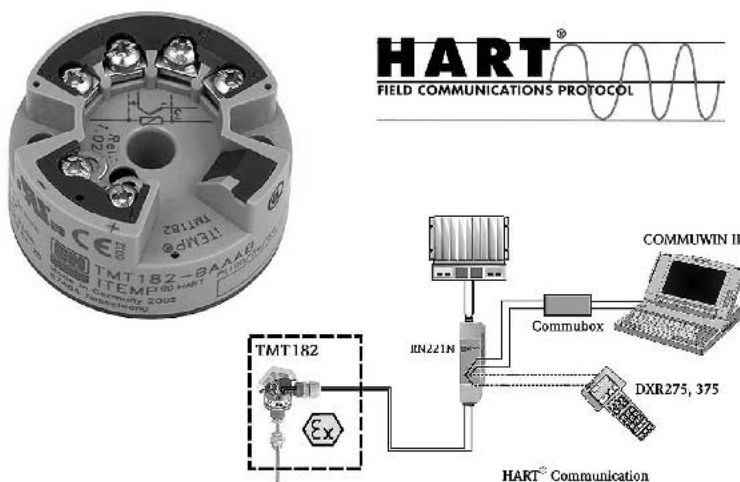


Technical Information

iTEMP[®] HART[®] TMT182

Temperature head transmitter

Head transmitter for resistance thermometers (RTD), thermocouples (TC), resistance and voltage transmitters (mV), HART[®] -protocol, for installation in a sensor head Form B



Application

- Temperature head transmitter with HART[®] -protocol 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)
- HART[®] -protocol for front end unit or panel unit operation using the hand operating module (DXR275, DXR375) or PC (e. g. ReadWin[®] 2000, COMMUWIN II or FieldCare)

- CSA General Purpose
- Ex-Certification
 - ATEX Ex ia and dust zone 22 in compliance with EN 50281-1
 - FM IS
 - CSA IS
- SIL2 compliant
- Output simulation
- Min./max. process value indicator function
- Customer specific linearization
- Linearization curve match
- Customer specific measurement range settings or expanded SETUP (see Questionnaire, → Page 7)

Your benefits

- Universal settings with HART[®] -protocol for various input signals
- Operation, visualisation and maintenance via PC, e. g. COMMUWIN II operating software
- 2 wire technology, 4 to 20 mA analogue 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



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 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 TMT182 is done using the HART®-Protocol with hand operating module (DXR275, DXR375) or PC (COMMUWIN II, Fieldcare).

Input

Measured variable Temperature (temperature linear transmission behaviour), resistance and voltage

Measuring range The transmitter records different measuring ranges depending on the sensor connection and input signals.

Type of input

	Type	Measurement ranges	min. meas. range
<i>Resistance thermometer (RTD)</i>	Pt100	-200 to 850 °C (-328 to 1562 °F)	10 K
	Pt500	-200 to 250 °C (-328 to 482 °F)	10 K
	Pt1000	-200 to 250 °C (-238 to 482 °F)	10 K
	acc. to IEC 751 (a = 0.00385)		
	Pt100 to JIS C1604-81 (a = 0.003916)	-200 to 649 °C (-328 to 1200 °F)	10 K
<i>Resistance transmitter</i>	Ni100	-60 to 250 °C (-76 to 482 °F)	10 K
	Ni500	-60 to 150 °C (-76 to 302 °F)	10 K
	Ni1000	-60 to 150 °C (-76 to 302 °F)	10 K
	acc. to DIN 43760		
	<ul style="list-style-type: none"> ■ 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 Ω	10 to 400 Ω 10 to 2000 Ω	10 Ω 100 Ω
<i>Thermocouple (TC)</i>	B (PtRh30-PtRh6)	0 to +1820 °C (32 to 3308 °F)	500 K
	C (W5Re-W26Re) ¹	0 to +2320 °C (32 to 4208 °F)	500 K
	D (W3Re-W25Re) ¹	0 to +2495 °C (32 to 4523 °F)	500 K
	E (NiCr-CuNi)	-270 to +1000 °C (-454 to 1832 °F)	50 K
	J (Fe-CuNi)	-210 to +1200 °C (-346 to 2192 °F)	50 K
	K (NiCr-Ni)	-270 to +1372 °C (-454 to 2501 °F)	50 K
	L (Fe-CuNi) ²	-200 to +900 °C (-328 to 1652 °F)	50 K
	N (NiCrSi-NiSi)	-270 to +1300 °C (-454 to 2372 °F)	50 K
	R (PtRh13-Pt)	-50 to +1768 °C (-58 to 3214 °F)	500 K
	S (PtRh10-Pt)	-50 to +1768 °C (-58 to 3214 °F)	500 K
	T (Cu-CuNi)	-270 to +400 °C (-454 to 752 °F)	50 K
	U (Cu-CuNi) ²	-200 to +600 °C (-328 to 1112 °F)	50 K
	acc. to IEC 584 Part 1		
		<ul style="list-style-type: none"> ■ Cold junction: internal (Pt100) ■ Cold junction accuracy: ± 1 K 	
<i>Voltage transmitters (mV)</i>	Millivolt transmitter (mV)	-10 to 75 mV	5 mV

