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Technical Information
iTHERM MultiSens Bundle TMS31
Multipoint thermometer

Direct contact TC/RTD temperature profiling solution with flexible metal rope for silos and storage tank applications

Application

The device is a versatile, modular multipoint temperature assembly designed for temperature average detection and profiling in grain, organic bulk material storage silos and in oil, fuel storage tanks. The device's mechanical robustness and accurate temperature sensors offer the necessary characteristics for safe, reliable and economic product storage operations. In its standard configuration it is available with up to 20 thermocouple (TC) or RTD sensors fitted to a primary metal rope.

- Oil storage tanks
- Bulk material silos

Your benefits

- Easy installation and process integration thanks to a high degree of customization
- Flexible rope that adapts to different silos or tank operating conditions (filling, emptying, storage, ...)
- Intrinsically safe components for use in Ex areas
- Highly robust design for a long product lifetime and continuous monitoring in all conditions

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Function and system design

Measuring principle

Thermocouples (TC)

Thermocouples are comparatively simple, robust temperature sensors which use the Seebeck effect for temperature measurement: if two electrical conductors made of different materials are connected at a point, a weak electrical voltage can be measured between the two open conductor ends if the conductors are subjected to a thermal gradient. This voltage is called thermoelectric voltage or electromotive force (emf.). Its magnitude depends on the type of conducting materials and the temperature difference between the "measuring point" (the junction of the two conductors) and the "cold junction" (the open conductor ends). Accordingly, thermocouples primarily only measure differences in temperature. The absolute temperature at the measuring point can be determined from these if the associated temperature at the cold junction is known or is measured separately and compensated for. The material combinations and associated thermoelectric voltage/temperature characteristics of the most common types of thermocouple are standardized in the IEC 60584 and ASTM E230/ANSI MC96.1 standards.

Resistance thermometers (RTD)

Resistance thermometers use a Pt100 temperature sensor in accordance with IEC 60751. This temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100 Ω at 0 °C (32 °F) and a temperature coefficient α = 0.003851 °C-1.

There are generally two different kinds of platinum resistance thermometers:

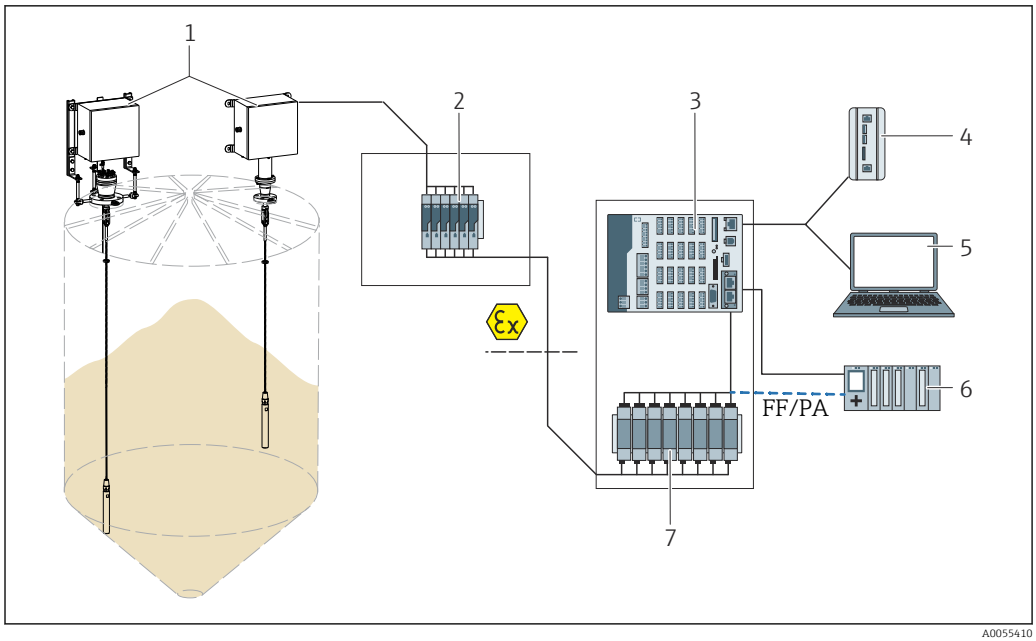
- **Wire-wound (WW):** In these thermometers, a double coil of fine, high-purity platinum wire is located in a ceramic support. This support is then sealed top and bottom with a ceramic protective layer. Such resistance thermometers not only facilitate very reproducible measurements but also offer good long-term stability of the resistance/temperature characteristic within temperature ranges up to 600 °C (1 112 °F). This type of sensor is relatively large in size and is comparatively sensitive to vibrations.
- **Thin-film platinum resistance thermometers (TF):** A very thin, ultrapure platinum layer, approx. 1 µm thick, is vaporized in a vacuum on a ceramic substrate and then structured photolithographically. The platinum conductor paths formed in this way create the measuring resistance. Additional covering and passivation layers are applied and reliably protect the thin platinum layer from contamination and oxidation, even at high temperatures. The primary advantages of thin film temperature sensors over wire wound versions are their smaller sizes and better vibration resistance. A relatively low principle-based deviation of the resistance/temperature characteristic from the standard characteristic of IEC 60751 can frequently be observed among TF sensors at high temperatures. As a result, the tight limit values of tolerance class A as per IEC 60751 can only be observed with TF sensors at temperatures up to approx. 300 °C (572 °F). For this reason, thin-film sensors are generally only used for temperature measurements in ranges below 400 °C (752 °F).

Measuring system

Endress+Hauser offers a complete portfolio of optimized components for the temperature measuring point – everything you need for the seamless integration of the measuring point into the overall facility.

These include:
- Power supply unit/active barrier
- Configuration units
- Overvoltage protection

For more information, see the brochure 'System Components - Solutions for a Complete Measuring Point' (FA00016K/09)



1 *Application example in a silo.*

1 *Mounted multipoint thermometer, optionally with built-in transmitters in the junction box for 4 to 20 mA, HART, PROFIBUS® PA and FOUNDATION Fieldbus™ communication or with terminal blocks for remote wiring.*
2 *iTEMP TMT82 or any other Ex approved transmitters*
3 *Memograph M RSG45 with data recording, calculation, logic control, limit monitoring, alarms and events for 4 to 20 mA or HART communication*
4 *Edge device SGC500*
5 *Device configuration with application software FieldCare*
6 *Fieldbus to DCS/PLC*
7 *Active barrier of the RN series (24 V_{DC}, 30 mA) with galvanically isolated output for the power supply of loop-powered transmitters. The universal power supply works with an input supply voltage of 20 to 250 V DC/AC; 50/60 Hz, which means that it can be used in all international power grids.*

Equipment architecture

The multipoint thermometer belongs to a range of modular product configuration for multipoint temperature detection with a design where subassemblies and components can be managed individually for easy maintenance and spare part ordering.

The temperature probe-only version consists of many sub-assemblies:

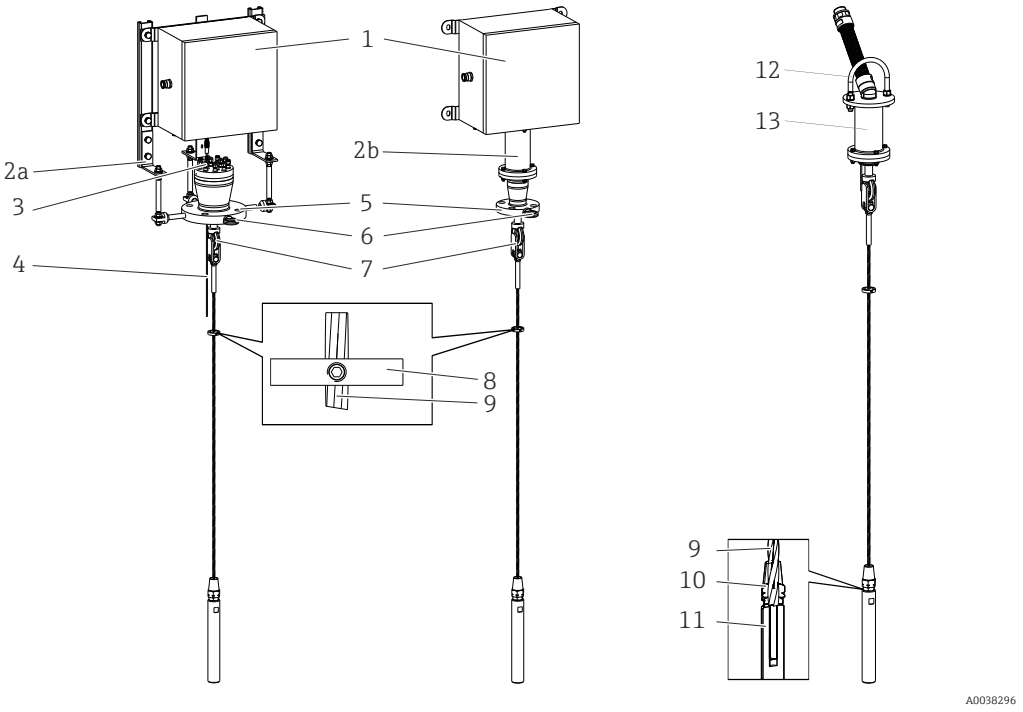
- Temperature sensors
- Stainless steel rope
- Stabilization weight
- Process connection
- Neck (see below for a more detailed description)

In general the instrument measures the temperature profile inside the process environment by means of many sensors wrapped around a rope, jointed to a suitable process connection which ensures the right tightness level.

Output communication protocols available are: Analog output 4 to 20 mA, HART®, PROFIBUS® PA, FOUNDATION Fieldbus™. In case of Memograph M RSG45: Ethernet TCP/IP, Modbus (TCP) USB-B (webserver, etc.) USB-A (USB stick, data storage, barcode reader, printer, etc.) SD-Card for data storage PROFINET, EtherNet/IP, PROFIBUS DP RS232/RS485 (Modbus RTU). Externally the

extension cables are wired into the junction box, which can be directly mounted or remotely as an option.

Design



2 MultiSens Bundle design with open frame with protection on the left side, tube neck design in the middle and MultiSens Bundle design with roof bracket on the right side.

