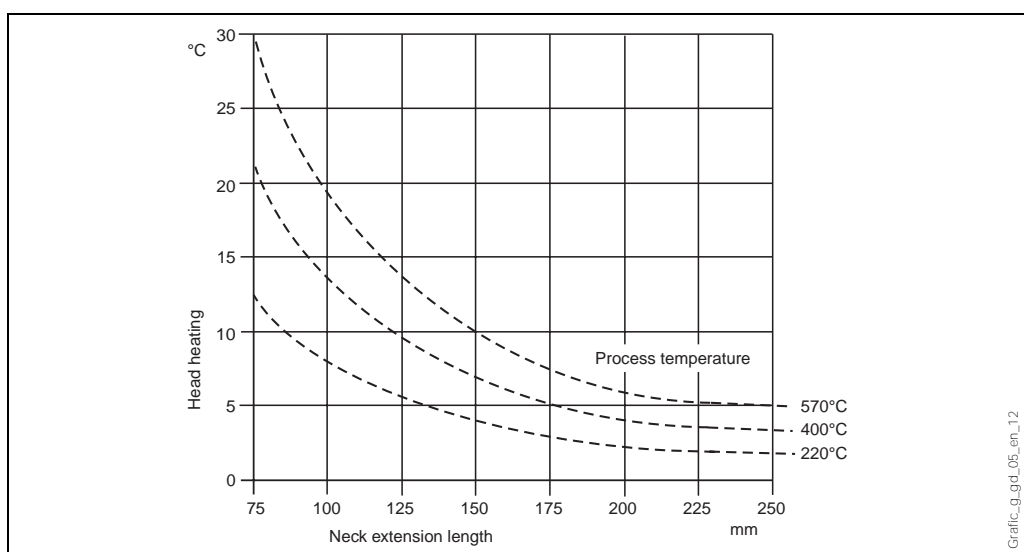


Fig. 8: Heating of the head consequent to the process temperature

Process connection

Standard connections are available in the following types:

- M20x1.5
- G 1/2" and G 1" DIN 43772 (DIN 3852 form A)
- G 1/2", G 3/4" and G 1" BSP cylindrical
- 1/2" and 3/4" NPT.

Other versions may be supplied upon request.

Figure 9 illustrates the engaging lengths.

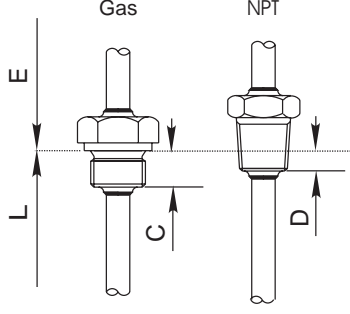
| Process connection | | Thread | mm |
|---|---|------------|-----|
|  | C | G 1/2" DIN | 15 |
| | | G 1" DIN | 18 |
| | | G 1/2" BSP | 15 |
| | | G 3/4" BSP | 15 |
| | | G 1" BSP | 20 |
| | | M 20X1.5 | 14 |
| | D | 1/2" NPT | 8 |
| | | 3/4" NPT | 8.5 |

Fig. 9: Engaging lengths

Probe

In the TR 10 the measuring probe is made up of a mineral (MgO) insulated insert positioned inside the thermowell.

The insert length is available in the standard dimensions DIN 43772 and in the most commonly used ones, or it can be personalized by the client within a range of values (refer to "Sales Structure" at the end of the document).

For replacement, the length of the insert (IL) must be chosen in compliance with the immersion length (L) of the thermowell. If spare parts are required, refer to the following table:

| Tip of the sensor | Insert | Insert Diameter | Extension neck | Insert Length (mm) |
|---------------------------------------|---------|-----------------|----------------|--------------------|
| Straight | TPR 100 | 6 mm | 80 mm | IL = L + 90 |
| Reduced on Ø 9 and 11/ tapered on Ø 9 | TPR 100 | 3 mm | 80 mm | IL = L + 90 |
| Tapered on Ø 12 | TPR 100 | 6 mm | 82 mm | IL = L + 90 |
| Straight | TPR 100 | 6 mm | 145 mm | IL = L + 155 |
| Reduced on Ø 9 and 11/ tapered on Ø 9 | TPR 100 | 3 mm | 145 mm | IL = L + 155 |
| Tapered on Ø 12 | TPR 100 | 6 mm | 147 mm | IL = L + 155 |
| Straight / tapered on Ø 12 | TPR 100 | 6 mm | E | IL = L + E + 10 |
| Reduced on Ø 9 and 11/ tapered on Ø 9 | TPR 100 | 3 mm | E | IL = L + E + 10 |

