



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
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Services



Solutions

## Technical Information

# Omnigrad M TR44, TR45

Hygienic, modular RTD assembly,  
thermowell 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 and reliability compared to directly wired sensors. Easy customizing by choosing one of the following outputs and communication 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 with EHEDG certification and hygienic design due to 3-A® guidelines
- High accuracy with Pt100 sensors according to IEC 60751 (class A or better)
- Type of protection for use in hazardous areas:  
Intrinsic Safety (Ex ia)  
Non-Sparking (Ex nA)



## Function and system design

### Measuring principle

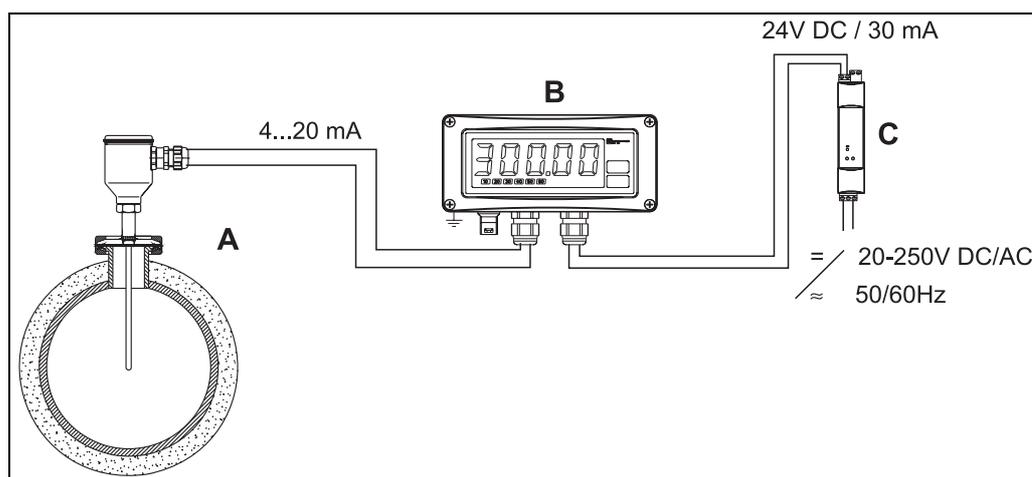
These resistance thermometers use a Pt100 temperature sensor according to IEC 60751. This temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100  $\Omega$  at 0 °C (32 °F) and a temperature coefficient  $\alpha = 0.003851 \text{ } ^\circ\text{C}^{-1}$ .

There are generally two different kinds of platinum resistance thermometers:

- **Wire wound (WW):** Here, a double coil of fine, high-purity platinum wire is located in a ceramic support. This is then sealed top and bottom with a ceramic protective layer. Such resistance thermometers not only facilitate very reproducible measurements but also offer good long-term stability of the resistance/temperature characteristic within temperature ranges up to 600 °C (1112 °F). This type of sensor is relatively large in size and it is comparatively sensitive to vibrations.
- **Thin film platinum resistance thermometers (TF):** A very thin, ultrapure platinum layer, approx. 1  $\mu\text{m}$  thick, is vaporized in a vacuum on a ceramic substrate and then structured photolithographically. The platinum conductor paths formed in this way create the measuring resistance. Additional covering and passivation layers are applied and reliably protect the thin platinum layer from contamination and oxidation even at high temperatures.

The primary advantages of thin-film temperature sensors over wire wound versions are their smaller sizes and better vibration resistance. A relatively low principle-based deviation of the resistance/temperature characteristic from the standard characteristic of IEC 60751 can frequently be observed among TF sensors at high temperatures. As a result, the tight limit values of tolerance category A as per IEC 60751 can only be observed with TF sensors at temperatures up to approx. 300 °C (572 °F). For this reason, thin-film sensors are generally only used for temperature measurements in ranges below 400 °C (932 °F).

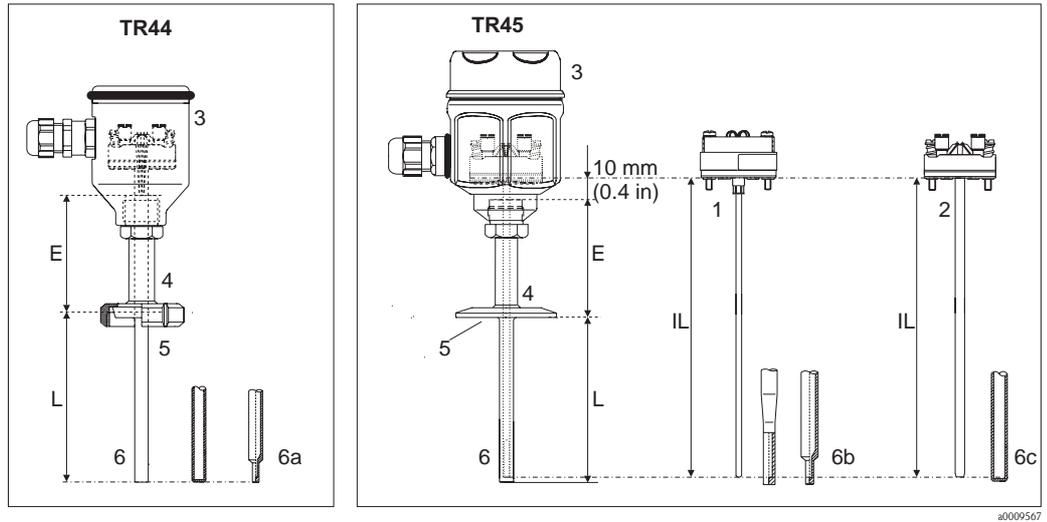
### Measuring system



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 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 (Ø 3 mm, 0.12 in) with mounted head transmitter, for example
- 2 Insert (Ø 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 Ø 3 mm (0.12 in)
  - 6c Straight for TR45 inserts with Ø 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® standard. The hygienic process connections are easy to clean and thus they are compliant with EHEDG. The thermometers can be installed in the process (pipe or tank) using a hygienic process connection. The most common process connections are available.

- Omnigrad M TR44 RTD assemblies consist of a terminal head and a protection armature with integrated insert. With a diameter of 6 mm (0.24 in) resp. 8 mm (0.31 in) reduced to 5.3 mm (0.21 in) at the tip, it is possible to realize best thermal 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 thermowell.

Measurement range

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

Performance characteristics

Operating conditions

Ambient temperature

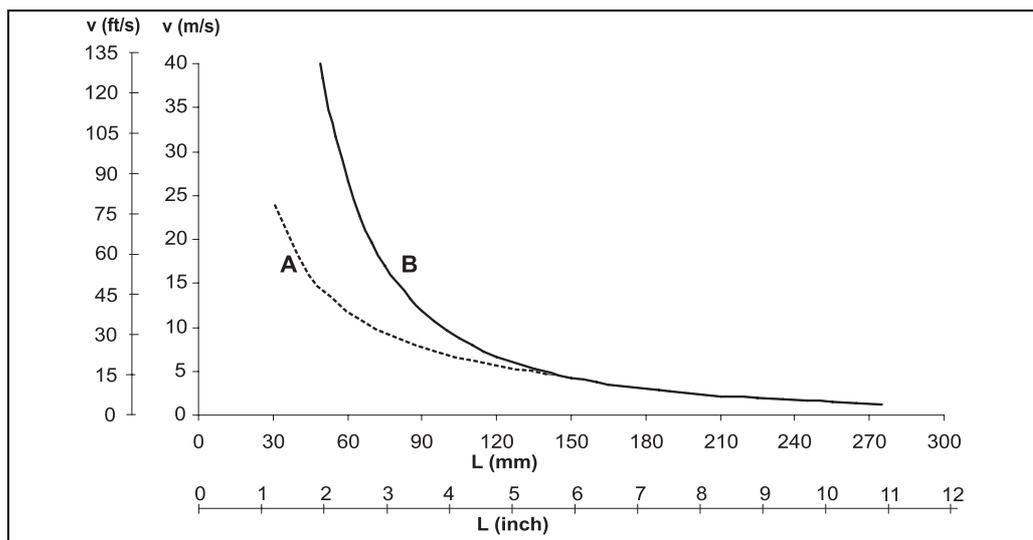
Terminal head	Temperature in °C (°F)
Without mounted head transmitter	Depends on the terminal head used and the cable gland or fieldbus connector, see 'Terminal heads' section, → 9
With mounted head transmitter	-40 to 85 °C (-40 to 185 °F)
With mounted head transmitter and display	-20 to 70 °C (-4 to 158 °F)

**Permitted process pressure at the protection armature**

The maximum process pressure is 40 bar (600 psi). It is limited further by the process connection in question. See → 13.

