

Thermowell for Temperature Sensor *omnigrad M TW 45*

Medium duty, built from pipe
Hygienic design
Spare part of TR 45 sensor



TW 45 is a protection well for thermometers, employed in the temperature sensor TR 45. The thermowell omnigrad M type TW 45 is especially designed for hygienic applications (food, pharmaceutical and fine chemicals industry).

Features and benefits

- 3-A[®] and EHEDG certification
- SS 316L/1.4435 for "wetted" parts (BN 2 compliance on request)
- Most common hygienic process connections as standard; other on request
- Customized immersion length
- Tapered or reduced tip for fast response time
- Surface finishing down to Ra < 0.4 µm, with or without electropolishing
- Material certification (3.1.B, ...)
- Ferrite content determination



Endress + Hauser

The Power of Know How



Areas of application

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

Function and system design

Equipment architecture

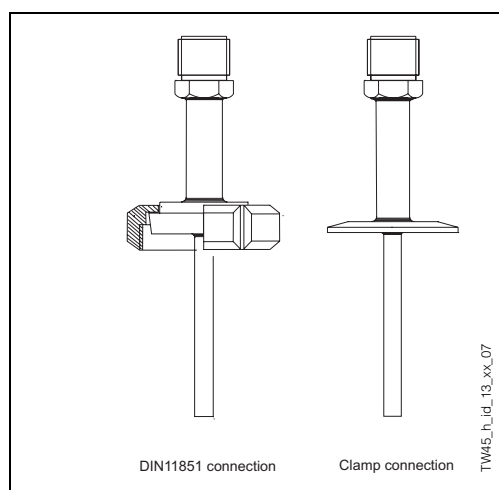


Fig. 1: TW 45 with different process connections

The thermowell (TW 45) is obtained from a 9 mm diameter pipe. The final (sensing) part can be straight, tapered, (that is with diameter smoothly decreased by means of a swaging procedure), or reduced (stepped). Omnigrad M TW 45 can be mounted on the wall of pipes or vessels. The thermowell TW 45 can be installed on the plant (pipe or vessel) by means of a hygienic process connection, which can be chosen among the most common types (see section "System components"). The TW 45 is built to 3-A[®] and EHEDG design criteria, which allow the thermowell to withstand any stress caused by CIP (Cleaning In Place) and SIP (Sterilization In Place) processes.

Material

Wetted parts in SS 316L/1.4435.

Weight

From 0.5 to 1 kg for standard options.

Performance

Operating conditions

Maximum process pressure

- 5 MPa (50 bar) at 20°C
- 3.3 MPa (33 bar) at 250°C
- 2.4 MPa (24 bar) at 400°C

Lower maximum pressures can be due to the process connection (i.e. clamp, ...).

Maximum flow velocity

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

Installation

The counterparts for the process connections and the respective gaskets or sealing rings, are generally not supplied with the thermowell, and are considered to be the customer's responsibility (EHEDG and 3-A[®] requirements must be fulfilled).

The only exception are the G1" and the Ingold connections, for which thermowell with the adaptor to be welded on the plant can be supplied.

Furthermore the Ingold connection and the G1" Liquiphant M type counterpart are supplied with the required sealing o-rings. As a general rule, the sensors should be installed in such a way that does not adversely affect their cleanability.

The immersion length may affect the accuracy of the sensors. To avoid this source of inaccuracy, the immersion length (L) should be, if possible, at least 80 mm. In small diameter pipes, the axis line of the duct must be reached, and even slightly exceeded, by the tip of the probe (see figure 3).

Another solution could be a tilted installation (see figure 2).

Attention should be paid in the choice of the measurement point in case of two-phase flows, which may cause fluctuations in the detected temperature value.

For installation of the sensors in small pipes, suitable solutions are shown in figure 3.

