

# Technical Information

## iTEMP TMT80

Universal temperature head transmitter for  
resistance thermometers and thermocouples  
PC-programmable



### Application

- PC programmable (PCP) temperature head transmitter for the conversion of different input signals into an analog, scalable 4 to 20 mA output signal
- For resistance thermometers (RTD) and thermocouples (TC)
- Device configuration via PC with configuration kit and PC software

### Your benefits

- 2-wire power supply, analog output 4 to 20 mA
- Fault signal in the event of sensor break or sensor short circuit, adjustable as per NAMUR NE43
- Meets EMC requirements as per NAMUR NE21
- Galvanic isolation 500 V (input/output)
- Adjustment of the application-specific measuring range

## Function and system design

<b>Measuring principle</b>	Electronic recording and conversion of various input signals in industrial temperature measurement.
<b>Measuring system</b>	The iTEMP TMT80 temperature head transmitter is a two-wire transmitter with an analog output and a measuring input for resistance thermometers with a 2-, 3-, or 4-wire connection and thermocouples. The device is configured using a configuration kit and the free ReadWin 2000 operating software.

## Input

<b>Measured variable</b>	Temperature (temperature-linear transmission behavior)
<b>Measuring range</b>	The device provides different measuring ranges depending on the sensor connection and input signals:

Resistance thermometer (RTD) as per standard	Designation	Measuring range limits	Min. span
IEC 60751 ( $\alpha = 0.00385$ )	Pt100 Pt1000	-200 to +850 °C (-328 to +1562 °F) -200 to +250 °C (-328 to +482 °F)	10 K (18 °F)
	<ul style="list-style-type: none"> <li>■ Connection type: 2-, 3- or 4-wire connection</li> <li>■ With 2-wire circuit, compensation of wire resistance possible (0 to 20 Ω)</li> <li>■ Cable resistance: sensor wire resistance up to max. 11 Ω per wire</li> <li>■ Sensor current: <math>\leq 0.6</math> mA</li> </ul>		

Thermocouples as per standard	Designation	Measuring range limits	Min. span
IEC 60584, Part 1	Type B (PtRh30-PtRh6) (31) Type K (NiCr-Ni) (36) Type N (NiCrSi-NiSi) (37) Type R (PtRh13-Pt) (38) Type S (PtRh10-Pt) (39)	+40 to +1820 °C (+104 to +3 308 °F) -200 to +1372 °C (-328 to +2 501 °F) -270 to +1300 °C (-454 to +2 372 °F) -50 to +1 768 °C (-58 to +3 214 °F) -50 to +1 768 °C (-58 to +3 214 °F)	500 K 50 K 50 K 500 K 500 K
	<ul style="list-style-type: none"> <li>■ Internal reference junction (Pt100)</li> <li>■ Reference junction accuracy: <math>\pm 1</math> K</li> </ul>		

## Output

<b>Output signal</b>	Analog, 4 to 20 mA
<b>Signal on alarm</b>	<ul style="list-style-type: none"> <li>■ Underranging: Linear drop to 3.8 mA</li> <li>■ OVERRANGING: Linear rise to 20.5 mA</li> <li>■ Sensor breakage; sensor short-circuit<sup>1)</sup>: <math>\leq 3.6</math> mA or <math>\geq 21.0</math> mA (if setting is <math>\geq 21.0</math> mA an output current <math>\geq 21.5</math> mA is guaranteed)</li> </ul>
<b>Load</b>	Max. $(V_{\text{power supply}} - 8 \text{ V}) / 0.025 \text{ A}$ (Current output)
<b>Transmission behavior</b>	Temperature linear
<b>Galvanic isolation</b>	$U = 500 \text{ V}_{\text{AC}}$ (input/output)

