

Technical Information

iTEMP TMT181

Universal head transmitter for resistance thermometers (RTD), thermocouples, resistance and voltage transmitters, PC programmable, for installation in a terminal head form B



Application

- PC programmable (PCP) temperature head transmitter for converting various input signals into an scalable 4 to 20 mA analog output signal
- Input:
 - Resistance thermometer (RTD)
 - Thermocouple (TC)
 - Resistance transmitter (Ω)
 - Voltage transmitter (mV)
- Online configuration using PC with TXU10-AA configuration kit (accessory)

Your benefits

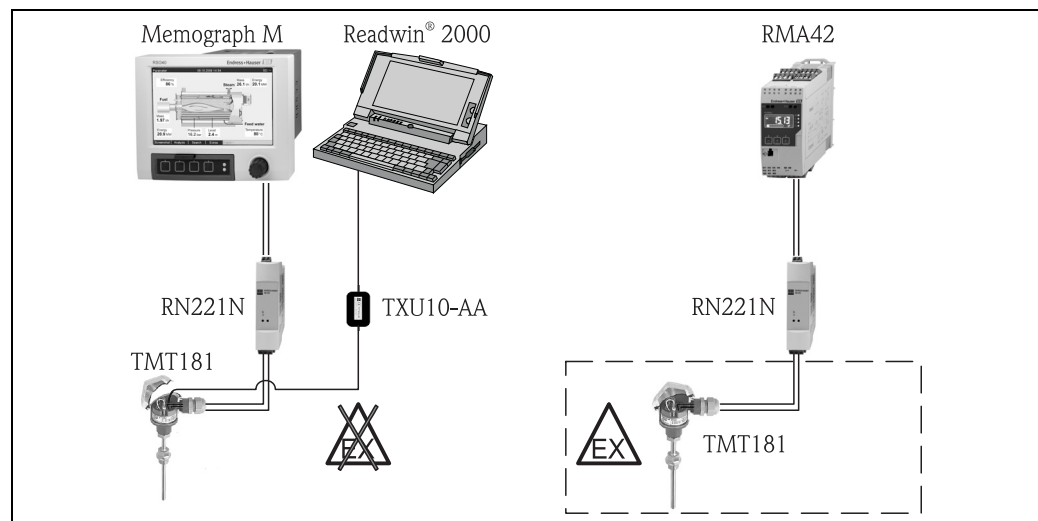
- Universally PC programmable for various signals
- 2 wire technology, 4 to 20 mA analog output
- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit, pre-settable to NAMUR NE 43
- EMC to NAMUR NE 21, CE

- UL recognized component to UL 3111-1
- Marine approval
 - Ex certification
 - ATEX Ex ia and dust ex zone 22 in compliance with EN 50281-1
 - FM IS
 - CSA IS
- Galvanic isolation
- Online configuration during measurement using SETUP connector
- Customer-specific linearization
- Adjustment of characteristic curve
- Output simulation

Function and system design

Measuring principle

Electronic measurement and conversion of input signals in industrial temperature measurement.



Application example TMT181

Measuring system

The iTEMP PCP TMT181 temperature head transmitter is a two wire transmitter with an analog output. It has measurement input for resistance thermometers (RTD) in 2-, 3- or 4-wire connection, thermocouples and voltage transmitters. Setting up of the TMT181 is done using the TXU10-AA configuration kit.

Input

Input signal

Resistance thermometer (RTD)

	Type	Measurement ranges	min. measurement range
as per IEC 751 (a = 0.00385)	Pt100	-200 up to 850 °C (-328 up to +1562 °F)	10 K (18 °F)
	Pt500	-200 up to 250 °C (-328 up to +482 °F)	10 K (18 °F)
	Pt1000	-200 up to 250 °C (-328 up to +482 °F)	10 K (18 °F)
as per DIN 43760 (a = 0.00618)	Ni100	-60 up to 180 °C (-76 up to +356 °F)	10 K (18 °F)
	Ni500	-60 up to 150 °C (-76 up to +302 °F)	10 K (18 °F)
	Ni1000	-60 up to 150 °C (-76 up to +302 °F)	10 K (18 °F)
Connection type	2-, 3- or 4-wire connection cable resistance compensation possible in the 2 wire system (0 up to 20 Ω).		
Sensor cable resistance	max. 11 Ω per wire		
Sensor current	≤ 0.6 mA		

