

Technical Information

iTHERM MultiSens Flex

TMS02

Modular direct contact TC and RTD multipoint
(with or without thermowells)



Application

- Easy-to-use device with modular and flexible design, ready to be installed either for direct contact measurements, or in an existing thermowell
- Specifically designed for Oil & Gas and Petrochemical processing industries
- Measuring range:
 - Resistance insert (RTD): -200 to 600 °C (-328 to 1 112 °F)
 - Thermocouple (TC): -270 to 1 150 °C (-454 to 2 102 °F)
- Static pressure range: Up to 200 bar (2 900 psi). Specific maximum process pressure achievable depending on process type and temperature
- Degree of protection: IP66/67

Head transmitter

All Endress+Hauser transmitters are available with enhanced accuracy and reliability compared to directly wired sensors. Easy customizing by choosing one of the following outputs and communication protocols:

- Analog output 4 to 20 mA
- HART®
- PROFIBUS® PA
- FOUNDATION Fieldbus™

Your benefits

- Infinite 3D sensors distribution layouts for any process monitoring configuration
- High degree of customization thanks to a modular product design for easy installation, process integration and maintenance
- Easy integration due to inserts according to standards as per standard IEC 60584, ASTM E230 and IEC 60751
- Advanced diagnosis to monitor the performances of the complete thermometric device during its operating time and to plan in advanced any maintenance action
- Electrical and Pressure Directive compliance for an easy and fast process integration
- Compliance to different types of protection for use in hazardous locations for a wide and easy process integration
- Possibility to individually replace inserts, even in operating conditions
- Increased safety thanks to a diagnostic chamber able to contain the process in the event of leakages through the primary seals

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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 thermometer (RTD)

These resistance thermometers use a Pt100 temperature sensor according to IEC 60751. The temperature sensor is a temperature-sensitive platinum resistor with a resistance of 100 Ω at 0 °C (32 °F) and a temperature coefficient $\alpha = 0.003851$ °C⁻¹.

There are generally two different kinds of platinum resistance thermometers:

- **Wire wound (WW):** Here, a double coil of fine, high-purity platinum wire is located in a ceramic support. This 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 it 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 category 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

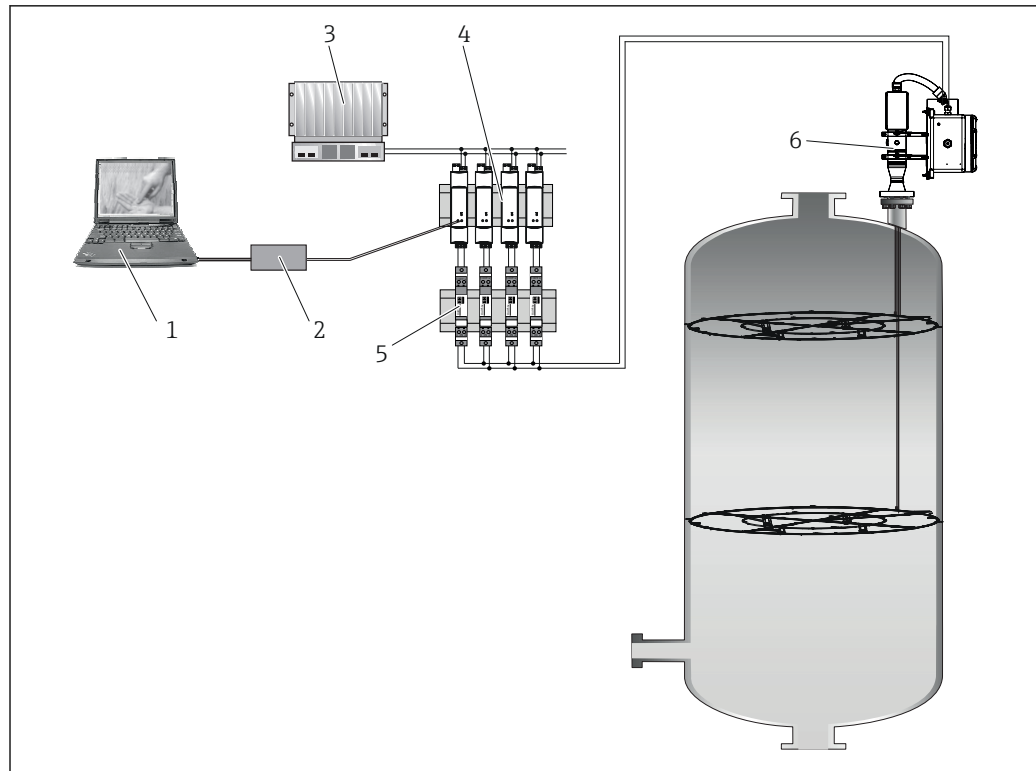
Endress+Hauser offers a complete portfolio of optimized components for the temperature measuring point – everything you need for the seamless integration of the measuring point into the overall facility.

This includes:

- 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)



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1 Application example in a reactor.

- 1 Device configuration with application software FieldCare
- 2 Commubox
- 3 PLC
- 4 Active barrier RN221N (24 V_{DC}, 30 mA) that has a galvanically isolated output for supplying voltage to 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.
- 5 Surge arrester modules HAW562 for protection of signal lines and components in hazardous areas, e.g. 4 to 20 mA-, PROFIBUS® PA, FOUNDATION Fieldbus™ signal lines. More information on this can be found in the Technical Information → 35
- 6 Mounted multipoint thermometer in a locally existing thermowell, optionally with built-in transmitters in the junction box for 4 to 20 mA-, HART-, PROFIBUS® PA-, FOUNDATION Fieldbus™ communication or terminal blocks for remote wiring.

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.

It consists of the following main sub-assemblies:

- **Insert:** Composed by individual metal sheathed sensing elements (Thermocouples or thermos-resistance) in direct contact with the process, welded to the process flange through reinforcing transition bushings. In addition, individual thermowells directly welded to the process connection can be provided to protect every thermoelement and to allow inserts replacement during operating conditions. When applicable, each insert can be handled as an individual spare part and ordered via specific standard product order codes (e.g. TSC310, TST310) or special codes. For the specific order code please contact your Endress+Hauser specialist.
- **Process Connection:** Represented by an ASME or EN flange, it might be provided with eyebolts for lifting the device. As an alternative to the flanged process connection, a welded thermowell insert can also be provided.
- **Head:** It is composed of a junction box provided with its components such as cable glands, draining valves, earth screws, terminals, head transmitters, etc.
- **Head Support Frame:** It is designed to support the junction box by components such as adjustable supporting systems.

- **Additional Accessories:** They can be ordered independently from the selected product configuration, such as fixing elements, pads, tip ends, spacers, support frame for thermoelements fixing, pressure transducers, manifolds, valves, purging system and fitting.
- **Protecting Thermowells:** They are directly welded on the process connection, designed to guarantee high degree of mechanical protection and corrosion resistance for each sensor.
- **Diagnostic Chamber:** This subassembly consists in a closed volume that ensures the continuous monitoring of the device conditions during its operating life and safe leakage containment. The chamber has integrated connections for accessories (such as valves, manifolds). A wide range of accessories is available to get the highest level of system information (pressure, temperature, fluids composition and next maintenance step).

In general, the system measures the temperature profile inside the process environment by means of many sensors, jointed to a suitable process connection which ensures the right tightness levels.

Design without protecting thermowells

The MultiSens Flex TMS02 without thermowells is available in **basic** and **advanced** configuration both with the same features, dimensions and materials. They differentiate by:

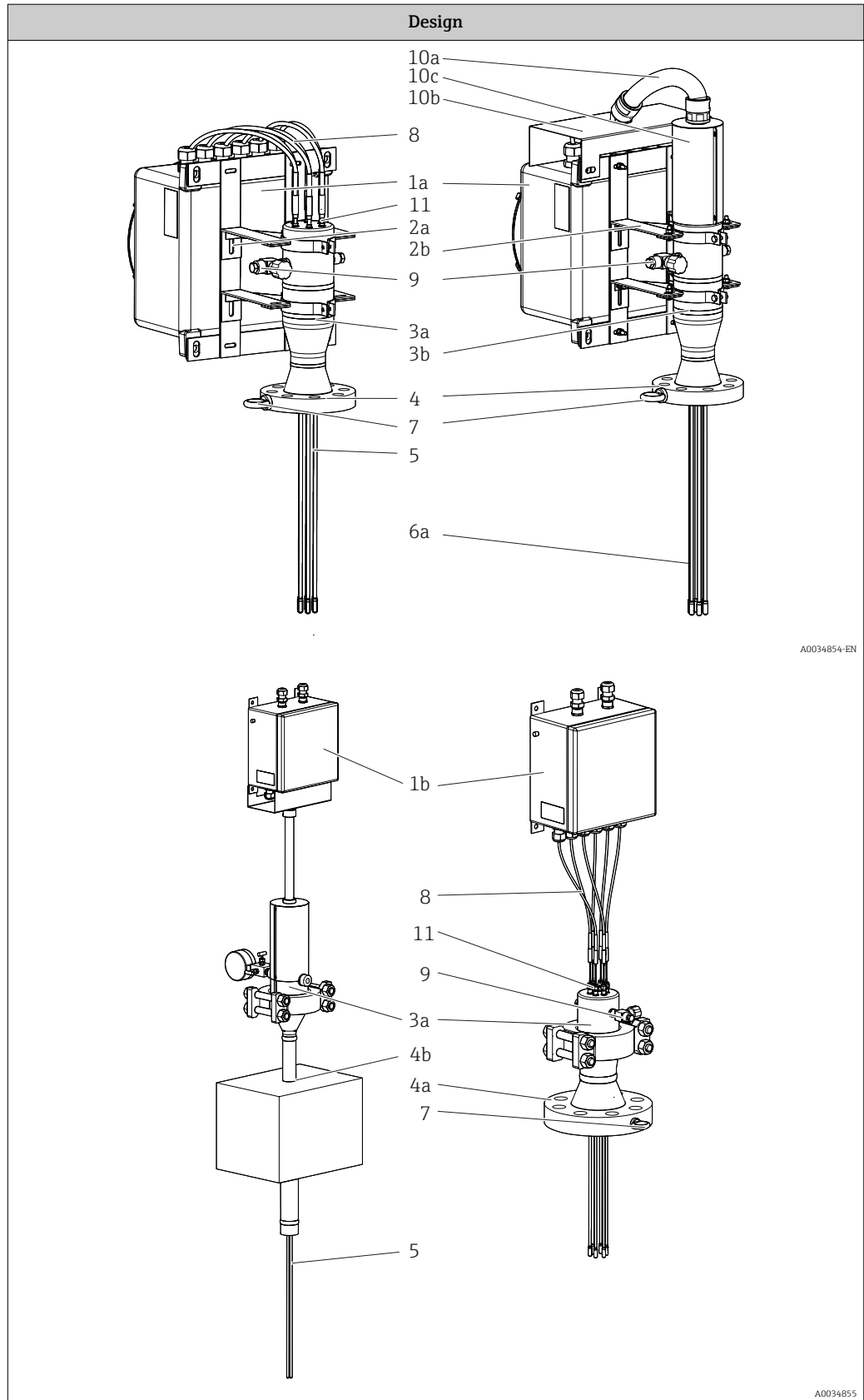
- **Basic design.** Extension cables directly connected to the diagnostic chamber and not replaceable inserts (welded to the chamber). The diagnostic chamber can contain leakages coming from the welded junctions between the sensors and the process connection.
- **Advanced design.** Extension cables connected to removable stump-inserts that can be individually inspected and replaced for an increased maintenance level. The release of the insert-stump is done by means of the compression fittings placed on diagnostic chamber head. An interruption (foreseen in case of stump-insert design) is located inside the diagnostic chamber and allows to any leakage to be vented into the chamber and be detected. The leakages can come from the welded joints between the sensors and process connection or from the sensor itself. This phenomenon might occur when unforeseen high corrosion rates compromise the insert sheath integrity.

