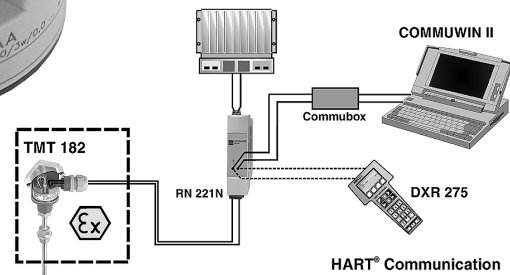


# Temperature head transmitter *iTEMP*<sup>®</sup> *HART*<sup>®</sup> *TMT 182*

**Universal head transmitter for resistance thermometers (RTD), thermocouples (TC), resistance and voltage transmitters (mV), settable via HART<sup>®</sup> - protocol, for installation in a sensor head Form B**



## Application

- Temperature head transmitter with HART<sup>®</sup>-protocol for converting various input signals into an scalable 4 to 20 mA analogue output signal
- Input:
  - Resistance thermometer (RTD)
  - Thermocouple (TC)
  - Resistance transmitter ( $\Omega$ )
  - Voltage transmitter (mV)
- HART<sup>®</sup>-protocol for front end unit or panel unit operation using the hand operating module (DXR 275) or PC (e. g. ReadWin<sup>®</sup>2000, COMMUWIN II or FieldCare)

## Your benefits

- Universal settings with HART<sup>®</sup>-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
- Ex-Certification
  - ATEX Ex ia and dust zone 22 in compliance with EN 50281-1
  - FM IS
  - CSA IS
- Galvanic isolation
- 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)



**Endress + Hauser**

The Power of Know How



## Function and system design

**Measuring principle** Electronic measurement and conversion of input signals in industrial temperature measurement.

**Measuring system** The iTEMP®HART®TMT 182 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 182 is done using the HART®-Protocol with hand operating module (DXR 275) or PC (COMMWIN II).

## 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<br>Pt500<br>Pt1000<br>acc. to IEC 751   | -200 to 850 °C (-328 to 1562 °F)<br>-200 to 250 °C (-328 to 482 °F)<br>-200 to 250 °C (-238 to 482 °F) | 10 K<br>10 K<br>10 K        |
|                                     | Ni100<br>Ni500<br>Ni1000<br>acc. to DIN 43760   | -60 to 250 °C (-76 to 482 °F)<br>-60 to 150 °C (-76 to 302 °F)<br>-60 to 150 °C (-76 to 302 °F)        | 10 K<br>10 K<br>10 K        |
|                                     | <ul style="list-style-type: none"> <li>• Connection type: 2-, 3- or 4-wire connection</li> <li>• Software compensation of cable resistance possible in the 2 wire system (0 to 30 Ω)</li> <li>• Sensor cable resistance max. 20 Ω per cable in the 3 and 4 wire system</li> <li>• Sensor current: ≤ 0.2 mA</li> </ul> |  |                             |
|                                     | <i>Resistance transmitter</i>   | Resistance Ω   | 10 to 400 Ω<br>10 to 2000 Ω |
| <i>Thermocouple (TC)</i>            | B (PtRh30-PtRh6)  | 0 to +1820 °C (32 to 3308 °F)  | 500 K                       |
|                                     | C (W5Re-W26Re) <sup>1</sup>   | 0 to +2320 °C (32 to 4208 °F)  | 500 K                       |
|                                     | D (W3Re-W25Re) <sup>1</sup>   | 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) <sup>2</sup>  | -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) <sup>2</sup>  | -200 to +600 °C (-328 to 1112 °F)  | 50 K                        |
|                                     | <ul style="list-style-type: none"> <li>• Cold junction: internal (Pt100)</li> <li>• Cold junction accuracy: ± 1 K</li> </ul>  |  |                             |
| <i>Voltage transmitters (mV)</i>    | Millivolt transmitter (mV)  | -10 to 75 mV   | 5 mV                        |