Description and available options	
1: Head	Hinged cover junction box for electrical connections. It includes components such as electrical terminals, transmitters and cable glandes. ▪ 316/316L ▪ Aluminum ▪ Other materials on request
2a: Open supporting frame	Modular support that is adjustable for all available junction boxes and ensures extension cable inspection. 304
2b: Tube neck	Modular tube frame support adjustable for all available junction boxes. 316/316L
3: Compression fitting	High reliability for tightness between process and external environment, for a wide range of process fluids concentration and severe combination between temperature and pressure. 316L
4: Temperature sensor	Thermocouple grounded and ungrounded execution or RTD (Pt100 wire wound).
5: Process connection	Represented by a flange according to international standards or engineered to satisfy specific process requirements.
6: Eyebolt	Lifting device for easy handling during installation phase. 316
7: Toggle joint	Connection between the rope and the process connection. 316

Description and available options	
8: Ogives	Insert guide for the correct positioning of the measuring sensing element. 316/316L
9: Rope	Metallic rope 316
10: Swage thread	Swageless threaded end connection. 316
11: Weight	Weight to maintain the rope pretensioned and in a straight position during working condition (i.e. tank filling). 316/316L
12: U-bolt	Hanging device to connect the multipoint to the silo roof. Material A4 according to DIN ISO 3506
13: Neck	Tube extension for multipoint hanging. 316/316L

Input

Measured variable

Temperature (temperature-linear transmission behavior)

Measuring range

RTD:

Input	Designation	Measuring range limits
RTD as per IEC 60751	Pt100	−200 to +600 °C (−328 to +1 112 °F)

Thermocouple:

Input	Designation	Measuring range limits
Thermocouples (TC) as per IEC 60584, part 1 - using an Endress+Hauser - iTEMP temperature head transmitter	Type J (Fe-CuNi) Type K (NiCr-Ni)	−40 to +520 °C (−40 to +968 °F) −40 to +800 °C (−40 to +1 472 °F)
	Internal cold junction (Pt100) Accuracy of cold junction: ± 1 K Max. sensor resistance: 10 kΩ	

Output

Output signal

Generally, the measured value can be transmitted in one of two ways:
- Directly-wired sensors - sensor measured values forwarded without a transmitter.
- Via all common protocols by selecting an appropriate Endress+Hauser iTEMP temperature transmitter. All the transmitters listed below are mounted directly in the junction box and wired with the sensory mechanism.

Family of temperature transmitters

Thermometers fitted with iTEMP transmitters are an installation-ready complete solution to improve temperature measurement by significantly increasing measurement accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

4 to 20 mA head transmitters
They offer a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP transmitters can be configured quickly and easily at a PC. Endress+Hauser offers free configuration software which can be downloaded from the Endress+Hauser Website.

HART® head transmitters
The iTEMP transmitter is a 2-wire device with one or two measuring inputs and one analog output. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using HART® communication. Swift and easy operation,

visualization and maintenance using universal configuration software like FieldCare, DeviceCare or FieldCommunicator 375/475. Integrated Bluetooth® interface for the wireless display of measured values and configuration via E+H SmartBlue (app), optional.

PROFIBUS® PA head transmitters
Universally programmable iTEMP transmitter with PROFIBUS® PA communication. Conversion of various input signals into digital output signals. High measurement accuracy over the complete ambient temperature range. PROFIBUS PA functions and device-specific parameters are configured via fieldbus communication.

FOUNDATION Fieldbus™ head transmitters
Universally programmable iTEMP transmitter with FOUNDATION Fieldbus™ communication. Conversion of various input signals into digital output signals. High measurement accuracy over the complete ambient temperature range. All iTEMP transmitters are approved for use in all the main process control systems. The integration tests are performed in Endress+Hauser's 'System World'.

Head transmitter with PROFINET® and Ethernet-APL
The iTEMP transmitter is a 2-wire device with two measurement inputs. The device not only transfers converted signals from resistance thermometers and thermocouples, it also transfers resistance and voltage signals using the PROFINET® protocol. Power is supplied via the 2-wire Ethernet connection according to IEEE 802.3cg 10Base-T1. The iTEMP transmitter can be installed as an intrinsically safe electrical apparatus in Zone 1 hazardous areas. The device can be used for instrumentation purposes in the terminal head form B (flat face) according to DIN EN 50446.

Head transmitter with IO-Link®
The iTEMP transmitter is an IO-Link® device with a measurement input and an IO-Link® interface. It offers a configurable, simple and cost-effective solution thanks to digital communication via IO-Link®. The device is mounted in a terminal head form B (flat face) as per DIN EN 5044.

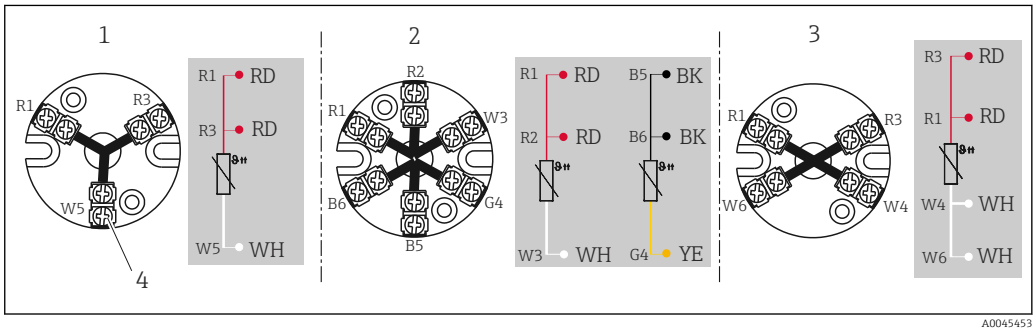
Advantages of the iTEMP transmitters:
- Double or single sensor input (optionally for certain transmitters)
- Attachable display (optionally for certain transmitters)
- Unsurpassed reliability, accuracy and long-term stability in critical processes
- Mathematical functions
- Monitoring of the thermometer drift, sensor backup functionality, sensor diagnostic functions
- Sensor-transmitter matching based on Callendar van Dusen coefficients (CvD).

Power supply

- Electrical connecting cables must be smooth, corrosion resistant, easily cleaned and inspected, robust against mechanical stresses and not susceptible to moisture.
- Grounding or shielding connections are possible via ground terminals on the junction box.

Wiring diagrams

RTD sensor connection type



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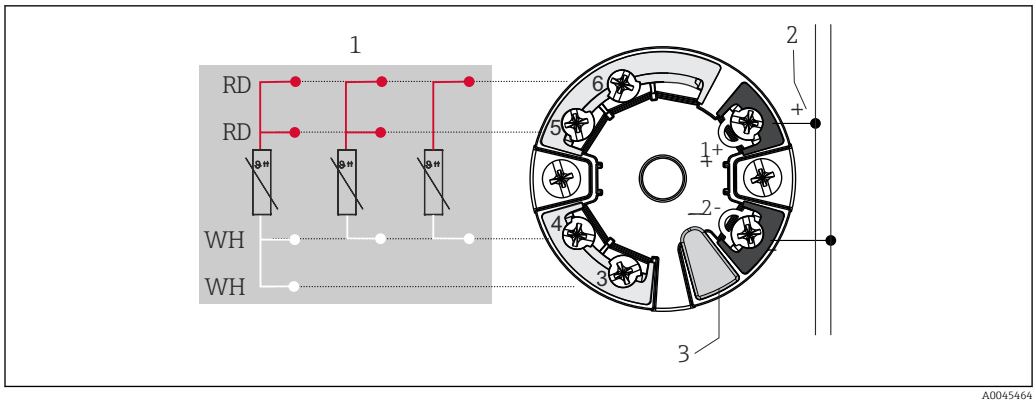
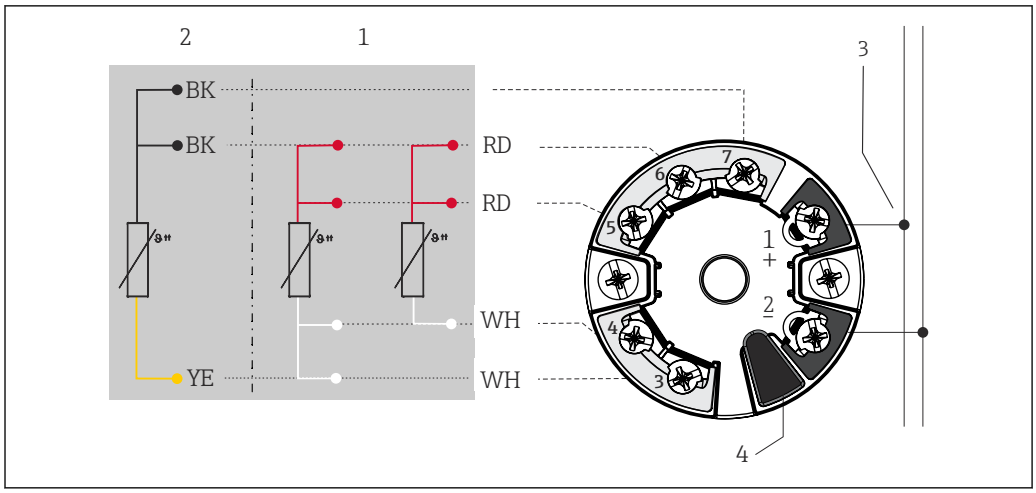
3 Mounted terminal block

1 3-wire, single
2 2 x 3-wire, single
3 4-wire, single
4 Outside screw



4 *Head mounted transmitter iTEMP TMT7x or iTEMP TMT31 (single input)*

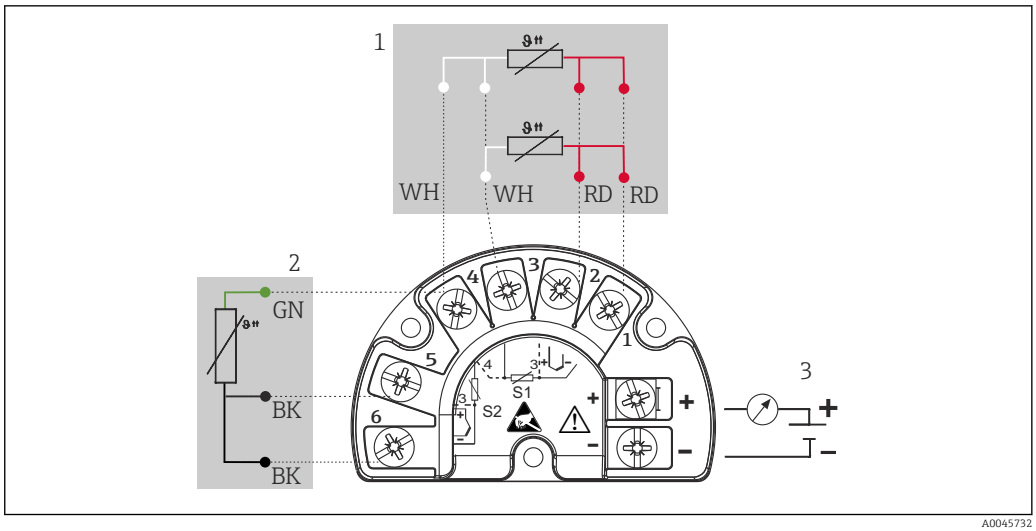
1 *Sensor input, RTD and Ω: 4-, 3- and 2-wire*
2 *Power supply or fieldbus connection*
3 *Display connection/CDI interface*