Design with protecting thermowells

The MultiSens Flex TMS02 with thermowells is available in **advanced** and **advanced & modular** configuration both with the same features, dimensions and materials. They differentiate by:

- **Advanced design.** The inserts are individually replaceable (even under operating conditions). The release of the insert is done by means of the compression fittings placed on diagnostic chamber head. Each protecting thermowell stops inside the diagnostic chamber and allows to any leakage to be vented into the chamber and be detected. The leakages can come from the welded joints between the thermowells and process connection or from the thermowell itself. This phenomenon might occur when unforeseen high corrosion rates compromise the thermowell wall integrity or diffusion/permeability is not negligible.
- **Advanced and modular design.** The inserts are individually replaceable (even under operating conditions). The release of the insert is done by means of the compression fittings placed on diagnostic chamber head. Each protecting thermowell stops inside the diagnostic chamber and allows to any leakage to be vented into the chamber and be detected. The diagnostic chamber can be open to allow the replacement of the whole bundle of protecting thermowells (not in operating conditions), saving all the other multipoint components (e.g chamber head, process connection, etc). The leakages can come from the welded joints between the thermowells and process connection or from the thermowell itself. This phenomenon might occur when unforeseen high corrosion rates compromise the thermowell wall integrity or diffusion/permeability is not negligible.

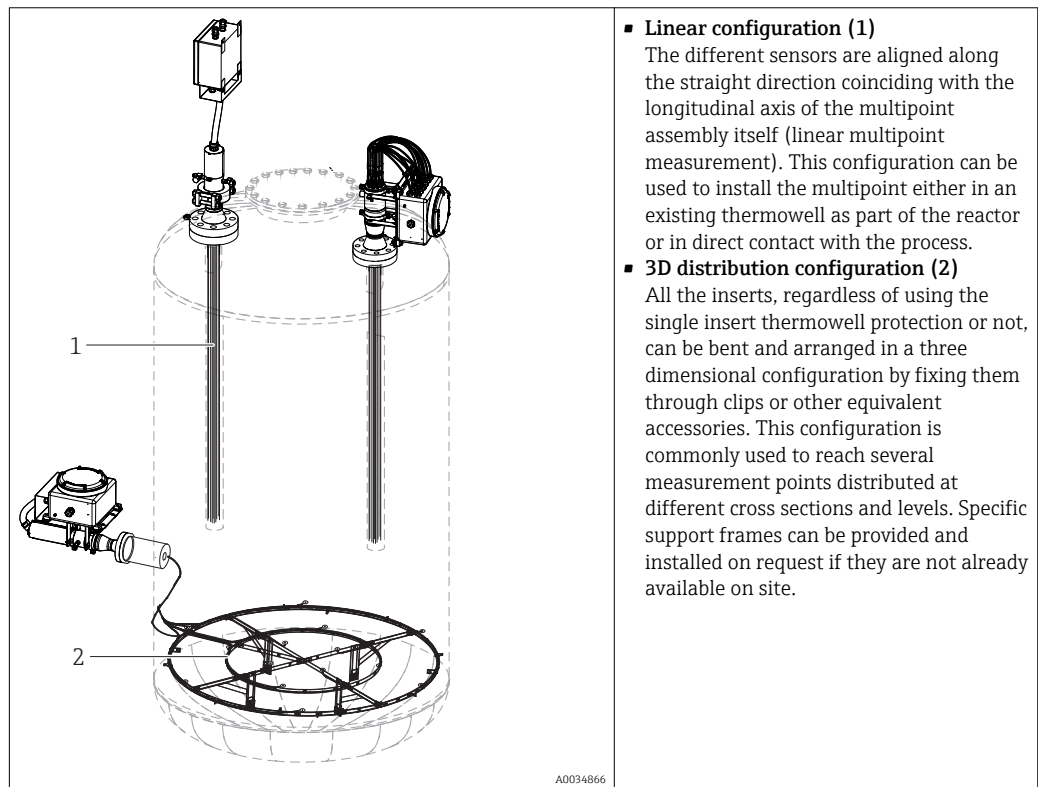
Sensor replaceability			
	Basic	Advanced	Advanced and modular
Without thermowells	Sensors are not replaceable	Only the outer stump-sensors are replaceable	Special version. The complete bundle of sensors can be replaced during shut-down
With thermowells	Not available	Sensors are replaceable in any conditions	Sensors are replaceable in any conditions



Description, available options and materials	
1: Head 1a: Directly mounted 1b: Remote	Hinged or screwed cover junction box for electrical connections. It includes components such as electrical terminals, transmitters and cable glands. <ul style="list-style-type: none"> ▪ 316/316L ▪ Aluminium alloys ▪ Other materials on request
2: Support Frame 2a: With accessible extension cables 2b: With protected extension cables	Modular frame support that is adjustable for all available junction boxes. 316/316L
	Modular frame support that is adjustable for all available junction boxes and ensures extension cable inspection. 316/316L
3: Diagnostic chamber 3a: Basic Chamber 3b: Advanced Chamber 3c: Advanced and modular	Diagnostic chamber for leakage detection and safe containment. System behavior monitoring thanks to a continuous pressure detection of the contained fluids. Basic configuration: For not dangerous fluids Advanced configuration: For dangerous fluids Advanced and Modular: For dangerous fluids and replaceable inserts <ul style="list-style-type: none"> ▪ 316/316L ▪ 321 ▪ 347
4: Process connection 4a: Flanged according to ASME, or EN standards 4b: Welded thermowell insert engineered according to reactor design	Represented by a flange according to international standards, or engineered to satisfy specific process requirements → 26, or engineered to satisfy reactor design and process conditions to provide alternative process connection with clamped and fast connectors. <ul style="list-style-type: none"> ▪ 304 + 304L ▪ 316 + 316L ▪ 316Ti ▪ 321 ▪ 347 ▪ Other materials on request
5: Insert	Mineral insulated grounded and ungrounded thermocouples or RTD (Pt100 wire wound). For details, refer to the Ordering information table
6a: Protecting thermowells 6b: Guiding open tubes	The thermometer can be equipped: <ul style="list-style-type: none"> ▪ either with protecting thermowells for increased mechanical strength, corrosion resistance for sensor replacement ▪ or open guiding tubes for installation in an existing thermowell. For details, refer to the Ordering information table
7: Eyebolt	Lifting device for easy handling during installation phase. SS 316
8: Extension cables	Cables for electrical connections between the inserts and junction box. <ul style="list-style-type: none"> ▪ Shielded PVC ▪ Shielded Hyflon MFA
9: Accessories connection	Auxiliary connections foreseen for pressure detection, fluid draining, purging, spilling, sampling and analysis. <ul style="list-style-type: none"> ▪ 316/316L ▪ 321 ▪ 347

Description, available options and materials	
10: Protections 10a: Cable conduit 10b: Cable conduit cover 10c: Extension cables cover	The extension cables cover is composed by two half-shields that together with the cable conduit protect the sensors extension cables. The two half shields are clamped together by means of screws and tightened to the chamber head. The cable conduit cover is made by a shaped stainless steel plate fixed to the head support frame in order to protect the cable connections.
11: Compression fitting	High performance compression fittings for a proper tightness between the diagnostic chamber-head and the external environment, suitable for a wide range of process fluids and severe combination between temperature and pressure. Not for basic design.

The modular multipoint thermometer is characterized by the following possible main configurations:



- **Linear configuration (1)**
The different sensors are aligned along the straight direction coinciding with the longitudinal axis of the multipoint assembly itself (linear multipoint measurement). This configuration can be used to install the multipoint either in an existing thermowell as part of the reactor or in direct contact with the process.
- **3D distribution configuration (2)**
All the inserts, regardless of using the single insert thermowell protection or not, can be bent and arranged in a three dimensional configuration by fixing them through clips or other equivalent accessories. This configuration is commonly used to reach several measurement points distributed at different cross sections and levels. Specific support frames can be provided and installed on request if they are not already available on site.

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 +1112 °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)	-210 to +720 °C (-346 to +1328 °F)
	Type K (NiCr-Ni)	-270 to +1150 °C (-454 to +2102 °F)
	Type N (NiCrSi-NiSi)	-270 to +1100 °C (-454 to +2012 °F)
	Internal cold junction (Pt100) Cold junction accuracy: ± 1 K Max. sensor resistance: 10 kΩ	
Thermocouples (TC) - flying leads - as per IEC 60584 and ASTM E230	Type J (Fe-CuNi)	-270 to +720 °C (-454 to +1328 °F), typical sensitivity above 0 °C ≈ 55 µV/K
	Type K (NiCr-Ni)	-270 to +1150 °C (-454 to +2102 °F) ¹⁾ , typical sensitivity above 0 °C ≈ 40 µV/K
	Type N (NiCrSi-NiSi)	-270 to +1100 °C (-454 to +2012 °F), typical sensitivity above 0 °C ≈ 40 µV/K

1) Limited by jacket material of insert

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 accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

PC programmable 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. More information can be found in the Technical Information.

HART® programmable head transmitters

The 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. It can be installed as an intrinsically safe apparatus in Zone 1 hazardous areas and is used for instrumentation in the terminal head (flat face) as per DIN EN 50446. Swift and easy operation, visualization and maintenance by PC using operating software, Simatic PDM or AMS. For more information, see the Technical Information.

PROFIBUS® PA head transmitters

Universally programmable head transmitter with PROFIBUS® PA communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software, Simatic PDM or AMS. For more information, see the Technical Information.

FOUNDATION Fieldbus™ head transmitters

Universally programmable head transmitter with FOUNDATION Fieldbus™ communication. Conversion of various input signals into digital output signals. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e.g. using operating software such as ControlCare from Endress +Hauser or NI Configurator from National Instruments. For more information, see the Technical Information.

Advantages of the iTEMP transmitters:

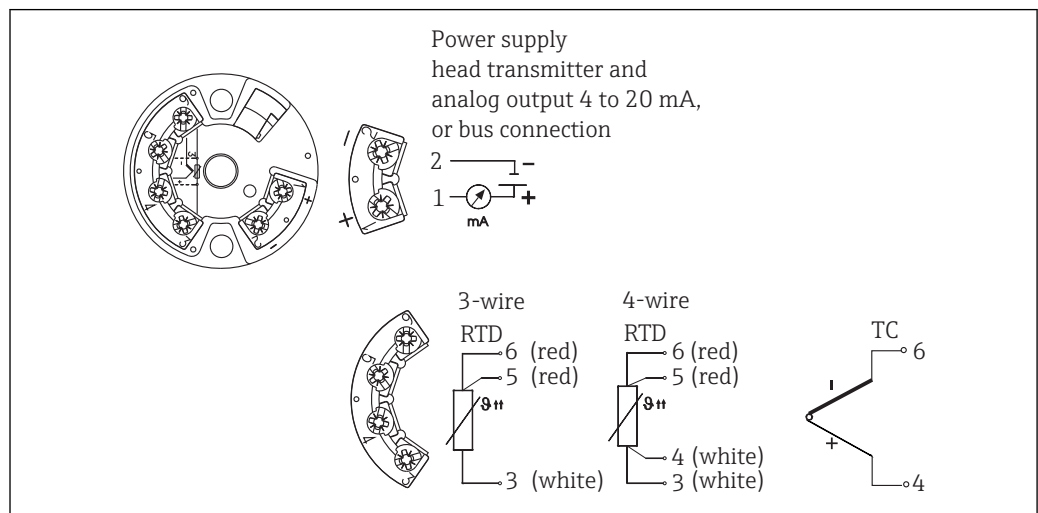
- Dual or single sensor input (optionally for certain transmitters)
- Unsurpassed reliability, accuracy and long-term stability in critical processes
- Mathematical functions
- Monitoring of the thermometer drift, sensor backup functionality, sensor diagnostic functions
- Sensor-transmitter matching for dual sensor input transmitter, based on Callendar/Van Dusen coefficients

Wiring

- Electrical connecting cables must be smooth, corrosion resistant, easy to be cleaned and inspected, robust against mechanical stresses, no-humidity sensitivity.
- Grounding or shielding connections are possible via ground terminals on the junction box.