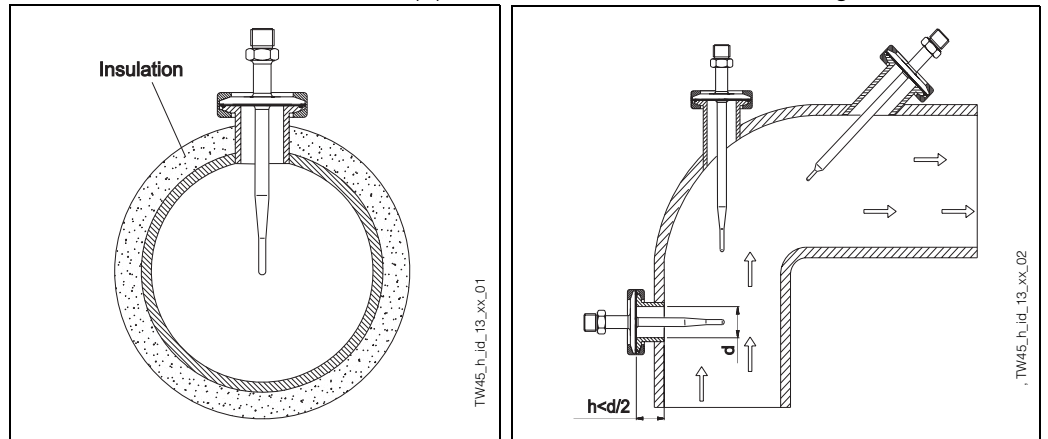


Fig. 2: General installation solutions

In hygienic applications, a good, strict, installation rule consists in not to leave any dead spaces along the flow of the process fluid. The required flush-mounting can be achieved by the connections Varivent®, G1" Liquiphant M type (+ purpose built adaptor) and Ingold (+ purpose built adaptor). The clamp flanges can also partly fulfil this requirement, if the Tri-Clamp® components 7IMPS or TL7IWWMS (Instrument Tees) are used.

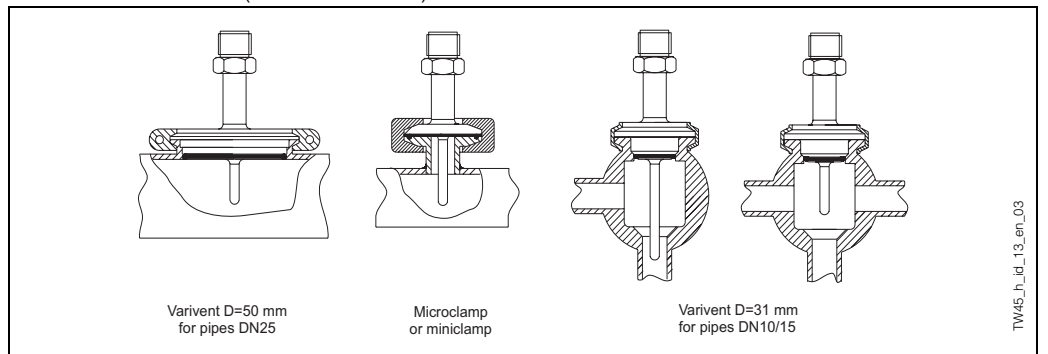


Fig. 3: Installation solutions in small pipes

For other connection arrangements, the diagram illustrated in figure 2 should be followed [$h \leq d/2$]. For weld-in connections, care should be taken by the user in the execution of the welding on the process side (suitable weld material, welding radius > 3 mm, absence of pits, folds, crevices, ...).

The use of purely threaded and metal-to-metal joints is not recommended by some hygienic design standards (i.e. 3-A® Standard 74-01 and Document 8 from EHEDG respectively). This is the reason why E+H Temperature division doesn't suggest those solutions in "sanitary" applications. Moreover often metal-to-metal couplings can only be used effectively once

Regarding corrosion, the basic material of the wetted parts (SS 316L/1.4435) is capable to tolerate common corrosive media up to high temperatures. The gaskets supplied with the Ingold process connection and with the G1" Liquiphant M type weld-in adaptor, besides CIP and SIP-proof, are resistant to a wide variety of aggressive substances. For information regarding any particular applications, please contact the E+H Service Department.

