



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Omnigrad M TR44, TR45

Hygienic, modular RTD assembly,
protection tube for TR45,
various process connections and neck tube



Application

- All hygienic applications for food, pharmaceutical and fine chemicals industries
- Measuring range: -50...400 °C (-58...752 °F)
- Pressure range up to 40 bar (580 psi)
- Degree of protection: up to IP 68

Head transmitters

All Endress+Hauser transmitters are available with enhanced accuracy, reliability and cost effectiveness compared to directly wired sensors. Easy customizing by choosing one of the following outputs and protocols:

- Analog output 4...20 mA
- HART®
- PROFIBUS® PA
- FOUNDATION Fieldbus™

Your benefits

- High flexibility due to modular assembly with standard terminal heads and customized immersion length
- Providing most common hygienic process connections, easily cleanable terminal heads and ferrit content determination due to the hygienic design with 3-A® and EHEDG certification
- Highest accuracy with Pt100 sensors according to IEC 60751
- Type of protection for use in hazardous areas:
Intrinsic Safety (EX ia)
Non-Sparking (Ex nA)



Function and system design

Measuring principle

The Resistance Temperature Detector (RTD) element has an electrical resistance with a value of $100\ \Omega$ at $0\ ^\circ\text{C}$ ($32\ ^\circ\text{F}$). It is commonly known as Pt100 and complies with IEC 60751. This resistance value increases at higher temperatures according to the characteristics of the resistor material (platinum). These kind of sensors are called Positive Temperature Coefficient elements (PTC).

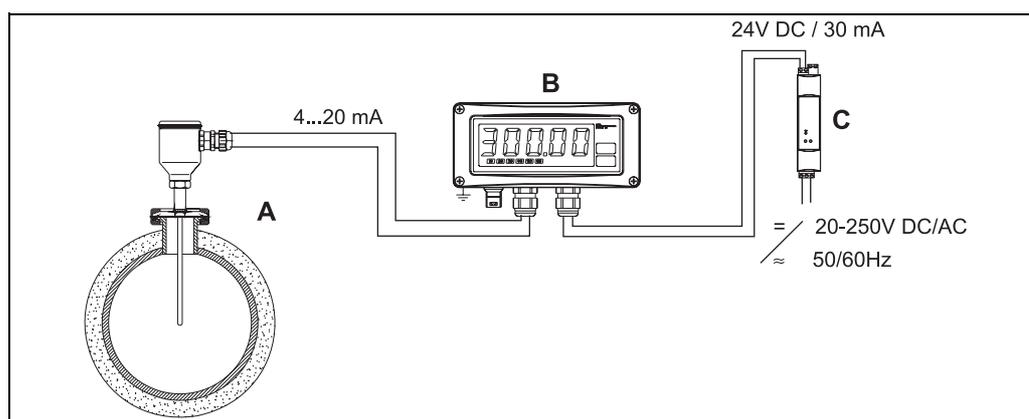
The coefficient is fixed with $\alpha = 0.00385\ ^\circ\text{C}^{-1}$, calculated between 0 and $100\ ^\circ\text{C}$ (32 and $212\ ^\circ\text{F}$), according to ITS90 (International Temperature Scale).

Wire wound platinum resistance thermometers (WW) consist of hair thin highly purified platinum wire double wound inside a ceramic carrier. This is then sealed top and bottom with a ceramic protective layer. The measurements achieved by these resistance thermometers are not only highly reproducible, but also show long term resistance/temperature characteristic stability within temperature ranges up to $600\ ^\circ\text{C}$ ($1112\ ^\circ\text{F}$). This sensor type is relatively large in its dimensions and is also sensitive to vibration.

Thin film platinum resistance thermometers (TF) consist of a precise amount of platinum which is vaporized under vacuum onto a ceramic substrate to a thickness of $1\ \mu\text{m}$. This is then protected by a glass layer. The advantages are: smaller dimensions than wire wound and greatly improved vibration resistance. Thin film resistances (TF) are flat, microscopic versions of the wire wound types (WW) with a measurement relevant difference:

The temperature expansion behavior of the different layers of this structure leads to minimal mechanical stress. Temperature changes in thin film resistances (TF) cause the desired temperature relevant changes of the resistance as well as minimal tension stress related resistance changes. Through this the resistance/temperature characteristic of most thin film platinum resistance thermometers (TF) differs considerably from the standard characteristics at higher temperatures. Thin film resistances are therefore used for temperature measurement in ranges below $500\ ^\circ\text{C}$ ($932\ ^\circ\text{F}$).

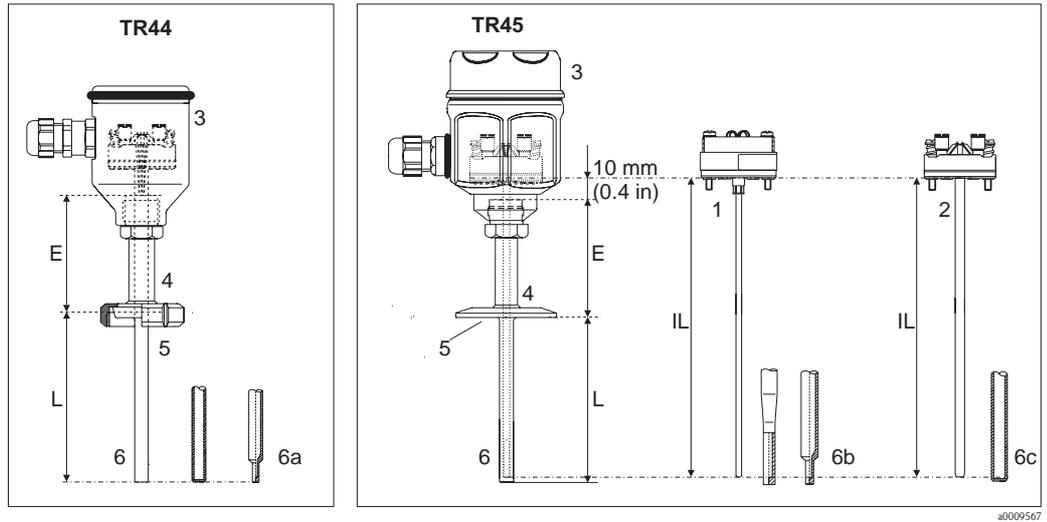
Measuring system



Example of an application

- A Built-in RTD assembly TR44 or TR45 with head transmitter
- B RIA261 Field display
 - The display measures an analog measurement signal and indicates this on the display. The display is connected in a 4 to 20 mA current loop and also derives its supply from the loop. The voltage drop is almost negligible ($< 2.5\ \text{V}$). The dynamic internal resistance (load) makes sure that independently from the loop current, the maximum voltage drop is never exceeded. The analog signal at the input is digitalized, analyzed, and shown in the rear illuminated display. For details see Technical Information (see chapter "Documentation").
- C Active barrier RN221N
 - The RN221N active barrier (24 V DC, 30 mA) has a galvanically isolated output for supplying voltage to loop powered transmitters. The power supply has a wide-range input for mains power, 20 to 250 V DC/AC, 50/60 Hz to be used in any electrical circuit. For details see Technical Information (see chapter "Documentation").

Equipment architecture



Equipment architecture of the Omnigrad M TR44 (non-replaceable insert) and TR45 (replaceable insert)

- 1 Insert (∅ 3 mm, 0.12 in) with mounted head transmitter, for example
- 2 Insert (∅ 6 mm, 0.24 in) with mounted ceramic terminal block, for example
- 3 Various terminal heads
- 4 Protection armature
- 5 Various hygienic process connections, detailed information see chapter 'process connection'
- 6 Various tip shapes, detailed information see chapter 'tip shape':
 - 6a Straight and reduced for TR44
 - 6b Tapered and reduced for TR45 inserts with ∅ 3 mm (0.12 in)
 - 6c Straight for TR45 inserts with ∅ 6 mm (0.24 in)
- E Neck tube
- L Immersion length
- IL TR45 Insertion length = E + L + 10 mm (0.4 in)

The RTD assemblies Omnigrad M TR44 and TR45 are built up for hygienic processes and the main requirements regarding "Cleaning-in-process" (CIP) and "Sterilization-in-process" (SIP). The architecture is according to 3-A and EHEDG approvals. All common used hygienic process connections are possible to build in.

Omnigrad M TR44 RTD assemblies consist of a terminal head and a protection armature with integrated insert. With a tip diameter of 6 mm (0.24 in) resp. 8 mm (0.31 in) reduced to 5.3 mm (0.21 in), it is possible to realize best response times. Insert and neck tube are welded together. The hygienic process connection is also fixed connected to the neck tube.

The Omnigrad M TR45 RTD assemblies are constructed in three modules: terminal head, protection armature and a replaceable insert. The protection armature consists of a neck tube, process connection welded between neck tube and integrated protection tube.

Measurement range

According to IEC 60751:

- TR44: -50 °C...250 °C (-58 °F...482 °F)
- TR45: -50 °C...400 °C (-58 °F...752 °F)

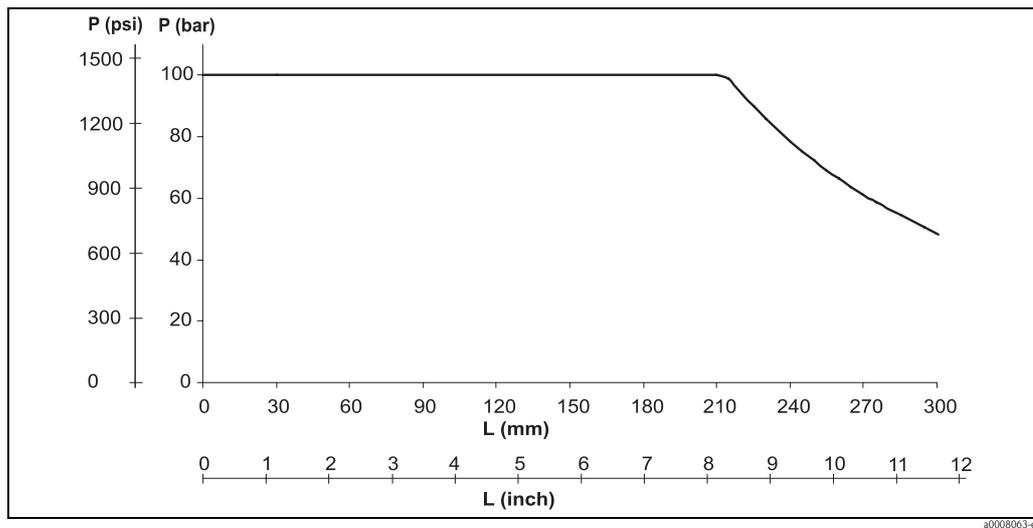
Performance characteristics

Operating conditions

Ambient temperature

| Terminal head | Temperature in °C (°F) |
|---|--|
| Without mounted head transmitter | <ul style="list-style-type: none"> ■ Housing, material aluminum -40 to 100 °C (-40 to 212 °F) ■ Housing, material polyamide -40 to 85 °C (-40 to 185 °F) |
| With mounted head transmitter | -40 to 85 °C (-40 to 185 °F) |
| With mounted head transmitter and display | -20 to 70 °C (-4 to 158 °F) |