1) acc. to ASTM E988

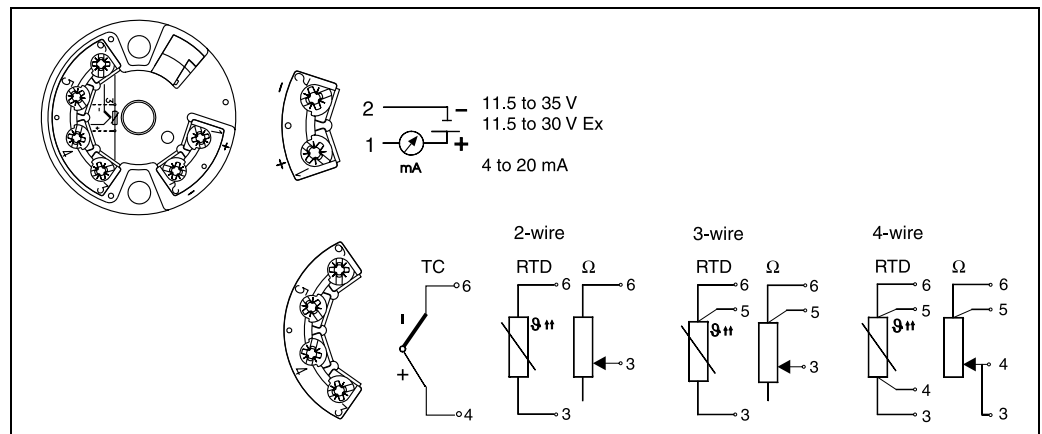
2) acc. to DIN 43710

## Output

|   |   |
|---|---|
| <b>Output signal</b>                        | Analogue 4 to 20 mA, 20 to 4 mA   |
| <b>Signal on alarm</b>                      | <ul style="list-style-type: none"> <li>• Underranging<br/>Linear drop to 3.8 mA</li> <li>• Overranging:<br/>Linear rise to 20.5 mA</li> <li>• Sensor break; sensor short-circuit (not for thermocouples TC):<br/><math>\leq 3.6 \text{ mA}</math> or <math>\geq 21.0 \text{ mA}</math></li> </ul> |
| <b>Load</b>                                 | $\text{max. } (V_{\text{Power supply}} - 11.5 \text{ V}) / 0.022 \text{ A}$ (Current output)  |
| <b>Linearisation/transmission behaviour</b> | Temperature linear, resistance linear, voltage linear   |
| <b>Filter</b>                               | 1st order digital filter: 0 to 100 s  |
| <b>Galvanic isolation</b>                   | $U = 2 \text{ kV AC}$ (input/output)  |
| <b>Input current required</b>               | $\leq 3.5 \text{ mA}$   |
| <b>Current limit</b>                        | $\leq 23 \text{ mA}$  |
| <b>Switch on delay</b>                      | 4 s (during power up $I_a = 3.8 \text{ mA}$ )   |

## Power supply

### Electrical connection



Head transmitter terminal connections

|                        |   |
|------------------------|---|
| <b>Supply voltage</b>  | $U_b = 11.5 \text{ to } 35 \text{ V}$ , polarity protected  |
| <b>Residual ripple</b> | 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

**Reference operating conditions** Calibration temperature: +23 °C (73.4 °F) ± 5 K

### Maximum measured error

|                                   | Type             | Measurement accuracy <sup>1</sup> |
|-----------------------------------|------------------|-----------------------------------|
| <b>Resistance thermometer RTD</b> | Pt100, Ni100     | 0.2 K or 0.08%                    |
|                                   | Pt500, Ni500     | 0.5 K or 0.20%                    |
|                                   | Pt1000, Ni1000   | 0.3 K or 0.12%                    |
| <b>Thermocouple TC</b>            | 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 <sup>1</sup> |
|-----------------------------------|-------------------|-----------------------------------|
| <b>Resistance transmitter (Ω)</b> | 10 to 400 Ω       | ± 0.1 Ω or 0.08%                  |
|                                   | 10 to 2000 Ω      | ± 1.5 Ω or 0.12%                  |
| <b>Voltage transmitters (mV)</b>  | -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 (+23 °C (73.4 °F) ± 5 K).