1) Not for thermocouples

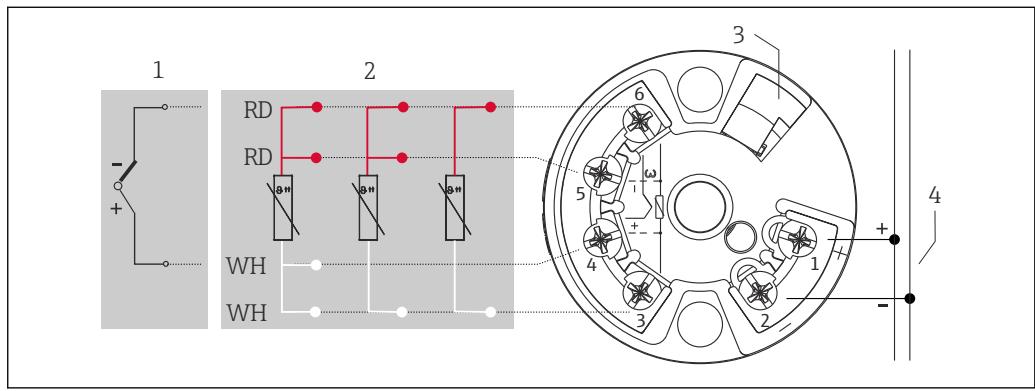
**Input current required**  $\leq 3.5 \text{ mA}$

**Current limit**  $\leq 25 \text{ mA}$

**Switch-on delay** 4 s

## Power supply

**Terminal assignment**



A0047182

Fig. 1 Transmitter mounted in the terminal head

- 1 Sensor input, TC
- 2 Sensor input, RTD and  $\Omega$ : 4-, 3- and 2-wire
- 3 Display connection/CDI interface
- 4 Power supply

**Supply voltage**  $U_b = 8 \text{ to } 35 \text{ V}$ , reverse polarity protection

**Residual ripple** Permitted residual ripple  $U_{ss} \leq 3 \text{ V}$  at  $U_b \geq 15 \text{ V}$ ,  $f_{\max.} = 1 \text{ kHz}$

## Performance characteristics

**Response time** 1 s

**Reference operating conditions**

- Calibration temperature:  $+25^\circ\text{C}$  ( $+77^\circ\text{F}$ )  $\pm 5 \text{ K}$  ( $9^\circ\text{F}$ )
- Supply voltage:  $24 \text{ V}_{\text{DC}}$
- 4-wire circuit for resistance adjustment

**Maximum measured error** The data relating to the measured error are typical values and correspond to a standard deviation of  $\pm 3\sigma$  (normal distribution), i.e. 99.8% of all measured values achieve the specified values or better values. Percentage values refer to the set span. The larger value applies.

	Designation	Accuracy
Resistance thermometer RTD	Pt100, Pt1000	0.5 K or 0.15%
Thermocouples TC	K, N S, B, R	typ. 1.0 K or 0.15 % typ. 2.0 K or 0.15 %

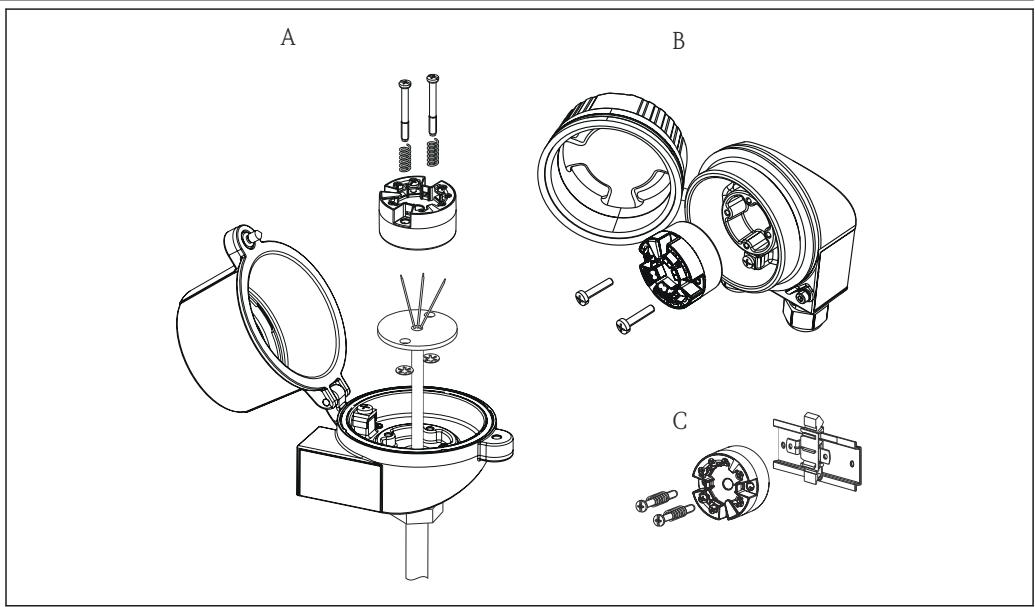
**Influence of the supply voltage**  $\leq \pm 0.01\%/\text{V}$  deviation from  $24 \text{ V}^2)$

