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# Safety Instructions
# TR1x, Tx88, TSx310, Tx6x, TC1x, TPx100, TM411, TR24

Thermometers and inserts

Ex ia IIC T1...T6 Ga
Ex ia IIIC $T_{200}$ 85 °C...$T_{200}$ 450 °C Da


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# TR1x, Tx88, TSx310, Tx6x, TC1x, TPx100, TM411, TR24

Thermometers and inserts

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**Associated documentation**

To commission the device, please observe the Operating Instructions pertaining to the device:
www.endress.com/<product code>, e.g. TM411

**Supplementary documentation**

Explosion protection brochure: CP00021Z

The explosion protection brochure is available on the Internet:
www.endress.com/Downloads

**Manufacturer's certificates**

**NEPSI Certificate of conformity**

Certificate number:

GYJ20.1295X

GYJ18.1371X

Affixing the certificate number certifies conformity with the following standards (depending on the device version)

- GB3836.1-2010
- GB3836.4-2010
- GB3836.20-2010
- GB12476.1-2013
- GB12476.4-2010

**CCC Certificate of conformity**

Certificate number:

2020322315002447

2020322315002446

Affixing the certificate number certifies conformity with the following standards (depending on the device version)

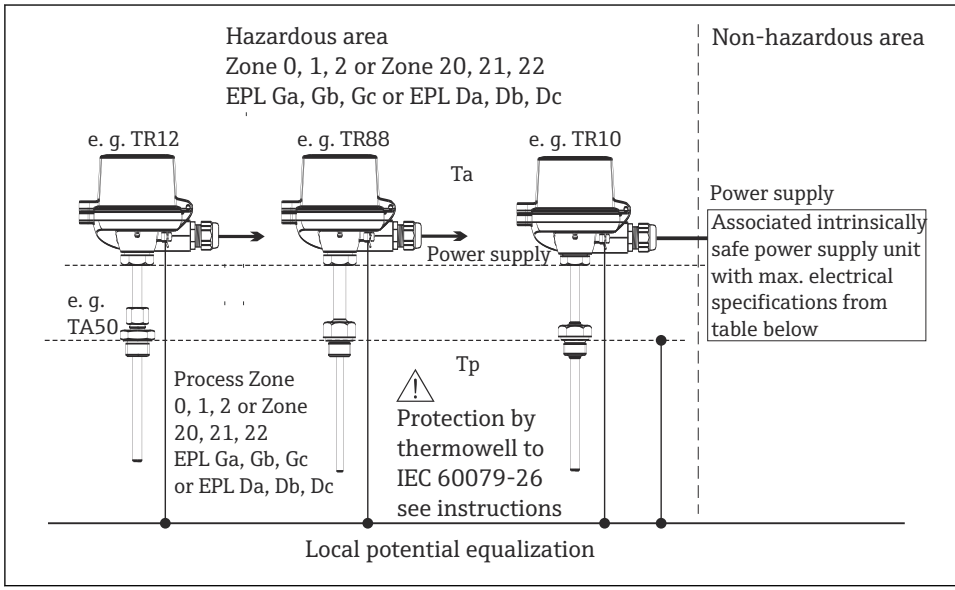
- GB/T 3836.1-2021
- GB/T 3836.4-2021

Please refer to NEPSI/CCC certificates for conditions of safe use.

**Manufacturer address**

Endress+Hauser Wetzer GmbH + Co. KG
Obere Wank 1
87484 Nesselwang, Germany

**Safety instructions:**




**Safety instructions: General**

- Comply with the installation and safety instructions in the Operating Instructions.
- Install the device according to the manufacturer's instructions and any other valid standards and regulations (e.g. EN/IEC 60079-14).
- The housing of the thermometer must be connected to the local potential equalization or installed in a grounded metallic piping or tank respectively.
- It cannot be taken for granted that when using compression fittings (e.g. TA50, TA60, TA70) with non metallic olives that there is a secure grounding when installing in a metal system. This means that an additional safe connection to the local potential equalization needs to be used.
- For using of a plug-in connector (e.g. PA-connector by Weidmüller) is to be observed that the requirements for the respective category and the operating temperature are followed.

