

# Safety Instructions

## **iTHERM TM111, TM131, TS111, TS211**

Thermometers and inserts

Ex ia IIC T1...T6 Ga

Ex ia IIC T1...T6 Ga/Gb

Ex ia IIIC T85 °C...T450 °C Db



# iTHERM TM111, TM131, TS111, TS211

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>](http://www.endress.com/<product code>), e.g. TM111

**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****NEPSI certificate**

Certificate number: GYJ23.1067X

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
- GB 3836.20-2010

**CCC Certificate of conformity**

Certificate number:

2020322315002502

2020322315002503

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

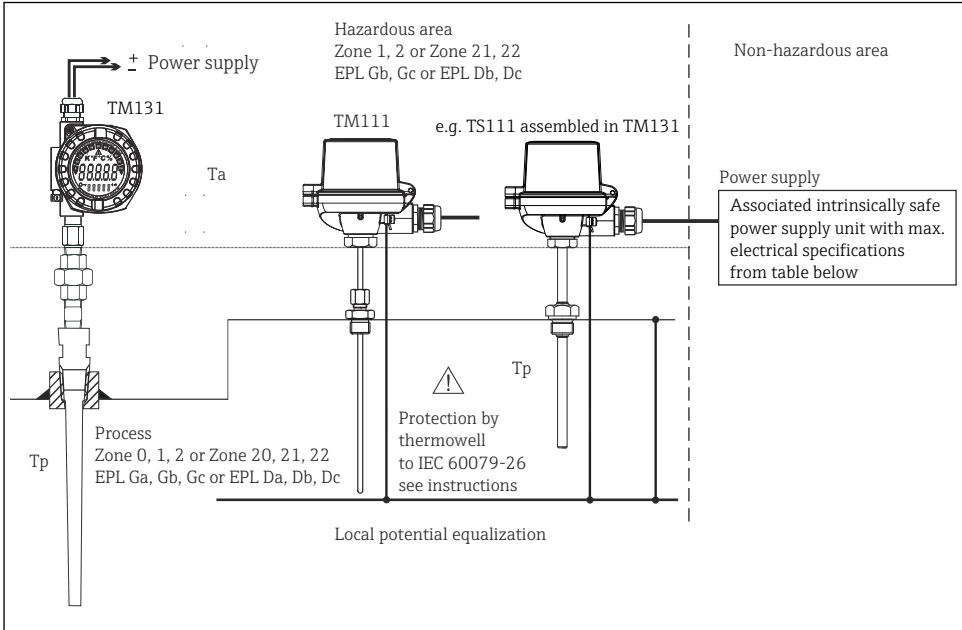


Please refer to NEPSI/CCC certificates for conditions of safe use.

**Manufacturer address**

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

## Safety instructions



A0046895

## 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 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 of TM111 with a diameter smaller than 6mm shall be protected by a thermowell providing a degree of protection of at least IP5X and in compliance with the enclosure requirements to IEC/EN 60079-0.
- TM131 temperature sensors shall always be protected by a thermowell providing a degree of protection of at least IP5X and in compliance with the enclosure requirements to IEC/EN 60079-0.
- Seal the cable entries tight with certified cable glands (min. IP6X) IP6X according to IEC/EN 60529.
- The provided cable entries to option code glands 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  $T_a +5$  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 enclosure 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 IEC/EN 60079-26.
- The inserts with dual circuits ( $\varnothing 3$  mm and 6 mm) and  $\varnothing 3$  mm are not isolated to the metallic sheath in conformance with IEC/EN 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 TSx11 must be connected to the local potential equalization.
- For inserts with 3 mm diameter or grounded inserts, e.g. type TSx11 an intrinsically safe supply with galvanic isolation must be used.

**Safety instructions:**  
**Partition wall**

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

**Safety instructions:**  
**Specific conditions of use**

- From the safety point of view, the circuit of versions of the following temperature sensors and inserts shall be considered to be connected to earth (for details, the instruction manual, provided with the equipment, shall be observed):
  - Type TS111, TS211 with diameter 3 mm, single or dual
  - Type TS111, TS211 with diameter 6 mm dual
- 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.
- Avoid electrostatic charging of the plastic housing (do not rub dry).