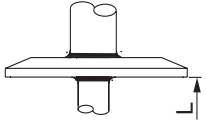
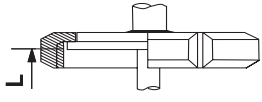
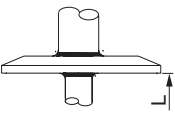
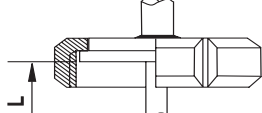
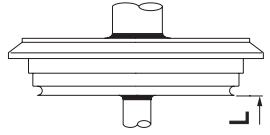
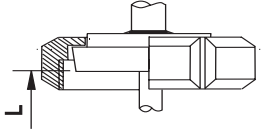
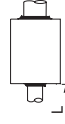
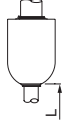
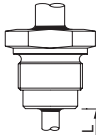


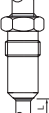
System components

Extension neck

Manufactured in stainless steel, the extension neck (part between the process connection and the housing) is made up of a tube with a standard diameter of 15 mm and is 82 mm in length. For the Ingold process connection, the 82 mm neck is not sufficient and a greater length (at least 100 mm) must be specified by the client through the "9" digit in the product order code. The upper connection of the neck permits adjustments to the orientation of the sensor head.

Process connection

It can be chosen among the types:

| | |
|---|--|
| ISO 2852 Clamp  CLAMP_h_gd_09_xx_01 | SMS 1147/8  SMS_h_gd_09_xx_02 |
| Tri-Clamp®  CLAMP_h_gd_09_xx_01 | DIN11864-1-A  D11864_h_gd_09_xx_02 |
| Varivent®  VARIVENT_h_gd_09_xx_01 | DIN 11851  D11851_h_gd_09_xx_01 |
| Weld-in cylindrical  WELD_h_gd_09_xx_02 | Weld-in spherical  WELD_h_gd_09_xx_03 |
| G1" Liquiphant M  LIQUIF_h_gd_09_xx_01 | Ingold  GOLD_h_gd_09_xx_01 |
| Conical connection metal-to-metal M12  M12_h_gd_09_xx_01 | Conical connection metal-to-metal G"1/4  G1_4_h_gd_09_xx_01 |

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 between the lower surface of the connection and the sensor stem (according to EHEDG and 3-A® standards).

The Ingold connection is supplied with the sealing o-ring mounted. The silicone material from which the o-ring seal is made complies with FDA CFR Title 21, § 177.2600 (max temperature 230°C). Please refer to paragraph on "Accessories" for information regarding availability of welding adaptors.

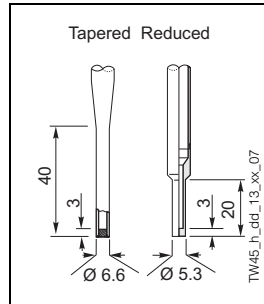
The Varivent® connections must be used with dedicated Tuchenhausen® in-line components or tank adaptors for Varivent® flanges with small nominal diameter. Maximum immersion lengths for usual applications are listed in the following table (also refer to figure 3).

| | TW 45 (reduced tip) | |
|--------------------------------|-----------------------------|------------------------|
| Varivent® nominal diameter | DN 10/15 | DN 25 |
| Suggested immersion length (L) | 17 ÷ 30 mm (special option) | 17 mm (special option) |

Please be aware that in the past the Varivent® connection DN 25 has been used also for pipes with nominal diameter DN 32.

Well

The immersion length is available in some standard values, or it can be chosen "customized" within a range (please see the product structure in the last pages of this document). For special versions of TR 45, where the immersion is shorter than 30 mm, the diameter of the thermowell, as in the reduced tip, should be 5.3 mm.



The starting material for the wetted parts can be supplied in compliance of Basler Norm 2 (BN2), which imposes a limited ferrite content and consequently enhances corrosion resistance, on request. In some sensor configurations, the compliance with the requirements of BN2 can also be assured after the welding and machining operations, that is in the finished product.

The surface roughness (Ra) of the wetted parts is supplied at a 0.4 µm level. A roughness below 0.4÷0.5 µm has not been proven to be advantageous in hygienic applications. Electropolishing is an electrolytic treatment of the metal surface, which results in it being cleaned, levelled and passivated.

