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Safety Instructions
TRxx, TCxx, TEC420, TPx100, TSx310, iTHERM TS111/ TM211/TM41x/TM1xx/TM611

RTD/TC thermometers

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

Endress+Hauser
People for Process Automation

TRxx, TCxx, TEC420, TPx100, TSx310, iTHERM TS111/TM211/TM41x/TM1xx/ TM611

RTD/TC thermometers

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About this document

The document number of these Safety Instructions (XA) must match the information on the nameplate.

Associated documentation

All documentation is available on the Internet:
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>, e.g. iTHERM TM131

Supplementary documentation

Explosion protection brochure: CP00021Z

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

Certificates and declarations

EU Declaration of Conformity

Declaration number: EC_00169 X

The EU Declaration of Conformity is available on the Internet:
www.endress.com/Downloads

UKCA Declaration of Conformity

Declaration number: UK_00427

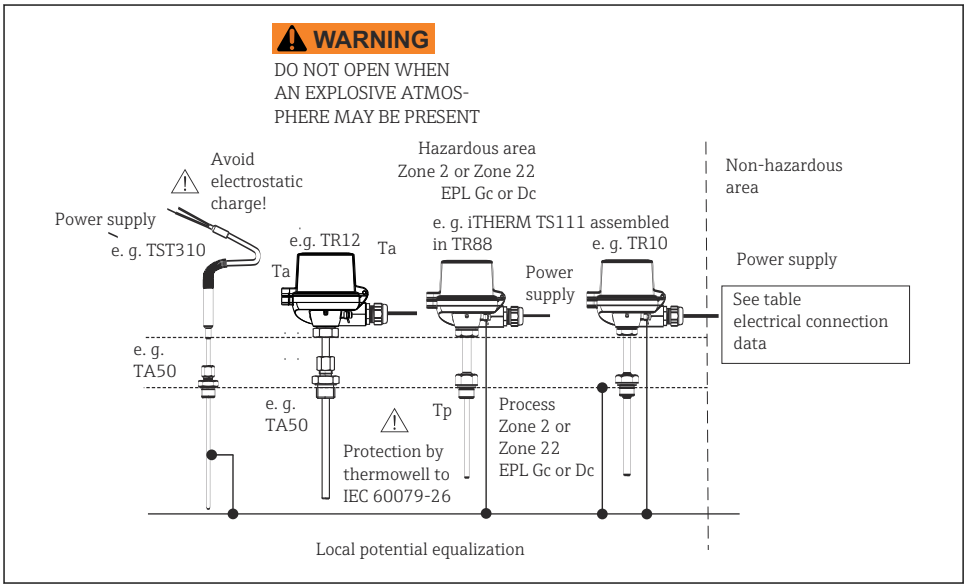
Affixing the certificate number certifies conformity with the following standards (depending on the device version)

- EN IEC 60079-0: 2018
- EN 60079-7: 2015
- EN 60079-15: 2010
- EN 60079-31: 2014

Manufacturer address

Endress+Hauser Wetzer 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).
- 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 +65 °C, use suitable heat-resisting cables or wires, cable entries and sealing facilities for Ta +5 K above surrounding.
- 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 a plug-in connector (e.g. TURCK PA connector), ensure that the requirements for category 3 and the operating temperature are observed.

Safety instructions: Dust ignition protection by enclosure "t"

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 iTEHRM TM111/TM112 with a diameter smaller than 6 mm or ¼" shall be protected by a thermowell.
- iTHERM TM611 temperature sensor is to be protected by its provided coupling element, type TT611.
- iTHERM TM131, iTHERM TM15x temperature sensors shall be protected by the thermowell as provided or by a thermowell as specified in the instructions
- 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.
  - the temperature of the optionally used RB**1NS union does not exceed the service temperature range of −50 to +150 °C for following option:
    iTHERM TM131-abc...
    iTHERM TM151-abc...
    c Thermometer Design:
    M Nipple-union connection NPT½
    N Nipple-union-nipple connection NPT½

The temperature of the coupling element does not exceed the service temperature range for following option: iTHERM TM611-abc...

