



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

iTEMP[®] TMT80

Universal temperature head transmitter for
resistance thermometers and thermocouples
PC programmable



Application

- PC programmable (PCP) temperature head transmitter for converting various input signals into a scalable 4 to 20 mA analog output signal
- Suitable for resistance thermometer (RTD) and thermocouple (TC)
- Device configuration using PC with configuration kit and PC software ReadWin[®] 2000

Benefits at a glance

- 2-wire technology, 4 to 20 mA analog output
- Fault signal on sensor break or short circuit, presettable to NAMUR NE43
- Meets the EMC requirements as per NAMUR NE21
- Galvanic isolation 500 V (input/output)
- Application specific measuring range setting



Function and system design

Measuring principle Electronic recording and conversion of various input signals in industrial temperature measurement.

Measuring system The temperature head transmitter iTEMP® TMT80 is a two wire transmitter with analog output. It has a measurement input for resistance thermometers (RTD) in 2-, 3-, or 4-wire connection and thermocouples. Setting up of the device is done using a configuration kit and the free of charge configuration software ReadWin® 2000.

Input

Measured variable Temperature (temperature linear transmission behavior)

Measuring range The transmitter records different measuring ranges depending on the sensor connection and input signals:

Type of input	Designation	Measuring range limits	min. measuring span
Resistance thermometer (RTD) according to IEC 60751 ($\alpha = 0,00385$)	Pt100	-200 to 850 °C (-328 to 1562 °F)	10 K (18 °F)
	Pt1000	-200 to 250 °C (-328 to 482 °F)	10 K (18 °F)
<ul style="list-style-type: none"> ■ Connection type: 2-wire, 3-wire or 4-wire connection ■ For 2-wire circuit, compensation for wire resistance possible (0 to 20 Ω) ■ Sensor cable resistance max. 11 Ω per cable ■ Sensor current: ≤ 0.6 mA 			
Thermocouples (TC) according to IEC 60584 part 1	B (PtRh30-PtRh6)	0 to +1820 °C (32 to 3308 °F)	500 K (900 °F)
	K (NiCr-Ni)	-270 to +1372 °C (-454 to 2501 °F)	50 K (90 °F)
	N (NiCrSi-NiSi)	-270 to +1300 °C (-454 to 2372 °F)	50 K (90 °F)
	R (PtRh13-Pt)	-50 to +1768 °C (-58 to 3214 °F)	500 K (900 °F)
	S (PtRh10-Pt)	-50 to +1768 °C (-58 to 3214 °F)	500 K (900 °F)
<ul style="list-style-type: none"> ■ Internal cold junction (Pt100) ■ Cold junction accuracy: ± 1 K (1.8 °F) 			

Output

Output signal analog 4 to 20 mA

Signal on alarm

- Underranging:
Linear drop to 3.8 mA
- Overranging:
Linear rise to 20.5 mA
- Sensor break; sensor short circuit¹:
- ≤ 3.6 mA or ≥ 21.0 mA (if setting is ≥ 21.0 mA, an output signal ≥ 21.5 mA is guaranteed)

Load max. $(V_{\text{Power supply}} - 8 \text{ V}) / 0.025 \text{ A}$ (current output)

Linearization / transmission behavior Temperature linear

Galvanic isolation U = 500 V AC (input/output)