1) acc. to ASTM E988

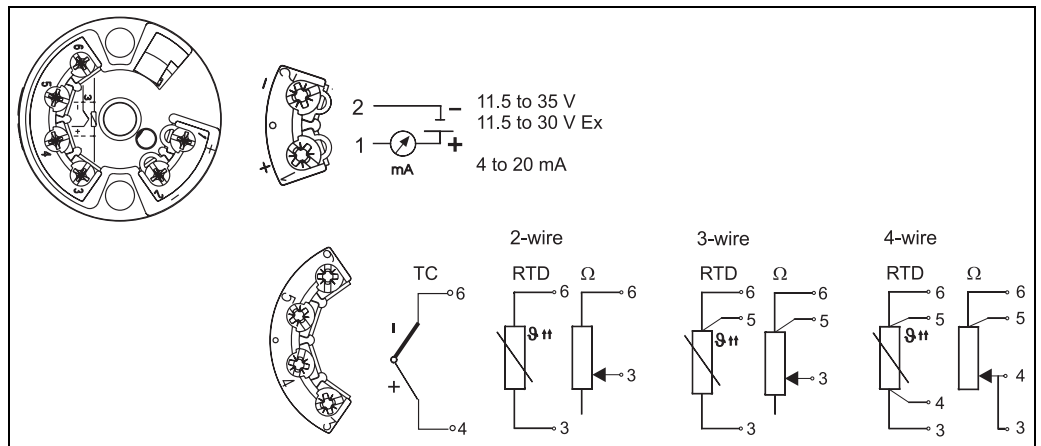
2) acc. to DIN 43710

Output

Output signal	Analogue 4 to 20 mA, 20 to 4 mA
Signal on alarm	<ul style="list-style-type: none"> ■ Underranging Linear drop to 3.8 mA ■ Overranging: Linear rise to 20.5 mA ■ Sensor break; sensor short-circuit (not for thermocouples TC): ≤ 3.6 mA or ≥ 21.0 mA Failure signal ≥ 21.0 mA; if output setting is ≥ 21.0 mA, > 21.5 mA is guaranteed
Load	max. $(V_{\text{Power supply}} - 11.5 \text{ V}) / 0.022 \text{ A}$ (Current output)
Linearisation/transmission behaviour	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 $I_a = 3.8 \text{ mA}$)

Power supply

Electrical connection



Head transmitter terminal connections

Supply voltage	$U_b = 11.5 \text{ to } 35 \text{ V}$, 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 $U_{ss} \leq 3 \text{ V}$ at $U_b \geq 13 \text{ V}$, $f_{\text{max.}} = 1 \text{ kHz}$

Performance characteristics

Response time 1 s (TC), 1.5 s (RTD)

Reference operating conditions Calibration temperature: +25 °C (77 °F) ± 5 K (9 °F)

Maximum measured error

	Type	Measurement accuracy ¹
Resistance thermometer RTD	Pt100, Ni100	0.2 K or 0.08%
	Pt500, Ni500	0.5 K or 0.20%
	Pt1000, Ni1000	0.3 K or 0.12%
Thermocouple TC	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	typ. 2.0 K or 0.08%

	Measurement range	Measurement accuracy ¹
Resistance transmitter (Ω)	10 to 400 Ω	± 0.1 Ω or 0.08%
	10 to 2000 Ω	± 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):
 $T_d = \pm(15 \text{ ppm/K} * \text{max. meas. range} + 50 \text{ ppm/K} * \text{preset meas. range}) * \Delta \vartheta$
- Resistance 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 according to the reference condition.

