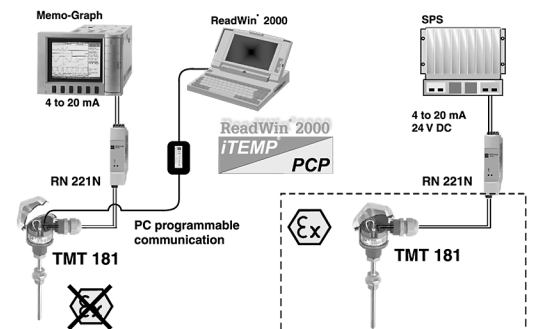


Temperature head transmitter *iTEMP PCP TMT 181*

Universal head transmitter for resistance thermometers (RTD), thermocouples, resistance and voltage transmitters, settable using a PC, for installation in a sensor head (Form B)



Application areas

- PC programmable (PCP) temperature head transmitter for converting various input signals into an scalable 4 to 20 mA analogue output signal
- Input:
Resistance thermometer (RTD)
Thermocouple (TC)
Resistance transmitter (Ω)
Voltage transmitter (mV)
- Online configuration using PC with TMT 181A configuration kit

Features and benefits

- Universally PC programmable for various signals
- Galvanic isolation
- 2 wire technology, 4 to 20 mA analogue output

- High accuracy in total ambient temperature range
- Fault signal on sensor break or short circuit, presetable 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 zone 22 in compliance with EN 50281-1
 - FM IS
 - CSA IS
- Online configuration during measurement using SETUP connector
- Output simulation
- Customer specific measurement range settings or expanded SETUP (see questionnaire, page 5)



Endress + Hauser
 The Power of Know How



Operation and system construction

Measurement principle	Electronic measurement and conversion of input signals in industrial temperature measurement.
Measurement system	The iTEMP PCP TMT 181 temperature head transmitter is a two wire transmitter with an analogue output. It has measurement input for resistance thermometers (RTD) in 2-, 3- or 4-wire connection, thermocouples and voltage transmitters. Setting up of the TMT 181 is done using the TMT 181A configuration kit.

Input

Resistance thermometer (RTD)

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

Resistance transmitter (Ω)

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

Thermocouples (TC)

Type	Measurement range		min. measurement range
B (PtRh30-PtRh6)	0 to +1820 °C	32 to 3308 °F	500 K (900 °F)
C (W5Re-W26Re) ^[3]	0 to +2320 °C	32 to 4208 °F	500 K (900 °F)
D (W3Re-W25Re) ^[3]	0 to +2495 °C	32 to 4523 °F	500 K (900 °F)
E (NiCr-CuNi)	-200 to +915 °C	-328 to 1679 °F	50 K (90 °F)
J (Fe-CuNi)	-200 to +1200 °C	-328 to 2192 °F	50 K (90 °F)
K (NiCr-Ni)	-200 to +1372 °C	-328 to 2501 °F	50 K (90 °F)
L (Fe-CuNi) ^[2]	-200 to + 900 °C	-328 to 1652 °F	50 K (90 °F)
N (NiCrSi-NiSi)	-270 to +1300 °C	-454 to 2372 °F	50 K (90 °F)
R (PtRh13-Pt)	0 to +1768 °C	32 to 3214 °F	500 K (900 °F)
S (PtRh10-Pt)	0 to +1768 °C	32 to 3214 °F	500 K (900 °F)
T (Cu-CuNi)	-200 to + 400 °C	-328 to 752 °F	50 K (90 °F)
U (Cu-CuNi) ^[2]	-200 to + 600 °C	-328 to 1112 °F	50 K (90 °F)
MoRe5-MoRe41 ^[1] accord. to IEC 584 Part 1	0 to +2000 °C	32 to 3632 °F	500 K (900 °F)
Cold junction	internal (Pt100) or external (0 to 80 °C; 32 to 176 °F)		
Cold junction accuracy	± 1 K		
Sensor current	30 nA		

Voltage transmitters (mV)

Type	Measurement range	min. measurement range
Millivolt transmitter (mV)	-10 to 100 mV	5 mV

Output (analogue)

Output signal	4 to 20 mA, 20 to 4 mA
Transmission as	temperature linear, resistance linear, voltage linear
Max. load	(V _{power supply} - 8 V) / 0.025 A

Output

[1] no reference
[2] according to DIN 43710
[3] according to ASTM E988

Digital filter 1st degree	0...8 s
Input current required	≤ 3.5 mA
Current limit	≤ 25 mA
Switch on delay	4 s (during power up $I_a = 3.8$ mA)
Reply time	1 s

Failure signal (fault monitoring)

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 can be set up

Electrical connection

Power supply	$U_b = 8$ to 35 V DC, polarity protected
Galvanic isolation (In/out)	$\hat{U} = 3.75$ kV AC
Allowable ripple	$U_{ss} \leq 5$ V at $U_b \geq 13$ V, $f_{max.} = 1$ kHz

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

Resistance thermometer (RTD)