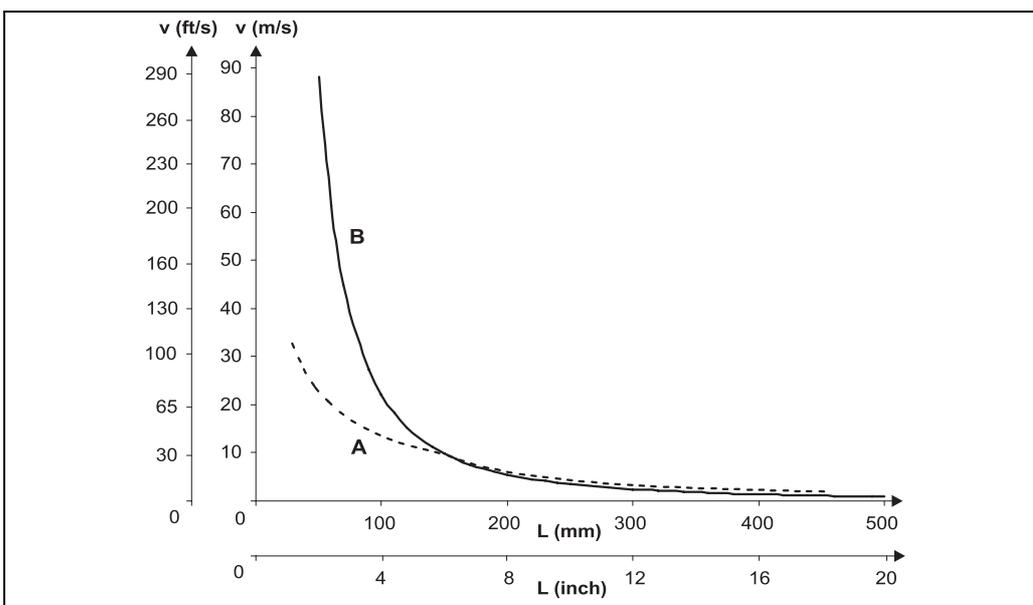
**Permitted flow velocity depending on the immersion length**

The highest flow velocity tolerated by the thermometer diminishes with increasing immersion length exposed to the stream of the fluid. In addition it is dependent on the diameter of the thermometer tip, on the kind of measuring medium, on the process temperature and on the process pressure. The following figures exemplify the maximum permitted flow velocities in water and superheated steam at a process pressure of **4 MPa (40 bar = 580 PSI)**.



Maximum flow velocity TR44

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



Maximum flow velocity TR45  
 - Tube diameter 9 x 1 mm (0.35 in) ———

- |   |   |   |                  |
|---|---|---|------------------|
| A | Medium water at T = 50 °C (122 °F)              | L | Immersion length |
| B | Medium superheated steam at T = 400 °C (752 °F) | 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
<b>RTD maximum error type TF - range: -50 to +400 °C</b>			
Cl. A	$\pm (0.15 + 0.002 \cdot  t ^{1.1})$	-50 °C to +250 °C <sup>2)</sup>	
C. AA, former 1/3 Cl. B	$\pm (0.1 + 0.0017 \cdot  t ^{1.1})$	0 °C to +150 °C	
Cl. B	$\pm (0.3 + 0.005 \cdot  t ^{1.1})$	-50 °C to +400 °C	

- 1) |t| = absolute value °C
- 2) For TR44: -50 °C to 200 °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 change; For immersion length L > 45 mm (1.77 in):

<b>Thermometer TR44 without thermowell</b>			
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)	$t_{50}$ $t_{90}$	$\leq 3$ s $\leq 7$ s	not available not available
6 mm (0.24 in)	$t_{50}$ $t_{90}$	not available not available	$\leq 4$ s $\leq 10$ s

<b>TR45 with thermowell</b>							
Diameter	Response time	Reduced tip $\varnothing$ 5.3 mm (0.2 in)		Tapered tip $\varnothing$ 6.6 mm (0.26 in)		Straight tip $\varnothing$ 9 mm (0.35 in)	
		A <sup>1)</sup>	B <sup>2)</sup>	A <sup>1)</sup>	B <sup>2)</sup>	A <sup>1)</sup>	B <sup>2)</sup>
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 thermally conductive paste
- 2) with thermally conductive paste

**Insulation resistance** Insulation resistance  $\geq 100 \text{ M}\Omega$  at ambient temperature.  
Insulation resistance between each terminal and the sheath is measured 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 temperature conductivity and flow velocity of the process. This self heating error is negligible when an Endress+Hauser iTEMP<sup>®</sup> temperature transmitter (very small measurement current) is connected.

**Calibration specifications** Endress+Hauser provides comparison temperature calibration from  $-50$  to  $+400 \text{ }^\circ\text{C}$  ( $-58$  to  $752 \text{ }^\circ\text{F}$ ) 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 (the complete thermometer is calibrated) TR45 (only the measurement instert is calibrated)	Minimum standard immersion length L in mm (inch)	
	without head transmitter	with head transmitter (thermometer without neck)
Temperature range		
$-80 \text{ }^\circ\text{C} < -40 \text{ }^\circ\text{C}$ ( $-110 \text{ }^\circ\text{F} < -40 \text{ }^\circ\text{F}$ )	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** Extension neck and thermowell  
The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load. The maximum operation temperatures are reduced considerably in some cases where abnormal conditions such as high mechanical load occur or in aggressive media.

Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	$650 \text{ }^\circ\text{C}$ ( $1200 \text{ }^\circ\text{F}$ ) <sup>1)</sup>	<ul style="list-style-type: none"> <li>■ Austenitic, stainless steel</li> <li>■ High corrosion resistance in general</li> <li>■ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration)</li> <li>■ Increased resistance to intergranular corrosion and pitting</li> <li>■ Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content</li> </ul>

1) Can be used to a limited extent up to  $800 \text{ }^\circ\text{C}$  ( $1472 \text{ }^\circ\text{F}$ ) for low compressive loads and in non-corrosive media. Please contact your Endress+Hauser sales team for further information.

### Transmitter specifications

	TMT180 PCP Pt100	TMT181 PCP Pt100, TC, $\Omega$ , mV	TMT182 HART <sup>®</sup> Pt100, TC, $\Omega$ , mV	TMT84 PA / TMT85 FF Pt100, TC, $\Omega$ , 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 a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP® transmitters can be configured quickly and easily at a PC. Endress+Hauser offers the ReadWin® 2000 configuration software for this purpose. This software can be downloaded free of charge at [www.readwin2000.com](http://www.readwin2000.com). More information can be found in the Technical Information (see "Documentation" section).