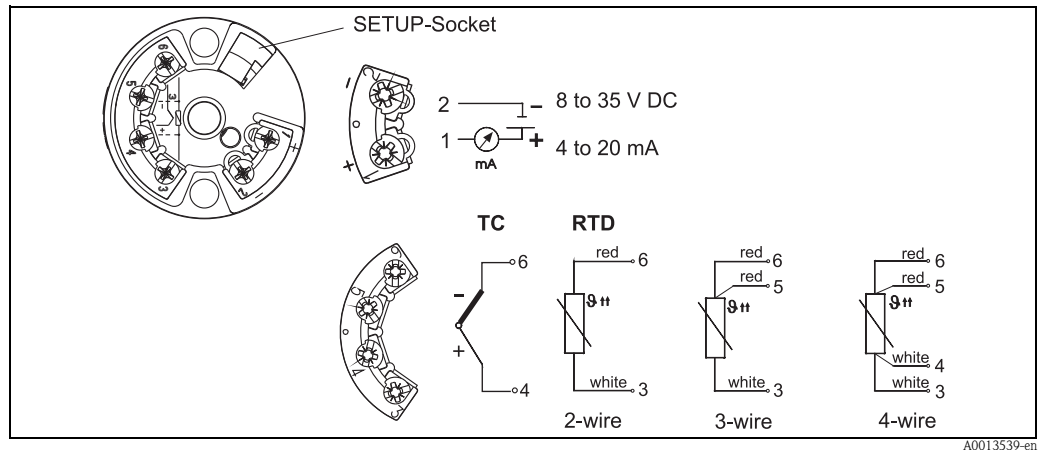
Min. current consumption ≤ 3.5 mA

1. Not for thermocouple

Current limit	$\leq 25 \text{ mA}$
Switch-on delay	4 s (during power up $I_a \approx 3.8 \text{ mA}$)

Power supply

Electrical connection



Terminal assignment of temperature transmitter

Supply voltage	$U_b = 8 \text{ to } 35 \text{ V DC}$, polarity protected
Residual ripple	Permitted residual ripple $U_{ss} \leq 3 \text{ V}$ at $U_b \geq 15 \text{ V}$, $f_{\text{max.}} = 1 \text{ kHz}$

Performance characteristics

Response time	1 s
Reference operating conditions	<ul style="list-style-type: none"> ■ Calibration temperature: $+25 \text{ °C} \pm 5 \text{ K}$ ($77 \text{ °F} \pm 9 \text{ °F}$) ■ Supply voltage: 24 V DC ■ 4-wire circuit for resistance adjustment

Maximum measured error The accuracy data are typical values and correspond to a standard deviation of $\pm 3\sigma$ (normal distribution), i.e. 99.8% of all the measured values achieve the given values or better values. % is related to the adjusted measurement range (the value to be applied is the greater one).

	Type	Measurement accuracy
Resistance thermometer RTD	Pt100, Pt1000	0.5 K (0.9 °F) or 0.15%
Thermocouple TC	K, N S, B, R	typ. 1.0 K (1.8 °F) or 0.15% typ. 2.0 K (3.6 °F) or 0.15%

Influence of power supply	$\leq \pm 0.01\%/V$ deviation from 24 V ¹
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1. All data is related to a measurement end value

Influence of ambient temperature (temperature drift)

■ Resistance thermometer (RTD):

$$T_d = \pm[(15 \text{ ppm/K} * (\text{Measuring range end value} - \text{measuring range start value})) + (50 \text{ ppm/K} * \text{preset measuring range})] * \Delta \vartheta$$

Example RTD thermometer Pt100:

$$T_d = \pm[(15 \text{ ppm/K} * (850 \text{ °C} + 200 \text{ °C})) + (50 \text{ ppm/K} * 100 \text{ °C})] * 10 \text{ K} = \pm 0.21 \text{ K}$$

Measuring range end value: 850 °C, measuring range start value: -200 °C, measuring range (4...20 mA) preset = 0...+100 °C, ambient temperature deviation $\Delta \vartheta = 10 \text{ K}$

■ Thermocouple (TC):

$$T_d = \pm[(50 \text{ ppm/K} * (\text{Measurement range end value} - \text{measurement range start value})) + (50 \text{ ppm/K} * \text{preset measurement range})] * \Delta \vartheta$$

