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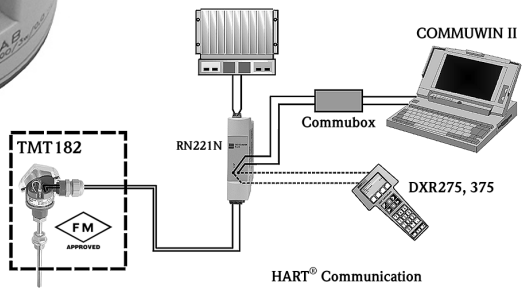
Technical Information

iTEMP® HART® TMT182

Temperature head transmitter

Universal head transmitter for an economical, high accuracy temperature monitoring. Settable via HART® -Protocol, for installation in a DIN B sensor head



Application

- Economical and technical alternative to direct wiring to DCS or PLC
- HART® -protocol operation using handheld terminal (*DXR275/DXR375*) or remotely via PC
- Suitable for RTD thermometers, thermocouples TC, Ohm and mV inputs
- 2-wire transmitter with a linear temperature proportional analog output

Features and benefits

- Operation, visualization and maintenance with PC, e. g. using COMMUWIN II software or ReadWin® 2000 operating freeware
- High accuracy: 0.08 % of span
- Breakdown information in event of sensor break or sensor short-circuit enables a quick maintenance intervention
- Galvanic isolation 2 kV AC (from the sensor input to the output)
- Output simulation for a quick and easy check of the loop
- Min./max. process value indicator function
- Customized measuring range setup or expanded SETUP (see questionnaire page 8)
- Long term stability: < 0.05 %/year

and also:

- Electromagnetic compatibility to IEC 61326 for use in noisy environments
- Fully potted electronics and gold plated terminals allow humidity
- Captive screws for ease of connection
- Customer specific linearization
- Linearization curve match improves accuracy
- Approvals: FM, CSA and ATEX for high safety
- UL recognized component to UL 3111-1
- GL German Lloyd marine approval
- CSA General Purpose

TI078R/24/ae
Nr. 51005888

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Function and system design

Measuring principle

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

Measuring system

The iTEMP® HART® TMT182 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. Set up of the TMT182 is done using the HART® -Protocol with hand operating module (DXR275/DXR375) or PC (COMMUWIN II or ReadWin® 2000 operating software).

Input

Measured variable

Temperature (temperature linear transmission behavior), resistance and voltage

Measuring range

The transmitter monitors different measuring ranges depending on the sensor connection and input signals.

Input	Designation	Measuring range limits	Min. span
Resistance thermometer (RTD)			
to IEC 751	Pt100	-328 to 1562 °F (-200 to 850 °C)	18 °F (10 °C)
(α = 0.00385)	Pt500	-328 to 482 °F (-200 to 250 °C)	18 °F (10 °C)
	Pt1000	-328 to 482 °F (-200 to 250 °C)	18 °F (10 °C)
to JIS C1604-81	Pt100	-200 to 649 °C (-328 to 1200 °F)	18 °F (10 °C)
(a = 0.003916)			
to DIN 43760	Ni100	-76 to 482 °F (-60 to 250 °C)	18 °F (10 °C)
(α = 0.006180)	Ni500	-76 to 302 °F (-60 to 150 °C)	18 °F (10 °C)
	Ni1000	-76 to 302 °F (-60 to 150 °C)	18 °F (10 °C)
	■ Connection type: 2-, 3- or 4-wire connection ■ Software compensation of cable resistance possible in the 2 wire system (0 to 30 Ω) ■ Sensor cable resistance max. 20 Ω per cable in the 3 and 4 wire system ■ Sensor current: ≤ 0.2 mA ■ Corrosion detection as per NAMUR NE 89 for Pt100 4-wire connection (optional for 'Advanced Diagnostics' version, see 'Product structure'). If corrosion detection is active, the response time is 2 s.		
Resistance transmitter	Resistance Ω	10 to 400 Ω 10 to 2000 Ω	10 Ω 100 Ω
Thermocouples (TC)			
to NIST Monograph 175,	Type B (PtRh30-PtRh6)[1]	32 to 3308 °F (0 to +1820 °C)	900 °F (500 °C)
IEC 584	Type E (NiCr-CuNi)	-454 to 1832 °F (-270 to +1000 °C)	90 °F (50 °C)
	Type J (Fe-CuNi)	-346 to 2192 °F (-210 to +1200 °C)	90 °F (50 °C)
	Type K (NiCr-Ni)	-454 to 2501 °F (-270 to +1372 °C)	90 °F (50 °C)
	Type N (NiCrSi-NiSi)	-454 to 2372 °F (-270 to +1300 °C)	90 °F (50 °C)
	Type R (PtRh13-Pt)	-58 to 3214 °F (-50 to +1768 °C)	900 °F (500 °C)
	Type S (PtRh10-Pt)	-58 to 3214 °F (-50 to +1768 °C)	900 °F (500 °C)
	Type T (Cu-CuNi)	-454 to 752 °F (-270 to +400 °C)	90 °F (50 °C)
to ASTM E988	Type C (W5Re-W26Re)	32 to 4208 °F (0 to +2320 °C)	900 °F (500 °C)
	Type D (W3Re-W25Re)	32 to 4523 °F (0 to +2495 °C)	900 °F (500 °C)
to DIN 43710	Type L (Fe-CuNi)	-328 to 1652 °F (-200 to +900 °C)	90 °F (50 °C)
	Type U (Cu-CuNi)	-328 to 1112 °F (-200 to +600 °C)	90 °F (50 °C)
	■ Internal cold junction (Pt100) ■ Accuracy of cold junction: ± 1.8 °F (1 °C)		
Voltage transmitter (mV)	Millivolt transmitter (mV)	-10 to 75 mV	5 mV