5 *Head mounted transmitter iTEMP TMT8x (dual input)*

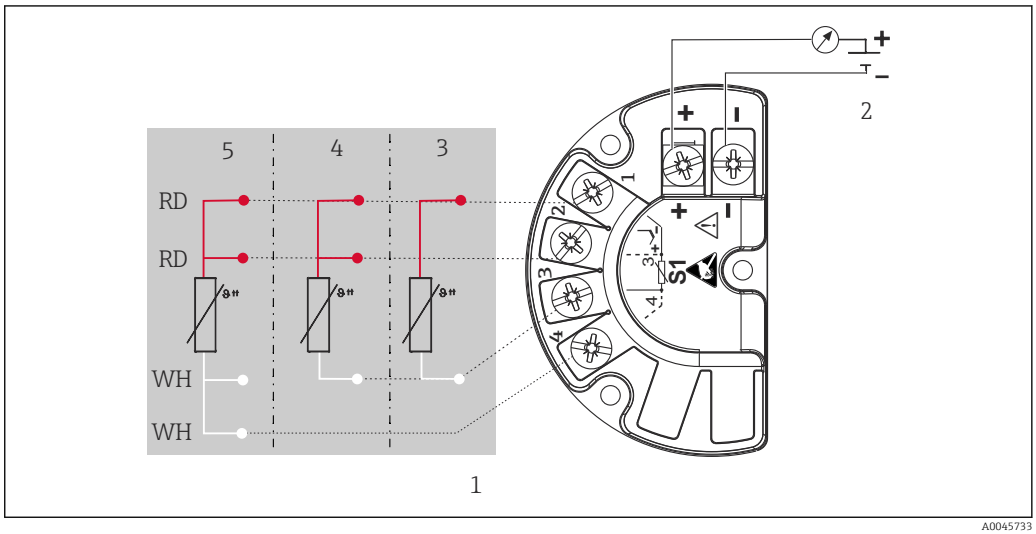
1 *Sensor input 1, RTD: 4- and 3-wire*
2 *Sensor input 2, RTD: 3-wire*
3 *Power supply or fieldbus connection*
4 *Display connection*

Mounted field transmitter: Fitted with screw terminals



6 *iTEMP TMT162 (dual input)*

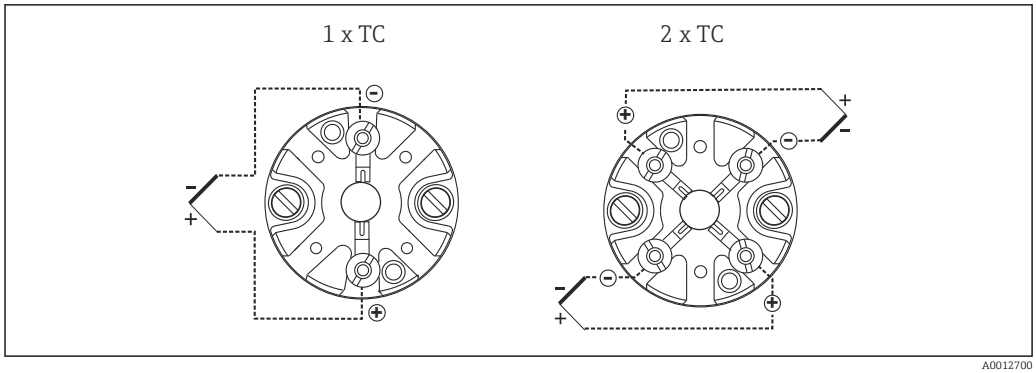
1 *Sensor input 1, RTD: 3- and 4-wire*
2 *Sensor input 2, RTD: 3-wire*
3 *Power supply, field transmitter and analog output 4 to 20 mA or fieldbus connection*



7 *iTEMP TMT142B (single input)*

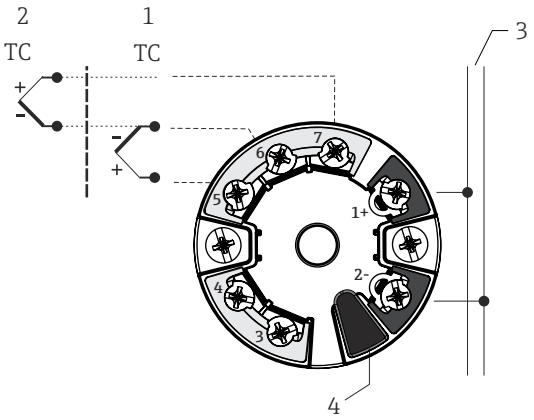
1 *Sensor input RTD*
2 *Power supply, field transmitter and analog output 4 to 20 mA, HART® signal*
3 *2-wire*
4 *3-wire*
5 *4-wire*

Thermocouple (TC) sensor connection type



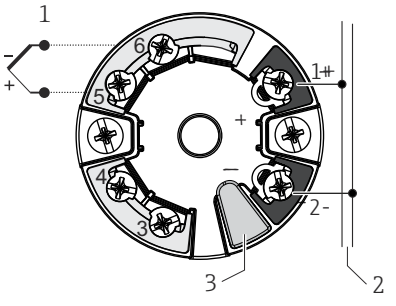
8 Mounted terminal block

Head mounted transmitter TMT8x (dual sensor input) [1]



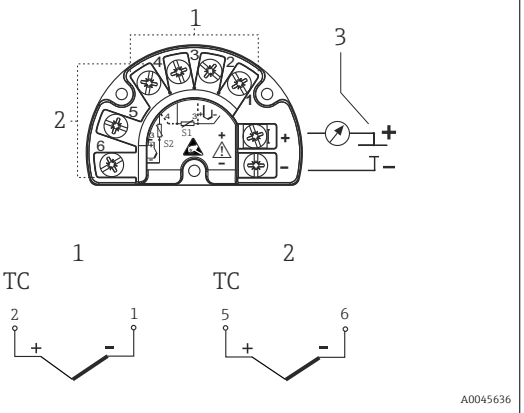
1 Sensor input 1
2 Sensor input 2
3 Fieldbus communication and power supply
4 Display connection

Head mounted transmitter iTEMP TMT7x (single input) [1]



1 Sensor input TC, mV
2 Power supply, bus connection
3 Display connection/CDI interface

Mounted field transmitter iTEMP TMT162 or iTEMP TMT142B



1 Sensor input 1
2 Sensor input 2 (not iTEMP TMT142B)
3 Supply voltage for field transmitter and 4 to 20 mA analog output or fieldbus communication

1) Fitted with spring terminals if screw terminals are not explicitly selected or a dual sensor is installed.

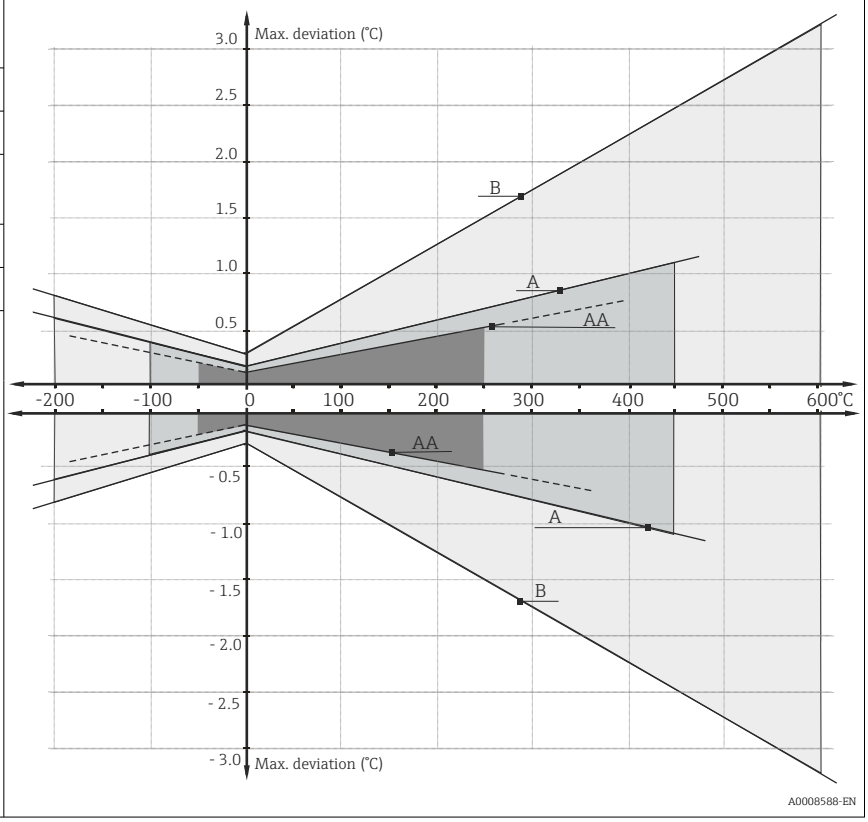
Thermocouple wire colors

As per IEC 60584	As per ASTM E230
▪ Type J: black (+), white (-) ▪ Type K: green (+), white (-) ▪ Type N: pink (+), white (-) ▪ Type T: brown (+), white (-)	▪ Type J: white (+), red (-) ▪ Type K: yellow (+), red (-) ▪ Type N: orange (+), red (-) ▪ Type T: blue (+), red (-)

Performance characteristics

Maximum measured error RTD resistance thermometer as per IEC 60751

Class	Max. tolerances (°C)		Characteristics
Cl. AA, former 1/3 Cl. B	± (0.1 + 0.0017 · |t| [1])		
Cl. A	± (0.15 + 0.002 · |t| [1])		
Cl. B	± (0.3 + 0.005 · |t| [1])		
Temperature ranges for compliance with the tolerance classes			
Wire wound sensor (WW):	Cl. A	Cl. AA	
	−100 to +450 °C	−50 to +250 °C	
Thin-film version (TF):	Cl. A	Cl. AA	
Standard	−30 to +300 °C	0 to +150 °C	



1) |t| = absolute value °C

In order to obtain the maximum tolerances in °F, the results in °C must be multiplied by a factor of 1.8.

Permissible deviation limits of thermoelectric voltages from the standard characteristic for thermocouples as per IEC 60584 or ASTM E230/ANSI MC96.1:

Standard	Type	Standard tolerance		Special tolerance	
IEC 60584		Class	Deviation	Class	Deviation
	J (Fe-CuNi)	2	±2.5 °C (−40 to 333 °C) ±0.0075 |t| [1] (333 to 750 °C)	1	±1.5 °C (−40 to 375 °C) ±0.004 |t| [1] (375 to 750 °C)
	K (NiCr-NiAl)	2	±2.5 °C (−40 to 333 °C) ±0.0075 |t| [1] (333 to 1 200 °C)	1	±1.5 °C (−40 to 375 °C) ±0.004 |t| [1] (375 to 1 000 °C)

1) |t| = absolute value °C

In general, the base-metal thermocouples that are delivered comply with the production tolerances for temperatures > −40 °C (−40 °F) indicated in the table. These materials are mostly unsuitable for temperatures < −40 °C (−40 °F). The tolerances for Class 3 cannot be respected. A special choice of material is required for this temperature range. This cannot be processed through the standard product selection system.