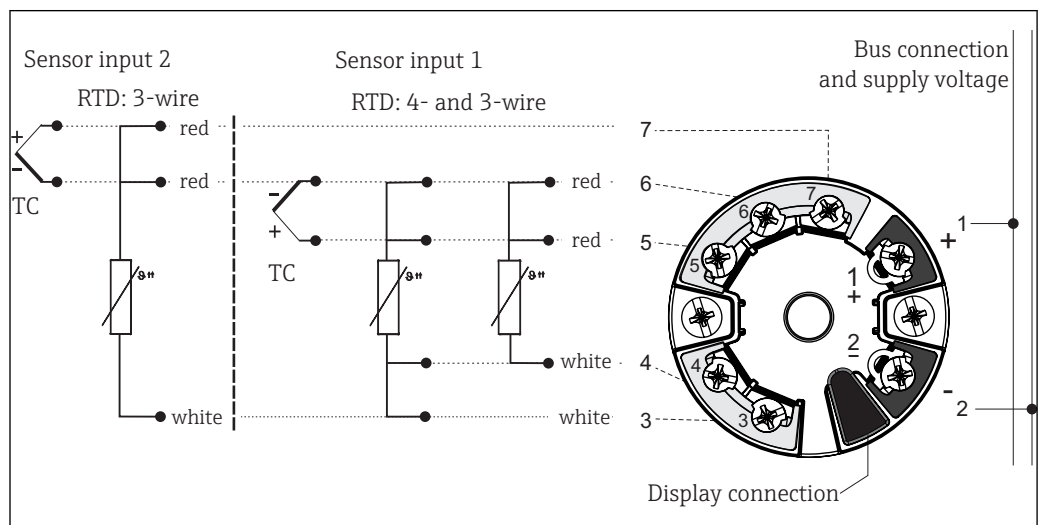
Wiring diagrams

Wiring diagrams for TC and RTD connection



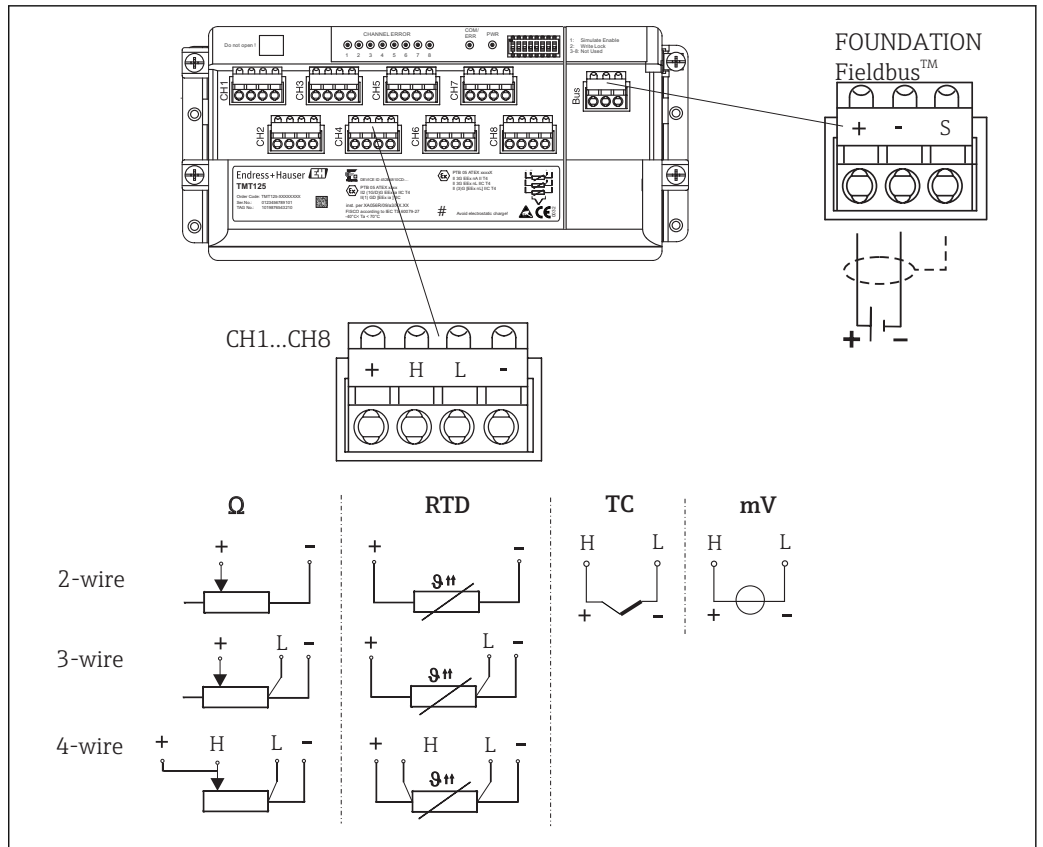
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2 Wiring diagram of the single sensor input head transmitters (TMT18x)



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3 Wiring diagram of the dual sensor input head transmitters (TMT8x)

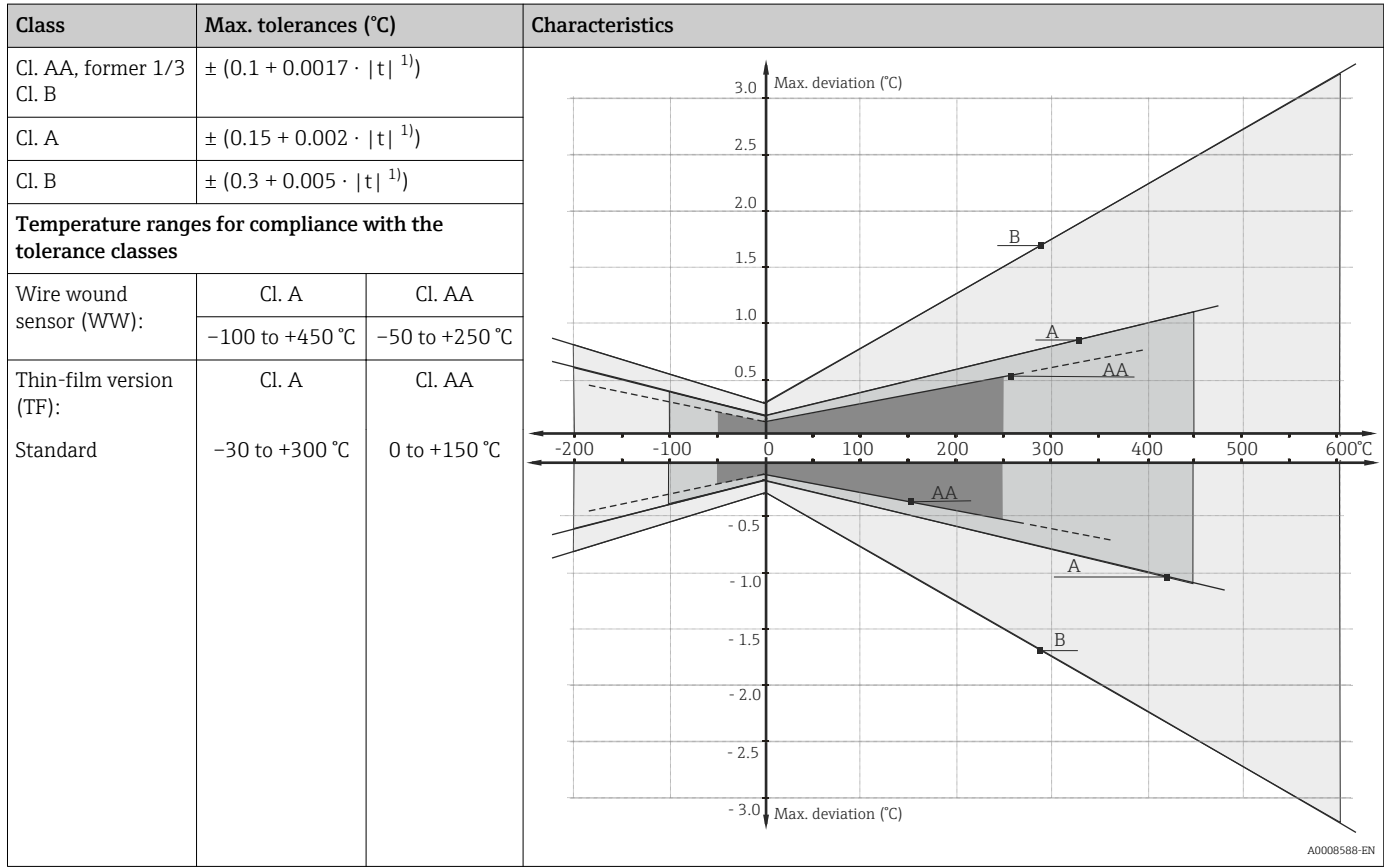


4 Wiring diagram of multi-channel transmitter

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Performance characteristics

Accuracy RTD resistance thermometer as per IEC 60751



1) |t| = absolute value °C

i 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	
		Class	Deviation	Class	Deviation
IEC 60584	J (Fe-CuNi)	2	$\pm 2.5 \text{ °C } (-40 \text{ to } 333 \text{ °C})$ $\pm 0.0075 t ^{1} (333 \text{ to } 750 \text{ °C})$	1	$\pm 1.5 \text{ °C } (-40 \text{ to } 375 \text{ °C})$ $\pm 0.004 t ^{1} (375 \text{ to } 750 \text{ °C})$
		2	$\pm 2.5 \text{ °C } (-40 \text{ to } 333 \text{ °C})$ $\pm 0.0075 t ^{1} (333 \text{ to } 1200 \text{ °C})$	1	$\pm 1.5 \text{ °C } (-40 \text{ to } 375 \text{ °C})$ $\pm 0.004 t ^{1} (375 \text{ to } 1000 \text{ °C})$
	K (NiCr-NiAl) N (NiCrSi-NiSi)	2	$\pm 2.5 \text{ °C } (-40 \text{ to } 333 \text{ °C})$ $\pm 0.0075 t ^{1} (333 \text{ to } 1200 \text{ °C})$	1	$\pm 1.5 \text{ °C } (-40 \text{ to } 375 \text{ °C})$ $\pm 0.004 t ^{1} (375 \text{ to } 1000 \text{ °C})$

1) |t| = absolute value °C

Standard	Type	Standard tolerance	Special tolerance
ASTM E230/ANSI MC96.1		Deviation, the larger respective value applies	
	J (Fe-CuNi)	$\pm 2.2 \text{ K or } \pm 0.0075 t ^{1} (0 \text{ to } 760 \text{ °C})$	$\pm 1.1 \text{ K or } \pm 0.004 t ^{1} (0 \text{ to } 760 \text{ °C})$
	K (NiCr-NiAl) N (NiCrSi-NiSi)	$\pm 2.2 \text{ K or } \pm 0.02 t ^{1} (-200 \text{ to } 0 \text{ °C})$ $\pm 2.2 \text{ K or } \pm 0.0075 t ^{1} (0 \text{ to } 1260 \text{ °C})$	$\pm 1.1 \text{ K or } \pm 0.004 t ^{1} (0 \text{ to } 1260 \text{ °C})$

1) |t| = absolute value °C

Response time

Response time for the sensor assembly without transmitter. It refers to inserts in direct contact with process. When thermowells are selected specific evaluation should be done.

RTD

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

Insert 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 insert in running water (0.4 m/s flow rate, 10 K excess temperature):

Insert 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
Grounded thermocouple 6 mm (¼ in)	t ₅₀	2 s
	t ₉₀	5 s
Ungrounded thermocouple 6 mm (¼ in)	t ₅₀	2.5 s
	t ₉₀	7 s
Grounded thermocouple 8 mm (0.31 in)	t ₅₀	2.5 s
	t ₉₀	5.5 s
Ungrounded thermocouple 8 mm (0.31 in)	t ₅₀	3 s
	t ₉₀	6 s

Shock and vibration 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

Calibration

Calibration is a service that can be performed on each individual insert, 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 inserts (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 inserts:

- 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.

i Evaluation of inserts

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

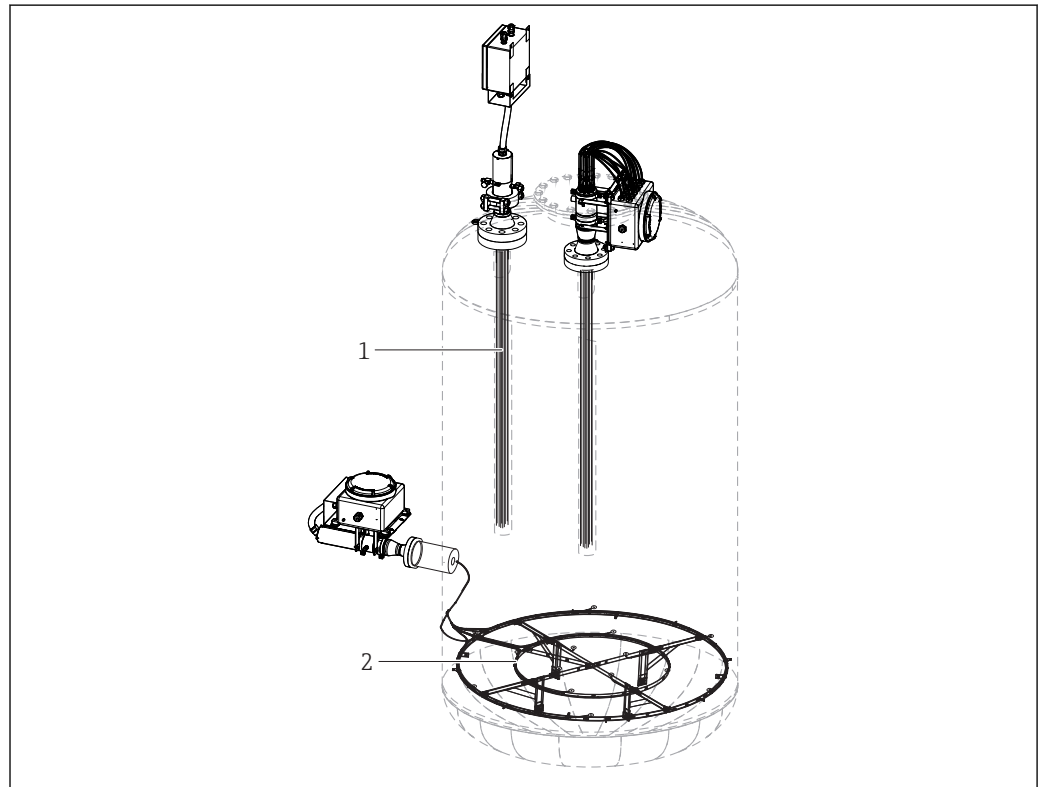
Installation

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 reactor's wall (usually not included in the scope of delivery) or of any other existing frame in the installation area.