**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
TM111, TM131 TS111, TS211	TMT84, TMT85 TMT162 PA, FF	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
	TMT71, TMT72, TMT86 <sup>1)</sup> TMT162 HART TMT142 HART	T6	$-50\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C
		T5	$-50\text{ °C} \leq T_a \leq +70\text{ °C}$	T100 °C
		T4	$-50\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT82 <sup>1)</sup>	T6	$-50\text{ °C} \leq T_a \leq +58\text{ °C}$	T85 °C
		T5	$-50\text{ °C} \leq T_a \leq +75\text{ °C}$	T100 °C
		T4	$-50\text{ °C} \leq T_a \leq +85\text{ °C}$	T135 °C
	TMT8x, TMT7x with display	T6	$-40\text{ °C} \leq T_a \leq +55\text{ °C}$	T85 °C

Type	Assembled Transmitter	Temperature class	Ambient temperature range housing	Maximum surface temperature housing
		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

1) lower temperature of  $-52\text{ °C}$  is possible with marking Ex ia IIC Ga/Gb only

Type	Assembled Transmitter	Insert diameter	Process temperature range	Temperature class/ maximum surface temperature sensor		
TM111, TM131 TS111, TS211	TMT8x, TMT7x	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		
			$-50\text{ °C} \leq T_p \leq +276\text{ °C}$	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 range	Temperature class/ maximum surface temperature sensor		
TM131 TS211	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

Type	Assembled Transmitter	Insert diameter	Process temperature range	Temperature class/maximum surface temperature sensor
			$-50\text{ °C} \leq T_p \leq +286\text{ °C}$	T2/T300 °C
			$-50\text{ °C} \leq T_p \leq +431\text{ °C}$	T1/T450 °C



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 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) <sup>1)</sup>
		Pi ≤ 750 mW	Pi ≤ 800 mW	Pi ≤ 1000 mW	
3 mm, 3 mm dual or 6 mm dual	T1/T450 °C	320 °C	312 °C	280 °C	$-40\text{ °C} \leq T_a \leq +130\text{ °C}$
	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	$-40\text{ °C} \leq T_a \leq +116\text{ °C}$



Insert diameter	Temperature class/ Maximum surface temperature	Tp (process) - maximum allowed process temperature (sensor)			Ta (ambient) - ambient temperature (housing) <sup>1)</sup>
		Pi ≤ 750 mW	Pi ≤ 800 mW	Pi ≤ 1000 mW	
	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	
	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) The ambient temperature at the terminal head may be directly influenced by the process temperature, but its restricted to the range -40 to +130 °C, besides for types TA30A, TA30D and TA30H with a restricted range -50 to +130 °C. For thermometers with two mounted head transmitters the allowed ambient temperature is up to 12 K lower than each head transmitter's certified ambient temperature.



For thermocouple inserts, the temperature class T6...T1 and the maximum surface temperature T85 °C...T450 °C are equal to the process temperature.

## Electrical 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
TMT71/TMT72	30 V	100 mA	800 mW	0	0
TMT82	30 V	130 mA	800 mW	0	0
TMT142 HART	30 V	300 mA	1000 mW	5 nF	0
TMT162 HART	30 V	300 mA	1000 mW	0	0
TMT162 PA/FF	FISCO field device				
TMT84, TMT85, TMT86	FISCO field device				

Transmitter	U <sub>i</sub>	I <sub>i</sub>	P <sub>i</sub>	C <sub>i</sub>	L <sub>i</sub>
Terminal block	30 V	140 mA	1 000 mW	See tables below	
Flying leads	30 V	140 mA	1 000 mW	See tables below	

Sensor type	Insertion Length IL		Flying leads		Terminal block	
	C <sub>i</sub> /m	L <sub>i</sub> /m	C <sub>i</sub>	L <sub>i</sub>	C <sub>i</sub>	L <sub>i</sub>
Single	200 pF	1 μH	56.4 pF	282 nH	4.6 pF	23 nH
Dual	400 pF	2 μH	113 pF	564 nH	9.2 pF	46 nH

**Calculation formula for options with flying leads only:**

- $C_i = C_i \text{ Insertion length IL} \times \text{IL} + C_i \text{ Flying leads}$
- $L_i = L_i \text{ Insertion length IL} \times \text{IL} + L_i \text{ Flying leads}$

**Calculation formula for options with terminal block only:**

- $C_i = C_i \text{ Insertion length IL} \times \text{IL} + C_i \text{ Terminal block}$
- $L_i = L_i \text{ Insertion length IL} \times \text{IL} + L_i \text{ Terminal block}$





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