



Level



Pressure



Flow



Temperature



Liquid Analysis



Registration



Systems Components



Services



Solutions

## Technical information

# iTEMP® TC TMT128

DIN rail mounted Temperature Transmitter  
for Thermocouples (TC)



### Application

- Temperature transmitter with fixed measuring ranges for converting TC input signals into an analogue, scalable 4 to 20 mA output signal
- Input:  
Thermocouples (TC)

### Features and benefits

- High accuracy: 0.08 % of span
- Breakdown information in event of sensor break enables a quick maintenance intervention
- Galvanic isolation 2 kV (from the sensor input to the output)
- Long term stability: < 0.05 %/year
- Electromagnetic compatibility to IEC 61326 for use in noisy environments
- Ex approvals for high safety standards:
  - ATEX EEx ia, nA
  - CSA IS, NI
  - CSA GP
  - FM IS, NI
- GL Germanische Lloyd / marine approval
- UL recognized component to UL 3111-1



## Function and system design

<b>Measuring principle</b>	Electronic acquisition and conversion of input signals in industrial temperature measurement.
<b>Measuring system</b>	The iTEMP® TC TMT128 DIN rail temperature transmitter is a two-wire transmitter with analog output and measuring input for thermocouples.

## Input values

<b>Measured variable</b>	Temperature																																																					
<b>Measuring range</b>	Depending on the application, different measuring ranges can be ordered (see 'Product structure').																																																					
<b>Input type</b>	<table border="1"> <thead> <tr> <th>Input</th> <th>Designation</th> <th>Measuring range limits</th> <th>Min. span</th> </tr> </thead> <tbody> <tr> <td rowspan="16">Thermocouples (TC)</td> <td>B (PtRh30-PtRh6)</td> <td>0 to +1820 °C (32 to 3308 °F)</td> <td>500 K</td> </tr> <tr> <td>C (W5Re-W26Re)<sup>1)</sup></td> <td>0 to +2320 °C (32 to 4208 °F)</td> <td>500 K</td> </tr> <tr> <td>D (W3Re-W25Re)<sup>1)</sup></td> <td>0 to +2495 °C (32 to 4523 °F)</td> <td>500 K</td> </tr> <tr> <td>E (NiCr-CuNi)</td> <td>-270 to +1000 °C (-454 to 1832 °F)</td> <td>50 K</td> </tr> <tr> <td>J (Fe-CuNi)</td> <td>-210 to +1200 °C (-346 to 2192 °F)</td> <td>50 K</td> </tr> <tr> <td>K (NiCr-Ni)</td> <td>-270 to +1372 °C (-454 to 2501 °F)</td> <td>50 K</td> </tr> <tr> <td>L (Fe-CuNi)<sup>2)</sup></td> <td>-200 to +900 °C (-328 to 1652 °F)</td> <td>50 K</td> </tr> <tr> <td>N (NiCrSi-NiSi)</td> <td>-270 to +1300 °C (-454 to 2372 °F)</td> <td>50 K</td> </tr> <tr> <td>R (PtRh13-Pt)</td> <td>-50 to +1768 °C (-58 to 3214 °F)</td> <td>500 K</td> </tr> <tr> <td>S (PtRh10-Pt)</td> <td>-50 to +1768 °C (-58 to 3214 °F)</td> <td>500 K</td> </tr> <tr> <td>T (Cu-CuNi)</td> <td>-270 to +400 °C (-454 to 752 °F)</td> <td>50 K</td> </tr> <tr> <td>U (Cu-CuNi)<sup>2)</sup></td> <td>-200 to +600 °C (-328 to 1112 °F)</td> <td>50 K</td> </tr> <tr> <td>to IEC 60584 part 1</td> <td></td> <td></td> </tr> <tr> <td>■ Internal cold junction (Pt100)</td> <td></td> <td></td> </tr> <tr> <td>■ Accuracy of cold junction: ±1 K</td> <td></td> <td></td> </tr> <tr> <td>■ Sensor current: = 350 nA</td> <td></td> <td></td> </tr> </tbody> </table>	Input	Designation	Measuring range limits	Min. span	Thermocouples (TC)	B (PtRh30-PtRh6)	0 to +1820 °C (32 to 3308 °F)	500 K	C (W5Re-W26Re) <sup>1)</sup>	0 to +2320 °C (32 to 4208 °F)	500 K	D (W3Re-W25Re) <sup>1)</sup>	0 to +2495 °C (32 to 4523 °F)	500 K	E (NiCr-CuNi)	-270 to +1000 °C (-454 to 1832 °F)	50 K	J (Fe-CuNi)	-210 to +1200 °C (-346 to 2192 °F)	50 K	K (NiCr-Ni)	-270 to +1372 °C (-454 to 2501 °F)	50 K	L (Fe-CuNi) <sup>2)</sup>	-200 to +900 °C (-328 to 1652 °F)	50 K	N (NiCrSi-NiSi)	-270 to +1300 °C (-454 to 2372 °F)	50 K	R (PtRh13-Pt)	-50 to +1768 °C (-58 to 3214 °F)	500 K	S (PtRh10-Pt)	-50 to +1768 °C (-58 to 3214 °F)	500 K	T (Cu-CuNi)	-270 to +400 °C (-454 to 752 °F)	50 K	U (Cu-CuNi) <sup>2)</sup>	-200 to +600 °C (-328 to 1112 °F)	50 K	to IEC 60584 part 1			■ Internal cold junction (Pt100)			■ Accuracy of cold junction: ±1 K			■ Sensor current: = 350 nA		
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1) to ASTM E988