Orientation

No restrictions. The multipoint thermometer can be installed either in horizontal or in vertical configuration, related to the reactor or vessel vertical axis. The modular support frame ensures an orientable placement of the junction box, considering the available space in the installation plant.



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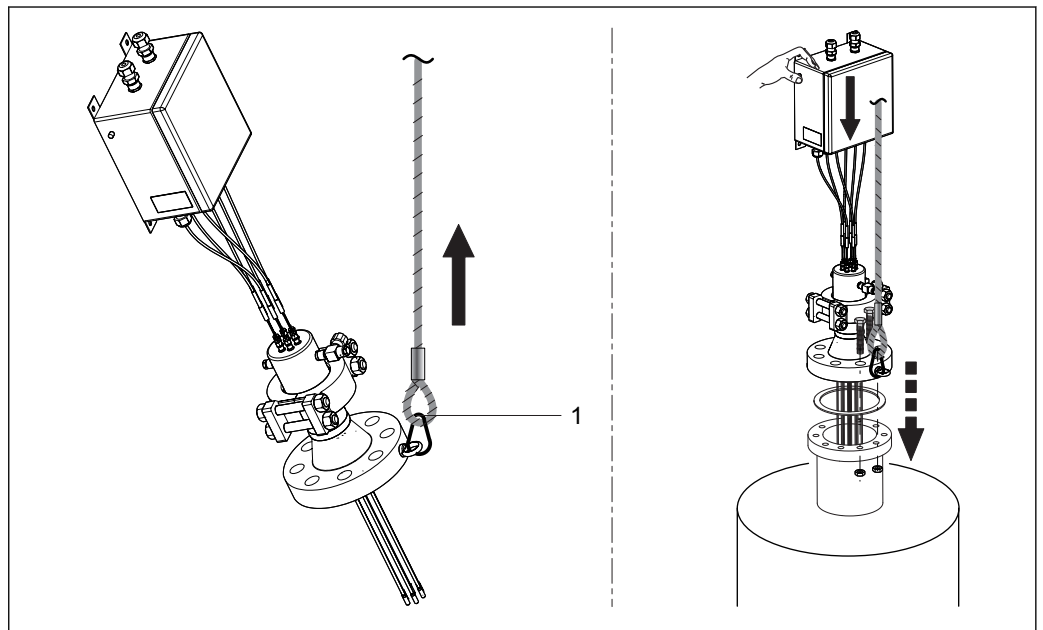
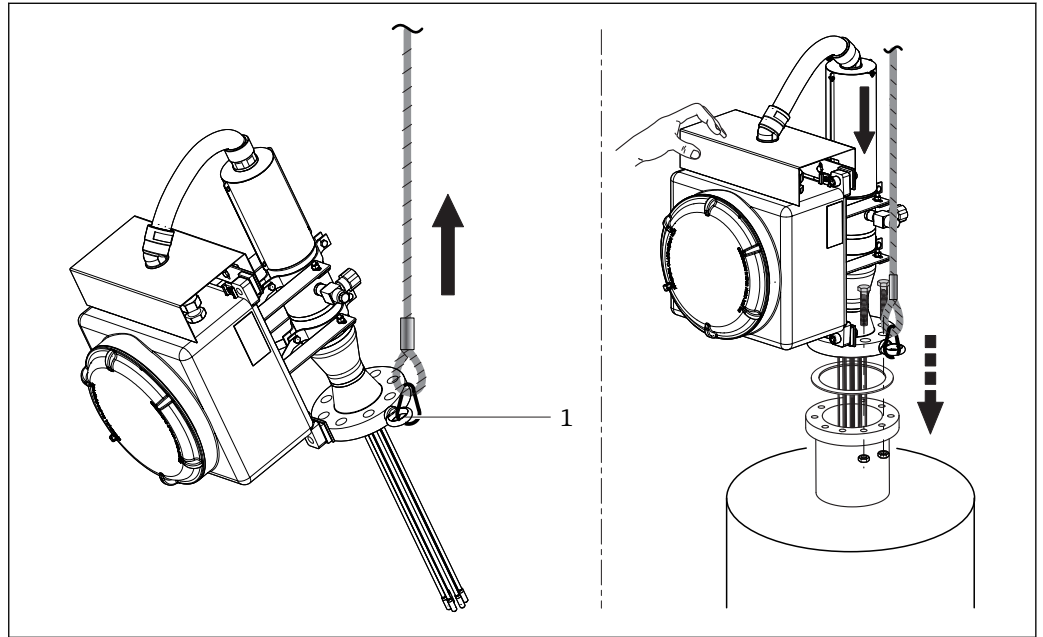
Installation instructions

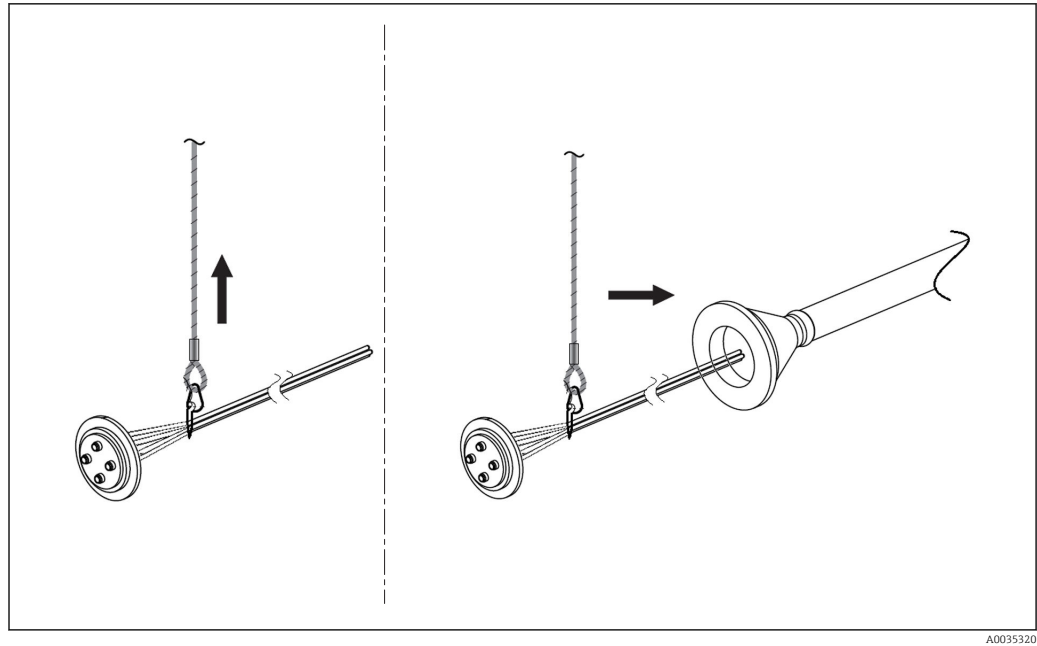
The modular multipoint thermometer is designed to be installed with a flanged or clamped process connection into a vessel, reactor, tank or similar environment. All parts and components have to be handled with care. During the installation phase, lifting and introduction of the equipment through the preset nozzle, the following must be avoided:

- Misalignment with the nozzle 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.
- Bending radius of the thermowells smaller than 20 times its diameter.

- Bending radius of the sheathed cables (inserts) smaller than 5 times the outer diameter of the sheathed cable.
- Friction between the temperature probes and the internals of the reactor.
- Fixing the temperature probes to the reactor's infrastructures without allowing axial displacements or movements.

Vessel's internals have to be kept into consideration for the interaction with the multipoint inserts. These internals can be considered as the interface between multipoint and the process, when they are used to fix the tips of the inserts, or constraints when the route of the thermocouples has to be performed as per installation instructions. When internals are not usable as interface of insert, Endress + Hauser provides dedicated support frames with minimum process invasiveness to achieve the desired measuring points. Frames components are always designed to be mechanically jointed without any thermal effect and impact on the material internals.





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i During installation the whole thermometer must only be lifted and moved by using ropes properly mounted on the eyebolt of the flange (1) or careful on the thermowells.

Environment

Ambient temperature range

Junction box	Non-hazardous area	Hazardous area
Without mounted transmitter	-50 to +85 °C (-58 to +185 °F)	-50 to +60 °C (-58 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.
With mounted multi-channel transmitter	-40 to +85 °C (-40 to +185 °F)	-40 to +70 °C (-40 to +158 °F)

Storage temperature

Junction box	
With head transmitter	-50 to +100 °C (-58 to +212 °F)
With multi-channel transmitter	-40 to +80 °C (-40 to +176 °F)
With DIN rail transmitter	-40 to +100 °C (-40 to +212 °F)

Humidity

Condensation according to IEC 60068-2-33:

- 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

Electromagnetic compatibility (EMC)

Depending on the head transmitter used. For detailed information see the related Technical Information, listed at the end of this document. → 35

Process

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 Up to +1 150 °C (+2 102 °F).



Process connection flanges with their specific ratings, selected according to the plant requirements, define the maximum process conditions, which the device has to operate.

Process pressure range 0 to 200 bar (0 to 2 900 psi)



Anyhow, the maximum required process pressure has to be combined with the maximum design process temperature. Process connections like compression fittings, flanges with their specific ratings, thermowells, selected according to the plant requirements, define the maximum process conditions at which the device has to operate. Endress+Hauser experts can support the customer on any related questions.