1) High measuring error increase for temperature lower than 572 °F (300 °C)

Output

Output signal

Analog 4 to 20 mA, 20 to 4 mA

Breakdown information

Breakdown information to NAMUR NE 43
Breakdown information is created when the measuring information is invalid or not present anymore and gives a complete listing of all errors occuring in the measuring system.

		Signal (mA)
Under ranging	Standard	3.8
Over ranging	Standard	20.5
Sensor break; sensor short circuit low	To NAMUR NE 43	≤ 3.6
Sensor break; sensor short circuit high	To NAMUR NE 43	≥ 21.0

Source impedance

max. ($V_{Power\ supply}$ - 11.5 V) / 0.022 A (current output), e.g. (24 V-11.5 V)/0.022 A = 568.2 Ω

Transmission behavior

Temperature linear, resistance linear, voltage linear

Filter

1st order digital filter: 0 to 100 s

Galvanic isolation

U = 2 kV AC (input/output)

Min. current consumption

≤ 3.5 mA

Current limit

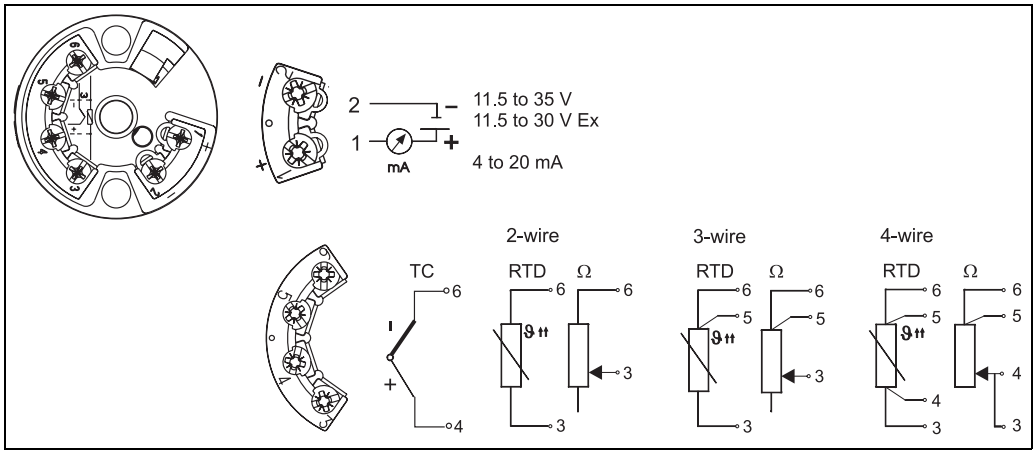
≤ 23 mA

Switch on delay

4 s (during power up I_a ≤ 3.8 mA)

Power supply

Electrical connection



Head transmitter terminal connections

Supply voltage

U_b= 11.5 to 35 V, polarity protection

Undervoltage detection

Optional for 'Advanced Diagnostic' version.
If the supply voltage is not sufficient to output the output signal corresponding to the measured temperature, a signal on alarm ≤ 3.6 mA is generated. After approx. 2 to 3 s, the system makes another attempt to output the signal corresponding to the temperature.