2) to DIN 43710

## Output

<b>Output signal</b>	Analog 4 to 20 mA												
<b>Breakdown information</b>	<b>Breakdown information to NAMUR NE 43</b> Breakdown information is created when the measuring information is invalid or not present anymore and gives a complete listing of all errors occurring in the measuring system.												
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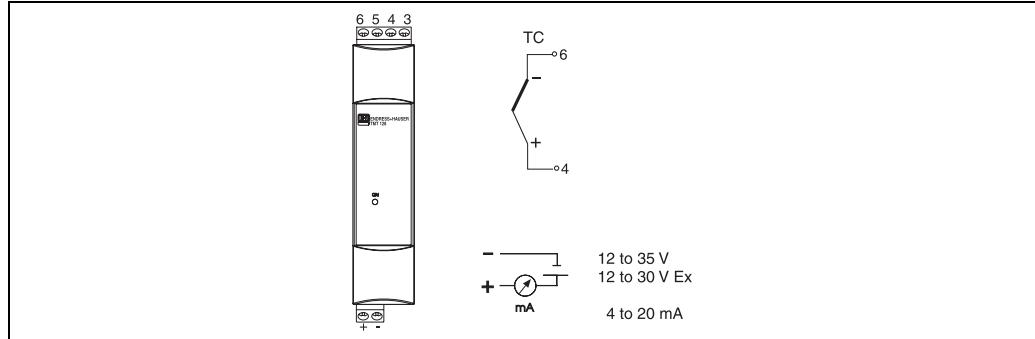
1) if output setting is ≥ 21.0 mA, &gt; 21.5 mA is guaranteed

<b>Source impedance</b>	Max. $(V_{\text{power supply}} - 12\text{V}) / 0.022\text{ A}$ (current output) e. g. $(24\text{V} - 12\text{V}) / 0.022\text{ A} = 545.5\text{ Ω}$
<b>Transmission behavior</b>	Temperature linear

<b>Galvanic isolation</b>	U = 2 kV AC (input/output)
<b>Induced current requirement</b>	≤ 3.5 mA
<b>Current limitation</b>	≤ 23 mA
<b>Switch-on delay</b>	4 s (during switch-on procedure $I_a \leq 3.8$ mA)

## Power supply

### Electrical connection



Temperature transmitter terminal assignment

<b>Supply voltage</b>	$U_b = 12$ to $35$ V, reverse polarity protection
<b>Residual ripple</b>	Permitted residual ripple $U_{ss} \leq 3$ V at $U_b \geq 15$ V, $f_{max.} = 1$ kHz

## Accuracy

<b>Response time</b>	1 s
<b>Reference operating conditions</b>	Calibration temperature: $+25$ °C ( $77$ °F) $\pm 5$ K
<b>Maximum measured error</b>	

	<b>Designation</b>	<b>Accuracy<sup>1)</sup></b>
<b>Thermocouples (TC)</b>	K, J, T, E, L, U N, C, D S, B, R	typ. 0.5 K or 0.08% typ. 1.0 K or 0.08% typ. 2.0 K or 0.08%

1) % refer to the set span. The highest value is valid.

