Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Technical Information

iTEMP® TMT85

Dual-Input Temperature Head Transmitter with FOUNDATION Fieldbus™ communication

Application

- Temperature head transmitter with 2 input channels and FOUNDATION Fieldbus™ protocol for the conversion of different input signals into digital output signals
- Temperature transmitter for all critical applications requiring signal reliability, long-term stability, high precision and advanced diagnostics (important in critical processes)
- Dual channel functionality fits applications needing highest level of safety, availability and risk reduction
- Usable for resistance thermometer (RTD), thermocouple (TC), resistance transmitter (Ω), voltage transmitter (mV)
- DIN B style head transmitter to fit in the smallest connection heads or in remote housings

Your benefits

- Easy and standardized communication via FOUNDATION Fieldbus™ H1
- Meets the EMC requirements as per NAMUR NE21 and the recommendations of NE89 with regard to temperature transmitters with digital signal processing
- Straightforward design of measuring points in Ex-areas through FISCO/FNICO conformity in accordance with IEC 600079-27
- Safe operation in hazardous areas thanks to international approvals such as
  – FM IS, NI
  – CSA IS, NI
  – ATEX Ex ia, Ex nA
  for intrinsically safe installation in zone 1 and zone 2
- High accuracy through sensor-transmitter matching
- Easy and reliable operation with sensor monitoring and device hardware fault recognition
- Variable installations due to a wide range of mounting versions and sensor connection options
- Rapid no-tools wiring due to optional spring terminal technology

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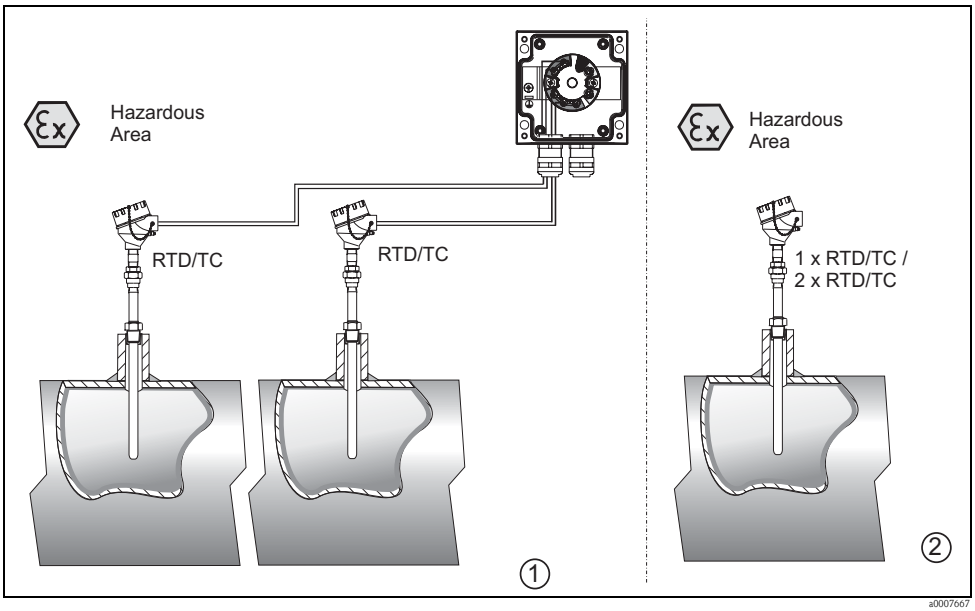
Function and system design

Measuring principle

Electronic recording and conversion of various input signals in industrial temperature measurement.

Measuring system

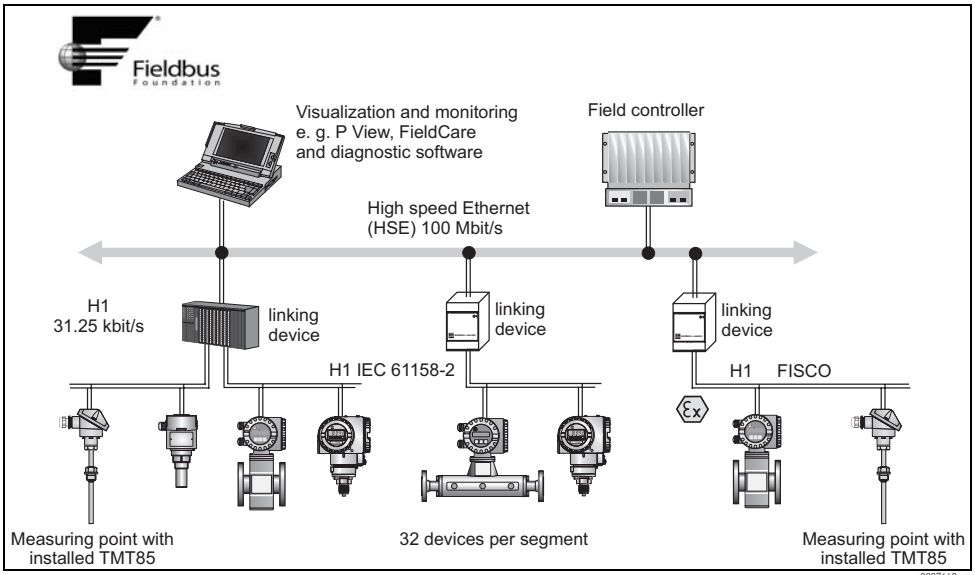


Application examples

① Two sensors with measuring input (RTD or TC) in remote installation with the following advantages: drift warning, sensor backup function and temperature-dependent switching
② Built-in head transmitter - 1 x RTD/TC or 2 x RTD/TC as redundancy

Endress+Hauser is a producer of a wide range of resistance thermometers, thermocouples and matching thermowells.
In conjunction with these components, the temperature head transmitter forms a complete measuring point for various applications in the industrial sector.