Resistance transmitter (Ω)

Type	Measurement ranges	min. measurement range
Resistance (Ω)	10 up to 400 Ω 10 up to 2000 Ω	10 Ω 100 Ω

Thermocouple (TC)

	Type	Measurement ranges	min. measurement range
as per NIST Monograph 175, IEC 584	B (PtRh30-PtRh6) ¹⁾ E (NiCr-CuNi) J (Fe-CuNi) K (NiCr-Ni) N (NiCrSi-NiSi) R (PtRh13-Pt) S (PtRh10-Pt) T (Cu-CuNi)	0 up to +1820 °C (32 up to 3308 °F) -200 up to +915 °C (-328 up to 1679 °F) -200 up to +1200 °C (-328 up to 2192 °F) -200 up to +1372 °C (-328 up to 2501 °F) -270 up to +1300 °C (-454 up to 2372 °F) 0 up to +1768 °C (32 up to 3214 °F) 0 up to +1768 °C (32 up to 3214 °F) -200 up to +400 °C (-328 up to 752 °F)	500 °C (900 °F) 50 °C (90 °F) 50 °C (90 °F) 50 °C (90 °F) 50 °C (90 °F) 500 °C (900 °F) 500 °C (900 °F) 50 °C (90 °F)
as per ASTM E988	C (W5Re-W26Re) D (W3Re-W25Re)	0 up to 2320 °C (32 up to 4208 °F) 0 up to 2495 °C (32 up to 4523 °F)	50 °C (90 °F) 50 °C (90 °F)
as per DIN 43710	L (Fe-CuNi) U (Cu-CuNi)	-200 up to +900 °C (-328 up to 1652 °F) -200 up to +600 °C (-328 up to 1112 °F)	50 °C (90 °F) 50 °C (90 °F)
w/o	MoRe5-MoRe41	0 up to 2000 °C (32 up to 3632 °F)	500 °C (900 °F)
Cold junction		internal (Pt100) or external (0 up to 80 °C (32 up to 176 °F))	
Accuracy of cold junction		± 1 K (± 1.8 °F)	
Sensor current		30 nA	

1) Higher measurement error for temperatures below 300 °C (572 °F).

Voltage transmitter (mV)

Designation	Measurement ranges	min. measurement range
Millivolt transmitter (mV)	-10 up to 100 mV	5 mV

Output**Output signal****Current output**

4 up to 20 mA, 20 to 4 mA

Signal on alarm

Measurement range undercut	linear drop to 3.8 mA
Exceeding measurement range	linear rise to 20.5 mA
Sensor breakage, sensor short circuit ¹⁾	≤ 3.6 mA or ≥ 21.0 mA