Standard	Type	Standard tolerance	Special tolerance
ASTM E230/ANSI MC96.1		Deviation, the larger respective value applies	
	J (Fe-CuNi)	±2.2 K or ±0.0075 |t| [1] (0 to 760 °C)	±1.1 K or ±0.004 |t| [1] (0 to 760 °C)
	K (NiCr-NiAl)	±2.2 K or ±0.02 |t| [1] (−200 to 0 °C) ±2.2 K or ±0.0075 |t| [1] (0 to 1260 °C)	±1.1 K or ±0.004 |t| [1] (0 to 1260 °C)

1) |t| = absolute value °C

In general, the thermocouple materials that are delivered comply with the tolerances for temperatures > 0 °C (32 °F) indicated in the table. These materials are mostly unsuitable for temperatures < 0 °C (32 °F). The tolerances indicated cannot be respected. A special choice of material is required for this temperature range. This cannot be processed through the standard product selection system.

Influence of ambient temperature

Depends on the head transmitter used. For details, see the Technical Information.

Response time

Response time for the sensor assembly without transmitter. It refers to temperature sensors in direct contact with process.

RTD

Calculated at an ambient temperature of approx. 23 °C by immersing the sensing element in running water (0.4 m/s flow rate, 10 K excess temperature):

Diameter	Response time	
Mineral-insulated cable, 3 mm (0.12 in)	t_{50}	2 s
	t_{90}	5 s
RTD insert StrongSens, 6 mm (¼ in)	t_{50}	< 3.5 s
	t_{90}	< 10 s

Thermocouple (TC)

Calculated at an ambient temperature of approx. 23 °C by immersing the sensing element in running water (0.4 m/s flow rate, 10 K excess temperature):

Diameter	Response time	
Grounded thermocouple: 3 mm (0.12 in), 2 mm (0.08 in)	t_{50}	0.8 s
	t_{90}	2 s
Ungrounded thermocouple: 3 mm (0.12 in), 2 mm (0.08 in)	t_{50}	1 s
	t_{90}	2.5 s

Calibration

Calibration is a service that can be performed on each individual temperature sensor, either in order phase, or after multipoint installation.

When calibration shall be performed once the multipoint is installed, please contact the Endress+Hauser service to get full support. Together with the Endress +Hauser service any further activity can be organised to achieve the calibration of the target sensor. In any case it is forbidden to unscrew any threaded component on the process connection under operating conditions = running process.

Calibration involves comparing the measured values of the sensing elements of the multipoint (DUT device under test) with those of a more precise calibration standard using a defined and reproducible measurement method. The aim is to determine the deviation of the DUT measured values from the true value of the measured variable.

Two different methods are used for the temperature sensors:
- Calibration at fixed-point temperatures, e.g. at the freezing point of water at 0 °C (32 °F).
- Calibration compared against a precise reference thermometer.

Evaluation

If a calibration with an acceptable uncertainty of measurement and transferable measurement results is not possible, Endress+Hauser offers an evaluation measurement service, if technically feasible.

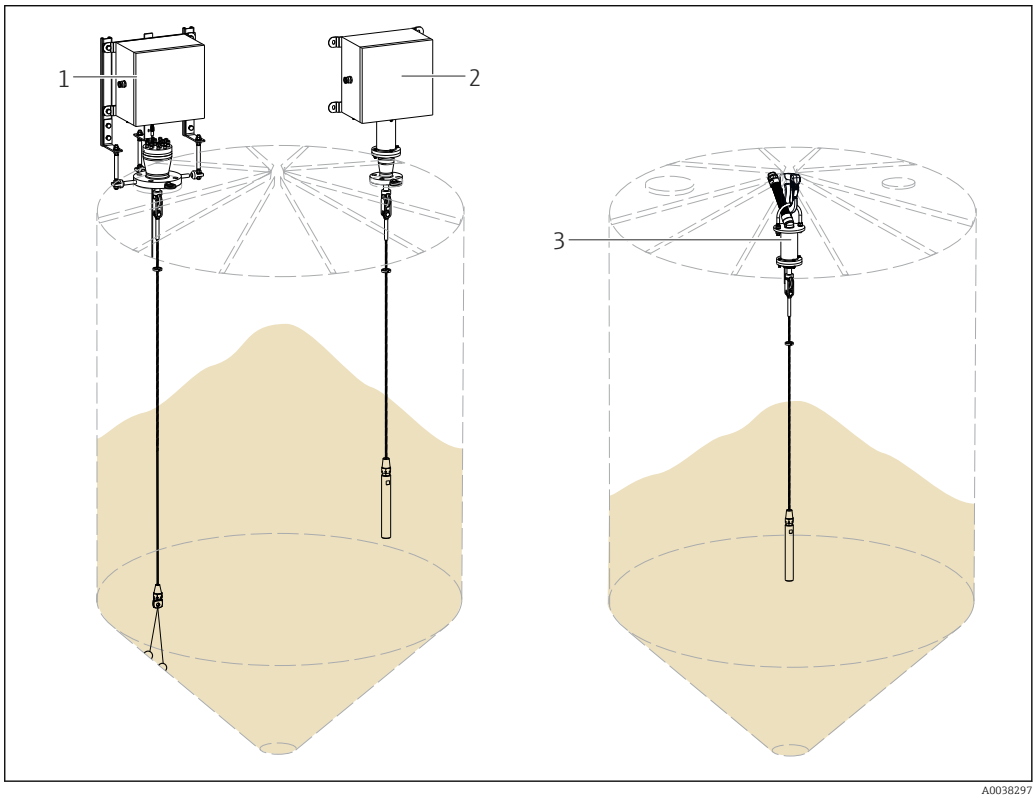
Installation

Mounting location

The installation location must meet the requirements listed in this documentation, such as ambient temperature, protection classification, climatic class, etc.. Care should be taken when checking the sizes of possible existing support frames or brackets welded on the wall of the storage tank or of any other existing frame in the installation area.

Orientation

The rope multipoint thermometer can be installed in vertical position. The rooftop of the storage tank or silo can be either horizontal or oblique, the rope-joint will automatically adjust its inclination to keep the rope always straight in vertical position.



9 Installation examples

1 TMS31 hooked to be anchored to the bottom
2 TMS31 with free hanging weight
3 TMS31 hooked to the roof

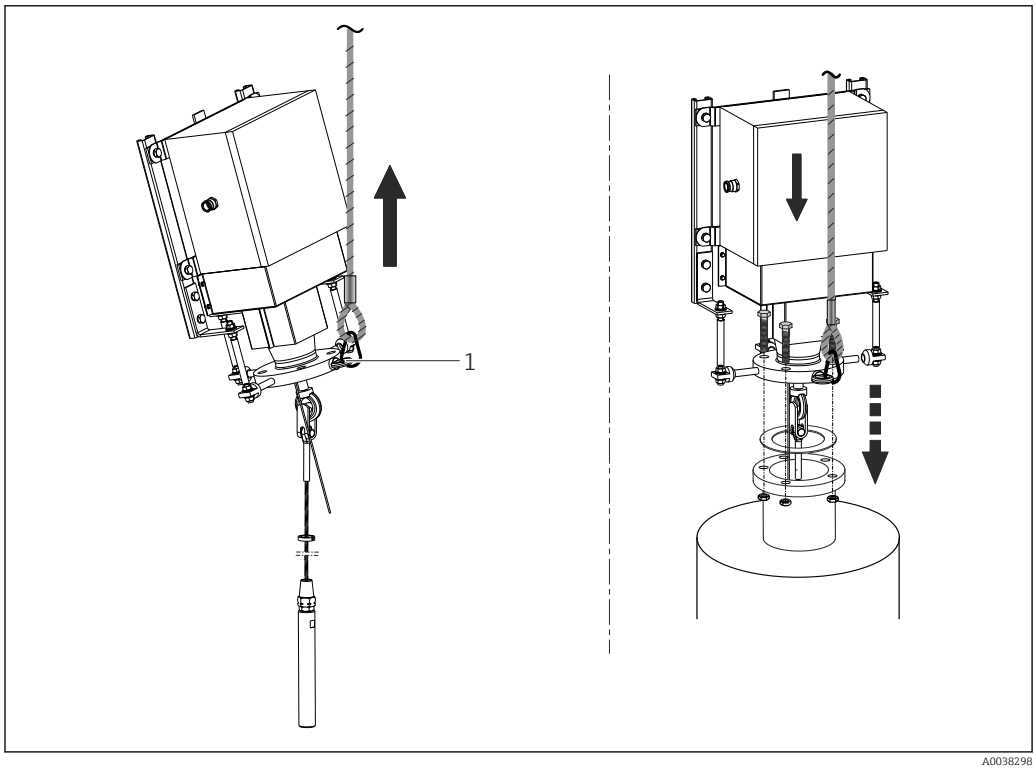
Installation instructions

The rope multipoint thermometer is designed to be installed with a flanged process connection or roof bracket into a storage tank, silo or similar environment. All parts and components have to be handled with care. During the installation phase, lifting and inserting the device, the following must be avoided:

- Misalignment with the entry axis.
- Any load on the welded or threaded parts due to the action of the weight of the device.
- Deformation or crushing of the threaded components, bolts, nuts, cable glands and compression fittings.
- Friction between the temperature probes and the internals of the storage tank.
- Avoid any excessive twisting of the rope around its axis which may cause damage to the rope or to the temperature probes.

Ensure that:

- In case of hanging weight design, the same is not touching the bottom of the storage tank.
- In case of swage eye design, the rope is correctly tensioned thanks to proper hooks or similar systems (end users responsibility).



10 Multipoint thermometer installation in a storage tank nozzle via flange process connection.

During installation the whole thermometer must only be lifted and moved by using ropes and the eyebolt of the flange (1) in order to keep the device as straight as possible.

Environment

Ambient temperature range

Junction box	Non-hazardous area	Hazardous area
Without mounted transmitter	−40 to +85 °C (−40 to +185 °F)	−40 to +60 °C (−40 to +140 °F)
With mounted head transmitter	−40 to +85 °C (−40 to +185 °F)	Depends on the respective hazardous area approval. Details see Ex documentation.