Device architecture



System integration via FOUNDATION Fieldbus™

The temperature head transmitter is a two-wire device with two measuring inputs. Using FOUNDATION Fieldbus™, the device transfers converted signals from resistance thermometers and thermocouples in addition to other resistance and millivolt signals. The device is powered via the FOUNDATION Fieldbus™ H1 bus and can be installed as an intrinsically safe apparatus in zone 1 hazardous areas. The device is used for instrumentation purposes in the terminal head form B as per DIN 43729. Data transfer takes place via the following function blocks:

- 2 x 3 analog input (AI),
- 1 x standard PID controller (PID) and
- 1 x input selector (ISEL).

Sensor diagnosis functions
Sensor diagnoses such as cable open circuit, short-circuit, cable corrosion, wiring error and device hardware error are supported. In addition, the work area of the sensor and the ambient temperature are monitored.

2-channel functions

These functions increase the reliability and availability of the process values:
- Sensor backup switches to the second sensor if the primary sensor fails
- Temperature-dependent switching between sensors which have advantages in different ranges
- Drift warning or alarm if the deviation between sensor 1 and sensor 2 is less than or greater than a predefined limit value.

Input

Measured variable

Temperature (temperature linear transmission behavior), resistance and voltage.

Measuring range

The transmitter records different measuring ranges depending on the sensor connection and input signals (see 'Type of input').

Type of input

It is possible to connect two sensors which are independent of each other. The measuring inputs are not galvanically isolated from each other.

Type of input	Designation	Measuring range limits
Resistance thermometer (RTD) as per IEC 60751 (α = 0.00385)	Pt100	-200 to 850 °C (-328 to 1562 °F)
	Pt200	-200 to 850 °C (-328 to 1562 °F)
	Pt500	-200 to 250 °C (-328 to 482 °F)
	Pt1000	-200 to 250 °C (-238 to 482 °F)
as per JIS C1604-81 (α = 0.003916)	Pt100	-200 to 649 °C (-328 to 1200 °F)
as per DIN 43760 (α = 0.006180)	Ni100	-60 to 250 °C (-76 to 482 °F)
	Ni1000	-60 to 150 °C (-76 to 302 °F)
as per Edison Copper Winding No.15 (α = 0.004274)	Cu10	-100 to 260 °C (-148 to 500 °F)
as per Edison Curve (α = 0.006720)	Ni120	-70 to 270 °C (-94 to 518 °F)
as per GOST (α = 0.003911)	Pt50	-200 to 1100 °C (-328 to 2012 °F)
	Pt100	-200 to 850 °C (-328 to 1562 °F)
as per GOST (α = 0.004278)	Cu50, Cu100	-200 to 200 °C (-328 to 392 °F)
	Pt100 (Callendar-Van Dusen)	10 to 400 Ω 10 to 2000 Ω
	Polynomial nickel	10 to 400 Ω 10 to 2000 Ω
	Polynomial copper	10 to 400 Ω 10 to 2000 Ω
	■ Connection type: 2-wire, 3-wire or 4-wire connection, sensor current: ≤ 0.3 mA ■ For 2-wire circuit, compensation for wire resistance possible (0 to 30 Ω) ■ For 3-wire and 4-wire connection, sensor wire resistance up to max. 50 Ω per wire	

Type of input	Designation	Measuring range limits
Resistance transmitter	Resistance Ω	10 to 400 Ω 10 to 2000 Ω
Thermocouples (TC) as per IEC 584, Part 1	Type B (PtRh30-PtRh6) Type E (NiCr-CuNi) Type J (Fe-CuNi) Type K (NiCr-Ni) Type N (NiCrSi-NiSi) Type R (PtRh13-Pt) Type S (PtRh10-Pt) Type T (Cu-CuNi)	0 to +1820 °C (32 to 3308 °F) -270 to +1000 °C (-454 to 1832 °F) -210 to +1200 °C (-346 to 2192 °F) -270 to +1372 °C (-454 to 2501 °F) -270 to +1300 °C (-454 to 2372 °F) -50 to +1768 °C (-58 to 3214 °F) -50 to +1768 °C (-58 to 3214 °F) -270 to +400 °C (-454 to 752 °F)
as per ASTM E988	Type C (W5Re-W26Re) Type D (W3Re-W25Re)	0 to +2315 °C (32 to 4199 °F) 0 to +2315 °C (32 to 4199 °F)
as per DIN 43710	Type L (Fe-CuNi) Type U (Cu-CuNi)	-200 to +900 °C (-328 to 1652 °F) -200 to +600 °C (-328 to 1112 °F)
	■ 2-wire connection ■ Internal cold junction (Pt100, Class A) ■ External cold junction: value adjustable from -40 to +85 °C (-40 to +185 °F) ■ Maximum sensor resistance 10 kΩ (if the sensor resistance is greater than 10 kΩ, an error message is output in accordance with NAMUR NE89)	
Voltage transmitter (mV)	Millivolt transmitter (mV)	-20 to 100 mV

When assigning both sensor inputs, the following connection combinations are possible:

		Sensor input 1			
		RTD or resistance transmitter, 2-wire	**RTD or resistance transmitter, 3-wire**	**RTD or resistance transmitter, 4-wire**	**Thermocouple (TC), voltage transmitter**
Sensor input 2	**RTD or resistance transmitter, 2-wire**	√	√	x	√
	RTD or resistance transmitter, 3-wire	√	√	x	√
	RTD or resistance transmitter, 4-wire	x	x	x	x
	Thermocouple (TC), voltage transmitter	√	√	√	√

Output

Output signal

- FOUNDATION Fieldbus™ H1, IEC 61158-2
- FDE (Fault Disconnection Electronic) = 0 mA
- Data transmission rate: supported baud rate = 31.25 kBit/s
- Signal coding = Manchester II
- Output data:
  Available values via AI blocks: temperature (PV), temp sensor 1 + 2, terminal temperature
- LAS (link active scheduler), LM (link master) function is supported:
  Thus, the head transmitter can assume the function of a link active scheduler (LAS) if the current link master (LM) is no longer available. The device is supplied as a BASIC device. To use the device as an LAS, this must be defined in the distributed control system and activated by downloading the configuration to the device.
- In accordance with IEC 60079-27, FISCO/FNICO

Breakdown information

Status message in accordance with FOUNDATION Fieldbus™ specification.

Linearization/transmission behavior	Temperature linear, resistance linear, voltage linear
Mains voltage filter	50/60 Hz
Galvanic isolation	U = 2 kV AC (sensor input to the output)
Current consumption	≤ 11 mA
Switch-on delay	8 s

Data of the FOUNDATION Fieldbus interface

Basic Data

Device Type	11CE (hex)
Device Revision	01 (hex)
Node address	Default: 247
ITK Version	5.0.1
ITK-Certification Driver-No.	IT050600
Link Master (LAS) capable	yes
Link Master / Basic Device selectable	yes; Default: Basic Device
Number VCRs	44
Number of Link-Objects in VFD	50

Virtual communication references (VCRs)

Permanent Entries	44
Client VCRs	0
Server VCRs	5
Source VCRs	8
Sink VCRs	0
Subscriber VCRs	12
Publisher VCRs	19

Link Settings

Slot time	4
Min. Inter PDU delay	12
Max. response delay	40

Blocks

Block description	Block index[1)]	Execution time (macro cycle ≤ 500 ms)	Block class
Resource Block	400	–	Extended
Transducer Block Sensor 1	500	–	Manufacturer-specific
Transducer Block Sensor 2	600	–	Manufacturer-specific
Transducer Block Display	700	–	Manufacturer-specific
Transducer Block Adv. Diag.	800	–	Manufacturer-specific
Function block AI1	900	35 ms	Extended
Function block AI2	1000	35 ms	Extended
Function block AI3	1100	35 ms	Extended
Function block AI4	(1200)	35 ms (not instantiated)	Extended
Function block AI5	(1300)	35 ms (not instantiated)	Extended
Function block AI6	(1400)	35 ms (not instantiated)	Extended
Function block PID	1200 (1500)	100 ms	Standard
Function block ISEL	1300 (1600)	35 ms	Standard

1) The values in brackets are valid if all the AI blocks (AI1-AI6) are instantiated.

Brief description of the blocks

Resource Block
The Resource Block contains all the data that clearly identify and characterize the device. It is like an electronic device nameplate. In addition to parameters that are needed to operate the device on the fieldbus, the Resource Block also makes other information available such as the order code, device ID, hardware revision, software revision, device release etc.

Transducer Block "Sensor 1" and "Sensor 2"
The Transducer Blocks of the head transmitter contain all the measurement-related and device-specific parameters that are relevant for measuring the input variables.

Display Transducer
The parameters of the "Display" Transducer Block allow the configuration of the optional display.

Advanced Diagnostic
All the parameters for automatic monitoring and diagnosis are grouped together in this Transducer Block.

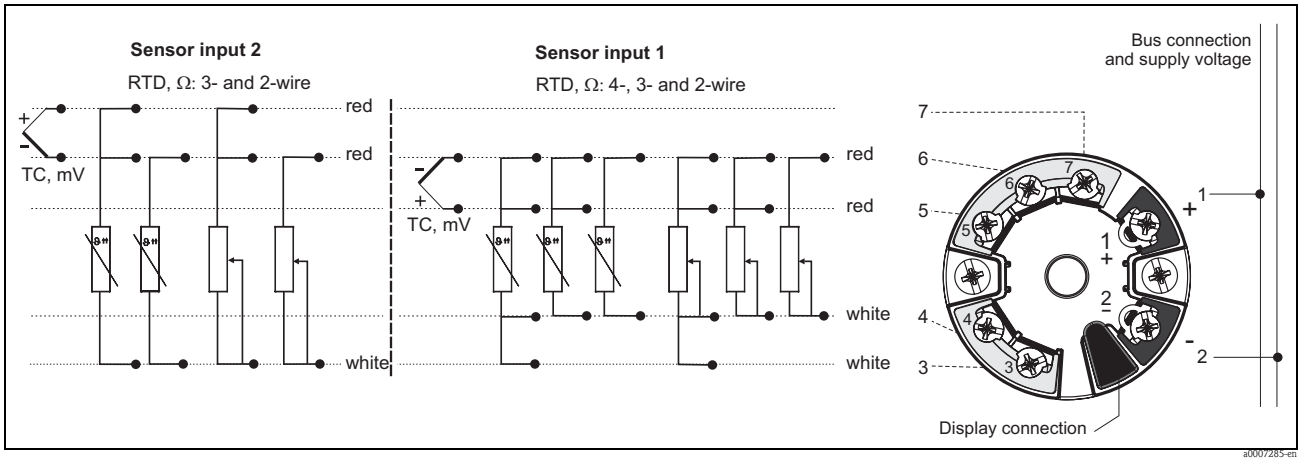
Analog Input (AI)
In the AI function block, the process variables from the Transducer Blocks are prepared for subsequent automation functions in the control system (e.g. scaling, limit value processing).