1) Not for thermocouple

Load

Max. load: $(V_{\text{supply}} - 8 \text{ V}) / 0.025 \text{ A}$

Transmission behavior

Temperature linear, resistance linear, voltage linear

Galvanic isolation

I/O: U = 2 kV AC

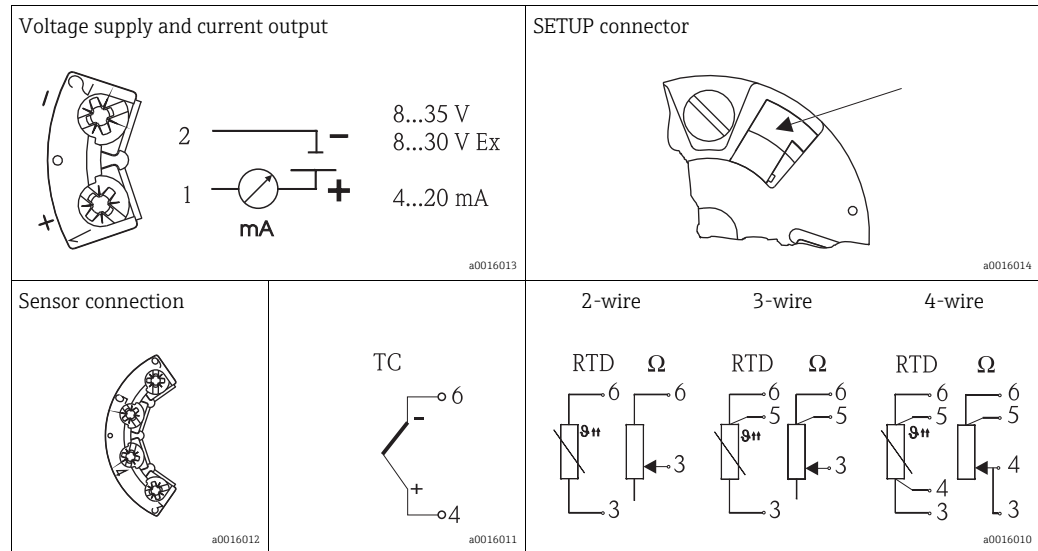
Filter 1st degree digital filter: 0 up to 8 s

Current limit ≤ 25 mA

Switch-on delay 4 s ($I_a = 3.8$ mA during switch-on)

Power supply

Terminal assignment



Supply voltage 8 up to 35 V DC, polarity protected
Ex version: 8 up to 30 V DC

Residual ripple Permissible residual ripple $U_{SS} \leq 5$ V at $U_b \geq 13$ V, $f_{max} = 1$ kHz

Performance characteristics

Response time 1 s

Reference operating conditions Calibration temperature 23 °C ± 5 K (73.4 °F ± 9 °F)

Maximum measured error Resistance thermometer (RTD)

Type	Measurement accuracy ¹⁾
Pt100, Ni100	0.2 K (0.36 °F) or 0.08 %

1) % is related to the adjusted measurement range (the value to be applied is the greater).

Resistance transmitter (Ω)

Type	Measurement accuracy ¹⁾	Measurement range
Resistance	± 0.1 Ω or 0.08 %	10 up to 400 Ω
	± 1.5 Ω or 0.12 %	10 up to 2000 Ω

1) % is related to the adjusted measurement range (the value to be applied is the greater).

Thermocouple (TC)

Type	Measurement accuracy ¹⁾
K, J, T, E, L, U N, C, D S, B, R, MoRe5MoRe41	typ. 0.5 K (0.8 °F) or 0.08 % typ. 1.0 K (1.8 °F) or 0.08 % typ. 2.0 K (3.6 °F) or 0.08 %
Influence of the internal reference junction	Pt100 DIN IEC 751 Kl. B

1) % is related to the adjusted measurement range (the value to be applied is the greater).

Voltage transmitter (mV)

Type	Measurement accuracy ¹⁾	Measurement range
Millivolt transmitter	± 20 µV or 0.08 %	-10 up to 100 mV
Influence of the supply voltage	≤ ± 0.01 %/V deviation from 24 V ²⁾	
Influence of the load	≤ ± 0.02 %/100 Ω ²⁾	

1) % is related to the adjusted measurement range (the value to be applied is the greater).

2) All data is related to a measurement end value (FSD) of 20 mA.

Long-term drift 0.1 K/year (0.18 °F/year) ¹⁾ or 0.05 %/year ¹⁾²⁾

Influence of ambient temperature

T_d = temperature drift
 ΔT = deviation of ambient temperature from reference condition
 For temperatures in °F, divide the result by 1.8.

Resistance thermometer (RTD):

$$T_d = \pm (15 \text{ ppm/K} * \text{max. measurement range} + 50 \text{ ppm/K} * \text{preset measurement range}) * \Delta T$$

Resistance thermometer Pt100:

$$T_d = \pm (15 \text{ ppm/K} * (\text{range end value} + 200) + 50 \text{ ppm/K} * \text{preset measuring range}) * \Delta T$$

Thermocouple (TC):

$$T_d = \pm (50 \text{ ppm/K} * \text{max. measurement range} + 50 \text{ ppm/K} * \text{preset measurement range}) * \Delta T$$

Installation

Mounting location Terminal head as per DIN EN 50446 Form B; field housing TAF10

Orientation No restrictions

1) under reference conditions

2) % is related to the adjusted measurement range (the value to be applied is the greater).

