EPIC® SENSORS

Temperature sensor & IoTKey® products and services
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### PRODUCED EPIC® SENSORS TEMPERATURE SENSORS

- Pt100 (2xPt100, 3xPt100)
- Pt1000
- Thermocouples
- Flanged thermowells
- PT100 with silicon well
- Cable probes
- Bayonet probes
- Ceramic sensors
- Coated thermowells
- Multi-point temperature sensors
- Ex-approved sensors
- Bearing temperature sensors
- Temperature sensors with magnet
- Immerisible temperature sensors
- Customer specific solutions
- Materials used are stainless, acid-proof, and heat-resistant steel, titanium, Hastelloy and polyamids, among others.

### OUR APPROVALS AND CERTIFICATES

- DNV ISO9001:2015 Management system certificate
- EESF 18 ATEX G 006 product quality assurance notification
- EESF 18 ATEX 092X product certificate for Ex db sensors
- IECEx quality assessment report
- ATEX product certificates for all Ex e sensors
- IECEx product certificates for specific Ex e sensors
- RU-T-Metrological - Russian metrological certificate for TC sensors
- RU-W-Metrological - Russian metrological certificate for RTD sensors
- EAC Russian certificate (Ex)
- Ex e Korean KCs certificate for thermocouple T-M 303 sensors
- Ex e Korean KCs certificate for Pt 100 W-M 303 sensors
- Ex e Korean KCs certificate for Pt 100 bayonet sensors
- Ex e Korean KCs certificate for Pt 100 cable sensors

### 5-YEAR WARRANTY

We rely on the craftsmanship and quality of our sensor manufacturing and want this to be beneficial to our customers in planning and maintaining their temperature measuring systems. That’s why we grant a five year product warranty for EPIC® SENSORS temperature sensors.
ENERGY AND PULP & PAPER INDUSTRIES
The long tradition of Finnish pulp & paper plants with their self-contained power production, has taught us to deal with extreme materials, temperatures and scale of machinery. Even in the changing environment, this vast knowledge can be adapted to renewable energy applications and advanced, smart production automation.

OIL, GAS, AND PETROCHEMICAL INDUSTRIES
We have a long history in delivering and manufacturing temperature measurement solutions for oil refineries, bio-diesel plants and the petrochemical industry. We have delivered temperature instrumentation solutions for:
- Columns
- Trace heating
- Reactor temperature measurements (inside reactors, single point, multi-point and surface)
- Furnaces
- Pipelines
- Laboratories
- Oil tanks
- Ethylene plants
- Underground oil reservoirs
- Bio-diesel manufacturing and pyrolysis processes
- Flare temperature measurement.

HYGIENIC INDUSTRY
EPIC® SENSORS temperature sensors can be used in areas where strict hygiene is required and extreme cleaning processes are used. Our range of temperature sensors include many products designed specifically for hygienic applications. The temperature sensors can be customized for all kinds of cleaning processes. Hygienic solutions are used in the food & beverage, pharmaceutical, and medical equipment industries, and clean room solutions, for example.

MACHINE BUILDING INDUSTRY
We have a wide variety of solutions for the machine building applications. When measuring temperature in machine building, it is essential to take into account vibration, thermal stability and screening. We have developed sensor variations, which specially suit the machine building designs; confined installation spaces, easy assembly and cost effective solutions. We have accumulated experience in electric motor stators, different energy chain applications, circuit boards, gear oil & bearing, and transformer measurements, to name a few. We design and manufacture temperature measurement sensors, no matter how big or small the application.

SENSORS FOR EX-AREAS
EPIC® SENSORS temperature sensors are also manufactured for different kind of potentially explosive areas and zones. We have implemented temperature measurement applications related to potentially explosive areas for more than ten years. The risk of explosion can be caused by flammable liquids, gases or dust. Temperature measurements have been made for a variety of devices and applications used in Ex-areas. For example:
- Pipes/tanks
- Trace heating control
- Electrical equipment and components
- Gearboxes
- Pumps and pump/motor combinations.
Solutions can be executed according to the application requirements, with the following protection types:
- Flameproof enclosure Ex db ATEX-certified
- Increased safety Ex e ATEX- / IECEx-certified
- Dust protection by housing Ex tb ATEX- / IECEx-certified.
**EPIC® SENSORS PT100 TEMPERATURE SENSORS**

- The measurement is based on resistance principle.
- The measurement element material is platinum and the resistance value is 100 ohm at 0 °C temperature.
- Platinum has a positive resistance temperature factor so the resistance increases with rising temperature.
- Resistance variation is according to IEC 60751.
- Long term stability is the main advantage compared to other temperature measuring methods. Change of measurement value is smaller than 0.2 Ω /0 °C.
- One sensor structure can include several Pt100 resistances: 1, 2 or 3 × Pt100 (the most common is 1 × Pt-100).
- For different measuring circuits the resistance element can be produced in different versions: 2-, 3- or 4-wire connection, most accurate version is 4-wire connection.
- Standard version of the industrial Pt100 sensor is vibration proof, additionally it can be produced as an extra vibration proof version for extreme conditions.

**VIBRATION PROOF RESISTANCE SENSING ELEMENTS, SHEATH CONSTRUCTION**

- Standard sheath material AISI 316L.
- Length according to specification.
- Diameter 1.6...8 mm.
- As Pt100 probes (1xPt100, 2x Pt100, other norms on request).
- 2-, 3- and 4-wire connection + compensation loop.
- Precision classes: Class A, B, 1/3 DIN and 1/10 DIN.

**CABLE PROBES**

- Diameter and length according to specification (AISI 316).
- Various cable options.
- As thermocouples.
- As Pt100 probes (1xPt100, 2x Pt100, other norms on request).
- 2-, 3- and 4-wire connection (Pt100).
- Precision classes: Class A, B, 1/3 DIN, 1/10 DIN (Pt100) and Class 1 (TC).
- Various coupling options.

**EXAMPLES OF PRECISION CLASSES FOR, WIRE WOUND RESISTORS AND THIN FILM RESISTORS**

<table>
<thead>
<tr>
<th>For wire wound resistors</th>
<th>For film resistors</th>
<th>Tolerance value</th>
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</thead>
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<tr>
<td>Tolerance</td>
<td>Temperature range of validity °C</td>
<td>Tolerance</td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td>Class</td>
</tr>
<tr>
<td>A</td>
<td>-50 to +250</td>
<td>0.1 ± (0.0007</td>
</tr>
<tr>
<td>B</td>
<td>-100 to +450</td>
<td>0.15 ± (0.002</td>
</tr>
<tr>
<td>C</td>
<td>-196 to +600</td>
<td>0.3 ± (0.005</td>
</tr>
<tr>
<td>D</td>
<td>-196 to +600</td>
<td>0.6 ± (0.01</td>
</tr>
</tbody>
</table>

If the required precision exceeds the values given in precision class A, then class AA will be used or the fractions will be based on class B, for instance:

- Class AA: ±0.0007 | t |
- Class B: ±0.002 | t |
- Class C: ±0.005 | t |
- Class D: ±0.01 | t |

The fractional values are not valid for the total measurement range, only at point 0 °C.
**THERMOCOUPLES**

EPIC® SENSORS thermocouple sensor produces an mV measuring signal, which is proportional to temperature depending on which TC type is used.

**MEASURING PRINCIPLE**

When two wires of different metals or metal alloys (thermowires) are joined together in one end (hot junction), a thermocouple is formed. The free ends of those wires form a reference point. If there is a temperature difference between hot junction T1 and reference point T2, a thermal electromotive force (voltage) is created in the thermocouple, the level of this voltage is proportional only to temperature difference T1-T2 and to materials, which the thermocouple is formed of (Seebeck effect).

For that reason it is important to have the reference point as stable as possible, when it is moved to a location of standard temperature (reference temperature) using extension wire or insulated thermo wire.

**COLD JUNCTION COMPENSATION (CJC)**

A temperature transmitter or measuring system needs information from the reference point (cold junction) temperature T2. Variations in the reference point temperature are compensated with CJC measuring (Cold Junction Compensation). The temperature transmitters’ CJC measurement can be done by internal measurement or with a resistance sensor (RTD) installed on the connector. If the reference point is far from the transmitter, a separate temperature measurement is required to measure and compensate the temperature at that point.

**VIBRATION-PROOF THERMOCOUPLES, SHEATH CONSTRUCTION**

- Diameter 0.5...8 mm
- Standard sheath material Inconel 600 or AISI 316
- Precision class 1
- Length according to specification.