Influence of load ■ ± 0.02%/100 Ω
Values refer to the full scale value

Long-term stability ■ ≤ 0,1 K/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 DIN IEC 60751 Cl. B (internal cold junction with thermocouples TC)

Installation conditions

Installation instructions

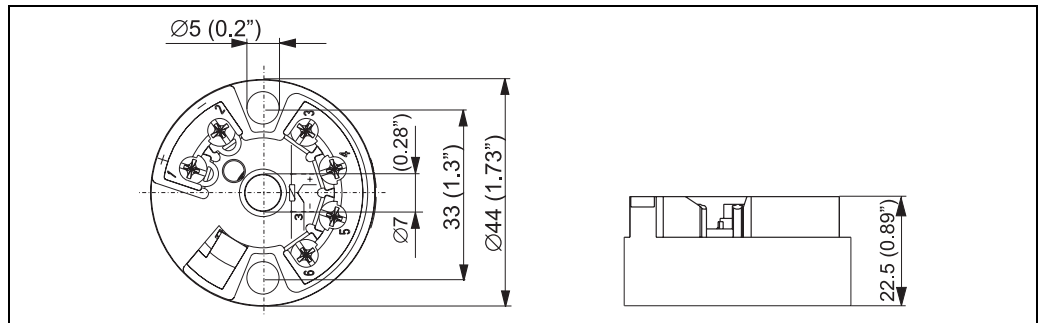
- Installation angle:
no limit
- Installation area:
Connection head accord. to DIN 43 729 Form B; TAF10 field housing

Environment conditions

Ambient temperature limits	-40 to +85 °C (-40 to 185 °F) for Ex-area, see Ex-certificate
Storage temperature	-40 to +100 °C (-40 to 212 °F)
Climate class	as per IEC 60 654-1, class C
Condensation	allowable
Degree of protection	IP 00, IP 66 installed
Shock and vibration resistance	4g / 2 to 150 Hz as per IEC 60 068-2-6
Electromagnetic compatibility (EMC)	Shock resistance and interference emission as per IEC 61326 and NAMUR NE 21

Mechanical construction

Design, dimensions



Dimensions of the head transmitter in mm (inches)

Weight	approx. 40 g
Material	<ul style="list-style-type: none"> ■ Housing: PC ■ Potting: PUR
Terminals	<ul style="list-style-type: none"> ■ Cable up to max. 1.75 mm² (secure screws) ■ or 1.5 mm² 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, COMMUWIN II or FieldCare PC software.
Operating elements	No operating elements are present directly on the display. The temperature transmitter is configured via remote operation with the ReadWin [®] 2000, COMMUWIN II or FieldCare PC software.

Remote operation	<p>Configuration Hand operating module DXR275, DXR375 or PC with Commubox FXA191 and operating software (ReadWin® 2000, COMMUWIN II or FieldCare).</p> <p>Interface PC interface RS232 and Commubox FXA191.</p> <p>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</p>
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Certificates and approvals

CE-Mark	The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
Hazardous area approvals	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.
GL	Ship building approval (Germanischer Lloyd)
UL	Recognized component to UL 3111-1
Other standards and guidelines	<ul style="list-style-type: none"> ■ IEC 60529: Degree of protection provided by housing (IP-Code) ■ IEC 61010: Safety requirements for electrical measurement, control and laboratory use. ■ IEC 61326: Electromagnetic compatibility (EMC requirements) ■ NAMUR Standards working group for measurement and control technology in the chemical industry. (www.namur.de)
CSA GP	CSA General Purpose

Ordering information

Questionnaire

Questionnaire Endress+Hauser iTEMP temperature transmitter Customer specific setup / Kundenspezifische Einstellung			
Standard setup / Standardeinstellung			
Sensor	TC	<input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> J <input type="checkbox"/> K <input type="checkbox"/> L <input type="checkbox"/> N <input type="checkbox"/> R <input type="checkbox"/> S <input type="checkbox"/> T <input type="checkbox"/> U	
	RTD	<input type="checkbox"/> Pt100 <input type="checkbox"/> Pt500 <input type="checkbox"/> Pt1000 <input type="checkbox"/> Ni100 <input type="checkbox"/> Ni500 <input type="checkbox"/> Ni1000	
Unit / Einheit		<input type="checkbox"/> 2 wire <input type="checkbox"/> 3 wire <input type="checkbox"/> 4 wire <input type="checkbox"/> °C <input type="checkbox"/> °F	
Range / Messbereich <small>(not / nicht PROFIBUS-PA)</small>	Low scale Anfang	<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	Bitte beachten: Messbereich und min. Spanne (s. Techn. Daten)
	High scale Ende	<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	Note! Range and min. span (s. Techn. data)
Bus address / Busadresse <small>(only / nur PROFIBUS-PA)</small>		<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	[0...126]
Expanded setup / Erweiterte Einstellung			
Reference junction / Vergleichsstelle	<input type="checkbox"/> intern <input type="checkbox"/> extern	<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	<input type="checkbox"/> (only / nur TC) [0...80°C; 32...176°F]
Compensation wire resistance / Kompensation Leitungswiderstand		<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	<input type="checkbox"/> [0...20 Ohm] (only / nur RTD 2 wire) <input type="checkbox"/> [0...30 Ohm] (only / nur HART, PA RTD 2 wire)
Failure mode / Fehlerverhalten	<input type="checkbox"/> ≤ 3.6 mA <input type="checkbox"/> ≥ 21.0 mA		(not / nicht PROFIBUS-PA)
Output / Ausgang	<input type="checkbox"/> 4...20 mA <input type="checkbox"/> 20...4 mA		(not / nicht PROFIBUS-PA)
Filter		<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	<input type="checkbox"/> [0, 1, 2, ..., 8s] (only / nur PCP) <input type="checkbox"/> [0, 1, 2, ..., 100s]
Offset		<input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/> <input style="width: 20px; height: 15px;" type="text"/>	[-9.9... 0...+9.9K]
TAG	PCP	<input style="width: 100px; height: 15px;" type="text"/>	
	HART	(HART: 8 char. TAG + 16 char. Descriptor , PROFIBUS-PA: 32 char.)	
	PROFIBUS-PA	<input style="width: 100px; height: 15px; border: 1px dashed black;" type="text"/>	
Endress+Hauser			
<small>People for Process Automation</small>			

