



Level



Pressure



Flow



Temperature



Liquid Analysis



Registration



Systems Components



Services



Solutions

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)

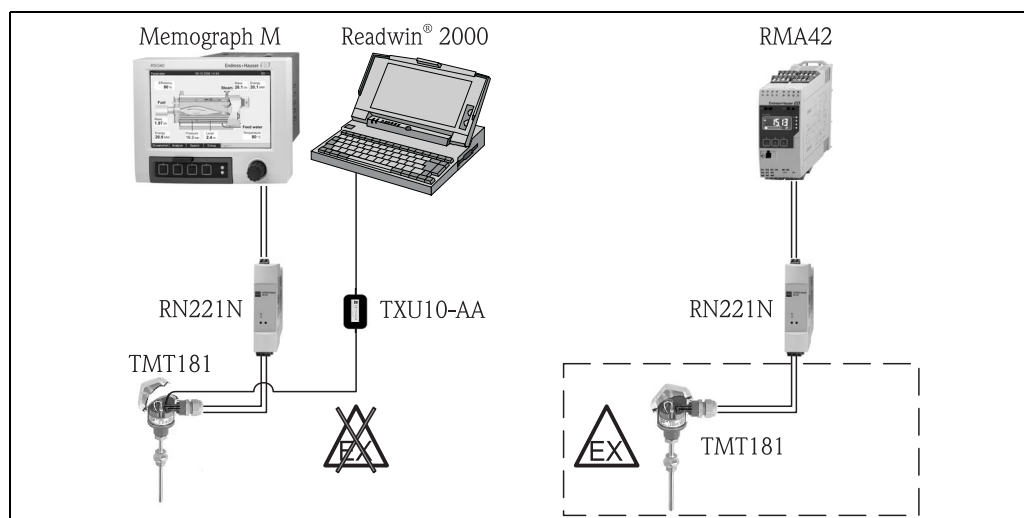
Your benefits

- 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, presettable to NAMUR NE 43
- EMC to NAMUR NE 21, CE
- UL recognized component to UL 3111-1
- GL Germanischer Lloyd 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 ($\alpha = 0.00385$) | 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 ($\alpha = 0.00618$) | 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 -200 up to +915 °C -200 up to +1200 °C -200 up to +1372 °C -270 up to +1300 °C 0 up to +1768 °C 0 up to +1768 °C -200 up to +400 °C | (32 up to 3308 °F) (-328 up to 1679 °F) (-328 up to 2192 °F) (-328 up to 2501 °F) (-454 up to 2372 °F) (32 up to 3214 °F) (32 up to 3214 °F) (-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 0 up to 2495 °C | (32 up to 4208 °F) (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 -200 up to +600 °C | (-328 up to 1652 °F) (-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

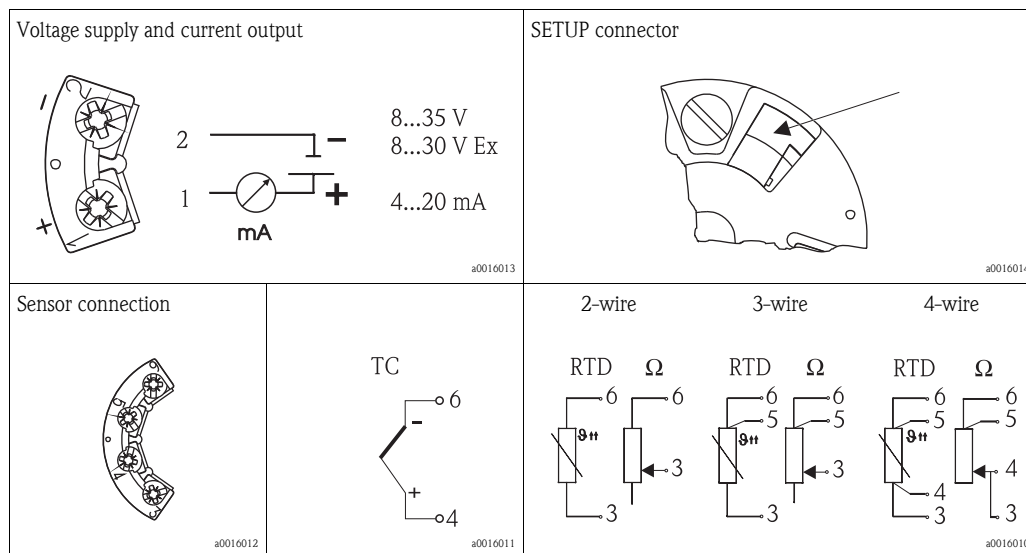
1st degree digital filter: 0 up to 8 s

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
 $\Delta\theta$ = deviation of ambient temperature from reference condition
 For temperatures in °F, divide the result by 1.8.