Type	Measurement accuracy ^[2]
Pt100, Ni100	0.2 K or 0.08%
Pt500, Ni500	0.5 K or 0.20%
Pt1000, Ni1000	0.3 K or 0.12%

Resistance transmitter (Ω)

Type	Measurement accuracy ^[2]	Measurement range
Resistance (Ω)	$\pm 0.1 \Omega$ or 0.08%	10 to 400 Ω
	$\pm 1.5 \Omega$ or 0.12%	10 to 2000 Ω

Thermocouple (TC)

Type	Measurement accuracy ^[2]
K, J, T, E, L, U	typ. 0.5 K or 0.08%
N, C, D	typ. 1.0 K or 0.08%
S, B, R MoRe5-MoRe41	typ. 2.0 K or 0.08%
Influence of the internal reference junction	Pt100 DIN IEC 751 Cl. B

Voltage transmitter (mV)

Type	Measurement accuracy ^[2]	Measurement range
Millivolt transmitter (mV)	$\pm 20 \mu\text{V}$ or 0.08%	-10 to 100 mV

Influence of power supply	$\leq \pm 0.01\%/V$ deviation from 24 V ^[3]
Load influence	$\leq \pm 0.02\%/100 \Omega$ ^[3]

[1] Not for thermocouple

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

[3] All data is related to a measurement end value (FSD) of 20 mA

Temperature drift	Resistive thermometer (RTD): $T_d = \pm (15 \text{ ppm/K} * \text{max. meas. range} + 50 \text{ ppm/K} * \text{preset meas. range}) * \Delta\vartheta$ Resistive thermometer Pt100: $T_d = \pm (15 \text{ ppm/K} * (\text{range end value} + 200) + 50 \text{ ppm/K} * \text{preset meas. range}) * \Delta\vartheta$ Thermocouple (TC): $T_d = \pm (50 \text{ ppm/K} * \text{max. meas. range} + 50 \text{ ppm/K} * \text{preset meas. range}) * \Delta\vartheta$ $\Delta\vartheta =$ Deviation of the ambient temperature accord. to the reference condition
Long term stability	$\leq 0.1\text{K/Year}^{[1]}$ or $\leq 0.05\%/Year^{[1][2]}$

Installation conditions

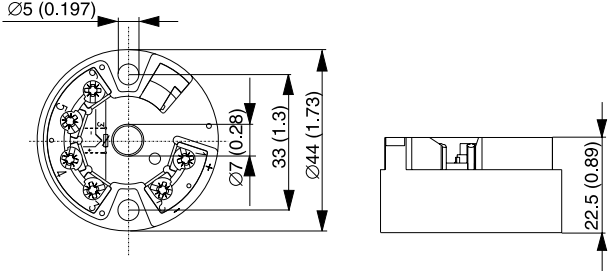
Installation angle	No limit
Installation area	Connection head accord. to DIN 43 729 Form B; TAF 10 field housing

Application conditions

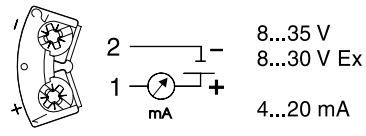
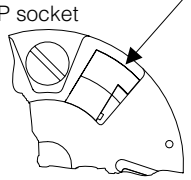
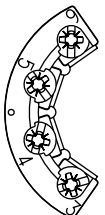
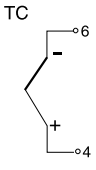
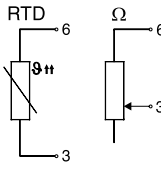
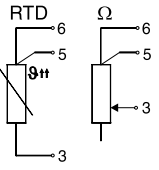
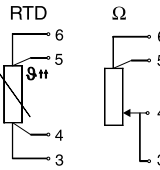
Ambient conditions

Ambient temperature	-40 to +85 °C (-40 to 185 °F), for Ex-areas see Ex-certification
Storage temperature	-40 to +100 °C (-40 to 212 °F)
Climatic class	To EN 60 654-1, Class C
Moisture condensation	Allowable
Ingress protection	IP 00 / IP66 installed
Vibration protection	4g / 2 to 150 Hz according to IEC 60 068-2-6
EMC immunity	Interference immunity and interference emission according to EN 61 326-1 and NAMUR NE 21

Mechanical construction

Dimensions	Dimensions in mm (in) 
Weight	approx. 40 g
Materials	Housing: PC Potting: PUR
Terminals	Cable up to max. 1.75 mm ² (0.0027 in ²), secure screws

Terminal connections

Power supply and current output 		SETUP socket 	
Sensor connection 	TC 	2-wire RTD 	3-wire RTD 
		4-wire RTD 	

[1] according to reference condition

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

Display and operating system

Remote operation

Configuration set	Configuration kit TMT 181A
Configuration	Using PC programme (ReadWin® 2000)
Interface	PC interface connection cable TTL +/- RS 232 with plug
Configurable parameters	Sensor type and connection type, engineering units (°C/°F), measurement range, internal/external cold junction compensation, cable resistance compensation on 2 wire connection, fault conditioning, output signal (4 to 20 / 20 to 4 mA), digital filter (damping), offset, measurement point identification (8 characters), output simulation

Certification

CE mark	This unit complies with the legal requirements laid out within the EU regulations.
Ex-certification	For further details on the available Ex versions (ATEX, CSA, FM, etc.), please contact your nearest E+H sales organisation. 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 organisation.