Storage temperature

Junction box	
With head transmitter	−40 to +95 °C (−40 to +203 °F)
With DIN rail transmitter	−40 to +95 °C (−40 to +203 °F)

Relative humidity	Condensation according to IEC 60068-2-14: ▪ Head transmitter: Permitted ▪ DIN rail transmitter: Not permitted Maximum relative humidity: 95% according to IEC 60068-2-30
Climate class	Determined when the following components are installed into the junction box: ▪ Head transmitter: Class C1 according to EN 60654-1 ▪ Multi-channel transmitter: Tested as per IEC 60068-2-30, meets the requirements regarding class C1-C3 in accordance with IEC 60721-4-3 ▪ Terminal blocks: Class B2 according to EN 60654-1
Degree of protection	▪ Specification for conduit: IP68 ▪ Specification for the junction box: IP66/67
Vibration resistance and shock resistance	▪ RTD: 3g / 10 to 500 Hz according to IEC 60751 ▪ RTD iTHERM StrongSens Pt100 (TF, vibration resistant): Up to 60g ▪ TC: 4g / 2 to 150 Hz according to IEC 60068-2-6
Electromagnetic compatibility (EMC)	Depending on the transmitter used. For detailed information see the related Technical Information.

Process

Agriculture:

The loading and unloading forces and the connection to the tank or silo are the minimum input parameters for the selection of the right product configuration. If special design is requested, additional data such as type of stored material, geometry of the container and type of connection have to be considered as mandatory for the whole product definition.

Petrochemistry, Oil & Gas:

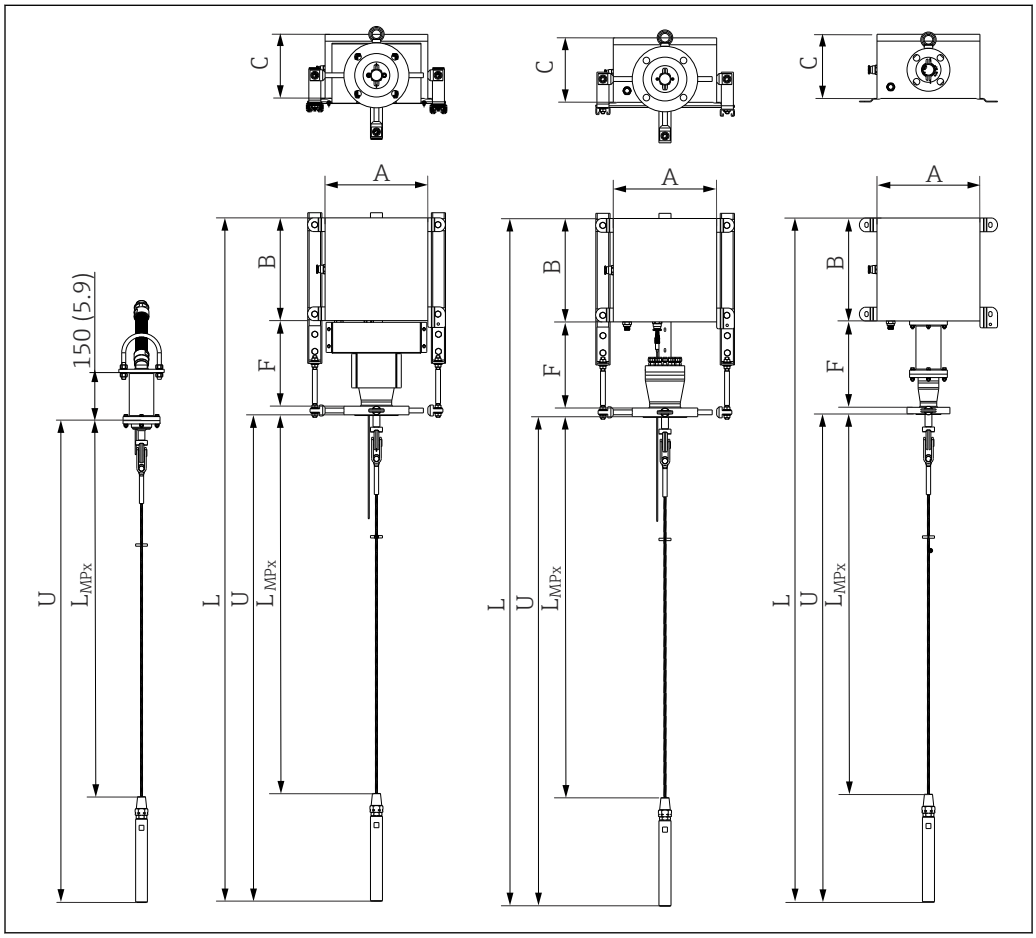
The process temperature and process pressure are the minimum input parameters for the selection of the right product configuration. If special product features are requested, additional data such as process fluid type, phases, concentration, viscosity, stream and turbulences, corrosion rate have to be considered as mandatory for the whole product definition.

Process temperature range	0 to +100 °C (+32 to +212 °F).
Process pressure range	Up to 40 bar (580.1 psi) Anyhow, the maximum required process pressure has to be combined with the maximum design process temperature. Process connections like compression fittings and flanges with their specific ratings define the maximum operating conditions. Endress+Hauser experts can support the customer on any related questions. Process application examples: ▪ Storage of Hydrocarbons ▪ LPG/LNG ▪ Liquid Nitrogen ▪ Organic bulk material storage (cereals, crop, ...) ▪ Grain silos ▪ Bulk liquid storage tank ▪ Beverage processing

Mechanical construction

Design, dimensions	The overall rope assembly is made of different parts. The rope joint ensures sufficient degree of freedom to the rope system allowing movements during filling and emptying operations. This guarantees low stresses (no extra tensioning) on the rope due to possible lateral force acting on it,

therefore a lateral sag of 0.3 m (0.98 ft) per 10 m (32.81 ft) rope length is recommended. The transition between the temperature sensors and the extension cable is obtained by the usage of compression fittings, ensuring the declared IP degree protection.



11 *Design of the modular multipoint thermometer, with roof bracket on the left, supporting frame neck (with covers or open) in the middle and with tube neck design on the right. All dimensions in mm (in)*

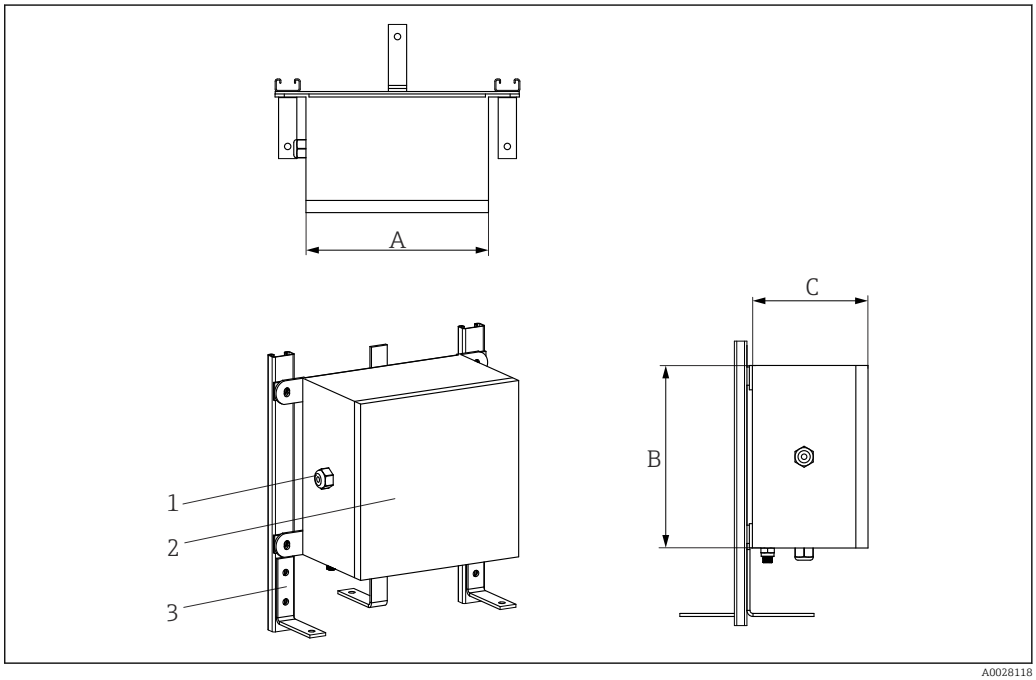
A, B, Dimensions of the junction box, see following figure
C
MPx Numbers and distribution of measuring points: MP1, MP2, MP3 etc.
L_{MPx} Immersion length of sensing elements or thermowells
F Extension neck length
L Device length
U Immersion length

Extension neck E in mm (in)
Standard 250 (9.84) Specifically customized extension necks are available on request.

Immersion lengths MPx of sensing elements/thermowells:
Based on customer requirements

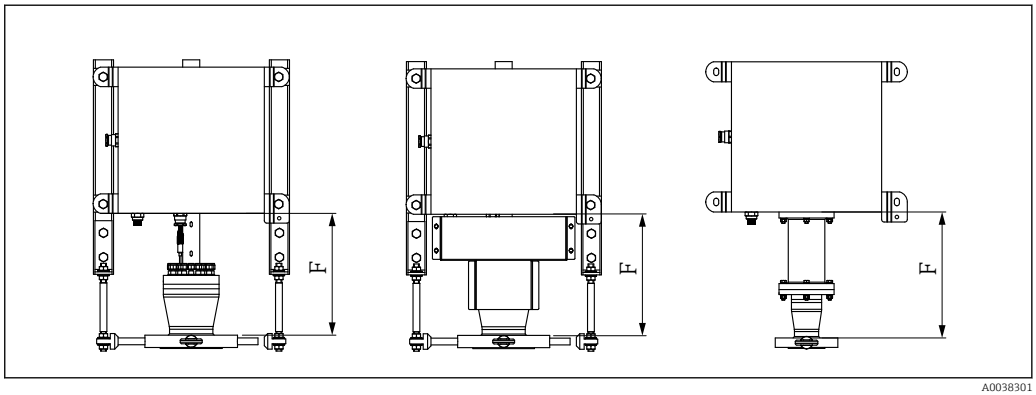
Rope maximum load:					
	Rope Ø mm	Construction	Weight kg/m	MBL	
				kN	kg
 A0038300	6	1x19	0,1786	29,5	3000
	8	1x19	0,322	53	5400
	10	1x19	0,502	84	8500
▪ Stainless steel AISI 316 ▪ Rope according to EN 10264-4 ▪ Rope grade 1.570 N/mm2					

Junction box (directly mounted)