Process pressure TR44



Maximum process pressure

L = Immersion length

P = Process pressure

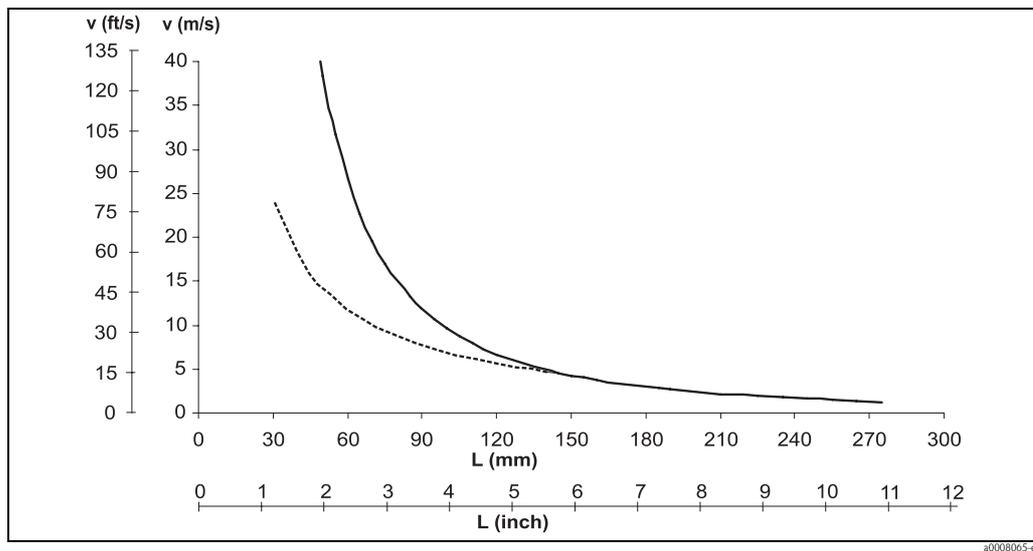
The diagram takes into consideration not only the overpressure but also the pressure load caused by the flow, whereby a safety factor of 1.9 has been specified for operation with flow. The maximum permitted static operating pressure is lower at greater insertion lengths due to the increased bending load caused by the flow. The calculation assumes the maximum permitted medium velocity for the respective insertion length (see diagram below).



Caution!

The maximum process pressure for the conical metal-metal process connection (Option **ND**) is 16 bar = 1.6 MPa (232 psi)!

Maximum flow velocity TR44



Flow velocity

L = Immersion length, during flow

v = Flow velocity

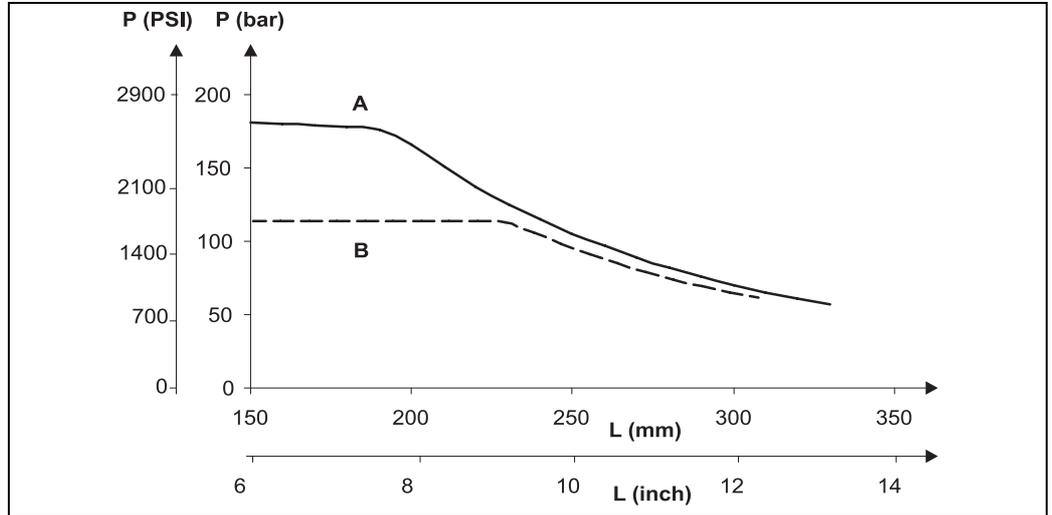
Medium: — air; - - - - water

The permitted flow velocity is the minimum from resonance velocity (resonance distance 80%) and load or buckling caused by flow, which would lead to failure of the thermometer tube or to exceedance of the safety

factor (1.9). Calculation was performed for the specified limit operating conditions of 200°C (392°F) and ≤10 bar (1450 PSI) process pressure.

Process pressure TR45

The pressure values to which the protection tube can be subjected at the various temperatures are illustrated by the figures below.

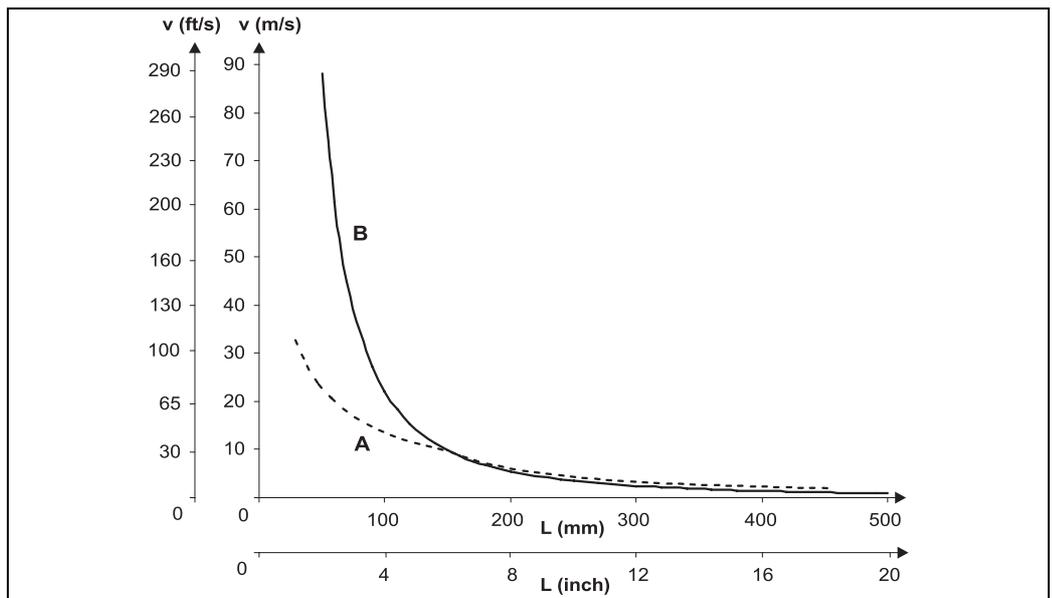


Maximum permitted process pressure for tube diameter
 – Tube diameter 9 x 1 mm (0.35 in) ———

- A Medium water at T = 50 °C (122 °F)
- B Medium superheated steam at T = 400 °C (752 °F)
- L Immersion length
- P Process pressure

Maximum flow velocity TR45

The highest flow velocity tolerated by the protection tube diminishes with increasing immersion lengths exposed to the stream of the fluid.



Flow velocity depending on the immersion length
 – Tube diameter 9 x 1 mm (0.35 in) ———

- A Medium water at T = 50 °C (122 °F)
- B Medium superheated steam at T = 400 °C (752 °F)
- L Immersion length
- v flow velocity

Shock and vibration resistance 4g / 2 to 150 Hz as per IEC 60068-2-6

Accuracy RTD corresponding to IEC 60751

| Class | max. Tolerances (°C) | Temperature range | Characteristics |
|--|----------------------------------|-------------------|-----------------|
| RTD maximum error type TF - range: -50 to +400 °C | | | |
| F0.15 (Cl. A) | $0.15 \pm 0.002 \cdot t ^{1)}$ | -50 °C to +250 °C | |
| F0.1 (1/3 Cl. B) | $0.10 \pm 0.0017 \cdot t ^{1)}$ | 0 °C to +150 °C | |
| F0.3 (Cl. B) | $0.3 \pm 0.005 \cdot t ^{1)}$ | -50 °C to +400 °C | |

1) $|t|$ = absolute value °C



Note!

For measurement errors in °F, calculate using equations above in °C, then multiply the outcome by 1.8.

Response time

Tests of the sensor assemblies without transmitter in water at 0.4 m/s (1.3 ft/s), according to IEC 60751; 10 K temperature step changes; For immersion length $L > 45$ mm (1.77 in):

| Thermometer TR44 without protection tube | | | |
|--|----------------------|---|---|
| Outer diameter | Response time | Reduced tip \varnothing 5.3 mm (0.2 in) | Straight tip \varnothing 6 mm (0.24 in) |
| 8 mm (0.31 in) | t_{50} t_{90} | ≤ 3 s ≤ 7 s | - - |
| 6 mm (0.24 in) | t_{50} t_{90} | - - | ≤ 4 s ≤ 10 s |

| TR45 with protection tube | | | | | | | |
|---------------------------|----------------------|---|-----------------|--|-----------------|---|-----------------|
| Diameter | Response time | Reduced tip \varnothing 5.3 mm (0.2 in) | | Tapered tip \varnothing 6.6 mm (0.26 in) | | Straight tip \varnothing 6 mm (0.24 in) | |
| | | A ¹⁾ | B ²⁾ | A ¹⁾ | B ²⁾ | A ¹⁾ | B ²⁾ |
| 9 x 1 mm (0.35 in) | t_{50} t_{90} | 7.5 s 21 s | 3.5 s 8 s | 11 s 37 s | 5 s 12 s | 18 s 55 s | 10 s 30 s |

1) without thermoconductive paste

2) with thermoconductive paste

Insulation resistance Insulation resistance $\geq 100 \text{ M}\Omega$ at ambient temperature.
Insulation resistance between each terminal and the sheath is tested with a voltage of 100 V DC.

Self heating RTD elements are passive resistances that are measured using an external current. This measurement current causes a self heating in the RTD element itself which in turn creates an additional measurement error. In addition to the measurement current the size of the measurement error is also affected by the thermal conductivity and flow velocity of the process. This self heating error is negligible when an Endress+Hauser iTEMP[®] temperature transmitter (very small measurement current) is connected.

Calibration specifications Endress+Hauser provides comparison temperature calibration from -80 to $+600 \text{ }^\circ\text{C}$ ($-110 \text{ }^\circ\text{F}$ to $1112 \text{ }^\circ\text{F}$) based on the International Temperature Scale (ITS90). Calibrations are traceable to national and international standards. The calibration report is referenced to the serial number of the thermometer.

| TR44 (without replaceable insert) TR45 (with replaceable insert) | Minimum standard immersion length L in mm (inch) | |
|--|--|---|
| Temperature range | without head transmitter | with head transmitter (thermometer without neck) |
| $-80 \text{ }^\circ\text{C}$ to $-40 \text{ }^\circ\text{C}$ ($-110 \text{ }^\circ\text{F}$ to $-40 \text{ }^\circ\text{F}$) | 200 (7.9) | |
| $-40 \text{ }^\circ\text{C}$ to $0 \text{ }^\circ\text{C}$ ($-40 \text{ }^\circ\text{F}$ to $32 \text{ }^\circ\text{F}$) | 160 (6.3) | |
| $0 \text{ }^\circ\text{C}$ to $250 \text{ }^\circ\text{C}$ ($32 \text{ }^\circ\text{F}$ to $480 \text{ }^\circ\text{F}$) | 120 (4.7) | 150 (5.9) |
| $250 \text{ }^\circ\text{C}$ to $400 \text{ }^\circ\text{C}$ ($480 \text{ }^\circ\text{F}$ to $752 \text{ }^\circ\text{F}$) | 300 (11.8) | |

Material

| Material | Short description | max. application temperature | Characteristics |
|---------------------------|-------------------|--|---|
| SS 316L/ 1.4404/1.4435 | X2CrNiMo 17 13 2 | $800 \text{ }^\circ\text{C}$ ($1472 \text{ }^\circ\text{F}$) | <ul style="list-style-type: none"> ■ Austenitic, stainless steel ■ High corrosion resistance ■ High resistance at low temperatures ■ Optimal corrosion resistance in an acid, non oxydizing environment (e.g. phosphorous and sulphuric acids in low concentration and at low temperatures) – Not resistant to chloride at high temperatures |