Although the wiring diagram of single Pt 100s is always supplied with 4 wires configuration, the connection of a transmitter can be executed with 3 wires as well, by avoiding to connect whichever of the terminals. The configuration Pt 100 double with 2 wires is only available for the ATEX certified inserts.

With regards to the thermowell, the surface roughness (Ra) of the wetted parts is 0.8 µm, while the various kinds of tips (reduced or tapered) are described in figure 10; if ordered as a spare part, the thermowell is called TW 10 (consult the code of the relative TI at the end of the document).

The reduced version "5x20 mm" (type R) is not recommended for the Pt 100 wire wound.

The use of standard dimensions (extension neck and length of immersion) allows for the use of the inserts on sensors of various kinds, and guarantees rapid delivery times; this allows our customers to reduce the amount of spare parts to be kept on stock.

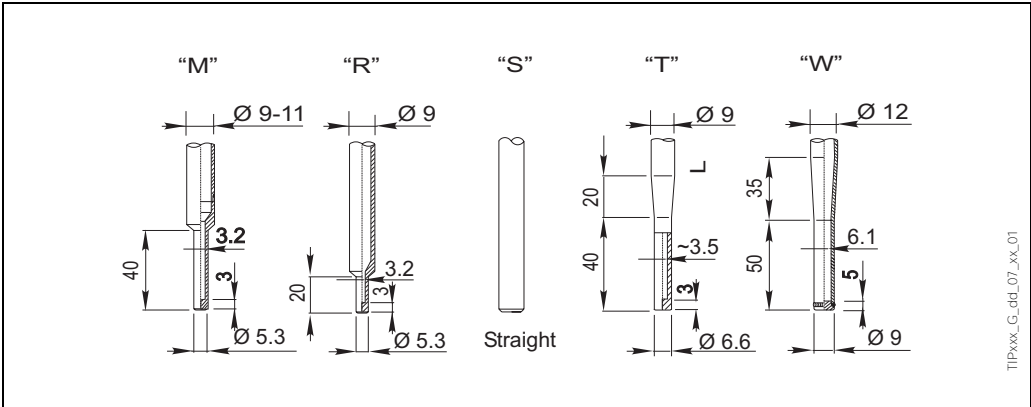


Fig. 10: Reductions (on the left) and tapers (on the right) of the thermowell

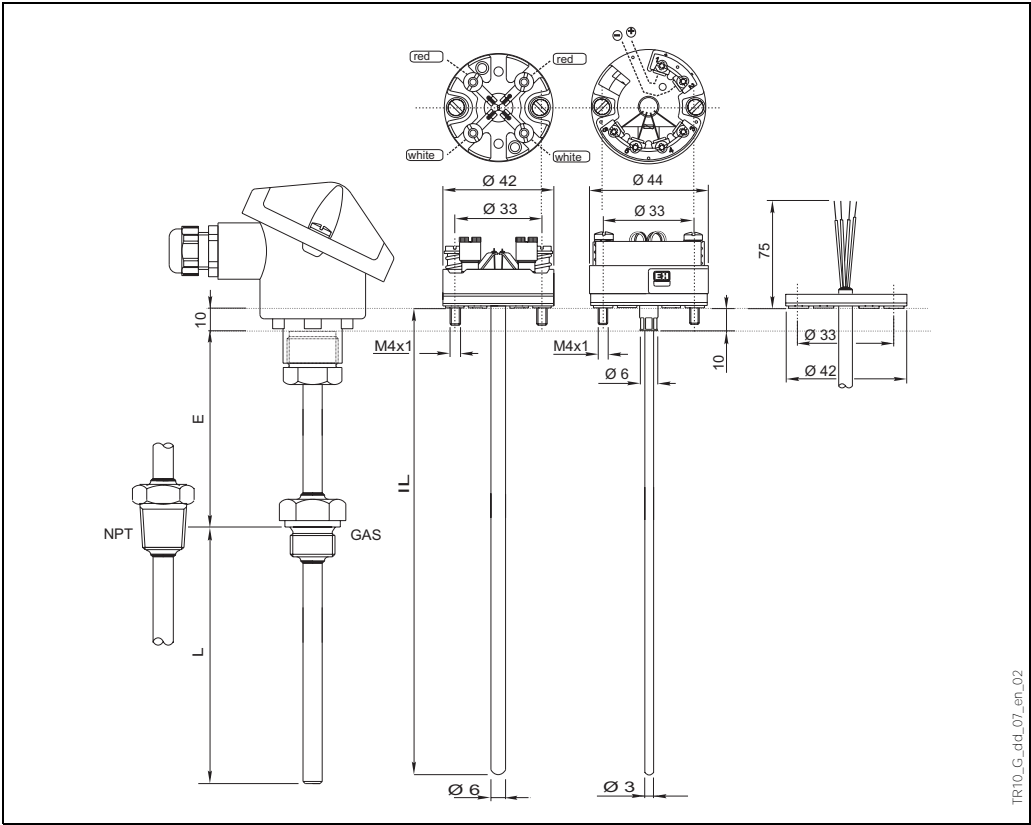


Fig. 11: Functional components

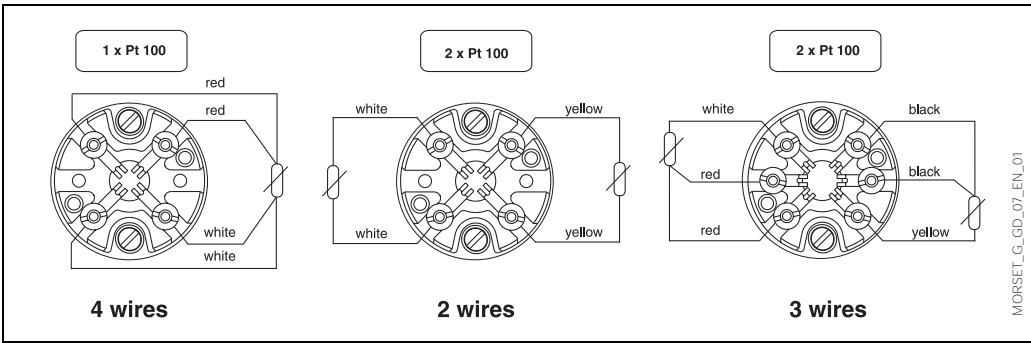


Fig. 12: Standard wiring diagrams (ceramic terminal block)

Certificates & Approvals

| | |
|---|--|
| <i>Ex approval</i> | ATEX Certificate KEMA 01ATEX1169 X (1 GD IIC EEx ia T6...T1 T85...450°C). With regards to the NAMUR NE 24 certificate and the Manufacturer's Declaration according to the standard EN 50020, E+H Customer Service will be able to provide further detailed information. |
| <i>PED approval</i> | 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 10 destined for general use. |