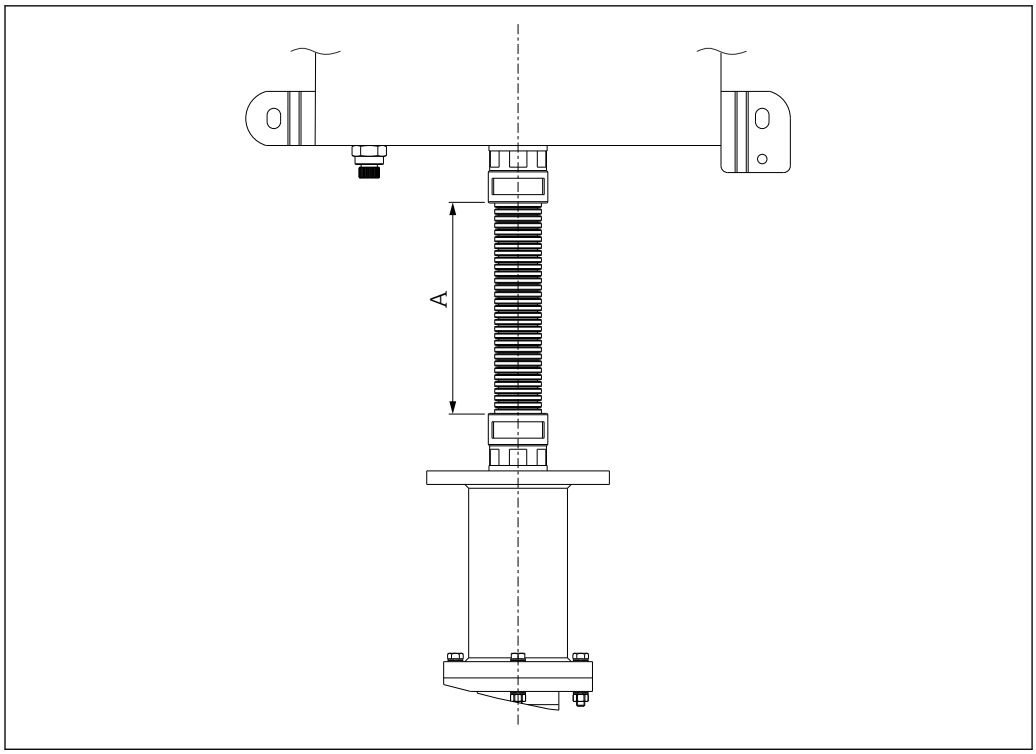
A0028118

1 Cable glands
2 Junction box
3 Frame



A0038301

12 Open supporting frame design on the left side, supporting frame with cover design in the middle and tube neck design on the right side



13 Remote junction box, flexible conduit cable length A

The junction box is suited for chemical agents environments. Sea water corrosion resistance and extreme temperature variation stability is guaranteed. Ex-e Ex-i terminals can be installed.

Possible junction box dimensions (A x B x C) in mm (in):

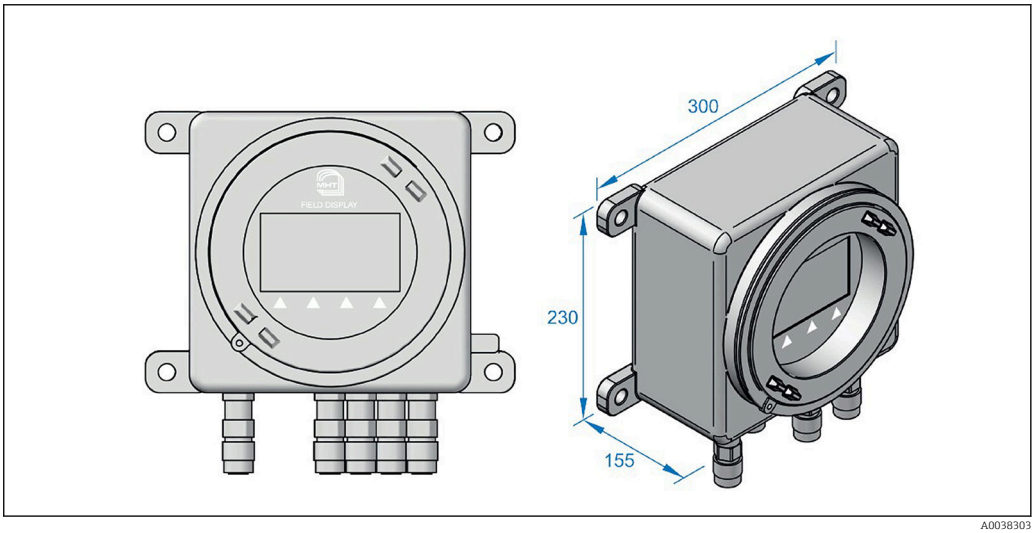
		A	B	C
Stainless Steel	Min.	260 (10.3)	260 (10.3)	200 (7.9)
	Max.	590 (23.2)	450 (17.7)	215 (8.5)
Aluminium	Min.	203 (8.0)	203 (8.0)	130 (5.1)
	Max.	650 (25.6)	650 (25.6)	270 (10.6)

Type of specification	Junction box	Cable glands
Material	AISI 316/Aluminium	NiCr Plated brass AISI 316 / 316L
Ingress protection (IP)	IP66/67	IP66
Ambient temperature range	−50 to +60 °C (−58 to +140 °F)	−52 to +110 °C (−61.1 to +140 °F)
Approvals	ATEX, UL, CSA approval for use in hazardous area IEC	-
Marking	▪ ATEX II 2 GD Ex e IIC /Ex ia Ga IIC Ex tb IIIC Db T6/T5/T4 ▪ UL913 Class I, Division 1 Groups B, C, D T6/T5/T4 ▪ CSA C22.2 No. 157 Class 1, Division 1 Groups B, C, D T6/T5/T4	-
Cover	Hinged	-
Maximum sealing diameter	-	6 to 12 mm (0.24 to 0.47 in)

		On board	Remote
Type of protection	Intrinsically safe and increased safety	▪ With frame ▪ Tube neck	Flexible conduit
	Flameproof	With supporting frame	

Field display

Power:	100-240 Vac, 50-60 Hz, 25 VA, 0.375 A max
Certification:	ATEX II 2 G D Ex ‘d’ IIC T6, IP 66
Enviroment:	Hazardous Area Zone 1
Operating temperture:	-20 °C to +55 °C
Storage temperture:	-40 °C to +85 °C
Enclosure:	Aluminium alloy Painted RAL 7035 grey epoxy
IP rating:	IP66
Entries:	M20 threaded entries (quantity 5 off)
External dimensions:	300 x 230 x 155 mm
Fixings:	To suit M12 bolts, four positions
Weight:	7.5 kg
No. of host ports:	4 Ports
Interfaces supported:	RS-232, RS-422/485, Modbus RTU HART®



A0038303

Neck extension

The neck extension ensures the connection between the flange and the junction box. The design has been developed to ensure several mounting layouts to deal with possible obstacles and constraints that can be met in any plant such as the storage tank infrastructure (step ways, loading structures, stairs, etc.) and an eventual thermal insulation. It guarantees a high stiffness connection for the junction box and vibration loads.

Weight

The weight can vary depending on the configuration: Dimension and content of the junction box, neck length, dimensions of process connection, the number of temperature sensors and the weight of the rope end. The approximate weight of a typically configured multipoint rope (number of sensors = 12, flange size = 3", medium size junction box) = 55 kg (121 lb)

Materials

It refers to the sheath, neck extension, junction box and all wetted parts.

The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load. The maximum operation temperatures are reduced considerably in some cases where abnormal conditions such as high mechanical load occur or in aggressive media.

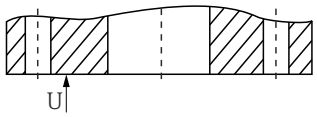
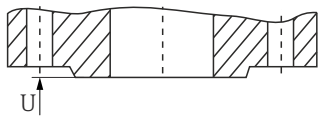
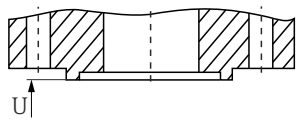
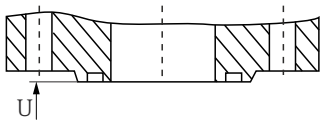
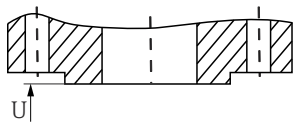
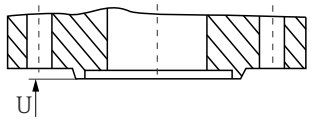
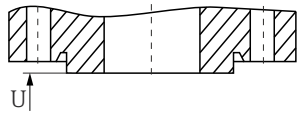
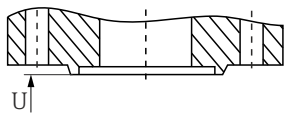
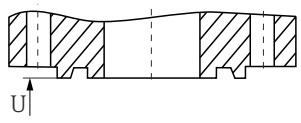
Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316/1.4401	X5CrNiMo 17-12-2	650 °C (1202 °F)	▪ Austenitic, stainless steel ▪ High corrosion resistance in general ▪ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration)
AISI 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	650 °C (1202 °F)	▪ Austenitic, stainless steel ▪ High corrosion resistance in general ▪ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) ▪ Increased resistance to intergranular corrosion and pitting ▪ Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content
AISI 316Ti/ 1.4571	X6CrNiMoTi17-12-2	700 °C (1292 °F)	▪ Addition of titanium means increased resistance to intergranular corrosion even after welding ▪ Broad range of uses in the chemical, petrochemical and oil industries as well as in coal chemistry ▪ Can only be polished to a limited extent, titanium streaks can form

Process connection

The flanges are supplied in stainless steel AISI 316L with material number 1.4404 or 1.4435. With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in DIN EN 1092-1 Tab.18 and under 023b in JIS B2220:2004 Tab. 5. The ASME flanges are grouped together under Tab. 2-2.2 in ASME B16.5-2013. Inches are converted into metric units (in - mm) using the factor 2.54. In the ASME standard, the metric data is rounded to 0 or 5.