**Safety instructions: Installation in equipment of Group III**

- Sensors for thermometers without thermowell (e.g. TX62, TR24, TX88) are to be protected by thermowell providing a degree of protection of at least IP5X and in compliance with the enclosure requirements to EN/IEC 60079-0.
- Sensors of TX65 and TR24 with a diameter smaller than 6 mm or reduced tip shall be protected by a thermowell providing a degree of protection of at least IP5X and in compliance with the enclosure requirements to EN/IEC 60079-0.
- Seal the cable entries tight with certified cable glands (min. IP6X) IP6X according to EN/IEC 60529.
- The provided cable glands according to option code are suitable ATEX/IECEx Ex certified glands with a temperature range of −20 to +95 °C.
- For operating the thermometer at an ambient temperature under −20 °C, appropriate cables, cable entries and sealing facilities permitted for this application must be used.
- For ambient temperatures higher than +70 °C, use suitable heat-resisting cables or wires, cable entries and sealing facilities for Ta +5 K above surrounding.
- For using of a plug-in connector (e.g. PA-connector by Weidmüller) is to be observed that the requirements for the respective category and the operating temperature are followed.
- The thermometer must be installed and maintained so, that even in the event of rare incidents, an ignition source due to impact or friction between the housing and iron/steel is excluded.

**⚠ WARNING**

**Explosive atmosphere**

▶ In an explosive atmosphere, do not open the device when voltage is supplied (ensure that the IP6x housing protection is maintained during operation).

**Safety instructions for intrinsic safety: Installation**

- Comply with the installation and safety instructions in the Operating Instructions.
- Install the device according to the manufacturer's instructions and any other valid standards and regulations (e.g. EN/IEC 60079-14).
- Observe the safety instructions for the used transmitters.
- The display, type TID10, may only be installed in Zone 1 (EPL Gb) or Zone 2 (EPL Gc).
- The type of protection changes as follows when the devices are connected to certified intrinsically safe circuits of Category ib: Ex ib IIC.
- When connecting to an intrinsically safe ib circuit, do not operate the sensor at Zone 0 without any thermowell according to EN/IEC 60079-26.

- The inserts with dual circuits (3 and 6 mm diameter) and 3 mm diameter are not isolated to the metallic sheath in conformance with EN/IEC 60079-11 chapter 6.3.13.
- When connecting dual sensors make sure that the potential equalizations are at the same local potential equalization.
- Inserts with 3 mm diameter or grounded inserts, e.g. type TPC100 must be connected to the local potential equalization.
- For inserts with 3 mm diameter or grounded inserts, e.g. type TPC100 an intrinsically safe supply with galvanic isolation must be used.

**Safety instructions: Zone 0**

- Only operate devices in potentially explosive vapour/air mixtures under atmospheric conditions:
  - −20 °C ≤ Ta ≤ +60 °C
  - −0.8 bar ≤ p ≤ 1.1 bar
- If no potentially explosive mixtures are present, or if additional protective measures have been taken, according to EN 1127-1, the transmitters may be operated under other atmospheric conditions in accordance with the manufacturer's specifications.
- Associated apparatus with galvanic isolation between the intrinsically safe and non-intrinsically safe circuits are preferred.

**Safety instructions: Special conditions**

- The thermometer must be installed so, that even in the event of rare incidents, an ignition source due to impact or friction between the housing and iron/steel is excluded.
- Avoid electrostatic charging of the plastic surfaces of TA20B housing.
- Avoid electrostatic charging of coated and plastic surfaces. Do not rub.
- Special conditions for safe use:
- The suffix "X" placed after the certificate number indicates that this product is subject to special conditions for safe use, that is:
  - The insert TPR100 and TPC100 should be provided with a mounting head including the cable entry device to ensure a degree of protection of at least IP20 when in use.
  - For EPL Ga applications, electrostatic changes on the cable of product TST310 and TSC310 shall be avoided.
  - For EPL Ga applications, at the metallic parts of the products made of light metal there is a danger of ignition by impact or friction.

**Safety instructions: Partition wall**

Install the thermometer in a partition wall which is in compliance with EN/IEC 60079-26 in reference to its ultimate application.