| <i>Material certification</i> | The material certificate 3.1.B (according to standard EN 10204) can be directly selected from the sale structure of the product and refers to the parts of the sensor in contact with the process fluid. Other types of certificates related to materials can be requested separately. The "short form" certificate includes a simplified declaration with no enclosures of documents related to the materials used in the construction of the single sensor and guarantees the traceability of the materials through the identification number of the thermometer. The data related to the origin of the materials can subsequently be requested by the client if necessary. |
| <i>Test on thermowell</i> | The pressure tests are carried out at ambient temperature in order to verify the resistance of the thermowell to the specifications indicated by the norm DIN 43772. With regards to the thermowells that do not comply with this norm (with a reduced tip, a tapered tip on a 9 mm tube, special dimensions, ...), the pressure of the corresponding straight tube with similar dimensions is verified. The sensors certified for use in Ex Zones, are always tested to pressure according to the same criteria. Tests at different pressures can be carried out upon request. The liquid penetrant test verifies the absence of crevices on the weldings of the thermowell. |
| <i>Test report and calibration</i> | With regards to the tests and calibration, the "Inspection Report" consists of a compliance declaration for the essential points of the standard DIN EN 60751. The "Factory calibration" is carried out in an EA (European Accreditation) authorised laboratory of E+H according to an internal procedure. A calibration may be requested separately according to an EA accredited procedure (SIT calibration). Calibration is carried out on the thermometer insert. |