Resistance thermometer (RTD):

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

Resistance thermometer Pt100:

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

Thermocouple (TC):

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

Installation

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

Orientation No restrictions

1) under reference conditions

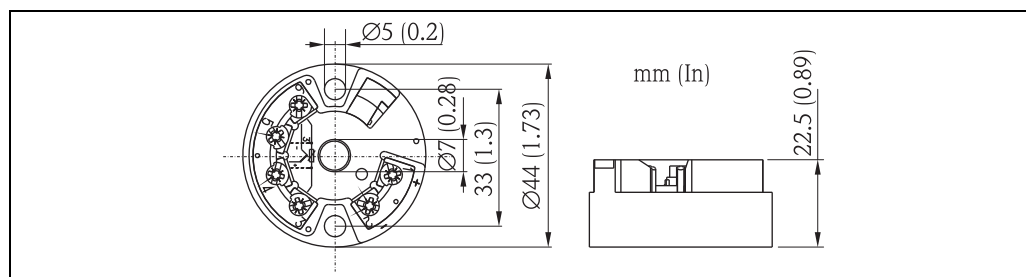
2) % is related to the adjusted measurement range (the value to be applied is the greater).

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) |

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 mm ² (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 E+H sales organization. |

Ordering information

Product structure

| | |
|---------|---|
| TMT181- | Universally PC programmable for resistance thermometers, thermocouples, resistance and voltage transmitters, 2-wire technology, 4 to 20 mA analog output, In/Out galvanic isolation, for mounting in Form B head to DIN EN 50446, UL recognized component, ship building approval GL Germanischer Lloyd |
|---------|---|

| Approval: | |
|-----------|---|
| A | Non-hazardous area |
| B | ATEX II1G EEx ia IIC T4/T5/T6 |
| C | FM IS,NI,Class I,Div.1+2,Group ABCD |
| D | CSA IS,NI,Class I,Div.1+2,Group ABCD |
| E | ATEX II3G Ex nA II T4/T5/T6 |
| F | ATEX II3D |
| G | ATEX II1G EEx ia IIC T6, II3D |
| H | ATEX II3G Ex nA II T6, II3D |
| I | FM+CSA IS,NI,Class I,Div.1+2,Group ABCD |
| J | CSA General Purpose |
| K | TIIS Ex ia IIC T4 |
| L | TIIS Ex ia IIC T6 |
| 1 | NEPSI Ex ia IIC T4-T6 |
| 2 | NEPSI Ex nA II T4-T6 |

| Configuration Connection: | |
|---------------------------|-------------------------------------|
| A | Factory setup Pt 100 3-wire 0-100°C |
| 1 | Thermocouple TC |
| 2 | RTD 2-wire |
| 3 | RTD 3-wire |
| 4 | RTD 4-wire |

| Configuration Sensor Type: | |
|----------------------------|---|
| A | Factory setup Pt100 3-wire 0-100°C |
| B | Type B, 0 up to 1820°C, min. span 500K |
| C | Type C, 0 up to 2320°C, min. span 500K |
| D | Type D, 0 up to 2495°C, min. span 500K |
| E | Type E, -200 up to 1000°C, min. span 50K |
| J | Type J, -200 up to 1200°C, min. span 50K |
| K | Type K, -200 up to 1370°C, min. span 50K |
| L | Type L, -200 up to 900°C, min. span 50K |
| N | Type N, -270 up to 1300°C, min. span 50K |
| R | Type R, -50 up to 1768°C, min. span 500K |
| S | Type S, -50 up to 1768°C, min. span 500K |
| T | Type T, -200 up to 400°C, min. span 50K |
| U | Type U, -200 up to 600°C, min. span 50K |
| V | Voltage transmitter -10 up to 100mV, Min. span 5mV |
| 1 | Pt100, -200 up to 850°C, min. span 10K, IEC751 ($\alpha = 0.00385$) |
| 2 | Ni100, -60 up to 180°C, min. span 10K |
| 3 | Pt500, -200 up to 250°C, min. span 10K |
| 4 | Ni500, -60 up to 150°C, min. span 10K |
| 5 | Pt1000, -200 up to 250°C, min. span 10K |
| 6 | Ni1000, -60 up to 150°C, min. span 10K |
| 7 | Resistance transmitter 10 up to 400 Ohm, Min. span 10 Ohm |
| 8 | Resistance transmitter 10 up to 2000 Ohm, Min. span 100 Ohm |

| Configuration: | |
|----------------|---------------------------------------|
| A | Factory setup Pt100 3-wire 0-100°C |
| B | Measuring range, see additional spec. |
| C | TC config. range, see questionnaire |
| D | RTD config. range, see questionnaire |

| Additional option: | |
|--------------------|--|
| A | Standard - DIN mounting set |
| B | Works calib.certif., 6-point, DIN mounting set |
| K | US - M4 mounting screws |

Accessories

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

Ergänzende Dokumentation

Standard documentation

- Operating instructions KA141R/09/
- ATEX Safety instructions:
 - ATEX II1G: XA004R/09
 - ATEX II3G: XA010R/09
 - ATEX II3D: XA026R/09

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