PID
This function block contains input channel processing, proportional integral-differential control (PID) and analog output channel processing. The following can be implemented: basic controls, feedforward control, cascade control and cascade control with limiting.

Input Selector (ISEL)
The block for selecting a signal (Input Selector Block - ISEL) allows the user to choose up to four inputs and generates an output based on the configured action.

Power supply

Electrical connection



Terminal assignment of head transmitter.

Supply voltage

U = 9 to 32 V DC, polarity independent (max. voltage U_b = 35 V)

Performance characteristics

Response time

1 s per channel

Reference operating conditions

- Calibration temperature: + 25 °C ± 5 K (77 °F ± 9 °F)
- Supply voltage: 24 V DC
- 4-wire circuit for resistance adjustment

Resolution

Resolution A/D converter = 18 bit

Maximum measured error

Note!
The accuracy data are typical values and correspond to a standard deviation of ± 3σ (normal distribution), i.e. 99.8% of all the measured values achieve the given values or better values.

	Designation	**Performance characteristics**
Resistance thermometers (RTD)	Cu100, Pt100, Ni100, Ni120 Pt500 Cu50, Pt50, Pt1000, Ni1000 Cu10, Pt200	0.1 °C (0.18 °F) 0.3 °C (0.54 °F) 0.2 °C (0.36 °F) 1 °C (1.8 °F)
Thermocouples (TC)	Type: K, J, T, E, L, U Type: N, C, D Type: S, B, R	typ. 0.25 °C (0.45 °F) typ. 0.5 °C (0.9 °F) typ. 1.0 °C (1.8 °F)
	Measuring range	**Performance characteristics**
Resistance transmitters (Ω)	10 to 400 Ω 10 to 2000 Ω	± 0.04 Ω ± 0.8 Ω
Voltage transmitters (mV)	-20 to 100 mV	± 10 µV

Sensor transmitter matching
RTD sensors are one of the most linear temperature measuring elements. Nevertheless, the output must be linearized. To improve temperature measurement accuracy significantly, the device enables the use of two methods:

- Callendar-Van Dusen coefficients (Pt100 resistance thermometer)
  The Callendar-Van Dusen equation is described as:

$$R_T = R_0[1 + AT + BT^2 + C(T - 100)T^3]$$

  The coefficients A, B and C are used to match the sensor (platinum) and transmitter in order to improve the accuracy of the measuring system. The coefficients for a standard sensor are specified in IEC 751. If no standard sensor is available or if greater accuracy is required, the coefficients for each sensor can be determined specifically by means of sensor calibration.

- Linearization for copper/nickel resistance thermometers (RTD)
  The polynomial equations for nickel are described as:

$$R_T = R_0[1 + AT + BT^2 + C(T - 100)T^3]$$

  The equations for copper, subject to temperature, are described as:

$$R_T = R_0(1 + AT)$$

  T = -50 °C to 200 °C (-58 °F to 392 °F)

$$R_T = R_0[1 + AT + B(T + 6.7) + CT^2]$$

  T = -180 °C to -50 °C (-292 °F to -58 °F)

  These coefficients A, B and C are used for the linearization of nickel or copper resistance thermometers (RTD). The exact values of the coefficients derive from the calibration data and are specific to each sensor.

Sensor transmitter matching using one of the above-named methods significantly improves the temperature measurement accuracy of the entire system. This is due to the fact that to calculate the temperature measured, the transmitter uses the specific data pertaining to the connected sensor instead of using the standardized sensor curve data.

Non-repeatability

As per EN 61298-2

Physical input measuring range of sensors		Non-repeatability
10 to 400 Ω	Cu10, Cu50, Cu100, Pt50, Pt100, Ni100, Ni120	15 mΩ
10 to 2000 Ω	Pt200, Pt500, Pt1000, Ni1000	100 ppm x measured value
-20 to 100 mV	Thermocouples type: C, D, E, J, K, L, N, U	4 µV
-5 to 30 mV	Thermocouples type: B, R, S, T	3 µV

Long-term stability

≤ 0.1 °C/year (≤ 0.18 °F/year) in reference operating conditions

Influence of ambient temperature (temperature drift)

Impact on accuracy when ambient temperature changes by 1 K (1.8 °F):	
Input 10 to 400 Ω	0.001% of the measured value, min. 1 mΩ
Input 10 to 2000 Ω	0.001% of the measured value, min. 10 mΩ
Input -20 to 100 mV	0.001% of the measured value, min. 0.2 µV
Input -5 to 30 mV	0.001% of the measured value, min. 10 µV

Typical sensitivity of resistance thermometers		
Pt: 0.00385 * R_{nom}/K	Cu: 0.0043 * R_{nom}/K	Ni: 0.00617 * R_{nom}/K