Residual ripple

Allowable ripple U_{ss} ≤ 3 V at U_b ≥ 13 V, $f_{max.}$ = 1 kHz

Performance characteristics

Response time

1 s (TC), 1.5 s (RTD)

Reference operating conditions

Calibration temperature: 77 °F ± 9 °F (+25 °C ± 5 °C)

Maximum measured error

	Type	Measurement accuracy[1]
Resistance thermometer RTD	Pt100, Ni100 Pt500, Ni500 Pt1000, Ni1000	0.36 °F (0.2 °C) or 0.08% 0.9 °F (0.5 °C) or 0.20% 0.54 °F (0.3 °C) or 0.12%
Thermocouple TC	K, J, T, E, L, U N, C, D S, B, R	typ. 0.9 °F (0.5 °C) or 0.08% typ. 1.8 °F (1.0 °C) or 0.08% typ. 3.6 °F (2.0 °C) or 0.08%

	Measurement range	Measurement accuracy[1]
Resistance transmitter (Ω)	10 to 400 Ω 10 to 2000 Ω	± 0.1 Ω or 0.08% ± 1.5 Ω or 0.12%
Voltage transmitters (mV)	-10 to 75 mV	± 20 µV or 0.08%

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

Influence of supply voltage

- ≤ ±0.01%/V deviation from 24 V
  Percentages refer to the full scale value.

Influence of ambient temperature (Temperature drift)

- Resistance thermometer (RTD):
  T_d= ±(8.3 ppm/°F * max. meas. range + 27.8 ppm/°F * preset meas. range) * Δ ϑ
- Resistance thermometer Pt100:
  T_d= ±(8.3 ppm/°F * (range end value + 328) + 27.8 ppm/°F * preset meas. range) * Δ ϑ
- Thermocouple (TC):
  T_d= ±(27.8 ppm/°F * max. meas. range + 27.8 ppm/°F * preset meas. range) * Δ ϑ

  Δ ϑ = Deviation of the ambient temperature according to the reference condition (77 °F ± 9 °F).

Influence of load

- ± 0.02%/100 Ω
  Values refer to the full scale value

Long-term stability

- ≤ 0.18 °F/year (0.1 °C/year) or ≤ 0.05%/year
  Values under reference operating conditions. % refer to the set span. The highest value is valid.

Influence of cold junction

Pt100 IEC 60751 Cl. B (internal cold junction for thermocouples TC)

Installation conditions

Installation instructions

- Installation angle:
  no limit
- Installation area:
  Connection head accord. to DIN 43 729 Form B; TAF10 field housing

Environment conditions

Ambient temperature limits

-40 to 185 °F (-40 to +85 °C) for Ex-area, see Ex-certification or control drawing

Storage temperature

-40 to 212 °F (-40 to +100 °C)

Altitude

Up to 6560 ft (2000 m) above sea level according to IEC 61010-1, CSA 1010.1-92

Climate class

as per IEC 60654-1, class C

Condensation

allowed

Degree of protection

IP 00, NEMA 4 (IP 66) installed in TAF10 field housing

Shock and vibration resistance

4g / 2 to 150 Hz as per IEC 60 068-2-6

Electromagnetic compatibility (EMC)

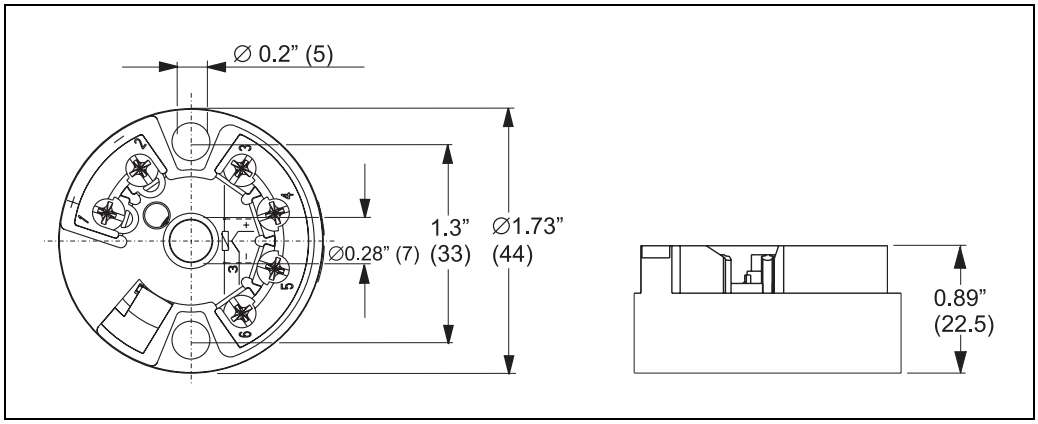
CE Electromagnetic Compatibility Compliance
The device meets all requirements listed under IEC 61326 Amendment 1, 1998 and NAMUR NE 21.

