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Safety Instructions
TR1x, TR4x, TR88, TSC310, TST310, TR6x, TC1x, TC6x, TC88, TPC100, TPR100, TM411, TM412, TR24

Thermometers and inserts

Ex iaIIC T1-T6 Ga, Ex iaD 20 T85-T450

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TR1x, TR4x, TR88, TSC310, TST310, TR6x, TC1x, TC6x, TC88, TPC100, TPR100, TM411, TM412, TR24

Thermometers and inserts

Supplementary Documentation

Explosion-protection brochure: CP00021Z/11

The Explosion-protection brochure is available: In the download area of the Endress+Hauser website: www.endress.com → Download → Advanced → Documentation code: CP00021Z

Manufacturer's certificates

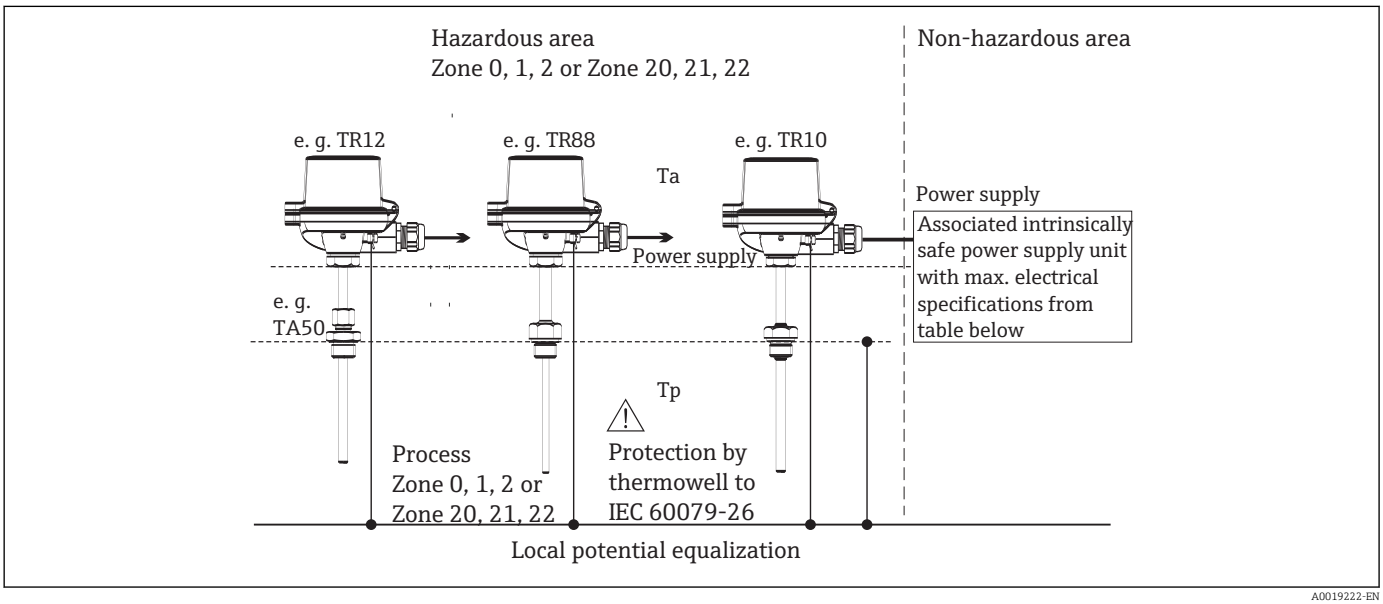
NEPSI Certificate of conformity

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

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.
- 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.
- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
  - Be suitably qualified for their role and the tasks they perform
  - Be trained in explosion protection
  - Be familiar with national regulations
- This product should be used in explosive gas atmospheres together with approved associated apparatus, follow the instruction manual of this product and associated apparatus when connecting the wiring. Connect the wiring terminals correctly.

- Connecting cable between the temperature sensor and associated apparatus should be insulated screen cable; connect the cable screen functionally to earth ground.
- The user shall not change the configuration in order to maintain/ensure the explosion protection performance of the equipment. Any change may impair safety.
- For installation, use and maintenance of this product, the end user shall observe the instruction manual and the following standards:
  - GB 3836.13-2013 “Explosive atmospheres – Part 13: Equipment repair, overhaul and reclamation”.
  - GB/T 3836.15-2017 “Explosive atmospheres – Part 15: Electrical installations design, selection and erection”.
  - GB/T 3836.16-2017 “Explosive atmospheres – Part 16: Electrical installations inspection and maintenance”.
  - GB/T 3836.18-2017 “Explosive atmospheres – Part 18: Intrinsically safe electrical systems”.
  - GB 12476.2-2010 "Electrical apparatus for use in the presence of combustible dust-Part 2: Selection and installation". (Only if installed in dust hazardous areas)
  - GB 50257-2014 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”
  - GB 15577-2018 “Safety regulations for dust explosion prevention and protection”. (Only if installed in dust hazardous areas).

Safety instructions: Installation in equipment of Group III

- Sensors for thermometers without thermowell (e.g. TX62, TR24, TX88) are to be mechanically protected by thermowell suitable for Group III in compliance with GB3836.4:2010 and GB3836.1:2010 and its ultimate application.
- Seal the cable entries tight with certified cable glands (min. IP6X) IP6X according to IEC 60529.
- The provided cable glands according to option code are suitable NEPSI 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 +5K 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 at least IP6X is maintained during operation).

Safety instructions: Intrinsic safety

- 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.
- 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 GB3836.20:2010.
- 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 the plastic housing (do not rub dry).
- 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 GB3836.20:2010 in reference to its ultimate application.

Temperature tables

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

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 TMT182 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 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

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

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
	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 ≤ 1000 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	
	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.

Determination of process temperature

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)]
	144K/W	
6 mm		

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

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