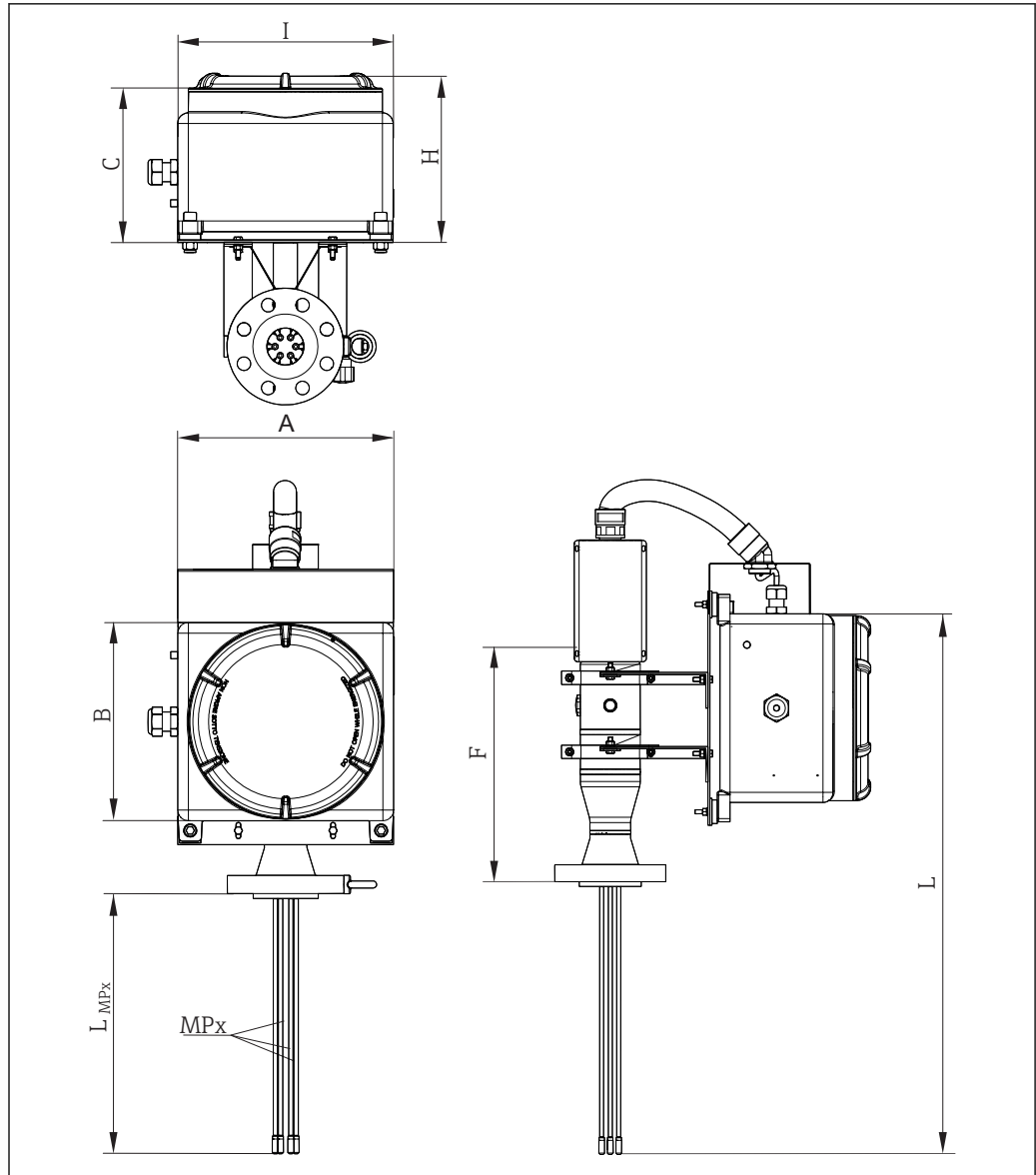
Process applications:

- Atmospheric/Vacuum Distillation
- Catalytic Cracking/Hydrocracking
- Hydro Treating
- Catalytic reforming
- Visbracker
- Delayed cocking
- Hydrodesulphurization

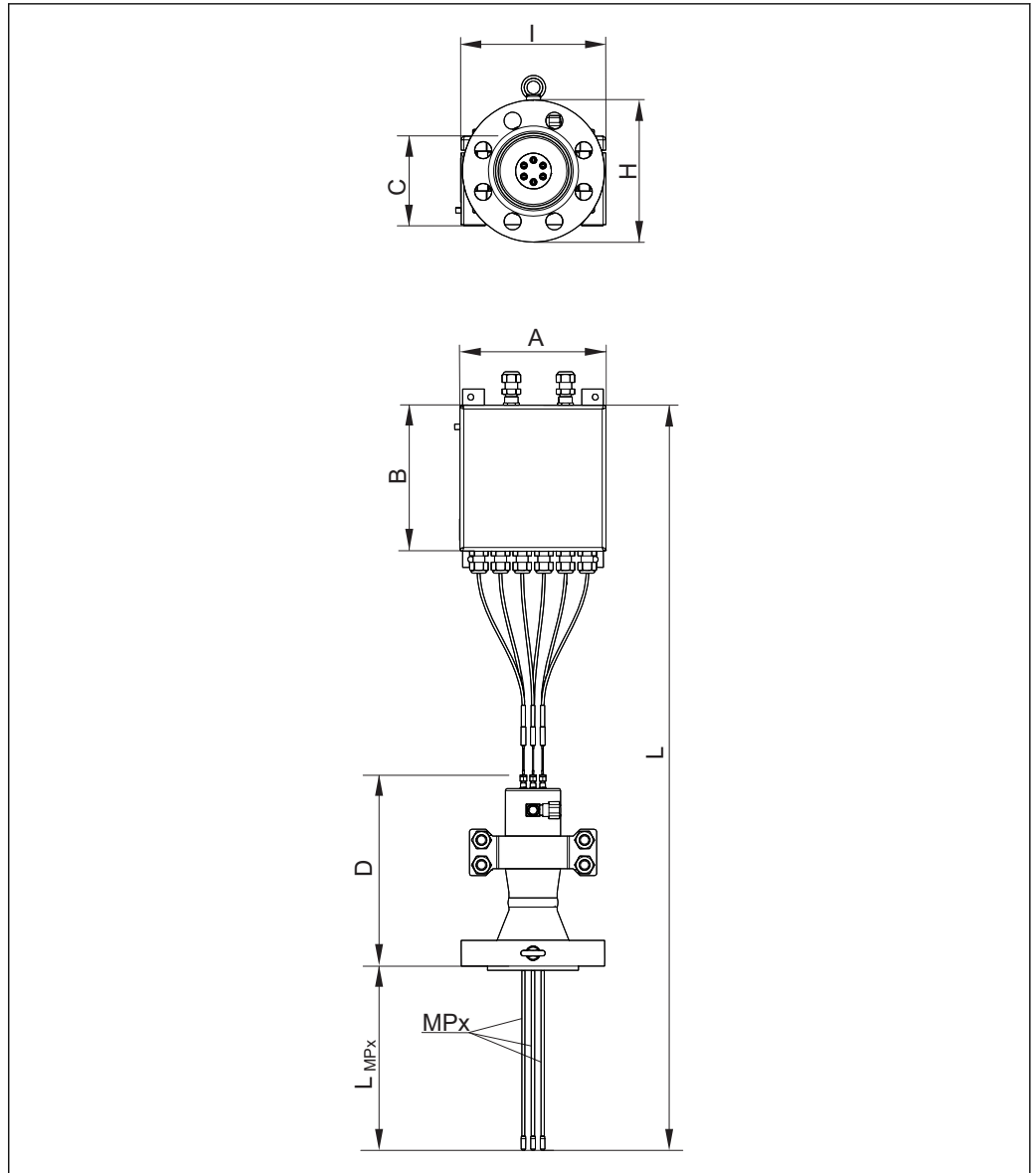
Mechanical construction

Design, dimensions

The overall multipoint assembly is composed of different sub-assemblies. Both linear and 3D configurations have the same features, dimensions and materials. Different inserts are available, based upon specific process conditions, in order to have the highest accuracy and an extended lifetime. In addition, protecting thermowells can be selected to further increase mechanical performances and corrosion resistance, and to allow insert replacement. Associated shielded extension cables are provided with high resistance sheath materials to withstand different environmental conditions and to ensure steady and noiseless signals. The transition between the inserts and the extension cable is obtained by the usage of specially sealed bushings, ensuring the declared IP degree protection.



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5 Design of the modular multipoint thermometer, with frame neck on the left side or remote design as option on the right side. All dimensions in mm (in)

A, B, Dimensions of the junction box, see following figure

C

D Diagnostic chamber length ~345 mm

F Diagnostic chamber and extension neck length ~600 mm

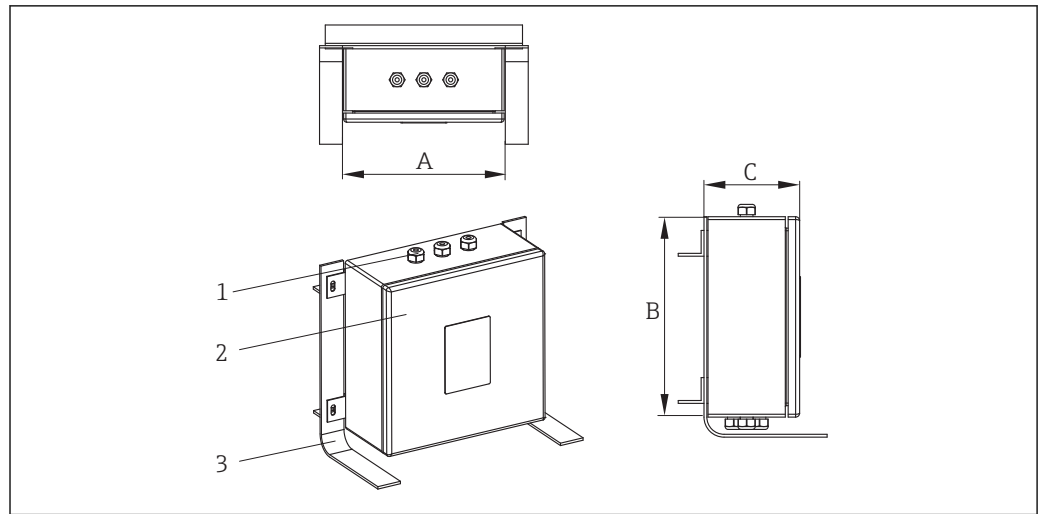
I, H Encumbrance of the junction box and support system

L_{MPx} Different immersion length of sensing elements or thermowells

L Overall device length

MPx Numbers and distribution of measuring points: MP1, MP2, MP3 etc.

Junction box



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- 1 Cable glands
2 Junction box
3 Frame

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.	170 (6.7)	170 (6.7)	130 (5.1)
	Max.	500 (19.7)	500 (19.7)	240 (9.5)
Aluminium	Min.	100 (3.9)	150 (5.9)	80 (3.2)
	Max.	330 (13)	500 (19.7)	180 (7.1)


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, FM, CSA approval for use in hazardous area	ATEX approval for use in hazardous area
Marking	ATEX II 2GD 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 FM3610 Class I, Division 1 Groups B,C,D T6/T5/T4 CSA C22.2 No.157 Class I, Division 1 Groups B,C,D T6/T5/T4	→ 22- According to the junction box approval
Cover	Hinged and threaded	-
Maximum sealing diameter	-	6 to 12 mm (0.24 to 0.47 in)

Support frame

Modular frame is foreseen for on board installation in different angular positions respect the system body.

It ensures the connection between the diagnostic chamber 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 reactor’s infrastructure (step ways, loading structures, supporting skirts, stairs, etc.) and reactor thermal insulation. The frame design ensures easy access for monitoring and maintaining inserts and extension cables. It guarantees a high stiffness connection for the junction box and vibration loads. No closed volumes are present in the frame design although it allows protection to the cables through covers and cable conduit of the junction box. This avoids the accumulation of waste and potentially dangerous fluids coming from the environment that can damage the instrumentation allowing continuous ventilation.

Insert and thermowells

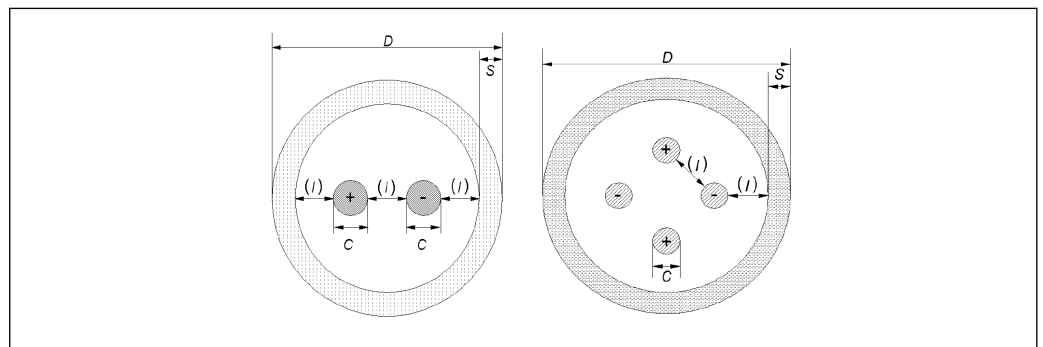
 Different insert and thermowell types are available. For any different requirement that is not described here, please contact the Endress+Hauser sales department.