## Temperature tables

*The dependency of the ambient and process temperatures upon the temperature class for assembly with transmitters:*

| Assembled Transmitter | Temperature class | Ambient temperature range housing | Maximum surface temperature housing |
|---|---|---|---|
| TMT181<br>TMT182<br>TMT84/TMT85 | T6 | −40 °C ≤ Ta ≤ +55 °C | T85 °C |
| | T5 | −40 °C ≤ Ta ≤ +70 °C | T100 °C |
| | T4 | −40 °C ≤ Ta ≤ +85 °C | T135 °C |
| TMT82 | T6 | −40 °C ≤ Ta ≤ +58 °C | T85 °C |
| | T5 | −40 °C ≤ Ta ≤ +75 °C | T100 °C |
| | T4 | −40 °C ≤ Ta ≤ +85 °C | T135 °C |
| TMT8x with display | T6 | −40 °C ≤ Ta ≤ +55 °C | T85 °C |
| | T5 | −40 °C ≤ Ta ≤ +70 °C | T100 °C |
| | T4 | −40 °C ≤ Ta ≤ +85 °C | T135 °C |

| Assembled Transmitter | Insert diameter | Process temperature range | Temperature class/maximum surface temperature sensor |
|---|---|---|---|
| TMT18x<br>TMT8x | 3 mm, 3 mm dual or 6 mm dual | −50 °C ≤ Tp ≤ +66 °C | T6/T85 °C |
| | | −50 °C ≤ Tp ≤ +81 °C | T5/T100 °C |
| | | −50 °C ≤ Tp ≤ +116 °C | T4/T135 °C |
| | | −50 °C ≤ Tp ≤ +181 °C | T3/T200 °C |
| | | −50 °C ≤ Tp ≤ +276 °C | T2/T300 °C |
| | | −50 °C ≤ Tp ≤ +426 °C | T1/T450 °C |
| | 6 mm | −50 °C ≤ Tp ≤ +73 °C | T6/T85 °C |
| | | −50 °C ≤ Tp ≤ +88 °C | T5/T100 °C |
| | | −50 °C ≤ Tp ≤ +123 °C | T4/T135 °C |
| | | −50 °C ≤ Tp ≤ +188 °C | T3/T200 °C |
| | | −50 °C ≤ Tp ≤ +283 °C | T2/T300 °C |
| | | −50 °C ≤ Tp ≤ +433 °C | T1/T450 °C |

For thermocouple inserts, the temperature class T6...T1 and the maximum surface temperature $T_{200}$ 85 °C . . . $T_{200}$ 450°C are equal to the process temperature.

*The dependency of the ambient and process temperatures upon the temperature class for assembly without transmitter (terminal block):*

| Insert diameter | Temperature class/ Maximum surface temperature | Tp (process) - maximum allowed process temperature (sensor) | | | | |
|---|---|---|---|---|---|---|
| | | Pi ≤ 50 mW | Pi ≤ 100 mW | Pi ≤ 200 mW | Pi ≤ 500 mW | Pi ≤ 650 mW |
| 3 mm, 3 mm dual or 6 mm dual | T1/T450 °C | 426 °C | 415 °C | 396 °C | 343 °C | 333 °C |
| | T2/T300 °C | 276 °C | 265 °C | 246 °C | 193 °C | 183 °C |
| | T3/T200 °C | 181 °C | 170 °C | 151 °C | 98 °C | 88 °C |
| | T4/T135 °C | 116 °C | 105 °C | 86 °C | 33 °C | 23 °C |
| | T5/T100 °C | 81 °C | 70 °C | 51 °C | −2 °C | −12 °C |
| | T6/T85 °C | 66 °C | 55 °C | 36 °C | −17 °C | −27 °C |
| 6 mm | T1/T450 °C | 433 °C | 428 °C | 420 °C | 398 °C | 388 °C |
| | T2/T300 °C | 283 °C | 278 °C | 270 °C | 248 °C | 238 °C |
| | T3/T200 °C | 188 °C | 183 °C | 175 °C | 153 °C | 143 °C |
| | T4/T135 °C | 123 °C | 118 °C | 110 °C | 88 °C | 78 °C |
| | T5/T100 °C | 88 °C | 83 °C | 75 °C | 53 °C | 43 °C |
| | T6/T85 °C | 73 °C | 68 °C | 60 °C | 38 °C | 28 °C |