**TEMPERATURE RANGES AND TOLERANCES OF THERMOCOUPLE TYPES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Accuracy class</th>
<th>Temperature range °C</th>
<th>Constant value °C</th>
<th>Tolerances allowed</th>
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<tbody>
<tr>
<td>T</td>
<td>1</td>
<td>-40...+350</td>
<td>± 0.5</td>
<td>± 0.004 [t]</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-40...+350</td>
<td>± 1.0</td>
<td>± 0.0075 [t]</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-200...+40</td>
<td>± 1.0</td>
<td>± 0.015 [t]</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>-40...+800</td>
<td>± 1.5</td>
<td>± 0.004 [t]</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-40...+900</td>
<td>± 2.5</td>
<td>± 0.0075 [t]</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-200...+40</td>
<td>± 2.5</td>
<td>± 0.015 [t]</td>
</tr>
<tr>
<td>J</td>
<td>1</td>
<td>-40...+750</td>
<td>± 1.5</td>
<td>± 0.004 [t]</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-40...+750</td>
<td>± 2.5</td>
<td>± 0.0075 [t]</td>
</tr>
<tr>
<td>K and N</td>
<td>1</td>
<td>-40...+1000</td>
<td>± 1.5</td>
<td>± 0.004 [t]</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>-40...+1200</td>
<td>± 2.5</td>
<td>± 0.0075 [t]</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-200...+40</td>
<td>± 2.5</td>
<td>± 0.015 [t]</td>
</tr>
<tr>
<td>R and S</td>
<td>1</td>
<td>0...+1600</td>
<td>± 1.0</td>
<td>± 1.0 [(t-1100) ×0.003] °C</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0...+1600</td>
<td>± 1.5</td>
<td>± 0.0025 [t]</td>
</tr>
<tr>
<td>L*</td>
<td>1</td>
<td>200...+400</td>
<td>± 3.0 °C</td>
<td>± 0.75 %</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>+400...+900</td>
<td></td>
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</table>

* Type L is defined in standard DIN 43710, all other types in standard IEC 60584.

**THERMO ELEMENT CONNECTIONS**

- **Thermocouple, Type K, Class 1, According to standard IEC 60584**
  - NiCr White
  - Ni Green

- **Thermocouple, Type N, Class 1, According to standard IEC 60584**
  - NiCrSi Green
  - NiSi Pink

- **Thermocouple, Type J, Class 1, According to standard IEC 60584**
  - Fe Black
  - CuNi White

- **Thermocouple, Type S, Class 1, According to standard IEC 60584**
  - Pt/Rh 90%/10% Orange
  - Pt White

- **Thermocouple, Type R, Class 1, According to standard IEC 60584**
  - Pt/Rh 87%/13% Orange
  - Pt White
IOTKEY® PRODUCTS AND SERVICES

WIRELESS FOR INDUSTRIAL APPLICATIONS
- Industry grade turn-key solution for cost efficient wireless measurements
- Fast and simple setup also for retro-fit and temporary installations
- Reliable, long range, low power wireless data communication with excellent immunity to interference even in demanding conditions.

SMARTER MAINTENANCE FOR BETTER PRODUCTIVITY
- Prevent, detect, locate and diagnose problems and failures faster and more efficiently
- Optimize inspection and maintenance intervals, conditions, product life-cycle and warranty costs based on real world up-to-date measurements
- Get more insight with more data - temperature, humidity, pressure level, vibration, oil quality, current, etc.

FUTURE-PROOF FLEXIBILITY
- Use as a stand-alone solution or integrate to existing systems
- Scale up with new sensors, locations and monitoring options
- Simple web-based access to real time data, trends and measurement configurations – anytime and anywhere, also with mobile devices.

APPLICATION EXAMPLES
- Problem diagnostics and preventive maintenance for bearings, pumps, gears, turbines, etc.
- Detection of efficiency drops and maintenance needs in heat exchangers
- Advanced and continuous oil quality monitoring for product maintenance, life cycle and cost optimization
- Environmental measurements and monitoring for warehouses and storage areas, laboratory space, etc.
- Remote monitoring for levels and temperatures in water supply and waste water networks
- Monitoring and improving energy efficiency in district heating systems
- Mobile measuring sets for temporary condition monitoring of machines and production facilities.

IoTKey® TRANSMITTER WLT 310
- Encrypted wireless LoRa communication
- Long range, low power and excellent interference immunity
- 1–3 sensors per transmitter, e.g. temperature, humidity, pressure, vibration, oil quality
- Configurable measuring interval and alarms.

IoTKey® GATEWAY & MONITORING
- Data routing (4G/Ethernet) to IoTKey cloud or any other system
- Real time monitoring, alarms and history data anywhere with any web enabled device
- Configurable dashboard views and measuring parameters.

TYPICAL INDUSTRY SECTORS
- Manufacturing
- Water & Infrastructure
- Energy
1 Threaded temperature sensor without neck pipe
   T-B-Ø / W-B-Ø

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2 Threaded temperature sensor with neck pipe and thermowell
   T-B-Ø / W-B-Ø

page 16-17

3 Flanged temperature sensor
   T-F / W-F

page 18-19

4 Weldable temperature sensor
   T-D / W-D

page 20-21

5 Threaded temperature sensor with neck pipe and sensing element
   T-H-12 / W-H-12

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6 Indoor/outdoor resistance temperature sensor
   W-K-F / W-M-F

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7 Mineral insulated element
   T-M-Ø / W-M-Ø

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8 Immersible temperature sensor

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9 Immersible thermocouple sensor
   T-K / T-AK / T-AKK

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10 Mineral insulated thermocouple or resistance sensor with cable
    T-M-303 / W-M-303 or T-M-302 / W-M-302

page 32-33

11 Mineral insulated thermocouple insert with connector
    T-M-313 or T-M-314

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12 Mineral insulated insert with connection head
    T-M-N / W-M-N

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13 Acid proof temperature sensor for hygienic installation
    T-M-6-HST-S / W-M-6-HST-CLAMP

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14 Pipe surface temperature sensor
    T-RO / W-RO

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15 Surface temperature sensor
    T-A-303-P / W-A-303 or T-P / W-P

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16 Temperature sensor
    T-CABLE / W-CABLE

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17 Bayonet temperature sensor
    T-BAJO / W-BAJO

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18 Magnetic temperature sensor
    T-MAGN / W-MAGN

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19 Temperature sensor for food industry
    T-106 / W-106

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20 Bearing temperature sensor
    T-BTD / W-BTD

page 52-53

21 Multi-point temperature sensor
    T-MP / W-MP or T-MPT / W-MPT

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22 Threaded temperature sensor with cable
    T-SCREW / W-SCREW

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23 Trace heating sensor
    T-W-TRACE or 2x W-TRACE

page 58-59

24 Silicone patch sensor
    T-SIL-PATCH / W-SIL-PATCH or 2x T-SIL-PATCH / 2x W-SIL-PATCH

page 60-61

25 Mineral insulated temperature sensor for multipoint measurement
    nxT-MP-303

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InTey® transmitter
    WLT 310

page 64-65
EPIC® SENSORS T-B-ØK / W-B-ØK
Threaded temperature sensor without neck pipe

Features
- according to DIN 43772 form 2
- temperature range -40...+250 °C
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- AISI 316L as standard delivery material, other materials on request
- MI cable structured sensor element
- internal sensor element replaceable on the fly
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version available.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
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<tr>
<th>Materials</th>
<th>AISI 316L, maximum temperature +250 °C, temporarily +300 °C, other materials on request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td>G, R, metric and NPT threads as standard delivery, other threads on request</td>
</tr>
</tbody>
</table>
| Tolerances Pt100 (IEC 60751) | A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C  
B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C  
1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C  
1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C |
| Tolerances thermocouple (IEC 60584) | Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t  
Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t |
| Temperature range Pt100 | -40...+250 °C |
| Temperature range thermocouple | -40...+250 °C |
| Approvals       | ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL                                    |
| Quality certificate | ISO 9001:2015 issued by DNV                                                        |
| IP rating       | IP65, higher IP rating on request                                                   |


Installation examples
**EPIC® SENSORS T-B-Ø / W-B-Ø**

Threaded temperature sensor with neck pipe and thermowell

### Features
- according to DIN 43772 form 2G
- temperature range -200...+1200 °C
- neck pipe for heat source clearance
- Pt100 or thermocouple as sensing element
- thermowell material according to the application
- Pt100 accuracy class A as a standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- internal sensor element replaceable on the fly
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version available
- neck pipe length 145 mm as standard delivery, other lengths on request.

### Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

### Technical data

#### Materials
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C,
- EN1.4841 heat-resistant steel, maximum temperature +1100 °C, temporarily +1200 °C
- Other materials on request

#### Thread
- G, R, metric and NPT threads as standard delivery, other threads on request

#### Tolerances Pt100
- (IEC 60751)
  - A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
  - B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
  - B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
  - B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

#### Tolerances thermocouple
- (IEC 60584)
  - Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t
  - Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

#### Temperature range Pt100
- -200...+1500 °C

#### Temperature range thermocouple
- -200...+1200 °C depending on thermocouple type and cooling neck length
- Neck pipe length = 250 mm → maximum temperature +750 °C
- Neck pipe length = 300 mm → maximum temperature +1000 °C
- Neck pipe length = 350 mm → maximum temperature +1200 °C

#### Approvals
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

#### Quality certificate
- ISO 9001:2015 issued by DNV

#### IP rating
- IP65, higher IP rating on request

### Product code key

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Pt100 resistance thermometer</td>
</tr>
<tr>
<td>2xW</td>
<td>2 x Pt100 resistance thermometer</td>
</tr>
<tr>
<td>T</td>
<td>thermocouple</td>
</tr>
<tr>
<td>2xT</td>
<td>2 x thermocouple</td>
</tr>
<tr>
<td>B</td>
<td>threaded sensor type (constant in code)</td>
</tr>
<tr>
<td>6, 8, 9, 11, 12</td>
<td>sensor element outer diameter (ØOD) [mm]</td>
</tr>
<tr>
<td>1, 2</td>
<td>connection head B</td>
</tr>
<tr>
<td>D/H</td>
<td>connection head with snap lock</td>
</tr>
<tr>
<td>D/H/D</td>
<td>connection head with snap lock and double barrel (2x cable gland)</td>
</tr>
<tr>
<td>D/H/H</td>
<td>high cover connection head with snap lock</td>
</tr>
<tr>
<td>D/H/H/D</td>
<td>high cover connection head with snap lock and double barrel (2x cable gland)</td>
</tr>
<tr>
<td>EXD</td>
<td>ATEX-compatible connection head</td>
</tr>
<tr>
<td>HST</td>
<td>acid proof connection head</td>
</tr>
<tr>
<td>N</td>
<td>connection head N</td>
</tr>
<tr>
<td>160</td>
<td>length L [mm]</td>
</tr>
<tr>
<td>Ø6½&quot;</td>
<td>thread size (all available, also NPT)</td>
</tr>
<tr>
<td>4, 3, 2</td>
<td>Pt100 wire count</td>
</tr>
<tr>
<td>K, N, J</td>
<td>thermocouple type</td>
</tr>
<tr>
<td>A, B</td>
<td>Pt100 accuracy class, (class A as standard delivery)</td>
</tr>
<tr>
<td>1, 2, 3</td>
<td>thermocouple accuracy class, (class 1 as standard delivery)</td>
</tr>
<tr>
<td>TR</td>
<td>wires for transmitter connection</td>
</tr>
<tr>
<td>CB</td>
<td>with ceramic terminal block</td>
</tr>
<tr>
<td>X</td>
<td>additional details on the last line</td>
</tr>
</tbody>
</table>

### Installation examples
**EPIC® SENSORS T-F / W-F**

**Flanged temperature sensor**

### Features
- according to DIN 43772 form 2F
- temperature range -200...+1200 °C
- neck pipe for heat source clearance
- AISI 316L as standard delivery material, other materials on request
- Pt 100 or thermocouple as sensing element
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- Mi cable structured sensor element
- internal sensor element replaceable on the fly
- flange size and type according to customer application
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available
- typical neck pipe length 145 mm, other lengths on request.

### Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

### Technical data

#### Thermowell materials
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C, EN1.4841 heat-resistant steel, maximum temperature +1100 °C, temporarily +1200 °C
- Other materials on request

#### Flange
- Flat face DIN EN 1092-1, type 05A, other flange types on request

#### Tolerances Pt100 (IEC 60751)
- A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
- B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

#### Tolerances thermocouple (IEC 60584)
- Type J tolerance class 1 = -40...375 °C ± 1.5 °C, 375...750 °C ±0.004 x t
- Type J and N tolerance class 1 = -40...375 °C ± 1.5 °C, 375...1000 °C ±0.004 x t

#### Temperature range Pt100
- -200...+550 °C

#### Temperature range thermocouple
- -200...+1200 °C, depending on thermocouple type and cooling neck length
- Neck pipe length = 250 mm - temp. max. +750 °C
- Neck pipe length = 300 mm - temp. max. +1000 °C
- Neck pipe length = 350 mm - temp. max. +1200 °C

#### Approvals
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

#### Quality certificate
- ISO 9001:2015 issued by DNV

#### IP rating
- IP65, higher IP rating on request

### Drawing

#### Product code key

- W = Pt100 resistance thermometer
- 2xW = 2 x Pt100 resistance thermometer
- T = thermocouple
- 2xT = 2 x thermocouple
- F = sensor with flange (constant in code)

- 11, 15, 22 = thermowell outer diameter (ØOD) [mm]
- (other diameters on request)

- L = length, L [mm]
- (typically 145 mm)

- Ø12 = cable gland for max Ø14 mm

- connection head D/H
- snap lock
- joint hinge

= Pt100 resistance thermometer

- 2xW = 2 x Pt100 resistance thermometer

- 11, 15, 22 = thermowell outer diameter (ØOD) [mm]
- (other diameters on request)

- L = length, L [mm]
- (typically 145 mm)

- Ø12 = cable gland for max Ø14 mm

= sensor with flange (constant in code)

- 11, 15, 22 = thermowell outer diameter (ØOD) [mm]
- (other diameters on request)

- L = length, L [mm]
- (typically 145 mm)

- Ø12 = cable gland for max Ø14 mm

- connection head D/H
- snap lock
- joint hinge

= Pt100 wire count

- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

= thermocouple type

- A,B = Pt100 accuracy class, (class A as standard delivery)
- J/L,S = thermocouple accuracy class, (class 1 as standard delivery)

= wires for transmitter connection

= with ceramic terminal block

= additional details on the text line

### Example code:


### Installation examples
EPIC® SENSORS T-D / W-D
Weldable temperature sensor

Features
- according to DIN 43772 form 4
- temperature range -200...+1200 °C
- neck pipe for heat source clearance
- with weldable thermowell
- AISI 316L as standard delivery material, other materials on request
- Pt 100 or thermocouple as sensing element
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- internal sensor element replaceable on the fly
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available
- neck pipe length 165 mm as standard delivery, other lengths on request.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

Materials
- AISI 316L, max. temperature +550 °C, temporarily +600 °C
- 10CrMo910/1.7380, max. temperature +580 °C
- 16Mo3/1.5415, max. temperature +480 °C

Other materials available on request, for example:
- AISI S31803/1.4462, SMO254/1.4547, AISI304L/1.4307, TiGr2/3.7035, etc.

Thermowell types
- D1, D2, D3, D4, D5, D6 with M18x1.5 thread or
- D1/S, D2/S, D4/S, D5/S with M14x1.5 thread

According to standard DIN 43772 form 4, other thermowell types on request

Tolerances Pt100
(IEC 60751)
- A tolerance ±0.15 ± 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 ± 0.005 x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±0.3 ± 0.005 x t, operating temperature -196...+600 °C
- B 1/10 DIN, tolerance ±0.3 ± 0.005 x t, operating temperature -196...+600 °C

Tolerances thermocouple
(IEC 60584)
- Type J tolerance class 1 = -40...375 °C ± 1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ± 1.5 °C, 375...1000 °C ±0.004 x t

Temperature range Pt100
- -200...+550 °C

Temperature range thermocouple
- -200...+1200 °C depending on thermoelement, thermowell material and cooling neck length
- Neck pipe length = 250 mm, temp. max. +750 °C
- Neck pipe length = 300 mm, temp. max. +1000 °C
- Neck pipe length = 350 mm, temp. max. +1200 °C

Approvals
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV

IP rating
- IP65, higher IP rating on request

Drawing

Product code key


Installation examples

Features
- according to DIN 43772 form 4
- temperature range -200...+1200 °C
- neck pipe for heat source clearance
- with weldable thermowell
- AISI 316L as standard delivery material, other materials on request
- Pt 100 or thermocouple as sensing element
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- internal sensor element replaceable on the fly
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available
- neck pipe length 165 mm as standard delivery, other lengths on request.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

Materials
- AISI 316L, max. temperature +550 °C, temporarily +600 °C
- 10CrMo910/1.7380, max. temperature +580 °C
- 16Mo3/1.5415, max. temperature +480 °C

Other materials available on request, for example:
- AISI S31803/1.4462, SMO254/1.4547, AISI304L/1.4307, TiGr2/3.7035, etc.

Thermowell types
- D1, D2, D3, D4, D5, D6 with M18x1.5 thread or
- D1/S, D2/S, D4/S, D5/S with M14x1.5 thread

According to standard DIN 43772 form 4, other thermowell types on request

Tolerances Pt100
(IEC 60751)
- A tolerance ±0.15 ± 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 ± 0.005 x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±0.3 ± 0.005 x t, operating temperature -196...+600 °C
- B 1/10 DIN, tolerance ±0.3 ± 0.005 x t, operating temperature -196...+600 °C

Tolerances thermocouple
(IEC 60584)
- Type J tolerance class 1 = -40...375 °C ± 1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ± 1.5 °C, 375...1000 °C ±0.004 x t

Temperature range Pt100
- -200...+550 °C

Temperature range thermocouple
- -200...+1200 °C depending on thermoelement, thermowell material and cooling neck length
- Neck pipe length = 250 mm, temp. max. +750 °C
- Neck pipe length = 300 mm, temp. max. +1000 °C
- Neck pipe length = 350 mm, temp. max. +1200 °C

Approvals
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV

IP rating
- IP65, higher IP rating on request
EPIC® SENSORS T-H-12 / W-H-12
Threaded temperature sensor with neck pipe and sensing element