Further details

| | |
|-----------------------------|--|
| <i>Maintenance</i> | The Omnigrad M thermometers do not require any specific maintenance. In the case of ATEX certified components (transmitter, insert) please refer to the corresponding specific relevant documentation (refer to the code at the end of the document). |
| <i>Delivery time</i> | For small quantities (10÷20 units) and standard options, between 5 and 15 days depending on the configuration required. |

Ordering Information

Sales structure

| TR10 | Safety (Ex) certification | | |
|------|---------------------------|--|--|
| | A | Ex certification not required | |
| | B | ATEX II 1 GD EEx ia IIC certified | |
| | C | *Certification NAMUR NE 24 | |
| | D | *Manufacturer's declaration acc. standard EN 50020 | |
| | | Head material, conduit, IP grade | |
| | A | TA20A Aluminium, conduit M20x1.5, IP66/IP67 | |
| | 4 | TA20A Aluminium, PROFIBUS® connector, IP66 | |
| | 2 | TA20A Aluminium, conduit 1/2" NPT, IP66/IP67 | |
| | 7 | TA20B Polyamide, black, conduit M20x1.5, IP65 | |
| | E | TA21E Aluminium, screw cap, M20x1.5, IP65 | |
| | 6 | TA20D Aluminium, high cap, conduit M20x1.5,IP66 | |
| | 5 | TA20D Aluminium, high cap, PROFIBUS® connector, IP66 | |
| | 8 | TA20D Aluminium, high cap, conduit 1/2" NPT, IP66 | |
| | J | TA20J SS 316L, conduit M20x1.5, IP66/IP67 | |
| | K | TA20J SS 316L, with display, conduit M20x1.5, IP66/IP67 | |
| | M | TA20J SS 316L, PROFIBUS® connector, IP66 | |
| | R | TA20R SS 316L, screw cap, conduit M20x1.5, IP66/IP67 | |
| | S | TA20R SS 316L, screw cap, PROFIBUS® connector, IP66 | |
| | W | TA20W Aluminium, round cap, clip, conduit M20x1.5, IP66 | |
| | Y | Special version | |
| | | Pipe size, type of material | |
| | A | Pipe diameter: 9 mm | material: SS 316L/1.4404 |
| | D | Pipe diameter: 9 mm | material: SS 316Ti/1.4571 |
| | G | Pipe diameter: 9 mm | material: Hastelloy C |
| | B | Pipe diameter: 11 mm | material: SS 316L/1.4404 |
| | E | Pipe diameter: 11 mm | material: SS 316Ti/1.4571 |
| | H | Pipe diameter: 11 mm | material: Hastelloy C |
| | F | Pipe diameter: 12 mm | material: SS 316Ti/1.4571 |
| | Y | Special version | |
| | | Length of the extension neck E (60-250 mm) | |
| | 1 | 80 | mm, extension length E (82 mm with tip model "W") |
| | 3 | 145 | mm, extension length E (147 mm with tip model "W") |
| | 8 | ... | mm, extension length E to be specified |
| | 9 | ... | mm, extension length E special |
| | | Process connection and material | |
| | | (the material must be the same as the material of the pipe) | |
| | BG | M20X1.5 | process connection, material: SS 316Ti |
| | BH | G 1/2" A DIN 43772 | process connection, material: SS 316Ti |
| | BJ | G 1" A DIN 43772 | process connection, material: SS 316Ti |
| | CA | G 1/2" BSP (cyl.) | process connection, material: SS 316L |
| | CB | G 3/4" BSP (cyl.) | process connection, material: SS 316L |
| | CC | G 1" BSP (cyl.) | process connection, material: SS 316L |
| | CD | 1/2" NPT | process connection, material: SS 316L |
| | CE | 3/4" NPT | process connection, material: SS 316L |
| | HH | G 1/2" A DIN 43772 | process connection, material: Hastelloy C |
| | HD | 1/2" NPT | process connection, material: Hastelloy C |
| | YY | Special version | |
| | | Type of tip | |
| | S | Straight tip | |
| | R | Reduced tip, L >= 60 mm (SS 9 mm pipe) | |
| | M | Reduced tip, L >= 80 mm (9 and 11 mm pipe) | |
| | T | Tapered tip, L >= 100 mm (SS 9 mm pipe) | |
| | W | Tapered tip, L >= 120 mm in compliance with DIN 43772 form 3G (SS 12 mm pipe, neck length 82/147 mm) | |
| | Y | Special version | |
| | | Immersion length (50-3700) | |
| | A | 70 | mm, immersion length L |
| | C | 120 | mm, immersion length L |
| | D | 160 | mm, immersion length L |
| | E | 220 | mm, immersion length L |
| | F | 250 | mm, immersion length L |
| | G | 280 | mm, immersion length L |
| | H | 310 | mm, immersion length L |
| | J | 400 | mm, immersion length L |
| | K | 580 | mm, immersion length L |