Fig. 4:

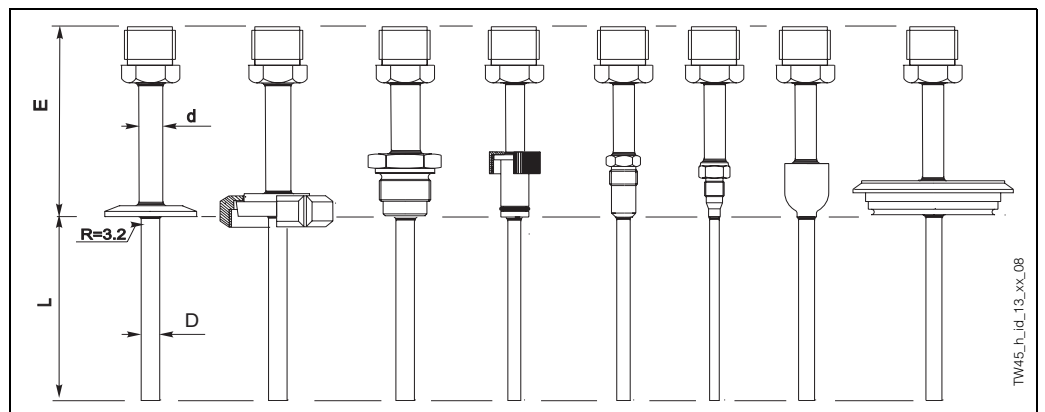


Fig. 5: TR 45 thermowell (left) and tip (right) design

Certificates & approvals

Sanitary compatibility

- EHEDG Type EL certification (TNO report n. V3912). EHEDG accepted process connections are: Varivent[®], IDF type ISO 2853, APV (acc. DIN 11864), APV Inline, DIN 11851 (only in combination with EHEDG certified gasket from Siersema), Suedmo, Naue, Neumo.
- 3-A[®] Authorization no. 1144 for the declaration of compliance with standard 74-01.

Material certification

The 3.1.B material certificate, according to standard EN 10204, is selectable directly from the sale structure of the product. Other types of material certifications can be requested separately.

The "standard" one is a simplified and cost effective version of the certificate, in which the documentation about the origin of the materials employed refers to each sensor.

The "labelled" version also has a specific marking that relates to the wetted parts of the sensor and ensures that the relevant data are placed in the archives by means of the serial number of the thermometer.

Further details

Maintenance

Omnigrad M thermowell do not require specific maintenance.

For the models supplied with process connections including seals, the integrity of the sealing ring should be checked regularly and it must be substituted when necessary.

Delivery time

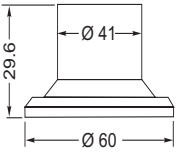
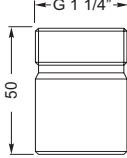
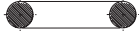
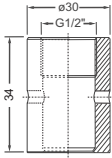
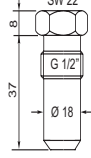
For small quantities (about 10 units) and standard options, from 10 to 20 days depending on the requested configuration.

