

Safety Instructions

Modular RTD assemblies for hygienic applications

iTHERM TM411, TM412

0Ex ia IIC T6...T1 Ga X

Ga/Gb Ex ia IIC T6...T1 Ga X

Ex ia IIIC T85°C...T450°C Da X

Ex ia IIIC T85°C...T450°C Da/Db X



Modular RTD assemblies for hygienic applications

iTHERM TM411, TM412

Table of contents

Associated documentation	4
Supplementary documentation	4
EAC certificate of conformity	4
Manufacturer address	4
Safety instructions	5
Safety Instructions: General	5
Safety instructions: Installation in equipment of Group III	6
Safety instructions: Intrinsic safety	6
Safety instructions: Zone 0	7
Safety instructions: Special conditions	7
Safety instructions: Partition wall	7
Temperature tables	7

Associated documentation

This document is an integral part of the following Operating Instructions:

- Operating Instructions: BA02023T
- Technical Information:
 - TM411: TI01038T
 - TM412: TI01057T

All documentation is available in:

- *W@M Device Viewer*: Enter the serial number from the nameplate in the (www.endress.com/deviceviewer): all data relating to the device and an overview of the Technical Documentation supplied with the device are displayed.
- *Endress+Hauser Operations App*: Enter the serial number on the nameplate or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information about the device and the technical documentation pertaining to the device is displayed.
- In the Download Area of the Endress+Hauser web site: www.endress.com → Download.

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

EAC certificate of conformity

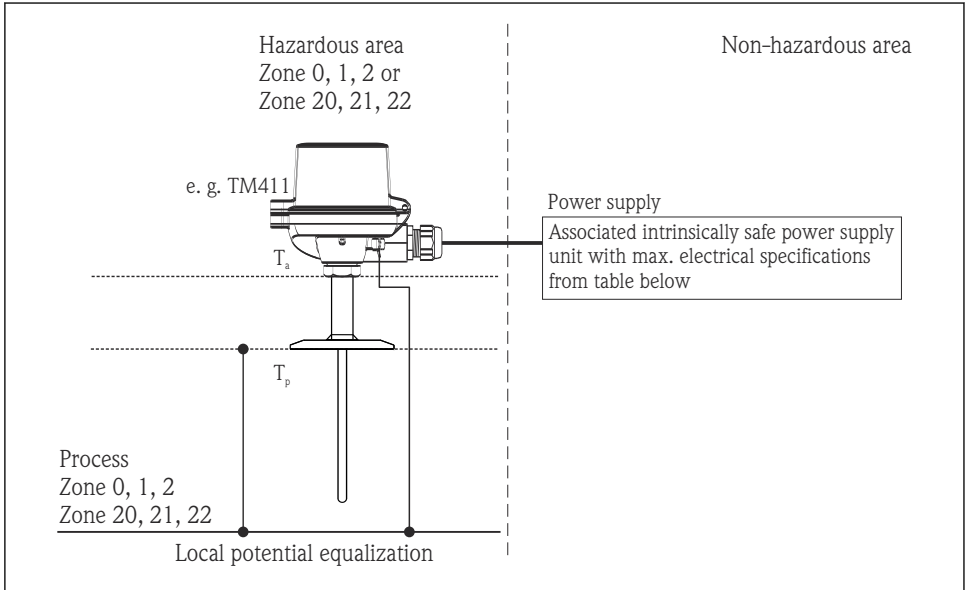
The RTD/TC inserts and cable thermometers meet the fundamental health and safety requirements for the design and construction of devices and protective systems intended for use in potentially explosive atmospheres in accordance with TR CU 012/2011. Certification body: НАННО "ЦСБЭ" Certificate number: EAЭС RU C-DE.AA87.B.00595/20 Affixing the certificate number certifies conformity with the following standards:

- GOST 31610.0-2014 (IEC 60079-0)
- GOST 31610.11-2014 (IEC 60079-11)
- GOST 31610.26-2012 (IEC 60079-26)

Manufacturer address

Endress+Hauser Wetzler GmbH + Co. KG
Obere Wank 1,
D-87484 Nesselwang or www.endress.com

Safety instructions



A0047136

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 (GOST 30852.13, 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. TK40) 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 are to be mechanically protected by thermowell suitable for Group III in compliance with GOST 31610.11 (IEC 60079-11) and GOST 31610.0 (IEC 60079-0) and its ultimate application.
- Seal the cable entries tight with certified cable glands (min. IP6X) IP6X according to IEC 60529.
- For operating the thermometer at an ambient temperature under $-20\text{ }^{\circ}\text{C}$, appropriate cables, cable entries and sealing facilities permitted for this application must be used.
- For ambient temperatures higher than $+70\text{ }^{\circ}\text{C}$, 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 (GOST 30852.13, 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 GOST 31610.26 (IEC 60079-26).
- 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 TS111 must be connected to the local potential equalization.
- For inserts with 3 mm diameter or grounded inserts, e.g. type TS111 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:
 - $-20\text{ °C} \leq T_a \leq +60\text{ °C}$
 - $-0.8\text{ bar} \leq p \leq 1.1\text{ bar}$
- 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.

Safety instructions: Partition wall

Install the thermometer in a partition wall which is in compliance with GOST 31610.26 (IEC 60079-26) 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	1 000 mW	1 nF	1 mH

Type of protection	Type
OEx ia IIC T6...T1 Ga X	iTHERM TM411, TM412
Ga/Gb Ex ia IIC T6...T1 Ga X	
Ex ia IIIC T85°C...T450°C Da X	
Ex ia IIIC T85°C...T450°C Da/Db X	

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
iTHERM TM411, TM412	TMT181 TMT182 TMT84/TMT85	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
	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	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 range	Temperature class/ maximum surface temperature sensor
iTHERM TM411 TM412	TMT18x TMT8x	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

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)
		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

Determination of process temperature for $P_i \leq 50 \text{ mW}$:

Insert diameter	Thermal resistance (Rth) for $P_i \leq 50 \text{ mW}$	Formula for calculating process temperature (Tp)
3 mm, 3 mm dual or 6 mm dual	274K/W	$T_p < T_{\text{class}}^{1)} - \text{Tol.}^{2)} - (\text{Rth} \times P_0^{3)})$
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: $T_p < T_{\text{class}} - \text{Tol.} - (\text{Rth} \times P_0)$

$$T_p < 85 \text{ °C(K)} - 5\text{K} - (144\text{K/W} \times 6.6 \text{ mW})$$

$$T_p < 79.04 \text{ °C}$$



71544865

www.addresses.endress.com