#### HART® TMT182 head transmitter

HART® communication is all about easy, reliable data access and getting additional information about the measurement point more inexpensively. iTEMP® transmitters integrate seamlessly into your existing control system and provide painless access to numerous diagnostic information. Configuration with a hand-held (Field Xpert SFX100 or DXR375) 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"> <li>■ Material: Housing (PC), Potting (PUR)</li> <li>■ Terminals: Cable up to max. max. ≤ 2.5 mm<sup>2</sup> / 16 AWG (secure screws) or with wire end ferrules</li> <li>■ Eyelets for easy connection of a HART®-handheld terminal with alligator clips</li> <li>■ Degree of protection NEMA 4 (see also type of terminal head)</li> </ul> Details see Technical Information (see chapter 'Documentation')

#### PROFIBUS® PA TMT84 head transmitter

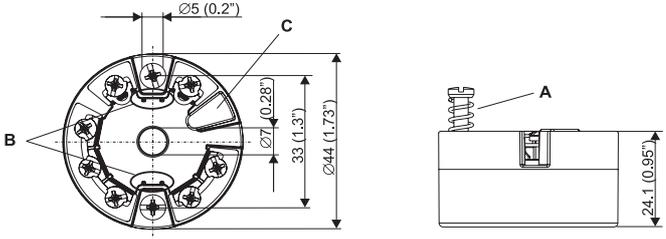
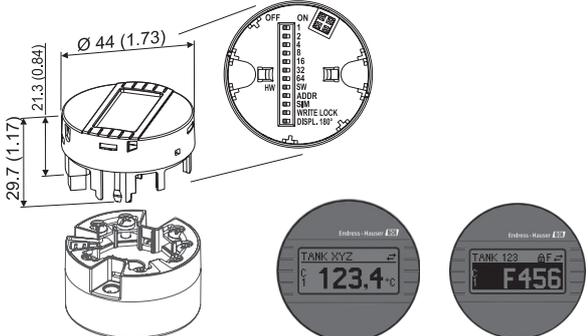
Universally programmable head transmitter with PROFIBUS® PA communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. 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').

#### 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.

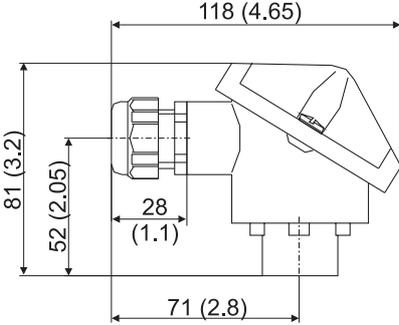
Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar-Van Dusen coefficients. Details see Technical Information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

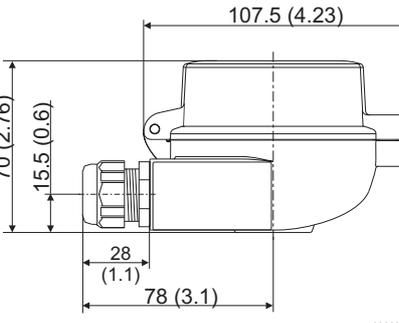
Type of transmitter	Specification
<p>iTEMP® TMT84 and TMT85</p>  <p style="text-align: right;">a0007301-en</p>	<ul style="list-style-type: none"> <li>■ Spring range <math>L \geq 5</math> mm (0.2"), see Pos. A</li> <li>■ Fixing elements for pluggable measured value display, see Pos. B</li> <li>■ Interface for contacting measured value display, see Pos. C</li> <li>■ Material (RoHS-compliant) Housing: PC Potting: PU</li> <li>■ Terminals: Screw terminals (cable up to max. <math>\leq 2.5</math> mm<sup>2</sup> / 16 AWG) or spring terminals (e. g. from 0.25 mm<sup>2</sup> to 0.75 mm<sup>2</sup> / 24 AWG to 18 AWG for flexible wires with wire-end ferrules with plastic ferrule)</li> <li>■ Degree of protection NEMA 4 (see also type of terminal head)</li> </ul> <p>Details see Technical Information (see chapter 'Documentation')</p>
<p>Pluggable display TID10 as option</p>  <p style="text-align: right;">a0009955</p>	<ul style="list-style-type: none"> <li>■ Displays the actual measured value and the measurement point identification</li> <li>■ Displays fault events in inverse color with channel ident and diagnostics code</li> <li>■ DIP-switches on the rear for hardware set-up, e. g. PROFIBUS® PA bus address</li> </ul> <p> <b>Note!</b> Display is only available with suitable terminal head with display window, e.g. TA30</p>

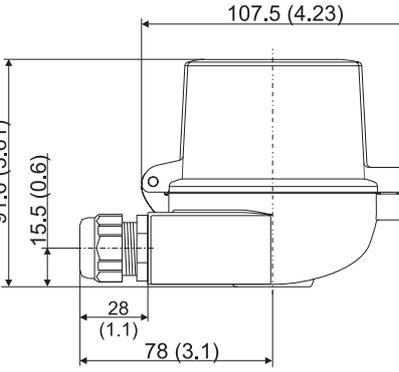
**Terminal heads**

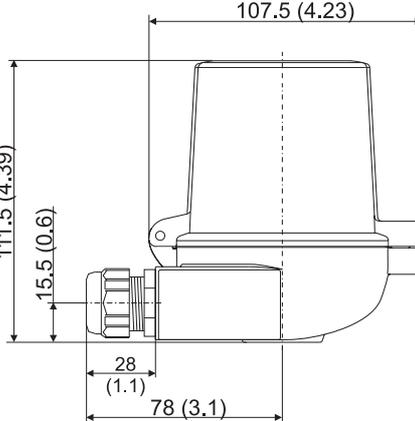
All terminal heads have internal geometry according to DIN 43729, form B and thermometer connection M24x1.5.

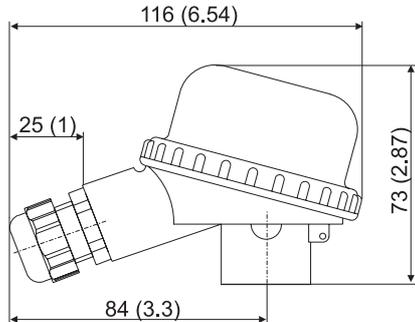
All dimensions in mm (inch). All cable gland dimensions in the graphics are based on SKINTOP ST M20x1.5

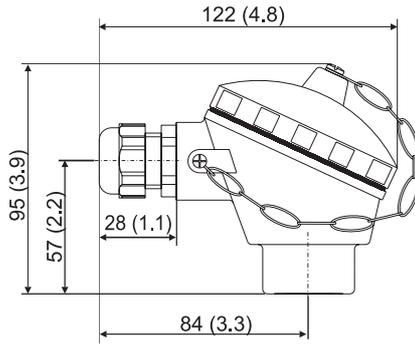
TA20A	Specification
 <p style="text-align: right; font-size: small;">a0008650</p>	<ul style="list-style-type: none"> <li>■ Degree of protection: IP66</li> <li>■ Max. temperature: 100 °C (212 °F)</li> <li>■ Material: aluminum alloy, rubber seal under the cover</li> <li>■ Cable entry: G ½", NPT ½" or M20x1.5; plug: M12x1 PA</li> <li>■ Protection armature connection: M24x1.5, NPT ½" or G ½"</li> <li>■ Head color: blue RAL 5012, epoxy resin coating</li> <li>■ Cap color: grey RAL 7035, epoxy resin coating</li> <li>■ Weight: 180 g (6.35 oz)</li> <li>■ 3-A® marked</li> </ul>

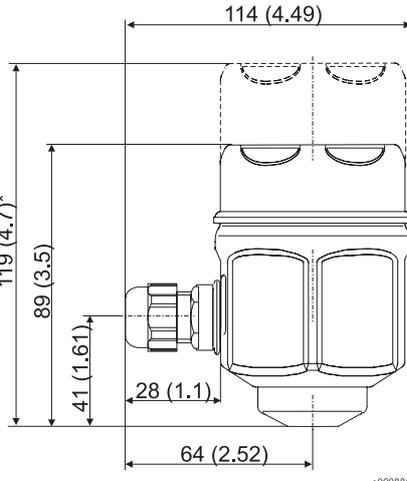
TA30A	Specification
 <p style="text-align: right; font-size: small;">a0009820</p>	<ul style="list-style-type: none"> <li>■ Degree of protection: IP66/68</li> <li>■ Max. temperature: 150 °C (300 °F)</li> <li>■ Material: aluminum, polyester powder coated</li> <li>■ Seals: silicone</li> <li>■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF</li> <li>■ Protection armature connection: M24x1.5</li> <li>■ Head color: blue RAL 5012</li> <li>■ Cap color: grey RAL 7035</li> <li>■ Weight: 330 g (11.64 oz)</li> </ul>