**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 751 Cl. B (internal cold junction with thermocouples TC)

## Installation conditions

**Installation instructions**

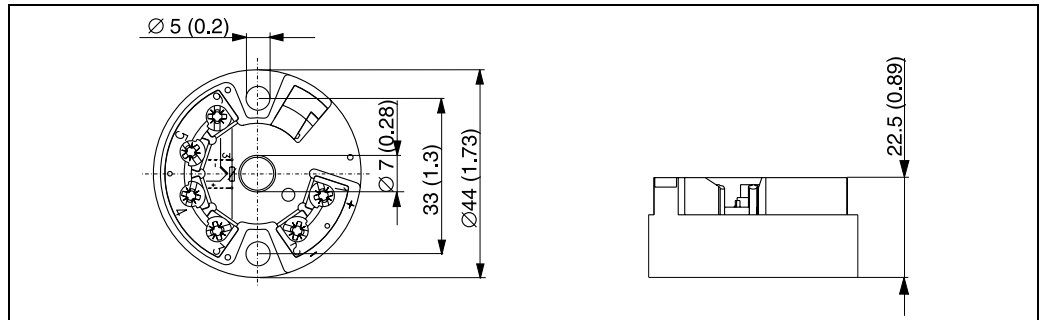
- Installation angle:  
no limit
- Installation area:  
Connection head accord. to DIN 43 729 Form B; TAF 10 field housing

## Environment conditions

|  |  |
|--|--|
| <b>Ambient temperature limits</b>          | -40 to +85 °C (-40 to 185 °F) for Ex-area, see Ex-certificate                            |
| <b>Storage temperature</b>                 | -40 to +100 °C (-40 to 212 °F)   |
| <b>Climate class</b>                       | as per EN 60 654-1, class C  |
| <b>Condensation</b>                        | allowable  |
| <b>Degree of protection</b>                | IP 00, IP 66 installed   |
| <b>Shock and vibration resistance</b>      | 4g / 2 to 150 Hz as per IEC 60 068-2-6   |
| <b>Electromagnetic compatibility (EMC)</b> | Shock resistance and interference emission as per EN 61 326-1 (IEC 1326) and NAMUR NE 21 |

## Mechanical construction

### Design, dimensions



Dimensions of the head transmitter in mm (inches)

|                  |   |
|------------------|---|
| <b>Weight</b>    | approx. 40 g  |
| <b>Material</b>  | <ul style="list-style-type: none"> <li>• Housing: PC</li> <li>• Potting: PUR</li> </ul> |
| <b>Terminals</b> | Cable up to max. 1.75 mm <sup>2</sup> (secure screws)                                   |

## Human interface

|                           |  |
|---------------------------|--|
| <b>Display elements</b>   | 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. |
| <b>Operating elements</b> | No operating elements are present directly on the display. The temperature transmitter is configured via remote operation with the ReadWin®2000 PC software.                       |

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**Remote operation****Configuration**

Hand operating module DXR 275 or PC with Commubox FXA 191 and operating software (ReadWin<sup>®</sup>2000, COMMUWIN II or FieldCare).

**Interface**

PC interface RS232 and Commubox FXA 191.

**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

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## Certificates and approvals

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**CE-Mark**

The measurement system fulfils the requirements demanded by the EU regulations. Endress+Hauser acknowledges successful unit testing by adding the CE mark.

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**Ex approval**


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.

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**Other standards and guidelines**

- EN 60529:  
Degrees of protection by housing (IP-Code)
- EN 61010:  
Safety requirements for electrical measurement, control and laboratory instrumentation.
- EN 61326 (IEC 1326):  
Electromagnetic compatibility (EMC requirements)
- NAMUR  
Standardization association for measurement and control in chemical and pharmaceutical industries.