Example Pt100: 0.00385 x 100 Ω/K = 0.385 Ω/K

Typical sensitivity of thermocouples					
B: 10 µV/K	C: 20 µV/K	D: 20 µV/K	E: 75 µV/K	J: 55 µV/K	K: 40 µV/K
L: 55 µV/K	N: 35 µV/K	R: 12 µV/K	S: 12 µV/K	T: 50 µV/K	U: 60 µV/K

Example of calculating the measured error with ambient temperature drift:

- Input temperature drift ϑ = 10 K (18 °F), Pt100, measuring range 0 to 100 °C (32 to 212 °F)
- Maximum process temperature: 100 °C (212 °F)
- Measured resistance value: 138.5 Ω (DIN EN 60751) at maximum process temperature

Typical temperature drift in Ω: (0.001% of 138.5 Ω) * 10 = 0.01385 Ω
Conversion to Kelvin: 0.01385 Ω / 0.385 Ω/K = 0.04 K (0.054 °F)

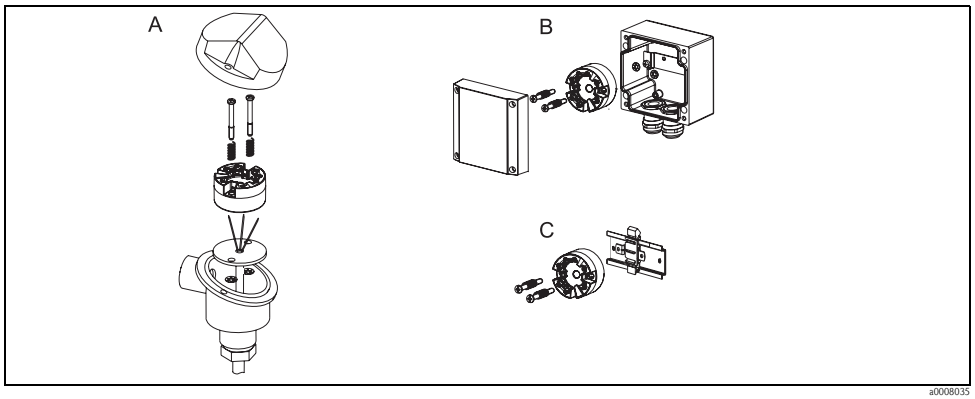
Influence of reference point (cold junction)

Pt100 DIN EN 60751 Cl. A, accuracy ± 1 K (± 1.8 °F), internal reference point for thermocouples TC

Installation conditions

Installation instructions

- Mounting location:



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A: Terminal head as per DIN 43 729 form B, direct installation onto insert with cable entry (middle hole 7 mm / 0.28")
B: Separated from process in field housing
C: With DIN rail clip on top-hat rail as per IEC 60715 (TH35)

- Orientation: No restrictions

Environment conditions

Ambient temperature range

-40 to +85 °C (-40 to +185 °F), for hazardous areas see Ex documentation (XA, CD) and 'Approvals' section.

Storage temperature

-40 to +100 °C (-40 to 212 °F)

Altitude

up to 4000 m (4374.5 yd) above mean sea level in accordance with IEC 61010-1, CSA 1010.1-92

Climate class

as per IEC 60654-1, Class C

Humidity

- Condensation as per IEC 60 068-2-33 permitted
- Max. rel. humidity: 95% as per IEC 60068-2-30

Degree of protection

IP 00. In the installed state, it depends on the terminal head or field housing used.

Shock and vibration resistance

10 to 2000 Hz for 5g as per IEC 60 068-2-6

Electromagnetic compatibility (EMC)

CE EMC compliance

The device meets all of the requirements mentioned in IEC 61326-1, 2007 and NAMUR NE21:2006.

This recommendation is a consistent determination whether the devices used in laboratories and in process control systems are immune to interference, thus increasing their functional safety.

ESD (electrostatic discharge)	IEC 61000-4-2	6 kV cont., 8 kV air	
Electromagnetic fields	IEC 61000-4-3	0.08 to 4 GHz	10 V/m
Burst (fast transients)	IEC 61000-4-4	1 kV	
Surge	IEC 61000-4-5	1 kV asym.	
Conducted RF	IEC 61000-4-6	0.01 to 80 MHz	10 V

Measuring category

Measuring category II as per IEC 61010-1. The measuring category is provided for measuring on power circuits that are directly connected electrically with the low-voltage network.

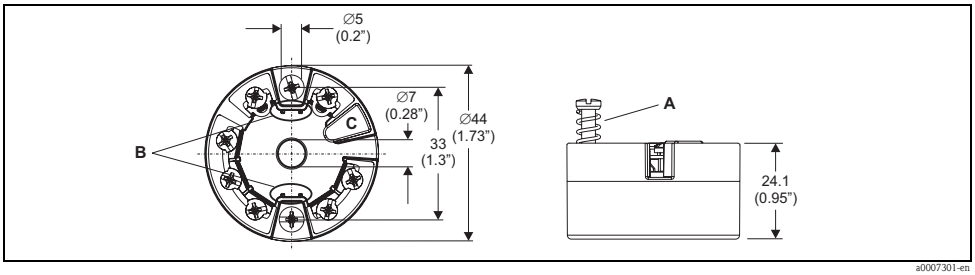
Degree of contamination

Pollution degree 2 as per IEC 61010-1.