Transmitter specifications

| | TMT180 PCP Pt100 | TMT181 PCP Pt100, TC, Ω , mV | TMT182 HART [®] Pt100, TC, Ω , mV | TMT84 PA / TMT85 FF Pt100, TC, Ω , mV |
|-----------------------------------|--|---|---|--|
| Measurement accuracy | $0.2 \text{ }^\circ\text{C}$ ($0.36 \text{ }^\circ\text{F}$), optional $0.1 \text{ }^\circ\text{C}$ ($0.18 \text{ }^\circ\text{F}$) or 0.08% % is related to the adjusted measurement range (the larger value applies) | $0.2 \text{ }^\circ\text{C}$ ($0.36 \text{ }^\circ\text{F}$) or 0.08% | | $0.1 \text{ }^\circ\text{C}$ ($0.18 \text{ }^\circ\text{F}$) |
| Sensor current | $I \leq 0.6 \text{ mA}$ | | $I \leq 0.2 \text{ mA}$ | $I \leq 0.3 \text{ mA}$ |
| Galvanic isolation (input/output) | - | | $\hat{U} = 2 \text{ kV AC}$ | |

System components

Family of temperature transmitters

Thermometers fitted with iTEMP® transmitters are an installation ready complete solution to improve temperature measurement by increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

PC programmable head transmitter TMT180 and TMT181

They offer you extreme flexibility and help control costs with the ability to stock devices and program them for your needs. Regardless of your choice of output, all iTEMP® transmitters can be configured quickly and easily with a PC. To help you with this task, Endress+Hauser offers free software ReadWin® 2000 which can be downloaded from the website www.readwin2000.com. Details see Technical Information (see chapter 'Documentation').

HART® TMT182 head transmitter

HART® communication is all about easy, reliable data access and getting better information more inexpensively. iTEMP® transmitters integrate seamlessly into your existing control system and provide painless access to preventative diagnostic information.

Configuration with a DXR275 or 375 hand-held or a PC with configuration program (FieldCare, ReadWin® 2000) or configure with AMS or PDM. Details see Technical Information (see chapter 'Documentation').

| Type of transmitter | Specification |
|---------------------|---|
| iTEMP® TMT18x | <ul style="list-style-type: none"> ■ Material: Housing (PC), Potting (PUR) ■ Terminals: Cable up to max. $\leq 2.5 \text{ mm}^2$ / 16 AWG (secure screws) or with wire end ferrules ■ Eyelets for easy connection of a HART®-handheld terminal with alligator clips ■ Degree of protection NEMA 4 (see also type of terminal head) Details see Technical Information (see chapter 'Documentation') |

PROFIBUS® PA TMT84 head transmitter

Universally programmable head transmitter with PROFIBUS® PA communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software such as FieldCare, Simatic PDM or AMS.

Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar-Van Dusen coefficients. Details see Technical Information (see chapter 'Documentation').



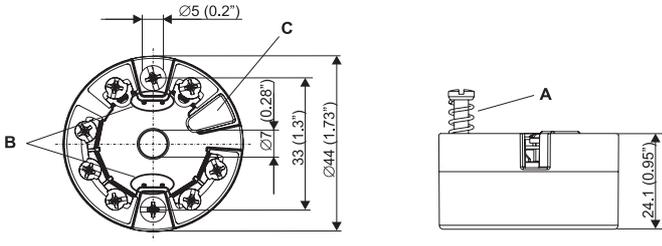
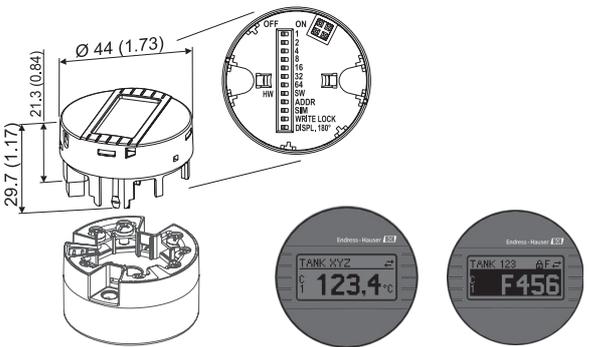
Note!

The previous model PROFIBUS® PA TMT184 head transmitter will be available for a transition time.

FOUNDATION Fieldbus™ TMT85 head transmitter

Universally programmable head transmitter with FOUNDATION fieldbus™ communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software such as ControlCare from Endress+Hauser or the NI Configurator from National Instruments.

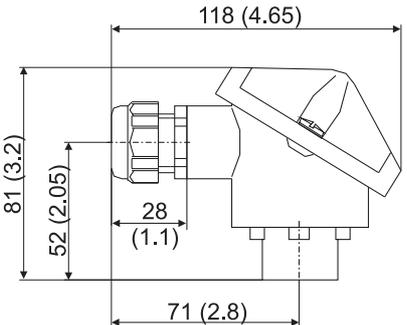
Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar-Van Dusen coefficients. Details see Technical Information (see chapter 'Documentation').

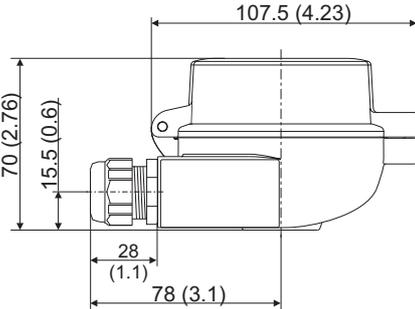
| Type of transmitter | Specification |
|--|--|
| <p>iTEMP® TMT84 and TMT85</p>  <p style="text-align: right; font-size: small;">a0007301-en</p> | <ul style="list-style-type: none"> ■ Spring range $L \geq 5 \text{ mm}$ (0.2"), see Pos. A ■ Fixing elements for pluggable measured value display, see Pos. B ■ Interface for contacting measured value display, see Pos. C ■ Material (RoHS-compliant) Housing: PC Potting: PU ■ Terminals: <ul style="list-style-type: none"> Screw terminals (cable up to max. $\leq 2.5 \text{ mm}^2 / 16 \text{ AWG}$) or spring terminals (e. g. from 0.25 mm^2 to $0.75 \text{ mm}^2 / 24 \text{ AWG}$ to 18 AWG for flexible wires with wire-end ferrules with plastic ferrule) ■ Degree of protection NEMA 4 (see also type of terminal head) <p>Details see Technical Information (see chapter 'Documentation')</p> |
| <p>Pluggable display TID10 as option</p>  <p style="text-align: right; font-size: small;">a0009955</p> | <ul style="list-style-type: none"> ■ Displays the actual measured value and the measurement point identification ■ Displays fault events in inverse color with channel ident and diagnostics code ■ DIP-switches on the rear for hardware set-up, e. g. PROFIBUS® PA bus address |

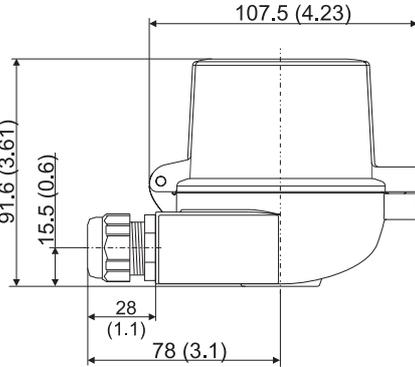
Terminal heads

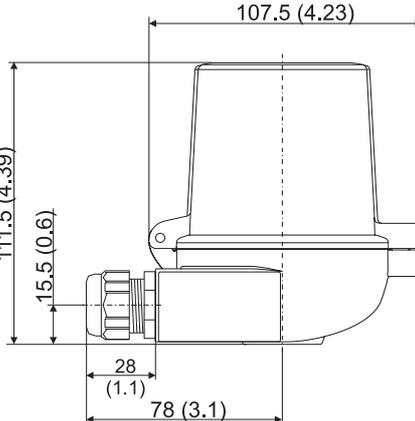
All terminal heads have internal geometry according to DIN 43729, form B and thermometer connection M24x1.5.

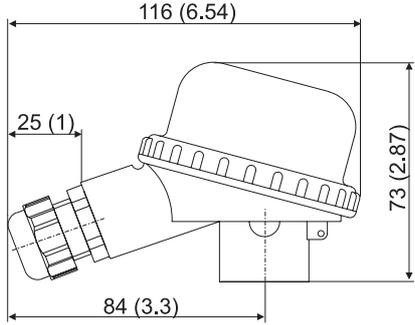
All dimensions in mm (inch). All cable gland dimensions in the graphics are based on SKINTOP ST M20x1.5

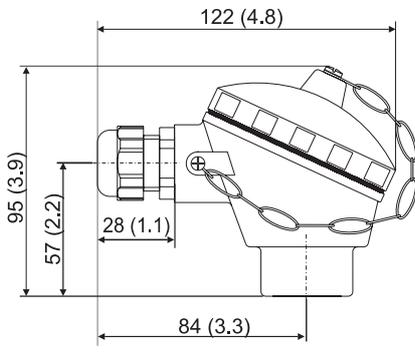
| TA20A | Specification |
|--|--|
|  <p style="text-align: right; font-size: small;">a0008650</p> | <ul style="list-style-type: none"> ■ Degree of protection: IP66 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 100 °C (212 °F) ■ Material: aluminum alloy, rubber seal under the cover ■ Cable entry: G 1/2", NPT 1/2", M12x1 PA or M20x1.5 ■ Protection armature connection: M24x1.5, NPT 1/2" or G 1/2" ■ Head color: blue RAL 5012, epoxy resin coating ■ Cap color: grey RAL 7035, epoxy resin coating ■ Weight: 180 g (6.35 oz) ■ 3-A® certified |

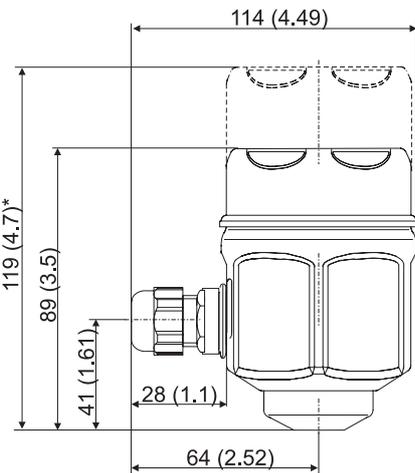
| TA30A | Specification |
|---|--|
|  | <ul style="list-style-type: none"> ■ Degree of protection: IP66/68 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: Silicone ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ■ Protection armature connection: M24x1.5 ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 330 g (11.64 oz) |

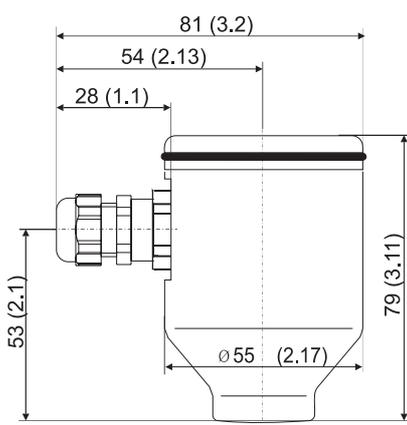
| TA30A with display window | Specification |
|--|--|
|  | <ul style="list-style-type: none"> ■ Degree of protection: IP66/68 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: Silicone ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ■ Protection armature connection: M24x1.5 ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 420 g (14.81 oz) ■ Head transmitter optional with TID10 display |

| TA30D | Specification |
|---|---|
|  | <ul style="list-style-type: none"> ■ Degree of protection: IP66/68 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: Silicone ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ■ Protection armature connection: M24x1.5 ■ Two head transmitters can be mounted. ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 390 g (13.75 oz) |

| TA20B | Specification |
|--|--|
|  <p style="text-align: right; font-size: small;">a0008663</p> | <ul style="list-style-type: none"> ■ Degree of protection: IP65 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 80 °C (176 °F) ■ Material: polyamide (PA) ■ Cable entry: M20x1.5 ■ Head and cap color: black ■ Weight: 80 g (2.82 oz) ■ 3-A® certified |