Thermocouple

Diameter in mm (in)	Type	Standard	Hot junction type	Sheath material
8 (0.31) 6 (0.23) 3 (0.12) 2 (0.08) 1.5 (0.06)	1x type K 2x type K 1x type J 2x type J 1x type N 2x type N	IEC 60584 / ASTM E230	Grounded/Ungrounded	Alloy600 / AISI 316L / Pyrosil / 321 / 347

Conductor thickness

Sensor Type	Diameter in mm (in)	Wall	Min. Sheath Thickness (S)	Min. Conductors Diameter (C)
Single Thermocouple	6 mm (0.23 in)	Heavy Wall	0.6 mm (0.023 in)	0,90 mm = 19 AWG
Double Thermocouple	6 mm (0.23 in)	Heavy Wall	0.54 mm (0.021 in)	0,66 mm = 22 AWG
Single Thermocouple	8 mm (0.31 in)	Heavy Wall	0.8 mm (0.031 in)	1,20 mm = 17 AWG
Double Thermocouple	8 mm (0.31 in)	Heavy Wall	0.64 mm (0.025 in)	0,72 mm = 21 AWG
Single Thermocouple	1.5 mm (0.05 in)	Standard	0.15 mm (0.005 in)	0,23 mm = 31 AWG
Double Thermocouple	1.5 mm (0.05 in)	Standard	0.14 mm (0.005 in)	0,17 mm = 33 AWG
Single Thermocouple	2 mm (0.07 in)	Standard	0.2 mm (0.007 in)	0,30 mm = 28 AWG
Double Thermocouple	2 mm (0.07 in)	Standard	0.18 mm (0.007 in)	0,22 mm = 31 AWG
Single Thermocouple	3 mm (0.11 in)	Standard	0.3 mm (0.01 in)	0,45 mm = 25 AWG
Double Thermocouple	3 mm (0.11 in)	Standard	0.27 mm (0.01 in)	0,33 mm = 28 AWG



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RTD

Diameter in mm (in)	Type	Standard	Sheath material
3 (0.12) 6 (1/4)	1x Pt100 WW/TF 2x Pt100 WW/TF/StrongSens	IEC 60751	AISI 316L

Thermowells

External diameter in mm (in)	Sheath material	Type	Thickness in mm (in)
6 (0.24)	AISI 316L or AISI 321 or AISI 347 or Alloy 600	closed or open	1 (0.04) or 1.5 (0.06)
8 (0.32)	AISI 316L or AISI 321 or AISI 347 or Alloy 600	closed or open	1 (0.04) or 1.5 (0.06) or 2 (0.08)
10.24 (1/8)	AISI 316L or AISI 321 or AISI 347 or Alloy 600	closed or open	1.73 (0.06) (SCH. 40) or 2.41 (0.09) (SCH. 80)

Sealing components

The sealing components (compression fittings) are welded on the chamber head to guarantee proper tightness under all the foreseen operating conditions and to allow the maintenance/replacement of the stump-insert (**advanced** solution without thermowells) or inserts (**advanced** solution with thermowells and **advanced and modular**).

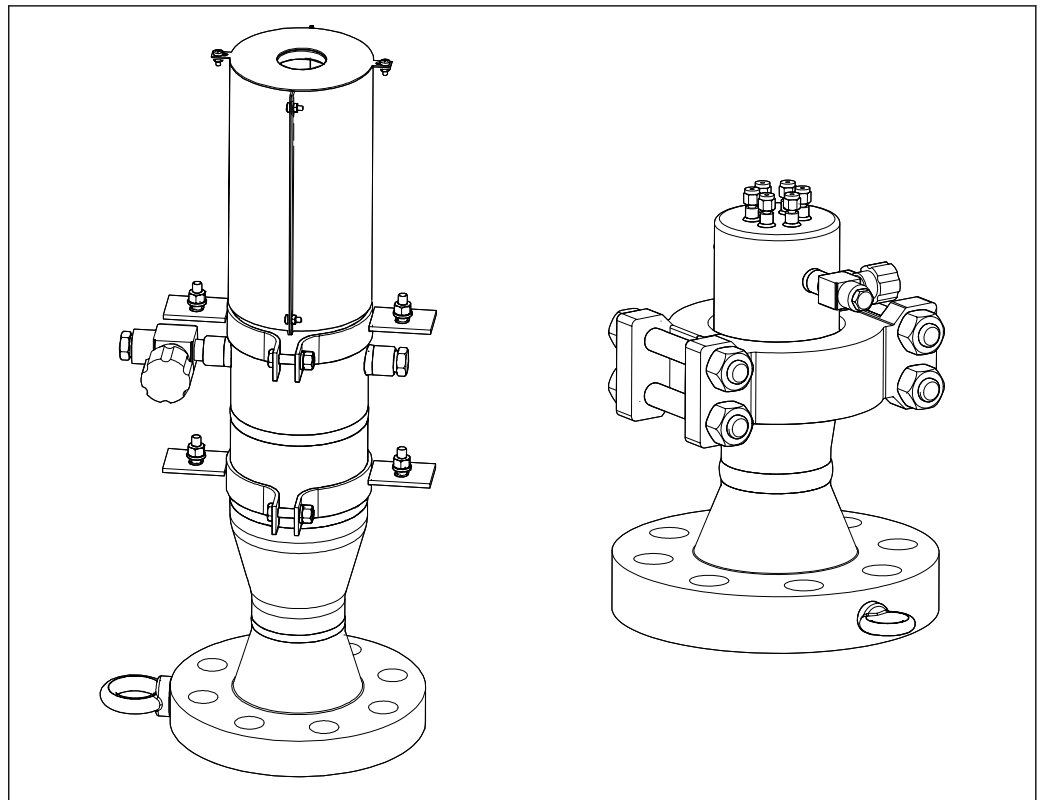
Material: AISI 316/AISI 316H

Cable Glands

Installed cable glands provide the proper level of reliability under the mentioned ambient and operating conditions.

Material	Marking	IP Rating	Ambient T range	Max. sealing diameter
NiCr Plated brass / AISI 316/AISI 316L	Atex II 2/3 GD Ex d IIC, Ex e II, Ex nR II, Ex tD A21 IP66 Atex II 2G, II 1D, Ex d IIC Gb, Ex e IIC Gb, Ex ta IIIC Da, II 3G Ex nR IIC Gc	IP66	-52 to +110 °C (-61.6 to +230 °F)	6 to 12 mm (0.23 to 0.47 in)

Diagnostic Chamber



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Diagnostic function

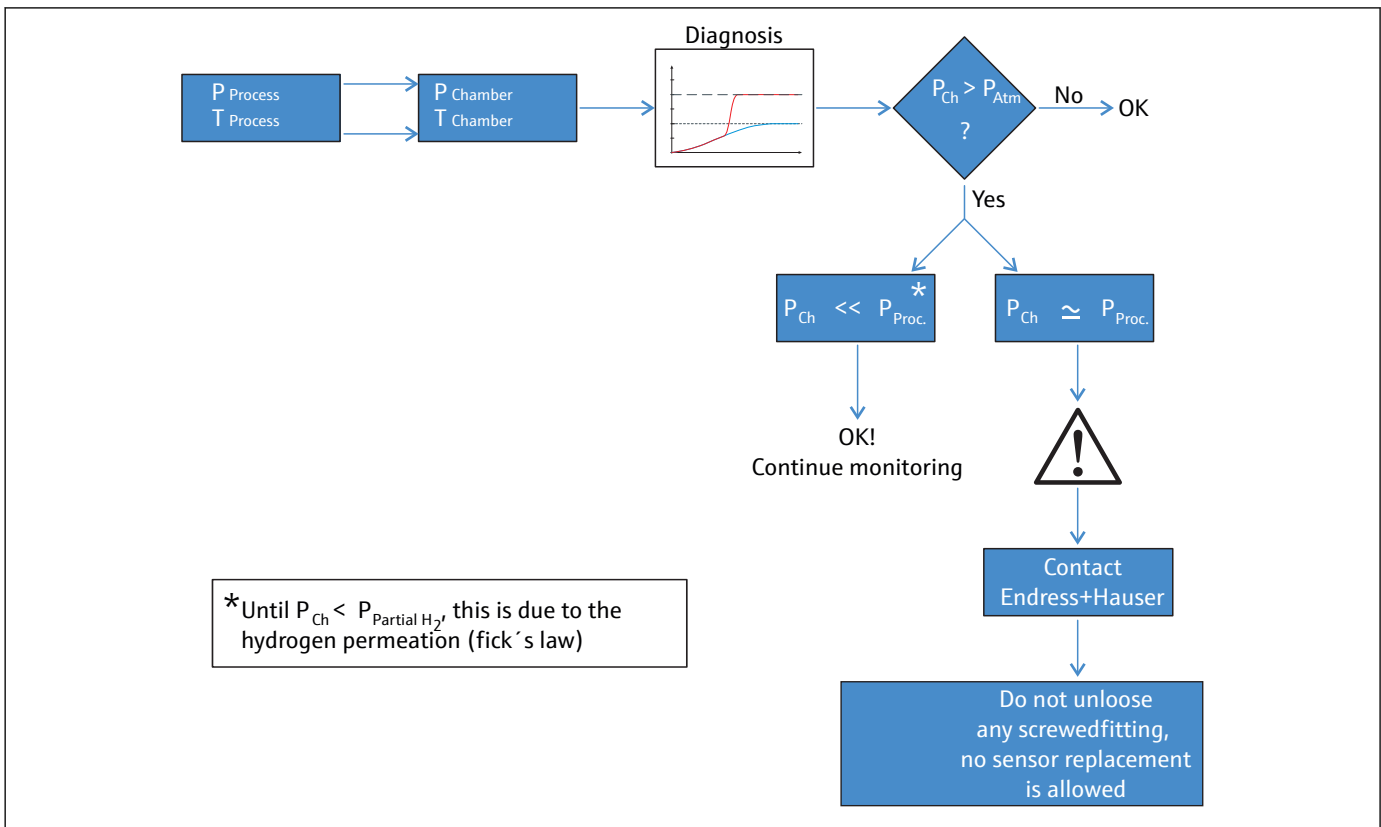
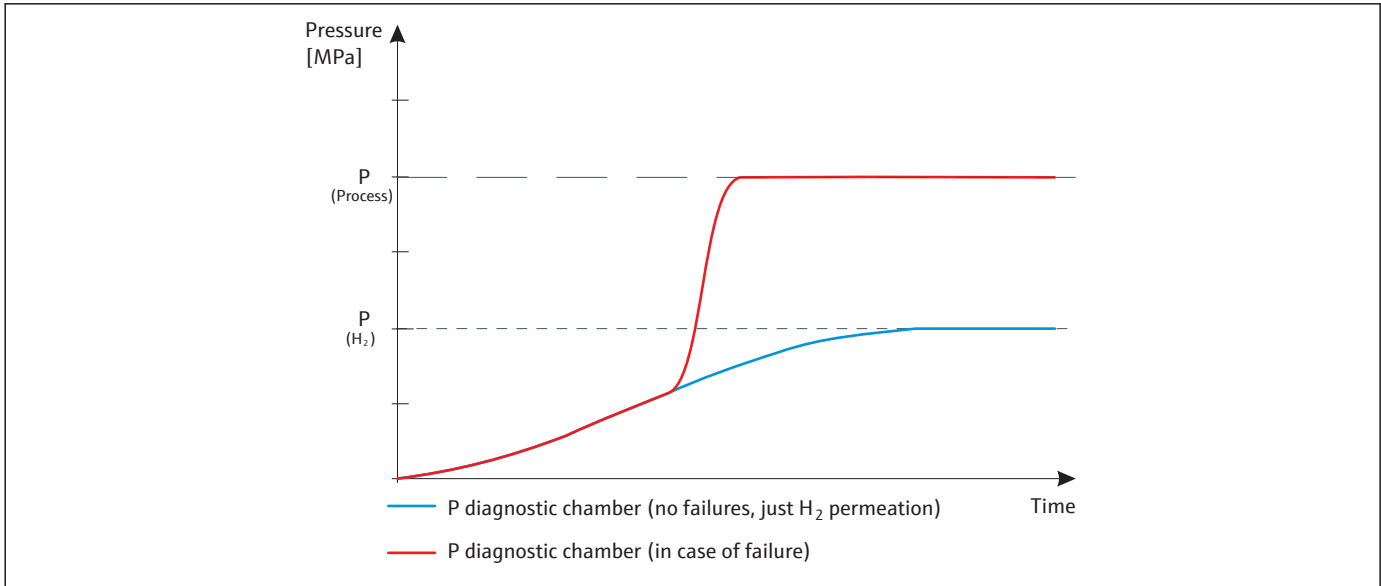
The diagnostic chamber is a module designed to allow the multipoint behavior monitoring in case of possible leakage or permeation coming from process and to safely contain them. Through the elaboration of all the acquired information, it allows to evaluate measurement accuracy, residual lifetime and maintenance plan.

The reactors where the multipoint assembly operate are usually characterized by severe conditions in terms of pressure, temperature, corrosion and dynamics of the process fluids. Pressurization of the diagnostic chamber may be caused by permeation, or process leakages that can occur through:

- inserts sheath
- welding seams between inserts and chamber disk
- protecting thermowells.

The fluids contained inside the chamber can be sampled on site by an E+H portable equipment, and analyzed in cooperation between E+H and the customer. Pressure and temperature data shall be continuously recorded by the user for self diagnostic evaluation or shared with Endress+Hauser for advanced diagnostic analysis.