Features
- temperature range -200...+1200 °C
- neck pipe for heat source clearance
- thread attachable to thermowell or process
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- internal sensor element replaceable on the fly
- standard delivery length for sensor element is 315, 375 or 435mm, other lengths available on request
- neck pipe length 165 mm as standard delivery, other lengths on request
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Thread</th>
<th>M14x1.5 or M18x1.5 thread as standard delivery, other threads on request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal sensor element diameter</td>
<td>3, 6 or 8 mm</td>
</tr>
<tr>
<td>Tolerances Pt100 (IEC 60751)</td>
<td>A tolerance ±0.5 + 0.002 x t, operating temperature -100...+450 °C</td>
</tr>
<tr>
<td></td>
<td>B tolerance ±0.3 + 0.003 x t, operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td>Tolerances thermocouple (IEC 60584)</td>
<td>Type J tolerance class 1 = -40...+375 °C ±1.5 °C, 375...750 °C ±0.004 x t</td>
</tr>
<tr>
<td></td>
<td>Type K and N tolerance class 1 = -40...+375 °C ±1.5 °C, 375...1000 °C ±0.004 x t</td>
</tr>
<tr>
<td>Temperature range Pt100</td>
<td>-200...+1500 °C</td>
</tr>
<tr>
<td>Temperature range thermocouple</td>
<td>-200...+1200 °C depending on thermocouple type, thermowell materials and cooling neck length</td>
</tr>
<tr>
<td></td>
<td>Neck pipe length = 250 mm → temp. max. +750 °C</td>
</tr>
<tr>
<td></td>
<td>Neck pipe length = 300 mm → temp. max. +1000 °C</td>
</tr>
<tr>
<td></td>
<td>Neck pipe length = 350 mm → temp. max. +1200 °C</td>
</tr>
<tr>
<td>Approvals</td>
<td>ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL</td>
</tr>
<tr>
<td>Quality certificate</td>
<td>ISO 9001 2015 issued by DNV</td>
</tr>
<tr>
<td>IP rating</td>
<td>IP65, higher IP rating on request</td>
</tr>
</tbody>
</table>

Approvals
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL
- IP65, higher IP rating on request

Installation examples

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Drawing

Example code: W = Pt100 resistance thermometer
2xW = 2 x Pt100 resistance thermometer
T = thermocouple
2xT = 2 x thermocouple
H = external diameter of neck pipe [mm]
X = additional details on the text line

Product code key


Installation examples


Installation examples
EPIC® SENSORS W-K-F / W-M-F
Indoor/outdoor resistance temperature sensor

Features
- temperature range -40...+80 °C
- Pt100 as sensing element
- Pt100 accuracy class A as standard delivery
- fast response time
- can be supplied with mA transmitter
- available with plastic or metal housing
- tailored solutions according to customer specific needs
- thermocouple versions available on request
- ATEX compatible Ex db-version also available.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Plastic enclosure dimensions 120x80x58 mm (W x H x D), Metal enclosure dimensions 80x75x58 mm (W x H x D) Other enclosures on request</th>
</tr>
</thead>
</table>
| Tolerances Pt100   | A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C  
                    | B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C  
                    | B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C  
                    | B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C |
| Temperature range Pt100 | -40...+80 °C, other measurement ranges on request                                                                                       |
| Approvals          | ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL                                                                                             |
| Quality certificate| ISO 9001:2015 issued by DNV                                                                                                                  |
| IP rating          | IP65, higher IP rating on request                                                                                                           |

Product code key


- W = Pt100 resistance thermometer
- 2xW = 2 x Pt100 resistance thermometer
- K = plastic enclosure
- M = metallic enclosure
- F = sensor type (constant in code)
- 4,3,2 = Pt100 wire count
- A, B = Pt100 accuracy class
- TR = sensor type (constant in code)
- CB = with ceramic terminal block
- X = additional details on text line

Approvals
- ATEX Ex d-versions: contact our sales

Installation examples
EPIC® SENSORS T-M-Ø / W-M-Ø
Mineral insulated element

Features
- similar to DIN 43762
- temperature range -200...+1200 °C
- Pt100 or thermocouple as sensing element
- AISI 316L or INCONEL 600 as standard delivery material, other materials on request
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- bendable
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Special applications
- for very high temperature solutions we can offer special thermocouple inserts with ceramic tubing and platinum wiring up to +1600 °C
- for this type of insert please contact our sales.

Technical data

Materials
- AISI 316L, max. temperature +550 °C; temporarily +600 °C
- INCONEL 600, max. temperature +1100 °C; temporarily +1200 °C
- Other materials on request

Tolerances Pt100
- (IEC 60751)
  A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
  B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
  B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
  B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

Tolerances thermocouple
- (IEC 60584)
  Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
  Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

Temperature range Pt100
- -200...+1200 °C, depending on sensor housing materials

Temperature range thermocouple
- -200...+1200 °C, depending on thermocouple type and sensor housing materials

Approvals
- METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV

IP rating
- IP65, higher IP rating on request


Product code key
- W = Pt100 resistance thermometer
- 2xW = 2 x Pt100 resistance thermometer
- T = thermocouple
- 2xT = 2 x thermocouple
- M = mineral insulated sensor [constant in code]
- 3, 6, 8 = outer diameter of MI cable [ØOD] [mm]
- 315 = length, L [mm]
- 4,3,2 = Pt100 wire count
- K, N, J = Pt100 wire count
- A, B = Pt100 accuracy class (class A as standard delivery)
- 1,2,3 = thermocouple accuracy class, (class 1 as standard delivery)
- TR = wires for transmitter connection
- CB = with ceramic terminal block
- X = additional details on the text line

W-M-6/315-3-A-CB
Pt100 resistance thermometer for 3 wire measurement, Pt100 with accuracy class A, mineral insulated element with diameter 6 mm and length 315 mm, ceramic block for cable connection.

T-M-6-SV/1500-K-1-TR
Thermocouple type K with accuracy class 1, mineral insulated element with diameter 6 mm and length 1500 mm, reinforced structure, connection head has space for housing, mA current transmitter block.
Immersible temperature sensor

Features
- according to DIN 43772 form 1
- temperature range -200...+1200 °C
- AISI 316L/EN1.4044 or heat-resistant steel AISI 446-1/EN1.4749 as typical material, other materials on request
- available with solid tip
- 200 mm as typical length for the solid tip
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- internal sensor element replaceable on the fly
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermowell material</td>
<td>AISI 316L/EN1.4044 max. temperature +550 °C, temporarily +600 °C, AISI 446-1/EN1.4749 max. temperature +1150 °C, temporarily +1200 °C</td>
</tr>
<tr>
<td>Other materials on request</td>
<td></td>
</tr>
<tr>
<td>Thermowell tip material</td>
<td>AISI 316L/EN1.4044 max. temperature +550 °C, temporarily +600 °C, AISI 446-1/EN1.4749 max. temperature +1150 °C, temporarily +1200 °C</td>
</tr>
<tr>
<td>Other materials on request</td>
<td></td>
</tr>
</tbody>
</table>

Tolerances Pt100 (IEC 60751)
- A tolerance ±0.15 ± 0.002 °C x t, operating temperature -100...+450 °C
- B tolerance ±0.3 ± 0.005 °C x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±0.3 ± 0.005 °C x t, operating temperature -196...+600 °C
- B ±1/10 DIN, tolerance ±0.3 ± 0.005 °C x t, operating temperature -196...+600 °C

Tolerances thermocouple (IEC 60584)

Type J tolerance class 1 = ±0.06 ± 0.001 °C x t, (t = operating temperature in °C)
Type K and N tolerance class 1 = ±0.06 ± 0.001 °C x t

Temperature range Pt100
-200...+550 °C, depending on housing and thermowell materials

Temperature range thermocouple
-200...+1200 °C, depending on thermocouple type and thermowell materials

Approvals
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL
- ISO 9001:2015 issued by DNV
- IP rating IP65, higher IP rating on request

Product code key

Example code: T — A — 22 — D/H — U / 1000 / 1.4749 — K — 1 — TR — X
- W = Pt100 resistance thermometer
- 2xW = 2 x Pt100 resistance thermometer
- 2xT = 2 x thermocouple
- A = immersible sensor type (constant in code)
- Ø = outer diameter of sensor element (ØOD) [mm] (other diameters available on request)
- L = length, L [mm]

T = thermowell or tip material, (other materials on request)
- 1.4404, 1.4749 = AISI 316L/EN1.4044, AISI 446-1/EN1.4749
- U = without solid tip
- U = with solid tip (tip length typically 200 mm)

1000 = length, L [mm]
1.4404, 1.4749 = thermowell or tip material, (other materials on request)
1, 2, 3 = Pt100 wire count
K, N, J = thermocouple type
A, B = Pt100 accuracy class, (class A as standard delivery)
1, 2, 3 = thermocouple accuracy class, (class 1 as standard delivery)
TR = for transmitter connection
CB = with ceramic terminal block
X = additional details on the text line

Installation examples

W-A-22-EXD-500/1.4404-4-A-CB
Pt100 resistance thermometer for 4 wire measurement, Pt100 with accuracy class A, immersible sensor type, 22 mm diameter for sensor element, ATEX compatible housing, without solid tip, sensor length 500 mm, materials AISI316L/EN1.4404, with ceramic block for cable connection.
EPIC® SENSORS T-K / T-AK / T-AKK
Immersible thermocouple sensor

Features
- similar to DIN 43733
- temperature range -200...+1600 °C
- thermocouple as sensing element
- thermocouple accuracy class 1 as standard delivery
- ceramic thermowell with C610 or C799 as typical material, other materials on request
- ceramic C610 and C799 are gas-tight materials
- typical neckpipe materials AISI304/316L
- thermo-cement filling in between neckpipe and ceramic
- installation recommendation with weldable flange, adjustable flange or with gas tight compression fitting
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available.