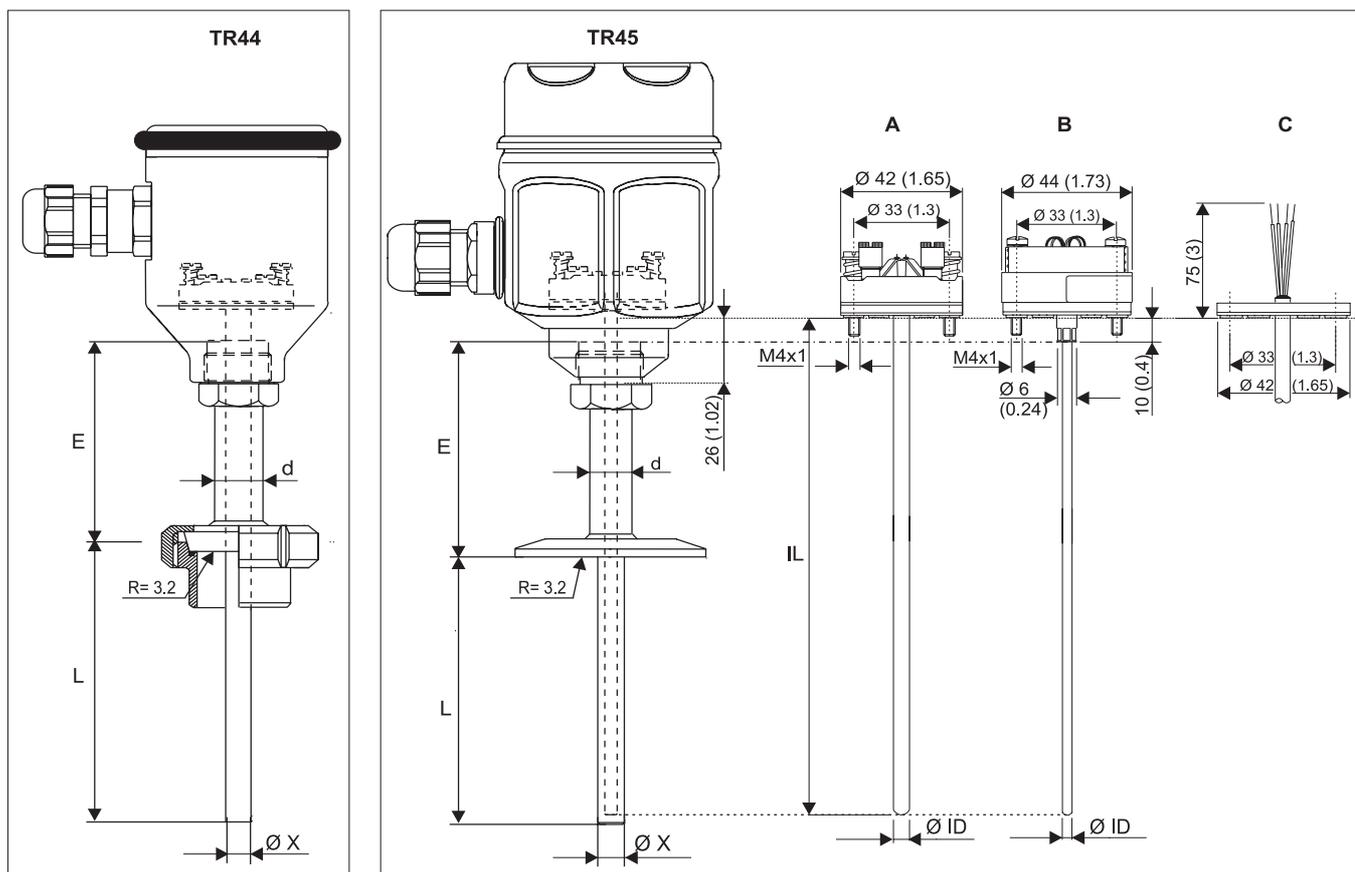
| TA21E | Specification |
|---|--|
|  <p style="text-align: right; font-size: small;">a0008669</p> | <ul style="list-style-type: none"> ■ Degree of protection: IP65 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 130 °C (266 °F) silicone, 100 °C (212 °F) rubber (observe max. permitted temperature of the cable gland!) ■ Material: aluminum alloy with polyester or epoxy coating; rubber or silicone seal under the cover ■ Cable entry: M20x1.5 or plug M12x1 PA ■ Protection armature connection: M24x1.5, G 1/2" or NPT 1/2" ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 300 g (10.58 oz) |

| TA20J | Specification |
|---|---|
|  <p style="text-align: right; font-size: small;">a0008866</p> <p><i>* dimensions with optional display</i></p> | <ul style="list-style-type: none"> ■ Degree of protection: IP66/IP67 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Material: 316L (1.4404) stainless steel, rubber seal under the cover (hygienic design) ■ 4 digits 7-segments LC display (loop powered) ■ Cable entry: 1/2" NPT, M20x1.5 or plug M12x1 PA ■ Protection armature connection: M24x1.5 or 1/2" NPT ■ Head and cap color: stainless steel, polished ■ Weight: 650 g (22.93 oz) with display ■ Humidity: 25 to 95%, no condensation ■ 3-A® certified <p>The programming is executed through 3 keys at the bottom of the display.</p> |

| TA20R | Specification |
|---|---|
|  | <ul style="list-style-type: none"> ■ Degree of protection: IP66/67 ■ Tapped hole spacing: 33 mm (1.30") for the measuring insert ■ Max. temperature: 100 °C (212 °F) ■ Material: SS 316L (1.4404) stainless steel ■ Cable entry: ½" NPT, M20x1.5 or plug M12x1 PA ■ Head and cap color: stainless steel ■ Weight: 550 g (19.4 oz) ■ LABS - free ■ 3-A® certified |

Protection tube

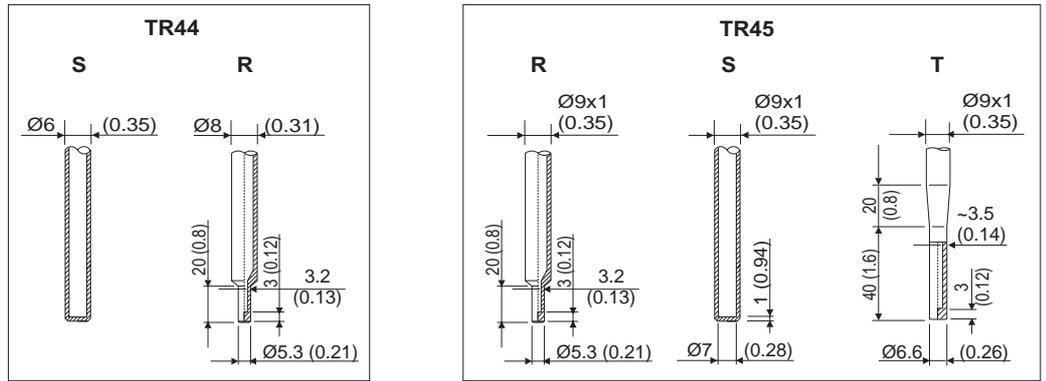
All dimensions in mm (inches).



Dimensions of the Omnigrad M TR44 and TR45

- | | | | |
|---|-------------------------------------|------|--|
| A | Model with terminal block mounted | Ø ID | Insert diameter |
| B | Model with head transmitter mounted | IL | TR45 insertion length = E + L + 10 mm (0.4 in) |
| C | Model with flying leads | L | Immersion length |
| d | Neck tube diameter | Ø X | Protection tube diameter |
| E | Neck tube length | | |

Tip shape



Available versions of protection tube tips (reduced, straight or tapered)

| Pos. No. | Tip shape, L = Immersion length | Insert Diameter |
|----------|---------------------------------|------------------|
| TR44-S | Straight for Ø 6 mm (0.24 in) | not available |
| TR44-R | Reduced for Ø 8 mm (0.32 in) | not available |
| TR45-R | Reduced, L ≥ 30 mm (1.2 in) | Ø 3 mm (0.12 in) |
| TR45-S | Straight | Ø 6 mm (0.24 in) |
| TR45-T | Tapered, L ≥ 65 mm (2.6 in) | Ø 6 mm (0.24 in) |

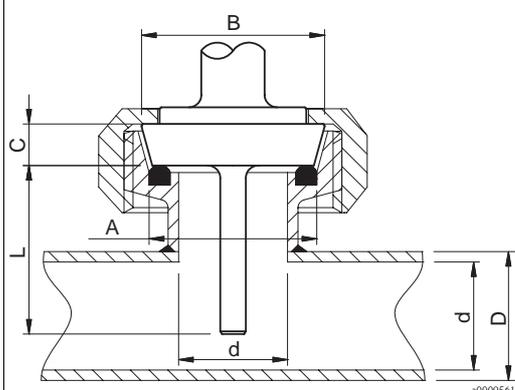
Weight

From 0.5 to 2.5 kg (1 to 5.5 lbs) for standard options.

Process connection

All dimensions are in mm. Surface finishing $R_a \leq 0.8 \mu\text{m}$, $\leq 0.4 \mu\text{m}$ or $\leq 0.4 \mu\text{m}$ electropolished.

DIN 11851 (3-A® certified)

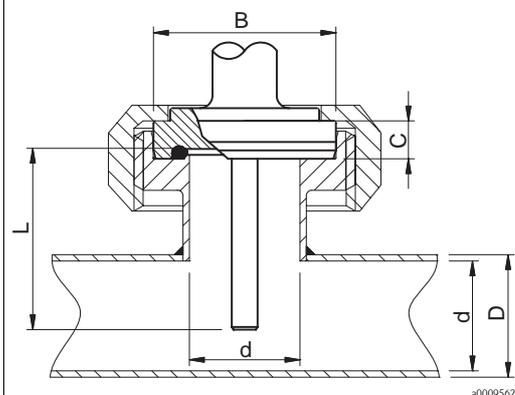


| (*) | All dimensions are in mm | | | | | | | (***) | | |
|-----------------|--------------------------|----|----|----|------------|-------------|-------------|-----------------|-------|-------|
| DN DIN 11851 | A | B | C | d | D light | D normal | D strong | PN max (bar) | TR44- | TR45- |
| 25 | 30 | 44 | 10 | 26 | - | - | 30 | 40 | CD | CD |
| | | | | | - | 29 | - | | | |
| | | | | | 28 | - | - | | | |
| 32 | 36 | 50 | 10 | 32 | - | 35 | - | 40 | CE | CE |
| | | | | | 34 | - | - | | | |
| | | | | | - | - | 42 | | | |
| 40 | 42 | 56 | 11 | 38 | - | 41 | - | 25 | CG | CG |
| | | | | | 40 | - | - | | | |
| | | | | | - | - | 54 | | | |
| 50 | 54 | 68 | 11 | 50 | - | 53 | - | 25 | CG | CG |
| | | | | | - | - | - | | | |
| | | | | | 52 | - | - | | | |

| (**) | All dimensions are in mm | | | | | | | (***) | | |
|--------------|--------------------------|----|----|------|-------------|------------|-----------------|-------|-------|---|
| DN Inches | A | B | C | d | D normal | D light | PN max (bar) | TR44- | TR45- | |
| 1" | 30 | 44 | 10 | 22,9 | 35 | - | 40 | CD | CD | |
| 1 ¼" | 36 | 50 | | 29,3 | 41 | - | | | | |
| | | | | | - | 31,8 | | | | - |
| 1 ½" | 42 | 56 | 11 | 35,1 | 48 | - | 25 | CF | CF | |
| 2" | 54 | 68 | | 47,8 | - | 38,1 | | | | - |
| | | | | | - | 61 | | | | - |

- (*) Pipes according to DIN 11850
- (**) Not included in DIN 11851 standard
- (***) With a suitable gasket, up to 140°C.