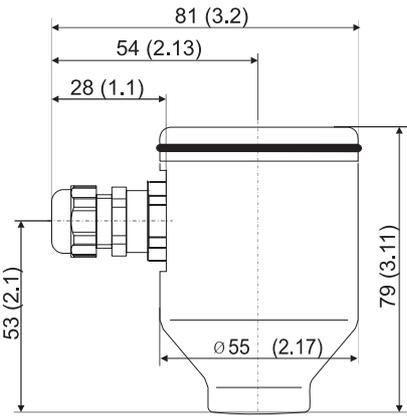
TA30A with display window	Specification
 <p style="text-align: right; font-size: small;">a0009821</p>	<ul style="list-style-type: none"> <li>■ Degree of protection: IP66/68</li> <li>■ Max. temperature: 150 °C (300 °F)</li> <li>■ Material: aluminum, polyester powder coated</li> <li>■ Seals: silicone</li> <li>■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF</li> <li>■ Protection armature connection: M24x1.5</li> <li>■ Head color: blue RAL 5012</li> <li>■ Cap color: grey RAL 7035</li> <li>■ Weight: 420 g (14.81 oz)</li> <li>■ Head transmitter optional with TID10 display</li> </ul>

TA30D	Specification
	<ul style="list-style-type: none"> <li>■ Degree of protection: IP66/68</li> <li>■ Max. temperature: 150 °C (300 °F)</li> <li>■ Material: aluminum, polyester powder coated</li> <li>Seals: silicone</li> <li>■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF</li> <li>■ Protection armature connection: M24x1.5</li> <li>■ Two head transmitters can be mounted. In the standard version, one transmitter is mounted in the terminal head cover and an additional terminal block is installed directly on the insert.</li> <li>■ Head color: blue RAL 5012</li> <li>■ Cap color: grey RAL 7035</li> <li>■ Weight: 390 g (13.75 oz)</li> </ul>

TA20B	Specification
	<ul style="list-style-type: none"> <li>■ Degree of protection: IP65</li> <li>■ Max. temperature: 80 °C (176 °F)</li> <li>■ Material: polyamide (PA)</li> <li>■ Cable entry: M20x1.5</li> <li>■ Head and cap color: black</li> <li>■ Weight: 80 g (2.82 oz)</li> <li>■ 3-A<sup>®</sup> marked</li> </ul>

TA21E	Specification
	<ul style="list-style-type: none"> <li>■ Degree of protection: IP65</li> <li>■ Max. temperature: 130 °C (266 °F) silicone, 100 °C (212 °F) rubber (observe max. permitted temperature of the cable gland!)</li> <li>■ Material: aluminum alloy with polyester or epoxy coating; rubber or silicone seal under the cover</li> <li>■ Cable entry: M20x1.5 or plug M12x1 PA</li> <li>■ Protection armature connection: M24x1.5, G ½" or NPT ½"</li> <li>■ Head color: blue RAL 5012</li> <li>■ Cap color: grey RAL 7035</li> <li>■ Weight: 300 g (10.58 oz)</li> <li>■ 3-A<sup>®</sup> marked</li> </ul>

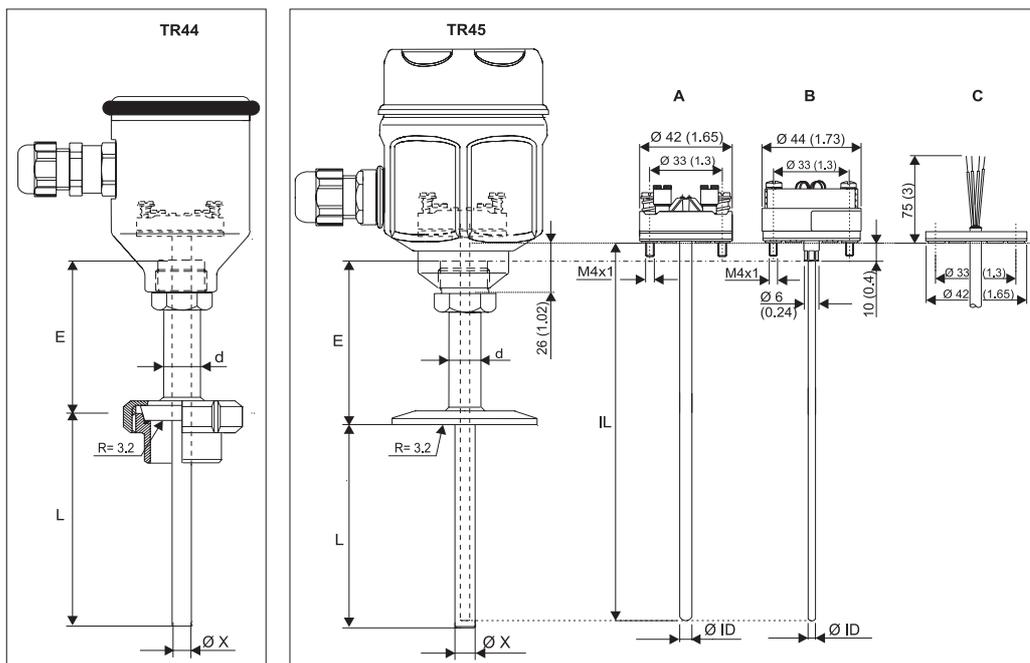
TA20J	Specification
 <p><i>* dimensions with optional display</i></p>	<ul style="list-style-type: none"> <li>■ Degree of protection: IP66/IP67</li> <li>■ Material: 316L (1.4404) stainless steel, rubber seal under the cover (hygienic design)</li> <li>■ 4 digits 7-segments LC display (loop powered with 4...20 mA transmitter)</li> <li>■ Cable entry: ½" NPT, M20x1.5 or plug M12x1 PA</li> <li>■ Protection armature connection: M24x1.5 or ½" NPT</li> <li>■ Head and cap color: stainless steel, polished</li> <li>■ Weight: 650 g (22.93 oz) with display</li> <li>■ Humidity: 25 to 95%, no condensation</li> <li>■ 3-A<sup>®</sup> marked</li> </ul> <p>The programming is executed through 3 keys at the bottom of the display.</p>

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

Maximum ambient temperatures for cable glands and fieldbus connectors	
Type	Temperature range
Cable gland ½" NPT, M20x1.5 (non Ex)	-40 to +100 °C (-40 to +212 °F)
Cable gland M20x1.5 (for dust ignition-proof area)	-20 to +95 °C (-4 to +203 °F)
Fieldbus connector (M12x1 PA, 7/8" FF)	-40 to +105 °C (-40 to +221 °F)

Assembly

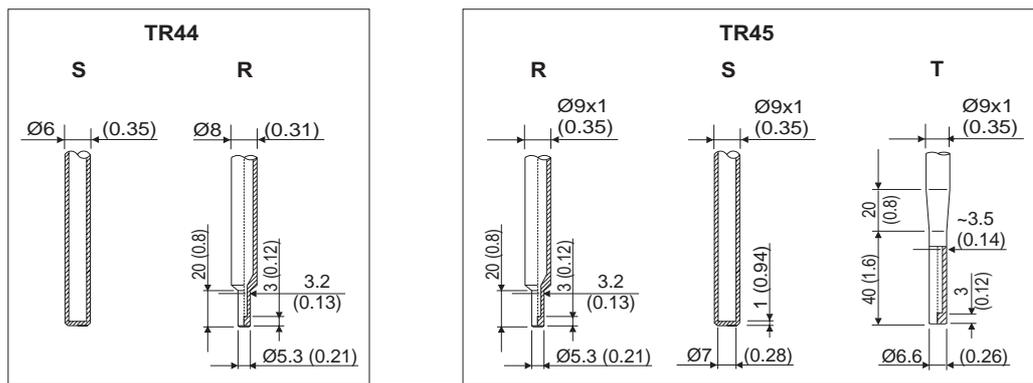
All dimensions in mm (inches).