c	Material coupling element:	Sensor temperature range:
xxx	1.4404	−50 to +450 °C
999	AlSi 1MgMn	−50 to +150 °C
999	1.4529, 2.4816, 2.4819	−50 to +450 °C
999	1.4547	−20 to +400 °C
999	1.4539	−50 to +425 °C
999	1.4462	−30 to +300 °C
999	1.4410	−35 to +260 °C

The temperature of thermowell materials do not exceed the service temperature range following option: iTHERM TM151-abcd...

d	Thermowell material:	Sensor temperature range:
CA	10CrMo9-10	−20 to +450 °C
CB	13CrMo4-5	−30 to +150 °C
CC	16Mo3	−10 to +450 °C
DA	A105	−10 to +450 °C
DB	C22.8	−10 to +450 °C
DC	P355NH	−20 to +450 °C
EA	Duplex S32205	−46 to +316 °C

The temperature of thermowell materials do not exceed the service temperature range following option: iTHERM TM152-abcd...

d	Thermowell material:	Sensor temperature range:
CD	A182 F11	−30 to +450 °C
CA	A182 F22	−20 to +450 °C
CE	A182 F91	−10 to +450 °C
DA	A105	−10 to +450 °C
EA	Duplex S32205	−46 to +316 °C

- Install only head transmitters not exceeding a maximum power dissipation of 2.2 W with a temperature input rating not exceeding 10 V_{DC} and 1 mA.
- The device 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 22 (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 iTHERM TM4xx iTHERM TMxxx	iTEMP TMT181 iTEMP TMT182 iTEMP TMT84/TMT85 iTEMP TMT71, TMT72 iTEMP TMT86	T6	−40 °C ≤ Ta ≤ +55 °C	T85 °C
		T5	−40 °C ≤ Ta ≤ +70 °C	T100 °C
		T4	−40 °C ≤ Ta ≤ +85 °C	T135 °C
	iTEMP TMT162 iTEMP TMT142	T6	−40 °C ≤ Ta ≤ +55 °C	T85 °C
		T5	−40 °C ≤ Ta ≤ +70 °C	T100 °C
		T4	−40 °C ≤ Ta ≤ +80 °C	T135 °C
	iTEMP TMT31 (RTD)	T6	−40 °C ≤ Ta ≤ +35 °C	T85 °C
		T5	−40 °C ≤ Ta ≤ +50 °C	T100 °C

Type	Assembled transmitter	Temperature class	Ambient temperature range (housing)	Maximum surface temperature (housing)
		T4	−40 °C ≤ Ta ≤ +85 °C	T135 °C
	iTEMP TMT31 (TC)	T6	−40 °C ≤ Ta ≤ +30 °C	T85 °C
		T5	−40 °C ≤ Ta ≤ +45 °C	T100 °C
		T4	−40 °C ≤ Ta ≤ +80 °C	T135 °C
	iTEMP 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
	iTEMP TMT8x with display iTEMP TMT7x with display Flying leads	T6	−40 °C ≤ Ta ≤ +55 °C	T85 °C
		T5	−40 °C ≤ Ta ≤ +70 °C	T100 °C
		T4	−40 °C ≤ Ta ≤ +85 °C	T135 °C

Type	Assembled transmitter	Insert diameter	Process temperature	Temperature class/maximum surface temperature (sensor)
TR1x TC1x iTHERM TM4xx iTHERM TMxxx	iTEMP TMT18x iTEMP TMT8x iTEMP TMT7x iTEMP TMT31 iTEMP TMT142 Flying leads	3 mm (1/8"), 3 mm (1/8") dual or 6 mm (1/4") 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 (1/4")	−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