<b>Influence of supply voltage</b>	■ $\leq \pm 0.01\%/\text{V}$ deviation from 24 V Percentages refer to the full scale value.
<b>Influence of ambient temperature (temperature drift)</b>	■ Thermocouple (TC): $T_d = \pm(50 \text{ ppm/K} * \text{max. measuring range} + 50 \text{ ppm/K} * \text{of set measuring range}) * \Delta 9$ $\Delta 9 = \text{deviation of the ambient temperature from the reference operating condition (25 } \text{°C (77 } \text{°F) } \pm 5 \text{ K).}$
<b>Influence of load</b>	■ $\pm 0.02\%/100 \Omega$ Values refer to the full scale value.

**Long-term stability**

- $\leq 0.1$  K/year or  $\leq 0.05\%$ /year

Values under reference operating conditions. % refer to the set span. The larger value applies.

## Installation conditions

**Installation instructions****Installation location**

No restrictions

## Environmental conditions

**Ambient temperature limits** -40 to +85 °C (-40 to 185 °F), for Ex-area, see Ex-certificate

**Storage temperature** -40 to +100 °C (-40 to 212 °F)

**Climate class** As per IEC 60654-1, Class C

**Degree of protection** IP 20

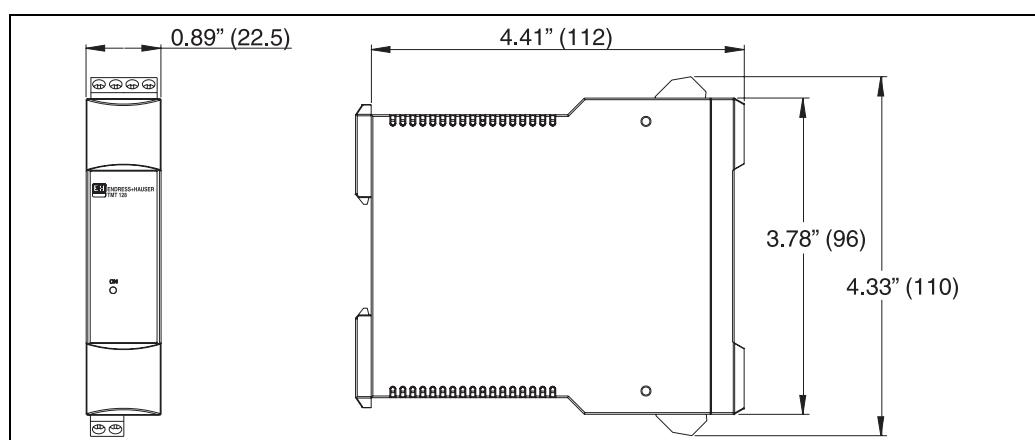
**Shock resistance** 4g / 2 to 150 Hz as per IEC 60068-2-6

**Vibration resistance** see 'Shock resistance'

**Electromagnetic compatibility (EMC)** Shock resistance and interference emission as per IEC 61326 and NAMUR NE 21.

**Condensation** permitted

## Mechanical construction

**Design, dimensions**

Values in inch (mm)

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<b>Weight</b>	approx. 90 g (3.18 oz)
<b>Material</b>	Housing: PC/ABS, UL 94VO
<b>Terminals</b>	Pluggable screw terminal, max. 2,5 mm <sup>2</sup> (16 AWG) solid, or strand with wire end sleeve.

## Human interface

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<b>Display elements</b>	Illuminated yellow LED (2 mm, 0.08 in) signals device operation.
<b>Operating elements</b>	There are no operating elements available on the device.

## Certificates and approvals

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<b>CE-Mark</b>	The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
<b>Hazardous area approvals</b>	For further details on the available Ex versions (ATEX, CSA, FM, etc.), please contact your Endress+Hauser sales organization. All relevant data for hazardous areas can be found in separate Ex documentation. If required, please request copies from your Endress+Hauser sales organization.
<b>GL</b>	Ship building approval (Germanischer Lloyd)
<b>Other standards and guidelines</b>	<ul style="list-style-type: none"> <li>■ IEC 60529: Degree of protection provided by housing (IP-Code)</li> <li>■ IEC 61010-1: Safety requirements for electrical measurement, control and laboratory use.</li> <li>■ IEC 61326-1: Electromagnetic compatibility (EMC requirements)</li> <li>■ NAMUR: International user association of automation technology in process industries</li> </ul>
<b>UL</b>	Recognized component to UL 3111-1

