

# Safety Instructions

## **TR<sub>xx</sub>, TC<sub>xx</sub>, TEC420, TS111, TM211, TM41x, TPx100, TSx310, TM1x1**

RTD/TC thermometers

ATEX: Ex nA IIC T6 Gc  
Ex tc IIIIC Txxx°C Dc





# TRxx, TCxx, TEC420, TS111, TM211, TM41x, TPx100, TSx310, TM1x1

RTD/TC thermometers

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**Associated  
documentation**

All documentation is available on the Internet:  
[www.endress.com/Deviceviewer](http://www.endress.com/Deviceviewer)  
(enter the serial number from the nameplate).



If not yet available, a translation into EU languages can be ordered.

To commission the device, please observe the Operating Instructions pertaining to the device:

[www.endress.com/<product code>](http://www.endress.com/<product code>), e.g. TM131

**Supplementary  
documentation**

Explosion protection brochure: CP00021Z

The explosion protection brochure is available on the Internet:

[www.endress.com/Downloads](http://www.endress.com/Downloads)

**Manufacturer's  
certificates****EU Declaration of Conformity**

Declaration number: EC\_00169

The EU Declaration of Conformity is available on the Internet:

[www.endress.com/Downloads](http://www.endress.com/Downloads)

**UKCA Declaration of Conformity**

Declaration number: UK\_00427

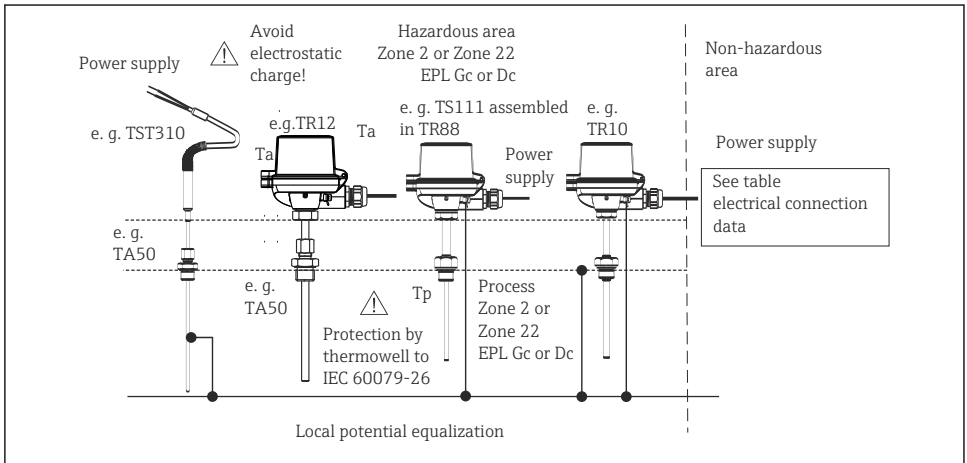
Affixing the certificate number certifies conformity with the following standards (depending on the device version)

- EN IEC 60079-0: 2018
- EN 60079-15: 2010
- EN 60079-31: 2014

**Manufacturer  
address**

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

## Safety instructions



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### 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).
- Seal the cable entries with certified cable glands and or blanking elements which have at least type of protection Ex ec or Ex tb suitable for Group IIC and IIIC (degree of protection IP6X).
- The provided cable entries to option code glands are suitable ATEX/IECEX Ex certified cable glands with a temperature range of  $-20$  to  $+95$  °C.
- For operating the thermometer at an ambient temperature under  $-20$  °C and above  $+95$  °C, appropriate cables, cable entries and sealing facilities permitted for this application must be used.
- The housing of the thermometer/sensor 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.
- Observe the safety instructions for the used transmitters.
- The device should never be used for hybrid mixtures (gas, dust, air).
- When using of a plug-in connector (e.g. TURCK PA-connector) is to be observed that the requirements for the respective category and the operating temperature are followed.

**Safety instructions: Dust ignition protection by enclosure "t"**

- 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.
- Clean the housing regularly to avoid a layer of dust accumulating on the housing.