[illegible]

Sales structure

| THT1 | | Model and version of the head transmitter |
|-------|-----|---|
| | A11 | TMT180-A11 programmable from...to...°C, accuracy 0.2 K, span limit -200...650°C |
| | A12 | TMT180-A12 programmable from...to...°C, accuracy 0.1 K, span limit -50...250°C |
| | A13 | TMT180-A21AA fixed range, accuracy 0.2 K, span 0...50°C |
| | A14 | TMT180-A21AB fixed range, accuracy 0.2 K, span 0...100°C |
| | A15 | TMT180-A21AC fixed range, accuracy 0.2 K, span 0...150°C |
| | A16 | TMT180-A21AD fixed range, accuracy 0.2 K, span 0...250°C |
| | A17 | TMT180-A22AA fixed range, accuracy 0.1 K, span 0...50°C |
| | A18 | TMT180-A22AB fixed range, accuracy 0.1 K, span 0...100°C |
| | A19 | TMT180-A22AC fixed range, accuracy 0.1 K, span 0...150°C |
| | A20 | TMT180-A22AD fixed range, accuracy 0.1 K, span 0...250°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 |
| | 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 |
| | K11 | TMT184-A PROFIBUS-PA®, 2-wire, programmable from...to...°C |
| | K21 | TMT184-B PROFIBUS-PA® ATEX, 2-wire, programmable from...to...°C |
| | K23 | TMT184-C PROFIBUS-PA® FM IS, 2-wire, programmable from...to...°C |
| | K24 | TMT184-D PROFIBUS-PA® CSA, 2-wire, programmable from...to...°C |
| | YYY | Special transmitter |
| | | Application and services |
| | 1 | Assembled into position |
| | 9 | Special version |
| THT1- | | Complete order code |

Supplementary Documentation

| | |
|--|---------------|
| <input type="checkbox"/> RTD thermometers Omnigrad TST - General Information | TI 088T/02/en |
| <input type="checkbox"/> Terminal housings - Omnigrad TA 20 | TI 072T/02/en |
| <input type="checkbox"/> Temperature head transmitter iTEMP® Pt TMT 180 | TI 088R/09/en |
| <input type="checkbox"/> Temperature head transmitter iTEMP® PCP TMT 181 | TI 070R/09/en |
| <input type="checkbox"/> Temperature head transmitter iTEMP® HART® TMT 182 | TI 078R/09/en |
| <input type="checkbox"/> Temperature head transmitter iTEMP® PA TMT 184 | TI 079R/09/en |
| <input type="checkbox"/> RTD insert for temperature sensor - Omniset TPR 100 | TI 268T/02/en |
| <input type="checkbox"/> Thermowell for temperature sensor - Omnigrad M TW 10 | TI 261T/02/it |
| <input type="checkbox"/> Safety instructions for use in hazardous areas | XA 003T/02/z1 |
| <input type="checkbox"/> E+H Thermolab - Calibration certificates for industrial thermometers. RTD and thermocouples | TI 236T/02/en |

Subject to modification

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