## Ordering information

| Questionnaire Endress+Hauser iTEMP temperature transmitter        |                                    | Customer specific setup / Kundenspezifische Einstellung           |                            |  |                                    |                            |
|---|------------------------------------|---|----------------------------|---|------------------------------------|----------------------------|
| <b>Standard setup / Standardeinstellung</b>                       |                                    |   |                            |   |                                    |                            |
| 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    |                            |
|   |                                    | <input type="checkbox"/> 2 wire                                   |                            | <input type="checkbox"/> 3 wire   | <input type="checkbox"/> 4 wire    |                            |
| Unit / Einheit  |                                    | <input type="checkbox"/> °C                                       |                            | <input type="checkbox"/> °F   |                                    |                            |
| Range / Messbereich<br>(not / nicht PROFIBUS-PA)                  | Low scale<br>Anfang                | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | <input type="text"/>               | <input type="text"/>       |
|   | High scale<br>Ende                 | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | <input type="text"/>               | <input type="text"/>       |
|   |                                    |   |                            | Bitte beachten:<br>Messbereich und min. Spanne<br>(s. Techn. Daten)                 |                                    |                            |
|   |                                    |   |                            | Note:<br>Range and min. span<br>(s. Techn. data)                                    |                                    |                            |
| Bus address / Busadresse<br>(only / nur PROFIBUS-PA)              |                                    | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | <b>[0...126]</b>                   |                            |
| <b>Expanded setup / Erweiterte Einstellung</b>                    |                                    |   |                            |   |                                    |                            |
| Reference junction /<br>Vergleichsstelle                          | <input type="checkbox"/> intern    | <input type="checkbox"/> extern                                   |                            | (only / nur TC)   |                                    |                            |
|   |                                    | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | [0...80°C; 32...176°F]             |                            |
| Compensation wire resistance /<br>Kompensation Leitungswiderstand |                                    | <input type="text"/>  | <input type="text"/>       | [0...20 Ohm] (only / nur RTD 2 wire)  |                                    |                            |
|   |                                    | <input type="text"/>  | <input type="text"/>       | [0...30 Ohm] (only / nur HART, PA RTD 2 wire)                                       |                                    |                            |
| Failure mode /<br>Fehlverhalten                                   | <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)   |                                    |                            |
| Damping / Dämpfung  |                                    | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | [0, 1, 2,..., 8s] (only / nur PCP) |                            |
|   |                                    | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | [0, 1, 2,..., 100s]                |                            |
| Offset  |                                    | <input type="text"/>  | ,                          | <input type="text"/>  | [-9,9...0...+9,9K]                 |                            |
| TAG   | PCP                                | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | <input type="text"/>               | <input type="text"/>       |
|   | HART                               | (HART: 8 char. TAG + 16 char. Descriptor , PROFIBUS-PA: 32 char.) |                            |   |                                    |                            |
|   | PROFIBUS-PA                        | <input type="text"/>  | <input type="text"/>       | <input type="text"/>  | <input type="text"/>               | <input type="text"/>       |

## Product structure

**Head transmitter iTEMP® HART® TMT 182**

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 |   |
|---------------|---|
| <b>A</b>      | Version for non hazardous areas             |
| <b>B</b>      | ATEX II1G EEx ia IIC T4/T5/T6               |
| <b>C</b>      | FM IS, Class I, Div. 1+2, Group A, B, C, D  |
| <b>D</b>      | CSA IS, Class I, Div. 1+2, Group A, B, C, D |
| <b>E</b>      | ATEX II3G EEx nA IIC T4/T5/T6               |
| <b>F</b>      | ATEX II3D                                   |
| <b>G</b>      | ATEX II1G EEx ia IIC T6, II3D               |
| <b>H</b>      | ATEX II3G EEx nA IIC T6, II3D               |

| Configuration transmitter connection |                                       |
|--------------------------------------|---------------------------------------|
| <b>A</b>                             | Standard factory configuration 3-wire |
| <b>1</b>                             | Configuration connection TC           |
| <b>2</b>                             | Configuration connection RTD (2-wire) |
| <b>3</b>                             | Configuration connection RTD (3-wire) |
| <b>4</b>                             | Configuration connection RTD (4-wire) |

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

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

| Model    |   |
|----------|---|
| <b>A</b> | Standard model                              |
| <b>B</b> | Works calibration certificate 6 test points |

|         |  |  |  |  |  |                         |
|---------|--|--|--|--|--|-------------------------|
| TMT182- |  |  |  |  |  | ← Order code (complete) |
|---------|--|--|--|--|--|-------------------------|

## Customised options

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

## Accessories

Commubox FXA 191

**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](http://www.endress.com/readwin)**

Hand operating module 'HART®Communicator DXR 275', **Order code:** DXR275-...

## Documentation

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- System information Temperature measurement (SI 008R/09/en)
- Operating short manual iTEMP®HART®TMT 182 (KA 142R/09/a3)
- Additional documentation for use in explosion-hazardous areas:
  - ATEX II1G: XA 006R/09/a3
  - ATEX II3G: XA 011R/09/a3
  - ATEX II3D: XA 027R/09/a3
  - FM, CSA, etc.
- Operating manual iTEMP®HART®Communication (BA 139R/09/a3)
- Operating short manual TAF 10 Field housing (KA 093R/09/a2)

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**Endress+Hauser GmbH+Co.**

Instruments International  
P.O. Box 2222  
D-79574 Weil am Rhein  
Germany

Tel. (07621) 975-02  
Tx 773926  
Fax (07621) 975 345  
e-mail: [info@ii.endress.com](mailto:info@ii.endress.com)

**Internet:**

<http://www.endress.com>

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