**Safety instructions: Specific conditions of use**

- Sensors for thermometers without thermowell (e.g. TX62, TR24, TX88) are to be mechanically protected by thermowell or equivalent suitable for category 3 in compliance with EN/IEC 60079-0 and its ultimate application.
- For assure that the temperature assembly has a degree of protection of IP54 or IP6X depending on the ultimate application the user shall provide a thermowell or equivalent component at the process side.
- Sensors of TM111 with a diameter smaller than 6mm shall be protected by a thermowell.
- TM131 temperature sensors shall always be protected by a thermowell.
- It shall be verified, taking into account the worst case process and ambient temperatures, that the temperature of the enclosure at the process connection point does not exceed the ambient temperature range of the assembly.
- Install only head transmitters not exceeding a maximum power dissipation of 2.2 W with a temperature input rating not exceeding 10 V<sub>DC</sub> and 1 mA.
- 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 enclosure and iron/steel is excluded.

**For type of protection Ex nA: (for inserts/sensors only)**

For use in the type of protection Ex nA, and for Zone 2 (EPL Gc) application, the sensor/insert shall be installed completely inside an additional enclosure, providing a degree of protection of not less than IP54 according to IEC/EN 60079-0 and IEC/EN 60079-15. The ambient temperature within the end use enclosure shall not exceed the limits of the permissible ambient temperature range. Clearances, creepage distances, and separations as defined in IEC/EN 60079-15 must be considered for the installation.

**For type of protection Ex t: (for inserts/sensors only)**

For use in the type of protection Ex tc, and for Zone 2 (EPL Dc) application, the sensor/insert shall be installed completely inside an additional enclosure, providing a degree of protection of not less than IP54 in event of non-conductive dust or IP6X in event of conductive dust according to IEC/EN 60079-0 and IEC/EN 60079-31.

 **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).

**Temperature tables**

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

Type	Assembled transmitter	Temperature class	Ambient temperature range (housing)	Maximum surface temperature (housing)
TR1x TC1x TM4xx TM1x1	TMT181 TMT182 TMT84/TMT85 TMT71, TMT72 TMT86	T6	$-40\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +70\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT162 TMT142	T6	$-40\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +70\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +80\text{ °C}$	T135 °C
	TMT31	T6	$-40\text{ °C} \leq T_a \leq +50\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +65\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT82	T6	$-40\text{ °C} \leq T_a \leq +58\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +75\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT8x with display TMT7x with display Flying leads	T6	$-40\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C
		T5	$-40\text{ °C} \leq T_a \leq +70\text{ °C}$	T100 °C
		T4	$-40\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C

Type	Assembled transmitter	Insert diameter	Process temperature	Temperature class/maximum surface temperature (sensor)
TR1x TC1x TM4xx TM1x1	TMT18x TMT8x TMT7x TMT31 TMT142 Flying leads	3 mm, 3 mm dual or 6 mm dual	$-50\text{ °C} \leq T_p \leq +66\text{ °C}$	T6/T85 °C
			$-50\text{ °C} \leq T_p \leq +81\text{ °C}$	T5/T100 °C
			$-50\text{ °C} \leq T_p \leq +116\text{ °C}$	T4/T135 °C
			$-50\text{ °C} \leq T_p \leq +181\text{ °C}$	T3/T200 °C

Type	Assembled transmitter	Insert diameter	Process temperature	Temperature class/maximum surface temperature (sensor)
			$-50\text{ °C} \leq T_p \leq +276\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +426\text{ °C}$	T1/T450 °C
		6 mm	$-50\text{ °C} \leq T_p \leq +73\text{ °C}$	T6/T85 °C
			$-50\text{ °C} \leq T_p \leq +88\text{ °C}$	T5/T100 °C
			$-50\text{ °C} \leq T_p \leq +123\text{ °C}$	T4/T135 °C
			$-50\text{ °C} \leq T_p \leq +188\text{ °C}$	T3/T200 °C
			$-50\text{ °C} \leq T_p \leq +283\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +433\text{ °C}$	T1/T450 °C