Typical applications
- very high temperature applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data
Thermowell material
Ceramic C610 max. temperature +1500 °C, gas-tight, medium to good thermal shock resistance
Ceramic C799 max. temperature +1600 °C, gas-tight, medium thermal shock resistance
Other materials on request

Tolerances thermocouple (IEC 60584)
Type J tolerance class 1 = -40...+375 °C ±1.5 °C, +375...+750 °C +/- 0.004 x t
Type K and N tolerance class 1 = -40...+375 °C ±1.5 °C, +375...+1000 °C ±0.004 x t
Type R and S tolerance class 1 = 0...+1100 °C ±1 °C, 1100...+1600 °C ±[1+0.003(t-1100)] °C

Temperature range -200...+1700 °C, depending on thermocouple type, thermowell material and neck pipe length

Approvals
ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

Quality certificate
ISO 9001:2015 issued by DNV

IP rating
IP65, higher IP rating on request

Installation examples

Drawing

Product code key


Features
- similar to DIN 43733
- temperature range -200...+1600 °C
- thermocouple as sensing element
- thermocouple accuracy class 1 as standard delivery
- ceramic thermowell with C610 or C799 as typical material, other materials on request
- ceramic C610 and C799 are gas-tight materials
- typical neckpipe materials AISI304/316L
- thermo-cement filling in between neckpipe and ceramic
- installation recommendation with weldable flange, adjustable flange or with gas tight compression fitting
- tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available.

Typical applications
- very high temperature applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data
Thermowell material
Ceramic C610 max. temperature +1500 °C, gas-tight, medium to good thermal shock resistance
Ceramic C799 max. temperature +1600 °C, gas-tight, medium thermal shock resistance
Other materials on request

Tolerances thermocouple (IEC 60584)
Type J tolerance class 1 = -40...+375 °C ±1.5 °C, +375...+750 °C +/- 0.004 x t
Type K and N tolerance class 1 = -40...+375 °C ±1.5 °C, +375...+1000 °C ±0.004 x t
Type R and S tolerance class 1 = 0...+1100 °C ±1 °C, 1100...+1600 °C ±[1+0.003(t-1100)] °C

Temperature range -200...+1700 °C, depending on thermocouple type, thermowell material and neck pipe length

Approvals
ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

Quality certificate
ISO 9001:2015 issued by DNV

IP rating
IP65, higher IP rating on request

Installation examples
EPIC SENSORS T-M-303 / W-M-303 or T-M-302 / W-M-302
Mineral insulated thermocouple or resistance sensor with cable

Features
- according to DIN 43721
- temperature range -200...+1200 °C
- Pt 100 or thermocouple as sensing element
- AISI 316L or INCONEL 600 as standard delivery material, other materials on request
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- bendable
- vibration proof
- ATEX compatible Ex e version also available.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

Materials
- AISI 316L, max. temperature +550 °C, temporarily +600 °C
- INCONEL 600, max. temperature +1100 °C, temporarily +1200 °C
- Other materials on request
(Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Cable materials
- SIL = silicone, max. +180 °C
- TEF = Teflon®, max. +205 °C
- GGD = glass silk cable/metal braid, max. +350 °C
- FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C
- SDS = silicone wire insulation/braid/shield/silicone jacket, only available as 2 wire cable, max. +180 °C
- TTD = Teflon® wire insulation/braid/shield/Teflon® jacket, max. +205 °C
- FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C
- FS = FEP wire insulation/shield, max. +180 °C
- CON = no cable, individual single wires, FEP wire insulation, max. +205 °C
(Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Tolerances Pt100
- IEC 60751
- A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
- C tolerance ±1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

Tolerances thermocouple
- IEC 60584
- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

Temperature range Pt100
- -200...+550 °C, depending on sensor element and cable material
(Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Temperature range thermocouple
- -200...+1200 °C, depending on thermocouple type and other sensor materials
(Note: maximum safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Approvals
- ATEX, RU Ex, EAC, IECEx, METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV

IP rating
- IP65, higher IP rating on request
EPIC® SENSORS T-M-313 or T-M-314
Mineral insulated thermocouple insert with connector

Features
- according to DIN 43721
- temperature range -200...+1200 °C
- thermocouple as sensing element
- thermocouple accuracy class 1 as standard delivery
- available with standard STD or mini-plug
- AISI 316L and INCONEL 600 as standard materials, other materials on request
- MI cable structured sensor element
- bendable
- vibration proof
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Product code key
T = thermocouple
2xT = 2 x thermocouple
M = MI cable structured sensor (constant in code)
313 = with STD connector
314 = with mini connector
0.5, 1, 1.5, 2, 3, 4.5, 6
outer diameter of sensor element (ØOD) [mm]
(Note: mini connector up to 4.5mm diameter)
(L other diameters on request)
1000 = immersion length, L [mm]
K, N, J = thermocouple type
1, 2, 3 = thermocouple accuracy class, (class 1 as standard delivery)
X = additional details on the text line

Technical data

<table>
<thead>
<tr>
<th>Materials</th>
<th>AISI 316L, maximum temperature +550 °C, temporarily +600 °C, INCONEL 600, maximum temperature +1100 °C, temporarily +1200 °C Other materials on request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectors</td>
<td>Construction &quot;313&quot; = connector with round pins, STD Construction &quot;314&quot; = connector with flat pins, mini</td>
</tr>
<tr>
<td>Diameter</td>
<td>0.5 / 1.0 / 1.5 / 2.0 / 3.0 / 4.5 / 6.0 mm (Note: mini connector up to 4.5 mm element diameter)</td>
</tr>
<tr>
<td>Color</td>
<td>According to EN 60584</td>
</tr>
<tr>
<td>Tolerances thermocouple (IEC 60584)</td>
<td>Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t</td>
</tr>
<tr>
<td>Temperature range</td>
<td>thermocouple -200...+1200 °C, depending on thermocouple type and sensor element material</td>
</tr>
<tr>
<td>Approvals</td>
<td>METROLOGICAL PATTERN APPROVAL</td>
</tr>
<tr>
<td>Quality certificate</td>
<td>ISO 9001:2015 issued by DNV</td>
</tr>
</tbody>
</table>

Installation examples

Drawing

Example code: T — M — 313 — 3 / 1000 — K — 1 — X
**EPIC SENSORS T-M-N / W-M-N**

Mineral insulated insert with connection head

### Features
- According to DIN 43721
- Temperature range -200...+1200 °C
- AISI 316L or INCONEL 600 as standard delivery material, other materials on request
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- Thermocouple accuracy class 1 as standard delivery
- MI cable structured sensor element
- Bendable
- Vibration proof
- Typically used with compression fitting
- Adjustable immersion length can be achieved
- Tailored solutions according to customer specific needs
- ATEX compatible Ex db version also available.

### Typical applications
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery and vessel construction
- Manufacturing industry.

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**Technical data**

**Materials**
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C
- INCONEL 600, maximum temperature +1100 °C, temporarily +1200 °C
- Other materials on request

**Tolerances Pt100 (IEC 60751)**
- A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
- B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

**Tolerances thermocouple (IEC 60584)**
- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

**Temperature range Pt100**
- -200...+550 °C, depending on sensor element material and length

**Temperature range thermocouple**
- -40...+1200 °C, depending on thermocouple type, sensor element material and length

**Approvals**
- ATEX, RU Ex, EAC, METROLOGICAL PATTERN APPROVAL

**Quality certificate**
- ISO 9001:2015 issued by DNV

**IP rating**
- IP65, higher IP rating on request

**Product code key**

Example code: T-M-HST-L / 1000-K-1-CB-X

**Drawing**

**Installation examples**

Thermocouple, mineral insulated sensor type with connection head D/W/H, no thread between the sensor element and connection head, no compression fitting in the sensor element, the sensor element’s diameter is 6 mm and length 5000 mm, thermocouple type N with accuracy class 1, connection head suitable for mA current transmitter housing.

---
EPIC® SENSORS W-E-6-HST-S / W-E-6-HST-CLAMP
Acid proof temperature sensor for hygienic installation

Features
- temperature range -200...+550 °C
- shaped for hygienic installations
- Pt100 as sensing element
- Pt100 accuracy class A as standard delivery
- mounting by weldable ball flange or with tri-clamp fitting
- thermowell material according to the application
- Mi cable structured inner element
- inner element replaceable on the fly
- vibration proof
- tailored solutions according to customer specific needs.