## Ordering information

### Product structure

<b>TMT128</b>	<b>iTEMP TC DIN rail TMT128</b>	
	for temperature measurement with TC Analog output 4 to 20 mA; 2-wire techn.; Galvanic isolation; Failure mode to NAMUR NE 43; 22.5 mm wide; for 35 mm top hat DIN rail according to IEC 60715; UL recognized, ship building approval GL	
	<b>Approval</b>	
	<b>A</b> Non-hazardous area <b>B</b> ATEX II2(1)G EEx ia IIC T4/T5/T6 <b>C</b> FM IS,NI,Class I,Div.1+2,Group ABCD <b>D</b> CSA IS,NI,Class I,Div.1+2,Group ABCD <b>E</b> ATEX II3G EEx nA IIC T4/T5/T6 <b>I</b> FM+CSA IS,NI,Class I,Div.1+2,Group ABCD <b>J</b> CSA General Purpose <b>K</b> TIIS Ex ia IIC T5 <b>1</b> NEPSI Ex ia IIC T4-T6 <b>2</b> NEPSI Ex nA II T4-T6	
	<b>Temperature sensor</b>	
	<b>B</b> Type B (-400 to 1820 °C, 752 to 3308 °F, min. span 500 K) <b>C</b> Type C (-500 to 2320 °C, 932 to 4208 °F, min. span 500 K) <b>D</b> Type D (-500 to 2495 °C, 932 to 4523 °F, min. span 500 K) <b>E</b> Type E (-200 to 1000 °C, -328 to 1832 °F, min. span 50 K) <b>J</b> Type J (-200 to 1200 °C, -328 to 2192 °F, min. span 50 K) <b>K</b> Type K (-200 to 1372 °C, -328 to 2501 °F, min. span 50 K) <b>L</b> Type L (-200 to 900 °C, -328 to 1652 °F, min. span 50 K) <b>N</b> Type N (-100 to 1300 °C, -148 to 2372 °F, min. span 50 K) <b>R</b> Type R (-50 to 1768 °C, -58 to 3214 °F, min. span 500 K) <b>S</b> Type S (-50 to 1768 °C, -58 to 3214 °F, min. span 500 K) <b>T</b> Type T (-200 to 400 °C, -328 to 752 °F, min. span 50 K) <b>U</b> Type U (-200 to 600 °C, -328 to 1112 °F, min. span 50 K)	
	<b>Measuring Range</b>	
	<b>AA</b> 0 to 100 °C (32 to 212 °F) <b>AB</b> 0 to 150 °C (32 to 302 °F) <b>AC</b> 0 to 250 °C (32 to 482 °F) <b>AD</b> 0 to 400 °C (32 to 752 °F) <b>AE</b> 0 to 600 °C (32 to 1112 °F) <b>AF</b> 0 to 900 °C (32 to 1652 °F) <b>AG</b> 0 to 1000 °C (32 to 1832 °F) <b>AH</b> 0 to 1200 °C (32 to 2192 °F) <b>AI</b> 0 to 1400 °C (32 to 2552 °F) <b>AJ</b> 0 to 1600 °C (32 to 2912 °F) <b>AK</b> 0 to 200 °C (32 to 392 °F) <b>AL</b> 0 to 300 °C (32 to 575 °F) <b>AM</b> 0 to 500 °C (32 to 932 °F) <b>DE</b> -10 to 200 °C (14 to 392 °F) <b>JA</b> -50 to 200 °C (-58 to 392 °F) <b>LA</b> -40 to 140 °F <b>NA</b> 0 to 100 °F <b>NB</b> 0 to 200 °F <b>NC</b> 0 to 300 °F <b>ND</b> 0 to 500 °F <b>NE</b> 0 to 750 °F <b>NG</b> 0 to 1000 °F <b>NI</b> 0 to 1500 °F <b>NK</b> 0 to 2500 °F <b>NL</b> 0 to 3200 °F	
	<b>Additional Option</b>	
	<b>A</b> Basic version <b>B</b> Works calibration certificate (6 test points)	
<b>TMT128-</b>		<b>⇒ Order code (complete)</b>

This ordering information can give an overview about the available order options. The Endress+Hauser sales organization can provide detailed ordering information and information on the order code.

## Accessories

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No accessories are required for this device.

## Documentation

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- Brochure 'Temperature measurement' (FA006T09en)
- Operating short manual "iTEMP® RTD/TC DIN rail TMT127/128" (KA140R09a3)
- Ex-Supplementary documentation: ATEX Safety instructions II2(1)G (XA013R09a3) and II3G (XA018R09a3)

**Instruments International**

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People for Process Automation