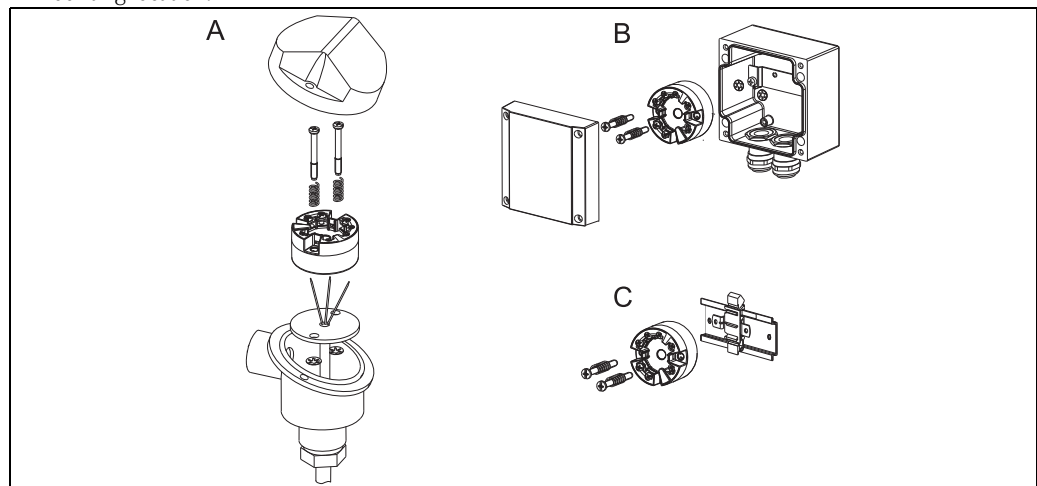
 $\Delta \vartheta =$ Deviation of the ambient temperature according to the reference condition $+25 \text{ °C} \pm 5 \text{ K} (77 \text{ °F} \pm 9 \text{ °F})$.**Long term stability** $\leq 0.1\text{K/year} (\leq 0.18 \text{ °F/year})$ or $\leq 0.05\%/year^1$ 2**Influence of load** $\leq \pm 0.02\%/100 \Omega^1$ **Influence of cold junction**

Pt100, according to DIN IEC 60751 Class B (internal reference junction for thermocouples TC)

Installation conditions

Installation instructions

■ Mounting location:



A: Terminal head as per DIN 43 729 form B, direct installation onto insert with cable entry (middle hole 7 mm / 0.28")

B: Separated from process in field housing

C: With DIN rail clip on top-hat rail as per IEC 60715 (TH35)

■ Orientation: No restrictions

Environment conditions

Ambient temperature

-40 to +85 °C (-40 to 185 °F)

Storage temperature

-40 to +100 °C (-40 to 212 °F)

Climate class

According to IEC 60654-1, Class C

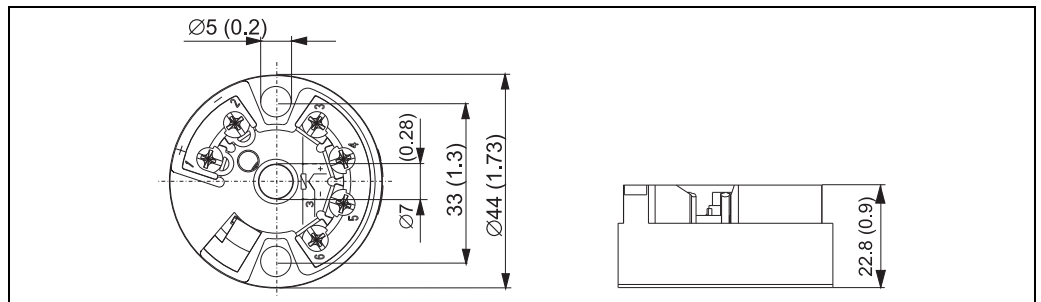
1. According to reference conditions

2. % is related to the adjusted measurement range. The value to be applied is the greater one.

Degree of protection	IP 00. In the installed state, it depends on the terminal head or field housing used.
Shock and vibration resistance	4g / 2 to 150 Hz according to IEC 60 068-2-6
Electromagnetic compatibility (EMC)	Interference immunity and interference emission according to IEC 61326 and NAMUR NE21
Humidity	<ul style="list-style-type: none"> ■ Condensation as per IEC 60 068-2-33 permitted ■ Max. rel. humidity: 95% as per IEC 60068-2-30

Mechanical construction

Design, dimensions



Dimensions in mm (in)