| Insert diameter | Temperature class/ Maximum surface temperature | Tp (process) - maximum allowed process temperature (sensor) | | | Ta (ambient) - ambient temperature (housing) [1)] |
|---|---|---|---|---|---|
| | | Pi ≤ 750 mW | Pi ≤ 800 mW | Pi ≤ 1 000 mW | |
| 3 mm, 3 mm dual or 6 mm dual | T1/T450 °C | 320 °C | 312 °C | 280 °C | −40 °C ≤ Ta ≤ +130 °C |
| | T2/T300 °C | 170 °C | 162 °C | 130 °C | |
| | T3/T200 °C | 75 °C | 62 °C | 30 °C | |
| | T4/T135 °C | 10 °C | 2 °C | −30 °C | −40 °C ≤ Ta ≤ +116 °C |
| | T5/T100 °C | −25 °C | −33 °C | - | −40 °C ≤ Ta ≤ +81 °C |
| | T6/T85 °C | −40 °C | - | - | −40 °C ≤ Ta ≤ +66 °C |
| 6 mm | T1/T450 °C | 381 °C | 377 °C | 361 °C | −40 °C ≤ Ta ≤ +130 °C |
| | T2/T300 °C | 231 °C | 227 °C | 211 °C | |
| | T3/T200 °C | 136 °C | 127 °C | 111 °C | |

| Insert diameter | Temperature class/ Maximum surface temperature | Tp (process) - maximum allowed process temperature (sensor) | | | Ta (ambient) - ambient temperature (housing) [1] |
|---|---|---|---|---|---|
| | | Pi ≤ 750 mW | Pi ≤ 800 mW | Pi ≤ 1000 mW | |
| | T4/T135 °C | 71 °C | 67 °C | 51 °C | −40 °C ≤ Ta ≤ +123 °C |
| | T5/T100 °C | 36 °C | 32 °C | 16 °C | −40 °C ≤ Ta ≤ +88 °C |
| | T6/T85 °C | 21 °C | 17 °C | 1 °C | −40 °C ≤ Ta ≤ +73 °C |

1) When using TA20R or TA21E housing please observe the maximumallowed temperature per TI072t02.

For thermocouple inserts, the temperature class T6...T1 and the maximum surface temperature $T_{200}$ 85 °C . . . $T_{200}$ 450°C are equal to the process temperature.

Transmitters are not in the scope of CCC. For detail information: www.endress.com.

*Determination of process temperature for Pi ≤ 50 mW:*

| Insert diameter | Thermal resistance (Rth) for Pi ≤ 50 mW | Formula for calculating process temperature (Tp) |
|---|---|---|
| 3 mm, 3 mm dual or6 mm dual | 274K/W | Tp < $T_{class}$ [1]-Tol. [2]Tol.-(Rth x $P_0$ [3]) |
| 6 mm | 144K/W | |

1) Inserting of temperature class, e.g. 85 °C (K) for T6
2) Inserting of Tolerances to IEC60079-0 chapter 26.5.1.3: 5 K for T6, T5, T4 and T3 10 K for T2 and T1
3) P0 of intrinsic safe temperature input (e.g. measurement circuit TMT182, P0 = 6.6 mW)

Calculation example for T6 and 6 mm insert: Tp < $T_{class}$ - Tol. - (Rth x $P_0$)

Tp < 85 °C(K) - 5K - (144K/W x 6.6 mW)

Tp < 79.04 °C

## Electrical connection data

*Associated intrinsically safe power supply unit with maximum electrical specifications below the characteristic values of the assembled transmitter:*

| Transmitter | Ui | Ii | Pi | Ci | Li |
|---|---|---|---|---|---|
| TMT181 | 30 V | 100 mA | 760 mW | 0 | 0 |
| TMT182 | | | 750 mW | | |
| TMT82 | | 130 mA | 800 mW | | |
| TMT84, TMT85 | 17.5 V | 500 mA | 5.5 W | 5 nF | - |
| without | 30 V | 140 mA | 1000 mW | 1 nF | 1 mH |


www.addresses.endress.com

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