The permeation phenomena can be quantitatively analyzed by comparing the theoretical Fick's law with the recorded data to analyze the ongoing multipoint operating conditions.



Weight The weight can vary based upon the configuration, depending on the junction box and the frame design, the diagnostic chamber and the presence of the clamp or the number of inserts and eventually the accessories. The approximate weight of a typically configured multipoint thermometer (number of inserts = 12, main body = 3", medium size junction box) = 70 kg (154.3 lb).

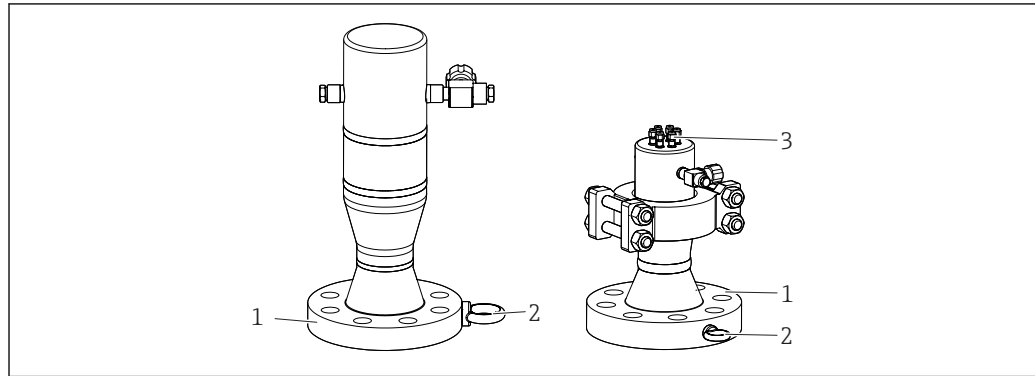
The eyebolt, which is part of the process connection, must be used as the only lifting component for move the entire device.

Materials

The listed material properties have to be taken into account when selected for wetted parts:

Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316/1.4401	X2CrNiMo17-12-2	650 °C (1 202 °F)	<ul style="list-style-type: none"> ▪ 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 (1 202 °F)	<ul style="list-style-type: none"> ▪ 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
INCONEL® 600 / 2.4816	NiCr15Fe	1 100 °C (2 012 °F)	<ul style="list-style-type: none"> ▪ A nickel/chromium alloy with very good resistance to aggressive, oxidizing and reducing atmospheres, even at high temperatures. ▪ Resistant to corrosion caused by chlorine gas and chlorinated media as well as many oxidizing mineral and organic acids, sea water etc. ▪ Corrosion from ultrapure water. ▪ Not to be used in a sulfur-containing atmosphere.
AISI 304/1.4301	X5CrNi18-10	850 °C (1 562 °F)	<ul style="list-style-type: none"> ▪ Austenitic, stainless steel ▪ Well usable in water and lowly pollute waste water ▪ Only at relatively low temperatures resistant to organic acids, saline solutions, sulphates, alkaline solutions, etc.
AISI 316Ti/1.4571	X6CrNiMoTi17-12-2	700 °C (1 292 °F)	<ul style="list-style-type: none"> ▪ Properties comparable to AISI316L. ▪ 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
AISI 321/1.4541	X6CrNiTi18-10	815 °C (1 499 °F)	<ul style="list-style-type: none"> ▪ Austenitic stainless steel ▪ High resistance to intergranular corrosion even after welding ▪ Good welding characteristics, suitable to all standard welding methods ▪ It is used in many sectors of the chemical industry, petrochemical, and pressurized vessels
AISI 347/1.4550	X6CrNiNb10-10	800 °C (1 472 °F)	<ul style="list-style-type: none"> ▪ Austenitic stainless steel ▪ Good resistance to a wide variety of environments in the chemical, textile, oil-refining, dairy and food industries ▪ Added niobium makes this steel impervious to intergranular corrosion ▪ Good weldability ▪ Main applications are furnace fire walls, pressure vessels, welded structures, turbine blades

Process connection and chamber body



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6 Flange as process connection

- 1 Flange
- 2 Eyebolt
- 3 Compression fittings

Standard process connection flanges are designed according to the following standards:

Standard ¹⁾	Size	Rating	Material
ASME	2", 3", 4", 6", 8"	600#, 900#, 1500#, 2500#	AISI 316, 347
EN	DN15, DN80, DN100, DN125, DN150, DN200	PN40, PN63, PN100, PN160	316/1.4401, 316L/1.4435 316Ti; 1.4571 321; 1.4541, 347; 1.4550

1) Flanges according to GOST standard are available on request.

Compression fittings

The compression fittings are welded onto the diagnostic chamber head to ensure sensors replacement (when applicable). Dimensions are coherent with the insert dimensions. Compression fittings comply with the highest standards of reliability in terms of materials and performances required

Material	AISI 316/316H
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Thermowell insert (alternative process connection)

The thermowell insert process connection is designed and provided to meet plant requirements where the standard nozzle is replaced by a compact round drilled bar. This round drilled bar, named thermowell insert, is welded on the internal reactor wall by means of a specific support already provided by the reactor's manufacturer. Such kind of process connection allows the installation of the MultiSens system through a fast and compact clamped connection. In case of new plants or new reactors the counterpart of the MultiSens system process connection has to be butt welded to the thermowell insert. In case of maintenance and repair installations, no additional welding activities shall be carried on, just clamp the MultiSens system with the already existing counterpart.

Material of the thermowell insert	AISI 321 - AISI 347 - AISI 316/L - Incoloy 825 - Inconel 625
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Operability

For details of operability, see the Technical Information of the Endress+Hauser temperature transmitters or the manuals of the related operating software. → 35

Certificates and approvals

CE Mark	The complete assembly is provided with individual components CE marked, to ensure safe use in hazardous areas and pressurized environments.
Hazardous area approvals	<p>The Ex approval applies to individual components like junction box, cable glands, terminals. For further details on the available Ex versions (ATEX, UL, FM, CSA, IEC-EX, NEPSI, EAC-EX), please contact your nearest Endress+Hauser sales organization. All relevant data for hazardous areas can be found in separate Ex documentation.</p> <p>ATEX Ex ia inserts are available only for diameters ≥ 1.5 mm (0.6 in). For further details contact an Endress+Hauser technician.</p>
PED approval	The diagnostic chamber is provided with PED approval if required as the European Directive 97/23/EC says. Calculation reports, testing procedures, certificates, are provided according to the required calculation code and as foreseen in the product technical dossier.
Certification HART	The HART [®] temperature transmitter is registered by the FieldComm Group. The device meets the requirements of the HART [®] Communication Protocol Specifications.
Certification FOUNDATION Fieldbus	<p>The FOUNDATION Fieldbus[™] temperature transmitter has successfully passed all test procedures and is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the following specification:</p> <ul style="list-style-type: none"> ▪ Certified according to FOUNDATION Fieldbus[™] specification ▪ FOUNDATION Fieldbus[™] H1 ▪ Interoperability Test Kit (ITK), up to date revision status (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[™]
Certification PROFIBUS[®] PA	<p>The PROFIBUS[®] PA temperature transmitter is certified and registered by the PNO (PROFIBUS[®] Nutzerorganisation e. V.), PROFIBUS user organization. The device meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified according to FOUNDATION Fieldbus[™] specification ▪ Certified in accordance with PROFIBUS[®] PA Profile (the up to date profile version is available on request) ▪ The device can also be operated with certified devices of other manufacturers (interoperability)
Other standards and guidelines	<ul style="list-style-type: none"> ▪ IEC 61326-1:2007: Electromagnetic compatibility (EMC requirements) ▪ IEC 60529: Degree of protection of housing (IP code) ▪ IEC 60584 and ASTM E230/ANSI MC96.1: Thermocouples ▪ ASME B16.5, EN 1092-1, GOST 12820-20: Flange
Material certification	The material certificate 3.1 (according to standard EN 10204) can be requested separately. The certificate includes a declaration related to the materials used in the construction of the single sensor and guarantees the traceability of the materials through the identification number of the multipoint. The data related to the origin of the materials can subsequently be requested by the client if necessary.
Test report and calibration	The "Factory calibration" is carried out according to an internal procedure in a laboratory of Endress+Hauser accredited by the European Accreditation Organization (EA) to ISO/IEC 17025. A calibration which is performed according to EA guidelines (SIT/Accredia) or (DKD/DAkkS) may be requested separately. The calibration is performed on the inserts of the multipoint.

Ordering information

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

Detailed ordering information is available from your Endress+Hauser Sales Center:

www.addresses.endress.com

Insert design	
Replaceable	<input type="checkbox"/>
Not replaceable	<input type="checkbox"/>

MultiSens version design	
Basic	<input type="checkbox"/>
Advanced	<input type="checkbox"/>
Advanced & Modular	<input type="checkbox"/>

Process connection: Flange		
Standard	<ul style="list-style-type: none"> ▪ Asme B16.5 ▪ En1092-1 	<input type="checkbox"/> <input type="checkbox"/>
Material	<ul style="list-style-type: none"> ▪ 316/1.4401 ▪ 316L/1.4435 ▪ 316Ti/1.4571 ▪ 321/1.4541 ▪ 347/1.4550 ▪ Alloy 625 / 2.4856 ▪ Alloy 800 / 1.4876 ▪ Alloy 825 / 2.4858 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Face	<ul style="list-style-type: none"> ▪ RF ▪ RTJ ▪ Type A ▪ Type B1 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Size	<ul style="list-style-type: none"> ▪ 2", 3", 4", 6", 8" ▪ DN50, DN80, DN100, DN125, DN150, DN 200 	<hr style="width: 100%; border: 0; border-top: 1px solid black; margin-bottom: 5px;"/> <hr style="width: 100%; border: 0; border-top: 1px solid black;"/>

Other process connections, including the "thermowell insert" design, have to be specified in terms of dimensions and overall characteristics.

Flange size ¹⁾ (considering a schedule 40 nozzle)	Basic		Advanced			
	Maximum number of inserts		Maximum number of inserts			
	Insert diameter		Insert diameter			
	6mm	8mm	6mm 1x	6mm 2x	8mm 1x	8mm 1x
2"	4	4	4	3	4	3
3"	9	7	7	7	7	7
4"	18	14	14	12	14	12
5"	30	22	22	20	22	20
6"	35	30	30	30	30	30
8"	52	48	48	45	48	45

1) In case of thermowell insert design, the maximum number of sensors is depending on its internal diameter. Please ask to Endress+Hauser sales organization.

Flange size (considering a schedule 40 nozzle)	Advanced		Advanced and modular	
	Maximum number of thermowells with insert- \varnothing : 1.5 mm (0.06 in) or 2 mm (0.08 in) or 3 mm (0.12 in)3mm(0,12 in)		Maximum number of thermowells with insert- \varnothing : 1.5 mm (0.06 in) or 2 mm (0.08 in) or 3 mm (0.12 in)3mm(0,12 in)	
	Thermowell diameter		Thermowell diameter	
	6mm	8mm	6mm	8mm
2"	4	4	4	4
3"	7	7	7	7
4"	14	14	14	14
5"	22	22	22	22
6"	30	30	/	/
8"	48	45	/	/

Protecting Thermowell		
Thermowell dimension	<ul style="list-style-type: none"> ▪ 6 mm ▪ 8 mm ▪ 1/8" 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Thermowell material	<ul style="list-style-type: none"> ▪ 316/1.4401 ▪ 316L/1.4435 ▪ 321/1.4541 ▪ 347/1.4550 ▪ Alloy 600 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Insert, sensor		
Measuring principle	<ul style="list-style-type: none"> ▪ Thermocouple (TC) ▪ Resistance Temperature Detection (RTD) 	<input type="checkbox"/> <input type="checkbox"/>
Type	TC: J, K, N RTD: Pt100	_____
Design	<ul style="list-style-type: none"> ▪ TC: Single, duplex ▪ RTD: 3-wire, 4-wire, 2x3-wire 	<input type="checkbox"/> <input type="checkbox"/>
Execution	<ul style="list-style-type: none"> ▪ TC: Grounded, Ungrounded ▪ RTD: Wire wound (WW), Thin Film (TF) 	<input type="checkbox"/> <input type="checkbox"/>
Sheath material	316L, 321, 347, Alloy 600, Pyrosil	_____
Approvals	Intrinsic Safety Non hazardous	<input type="checkbox"/> <input type="checkbox"/>
Insert diameter	<ul style="list-style-type: none"> ▪ 1.5 mm (0.05 in) ▪ 2 mm (0.08 in) ▪ 3 mm (0.12 in) ▪ 6 mm (0.23 in) ▪ 8 mm (0.31 in) 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Standard/Class	<ul style="list-style-type: none"> ▪ IEC/Class 1 ▪ ASTM/Class special ▪ IEC/Class A ▪ IEC/Class AA 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Measurement point distribution		
Positioning	<ul style="list-style-type: none"> ▪ Equi spaced ▪ Customized 	<input type="checkbox"/> <input type="checkbox"/>
Number	2, 4, 6, 8, 10, 12 ... 30 ¹⁾	_____
Insertion length	TAG (description)	(L _{MPx}) in mm (in)