Mechanical construction

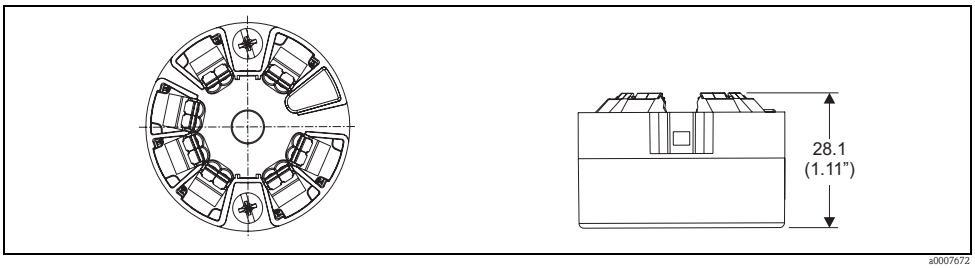
Design, dimensions

Specifications in mm (inch)



Model with screw terminals

Pos. A: Spring range L ≥5 mm (not applicable to US - M4 mounting screws)
Pos. B: Fixing elements for detachable measured value display
Pos. C: Interface for contacting measured value display



Model with spring terminals. The same dimensions except for height of housing.

Weight

approx. 40 to 50 g (1.4 to 1.8 oz)

Material

All materials used are RoHS-compliant.

- Housing: Polycarbonate (PC), complies with UL94 HB flammability standard (HB: horizontal burning test)
- Terminals
  Screw terminals: Nickel-plated brass and gold-plated contact
  Spring terminals: Tin-plated brass, contact spring V2A
- Potting: WEVO PU 403 FP / FL, according to UL94 V0 flammability standard (V0: vertical burning test)

Terminals

Choice of screw or spring terminals (see "Design, dimensions" diagram) for sensor and fieldbus wires:

- Screw terminals: ≤ 2.5 mm² (16 AWG) with latches at the fieldbus terminals for easy connection of a handheld terminal, e.g. DXR375
- Spring terminals:
  Stripped length = min. 10 mm (0.39")

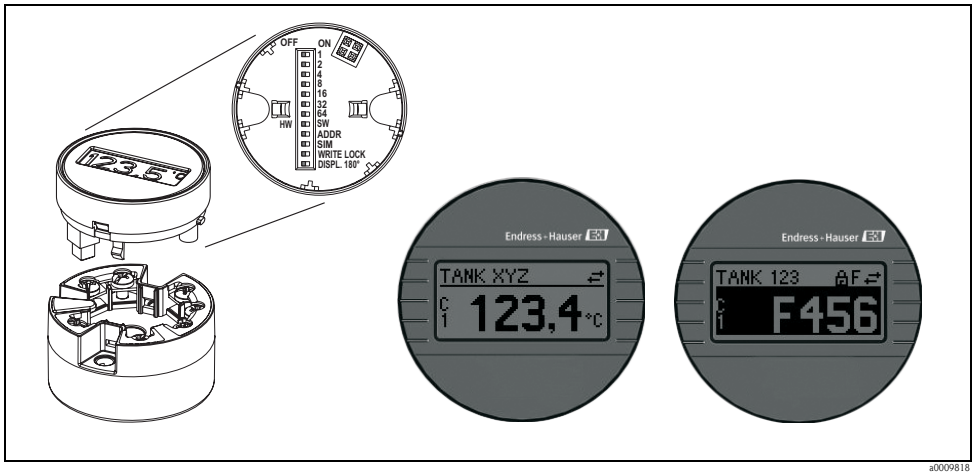
Wire version	Conductor cross-section
Rigid	0.14 mm² to 1 mm² (24 AWG to 18 AWG)
Flexible	0.14 mm² to 1.5 mm² (26 AWG to 14 AWG)
Flexible with wire-end ferrules without plastic ferrule	0.5 mm² to 1.5 mm² (20 AWG to 14 AWG)
Flexible with wire-end ferrules with plastic ferrule	0.25 mm² to 0.75 mm² (24 AWG to 18 AWG)

Note!
No ferrules have to be used when connecting flexible wires to spring terminals.

Human interface

Display and operating elements

There are no display or operating elements present at the head transmitter.
Optional the plug-on display TID10 can be used in connection with the head transmitter. It will display information regarding the actual measured value and the measurement point identification. In the event of a fault in the measurement chain this will be displayed in inverse color showing the channel ident and diagnostics code. DIP-switches can be found on the rear of the display. This enables the hardware set-up such as the PROFIBUS® device address.



Pluggable display TID10

Remote operation

The configuration of FOUNDATION Fieldbus™ functions and of device-specific parameters is performed via fieldbus communication. Special configuration systems provided by various manufacturers are available for this purpose.