Dimensions of the Omnigrad M TR44 and TR45

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

Tip shape



Available versions of thermowell 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 (milk pipe connection, 3-A<sup>®</sup> marked)**

1 Centering ring  
2 Gasket

Note!  
Only allowed with self centering gasket

All dimensions are in mm											
(*)	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	
						28	-				-
						-	-				36
32	36	50	10	32	-	35	-	40	CE	CE	
						34	-				-
						-	-				42
40	42	56	10	38	-	41	-	40	CF	CF	
						40	-				-
						-	-				54
50	54	68	11	50	-	-	54	25	CG	CG	
						52	-				-
						-	-				-

All dimensions are in mm										
(**)	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	
						41				25,4
						-				31,8
1 1/4"	36	50	10	29,3	48	-	40	CF	CF	
						-				38,1
						-				-
1 1/2"	42	56	11	35,1	61	-	25	CG	CG	
						-				50,8
						-				-

(\*) 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<sup>®</sup> marked)**

All dimensions are in mm										
(*)	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		40	CJ	CJ	
				41	-					
50	66,9	11	50	53	-	25	-	-		

All dimensions are in mm										
(**)	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			34,8	38,0				CJ	CJ	

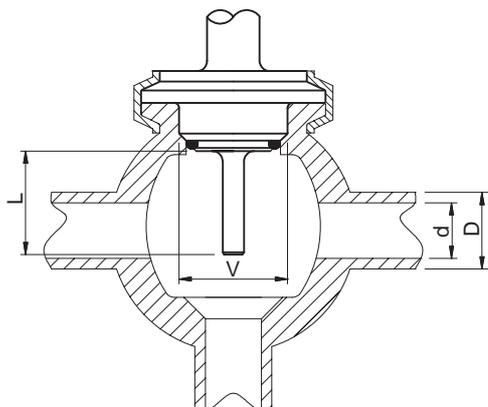
  

All dimensions are in mm										
(***)	All dimensions are in mm								(****)	
DN DIN EN ISO	B	C	d	D	PN max (bar)	TR44-	TR45-			
26,9	42,9	9	23,7	26,9	40	CH	CH			
42,4			38,4	42,4				CJ	CJ	

(\*) 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® marked)**

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			FB	FB	F
25	26	30			68	FA	FA
40	38	42	16				
50	50	54					
65	66	70	10				
80	81	85					
100	100	104					
125	125	129					

(**)							
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					

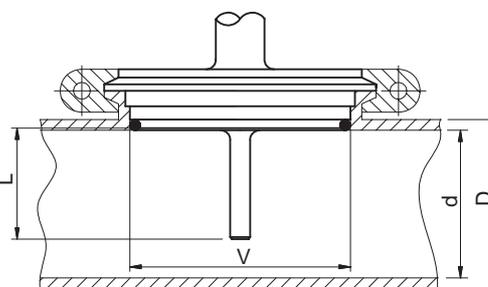
(***)							
DN inches	d	D	V	PN (bar)	TR44-	TR45-	Type
1"	22,2	25,4	50	25	FB	FB	F
1 1/2"	34,9	38,1					
2"	47,6	50,8					
2 1/2"	60,3	63,5	68	16	FA	FA	N
3"	73,0	76,1					
4"	97,6	101,6					

(****)							
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.

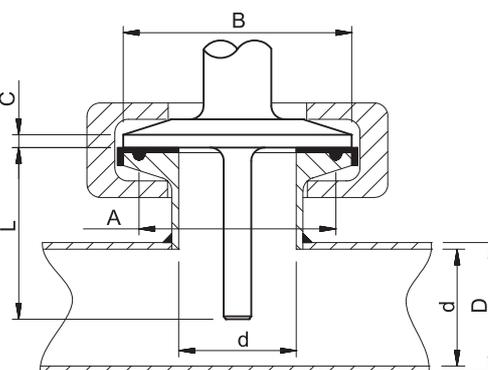
Type F (DN25, 1")

Type N (DN32...125, 1 1/4" ...6")



a0009564

**ISO 2852 clamp connection (3-A® marked)**

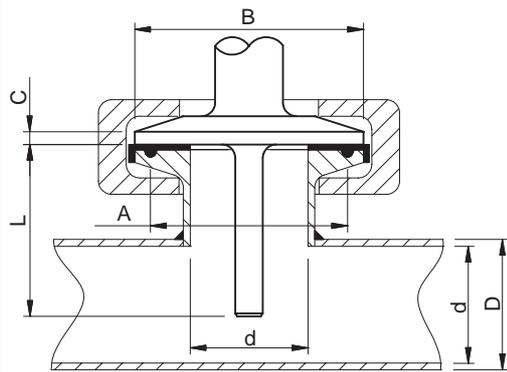


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DN ISO 2852	(*)						(****)					
	A	B	C	d	D Expanded type	D Welded type	PN max (bar)	TR44-	TR45-			
8÷18(**)	20,0	25,0	3,6	(**)	(**)	(**)	16	BM	-			
12(***)				12	16	-						
12,7(***)				12,7	16,7	-		BA	BA			
17,2(***)				17,2	21,2	-						
21,3(***)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

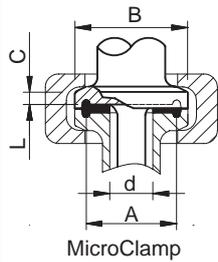
- (\*) Pipes according to ISO 2037 and BS 4825 Part1.
- (\*\*) MicroClamp (not included in std. ISO 2852); not standard pipes.
- (\*\*\*) MiniClamp.
- (\*\*\*\*) Depends on clamping ring type, at 121°C with suitable gasket.

**Tri-clamp® connection (3-A® marked)**



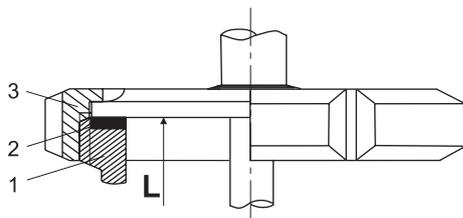
(*)							(**)		
DN	A	B	C	d	D std.	D strong	PNmax (bar)	TR44-	TR45-
1/2" (***)	20,0	25,0	3,6	9,5	-	12,7	-	BM	-
3/4" (***)				15,8	-	19,0	-		
1"	43,5	50,5	2,85	22,2	-	29,5	-	BF	BF
1 1/2"				34,9	-	42,6	-		
2"	56,5	64,0		47,6	-	55,7	-	BH	BH
					50,8	-	9±17,2		

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



a0009566

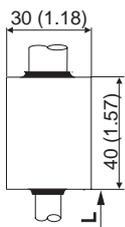
**SMS 1147/8 connection (3-A® marked)**



1 Counterpart connection  
 2 Gasket  
 3 Groove slip-on nut  
 Note!  
 Counterpart must fix gasket in position.

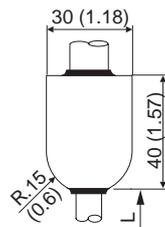
a0009568

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



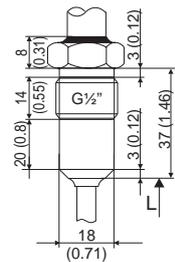
a0009569

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



a0009570

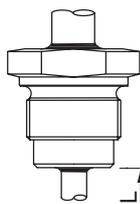
**Conical connection metal-to-metal G1/2" (not 3-A® marked)**



a0009571

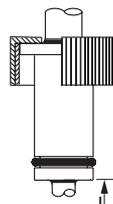
Caution!  
 Maximum process pressure P = 16 bar (232 psi)

**Liquiphant M G1" (3-A® marked)**



a0009572

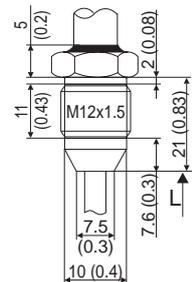
**Ingold (not 3-A® marked)**



25x50 mm  
 25x30 mm

a0009573

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



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<sup>®</sup> standards).

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



Note!

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, ...).

