



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)

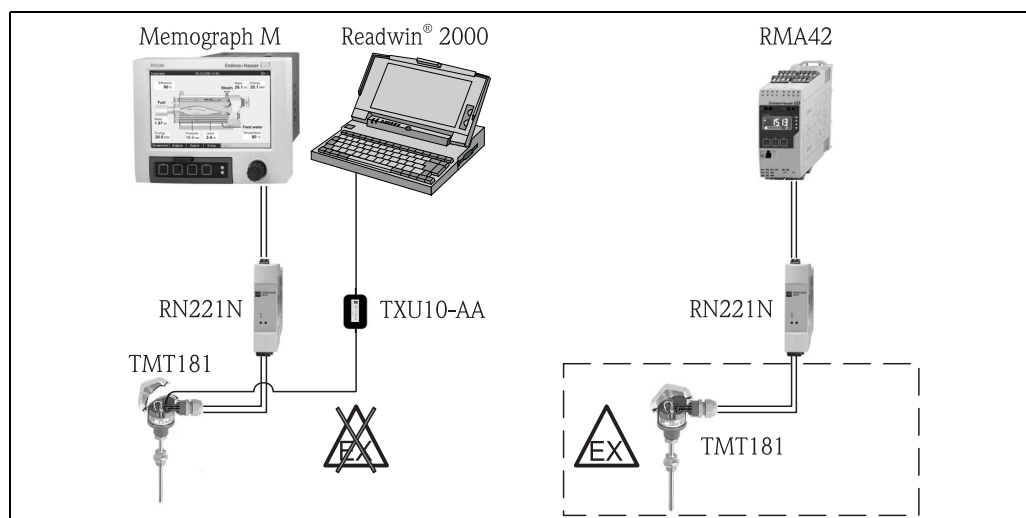
Your benefits

- 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

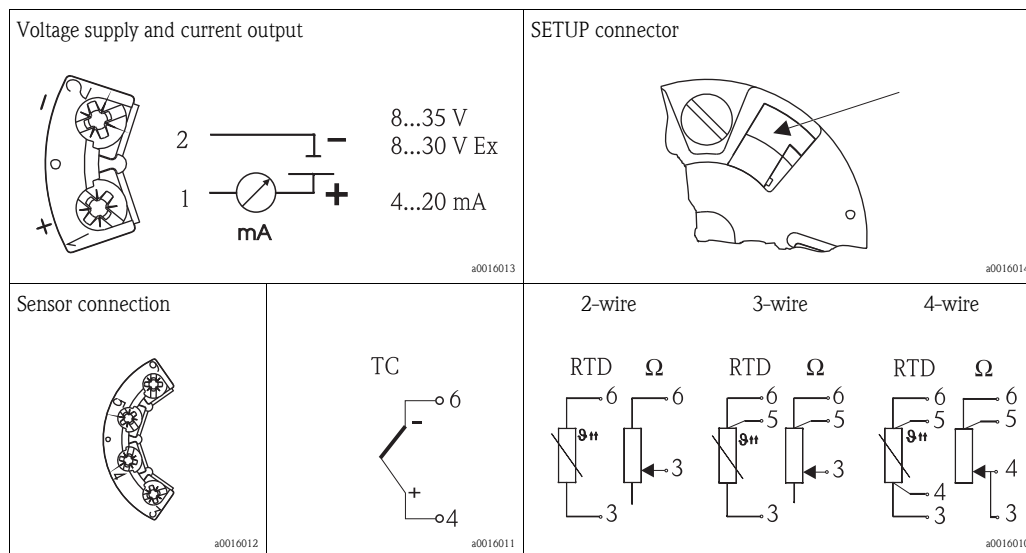
Filter

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

Response time	1 s
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Reference operating conditions	Calibration temperature 23 °C ± 5 K (73.4 °F ± 9 °F)
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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	$\pm 20 \mu\text{V}$ or 0.08 %	-10 up to 100 mV
Influence of the supply voltage	$\leq \pm 0.01 \text{ %/V}$ deviation from 24 V ²⁾	
Influence of the load	$\leq \pm 0.02 \text{ %/}100 \Omega$ 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

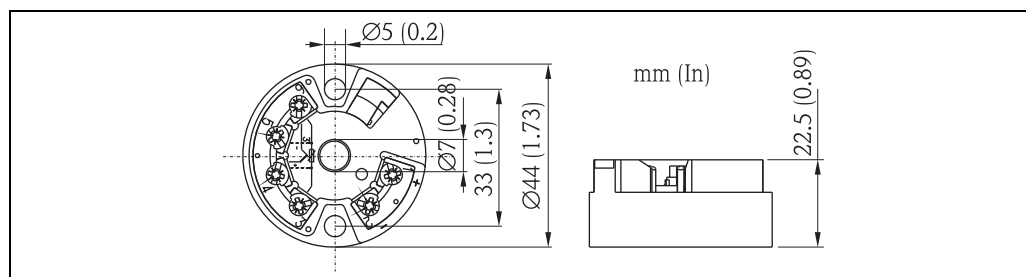
2) % is related to the adjusted measurement range (the value to be applied is the greater).

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
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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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