Typical applications
- food industry
- pharmaceutical industry
- chemical industry
- process industry
- energy and power plant technology
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Material</th>
<th>AISI 316 L, max. temperature +550 °C, temporarily +600 °C, other materials on request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerances Pt100</td>
<td>class 1, ± 0.15 + 0.002 x t, operating temperature -100...+650 °C</td>
</tr>
<tr>
<td></td>
<td>B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td>Temperature range Pt100</td>
<td>-200...+550 °C, depending on materials and neck pipe length</td>
</tr>
<tr>
<td>Approvals</td>
<td>METROLOGICAL PATTERN APPROVAL</td>
</tr>
<tr>
<td>Quality certificate</td>
<td>ISO 9001:2015 issued by DNV</td>
</tr>
<tr>
<td>IP rating</td>
<td>IP65, higher IP rating on request</td>
</tr>
</tbody>
</table>

Approvals
- METROLOGICAL PATTERN APPROVAL
- ISO 9001:2015 issued by DNV
- IP65, higher IP rating on request

Installation examples
EPIC® SENSORS T-RO / W-RO
Pipe surface temperature sensor

Features
- temperature range -200...+550 °C
- fitting for pipes or other cylindrical shapes
- fitting can be welded to the sensor element at factory
- sensors with no welded fitting meet the ATEX Ex e, EAC, IECEx, and Russian Ex requirements
- fitting can be supplied as separate item
- Pt 100 or thermocouple as sensing element
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- AISI 316L as standard delivery material, other materials on request
- MI cable structured sensor element
- bendable
- vibration proof
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

Materials
- AISI 316L, max. temperature +550 °C, temporarily +600 °C, other materials on request
- (Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Fittings available for pipe sizes
- 0...1000 mm, other sizes on request

Cable material
- SIL = silicone, max. +180 °C
- FEP = Teflon®, max. +205 °C
- GGD = glass silk cable/metal braid jacket, max. +350 °C
- FDF = FEP wire insulation/braid shield/FEP jacket, max. +200 °C
- SDS = silicone wire insulation/braid shield/silicone jacket, max. +180 °C
- TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
- FDS = FEP wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C
- FS = FEP wire insulation/silicone jacket, max. +180 °C
- CON = no cable, individual single wires, FEP wire insulation, max. +205 °C
- (Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Tolerances Pt100
- A tolerance ±0.15 + 0.002 x t, operating temperature -100...+400 °C
- B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
- B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
- (Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Tolerances thermocouple
- Type J tolerance class 1 = ±0.15 + 0.002 x t, operating temperature -40...+375 °C
- Type K and N tolerance class 1 = ±0.3 + 0.005 x t, operating temperature -40...+375 °C
- (Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Temperature range Pt100
- -200...+550 °C, depending on materials and neck pipe length
- (Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Temperature range thermocouple
- -200...+550 °C, depending on thermocouple type, materials and neck pipe length
- (Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Approvals
- ATEX Ex e, EAC, IECEx, and Russian Ex with remarks (see features), METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV

Pie chart

Example code:


Installation examples
**EPIC® SENSORS T-M-P / W-M-P or T-P / W-P**

**Surface temperature sensor**

**Features**
- temperature range -200...+550 °C
- fitting for plane surfaces
- fitting can be welded to sensor element at factory
- sensors with no welded fitting meet the ATEX Ex e, EAC, IECEx, and Russian Ex requirements
- fitting can be supplied as separate item
- installation typically with welding, bolt or steel ties
- Pt 100 or thermocouple as sensing element
- AISI 316L as standard delivery material, other materials on request
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- MI cable structured
- bendable sensor element
- vibration proof
- tailored solutions according to customer specific needs.

**Typical applications**
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

**Technical data**

**Materials**
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C, other materials on request (Note. max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

**Cable materials**
- SIL = silicone, max. +180 °C
- FEP = Teflon®, max. +205 °C
- GGD = glass silk cable/metal braid jacket, max. +350 °C
- FDS = FEP wire insulation/braid shield/FEP jacket, max. +205 °C
- SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C
- TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
- FS = FEP wire insulation/silicone jacket, max. +180 °C
- CON = no cable, individual single wires, FEP wire insulation, max. +205 °C

**Dimensions**
- 5x9x45 (WxHxL) (hole Ø5.1 mm), 12x12x50 (WxHxL) (hole Ø8.0 mm), other dimensions on request

**Tolerances Pt100 (IEC 60751)**
- A tolerance ±0.5 + 0.002 t, operating temperature -100...-450 °C
- B tolerance ±0.3 + 0.005 t, operating temperature -196...-600 °C
- B 1/10 DIN, tolerance ±0.1 t (3.3 + 0.005 x t), operating temperature -196...-600 °C
- B 1/10 DIN, tolerance ±0.1 t (3.3 + 0.005 x t), operating temperature -196...-600 °C

**Tolerances thermocouple (IEC 60584)**
- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

**Temperature range Pt100**
- -200...+550 °C, depending on materials and length of the MI cable or sensor element

**Temperature range thermocouple**
- -200...+550 °C, depending on thermocouple type, materials and length of the MI cable or sensor element (Note. max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

**Approvals**
- ATEX Ex e, EAC, IECEx, and RU Ex with remarks (see features), METROLOGICAL PATTERN APPROVAL

**Quality certificate**
- ISO 9001:2015 issued by DNV

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**Product code key**

Example code: W = Pt100 wire count
- M = thermocouple
- P = 4 wire measurement, surface temperature sensor with non-bending structure, sensor element with diameter of Ø6 mm, tip piece dimensions 5x9x45 mm, delivered with 15 meter glass silk cable which has metal braid jacket for mechanical stress reduction, maximum temperature +350 °C

**Installation examples**

Steel collar installation

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**Drawing**

**Example code:** W = Pt100 resistance thermometer
- M — Pt100 resistance thermometer
- P = 4 wire measurement, surface temperature sensor with non-bending structure, sensor element with diameter of Ø6 mm, tip piece dimensions 5x9x45 mm, delivered with 15 meter glass silk cable which has metal braid jacket for mechanical stress reduction, maximum temperature +350 °C

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**Technical data**

**Materials**
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C, other materials on request (Note. max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

**Cable materials**
- SIL = silicone, max. +180 °C
- FEP = Teflon®, max. +205 °C
- GGD = glass silk cable/metal braid jacket, max. +350 °C
- FDS = FEP wire insulation/braid shield/FEP jacket, max. +205 °C
- SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C
- TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
- FS = FEP wire insulation/silicone jacket, max. +180 °C
- CON = no cable, individual single wires, FEP wire insulation, max. +205 °C

**Dimensions**
- 5x9x45 (WxHxL) (hole Ø5.1 mm), 12x12x50 (WxHxL) (hole Ø8.0 mm), other dimensions on request

**Tolerances Pt100 (IEC 60751)**
- A tolerance ±0.5 + 0.002 t, operating temperature -100...-450 °C
- B tolerance ±0.3 + 0.005 t, operating temperature -196...-600 °C
- B 1/10 DIN, tolerance ±0.1 t (3.3 + 0.005 x t), operating temperature -196...-600 °C

**Tolerances thermocouple (IEC 60584)**
- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

**Temperature range Pt100**
- -200...+550 °C, depending on materials and length of the MI cable or sensor element

**Temperature range thermocouple**
- -200...+550 °C, depending on thermocouple type, materials and length of the MI cable or sensor element (Note. max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

**Approvals**
- ATEX Ex e, EAC, IECEx, and RU Ex with remarks (see features), METROLOGICAL PATTERN APPROVAL

**Quality certificate**
- ISO 9001:2015 issued by DNV
EPIC® SENSORS T-CABLE / W-CABLE
Temperature sensor with cable

Features
- temperature range -200...+350 °C
- Pt100 or thermocouple as sensing element
- AISI 316L as standard delivery material, other materials on request
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- ATEX compatible Ex e version available
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

| Materials | AISI 316L, maximum temperature +300 °C, temporarily +350 °C, other materials on request |
| Diameter | 3, 4, 5, 6 or 8 mm, other diameters on request |

| Cable materials | 
| SIL | silicone, max. +180 °C |
| FEP | Teflon®, max. +205 °C |
| GGD | glass silk cable/metal braid jacket, max. +350 °C |
| FDF | FEP wire insulation/braid shield/FEP jacket, max. +205 °C |
| SDS | silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C |
| TDT | Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C |
| FDS | FEP wire insulation/braid shield/silicone jacket, max. +180 °C |
| FS | FEP wire insulation/silicone jacket, max. +180 °C |
| CON | no cable, individual single wires, FEP wire insulation, max. +205 °C |

| Tolerances Pt100 (IEC 60751) | 
| A tolerance | ±0.15 + 0.002 x t, operating temperature -100...+450 °C |
| B tolerance | ±0.3 + 0.005 x t, operating temperature -196...+600 °C |
| B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C |

| Tolerances thermocouple (IEC 60584) | 
| Type J tolerance class 1 | ±1/2 x 0.3 + 0.005 x t, operating temperature -196...+600 °C |
| Type K and N tolerance class 1 | ±1/2 x 0.3 + 0.005 x t, operating temperature -196...+600 °C |

| Temperature range Pt100 | -200...+350 °C, depending on cable material |
| Temperature range thermocouple | -200...+350 °C, depending on thermocouple type and cable material |