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 III G 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 III G 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	-200 °C to 850 °C (-328 to 1562 °F)	min. sp. 10 K, acc. to IEC 751 (a = 0.00385)
9	Pt100	-200 °C to 649 °C (-328 to 1200 °F)	min. sp. 10 K, acc. to JIS C1604-81 (a = 0.003916)
2	Ni100	-60 °C to 250 °C (-76 to 482 °F)	min. sp. 10 K
3	Pt500	-200 °C to 250 °C (-328 to 482 °F)	min. sp. 10 K
4	Ni500	-60 °C to 150 °C (-76 to 302 °F)	min. sp. 10 K
5	Pt1000	-200 °C to 250 °C (-328 to 482 °F)	min. sp. 10 K
6	Ni1000	-60 °C to 150 °C (-76 to 302 °F)	min. sp. 10 K
B	Typ B	400 °C to 1820 °C (752 to 3308 °F)	min. sp. 500 K
C	Typ C	500 °C to 2320 °C (932 to 4208 °F)	min. sp. 500 K
D	Typ D	500 °C to 2495 °C (932 to 4523 °F)	min. sp. 500 K
E	Typ E	-270 °C to 1000 °C (-454 to 1832 °F)	min. sp. 50 K
J	Typ J	-210 °C to 1200 °C (-346 to 2192 °F)	min. sp. 50 K
K	Typ K	-270 °C to 1372 °C (-454 to 2501 °F)	min. sp. 50 K
L	Typ L	-200 °C to 900 °C (-328 to 1652 °F)	min. sp. 50 K
N	Typ N	-100 °C to 1300 °C (-148 to 2372 °F)	min. sp. 50 K
R	Typ R	-50 °C to 1768 °C (-58 to 3214 °F)	min. sp. 500 K
S	Typ S	-50 °C to 1768 °C (-58 to 3214 °F)	min. sp. 500 K
T	Typ T	-270 °C to 400 °C (-454 to 752 °F)	min. sp. 50 K
U	Typ U	-200 °C to 600 °C (-328 to 1112 °F)	min. sp. 50 K
Configuration			
A	Standard factory configuration (Pt100/3-wire/0 to 100 °C)		
B	Customised measurement range		
C	Customised expanded configuration for TC (see questionnaire)		
D	Customised expanded configuration for RTD (see questionnaire)		
Model			
A	Standard model		
B	Works calibration certificate 6 test points		
C	Diagnostic, advanced		
K	Standard model, North American region		
L	Advanced Diagnostic North American region		
TMT182-			⇐ Order code (complete)

Customised 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, COMMUWIN II or FieldCare
ReadWin® 2000 can be downloaded free of charge from the internet from the following address:
www.endress.com/readwin
- Hand operating module 'HART® Communicator DXR375', **Order code:** DXR375-...

Documentation

- Operating short manual iTEMP® HART® TMT182 (KA142R/09/a3)
- Additional documentation for use in explosion-hazardous areas:
 - ATEX III G: XA006R/09/a3
 - ATEX II 3 G: XA011R/09/a3
 - ATEX II 3 D: XA027R/09/a3
- Operating manual iTemp® HART® Communication (BA139R/09/a3)
- Operating short manual TAF10 Field housing (KA093R/09/a2)
- Functional safety manual TMT182 (SD006R/09/en)

International Head Quarter

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