Ordering information

Product structure

| TW45 | | Head connection | |
|-------|--|---|--|
| 1 | M24x1.5 | head connection | |
| 9 | Special | version | |
| | | Process connection | |
| | BA | ISO2852 clamp flange | DN 12/21.3 (miniclamp) |
| | BB | ISO2852 clamp flange | DN 25/38 |
| | BC | ISO2852 clamp flange | DN 40/51 |
| | BF | Tri-Clamp® flange | 1" and 1 1/2" |
| | BH | Tri-Clamp® flange | 2" |
| | CD | Dairy connection | DIN11851 DN 25 |
| | CF | Dairy connection | DIN11851 DN 40 |
| | CG | Dairy connection | DIN11851 DN 50 |
| | CH | Aseptic connection | DIN11864-1-A DN 25 |
| | CJ | Aseptic connection | DIN11864-1-A DN 40 |
| | DA | Welding conn. cylindrical | D30 x L40 mm |
| | DB | Welding conn. cyl./sph., | D30 x L40 mm |
| | EA | G1" for Liquiphant M type | weld-in adaptor (weld-in adapter 60017886; not included) |
| | FA | Varivent® D = 68 mm for pipes | DN 32/125 |
| | FB | Varivent® D = 50 mm for pipes | DN 25 |
| | FC | Varivent® D = 31 mm for pipes | DN 10/15 |
| | JD | SMS DN 25 (1") | |
| | NB | "Ingold" connection D = 25 mm, | L = 50 mm (weld-in adaptor 60017887; not included) |
| | ND | Conical metal-to-metal | connection with G"1/2 |
| | YY | Special version | |
| | | Neck dimensions E (75-250 mm) and d (Material: stainless steel) | |
| 5 | 82 | mm neck length E, | 15 mm diameter d |
| 8 | ... | mm neck length E, to | specify, 15 mm diameter d |
| 9 | ... | mm special neck length | E, and diameter d |
| | | Immersion length L (30-700 mm) | |
| G | 30 | mm immersion length L, | only reduced tip |
| A | 50 | mm immersion length L | |
| B | 90 | mm immersion length L | |
| F | 120 | mm immersion length L, | |
| D | 160 | mm immersion length L | |
| E | 220 | mm immersion length L | |
| X | ... | mm immersion length L, | to specify |
| Y | ... | mm special immersion, | length L |
| | | Pipe diameter D, material and finishing of wetted parts | |
| 1 | 9 mm = D | SS 316L/1.4435, Ra <=0.8 µm | |
| 3 | 9 mm = D | SS 316L/1.4435, Ra <=0.4 µm | |
| 4 | 9 mm = D | SS 316L/1.4435, Ra <=0.4 µm, | electropolishing |
| 9 | Special version | | |
| | | Type design | |
| S | Straight tip | | |
| R | Reduced tip (stepped), only for L >=30 mm | | |
| T | Tapered tip, only for L >=65 mm | | |
| Y | Special version | | |
| | | Certificates | |
| M | 3.1.B EN10204, short form certificate | | |
| N | 3.1.B EN10204, roughness short form | | |
| O | Certificates not required | | |
| G | 3.1.B EN10204, labelled for wetted parts | | |
| H | 3.1.B EN10204, labelled + roughness | | |
| L | 3.1.B EN10204, ferrite content certificate | | |
| J | 3.1.B, labelled+roughness+ferrite content | | |
| | | Additional options | |
| 0 | Additional options not required | | |
| TW45- | | | Complete order code |

Accessories

| | | |
|--|---|---|
| <p>G1" Liquiphant M type weld-in adapter for flush-mounting of "EA" process connection seal: silicone o-ring complying with FDA CFR Title 21, § 177.2600 max temperature: 230°C material: SS 316L/1.4435; weight: 0.13 kg provided with leakage detection port</p> | <p>mat. nr.: 60017886</p> |  <p>liquiM_h_dd_09_xx_01</p> |
| <p>"Ingold" D = 25 mm, L = 50 mm weld-in adapter for flush-mounting of "NB" process connection material: SS 316L/1.4435; weight: 0.32 kg provided with leakage detection port</p> | <p>mat. nr.: 60017887</p> |  <p>INGOLD_h_dd_09_xx_01</p> |
| <p>Set of gaskets (no. 5 o-rings) for G1" Liquiphant M type weld-in adapter seal: silicone o-ring complying with FDA CFR Title 21, § 177.2600 max temperature: 230°C Set of gaskets (no. 5 o-rings) for "Ingold" process connection seal: silicone o-ring complying with FDA CFR Title 21, § 177.2600 max temperature: 230°C</p> | <p>mat. nr.: 60018912</p> <p>mat. nr.: 60018911</p> |  <p>gasket_h_gd_09_xx_01</p> |
| <p>G1/2" metal-to-metal weld-in adapter for flush-mounting of "ND" process connection material: SS 316L/1.4435 provided with leakage detection port</p> | <p>mat. nr.: 60021387</p> |  <p>ATFGAS_g_dd_09_xx_01</p> |
| <p>Blind plug for G1/2" metal-to-metal weld-in adapter material: SS 316L/1.4435</p> | <p>mat. nr.: 60022519</p> |  <p>ATFGAS_g_dd_09_xx_01</p> |

Supplementary documentation

| | |
|--|---------------|
| <input type="checkbox"/> RTD thermometers Omnigrad TST - General information | TI 088T/02/en |
| <input type="checkbox"/> Pt 100 inset - Omnigrad TET 100 | TI 071T/02/en |
| <input type="checkbox"/> Pt 100 inset - Omnigrad TET 105 | TI 103T/02/en |
| <input type="checkbox"/> Terminal housings - Omnigrad TA 20 | TI 072T/02/en |

Subject to modification

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