Process control systems	Asset management systems
Endress+Hauser ControlCare	National Instruments NI Configurator (≥ 3.1.1)
Emerson DeltaV	Emerson AMS and Handheld FC375
PACTware	
Rockwell Control Logix/FFLD	
Honeywell PKS Experion	
Yokogawa Centum CS3000	

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

ATEX approval

TMT85		ATEX II 1G	Ex ia IIC	T6/T5/T4
Power supply (Terminals + and -)		$U_i \leq 17.5$ V DC $I_i \leq 500$ mA $C_i \leq 5$ nF L_i = negligibly small	or	$U_i \leq 24$ V DC $I_i \leq 250$ mA
Suitable for connecting to a fieldbus system as per the FISCO/FNICO model				
Sensor circuit (Terminals 3 to 7)		$U_0 \leq 7.2$ V DC $I_0 \leq 25.9$ mA $P_0 \leq 46.7$ mW C_i = negligibly small L_i = negligibly small		
Max. connection data	Ex ia IIC Ex ia IIB Ex ia IIA	$L_0 = 20$ mH $L_0 = 50$ mH $L_0 = 100$ mH	$C_0 = 0.7$ µF $C_0 = 4.6$ µF $C_0 = 6.0$ µF	
Temperature range	 T6 T5 T4	Zone 1, 2: Ta = -40 °C to +55 °C (-40 °F to 130 °F) Ta = -40 °C to +70 °C (-40 °F to 158 °F) Ta = -40 °C to +85 °C (-40 °F to 185 °F)	Zone 0: Ta = -20 °C to +40 °C (-4 °F to 104 °F) Ta = -20 °C to +50 °C (-4 °F to 122 °F) Ta = -20 °C to +60 °C (-4 °F to 140 °F)	

Application:
- Equipment category: potentially explosive gas and air mixtures (G)
- Category 1 zone 0, 1 or 2

Note!
For zone 0: potentially explosive steam and air mixtures may only occur under following atmospheric conditions:
- - 20 °C ≤ Ta ≤ +60 °C (- 4 °F ≤ Ta ≤ +140 °F)
- 0.8 bar ≤ p ≤ 1.1 bar (11.6 psi ≤ p ≤ 16 psi)

TMT85		ATEX II 3G Ex nA II T6/T5/T4 ATEX II 3D
Power supply (terminals + and -)		U ≤ 35 V DC
Output		FOUNDATION Fieldbus™ current consumption ≤ 11 mA
Temperature range	T6 T5 T4	Ta = -40 °C to + 55 °C (-40 °F to 130 °F) Ta = -40 °C to + 70 °C (-40 °F to 158 °F) Ta = -40 °C to + 85 °C (-40 °F to 185 °F)

Application (ATEX II 3G Ex nA II T6/T5/T4):
- Equipment category: potentially explosive gas and air mixtures (G)
- Category zone 2

Application (ATEX II 3D):
- Equipment category: potentially explosive dust and air mixtures (D)
- Category zone 22

FM approval

Labeling: IS / I / 1 / ABCD / T4, Entity* or FISCO*;
I / 0 / AEx ia IIC / T4 Ta, Entity* or FISCO*
NI / I / 2 / ABCD / T4, NIFW* or FNICO*;
*= Entity, FISCO, NIFW and FNICO parameters in accordance with **c**ontrol **d**rawings (CD)

Application: Intrinsic safety; Non-incendive
For connection data see table on ATEX approval ATEX II 1G

CSA approval (Canadian Standard Association)

Labeling:
Class I, Div. 1, Groups A, B, C, D, Entity* or FISCO*; Ex ia IIC
Class I, Div.2, Groups A, B, C, D, NIFW* or FNICO*; Ex nA IIC
*= Entity, FISCO, NIFW and FNICO parameters in accordance with **c**ontrol **d**rawings (CD)

Application: Intrinsic safety; Non-incendive
For connection data see table on ATEX approval ATEX II 1G

For further details on the available Ex versions (ATEX, CSA, FM, etc.), please contact your nearest Endress+Hauser sales organization. All relevant data for hazardous areas can be found in separate Ex documentation. If required, please request copies from us or your Endress+Hauser sales organization.

UL

Recognized component to UL61010-1

Other standards and guidelines

- IEC 60529: Degrees of protection through housing (IP code)
- IEC 61158-2: Fieldbus standard
- IEC 61326-1:2007: Electromagnetic compatibility (EMC requirements)
- IEC 60068-2-27 and IEC 60068-2-6: Shock and vibration resistance
- NAMUR: International user association of automation technology in process industries

CSA GP

CSA General Purpose

Certification FOUNDATION Fieldbus™

The temperature transmitter is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the specifications following:

- Certified according to FOUNDATION Fieldbus™ specification
- The device meets all the specifications of the FOUNDATION Fieldbus™ H1
- Interoperability Test Kit (ITK), revision status 5.0.1 (device certification no. available on request): the device can also be operated with certified devices of other manufacturers
- Physical layer conformance test of the FOUNDATION Fieldbus™ (FF-830 FS 1.0)

Ordering information

Product structure

TMT85	**iTEMP® TMT85, Head transmitter** Temperature transmitter with dual sensor input and advanced diagnostics for sensor monitoring. FOUNDATION™ Fieldbus protocol (ITK 5.0.1); Galvanic isolation 2 kV (sensor input to the output); Application: RTD, TC, Ω, mV; Current consumption: 11 mA; Mounting: terminal head Form B as per DIN 43729; UL listed, CSA General Purpose

Approvals			
A1	Non-hazardous area		
B1	ATEX	II 1G Ex ia IIC T4/T5/T6	
B2	ATEX	II 3G Ex nA II T4/T5/T6	
B3	ATEX	II 3D	
B4	ATEX	II 1G Ex ia IIC T6, II 3D	
B5	ATEX	II 3G Ex nA II T6, II 3D	
C1	FM	IS, NI I/1+2/ABCD	
C2	CSA	IS, NI I/1+2/ABCD	
CA	FM+CSA	IS, NI I/1+2/ABCD	
D1	NEPSI	Ex ia IIC T4/T5/T6	
D2	TIIS	Ex ia IIC T6	
E1	IECEx	Ex ia IIC T4/T5/T6	