2) All data is related to a full scale value

Long-term drift	$\leq 0.1 \text{ K/Year}^3)$ or $\leq 0.05\%/\text{Year}^4)$
Influence of ambient temperature	<ul style="list-style-type: none"> <li>Resistance thermometer (RTD):  <math>T_d = \pm [(15 \text{ ppm/K} * (\text{Upper range value} - \text{Lower range value})) + (50 \text{ ppm/K} * \text{Set measuring range})] * \Delta T</math>            Example of Pt100 resistance thermometer:  <math>T_d = \pm [(15 \text{ ppm/K} * (850 \text{ °C} + 200 \text{ °C})) + (50 \text{ ppm/K} * 100 \text{ °C})] * 10 \text{ K} = \pm 0.21 \text{ K}</math>            Upper range value: 850 °C, Lower range value: -200 °C, Measuring range (4 to 20 mA) configured = 0 to +100 °C, Temperature deviation <math>\Delta T = 10 \text{ K}</math></li> <li>Thermocouple (TC):  <math>T_d = \pm [(50 \text{ ppm/K} * (\text{Upper range value} - \text{Lower range value})) + (50 \text{ ppm/K} * \text{Set measuring range})] * \Delta T</math>  <math>\Delta T = \text{Deviation in ambient temperature from reference operating condition } (+25 \text{ °C } (+77 \text{ °F}) \pm 5 \text{ K } (9 \text{ °F})).</math></li> </ul>
Influence of load	$\leq \pm 0.02\% / 100 \Omega^5)$
Comparison point	Pt100, as per DIN IEC 60751 Class B (internal cold junction for thermocouples TC)

## Installation

### Mounting location



A Terminal head in accordance with DIN EN 43 729 flat face, direct installation on insert with cable entry (center hole 7 mm (0.28 in))  
 B Separate from process in field housing  
 C With clip on DIN rail as per IEC 60715 (TH35)

### Orientation

No restrictions

## Environment

### Ambient temperature range

-40 to +85 °C (-40 to +185 °F)

3) Under reference operating conditions

4) % is related to the set span. The larger value is valid.

5) Under reference operating conditions

<b>Storage temperature</b>	-40 to +100 °C (-40 to +212 °F)
<b>Humidity</b>	<ul style="list-style-type: none"> <li>▪ Condensation as per IEC 60 068-2-33:</li> <li>▪ Max. rel. humidity: 95% as per IEC 60068-2-30</li> </ul>
<b>Climate class</b>	As per IEC 60 654-1, Class C
<b>Degree of protection</b>	IP 00. Depends on the terminal head or field housing when installed.
<b>Shock and vibration resistance</b>	4 g / 2 to 150 Hz as per IEC 60 068-2-6
<b>Electromagnetic compatibility (EMC)</b>	<p><b>CE compliance</b>            Electromagnetic compatibility in accordance with all the relevant requirements of the IEC/EN 61326 series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity.</p> <p>Maximum measured error &lt;1% of measuring range.            Interference immunity as per IEC/EN 61326 series, industrial requirements            Interference emission as per IEC/EN 61326 series, Class B equipment</p>

## Mechanical construction

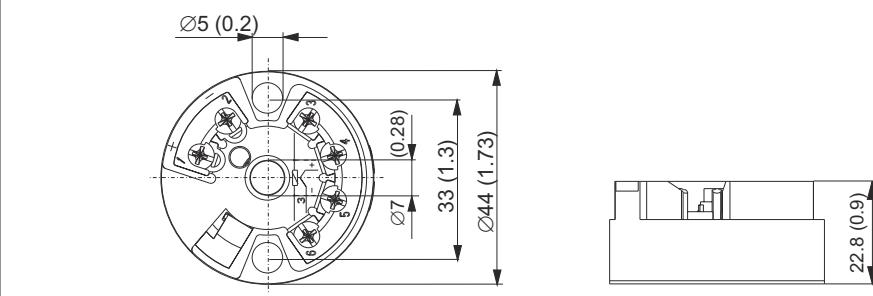
<b>Design, dimensions</b>	
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Fig. 2 Dimensions of the head transmitter in mm (in)