Versions
- EN flanges: European standard DIN EN 1092-1:2002-06 and 2007
- ASME flanges: American Society of Mechanical Engineers ASME B16.5-2013

Geometry of sealing surfaces

Flanges	Sealing surface	DIN 2526 [1]		DIN EN 1092-1			ASME B16.5	
		Form	Rz (µm)	Form	Rz (µm)	Ra (µm)	Form	Ra (µm)
without raised face	 A0043514	A B	- 40 to 160	A [2]	12.5 to 50	3.2 to 12.5	Flat face (FF)	3.2 to 6.3 (AARH 125 to 250 µin)
with raised face	 A0043516	C D E	40 to 160 40 16	B1 [3] B2	12.5 to 50 3.2 to 12.5	3.2 to 12.5 0.8 to 3.2	Raised face (RF)	
Tongue	 A0043517	F	-	C	3.2 to 12.5	0.8 to 3.2	Tongue (T)	3.2
Groove	 A0043518	N		D			Groove (G)	
Projection	 A0043519	V 13	-	E	12.5 to 50	3.2 to 12.5	Male (M)	3.2
Recess	 A0043520	R 13		F			Female (F)	
Projection	 A0043521	V 14	for O-rings	H	3.2 to 12.5	3.2 to 12.5	-	-
Recess	 A0043522	R 14		G			-	-
With ring-type joint	 A0052680	-	-	-	-	-	Ring-type joint (RTJ)	1.6

1) Contained in DIN 2527
2) Typically PN2.5 to PN40
3) Typically from PN63

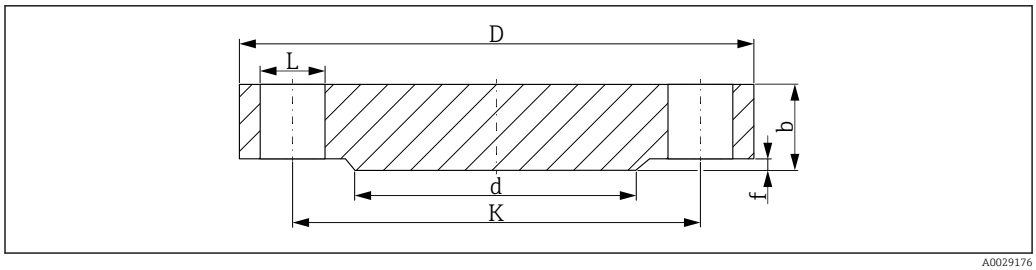
Flanges according to the old DIN standard are compatible with the new DIN EN 1092-1 standard.
Change in pressure ratings: Old DIN standards PN64 → DIN EN 1092-1 PN63.

Height of raised face [1)]

Standard	Flanges	Height of raised face f	Tolerance
DIN EN 1092-1:2002-06	all types	2 (0.08)	0 −1 (−0.04)
DIN EN 1092-1:2007	≤ DN 32		
	> DN 32 to DN 250	3 (0.12)	0 −2 (−0.08)
	> DN 250 to DN 500	4 (0.16)	0 −3 (−0.12)
	> DN 500	5 (0.19)	0 −4 (−0.16)
ASME B16.5 - 2013	≤ Class 300	1.6 (0.06)	±0.75 (±0.03)
	≥ Class 600	6.4 (0.25)	0.5 (0.02)
JIS B2220:2004	< DN 20	1.5 (0.06) 0	-
	> DN 20 to DN 50	2 (0.08) 0	
	> DN 50	3 (0.12) 0	

1) Dimensions in mm (in)

EN flanges (DIN EN 1092-1)



14 Raised face B1

L Bore diameter
d Diameter of raised face
K Diameter of pitch circle
D Flange diameter
b Total flange thickness
f Height of raised face (generally 2 mm (0.08 in)

PN16 [1)]

DN	D	b	K	d	L	approx. kg (lbs)
25	115 (4.53)	18 (0.71)	85 (3.35)	68 (2.68)	4xØ14 (0.55)	1.50 (3.31)
32	140 (5.51)	18 (0.71)	100 (3.94)	78 (3.07)	4xØ18 (0.71)	2.00 (4.41)
40	150 (5.91)	18 (0.71)	110 (4.33)	88 (3.46)	4xØ18 (0.71)	2.50 (5.51)
50	165 (6.5)	18 (0.71)	125 (4.92)	102 (4.02)	4xØ18 (0.71)	2.90 (6.39)
65	185 (7.28)	18 (0.71)	145 (5.71)	122 (4.80)	8xØ18 (0.71)	3.50 (7.72)
80	200 (7.87)	20 (0.79)	160 (6.30)	138 (5.43)	8xØ18 (0.71)	4.50 (9.92)
100	220 (8.66)	20 (0.79)	180 (7.09)	158 (6.22)	8xØ18 (0.71)	5.50 (12.13)
125	250 (9.84)	22 (0.87)	210 (8.27)	188 (7.40)	8xØ18 (0.71)	8.00 (17.64)
150	285 (11.2)	22 (0.87)	240 (9.45)	212 (8.35)	8xØ22 (0.87)	10.5 (23.15)
200	340 (13.4)	24 (0.94)	295 (11.6)	268 (10.6)	12xØ22 (0.87)	16.5 (36.38)

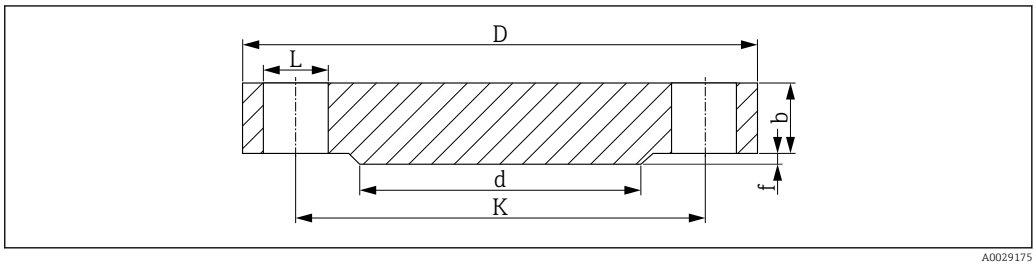
DN	D	b	K	d	L	approx. kg (lbs)
250	405 (15.9)	26 (1.02)	355 (14.0)	320 (12.6)	12xØ26 (1.02)	25.0 (55.13)
300	460 (18.1)	28 (1.10)	410 (16.1)	378 (14.9)	12xØ26 (1.02)	35.0 (77.18)

1) The dimensions in the following tables are in mm (in), unless otherwise specified

PN40

DN	D	b	K	d	L	approx. kg (lbs)
15	95 (3.74)	16 (0.55)	65 (2.56)	45 (1.77)	4xØ14 (0.55)	0.81 (1.8)
25	115 (4.53)	18 (0.71)	85 (3.35)	68 (2.68)	4xØ14 (0.55)	1.50 (3.31)
32	140 (5.51)	18 (0.71)	100 (3.94)	78 (3.07)	4xØ18 (0.71)	2.00 (4.41)
40	150 (5.91)	18 (0.71)	110 (4.33)	88 (3.46)	4xØ18 (0.71)	2.50 (5.51)
50	165 (6.5)	20 (0.79)	125 (4.92)	102 (4.02)	4xØ18 (0.71)	3.00 (6.62)
65	185 (7.28)	22 (0.87)	145 (5.71)	122 (4.80)	8xØ18 (0.71)	4.50 (9.92)
80	200 (7.87)	24 (0.94)	160 (6.30)	138 (5.43)	8xØ18 (0.71)	5.50 (12.13)
100	235 (9.25)	24 (0.94)	190 (7.48)	162 (6.38)	8xØ22 (0.87)	7.50 (16.54)
125	270 (10.6)	26 (1.02)	220 (8.66)	188 (7.40)	8xØ26 (1.02)	11.0 (24.26)
150	300 (11.8)	28 (1.10)	250 (9.84)	218 (8.58)	8xØ26 (1.02)	14.5 (31.97)
200	375 (14.8)	36 (1.42)	320 (12.6)	285 (11.2)	12xØ30 (1.18)	29.0 (63.95)
250	450 (17.7)	38 (1.50)	385 (15.2)	345 (13.6)	12xØ33 (1.30)	44.5 (98.12)
300	515 (20.3)	42 (1.65)	450 (17.7)	410 (16.1)	16xØ33 (1.30)	64.0 (141.1)

ASME flanges (ASME B16.5-2013)



15 *Raised face RF*

L Bore diameter
d Diameter of raised face
K Diameter of pitch circle
D Flange diameter
b Total flange thickness
f Height of raised face, Class 150/300: 1.6 mm (0.06 in) or from Class 600: 6.4 mm (0.25 in)

Surface quality of sealing surface Ra ≤ 3.2 to 6.3 µm (126 to 248 µin).

Class 150 [1)]

DN	D	b	K	d	L	approx. kg (lbs)
1"	108.0 (4.25)	14.2 (0.56)	79.2 (3.12)	50.8 (2.00)	4xØ15.7 (0.62)	0.86 (1.9)
1¼"	117.3 (4.62)	15.7 (0.62)	88.9 (3.50)	63.5 (2.50)	4xØ15.7 (0.62)	1.17 (2.58)
1½"	127.0 (5.00)	17.5 (0.69)	98.6 (3.88)	73.2 (2.88)	4xØ15.7 (0.62)	1.53 (3.37)
2"	152.4 (6.00)	19.1 (0.75)	120.7 (4.75)	91.9 (3.62)	4xØ19.1 (0.75)	2.42 (5.34)
2½"	177.8 (7.00)	22.4 (0.88)	139.7 (5.50)	104.6 (4.12)	4xØ19.1 (0.75)	3.94 (8.69)

DN	D	b	K	d	L	approx. kg (lbs)
3"	190.5 (7.50)	23.9 (0.94)	152.4 (6.00)	127.0 (5.00)	4xØ19.1 (0.75)	4.93 (10.87)
3½"	215.9 (8.50)	23.9 (0.94)	177.8 (7.00)	139.7 (5.50)	8xØ19.1 (0.75)	6.17 (13.60)
4"	228.6 (9.00)	23.9 (0.94)	190.5 (7.50)	157.2 (6.19)	8xØ19.1 (0.75)	7.00 (15.44)
5"	254.0 (10.0)	23.9 (0.94)	215.9 (8.50)	185.7 (7.31)	8xØ22.4 (0.88)	8.63 (19.03)
6"	279.4 (11.0)	25.4 (1.00)	241.3 (9.50)	215.9 (8.50)	8xØ22.4 (0.88)	11.3 (24.92)
8"	342.9 (13.5)	28.4 (1.12)	298.5 (11.8)	269.7 (10.6)	8xØ22.4 (0.88)	19.6 (43.22)
10"	406.4 (16.0)	30.2 (1.19)	362.0 (14.3)	323.8 (12.7)	12xØ25.4 (1.00)	28.8 (63.50)

1) The dimensions in the following tables are in mm (in), unless otherwise specified

Class 300

DN	D	b	K	d	L	approx. kg (lbs)
1"	124.0 (4.88)	17.5 (0.69)	88.9 (3.50)	50.8 (2.00)	4xØ19.1 (0.75)	1.39 (3.06)
1¼"	133.4 (5.25)	19.1 (0.75)	98.6 (3.88)	63.5 (2.50)	4xØ19.1 (0.75)	1.79 (3.95)
1½"	155.4 (6.12)	20.6 (0.81)	114.3 (4.50)	73.2 (2.88)	4xØ22.4 (0.88)	2.66 (5.87)
2"	165.1 (6.50)	22.4 (0.88)	127.0 (5.00)	91.9 (3.62)	8xØ19.1 (0.75)	3.18 (7.01)
2½"	190.5 (7.50)	25.4 (1.00)	149.4 (5.88)	104.6 (4.12)	8xØ22.4 (0.88)	4.85 (10.69)
3"	209.5 (8.25)	28.4 (1.12)	168.1 (6.62)	127.0 (5.00)	8xØ22.4 (0.88)	6.81 (15.02)
3½"	228.6 (9.00)	30.2 (1.19)	184.2 (7.25)	139.7 (5.50)	8xØ22.4 (0.88)	8.71 (19.21)
4"	254.0 (10.0)	31.8 (1.25)	200.2 (7.88)	157.2 (6.19)	8xØ22.4 (0.88)	11.5 (25.36)
5"	279.4 (11.0)	35.1 (1.38)	235.0 (9.25)	185.7 (7.31)	8xØ22.4 (0.88)	15.6 (34.4)
6"	317.5 (12.5)	36.6 (1.44)	269.7 (10.6)	215.9 (8.50)	12xØ22.4 (0.88)	20.9 (46.08)
8"	381.0 (15.0)	41.1 (1.62)	330.2 (13.0)	269.7 (10.6)	12xØ25.4 (1.00)	34.3 (75.63)
10"	444.5 (17.5)	47.8 (1.88)	387.4 (15.3)	323.8 (12.7)	16xØ28.4 (1.12)	53.3 (117.5)

Operability

For details of operability, see the Technical Information of the Endress+Hauser temperature transmitters or the manuals of the related operating software.