DIN 11864-1 Form A (aseptic connection, 3-A® certified)



| (*) | All dimensions are in mm | | | | | | (****) | | |
|-------------------|--------------------------|----|----|-------------|-------------|-----------------|--------|-------|--|
| DN DIN 11864-1 | B | C | d | D Normal | D strong | PN max (bar) | TR44- | TR45- | |
| 25 | 42,9 | 9 | 26 | - | 30 | 40 | CH | CH | |
| | | | | 29 | - | | | | |
| 40 | 54,9 | 10 | 38 | - | 42 | 25 | CJ | CJ | |
| | | | | 41 | - | | | | |
| 50 | 66,9 | 11 | 50 | 53 | - | - | - | - | |

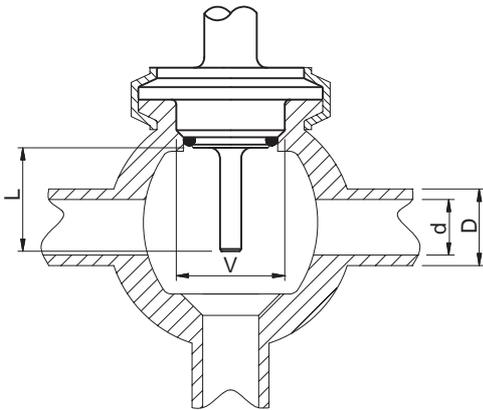
| (**) | All dimensions are in mm | | | | | | (****) | | |
|--------------|--------------------------|----|------|------|-----------------|-------|--------|--|--|
| DN ISO BS | B | C | d | D | PN max (bar) | TR44- | TR45- | | |
| 25 | 42,9 | 9 | 21,8 | 25,0 | 40 | CH | CH | | |
| 25,4 | | | 22,2 | 25,4 | | | | | |
| 38 | 54,9 | 10 | 34,8 | 38,0 | - | CJ | CJ | | |

| (***) | All dimensions are in mm | | | | | | (****) | | |
|------------------|--------------------------|----|------|------|-----------------|-------|--------|--|--|
| DN DIN EN ISO | B | C | d | D | PN max (bar) | TR44- | TR45- | | |
| 26,9 | 42,9 | 9 | 23,7 | 26,9 | 40 | CH | CH | | |
| 42,4 | | | 38,4 | 42,4 | | | | | |
| 42,4 | 54,9 | 10 | 38,4 | 42,4 | - | CJ | CJ | | |

- (*) Pipes according to DIN 11850.
- (**) Pipes according to ISO 2037 and BS 4825 Part 1.
- (***) Pipes according to DIN EN ISO 1127.
- (****) With a suitable gasket, up to 140°C.

Varivent® connection (3-A® certified)

Type B (DN10/DN15)

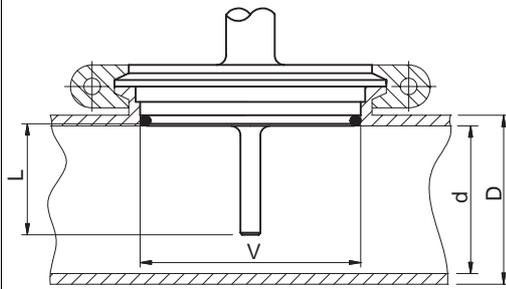


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| (*) | | | | | | | |
|-----------|-----|-----|----|----------|-------|-------|------|
| DN metric | d | D | V | PN (bar) | TR44- | TR45- | Type |
| 10 | 10 | 14 | 31 | 25 | FC | FC | B |
| 15 | 16 | 20 | | | | | |
| 25 | 26 | 30 | | | | | |
| 40 | 38 | 42 | 68 | 16 | FA | FA | N |
| 50 | 50 | 54 | | | | | |
| 65 | 66 | 70 | | | | | |
| 80 | 81 | 85 | | | | | |
| 100 | 100 | 104 | | | | | |
| 125 | 125 | 129 | | 10 | | | |

| (**) | | | | | | | |
|--------|------|------|----|----------|-------|-------|------|
| DN ISO | d | D | V | PN (bar) | TR44- | TR45- | Type |
| 25 | 29,7 | 33,7 | 68 | 25 | FA | FA | N |
| 32 | 38,4 | 42,4 | | | | | |
| 40 | 44,3 | 48,3 | | | | | |
| 50 | 56,3 | 60,3 | | | | | |

Type F (DN25, 1")
Type N (DN32...125, 1¼"...6")



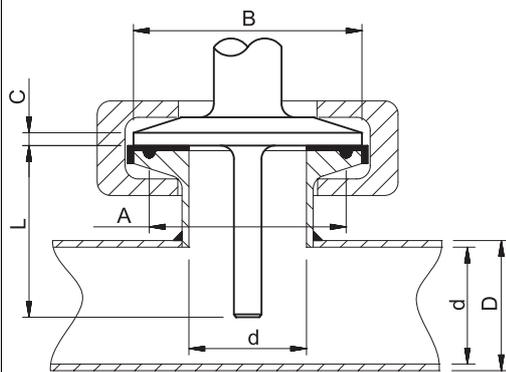
a0009564

| (***) | | | | | | | |
|-----------|------|-------|----|----------|-------|-------|------|
| DN inches | d | D | V | PN (bar) | TR44- | TR45- | Type |
| 1" | 22,2 | 25,4 | 50 | 25 | FB | FB | F |
| 1 ½" | 34,9 | 38,1 | | | | | |
| 2" | 47,6 | 50,8 | 68 | 16 | FA | FA | N |
| 2 ½" | 60,3 | 63,5 | | | | | |
| 3" | 73,0 | 76,1 | | | | | |
| 4" | 97,6 | 101,6 | | | | | |

| (****) | | | | | | | |
|--------|-------|-------|----|----------|-------|-------|------|
| DN IPS | d | D | V | PN (bar) | TR44- | TR45- | Type |
| 2" | 57,1 | 60,3 | 68 | 25 | FA | FA | N |
| 3" | 84,7 | 88,9 | | 16 | | | |
| 4" | 110,1 | 114,4 | | 10 | | | |
| 6" | 162,3 | 168,3 | | | | | |

- (*) Pipes according to DIN 11850.
- (**) Pipes according to DIN EN ISO 1127.
- (***) Pipes according to ISO 2037 and BS 4825 Part 1.
- (****) Pipes according to IPS Sch. 5.

ISO 2852 clamp connection (3-A® certified)

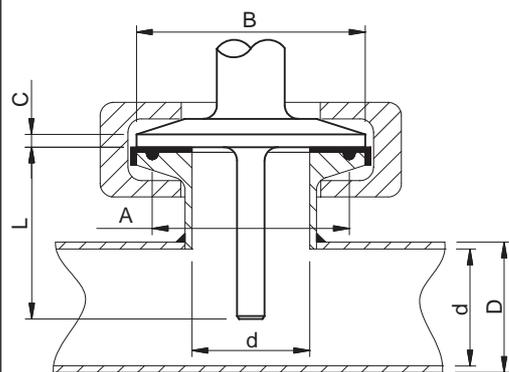


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| (*) | | | | | | | (****) | | |
|-------------|------|------|------|------|-----------------|---------------|--------------|-------|-------|
| DN ISO 2852 | A | B | C | d | D Expanded type | D Welded type | PN max (bar) | TR44- | TR45- |
| 8÷18(**) | 20,0 | 25,0 | 3,6 | (**) | (**) | (**) | 16 | BM | - |
| 12(***) | | | | 12 | 16 | - | | | |
| 12,7(***) | 27,5 | 34,0 | 2,85 | 12,7 | 16,7 | - | | BA | BA |
| 17,2(***) | | | | 17,2 | 21,2 | - | | | |
| 21,3(***) | | | | 21,3 | 25,3 | - | | | |
| 25 | | | | 25 | 29 | - | | | |
| 25 | 43,5 | 50,5 | | 22,6 | - | 25,6 | | BB | BB |
| 33,7 | | | | 33,7 | 38,1 | - | | | |
| 38 | | | | 31,3 | - | 34,3 | | | |
| 40 | | | | 38 | 42,4 | - | | | |
| 51 | | | | 35,6 | - | 38,6 | | | |
| 51 | 56,5 | 64,0 | | 40 | 44,8 | - | BC | BC | |
| 51 | | | 37,6 | - | 40,6 | | | | |
| 51 | | | 51 | 55,8 | - | | | | |
| 51 | | | 48,6 | - | 51,6 | | | | |

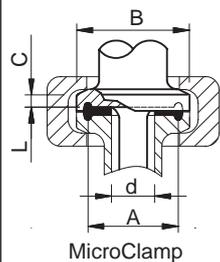
- (*) Pipes according to ISO 2037 and BS 4825 Part 1.
- (**) MicroClamp (not included in std. ISO 2852); not standard pipes.
- (***) MiniClamp.
- (****) Depends on clamping ring type, at 121°C with suitable gasket.

Tri-clamp® connection (3-A® certified)



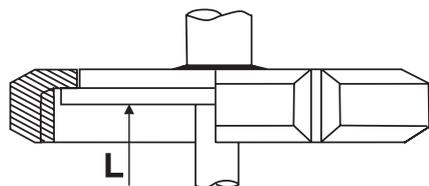
| DN | (*) | | C | d | D | | PNmax (bar) | TR44- | TR45- |
|------------|------|------|------|------|------|--------|-------------|-------|-------|
| | A | B | | | std. | strong | | | |
| 1/2" (***) | 20,0 | 25,0 | 3,6 | 9,5 | - | 12,7 | - | BM | - |
| 3/4" (***) | | | | 15,8 | - | 19,0 | - | | |
| 1" | 43,5 | 50,5 | 2,85 | 22,2 | - | 29,5 | - | BF | BF |
| 1 1/2" | | | | 34,9 | - | 42,6 | - | | |
| 2" | 56,5 | 64,0 | | 47,6 | - | 55,7 | - | BH | BH |
| | | | | | | 50,8 | - | | |

(*) Pipes according to ISO 2037 and BS 4825 Part1.
 (**) Depends on clamping ring type, at 121°C with suitable gasket.
 (***) MicroClamp.



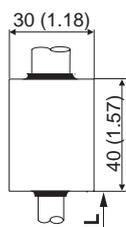
a0009566

SMS 1147/8 connection (3-A® certified)



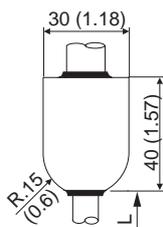
a0009568

Weld-in cylindrical (30x40 mm, 3-A® certified)



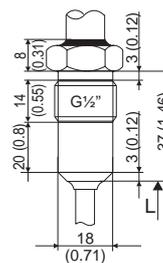
a0009569

Weld-in spherical (30x40 mm, 3-A® certified)



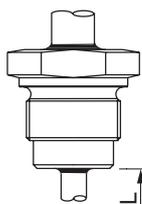
a0009570

Conical connection metal-to-metal G1/2" (not 3-A® certified)



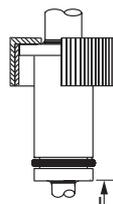
a0009571

Liquiphant M G1" (3-A® certified)



a0009572

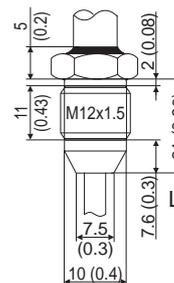
Ingold (not 3-A® certified)



25x50 mm
25x30 mm

a0009573

Conical connection metal-to-metal M12x1.5 (not 3-A® certified)



a0009574

Standard connections are available in several sizes. Others (i.e. Neumo, APV) are available on request. The process connection is continuously welded on the probe or on the well so as to obtain a minimum welding radius of 3.2 mm (0.13 in) between the lower surface of the connection and the sensor stem (according to EHEDG and 3-A® standards).