Weight	40 g (2.11 oz)
Material	<ul style="list-style-type: none"> ■ Housing: Polycarbonate (PC), complies with UL94 HB flammability standard (HB: horizontal burning test) ■ Terminals: Nickel-plated brass and gold-plated contact ■ Potting: WEVO PU 403 FP / FL, according to UL94 V0 flammability standard (V0: vertical burning test)
Terminals	Screw terminals, wires up to max. 1.75 mm ² (16 AWG) – secure screws or 1.5 mm ² (16 AWG) with wire end ferrules

Human interface

Operation via PC

Configuration via PC setup software ReadWin[®] 2000:

Menu	Configurable parameters
Standard settings	<ul style="list-style-type: none"> ■ Sensor type ■ Connection (2-, 3- or 4-wire connection) ■ Units: °C, °F ■ Measurements range limits (depends on selected sensor type) ■ Compensation resistance (0 to 20 Ω) on RTD 2-wire connection ■ Fault condition reaction: ≤ 3.6 mA or ≥ 21.0 mA; (for configuration ≥ 21.0 mA an output signal ≥ 21.5 mA is guaranteed) ■ Zero point, offset: -9.9 to +9.9 K / -18 to +18 °F)

Certificates and approvals

CE-Mark

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.

Other standards and guidelines

- IEC 60529: Degrees of protection through housing (IP code)
- IEC 61010: Safety requirements for electrical measurement, control and laboratory instrumentation
- IEC 61326: Electromagnetic compatibility (EMC requirements)
- NAMUR: International user association of automation technology in process industries (www.namur.de)

Ordering information

Product structure

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

TMT80	iTEMP® TMT80 PC-programmable temperature transmitter; Application: RTD, TC; 2-wire 4-20 mA, galvanic isolation; Fault reaction: NAMUR NE43; Mounting: terminal head form B according to DIN EN 50446 Factory setup: Pt100, 3-wire, 0...100 °C, sensor type/connection optional selectable		
	Approval		
	AA	Non-hazardous area	
TMT80-	AA	⇐ Order code (part 1)	
	Additional selection (as option - no selection or multiple selection is possible)		
		Adjustment Sensor type	
		C1	Pt100, -200...850 °C, min. span 10 K, IEC60751, measuring range to be specified
		C2	Pt1000, -200...250 °C, min. span 10 K, IEC60751, measuring range to be specified
		CA	Type B, 0...1820 °C, min. span 500 K, IEC60584, measuring range to be specified
		CB	Type K, -200...1370 °C, min. span 50 K, IEC60584, measuring range to be specified
		CC	Type N, -270...1300 °C, min. span 50 K, IEC60584, measuring range to be specified
		CD	Type R, -50...1768 °C, min. span 500 K, IEC60584, measuring range to be specified
		CE	Type S, -50...1768 °C, min. span 500 K, IEC60584, measuring range to be specified
		Connection	
		D2	RTD 2-wire
		D3	RTD 3-wire
		D4	RTD 4-wire
		Calibration	
		FA	Works calibration certificate 6-point
		Test, certificate	
		KH	Configuration report
		Marking	
		Z2	Tagging (TAG), on device
		Z3	Commissioning label, paper
TMT80-	AA	+	⇐ Order code, complete (part 1 + additional selection as option)

Accessories

- Head transmitter installation set: (4 screws, 6 springs, 10 circlips),
Order-Code: 51001112
- Adapter for DIN rail mounting, DIN rail clip according to IEC 60715
Order-Code: 51000856
- Field housing TAF10 for Endress+Hauser head transmitter, aluminum, IP 66
Order-Code: TAF10

Configuration kits for PC programmable transmitters

- FXA291 Commubox: PC-interface cable with 4-pin USB-plug;
Order-Code: 51516983
- TXU10-AA: Setup-program ReadWin[®] 2000 and PC-interface cable with 4-pin USB-plug;
Order-Code: TXU10-AA

The operating software ReadWin[®] 2000 can be downloaded free of charge from the Internet from the following address:

www.endress.com/readwin

Documentation

Operating Instructions "iTEMP[®] TMT80" (BA292R/09/a3)

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