Approvals
- ATEX, RU Ex, EAC, IECEx, METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV
EPIC® SENSORS T-BAJO / W-BAJO
Bayonet temperature sensor

Features
- temperature range -200...+300 °C
- spring-loaded
- suitable for bearings
- vibration proof
- quick installation due to bayonet connection
- AISI 316L as standard delivery material, other materials on request
- Pt 100 or thermocouple as sensing element
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- ATEX compatible Ex e version available
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

Materials
AISI 316L, max. temperature +250 °C, temporarily +300 °C, other materials on request
Sensor diameter
6 or 8mm, other diameters on request
Bayonet cap diameter
12.2 mm, other diameters on request
Cable material
SIL = silicone, max. +180 °C
FEP = Teflon®, max. +205 °C
GGD = glass silk cable/metal braid jacket, max. +350 °C
FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C
SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C
TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C
FS = FEP wire insulation/silicone jacket, max. +180 °C
CON = no cable, individual single wires, FEP wire insulation, max. +205 °C

Tolerances Pt100 (IEC 60751)
A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C

Tolerances thermocouple (IEC 60584)
Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t
Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

Temperature range Pt100
-200...+300 °C, depending on materials
Temperature range thermocouple
-200...+300 °C, depending on thermocouple type and materials
Approvals
ATEX, RU Ex, EAC, IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate
ISO 9001:2015 issued by DNV

Installation example
EPIC® SENSORS T-MAGN / W-MAGN
Magnetic temperature sensor

Features
- temperature range -200...+350 °C
- magnet suitable for high temperatures, does not lose magnetism when heated below +450 °C
- quick installation
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- AISI 316L as standard delivery material, other materials on request
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Materials</th>
<th>AISI 316L, max. temperature +250 °C, temporarily +350 °C, other materials on request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Small magnet, external Ø25 mm / height 7 mm, other dimensions on request</td>
</tr>
<tr>
<td></td>
<td>Large magnet, external Ø60 mm / height 15 mm, other dimensions on request</td>
</tr>
<tr>
<td>Cable materials</td>
<td>SIL  = silicone, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>FEP  = Teflon®, max. +205 °C</td>
</tr>
<tr>
<td></td>
<td>GGD  = glass silk cable/metal braid jacket, max. +350 °C</td>
</tr>
<tr>
<td></td>
<td>FDF  = FEP wire insulation/braid shield/FEP jacket, max. +205 °C</td>
</tr>
<tr>
<td></td>
<td>SDS  = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>TDF  = Teflon® wire insulation/braid shields/Teflon® jacket, max. +205 °C</td>
</tr>
<tr>
<td></td>
<td>FDS  = FEP wire insulation/braid shield/silicone jacket, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>FS   = FEP wire insulation/silicone jacket, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>CON  = no cable, individual single wires, FEP wire insulation, max. +205 °C</td>
</tr>
<tr>
<td>Tolerances Pt100</td>
<td>A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C</td>
</tr>
<tr>
<td>(IEC 60751)</td>
<td>B tolerance ±0.3 x 0.005 x t, operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/3 DIN, tolerance ±1/3 x (0.3 x 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/10 DIN, tolerance ±1/10 x (0.3 x 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td>Tolerances thermocouple</td>
<td>Type K tolerance class 1 = -40...+375 °C ±1.5 °C, 375...750 °C ±0.004 x t</td>
</tr>
<tr>
<td>(IEC 60584)</td>
<td>Type N tolerance class 1 = -40...+375 °C ±5 °C, 375...1000 °C ±0.004 x t</td>
</tr>
<tr>
<td>Temperature range Pt100</td>
<td>-200...+350 °C for large magnet, depending on cable material</td>
</tr>
<tr>
<td></td>
<td>-200...+200 °C for small magnet, depending on cable material</td>
</tr>
<tr>
<td>Temperature range thermocouple</td>
<td>-200...+350 °C for large magnet, depending on cable material</td>
</tr>
<tr>
<td></td>
<td>-200...+200 °C for small magnet, depending on cable material</td>
</tr>
<tr>
<td>Approvals</td>
<td>METROLOGICAL PATTERN APPROVAL</td>
</tr>
<tr>
<td>Quality certificate</td>
<td>ISO 9001:2015 issued by DNV</td>
</tr>
</tbody>
</table>

Drawing

Product code key

Example code: W – MAGN – D25 / 5.5x7 – 5000 / SIL – 4 – A – X

\[ W = Pt100 \text{ resistance thermometer} \]
\[ 2xW = 2 \times Pt100 \text{ resistance thermometer} \]
\[ T = \text{thermocouple} \]
\[ 2xT = 2 \times \text{thermocouple} \]
\[ MAGN = \text{magnetic sensor (constant in code)} \]
\[ D25/5.5x7 = \text{magnet dimensions} \]
\[ 5000 = \text{cable length, CL [mm]} \]
\[ SIL, FEP, GGD, FDF, TDF, SDS, FDS, FS, CON = \text{cable material (for more information, look technical data on first page of the datasheet)} \]
\[ 4,3,2 = \text{Pt100 wire count} \]
\[ A,B = \text{Pt100 accuracy class, (class A as standard delivery)} \]
\[ 1,2,3 = \text{thermocouple accuracy class, (class 1 as standard delivery)} \]
\[ X = \text{additional details on the text line} \]
EPIC® SENSORS T-106 / W-106
Temperature sensor for food industry

Features
- temperature range -200...+300 °C
- sharp tip
- handle
- Pt100 resistance thermometer as sensing element
- Pt100 accuracy class A as standard delivery
- AISI 316L as standard delivery material, other materials on request
- tailored solutions according to customer specific needs.

Typical applications
- food industry
- chemical industry.

Technical data

<table>
<thead>
<tr>
<th>Materials</th>
<th>AISI 316L, maximum temperature +250 °C, temporarily +300 °C, other materials on request (Note: plastic covered handle max. temperature +110 °C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip diameter</td>
<td>3, 4 or 6 mm, other diameters and tip shapes on request</td>
</tr>
<tr>
<td>Handle material</td>
<td>Plastics as standard delivery material, maximum temperature + 110 °C Available also in acid proof stainless steel</td>
</tr>
<tr>
<td>Cable material</td>
<td>SIL = silicone, max. +180 °C FEP = Teflon®, max. +205 °C GGD = glass silk cable/metal braid jacket, max. +350 °C FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C SBS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C FS = FEP wire insulation/silicone jacket, max. +180 °C CON = no cable, individual single wires, FEP wire insulation, max. +205 °C</td>
</tr>
<tr>
<td>Tolerances Pt100 (IEC 60751)</td>
<td>A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C</td>
</tr>
<tr>
<td>Tolerances thermocouple</td>
<td>Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t</td>
</tr>
<tr>
<td>Temperature range Pt100</td>
<td>-200...+300 °C, depending on material</td>
</tr>
<tr>
<td>Temperature range thermocouple</td>
<td>-200...+300 °C, depending on thermocouple type and material</td>
</tr>
<tr>
<td>Approvals</td>
<td>METROLOGICAL PATTERN APPROVAL</td>
</tr>
<tr>
<td>Quality certificate</td>
<td>ISO 9001:2015 issued by DNV</td>
</tr>
</tbody>
</table>


Product code key

| W = Pt100 resistance thermometer |
| 2xW = 2 x Pt100 resistance thermometer |
| T = thermocouple |
| 2xT = 2 x thermocouple |
| 106 = sensor for food industry (constant in code) |
| 3, 4, 6 = outer diameter of sensor element [ØOD] [mm] |
| 100 = sensor element length, L [mm] |
| 5000 = cable length, CL [mm] |
| SIL, FEP, FEP, FDF, TDT, SDS, FDS, FS, CON = cable material (for more information, look technical data on first page of the datasheet) |
| 4, 3, 2 = Pt100 wire count |
| K, N, J = thermocouple type |
| A, B = Pt100 accuracy class, class A as standard delivery |
| 1, 2, 3 = thermocouple accuracy class, class 1 as standard delivery |
| X = additional details on the text line |

Installation example
EPIC® SENSORS T-BTD / W-BTD
Bearing temperature sensor

Features
- temperature range -200...+300 °C
- suitable for bearing temperature measurement
- flat tip
- spring-loaded screw for installation
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- AISI 316L as standard delivery material, other materials on request
- brass tip as standard delivery material, other tip materials on request
- tailored solutions according to customer specific needs.