Questionnaire

Questionnaire Endress+Hauser iTEMP temperature transmitter			
Customer specific setup / Kundenspezifische Einstellung			
Standard setup / Standardeinstellung			
Sensor	TC	☐ B ☐ C ☐ D ☐ E ☐ J ☐ K ☐ L ☐ N ☐ R ☐ S ☐ T ☐ U	
	RTD	☐ Pt100 ☐ Pt500 ☐ Pt1000 ☐ Ni100 ☐ Ni500 ☐ Ni1000	
		☐ 2 wire ☐ 3 wire ☐ 4 wire	
Unit / Einheit	☐ °C ☐ °F		
Range / Messbereich (not / nicht PROFIBUS-PA)	Low scale Anfang	,	Bitte beachten: Messbereich und min. Spanne (s. Techn. Daten) Notel: Range and min. span (s. Techn. data)
	High scale Ende	,	
Bus address / Busadresse (only / nur PROFIBUS-PA)			[0...126]
Expanded setup / Erweiterte Einstellung			
Reference junction / Vergleichsstelle	☐ intern ☐ extern		[0...80°C; 32...176°F] (only / nur TC)
Compensation wire resistance / Kompensation Leitungswiderstand			☐ [0...20 Ohm] (only / nur RTD 2 wire) ☐ [0...30 Ohm] (only / nur HART, PA RTD 2 wire)
Failure mode / Fehlverhalten	☐ ≤ 3,6 mA ☐ ≥ 21,0 mA	(not / nicht PROFIBUS-PA)	
Output / Ausgang	☐ 4...20 mA ☐ 20...4 mA	(not / nicht PROFIBUS-PA)	
Damping / Dämpfung			☐ [0, 1, 2, ..., 8s] (only / nur PCP) ☐ [0, 1, 2, ..., 100s]
Offset	,		[-9,9...0...+9,9K]
TAG	PCP		
	HART	(HART: 8 char. TAG + 16 char. Descriptor , PROFIBUS-PA: 32 char.)	
	PROFIBUS-PA		

Accessories

TMT181A-VK - Configuration kit iTEMP PCP:
 Setup programme (ReadWin®2000) and PC serial interface connection cable (TTL-/RS 232C) for configuration of the TMT 181 (Order-No.: TMT181A).

Further Documentation

Operation short manual	KA 141R/09/a3	No. 510 04624
	ATEX II1G	XA 004R/09/a3
	ATEX II3G	XA 010R/09/a3
	ATEX II3D	XA 026R/09/a3
System information	SI 008R/09/en	No. 510 01361

iTEMP PCP TMT 181 head transmitter					
Universally PC programmable for resistance thermometers, thermocouples, resistance and voltage transmitters, 2-wire technology, 4 to 20 mA analogue output, In/Out galvanic isolation, for mounting in Form B head to DIN 43729, UL recognized component, ship building approval GL Germanischer Lloyd					
Certification A - Version for non Ex areas B - ATEX II1G EEx ia IIC T6/5/4 C - FM IS, Class I, div. 1+2 Group A, B, C, D D - CSA IS, Class I, div. 1+2 Group A, B, C, D E - ATEX II3G EEx nA IIC T4/T5/T6 F - ATEX II3D G - ATEX II1G EEx ia IIC T6, II3D H - ATEX II3G EEx nA IIC T6, II3D					
Connection type A - Standard factory configuration 3-wire 3 - RTD (3-wire) 4 - RTD (4-wire) 2 - RTD (2-wire) 1 - Thermocouple (TC)					
Sensor A - Standard factory configuration Pt100 1 - Pt100 -200 °C ...850 °C (-328...1562 °F), min.10 K) 2 - Ni100 -60 °C ...180 °C (-76...356 °F), min.10 K) B - Typ B 0 °C...1820 °C (32...3308 °F), min.500 K) E - Typ E -200 °C ...915 °C (-328...1679 °F), min.50 K) J - Typ J -200 °C...1200 °C (-328...2192 °F), min.50 K) K - Typ K -200 °C...1372 °C (-328...2502 °F), min.50 K) N - Typ N -270 °C...1300 °C (-454...2372 °F), min.50 K) R - Typ R 0 °C...1768 °C (32...3214 °F), min.500 K) S - Typ S 0 °C...1768 °C (32...3214 °F), min.500 K) T - Typ T -200 °C ...400 °C (-328... 752 °F), min.50 K)					
Setup A - Factory default setting [Pt100/3-wire/0...100 °C] B - Customer specific measurement range C - Customer specific expanded settings TC (see questionnaire) D - Customer specific expanded settings RTD (see questionnaire)					
Model A - standard model B - Works calibration certificate, 6 test points					
TMT181-					← Order-Code

Additional sensor types on request.

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