Please refer to chapter 'Accessories' for information regarding availability of welding adaptors. The Varivent® connections must be used with dedicated Tuchenhagen® in-line components or tank adaptors. For Varivent® flanges with small nominal diameter, maximum immersion lengths for usual applications are listed in the following table (also refer to chapter 'Installation conditions').

| Thermometers | TR44 (6 mm/0.24 in probe, straight tip) | | TR45 (reduced tip) | |
|--------------------------------|---|-------------------|--|-------------------|
| Varivent® nominal diameter | DN 10/15 | DN 25 | DN 10/15 | DN 25 |
| Suggested immersion length (L) | 30 to 50 mm (1.18 to 2 in) for low viscosity fluids 17 mm (0.7 in) for high viscosity fluids | 17 mm (0.7 in) | 30 mm (1.18 in) for low viscosity fluids 17 mm (0.7 in) for high viscosity fluids | 17 mm (0.7 in) |

Spare parts

- A thermowell for TR45 is available as spare part TW45 (see Technical Information in chapter 'Documentation').
- The RTD insert is available as spare part TPR100 (see Technical Information in chapter 'Documentation').

In TR45, the measuring probe is constituted by a mineral insulated insert positioned inside the protection tube. For its replacement, the insert length (IL) must be chosen depending on the immersion length (L). If spare parts are required, refer to the following table:

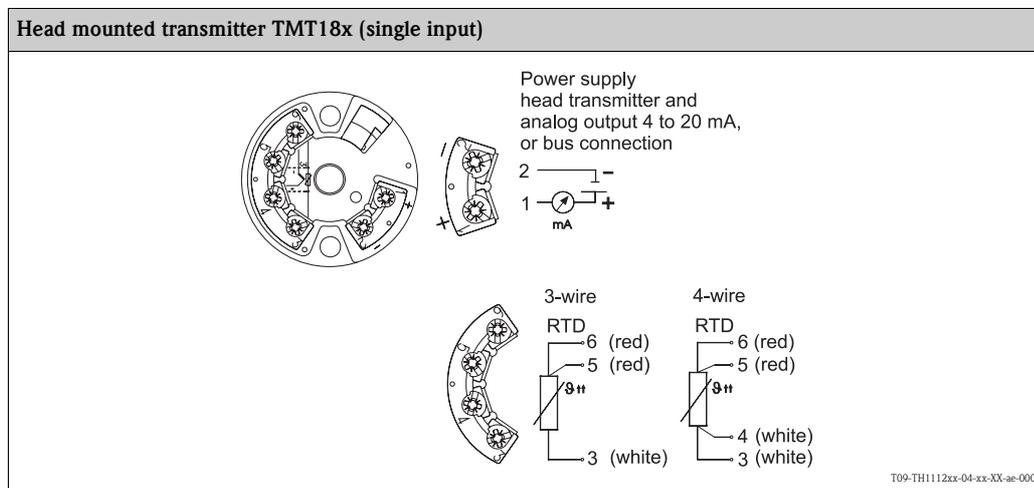
| Protection tube tip shape | ID | Neck tube length E | Insertion length IL |
|--|----------------|--|--------------------------------|
| Straight (version S) | 6 mm (0.24 in) | Standard 85 mm (3.45 in) or as specified | IL = L + E + 10 mm (0.4 in) |
| Reduced/tapered on Ø 9 mm (0.35 in), version R/T | 3 mm (0.12 in) | | |

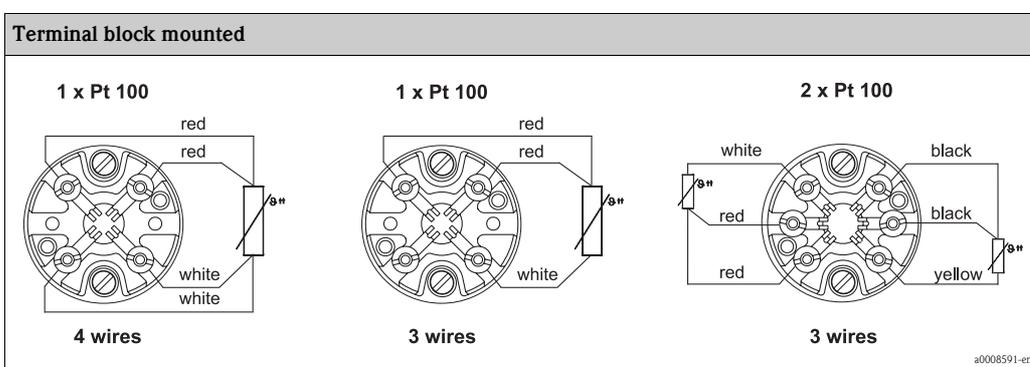
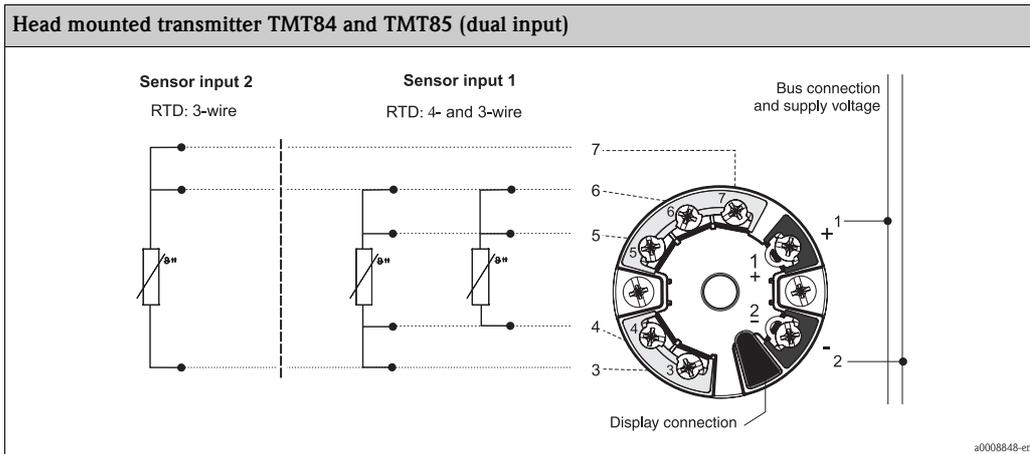
| Spare part | Material-No. |
|--|--------------|
| Gasket set M24x1.5, aramid+NBR (10 pieces) | 60001329 |

Wiring

Wiring diagrams

Type of sensor connection





Installation conditions

Orientation

No restrictions.

Installation instructions

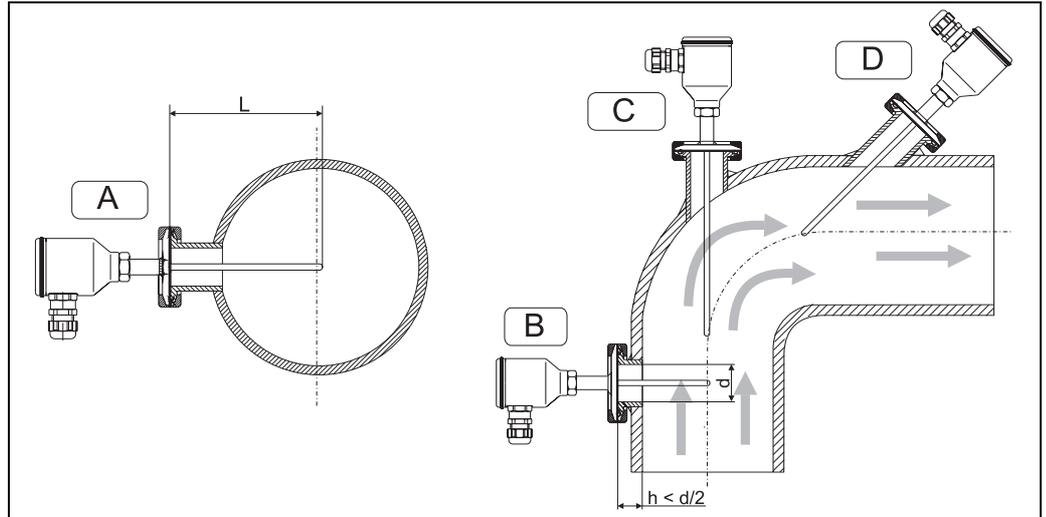
The immersion length of the thermometer influences the accuracy. If the immersion length is too small then errors in the measurement are caused by heat conduction via the process connection and the container wall. If installing into a pipe then the immersion length must be half of the pipe diameter, ideally.

- Installation possibilities: Pipes, tanks or other plant components
- Minimum immersion length = 80 to 100 mm (3.15 to 3.94 in)
The immersion length must be at least 8 times the protection tube diameter. Example: Protection tube diameter 12 mm (0.47 in) x 8 = 96 mm (3.8 in). Recommended standard immersion length according to DIN 43772: 120 mm (4.72 in)
- ATEX certification: Always take note of the installation regulations!



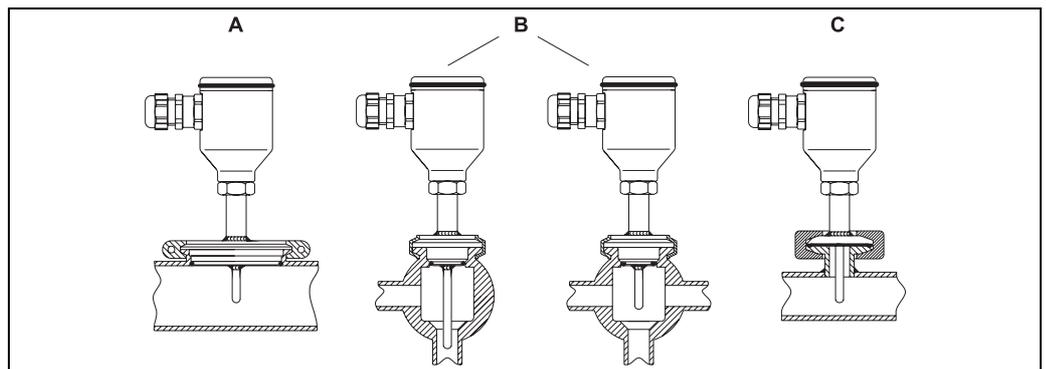
Note!

When operating in small nominal bore pipes it must be guaranteed that the protection tube tip is long enough to extend past the pipe center line (see Pos. A and B). A further solution could be an angled (tilted) installation (see Pos. C and D). When determining the immersion length all thermometer parameters and the process to be measured must be taken into account (e.g. flow velocity, process pressure).



General installation solutions

A - B: In pipes with a small cross section the sensor tip should reach or extend slightly past the center line of the pipe ($= L$).
C - D: Tilted installation.



Process connections for installation in small pipes

A Varivent® - process connection D = 50 mm for pipes DN25 C Clamp or micro-clamp
B Varivent® - process connection D = 31 mm for pipes DN10/15

The matches for the process connections as well as the gaskets are not included in the scope of delivery of this assembly. Welding adapter for Liquiphant M G1"- and Ingold process connections with associated o-ring sets are available as accessories, → 25.