Environment

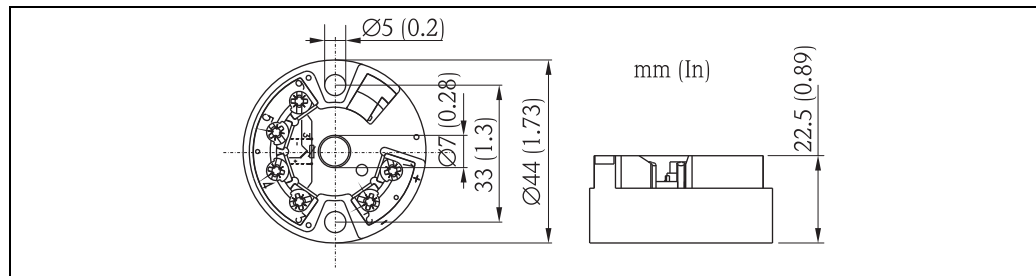
Ambient temperature range -40 up to +85 °C (-40 up to +185 °F) (for Ex-areas, see Ex-certification or control drawings)

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

Electromagnetic compatibility (EMC) CE conformity
EMC to all relevant requirements of the IEC/EN 61326-series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity.
Maximum fluctuations during EMC-tests: <1% of measuring span.
Interference immunity to IEC/EN 61326-series, requirements for industrial areas
Interference emission to IEC/EN 61326-series, electrical equipment Class B

Mechanical construction

Design, dimensions



Dimensions of the head transmitter

Weight 40 g (1.41 oz.)

Materials Housing: PC
Potting: PUR

Terminals Cable up to max. 1.75 mm² (16 AWG)

Operability

Operating concept


Remote operation

Configuration kit TXU10-AA (accessory)
Interface cable plus PC software Readwin® 2000
Interface: PC interface connection cable TTL +/- RS232 with plug
Configurable parameters: sensor type and connection type, measurement dimension (°C/°F), measurement ranges, internal/external cold junction, compensation of cable resistance for 2-wire connection, signal on alarm, output signal (4 up to 20 mA/20 to 4 mA), digital filter (damping), offset, measurement point identification (8 characters), output simulation.

Certificates and approvals

CE mark	This unit complies with the legal requirements laid out within the EU regulations.
Ex approval	For further details on the available Ex versions (ATEX, CSA, FM, etc.), please contact your nearest E+H sales organization. All relevant data for hazardous areas can be found in separate Ex documentation. If required, please request copies from us or your Endress+Hauser sales organization.
Marine approval	For further details on the available "Type Approval Certificates" (DNVGL, BV, etc.), please contact your nearest Endress+Hauser sales organization. All relevant data for marine approval can be found in separate "Type Approval Certificates". If required, please request copies from us or your Endress+Hauser sales organization.
UL approval	UL recognized component (see www.ul.com/database , search for Keyword "E225237")

Ordering information

Product structure	<p>Detailed ordering information is available from the following sources:</p> <ul style="list-style-type: none"> ▪ In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator. ▪ From your Endress+Hauser Sales Center: www.addresses.endress.com <p> Product Configurator - the tool for individual product configuration</p> <ul style="list-style-type: none"> ▪ Up-to-the configuration ▪ Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language ▪ Automatic verification of exclusion criteria ▪ Automatic creation of the order code and its breakdown in PDF or Excel output format ▪ Ability to order directly in the Endress-Hauser Online Shop
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Accessories

Device-specific accessories	Configuration kit TXU10-AA Interface cable plus PC software Readwin® 2000
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Documentation

Standard documentation	<ul style="list-style-type: none"> ▪ Operating instructions KA141R/09 ▪ ATEX Safety instructions: <ul style="list-style-type: none"> – ATEX II1G: XA004R/09 – ATEX II3G: XA010R/09 – ATEX II3D: XA026R/09
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www.addresses.endress.com