Thermometers	TR44 (6 mm/0.24 in probe, straight tip)		TR45 (reduced tip)	
	DN 10/15	DN 25	DN 10/15	DN 25
Varivent <sup>®</sup> 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 thermowell. 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:

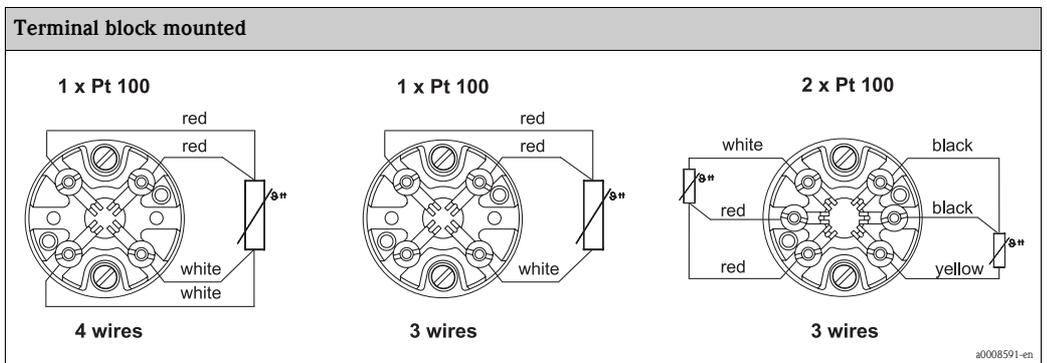
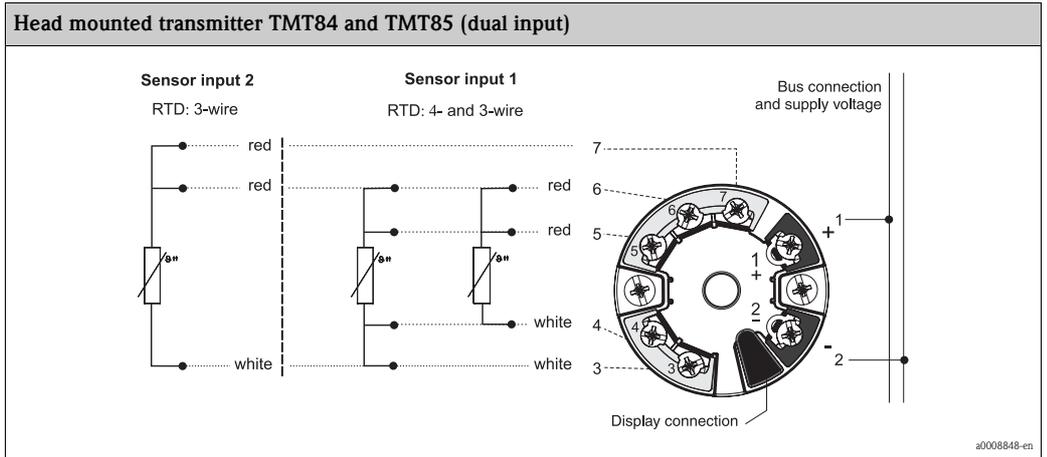
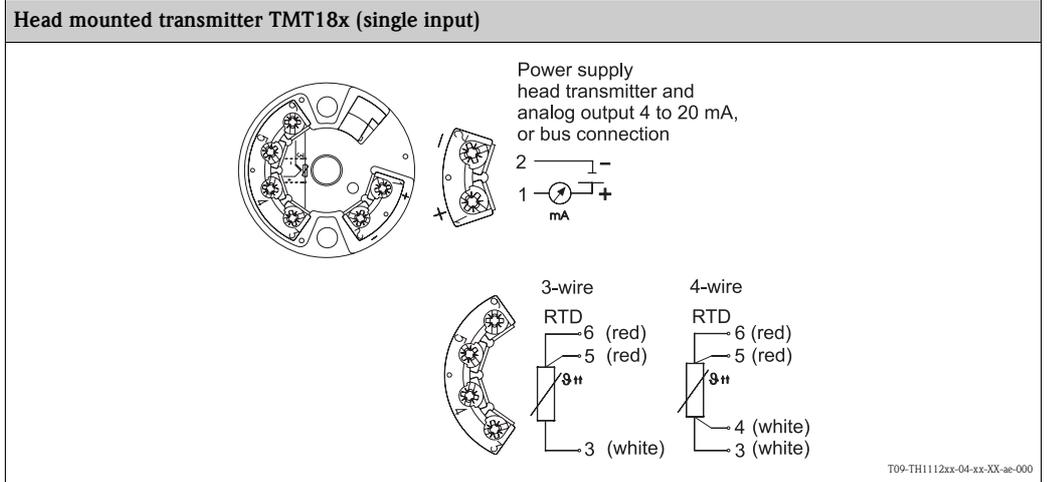
Thermowell tip shape	ID	Neck tube length E	Insertion length IL
Straight (version S)	6 mm (0.24 in)	Standard 85 mm (3.45 in) or as specified	IL = L + E + 10 mm (0.4 in)
Reduced/tapered on Ø 9 mm (0.35 in), version R/T	3 mm (0.12 in)		

# Wiring

Electrical connection cables must comply with 3-A® standard, must be smooth, corrosion resistant and cleanable.

## Wiring diagrams

Type of sensor connection



## Installation conditions

### Orientation

No restrictions, but self draining. If applicable leak detection hole must be at the lowest point.

### Installation instructions

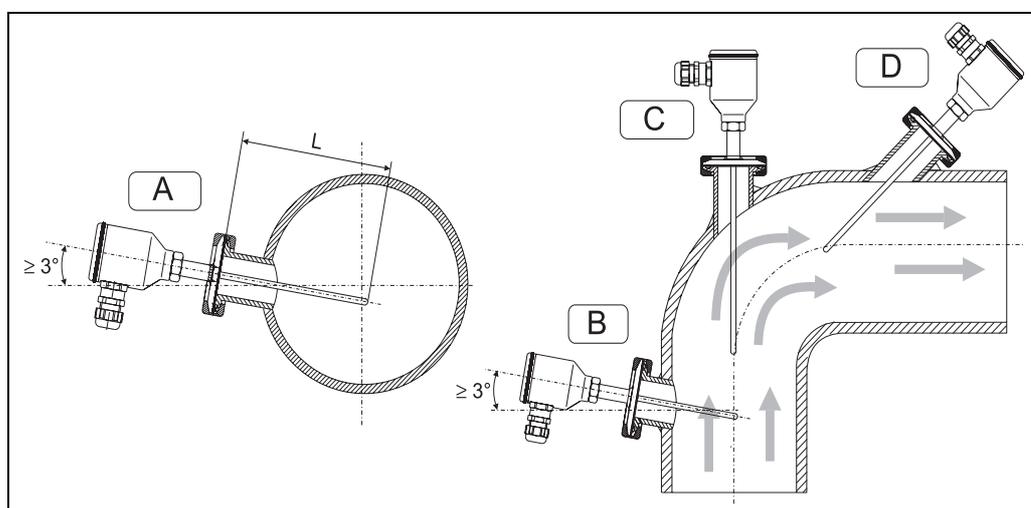
The immersion length of the thermometer influences the accuracy. If the immersion length is too small then errors in the measurement are caused by heat conduction via the process connection and the container wall. If installing into a pipe then the immersion length must be half of the pipe diameter, 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 should correspond to at least 8 times of the thermowell diameter. Example: Thermowell diameter 12 mm (0.47 in) x 8 = 96 mm (3.8 in). A standard immersion length of 120 mm (4.72 in) is recommended
- ATEX certification: Always take note of the installation regulations!