Measurement point distribution		
MP ₁	_____	_____
MP ₂	_____	_____
.....3	_____	_____
MP _x	_____	_____

1) Different numbers/configurations are available on request

Junction box (Head)		
Material	Stainless steel (standard) Aluminum (to be specified) Others on request	<input type="checkbox"/> <input type="checkbox"/>
Electrical connection	Terminal block wiring: <ul style="list-style-type: none"> ▪ Terminal block - standard/number ▪ Terminal block - compensated/number ▪ Terminal block - spare/number Transmitter wiring: <ul style="list-style-type: none"> ▪ HART protocol, e. g.: TMT182, TMT82 ▪ PROFIBUS PA protocol, e. g.: TMT84 ▪ FOUNDATION Fieldbus protocol, e. g.: TMT85, TMT125 (multi-channel transmitter) ▪ Quantity 	<input type="checkbox"/> / _____ <input type="checkbox"/> / _____ <input type="checkbox"/> / _____ <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> _____
Approvals	Ex e / Ex ia / Ex d / UL 913 / CSA C22.2 / UL 1203	_____
Cable entries (process side)	Single or multiple, type: M20, NPT 1/2" Quantity Other on request	_____ / _____ _____ / _____
Cable entries (wiring side)	Single or multiple, type: M20, M25, NPT 1/2", NPT 1" / Quantity Other on request	_____ / _____ _____ / _____

Junction box supporting frame	
<ul style="list-style-type: none"> ▪ Remote ▪ With accessible extension cables ▪ With protected extension cables ▪ Other on request 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> _____

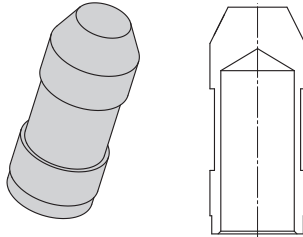
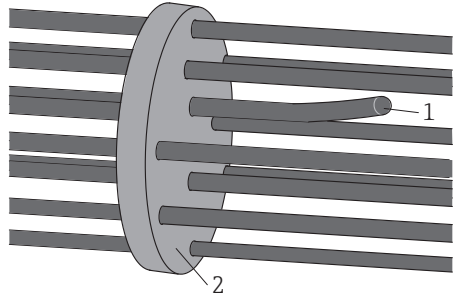
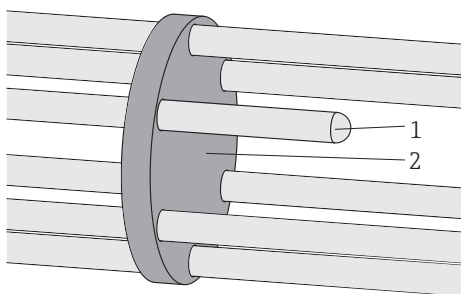
TAG		
Device information	Refer to customer specification / As specified	<input type="checkbox"/> <input type="checkbox"/> (table)
Measuring point information	Refer to customer specification Location, as specified: <ul style="list-style-type: none"> ▪ Tagging (TAG), on device (black foil) ▪ Tagging (TAG), by customer ▪ Tagging (TAG), on Transmitter ▪ Tagging (TAG), on device (metal tag) ▪ *Tagging (TAG), on tip ▪ Tagging (TAG), on extension cable ▪ *Tagging (TAG), on insert bushing ▪ Tagging (TAG), RFID ▪ To be specified 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

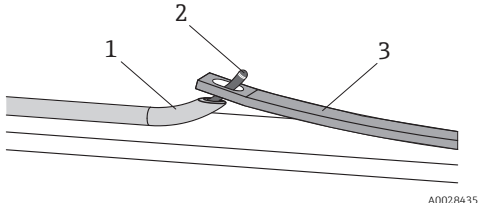
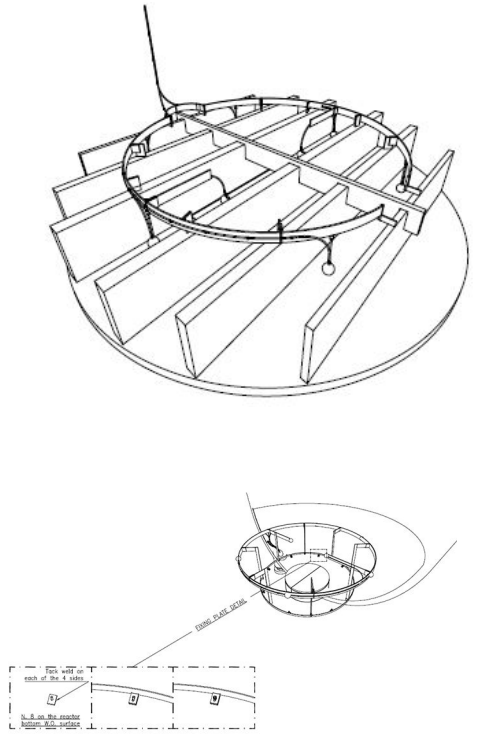
Additional requests		
Extension wire lengths, only for remote head	Specification in mm:	_____
Extension wires material	<ul style="list-style-type: none"> ■ PVC, -60...105°C ■ Hyflon MFA, -200...250°C ■ Others on request 	<input type="checkbox"/> <input type="checkbox"/> _____
On-site existing thermowell	Yes No	<input type="checkbox"/> <input type="checkbox"/>

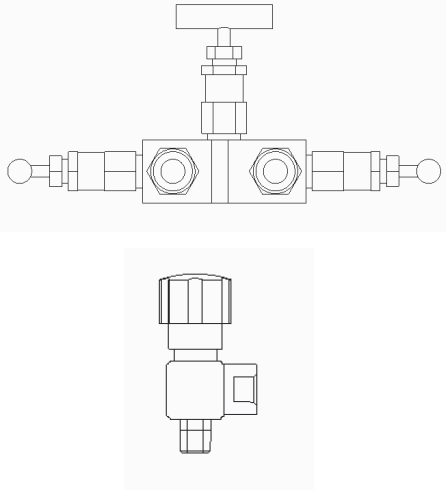
Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code is available from your local Endress+Hauser sales center.




Device-specific accessories





Accessories	Description
<p style="text-align: center;">Tip end</p>  <p style="text-align: right; font-size: small;">A0028427</p>	<p>Terminal closure welded at the tip end of the probe in order to protect the insert from aggressive process conditions to facilitate its fixing by metallic tie wraps and to ensure proper thermal contact.</p>
Thermal contact system	
<p style="text-align: center;">Insert and spacers</p>  <p style="font-size: small;">A0033485</p> <p>1 Insert 2 Spacer</p>	<ul style="list-style-type: none"> ▪ Used on straight configurations and existing thermowells for axial centering of the insert bundle ▪ Avoid the twisting of the inserts ▪ Give flexural stiffness to the sensor bundle
<p style="text-align: center;">Thermowells and spacers</p>  <p style="font-size: small;">A0028434</p> <p>1 Thermowell 2 Spacer</p>	

Accessories	Description
<p>Bimetallic stripes</p>  <p style="text-align: right; font-size: small;">A0028435</p> <p>7 Bimetal strips with or without guiding tubes</p> <p>1 Guiding tube 2 Insert 3 Bimetallic stripe</p>	<ul style="list-style-type: none"> ■ Used on straight configurations and inside existing thermowells ■ Allow sensor replacement ■ Guarantee thermal contact between the sensor tip and the thermowell due to bimetallic stripes activated by temperature difference ■ No friction during installation even with already installed sensors
 <p style="text-align: right; font-size: small;">A0034864</p> <p>Frame</p>	<p>Support structure that keeps the thermoelements fixed along the defined routing.</p>
<p>Tags</p>	<p>Nameplate can be applied to identify each measuring points and the whole assembly. Tags can be placed on the extension cables in the extension area and/or in to the junction box on individual wires.</p>
<p>Diagnostic chamber</p>	
<p>Pressure transducer</p>	<p>Digital or analogical pressure transmitter with welded metal sensor for measurement in gases, steam or liquids. Ref to Endress+Hauser PMP sensors family</p>


Accessories	Description
 <p style="text-align: right; font-size: small;">A0034865</p> <p>Fitting / manifolds / valves</p>	<p>Fitting, manifolds and valves are available for the installation of the pressure transmitter on the system body, and so allows the continuous monitoring of the device under the operating conditions. Used also for vent out eventual gas/liquids.</p>
<p>Purging system</p>	<p>A purging system for the depressurization of the diagnostic chamber The system is composed by:</p> <ul style="list-style-type: none"> ▪ 2 and 3 ways trunnion valves ▪ Pressure transmitter ▪ Two ways relief valves <p>The system eventually allows the connection of multiple number of diagnostic chambers installed in the same reactor.</p>
<p>Portable sampling system</p>	<p>A portable field system that allows to sample the fluid present inside the diagnostic chamber, so that can be chemically analyzed in an external laboratory. The system is composed by:</p> <ul style="list-style-type: none"> ▪ Three cylinders ▪ Pressure regulator ▪ Rigid and flexible tubes ▪ Vent lines ▪ Quick connectors and valves

Communication-specific accessories

<p>Configuration kit TXU10</p>	<p>Configuration kit for PC-programmable transmitter with setup software and interface cable for PC with USB port Order code: TXU10-xx</p>
<p>Commubox FXA195 HART</p>	<p>For intrinsically safe HART communication with FieldCare via the USB interface.  For details, see "Technical Information" TI00404F</p>
<p>Commubox FXA291</p>	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.  For details, see "Technical Information" TI00405C</p>
<p>HART Loop Converter HMX50</p>	<p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.  For details, see "Technical Information" TI00429F and Operating Instructions BA00371F</p>

Wireless HART adapter SWA70	<p>Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity.</p> <p> For details, see Operating Instructions BA061S</p>
Fieldgate FXA320	<p>Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser.</p> <p> For details, see "Technical Information" TI00025S and Operating Instructions BA00053S</p>
Fieldgate FXA520	<p>Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.</p> <p> For details, see "Technical Information" TI00025S and Operating Instructions BA00051S</p>
Field Xpert SFX100	<p>Compact, flexible and robust industry handheld terminal for remote configuration and for obtaining measured values via the HART current output (4-20 mA).</p> <p> For details, see Operating Instructions BA00060S</p>

Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> ▪ Calculation of all the necessary data for identifying the optimum measuring device: e.g. pressure loss, accuracy or process connections. ▪ Graphic illustration of the calculation results <p>Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.</p> <p>Applicator is available:</p> <ul style="list-style-type: none"> ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ On CD-ROM for local PC installation.
W@M	<p>Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.</p> <p>The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.</p> <p>W@M is available:</p> <ul style="list-style-type: none"> ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser. 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.</p> <p> For details, see Operating Instructions BA00027S and BA00059S</p>

Documentation

This guide is referred to the complete assembly. To have a complete overview of the technical and operative instructions of the parts refer to the other documents of the individual components manufactured by Endress+Hauser:

- Technical Information iTEMP temperature transmitters:
 - HART® TMT82, two-channel, RTD, TC, Ω, mV (TI01010TEN_1715)
 - HART® TMT182, two-channel, RTD, TC, Ω, mV (TI078ren_1310)
 - TMT181, PC-programmable, single-channel, RTD, TC, Ω, mV (ti070ren)
 - PROFIBUS® PA TMT84, two-channel, RTD, TC, Ω, mV (TI00138ren_0412)
 - FOUNDATION Fieldbus™ TMT85, two-channel, RTD, TC, Ω, mV (TI00134REN_0313)
 - FOUNDATION Fieldbus™ TMT125, 8 channel, RTD, TC, Ω, mV (TI00131ren_0111)
- Technical Information of inserts:
 - Thermocouple thermometer iTHERM TSC310 (TI00255ten_0111)
- Technical Information of pressure transmitter:
 - CERABARS PMP71 (TI00451PEN_0111)

www.addresses.endress.com