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 assemblies should be installed in such a way that does not adversely affect their cleanability (3-A® requirements must be adhered to). As a general rule, the assemblies should be installed in such a way that does not adversely affect their cleanability. The required flush-mounting can be achieved by the connection Varivent®, Liquiphant type M G1" (+ weld-in adapter) and Ingold (+ weld-in adapter).

Neck tube length

The neck tube 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 in contact with the medium.

The connection situated in the upper part of the neck allows for orientation of the terminal head. The heating of the terminal head consequent to the process temperature is negligibly small if the process temperature does not exceed the measuring range of TR44 and TR45.

- Standard neck tube diameter: 15 mm (0.6 in)
- Standard neck tube length:
 - TR44: 82 mm (3.23 in)
 - TR45: 85 mm (3.45 in)

Certificates and approvals

| | |
|---------------------------------------|--|
| CE Mark | The device meets the legal requirements of the EC directives if applicable. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark. |
| Hazardous area approvals | For further details on the available Ex versions (ATEX, CSA, FM, etc.), please contact your nearest Endress+Hauser sales organization. All relevant data for hazardous areas can be found in separate Ex documentation. If required, please request copies. |
| Sanitary compatibility | <p>Certifications from external bodies:</p> <ul style="list-style-type: none"> ■ EHEDG Type EL certification (TNO report n. V3912). EHEDG accepted process connections are: Varivent® ■ 3-A® Authorization no. 1144 for the declaration of compliance with standard 74-03 ■ 3-A® accept the process connections, marked in the product structure of TR44 (→ 21) and TR45 (→ 23) |
| Other standards and guidelines | <ul style="list-style-type: none"> ■ IEC 60529: Degrees of protection by housing (IP-Code). ■ IEC 61010-1: Safety requirements for electrical measurement, control and laboratory instrumentation. ■ IEC 60751: Industrial platinum resistance thermometer ■ DIN43772: Protection tubes ■ EN 50014/18, DIN 47229: Terminal heads ■ IEC 61326-1: Electromagnetic compatibility (EMC requirements) |
| PED approval | The thermometer complies with paragraph 3.3 of the Pressure Equipment Directive (97/23/CE) and is not marked separately. |
| Material certification | The material certificate 3.1 (according to standard EN 10204) can be directly selected from the sales 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. |
| Test on protection tube | Protection tube pressure tests are carried out in accordance with the specifications in the DIN 43772 standard. With regards to protection tubes with tapered or reduced tips that do not comply with this standard these are tested using the pressure of corresponding straight protection tubes. Sensors certified for use in Ex Zones, are always tested to pressures according to the same criteria. Tests according to other specifications can be carried out on request. Dye penetration tests verify the absence of cracks on the protection tube welding. |
| Test report and calibration | <p>With regards to the tests and calibration, the "Inspection Report" consists of a compliance declaration for the essential points of the standard IEC 60751.</p> <p>The "Factory calibration" is carried out in an EA (European Accreditation) authorized laboratory of Endress+Hauser 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.</p> |

Ordering information

Product structure TR44

RTD thermometer TR44 with sanitary process connection and neck. Designed for use in food and pharma industry. No replaceable insert, in direct contact with process medium: fast response time. Wetted part built from same material.

| Process connection: | |
|--|--|
| BA | DN12/21.3 minclamp ISO2852, 3A |
| BB | DN25/38 ISO2852, clamp, 3A |
| BC | DN40/51 ISO2852, clamp, 3A |
| BF | 1+1½", ISO2852, clamp, 3A |
| BH | 2", ISO2852, clamp, 3A |
| BM | DN8/18 microclamp, 3A |
| CD | DN25 DIN11851, 3A |
| CE | DN32 DIN11851, 3A |
| CF | DN40 DIN11851, 3A |
| CG | DN50 DIN11851, 3A |
| CH | DN25 Aseptic DIN11864-1-A, 3A |
| CJ | DN40 Aseptic DIN11864-1-A, 3A |
| DA | Cylindrical 30x40 mm, 3A |
| DB | Spherical 30x40 mm, 3A |
| EA | Liquiphant-M G1", 3A |
| FA | DN32/125 Varivent D=68 mm, 3A |
| FB | DN25 Varivent D=50 mm, 3A |
| FC | DN10/15 Varivent D=31 mm, 3A |
| JD | DN25 SMS, 3A |
| NB | Ingold 25x50 (not 3A certified) |
| NC | Ingold 25x30 (not 3A certified) |
| ND | G½" metal-to-metal (not 3A certified) |
| NE | M12x1.5 metal-to-metal (not 3A certified) |
| Neck Length E; Diameter D: | |
| 5 | 82 mm; 15 mm |
| 8 | ... mm; 15 mm |
| 9 | mm, as specified |
| Immersion Length L: | |
| A | 50 mm |
| B | 90 mm |
| D | 160 mm |
| E | 220 mm |
| F | 120 mm |
| G | 30 mm |
| X | mm |
| Y | mm, as specified |
| Pipe Diameter; Material; Finishing: | |
| A | 6 mm; 316L; Ra ≤ 0.8 µm |
| B | 6 mm; 316L; Ra ≤ 0.4 µm |
| D | 6 mm; 316L; Ra ≤ 0.4 µm (electro-polished) |
| E | 8 mm; 316L; Ra ≤ 0.8 µm |
| F | 8 mm; 316L; Ra ≤ 0.4 µm |
| G | 8 mm; 316L; Ra ≤ 0.4 µm (electro-polished) |
| Tip Shape: | |
| R | Reduced, D=8 mm |
| S | Straight |
| Terminal type: | |
| 2 | Flying leads |
| 3 | Terminal block |
| RTD; wire; meas. range; class; validity: | |
| H | 1x Pt100 TF; 3; -50/200 °C; A: -50/200 °C |
| L | 2x Pt100 WW; 3; -50/200 °C; A: -50/200 °C |
| M | 1x Pt100 TF; 4; -50/200 °C; A: -50/200 °C |
| P | 1x Pt100 TF; 3; -50/200 °C; 1/3B: 0/150 °C |
| Q | 2x Pt100 WW; 3; -50/200 °C; 1/3B: 0/150 °C |
| R | 1x Pt100 TF; 4; -50/200 °C; 1/3B: 0/150 °C |

| | | | | | | | | | | Head; Cable Entry: | |
|--------------|--|--|--|--|--|--|--|--|--|---------------------------------|--|
| | | | | | | | | | | A | TA20A Alu, IP66/IP67; M20 |
| | | | | | | | | | | B | TA20B PA white, IP55; M20 (x1.5) |
| | | | | | | | | | | E | TA21E Alu, screw cap IP65; M20 |
| | | | | | | | | | | G | TA30A Alu, IP66/68; M20 |
| | | | | | | | | | | H | TA30A Alu, IP66/67; M12 plug PA |
| | | | | | | | | | | I | TA30D Alu, high cover; G½" w/o gland |
| | | | | | | | | | | J | TA20J 316L, IP66/IP67; M20 |
| | | | | | | | | | | K | TA20J 316L, + display, IP66/IP67; M20 |
| | | | | | | | | | | L | TA30A Alu, IP66/IP67; 7/8" plug FF |
| | | | | | | | | | | M | TA20J 316L, IP66/IP67; M12 plug PA |
| | | | | | | | | | | N | TA30A Alu + display; IP66/IP68; M20 |
| | | | | | | | | | | O | TA30A Alu + display; IP66/IP67; M12 plug PA |
| | | | | | | | | | | P | TA30A Alu + display; IP66/IP67; 7/8" plug FF |
| | | | | | | | | | | Q | TA30A Alu + display; G½" w/o gland |
| | | | | | | | | | | R | TA20R 316L screw cap IP66/IP67; M20 |
| | | | | | | | | | | S | TA20R 316L screw cap IP66; M12 plug |
| | | | | | | | | | | T | TA30D Alu, high cover, IP66/68; M20 |
| | | | | | | | | | | U | TA30D Alu, IP66/67; M12 plug PA |
| | | | | | | | | | | V | TA30D Alu, IP66/67; M12 plug FF |
| | | | | | | | | | | 1 | TA30A Alu; G½" w/o gland |
| | | | | | | | | | | 7 | TA20B PA black, IP65; M20 |
| | | | | | | | | | | Head Transmitter; Range: | |
| | | | | | | | | | | A | TMT84-B1 PA ATEX |
| | | | | | | | | | | B | TMT84 PA |
| | | | | | | | | | | D | TMT85 FF |
| | | | | | | | | | | E | TMT85-B1 FF ATEX |
| | | | | | | | | | | P | TMT181-A (PCP); temp. range to be specified |
| | | | | | | | | | | Q | TMT181-B (PCP) ATEX; temp. range to be specified |
| | | | | | | | | | | R | TMT182-A (HART); temp. range to be specified |
| | | | | | | | | | | T | TMT182-B (HART) ATEX; temp. range to be specified |
| | | | | | | | | | | 0 | Not needed |
| | | | | | | | | | | 2 | TMT180-A21 fix; 0.2 K, temp. range to be specified, Span limit -200/650 °C |
| | | | | | | | | | | 3 | TMT180-A22 fix; 0.1 K, temp. range to be specified, Span limit -50/250 °C |
| | | | | | | | | | | 4 | TMT180-A11 PCP; 0.2 K, temp. range to be specified, Span limit -200/650 °C |
| | | | | | | | | | | 5 | TMT180-A12 PCP; 0.1 K, temp. range to be specified, Span limit -50/250 °C |
| | | | | | | | | | | Material Certificate: | |
| | | | | | | | | | | 0 | Not needed |
| | | | | | | | | | | C | EN10204-3.1 Material, shortform |
| | | | | | | | | | | E | EN10204-3.1 Material + roughness, shortform |
| | | | | | | | | | | G | EN10204-3.1 Material |
| | | | | | | | | | | H | EN10204-3.1 Material + roughness |
| | | | | | | | | | | J | EN10204-3.1 Material + roughness + ferrit content ≤ 3 % |
| | | | | | | | | | | L | EN10204-3.1 Material + + ferrit content ≤ 3 % |
| | | | | | | | | | | Test/Calibration: | |
| | | | | | | | | | | A | 0, 100 °C, RTD-Signal |
| | | | | | | | | | | B | 0, 100 °C, RTD-Signal, 4-20 mA/loop |
| | | | | | | | | | | C | 0, 100 °C, RTD-Signal, 2 Sensors |
| | | | | | | | | | | E | 0, 100 °C, 150 °C, RTD-Signal |
| | | | | | | | | | | F | 0, 100 °C, 150 °C, RTD-Signal, 4-20 mA/loop |
| | | | | | | | | | | G | 0, 100 °C, 150 °C, RTD-Signal, 2 Sensors |
| | | | | | | | | | | 0 | Not needed |
| TR44- | | | | | | | | | | ← Order code (complete) | |

This ordering information can give an overview about the available order options. The Endress+Hauser sales organization can provide detailed ordering information and information on the order code.