#### Note!

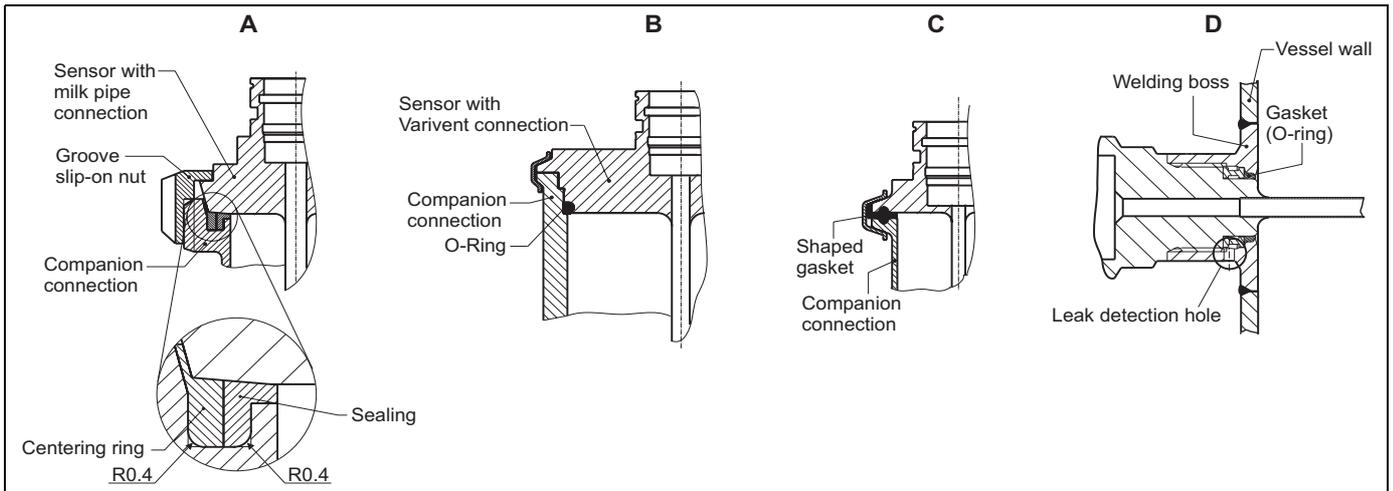
When operating in small nominal bore pipes it must be guaranteed that the thermowell tip is extending far enough into the process to reach out past the pipe center line (see Pos. A and B). A further solution could be an angled (tilted) installation (see Pos. C and D). When determining the immersion length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



#### General installation solutions

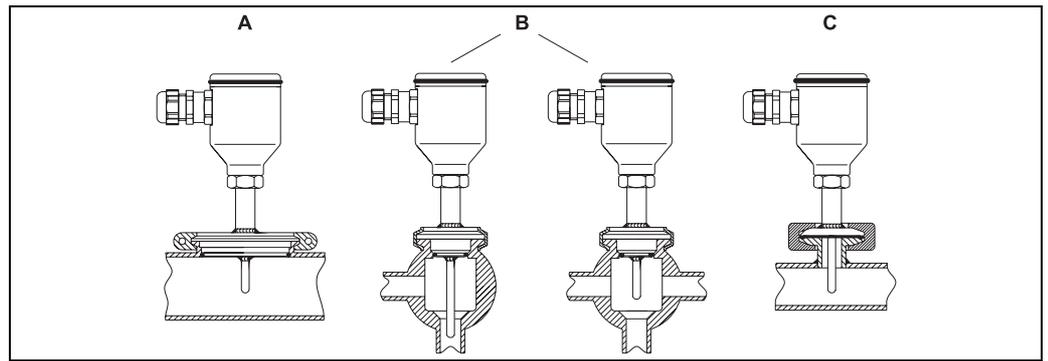
A - B: In pipes with a small cross section the sensor tip should reach or extend slightly past the center line of the pipe (=  $L$ ). Installation with minimal  $3^\circ$  inclination because of self draining.

C - D: Tilted installation.



Detailed installation instructions

- |   |  |
|---|--|
| A Milk pipe connection as per DIN 11851 only in linkage EHEDG certified and self centering ring | C Clamp as per ISO 2852  |
| B Varivent® - process connection  | D Liquiphant-M G1" process connection, horizontal 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). 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

<b>CE Mark</b>	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.
<b>Hazardous area approvals</b>	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.
<b>Sanitary compatibility</b>	<ul style="list-style-type: none"> <li>■ EHEDG Type EL certification (TNO report n. V3912). EHEDG accepted process connections are: Varivent®</li> <li>■ 3-A® Authorization no. 1144 for the declaration of compliance with standard 74-03</li> <li>■ 3-A® accept the process connections, marked in the product structure of TR44 (→ 21) and TR45 (→ 23)</li> </ul>
<b>Other standards and guidelines</b>	<ul style="list-style-type: none"> <li>■ IEC 60529: Degrees of protection by housing (IP-Code).</li> <li>■ IEC 61010-1: Safety requirements for electrical measurement, control and laboratory instrumentation.</li> <li>■ IEC 60751: Industrial platinum resistance thermometer</li> <li>■ DIN43772: Thermowells</li> <li>■ EN 50014/18, DIN 47229: Terminal heads</li> <li>■ IEC 61326-1: Electromagnetic compatibility (EMC requirements)</li> </ul>
<b>PED approval</b>	The thermometer complies with paragraph 3.3 of the Pressure Equipment Directive (97/23/CE) and is not marked separately.
<b>Material certification</b>	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.
<b>Test on thermowells</b>	Thermowell pressure tests are carried out in accordance with the specifications in the DIN 43772 standard. With regards to thermowells with tapered or reduced tips that do not comply with this standard these are tested using the pressure of corresponding straight thermowells. 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 thermowell welding.
<b>Test report and calibration</b>	<p>For the tests and calibration, the "Acceptance report" comprises a declaration of conformity with the primary points as per IEC 60751.</p> <p>The "Factory calibration" is carried out according to an internal procedure in a laboratory of Endress+Hauser accredited by the European Accreditation Organization (EA) to ISO/IEC 17025. A calibration which is performed according to EA guidelines (SIT or DKD calibration) may be requested separately. The calibration is performed on the replaceable insert of the thermometer. In the case of thermometers without a replaceable insert, the entire thermometer - from the process connection to the tip of the thermometer - is calibrated.</p>

## Ordering information

### Product structure TR44

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

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



**Product structure TR45**

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

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

<b>Process connection:</b>	
<b>BA</b>	DN12/21.3 minclamp ISO2852, 3A
<b>BB</b>	DN25/38 ISO2852, clamp, 3A
<b>BC</b>	DN40/51 ISO2852, clamp, 3A
<b>BF</b>	1+1/2", ISO2852, clamp, 3A
<b>BH</b>	2", ISO2852, clamp, 3A
<b>BM</b>	DN8/18 microclamp, 3A
<b>CD</b>	DN25 DIN11851, 3A
<b>CE</b>	DN32 DIN11851, 3A
<b>CF</b>	DN40 DIN11851, 3A
<b>CG</b>	DN50 DIN11851, 3A
<b>CH</b>	DN25 Aseptic DIN11864-1-A, 3A
<b>CJ</b>	DN40 Aseptic DIN11864-1-A, 3A
<b>DA</b>	Cylindrical 30x40 mm, 3A
<b>DB</b>	Spherical 30x40 mm, 3A
<b>EA</b>	Liquiphant-M G1", 3A
<b>FA</b>	DN32/125 Varivent D=68 mm, 3A
<b>FB</b>	DN25 Varivent D=50 mm, 3A
<b>FC</b>	DN10/15 Varivent D=31 mm, 3A
<b>JD</b>	DN25 SMS, 3A
<b>NB</b>	Ingold 25x50 (not 3A marked)
<b>NC</b>	Ingold 25x30 (not 3A marked)
<b>ND</b>	G1/2" metal-to-metal (not 3A marked)
<b>Neck Length E; Diameter D:</b>	
<b>5</b>	85 mm; 15 mm
<b>8</b>	... mm; 15 mm
<b>9</b>	..... mm, as specified
<b>Immersion Length L:</b>	
<b>A</b>	50 mm
<b>B</b>	90 mm
<b>D</b>	160 mm
<b>E</b>	220 mm
<b>F</b>	120 mm
<b>G</b>	30 mm
<b>X</b>	..... mm
<b>Y</b>	..... mm, as specified
<b>Pipe Diameter; Material; Finishing:</b>	
<b>1</b>	9 mm; 316L; Ra ≤ 0.8 µm
<b>3</b>	9 mm; 316L; Ra ≤ 0.4 µm
<b>4</b>	9 mm; 316L; Ra ≤ 0.4 µm (electro-polished)
<b>Tip Shape:</b>	
<b>P</b>	Straight + thermally conductive paste
<b>Q</b>	Reduced L ≥ 30 mm + thermally conductive paste
<b>R</b>	Reduced, L ≥ 30 mm
<b>S</b>	Straight
<b>T</b>	Tapered, L ≥ 65 mm
<b>U</b>	Tapered, L ≥ 65 mm + thermally conductive paste
<b>Terminal type:</b>	
<b>2</b>	Flying leads
<b>3</b>	Terminal block
<b>4</b>	HR fiber terminal block
<b>RTD; wire; meas. range; class; validity:</b>	
<b>H</b>	1x Pt100 TF; 3; -50/400 °C; A: -50/250 °C
<b>L</b>	2x Pt100 WW; 3; -50/400 °C; A: -50/250 °C
<b>M</b>	1x Pt100 TF; -50/400 °C; A: -50/250 °C
<b>P</b>	1x Pt100 TF; 3; -50/400 °C; 1/3B: 0/150 °C
<b>Q</b>	2x Pt100 WW; 3; -50/400 °C; 1/3B: 0/150 °C
<b>R</b>	1x Pt100 TF; 4; -50/400 °C; 1/3B: 0/150 °C