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Overview of the scope of delivery see the configuration table below.

Process connection: Flange		
Standard	▪ ASME B16.5 ▪ EN 1092-1 Others on request	☐ ☐
Material	▪ 316 ▪ 316L ▪ 316TI Others on request	☐ ☐ ☐
Face	RF, Type A, B1 Others on request	☐
Size	▪ 1½", 2", 3", 4" ▪ DN40, DN50, DN80, DN100 Others on request	_____ _____

The values reported in the table below are indicative, based on calculations for nozzles with standard dimensions. So the maximum number of measurement points can differ from the maximum number of the configuration table. It depends on the dimensions of the nozzle used on location.

Flange size (considering a schedule 40 nozzle)	**Maximum number of temperature sensors**
1½"	6
2"	20
3"	20
4"	20

Temperature sensor		
Measuring principle	▪ Thermocouple (TC) ▪ Resistance Temperature Detection (RTD)	☐ ☐
Type	TC: J, K RTD: Pt100 Others on request	_____ ☐
Design	▪ TC: Single, duplex ▪ RTD: 3-wire, 4-wire, 2x3-wire	☐ ☐
Execution	▪ TC: Grounded, Ungrounded ▪ RTD: Wire wound (WW); Thin film (TF)	☐ ☐
Sheath material	316L	_____

Temperature sensor		
Approvals	▪ Intrinsic safety ▪ Non hazardous	_____
Temperature sensor	▪ 3 mm (0.12 in) ▪ 6 mm (0.24 in) Others on request	☐ ☐
Standard/Class	IEC/Class 1 ASTM/Class special IEC/Class 2 ASTM/Class standard IEC/Class A IEC/Class AA Others on request	☐ ☐ ☐ ☐ ☐ ☐

Measurement point distribution		
Positioning	▪ Equi spaced ▪ Customized	☐ ☐
Number	2, 4, 6, 8, 10, 12 ... 20 [1]	_____

Insertion length	TAG (description)	(L_{MPx}) in mm (in)
MP_1	_____	_____
MP_2	_____	_____
MP_3	_____	_____
MP_4	_____	_____
MP_5	_____	_____
MP_6	_____	_____
MP_x	_____	_____

1) Different numbers/configurations are available on request

Junction box (head)		
Material	▪ Stainless steel (standard) ▪ Aluminum (to be specified) Others on request	☐ ☐
Electrical connection	Terminal block wiring: ▪ Terminal block - standard/number ▪ Terminal block - compensated/number ▪ Terminal block - spare/number Transmitter wiring: ▪ HART protocol, e. g.: iTEMP TMT182B, iTEMP TMT82 ▪ PROFIBUS PA protocol, e. g.: iTEMP TMT84 ▪ FOUNDATION Fieldbus protocol, e. g.: iTEMP TMT85 ▪ Quantity	 ☐ / _____ ☐ / _____ ☐ / _____ ☐ ☐ ☐ _____
Approvals (single components)	Ex e / Ex ia / Ex d Others on request	_____
Cable entries (process side)	Single or multiple, type: M20, Quantity Others on request	_____ / _____ _____ / _____
Cable entries (wiring side)	Single or multiple, type: M20, M25, NPT ½", NPT 1" / Quantity Others on request	_____ / _____ _____ / _____

Junction Box supporting frame		
▪ Remote with protecting hose ▪ Directly mounted with covers ▪ Directly mounted (open design)		☐ ☐ ☐

Extension neck		
Length F in mm (in)	▪ 250 mm (9.84 in) ▪ 150 mm (5.9 in) Or as specified	☐ ☐ _____

TAG		
Device information	Refer to customer specification As specified	☐ ☐ (table)
Measuring point information	Refer to customer specification Location, as specified: ▪ Tagging (TAG), on extension wires of the temperature sensors ▪ Tagging (TAG), RFID ▪ Tagging (TAG), on device ▪ Tagging (TAG), by customer ▪ Tagging (TAG), on transmitter Special version, to be specified	☐ ☐ ☐ ☐ ☐ ☐

Additional requests		
Extension wire length, only for remote head	Specification in mm:	_____
Extension wires sheath material	▪ PVC ▪ FEP, shielded Others on request	☐ ☐

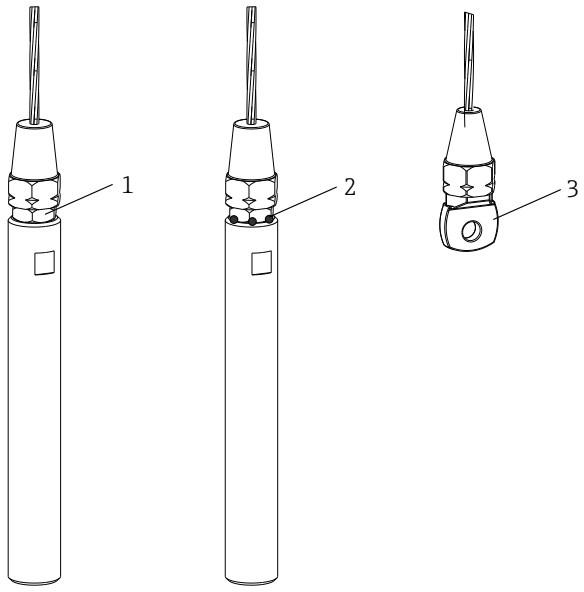
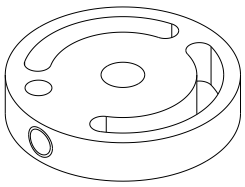
Test, Certificate, Declaration	
Inspection certificate 3.1, EN10204 (material certificate wetted parts)	☐
Inspection certificate 3.1, short form, EN10204, (material certificate wetted parts)	☐
PMI test, Endress+Hauser procedure, (wetted parts), test report	☐
Final assembly functional test, test report	☐
Final inspection report	☐
2D dimensional drawing	☐
Welding book (including welding map)	☐
Radiographic inspection certificate on hot junctions/tips for sensors	☐
Manufacturer declaration	☐
Dye penetrant test, test report	☐
Inspection test report (Sensor/TMT), inspection certificate	☐
Quality control plan	☐

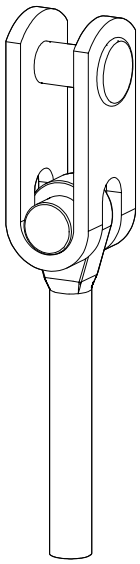
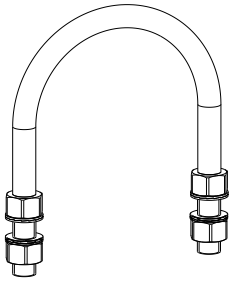
Accessories

The accessories currently available for the product can be selected at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

Device-specific accessories

Accessories	Description
Anchor weight  	The installation of the anchor weight ensures a straight vertical position of the rope, please make sure to have enough space for a correct weight positioning inside the storage system. The dimensions will be established during the order development according to the rope multipoint dimension. ▪ 1: Removable/Replaceable by thread ▪ 2: Fixed with welding spots ▪ 3: Not applicable
Ogives  	Ogives are integrated in the multipoint rope, they provide a correct positioning of the probe thermoelement along the rope length and maintain them in position under working condition.

Accessories	Description
Toggle joint terminal  A0038306	Toggle joint connection between rope and flange to allow reciprocal rotation.
 A0055454	Tool for suspension of the multipoint probe inside silos or any other supporting mean

Communication-specific accessories

Netilion
IIoT ecosystem: Unlock knowledge
With the Netilion IIoT ecosystem, Endress+Hauser enables you to optimize plant performance, digitize workflows, share knowledge, and enhance collaboration. Drawing on decades of experience in process automation, Endress+Hauser provides the process industry with an IIoT ecosystem that unlocks valuable insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.

www.netilion.endress.com

DeviceCare SFE100
Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices
DeviceCare is available for download at www.software-products.endress.com. You need to register in the Endress+Hauser software portal to download the application.

Technical Information TI01134S

FieldCare SFE500
FDT-based plant asset management tool
It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.

Technical Information TI00028S

System products

Advanced Data Manager Memograph M

The Advanced Data Manager Memograph M is a flexible and powerful system for organizing process values. Optional HART input cards are available, each having 4 inputs (4/8/12/16/20), with highly accurate process values from the HART devices directly connected for the purpose of calculation and data logging. The measured process values are clearly presented on the display and logged safely,

monitored for limit values and analyzed. Via common communication protocols, the measured and calculated values can be easily communicated to higher-level systems or individual plant modules can be interconnected.

Technical information: TI01180R

RN22

Single- or two-channel active barrier for safe separation of 0/4 to 20 mA standard signal circuits with bidirectional HART transmission. In the signal duplicator option, the input signal is transmitted to two galvanically isolated outputs. The device has one active and one passive current input; the outputs can be operated actively or passively. The RN22 requires a supply voltage of 24 V_{DC}.

Technical Information TI01515K

Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

The following documentation may be available depending on the device version ordered:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid for your device** The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions (KA)	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions (BA)	**Your reference document** These Operating Instructions contain all the information that is required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.
Description of Device Parameters (GP)	**Reference for your parameters** The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.
Safety Instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. The Safety Instructions are a constituent part of the Operating Instructions. Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.

www.addresses.endress.com

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