Product structure TR45

RTD thermometer TR45 with sanitary process connection, neck and protection tube. Designed for use in food and pharma industry. Replaceable mineral insulated insert with Pt100.

| Process connection: | |
|--|--|
| BA | DN12/21.3 minclamp ISO2852, 3A |
| BB | DN25/38 ISO2852, clamp, 3A |
| BC | DN40/51 ISO2852, clamp, 3A |
| BF | 1+1½", ISO2852, clamp, 3A |
| BH | 2", ISO2852, clamp, 3A |
| CD | DN25 DIN11851, 3A |
| CE | DN32 DIN11851, 3A |
| CF | DN40 DIN11851, 3A |
| CG | DN50 DIN11851, 3A |
| CH | DN25 Aseptic DIN11864-1-A, 3A |
| CJ | DN40 Aseptic DIN11864-1-A, 3A |
| DA | Cylindrical 30x40 mm, 3A |
| DB | Spherical 30x40 mm, 3A |
| EA | Liquiphant-M G1", 3A |
| FA | DN32/125 Varivent D=68 mm, 3A |
| FB | DN25 Varivent D=50 mm, 3A |
| FC | DN10/15 Varivent D=31 mm, 3A |
| JD | DN25 SMS, 3A |
| NB | Ingold 25x50 (not 3A certified) |
| NC | Ingold 25x30 (not 3A certified) |
| ND | G1/2" metal-to-metal (not 3A certified) |
| Neck Length E; Diameter D: | |
| 5 | 85 mm; 15 mm |
| 8 | ... mm; 15 mm |
| 9 | mm, as specified |
| Immersion Length L: | |
| A | 50 mm |
| B | 90 mm |
| D | 160 mm |
| E | 220 mm |
| F | 120 mm |
| G | 30 mm |
| X | mm |
| Y | mm, as specified |
| Pipe Diameter; Material; Finishing: | |
| 1 | 9 mm; 316L; Ra ≤ 0.8 µm |
| 3 | 9 mm; 316L; Ra ≤ 0.4 µm |
| 4 | 9 mm; 316L; Ra ≤ 0.4 µm (electro-polished) |
| Tip Shape: | |
| P | Straight + thermoconductive paste |
| Q | Reduced L ≥ 30 mm + thermocond. Paste |
| R | Reduced L ≥ 30 mm |
| S | Straight |
| T | Tapered, L ≥ 65 mm |
| U | Tapered, L ≥ 65 mm + thermocond. Paste |
| Terminal type: | |
| 2 | Flying leads |
| 3 | Terminal block |
| 4 | HR fiber terminal block |
| RTD; wire; meas. range; class; validity: | |
| H | 1x Pt100 TF; 3; -50/400 °C; A: -50/250 °C |
| L | 2x Pt100 WW; 3; -50/400 °C; A: -50/250 °C |
| M | 1x Pt100 TF; -50/400 °C; A: -50/250 °C |
| P | 1x Pt100 TF; 3; -50/400 °C; 1/3B: 0/150 °C |
| Q | 2x Pt100 WW; 3; -50/400 °C; 1/3B: 0/150 °C |
| R | 1x Pt100 TF; 4; -50/400 °C; 1/3B: 0/150 °C |
| Head; Cable Entry: | |
| A | TA20A Alu, IP66/IP67; M20 |
| B | TA20B PA white, IP55; M20 (x1.5) |
| E | TA21E Alu, screw cap IP65; M20 |
| G | TA30A Alu, IP66/68; M20 |

| | | | | | | | | | | Head; Cable Entry: | |
|--------------|--|--|--|--|--|--|--|--|--|---------------------------------|--|
| | | | | | | | | | | H | TA30A Alu, IP66/67; M12 plug PA |
| | | | | | | | | | | I | TA30D Alu, high cover; G½" w/o gland |
| | | | | | | | | | | J | TA20J 316L, IP66/IP67; M20 |
| | | | | | | | | | | K | TA20J 316L, + display, IP66/IP67; M20 |
| | | | | | | | | | | L | TA30A Alu, IP66/IP67; 7/8" plug FF |
| | | | | | | | | | | M | TA20J 316L, IP66/IP67; M12 plug PA |
| | | | | | | | | | | N | TA30A Alu + display; IP66/IP68; M20 |
| | | | | | | | | | | O | TA30A Alu + display; IP66/IP67; M12 plug PA |
| | | | | | | | | | | P | TA30A Alu + display; IP66/IP67; 7/8" plug FF |
| | | | | | | | | | | Q | TA30A Alu + display; G½" w/o gland |
| | | | | | | | | | | R | TA20R 316L screw cap IP66/IP67; M20 |
| | | | | | | | | | | S | TA20R 316L screw cap IP66; M12 plug |
| | | | | | | | | | | T | TA30D Alu, high cover, IP66/68; M20 |
| | | | | | | | | | | U | TA30D Alu, IP66/67; M12 plug PA |
| | | | | | | | | | | V | TA30D Alu, IP66/67; M12 plug FF |
| | | | | | | | | | | 1 | TA30A Alu; G½" w/o gland |
| | | | | | | | | | | 7 | TA20B PA black, IP65; M20 |
| | | | | | | | | | | Head Transmitter; Range: | |
| | | | | | | | | | | B | TMT84 PA |
| | | | | | | | | | | D | TMT85 FF |
| | | | | | | | | | | G | TMT181 (PCP); temp. range to be specified |
| | | | | | | | | | | H | TMT182 (HART); temp. range to be specified |
| | | | | | | | | | | 0 | Not needed |
| | | | | | | | | | | 2 | TMT180-A21 fix; 0.2 K, temp. range to be specified, Span limit -200/650 °C |
| | | | | | | | | | | 3 | TMT180-A22 fix; 0.1 K, temp. range to be specified, Span limit -50/250 °C |
| | | | | | | | | | | 4 | TMT180-A11 PCP; 0.2 K, temp. range to be specified, Span limit -200/650 °C |
| | | | | | | | | | | 5 | TMT180-A12 PCP; 0.1 K, temp. range to be specified, Span limit -50/250 °C |
| | | | | | | | | | | Material Certificate: | |
| | | | | | | | | | | 0 | Not needed |
| | | | | | | | | | | C | EN10204-3.1 Material, shortform |
| | | | | | | | | | | E | EN10204-3.1 Material + roughness, shortform |
| | | | | | | | | | | G | EN10204-3.1 Material |
| | | | | | | | | | | H | EN10204-3.1 Material + roughness |
| | | | | | | | | | | J | EN10204-3.1 Material + roughness + ferrit content ≤ 3 % |
| | | | | | | | | | | L | EN10204-3.1 Material + + ferrit content ≤ 3 % |
| | | | | | | | | | | Test/Calibration: | |
| | | | | | | | | | | A | 0, 100 °C, RTD-Signal |
| | | | | | | | | | | B | 0, 100 °C, RTD-Signal, 4-20 mA/loop |
| | | | | | | | | | | C | 0, 100 °C, RTD-Signal, 2 Sensors |
| | | | | | | | | | | E | 0, 100 °C, 150 °C, RTD-Signal |
| | | | | | | | | | | F | 0, 100 °C, 150 °C, RTD-Signal, 4-20 mA/loop |
| | | | | | | | | | | G | 0, 100 °C, 150 °C, RTD-Signal, 2 Sensors |
| | | | | | | | | | | 0 | Not needed |
| | | | | | | | | | | Additional option: | |
| | | | | | | | | | | A | ATEX II 1 GD EEx ia IIC |
| | | | | | | | | | | E | ATEX II 1/2 GD EEx ia IIC |
| | | | | | | | | | | G | ATEX II 1 G EEx ia IIC |
| | | | | | | | | | | H | ATEX II 3 GD EEx nA II |
| | | | | | | | | | | K | TIIS Ex ia IIC T4 |
| | | | | | | | | | | L | TIIS Ex ia IIC T6 |
| | | | | | | | | | | 0 | Not needed |
| TR45- | | | | | | | | | | ← Order code (complete) | |

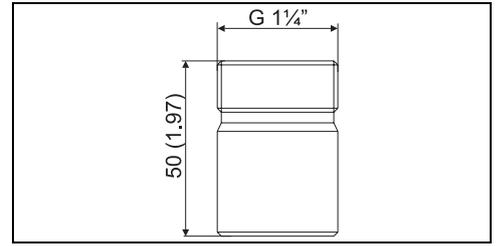
This ordering information can give an overview about the available order options. The Endress+Hauser sales organization can provide detailed ordering information and information on the order code.

Accessories

All dimensions in mm (inches).

Adapter for Ingold process connection

Welding boss
 Material of parts in contact with process: 316L/
 1.4435; weight: 0.32 kg (0.7 lb)
 Order no. 60017887

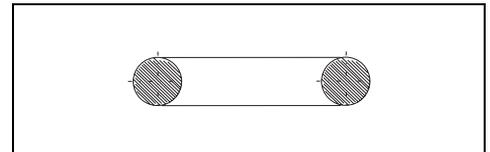


a0008956

O-ring sets

Ingold process connection:
 ■ Silicone O-ring as per FDA CFR 21
 ■ Max. temperature: 230 °C (446 °F)
 Order no. 60018911

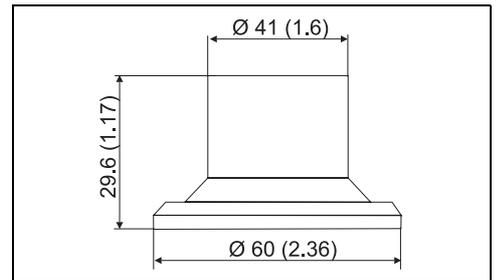
G1" Liquiphant type M process connection
 ■ Silicone O-ring as per FDA CFR 21, 3-A® tested
 ■ Max. temperature: 230 °C (446 °F)
 Order no. 60018912



a0008954

Adapter for Liquiphant process connection

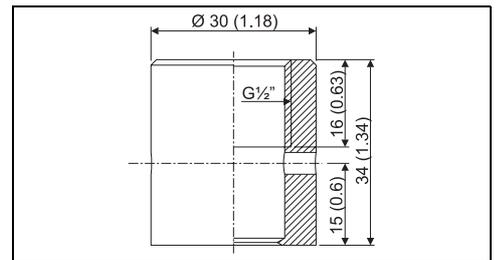
G1" Liquiphant type M welding boss
 Material of parts in contact with process: 316L/
 1.4435; weight: 0.13 kg (0.3 lb)
 Order no. 60017886
 3-A® certified



a0008957

Welding boss with sealing taper (metal-metal)

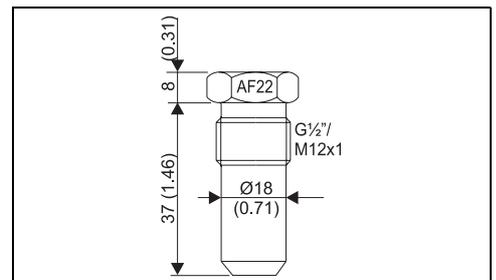
Welding boss
 Seal, metal-metal,
 Material of parts in contact with process: 316L
 Max. process pressure 16 bar (232 PSI)
 Order no. 60021387



a0006621

Blind plug

Blind plug for G $\frac{1}{2}$ " or M12x1 metal-to-metal weld-in adapter
 Material: SS 316L/1.4435
 Order no.:
 ■ 60022519 for G $\frac{1}{2}$ " thread
 ■ 60021194 for M12x1 thread



a0009213-en

Documentation

Technical Information:

- RTD Insert for Temperature Sensor Omniset TPR100 (TI268T/02/en)
 - Thermowell for temperature sensors omnigrad M TW 45 (TI252t/02/en)
 - Temperature head transmitter iTEMP® PCP TMT181 (TI070r/09/en)
 - Temperature head transmitter iTEMP® Pt TMT180 (TI088r/09/en)
 - Temperature head transmitter iTEMP® HART® TMT182 (TI078r/09/en)
 - Temperature head transmitter iTEMP® TMT84 PA (TI138r/09/en)
 - Temperature head transmitter iTEMP® TMT85 FF (TI134r/09/en)
-

Application example

Technical Information:

- Field display RIA261 (TI083r/09/en)
- Active barrier with power supply RN221N (TI073R/09/en)

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser 
People for Process Automation