										<b>Head; Cable Entry:</b>	
										<b>A</b>	TA20A Alu, IP66/IP67; M20
										<b>B</b>	TA20B PA white, IP55; M20 (x1.5)
										<b>E</b>	TA21E Alu, screw cap IP65; M20
										<b>G</b>	TA30A Alu, IP66/68; M20
										<b>H</b>	TA30A Alu, IP66/67; M12 plug PA
										<b>J</b>	TA20J 316L, IP66/IP67; M20
										<b>K</b>	TA20J 316L, + display, IP66/IP67; M20
										<b>L</b>	TA30A Alu, IP66/IP67; 7/8" plug FF
										<b>M</b>	TA20J 316L, IP66/IP67; M12 plug PA
										<b>N</b>	TA30A Alu + display; IP66/IP68; M20
										<b>O</b>	TA30A Alu + display; IP66/IP67; M12 plug PA
										<b>P</b>	TA30A Alu + display; IP66/IP67; 7/8" plug FF
										<b>Q</b>	TA30A Alu + display; G1/2" w/o gland
										<b>R</b>	TA20R 316L screw cap IP66/IP67; M20
										<b>S</b>	TA20R 316L screw cap IP66; M12 plug
										<b>T</b>	TA30D Alu, high cover, IP66/68; M20
										<b>U</b>	TA30D Alu, IP66/67; M12 plug PA
										<b>V</b>	TA30D Alu, IP66/67; M12 plug FF
										<b>7</b>	TA20B PA black, IP65; M20
										<b>Head Transmitter; Range:</b>	
										<b>B</b>	TMT84 PA
										<b>D</b>	TMT85 FF
										<b>G</b>	TMT181 (PCP); temp. range to be specified
										<b>H</b>	TMT182 (HART); temp. range to be specified
										<b>0</b>	Not needed
										<b>2</b>	TMT180-A21 fix; 0.2 K, temp. range to be specified, Span limit -200/650 °C
										<b>3</b>	TMT180-A22 fix; 0.1 K, temp. range to be specified, Span limit -50/250 °C
										<b>4</b>	TMT180-A11 PCP; 0.2 K, temp. range to be specified, Span limit -200/650 °C
										<b>5</b>	TMT180-A12 PCP; 0.1 K, temp. range to be specified, Span limit -50/250 °C
										<b>Material Certificate:</b>	
										<b>0</b>	Not needed
										<b>C</b>	EN10204-3.1 Material, shortform
										<b>E</b>	EN10204-3.1 Material + roughness, shortform
										<b>G</b>	EN10204-3.1 Material
										<b>H</b>	EN10204-3.1 Material + roughness
										<b>J</b>	EN10204-3.1 Material + roughness + ferrit content ≤ 3 %
										<b>L</b>	EN10204-3.1 Material + + ferrit content ≤ 3 %
										<b>Test/Calibration:</b>	
										<b>A</b>	0, 100 °C, RTD-Signal
										<b>B</b>	0, 100 °C, RTD-Signal, 4-20 mA/loop
										<b>C</b>	0, 100 °C, RTD-Signal, 2 Sensors
										<b>E</b>	0, 100 °C, 150 °C, RTD-Signal
										<b>F</b>	0, 100 °C, 150 °C, RTD-Signal, 4-20 mA/loop
										<b>G</b>	0, 100 °C, 150 °C, RTD-Signal, 2 Sensors
										<b>0</b>	Not needed
										<b>Additional option:</b>	
										<b>A</b>	ATEX II 1 GD EEx ia IIC
										<b>E</b>	ATEX II 1/2 GD EEx ia IIC
										<b>G</b>	ATEX II 1 G EEx ia IIC
										<b>H</b>	ATEX II 3 GD EEx nA II
										<b>K</b>	TIIS Ex ia IIC T4
										<b>L</b>	TIIS Ex ia IIC T6
										<b>0</b>	Not needed
<b>TR45-</b>										← <b>Order code (complete)</b>	



Note!

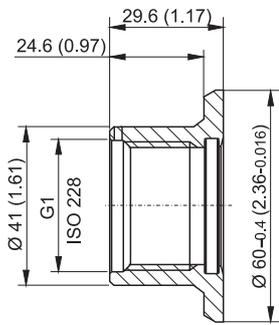
For the option 'connection type: 2 → free wire', in conjunction with the TA30D terminal head the transmitter is mounted directly without an additional terminal block.

## Accessories

All dimensions in mm (inches).

### Adapter for Liquiphant process connection

Welding boss G1", d=60 with flange for flush-mounted installation with sealing surface.

Dimensions	Version	Order number
 <ul style="list-style-type: none"> <li>■ max. 25 bar (363 psi) / max. 150 °C (302 °F)</li> <li>■ max. 40 bar (580 psi) / max. 100 °C (212 °F)</li> </ul>	AISI 316L (1.4435)	52001051
	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52011896
	Silicone O-ring, Ø 28.17 x 3.53 (1.11 x 0.14 inch) Material: VMQ70, FDA	52014472 (5 pieces)
	Sensor dummy for welding the welding boss	MVT2L0691
	FDA approved materials according to 21 CFR Part 177.1550/2600; EHEDG, 3-A® marked	
	<b>Alternative seals Ø 28.17 x 3.53 (1.11 x 0.14 inch)</b>	<b>Order number</b>
	Material: EPDM70, FDA	MVT2L0920
	Material: Viton665, FDA	MVT2L0705 (5 pieces)
	Material: Viton971, V, FDA	MVT2L1682
	Material: Kalrez comp. 4079	MVT2L0567
Material: Silicone, VMQ23-70, FDA, USP Class VI	71086102 (3 pieces)	

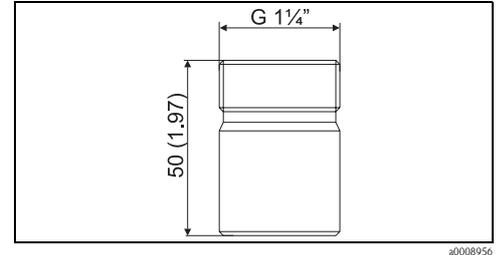
### Adapter for Ingold process connection

Welding boss

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

O-ring sets

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



### Welding boss with sealing taper (metal-metal)

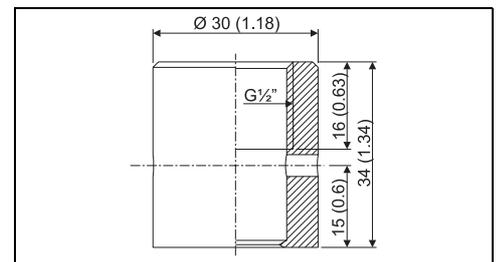
Welding boss for G½" thread

Seal, metal-metal,

Material of parts in contact with process: 316L/1.4435

Max. process pressure 16 bar (232 PSI)

Order no. 60021387



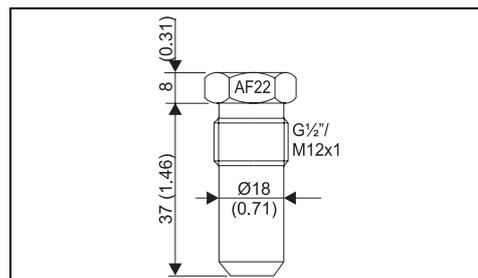
**Blind plug**

Blind plug for G½" or M12x1 metal-to-metal weld-in adapter

Material: SS 316L/1.4435

Order no.:

- 60022519 for G½" thread
- 60021194 for M12x1 thread

**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)



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