This recommendation is an uniform and practical way of determining whether the devices used in laboratory and process control are immune to interference with an objective to increase its functional safety.

Discharge of static electricity	IEC 61000-4-2	6 kV cont., 8 kV air	
Electromagnetic fields	IEC 61000-4-3	80 to 1000 Hz	10 V/m
Burst (signal)	IEC 61000-4-4	2 kV	
Transient voltage	IEC 61000-4-5	1 kV unsym. / 0.5 kV sym.	
HF coupling	IEC 61000-4-6	0.15 to 80 MHz	10 V
Line interference	IEC 61000-4-16	10 kHz to 150 kHz	10 V

Mechanical construction

Design, dimensions



Dimensions of the head transmitter in inches (mm)

Weight

approx. 1.4 oz (40 g)

Material

- Housing: PC
- Potting: PUR

Terminals

- Cable up to max. 16 AWG (secure screws)
- or 16 AWG with wire end ferrules
- eyelets for easy connection of a HART®-handheld terminal with alligator clips

Human interface

Display elements

No display elements are present directly on the temperature transmitter.
The measured value display can be called up using the ReadWin® 2000 or COMMUWIN II PC software.

Operating elements

No operating elements are present directly on the transmitter to prevent from manipulation. The device parameters of the head transmitter are configured using the DXR275/DXR375 handheld terminal or a PC with Commubox FXA191 and operating software (e.g. COMMUWIN II or ReadWin® 2000).

Remote operation

Configuration
Handheld terminal DXR275/DXR375 or PC with Commubox FXA191 and operating software (ReadWin® 2000 or COMMUWIN II).

Interface
PC interface RS232 and Commubox FXA191.

Configurable parameters
Sensor type and connection type, engineering units (°C/°F), measurement range, internal/external cold junction, compensation of wire resistance with 2-wire connection, failure mode, output signal (4 to 20/20 to 4 mA), digital filter (damping), offset, TAG + descriptor (8 + 16 characters), output simulation, customer specific linearization, min./max. process value indicator function

Certificates and approvals

CE-Mark	The measurement system fulfils the requirements demanded by the EU regulations. Endress+Hauser acknowledges successful unit testing by adding the CE mark.
Hazardous area approvals	■ FM IS, Class I, Div. 1+2, Group A, B, C, D ■ CSA IS, Class I, Div. 1+2, Group A, B, C, D ■ ATEX II1G EEx ia IIC T4/T5/T6 ■ ATEX II3G EEx nA IIC T4/T5/T6 ■ ATEX II3D in compliance with EN 50281.1
GL	Ship building approval (Germanischer Lloyd)
UL	Recognized component to UL 3111-1
Other standards and guidelines	■ IEC 60529: Degrees of protection by housing (IP-Code) ■ IEC 61010: Safety requirements for electrical measurement, control and laboratory instrumentation. ■ IEC 61326: Electromagnetic compatibility (EMC requirements) ■ NAMUR Standardization association for measurement and control in chemical and pharmaceutical industries. (www.namur.de) ■ NEMA Standardization association for the electrical industry
CSA GP	CSA General Purpose

Ordering information

Questionnaire

Questionnaire Endress+Hauser iTEMP temperature transmitter
Customer specific setup

Standard setup

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: **( ) °C** ( ) °F

Range
Low scale: [ ][ ][ ][ ][ ].[ ]
High scale: [ ][ ][ ][ ][ ].[ ]
Note!: Range and min. span (s. Techn. data)

Expanded setup

Cold junction: **( ) intern** ( ) extern (only TC)
[ ][ ][ ] [32 to 176°F; 0 to 80 °C]

Compensation wire resistance: [ ][ ] [**0**...30 Ohm] (only / nur RTD 2 wire)

Failure mode: ( ) ≤ 3.6 mA **( ) ≥ 21.0 mA**

Output: **( ) 4 to 20 mA** ( ) 20 to 4 mA

Filter: [ ][ ][ ] [**0**, 1, 2,..., 100s]

Offset: [ ][ ].[ ] [-9.9... **0**...+9.9 °C / -18... **0**...+18 °F]

TAG (HART: 8 char.) [ ][ ][ ][ ][ ][ ][ ][ ]

(Descriptor: 16 char.) [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

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Product structure

Head transmitter iTEMP® HART® TMT182
Temperature transmitter with HART®-Protocol for RTD's, TC's, Ohm and mV, analogue output 4 to 20 mA, 2-wire-technology, Galvanic isolation, fail. mode to NAMUR NE 43, for mounting in Form B head to DIN 43729, UL recognized component, ship building approval GL (Germanischer Lloyd)