Communication, output signal		
A	FOUNDATION Fieldbus H1	

Electrical connection		
1	Spring terminals	
2	Screw terminals	
9	Special version, to be specified	

Mounting material		
A	Standard - DIN mounting set	
B	US - M4 mounting screws	

TMT85-	⇐ **Order code** (part 1 - 1 attribute per category must be selected)

Additional selection (as option - no selection or multiple selection is possible)		
500	**Configuration input**	
A1	Ch1: RTD 2-wire, Ch2: inactive	
A2	Ch1: RTD 2-wire, Ch2: RTD 2-wire	
A3	Ch1: RTD 2-wire, Ch2: RTD 3-wire	
A4	Ch1: RTD 2-wire, Ch2: TC	
B1	Ch1: RTD 3-wire, Ch2: inactive	
B2	Ch1: RTD 3-wire, Ch2: RTD 2-wire	
B3	Ch1: RTD 3-wire, Ch2: RTD 3-wire	
B4	Ch1: RTD 3-wire, Ch2: TC	
C1	Ch1: RTD 4-wire, Ch2: inactive	
C2	Ch1: RTD 4-wire, Ch2: TC	
D1	Ch1: TC, Ch2: inactive	
D2	Ch1: TC, Ch2: TC	
510	**Display + Operating**	
E1	Meas. display + DIP-switch, pluggable	
520	**Calibration + test**	
F1	Works calibration certificate, 6-point (fixed points)	
895	**Marking**	
X1	Tagging (TAG), Fieldbus (1...32 digits)	
X2	Tagging (TAG), paper (3 lines, each 16 digits)	
X3	Tagging (TAG), metal (2 lines, each 16 digits)	
X4	Bus address (FF: 20...35/235...255)	

TMT85-	+	⇐ **Order code, complete** (part 1 + additional selection as option)

Questionnaire

Questionnaire / Fragebogen Endress+Hauser iTEMP® temperature transmitter
Customer specific setup / Kundenspezifische Einstellung

Standard setup / Standardeinstellung

Channel 1 / Kanal 1 (Ch1)	Channel 2 / Kanal 2 (Ch2)*
RTD ( ) Pt50, GOST ( ) Ni100, DIN 43760 ( ) Pt100, IEC751 ( ) Ni120, Edison Curve ( ) Pt100, JIS C1604-81 ( ) Ni1000, DIN 43760 ( ) Pt100, GOST ( ) Pt200, IEC751 ( ) Cu10, Edi. Cu. No. 15 ( ) Pt500, IEC751 ( ) Cu50, GOST ( ) Pt1000, IEC751 ( ) Cu100, GOST	RTD ( ) Pt50, GOST ( ) Ni100, DIN 43760 ( ) Pt100, IEC751 ( ) Ni120, Edison Curve ( ) Pt100, JIS C1604-81 ( ) Ni1000, DIN 43760 ( ) Pt100, GOST ( ) Pt200, IEC751 ( ) Cu10, Edi. Cu. No. 15 ( ) Pt500, IEC751 ( ) Cu50, GOST ( ) Pt1000, IEC751 ( ) Cu100, GOST
TC ( ) B ( ) E ( ) J ( ) K ( ) N ( ) R ( ) S ( ) T IEC584 ( ) C ( ) D ASTM E988 ( ) L ( ) U DIN 43710	TC ( ) B ( ) E ( ) J ( ) K ( ) N ( ) R ( ) S ( ) T IEC584 ( ) C ( ) D ASTM E988 ( ) L ( ) U DIN 43710

Unit / Einheit

( ) °C ( ) °F

Interconnection / Verschaltung*

( ) PV1 = Ch1; PV2 = Ch2 (default)
( ) PV1 = Ch1-Ch2: Difference value / Differenzwert
( ) PV1 = 0.5 x (Ch1+Ch2): Average value / Mittelwert
( ) PV1 = Ch1 (or Ch2) Backup

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* = only if Channel 2 is active / nur wenn Kanal 2 aktiv ist

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Accessories

Type	Order code
Display TID10 for Endress+Hauser head transmitters iTEMP® TMT8x, pluggable	TID10-xx
Field housing TAF10 for Endress+Hauser head transmitter, aluminum, IP 66, dimensions W x H x D: 100 x 100 x 60 mm (3.94" x 3.94" x 2.36")	TAF10-xx
DIN rail clip according to IEC 60715 (TH35) for head transmitter mounting	51000856
Standard - DIN mounting set (2 screws + springs, 4 securing disks and 1 display connector cover)	71044061
US - M4 mounting screws (2 screws M4 and 1 display connector cover)	71044062

The following accessories are contained in the scope of delivery:
- Multi-language Brief Operating Instructions as hard copy
- Supplementary documentation ATEX:
  ATEX Safety instructions (XA), **C**ontrol **D**rawings (CD)
- Operating Instructions on CD-ROM
- Mounting material for head transmitter

Documentation

- Operating instructions 'iTEMP® TMT85' (BA251R/09/en) on CD-ROM and associated Brief Operating Instructions 'iTEMP® TMT85' (KA252R/09) as hard copy
- Ex supplementary documentation:
  ATEX II 1G Ex ia IIC: XA069R/09/a3
  ATEX II 3G Ex nA II: XA073R/09/a3
  ATEX II 3D Ex tD A22: XA074R/09/a3

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