Type	Assembled transmitter	Insert diameter	Process temperature Tp [1]	Temperature class/maximum surface temperature (sensor)
iTHERM TM412 iTHERM TM112 iTHERM TM131 iTHERM TM151 iTHERM TM152	iTEMP TMT162	3 mm (1/8"), 3 mm (1/8") dual or 6 mm (1/4") dual	−50 °C ≤ Tp ≤ +64 °C	T6/T85 °C
			−50 °C ≤ Tp ≤ +79 °C	T5/T100 °C
			−50 °C ≤ Tp ≤ +114 °C	T4/T135 °C
			−50 °C ≤ Tp ≤ +179 °C	T3/T200 °C
			−50 °C ≤ Tp ≤ +279 °C	T2/T300 °C
			−50 °C ≤ Tp ≤ +424 °C	T1/T450 °C
		6 mm (1/4") dual	−50 °C ≤ Tp ≤ +71 °C	T6/T85 °C
			−50 °C ≤ Tp ≤ +86 °C	T5/T100 °C
			−50 °C ≤ Tp ≤ +121 °C	T4/T135 °C
			−50 °C ≤ Tp ≤ +186 °C	T3/T200 °C
			−50 °C ≤ Tp ≤ +286 °C	T2/T300 °C
			−50 °C ≤ Tp ≤ +431 °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	Tp (process) - maximum allowed process temperature (sensor) [1]
3 mm (1/8"), 3 mm (1/8") dual or 6 mm (1/4") dual	T1/T450 °C	426 °C
	T2/T300 °C	276 °C
	T3/T200 °C	181 °C
	T4/T135 °C	116 °C
	T5/T100 °C	81 °C
	T6/T85 °C	66 °C
6 mm (1/4") dual	T1/T450 °C	433 °C
	T2/T300 °C	283 °C
	T3/T200 °C	188 °C
	T4/T135 °C	123 °C

Insert diameter	Temperature class/maximum surface temperature	Tp (process) - maximum allowed process temperature (sensor) [1]
	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	Ta - ambient temperature (housing)
3 mm (1/8"), 3 mm (1/8") dual or 6 mm (1/4") dual	T1/T450 °C	−40 °C ≤ Ta ≤ +120 °C
	T2/T300 °C	
	T3/T200 °C	
	T4/T135 °C	−40 °C ≤ Ta ≤ +116 °C
	T5/T100 °C	−40 °C ≤ Ta ≤ +81 °C
	T6/T85 °C	−40 °C ≤ Ta ≤ +66 °C
6 mm (1/4") dual	T1/T450 °C	−40 °C ≤ Ta ≤ +120 °C
	T2/T300 °C	
	T3/T200 °C	
	T4/T135 °C	−40 °C ≤ Ta ≤ +120 °C
	T5/T100 °C	−40 °C ≤ Ta ≤ +88 °C
	T6/T85 °C	−40 °C ≤ Ta ≤ +73 °C

Electrical connection data

Electronic	Supply voltage Ub	Output/Current consumption
iTEMP TMT181	U ≤ 35 V_{DC}	4 to 20 mA
iTEMP TMT182		
iTEMP TMT82	U ≤42 V_{DC}	
ITEMP TMT84, TMT85	U ≤32 V_{DC}	≤11 mA
iTEMP TMT86	U ≤30 V_{DC}	
iTEMP TMT71, TMT72	U ≤ 36 V_{DC}	4 to 20 mA
iTEMP TMT31	U ≤ 36 V_{DC}	4 to 20 mA
iTEMP TMT142 HART7	U ≤ 36 V_{DC}	4 to 20 mA
iTEMP TMT162 HART7	U ≤ 42 V_{DC}	4 to 20 mA

Electronic	Supply voltage Ub	Output/Current consumption
iTEMP TMT162 PA/FF	U ≤32 V_{DC}	≤11 mA
Terminal block	U ≤ 10 V_{DC}	≤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, iTHERM TM411/TM412/ TS111/TM211, TST310 TC10, TC12, TC13, TC15, TC88, TEC420, TC61, TC62, TC63, TC65, TC66, TSC310 TPR100, iTHERM TS111, TPC100
II3D	Ex tc IIIC T85 °C…T450 °C Dc	
II3G	Ex ec IIC T6…T1 Gc	iTHERM TM111/TM112/TM131/TM151/TM152/TM611
II3D	Ex tc IIIC T85 °C…T450 °C Dc	

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