	Certification
A	Version for non hazardous areas
B	ATEX II1G EEx ia IIC T4/T5/T6
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 T4/T5/T6, II3D
I	FM+CSA IS,NI,Class I,Div.1+2,Group A,B,C,D
J	CSA General Purpose

		Configuration transmitter connection
A		Standard factory configuration 3-wire
1		Configuration connection TC
2		Configuration connection RTD (2-wire)
3		Configuration connection RTD (3-wire)
4		Configuration connection RTD (4-wire)

			Configuration temperature sensor			
A			Standard factory configuration Pt100			
1	Pt100	-328 to 1562 °F	(-200 °C to 850 °C)	min. sp. 18 °F (10 °C), acc. to IEC 751 (α = 0.00385)
9	Pt100	-328 to 1200 °F	(-200 °C to 649 °C)	min. sp. 18 °F (10 °C), acc. to JIS C1604-81 (α = 0.003916)
2	Ni100	-76 to 482 °F	(-60 °C to 250 °C)	min. sp. 18 °F (10 °C)
3	Pt500	-328 to 482 °F	(-200 °C to 250 °C)	min. sp. 18 °F (10 °C)
4	Ni500	-76 to 302 °F	(-60 °C to 150 °C)	min. sp. 18 °F (10 °C)
5	Pt1000	-328 to 482 °F	(-200 °C to 250 °C)	min. sp. 18 °F (10 °C)
6	Ni1000	-76 to 302 °F	(-60 °C to 150 °C)	min. sp. 18 °F (10 °C)
B	Type B	752 to 3308 °F	(400 °C to 1820 °C)	min. sp. 900 °F (500 °C)
C	Type C	932 to 4208 °F	(500 °C to 2320 °C)	min. sp. 900 °F (500 °C)
D	Type D	932 to 4523 °F	(500 °C to 2495 °C)	min. sp. 900 °F (500 °C)
E	Type E	-454 to 1832 °F	(-270 °C to 1000 °C)	min. sp. 90 °F (50 °C)
J	Type J	-346 to 2192 °F	(-210 °C to 1200 °C)	min. sp. 90 °F (50 °C)
K	Type K	-454 to 2501 °F	(-270 °C to 1372 °C)	min. sp. 90 °F (50 °C)
L	Type L	-328 to 1652 °F	(-200 °C to 900 °C)	min. sp. 90 °F (50 °C)
N	Type N	-148 to 2372 °F	(-100 °C to 1300 °C)	min. sp. 90 °F (50 °C)
R	Type R	-58 to 3214 °F	(-50 °C to 1768 °C)	min. sp. 900 °F (500 °C)
S	Type S	-58 to 3214 °F	(-50 °C to 1768 °C)	min. sp. 900 °F (500 °C)
T	Type T	-454 to 752 °F	(-270 °C to 400 °C)	min. sp. 90 °F (50 °C)
U	Type U	-328 to 1112 °F	(-200 °C to 600 °C)	min. sp. 90 °F (50 °C)

					Configuration
A					Standard factory configuration Pt100/3-wire/0 to 100 °C
B					Customized measurement range
C					Customized expanded configuration for TC (see questionnaire)
D					Customized expanded configuration for RTD (see questionnaire)

						Model
A						Standard model
B						Works calibration certificate 6 test points
C						Diagnostic, advanced
K						Standard model, North America region
L						Advanced diagnostic, North America region

TMT182-							⇐ **Order code (complete)**

Customized options

51003527	TAG print/configuration 8 char
51003546	Descriptor print/configuration 16 char

Accessories

- ❑ Commubox FXA191
  Order code: FXA191-G1
- ❑ PC-operating software: ReadWin® 2000 or COMMUWIN II
  ReadWin® 2000 can be downloaded free of charge from the internet from the following address:
  www.readwin2000.com
- ❑ Hand operating module 'HART® Communicator DXR375', **Order code:** DXR375-

Documentation

- ❑ Operating manual iTEMP® HART® TMT182 (BA105R/24/ae)
- ❑ Operating short manual iTEMP® HART® TMT182 (KA142R/09/a3)
- ❑ Additional documentation for use in explosion-hazardous areas:
  ATEX II1G: XA006R/09/a3
  ATEX II3G: XA011R/09/a3
  ATEX II3D: XA027R/09/a3
- ❑ Control Drawings:
  FM IS, NI 51004842
  CSA IS, NI 51005255
- ❑ Operating short manual TAF10 Field housing (KA093R/09/a2)

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