<b>Weight</b>	Approx. 40 g (1.41 oz)
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Housing: Polycarbonate (PC), complies with UL94 HB flammability standard (HB: Horizontal Burning Test). Terminals: nickel-plated brass and gold-plated or tin-plated contacts.</li> <li>▪ Potting: WEVO PU 403 FP/FL, approved in accordance with UL94 VO flammability standard (VO: Vertical Burning Test)</li> </ul>
<b>Terminals</b>	Screw terminals, wires up to max. 1.75 mm <sup>2</sup> (15 AWG) (secure screws) or 1.5 mm <sup>2</sup> (16 AWG) with wire end ferrules

## Operability

### Remote operation

Configuration using PC operating program ReadWin 2000

Menu	Configurable parameters
Standard settings	<ul style="list-style-type: none"> <li>▪ Options for sensor type</li> <li>▪ Connection type (2-, 3- or 4-wire connection)</li> <li>▪ Options for measuring unit: °C, °F</li> <li>▪ Measuring range limits (dependent on sensor type selected)</li> <li>▪ Compensation of wire resistance (0 to 20 Ω for RTD 2-wire circuit)</li> <li>▪ Failsafe mode: ≤ 3.6 mA or ≥ 21.0 mA; (if setting ≥ 21.0 mA, an output current of ≥ 21.5 mA is guaranteed)</li> <li>▪ Zero point, offset: -9.9 to +9.9 K</li> </ul>

## Certificates and approvals

Current certificates and approvals for the product are available via the Product Configurator at [www.endress.com](http://www.endress.com).

1. Select the product using the filters and search field.
2. Open the product page.

The **Configuration** button opens the Product Configurator.

## Accessories

### Device-specific accessories

- Mounting kit for head transmitter (4 screws, 6 springs, 10 fuses)  
**Order code:** 51001112
- Adapter for DIN rail mounting, DIN rail clip according to IEC 60715  
**Order code:** 71528231
- Field housing TAF10 for Endress+Hauser head transmitter, aluminum, IP 66  
**Order code:** TAF10

### Communication-specific accessories

- FXA291 Commubox: PC interface cable, USB, with 4-pin plug;  
**Order code:** 51516983
- TXU10-AA: ReadWin 2000 setup program and PC interface cable, USB, with 4-pin plug;  
**Order code:** TXU10-...

ReadWin 2000 can also be downloaded directly from the Internet for free at the following address:  
[www.endress.com/readwin](http://www.endress.com/readwin)

### Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> <li>▪ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections.</li> <li>▪ Graphic illustration of the calculation results</li> </ul> <p>Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.</p> <p>Applicator is available:</p> <ul style="list-style-type: none"> <li>▪ Via the Internet: <a href="https://portal.endress.com/webapp/applicator">https://portal.endress.com/webapp/applicator</a></li> <li>▪ On CD-ROM for local PC installation.</li> </ul>

Configurator	<p>Product Configurator - the tool for individual product configuration</p> <ul style="list-style-type: none"> <li>▪ Up-to-the-minute configuration data</li> <li>▪ Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language</li> <li>▪ Automatic verification of exclusion criteria</li> <li>▪ Automatic creation of the order code and its breakdown in PDF or Excel output format</li> <li>▪ Ability to order directly in the Endress+Hauser Online Shop</li> </ul> <p>The Configurator is available on the Endress+Hauser website: <a href="http://www.endress.com">www.endress.com</a> -&gt; Click "Corporate" -&gt; Select country -&gt; Click "Products" -&gt; Select the product using the filters and search field -&gt; Open product page -&gt; The "Configure" button to the right of the product image opens the Product Configurator.</p>
W@M	<p>Life cycle management for your plant</p> <p>W@M supports with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.</p> <p>The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records.</p> <p>W@M is available:</p> <ul style="list-style-type: none"> <li>▪ Via the Internet: <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></li> <li>▪ On CD-ROM for local PC installation.</li> </ul>

## Supplementary documentation

Operating Instructions iTEMP TMT80 (BA00292R)



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