Type	Assembled transmitter	Insert diameter	Process temperature $T_p$ <sup>1)</sup>	Temperature class/maximum surface temperature (sensor)
TM412 TM131	TMT162	3 mm, 3 mm dual or 6 mm dual	$-50\text{ °C} \leq T_p \leq +64\text{ °C}$	T6/T85 °C
			$-50\text{ °C} \leq T_p \leq +79\text{ °C}$	T5/T100 °C
			$-50\text{ °C} \leq T_p \leq +114\text{ °C}$	T4/T135 °C
			$-50\text{ °C} \leq T_p \leq +179\text{ °C}$	T3/T200 °C
			$-50\text{ °C} \leq T_p \leq +279\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +424\text{ °C}$	T1/T450 °C
		6 mm	$-50\text{ °C} \leq T_p \leq +71\text{ °C}$	T6/T85 °C
			$-50\text{ °C} \leq T_p \leq +86\text{ °C}$	T5/T100 °C
			$-50\text{ °C} \leq T_p \leq +121\text{ °C}$	T4/T135 °C
			$-50\text{ °C} \leq T_p \leq +186\text{ °C}$	T3/T200 °C
			$-50\text{ °C} \leq T_p \leq +286\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +431\text{ °C}$	T1/T450 °C

- 1) Maximum process pressure see relevant Technical Information. For thermocouple inserts, the temperature class T6 ... T1 and the maximum surface temperature T85 °C ... T450°C are equal to the process temperature.

*The dependency of the ambient and process temperatures upon the temperature class for assembly with terminal block or cable sensor, type TSx310 or TM211*

Insert diameter	Temperature class/maximum surface temperature	$T_p$ (process) - maximum allowed process temperature (sensor) <sup>1)</sup>
3 mm, 3 mm dual or 6 mm dual	T1/T450 °C	426 °C
	T2/T300 °C	276 °C
	T3/T200 °C	181 °C
	T4/T135 °C	116 °C



Insert diameter	Temperature class/maximum surface temperature	T <sub>p</sub> (process) - maximum allowed process temperature (sensor) <sup>1)</sup>
	T5/T100 °C	81 °C
	T6/T85 °C	66 °C
6 mm	T1/T450 °C	433 °C
	T2/T300 °C	283 °C
	T3/T200 °C	188 °C
	T4/T135 °C	123 °C
	T5/T100 °C	88 °C
	T6/T85 °C	73 °C

1) Maximum process pressure see relevant Technical Information

Insert diameter	Temperature class/maximum surface temperature	T <sub>a</sub> - ambient temperature (housing)
3 mm, 3 mm dual or 6 mm dual	T1/T450 °C	-40 °C ≤ T <sub>a</sub> ≤ +120 °C
	T2/T300 °C	
	T3/T200 °C	
	T4/T135 °C	-40 °C ≤ T <sub>a</sub> ≤ +116 °C
	T5/T100 °C	-40 °C ≤ T <sub>a</sub> ≤ +81 °C
	T6/T85 °C	-40 °C ≤ T <sub>a</sub> ≤ +66 °C
6 mm	T1/T450 °C	-40 °C ≤ T <sub>a</sub> ≤ +120 °C
	T2/T300 °C	
	T3/T200 °C	
	T4/T135 °C	-40 °C ≤ T <sub>a</sub> ≤ +120 °C
	T5/T100 °C	-40 °C ≤ T <sub>a</sub> ≤ +88 °C
	T6/T85 °C	-40 °C ≤ T <sub>a</sub> ≤ +73 °C

## Electrical connection data

Electronic	Supply voltage $U_b$	Output/Current consumption
TMT181	$U \leq 35 V_{DC}$	4 to 20 mA
TMT182		
TMT82	$U \leq 42 V_{DC}$	
TMT84, TMT85	$U \leq 32 V_{DC}$	$\leq 11$ mA
TMT86	$U \leq 30 V_{DC}$	
TMT71, TMT72	$U \leq 36 V_{DC}$	4 to 20 mA
TMT31	$U \leq 36 V_{DC}$	4 to 20 mA
TMT142 HART7	$U \leq 36 V_{DC}$	4 to 20 mA
TMT162 HART7	$U \leq 42 V_{DC}$	4 to 20 mA
TMT162 PA/FF	$U \leq 32 V_{DC}$	$\leq 11$ mA
Terminal block	$U \leq 10 V_{DC}$	$\leq 1$ mA

Category	Type of protection (ATEX)	Type
II3G	Ex nA IIC T6...T1 Gc	TR10, TR11, TR12, TR13, TR15, TR24, TR45, TR47, TR88, TR61, TR62, TR63, TR65, TR66, TM411, TM412, TS111, TM211, TST310 TM111, TM131, TC10, TC12, TC13, TC15, TC88, TEC420, TC61, TC62, TC63, TC65, TC66, TSC310 TPR100, TS111, TPC100
II3D	Ex tc IIIC T85 °C...T450 °C Dc	





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