Typical applications
- machinery
- motor manufacturing industry
- gear manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Materials</th>
<th>AISI 316L/brass tip, maximum temperature +250 °C, temporarily +300 °C, other materials on request. (Note: overall max. temperature according to the cable material)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip diameter</td>
<td>8 mm, other diameters on request (Note: sensor tube is tapered from tip portion to reduce the heat conduction)</td>
</tr>
</tbody>
</table>
| Cable material            | SIL = silicone, max. +180 °C  
FEP = Teflon®, max. +205 °C  
GGD = glass silk cable/metal braid jacket, max. +350 °C  
FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C  
SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C  
TDT = Teflon® wire insulation/braid shield/ Teflon® jacket, max. +205 °C  
FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C  
FS = FEP wire insulation/silicone jacket, max. +180 °C  
CON = no cable, individual single wires, FEP wire insulation, max. +205 °C  
PUR = polyurethane cable, extremely good oil resistance, max. +80 °C (Note: PUR cable available only for this sensor type) |
| Thread                    | R3/8” as standard delivery,R1/2” as option, other threads on request                                                                                                                                 |
| Tolerances Pt100 (IEC 60751) | A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C  
B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C  
B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C  
B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C |
| Tolerances thermocouple (IEC 60584) | Type J tolerance class 1 = -40...+375 °C ±1.5 °C, 375...750 °C ±0.004 x t  
Type K and N tolerance class 1 = -40...+375 °C ±1.5 °C, 375...1000 °C ±0.004 x t |
| Temperature range Pt100 | -200...+300 °C, depending on cable material                                                                                                                                                    |
| Temperature range thermocouple | -40...+250 °C, depending on thermocouple type and cable material                                                                                                                             |
| Approvals                 | METROLOGICAL PATTERN APPROVAL                                                                                                                                                                   |
| Quality certificate        | ISO 9001:2015 issued by DNV                                                                                                                                                                    |

Example code: W – BTD – Pt100A – L30 – 4M / SIL – X

W  = Pt100 resistance thermometer
2xW = 2 x Pt100 resistance thermometer
T  = thermocouple
2xT = 2 x thermocouple
BTD = bearing sensor (constant in code)
Pt100A = Pt100, with accuracy class A
TC-K1 = thermocouple type K, accuracy class 1
TC-N1 = thermocouple type N, accuracy class 1
TC-J1 = thermocouple type J, accuracy class 1
L30 = length [mm]
4M = cable length, CL [m]
SIL, FEP, GGD, FDF, TDT, SDS, = cable material (for more information, look technical data on first page of the datasheet)
FDS, FS, CON, PUR = additional details on the text line
EPIC® SENSORS T-MP / W-MP or T-MPT / W-MPT
Multi-point temperature sensor

Features
- temperature range -200...+1200 °C
- multi-point measurement
- Pt 100 or thermocouple as sensing element
- AISI 316L or INCONEL 600 as standard delivery material, other materials on request
- available with a connection box
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- Mi cable structured sensor elements
- bendable
- vibration proof structure
- Flexible armoured conduit version available
- changeable measurement elements
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

Materials
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C
- INCONEL 600, maximum temperature +1000 °C, temporarily +1200 °C, other materials on request

Flange material
- AISI 316L, maximum temperature +550 °C, temporarily +600 °C, other flange materials on request

Flange type
- Flange type according to ANSI, EN 1092-1, other flange types on request

Diameter of sensor elements
- 3 or 6 mm, other diameters on request

Enclosure
- Enclosure according to customer specific needs.

Cable material
- SIL = silicone, max. +180 °C
- FEP = Teflon®, max. +205 °C
- GSD = glass silk cable/metal braid jacket, max. +350 °C
- FFD = FEP wire insulation/braid shield/FEP jacket, max. +205 °C
- TDF = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
- FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C
- FS = FEP wire insulation/silicone jacket, max. +180 °C
- CON = no cable, individual single wires, FEP wire insulation, max. +205 °C

Tolerances Pt100
- A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C
- B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

Tolerances thermocouple
- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

Temperature range Pt100
- -200...+550 °C, depending on materials

Temperature range thermocouple
- -200...+1200 °C, depending on thermocouple type, neck pipe length and other materials

Approvals
- METROLOGICAL PATTERN APPROVAL

Quality certificate
- ISO 9001:2015 issued by DNV

Drawing

Product code key

Example code: 3XW — MPT — 3 / 2500/.../7500 — DN50/PN16 — 4 — A — TR — BOX — X

- W = Pt100 resistance thermometer
- 2xW = 2 x Pt100 resistance thermometer
- nW = n x Pt100 resistance thermometer
- T = thermocouple
- 2xT = 2 x thermocouple
- nX = n x thermocouple
- MPT = multipoint sensor, no armour
- MP = multipoint sensor, with armour
- 3, 6 = outer diameter of sensor elements (ØOD) [mm]
- 2500/... = sensor element lengths [mm]
- DN50/PN16 = flange size / flange thickness
- 4,3,2 = Pt100 wire count
- n = number of measurement points
- B, A = thermocouple type
- K, N = thermocouple accuracy class
- 1,2,3 = thermocouple accuracy class, (class A as standard delivery)
- 1,2,3 = thermocouple accuracy class, (class 1 as standard delivery)
- TR = sensor for transmitter connection
- CB = with ceramic terminal block
- empty = no junction box
- BOX = supplied with junction box, (add info of supplier, type, etc. to the text line)
- X = additional details on the text line
EPIC® SENSORS T-SCREW / W-SCREW
Threaded temperature sensor with cable

Features
- temperature range -200...+300 °C
- Pt 100 or thermocouple as sensing element
- AISI 316L as standard delivery material, other materials on request
- Pt 100 accuracy class A as standard delivery
- thermocouple accuracy class 1 as standard delivery
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Materials</th>
<th>AISI 316L, maximum temperature +250 °C, temporarily +300 °C, other materials on request (Note: overall max. temperature according to the cable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>3, 4, 5, 6 or 8mm, other diameters on request</td>
</tr>
<tr>
<td>Thread size and length</td>
<td>According to request, all sizes and lengths available</td>
</tr>
<tr>
<td>Cable material</td>
<td>SIL = silicone, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>FEP = Teflon®, max. +205 °C</td>
</tr>
<tr>
<td></td>
<td>GGD = glass silicone/metal braid jacket, max. +350 °C</td>
</tr>
<tr>
<td></td>
<td>FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C</td>
</tr>
<tr>
<td></td>
<td>SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C</td>
</tr>
<tr>
<td></td>
<td>FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>FS = FEP wire insulation/silicone jacket, max. +180 °C</td>
</tr>
<tr>
<td></td>
<td>CON = no cable, individual single wires, FEP wire insulation, max. +205 °C</td>
</tr>
<tr>
<td>Tolerances Pt100</td>
<td>A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C</td>
</tr>
<tr>
<td>(IEC 60751)</td>
<td>B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/3 DIN, tolerance ±1/3 x (0.3 ± 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td></td>
<td>B 1/10 DIN, tolerance ±1/10 x (0.3 ± 0.005 x t), operating temperature -196...+600 °C</td>
</tr>
<tr>
<td>Tolerances thermocouple</td>
<td>Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t</td>
</tr>
<tr>
<td>(IEC 60584)</td>
<td>Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t</td>
</tr>
<tr>
<td>Temperature range Pt100</td>
<td>-200...+300 °C, depending on material</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-200...+300 °C, depending on thermocouple type and material</td>
</tr>
<tr>
<td>thermocouple</td>
<td></td>
</tr>
<tr>
<td>Approvals</td>
<td>METROLOGICAL PATTERN APPROVAL</td>
</tr>
<tr>
<td>Quality certificate</td>
<td>ISO 9001:2015:2015 by DNV</td>
</tr>
</tbody>
</table>

Product code key

Example code: W – SCREW – M6x1 / 10 – 6 – 100 – 5000 / SIL – 4 – A – X

| W         | = Pt100 resistance thermometer                                                                                                  |
| 2xW       | = 2 x Pt100 resistance thermometer                                                                                                |
| T         | = thermocouple                                                                                                                    |
| 2xT       | = 2 x thermocouple                                                                                                                |
| SCREW     | = sensor with thread (constant in code)                                                                                           |
| Mnx1      | = thread size (all available)                                                                                                     |
| 10        | = thread length (mm)                                                                                                             |
| 6         | = outer diameter of sensor element (ØOD) (mm)                                                                                     |
| 100       | = immersion length L (mm)                                                                                                       |
| 5000      | = cable length, CL (mm)                                                                                                          |
| SIL, FEP, | = cable material (for more information, look technical data on first page of the datasheet)                                    |
| GGD, FDF, | = thermocouple type                                                                                                              |
| TDT, SDS, | = Pt100 wire count                                                                                                                |
| CON       | = Pt100 accuracy class, (class A as standard delivery)                                                                             |
| 1,2,3     | = thermocouple accuracy class, (class 1 as standard delivery)                                                                    |
| X         | = additional details on the text line                                                                                             |
EPIC® SENSORS W-M-TRACE or 2x W-M-TRACE
Trace heating sensor

Features
- temperature range -40…+450 °C, temporarily +550 °C
- temperature range -40…+80 °C for standard delivery enclosure
- Pt 100 as sensing element
- Pt 100 accuracy class A as standard delivery
- 1 or 2 measurement points
- replaceable sensor elements
- AISI 316L as standard delivery material for the sensor elements, other materials on request
- components are available as ATEX compatible Ex e, however the complete assembly is not ATEX certified
- tailored solutions according to customer specific needs.

Typical applications
- energy and power plant technology
- process industry
- chemical industry
- machinery and vessel construction
- manufacturing industry.

Technical data

<table>
<thead>
<tr>
<th>Material Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 316L</td>
<td>Maximum temperature: +450 °C, temporarily +550 °C, other materials on request</td>
</tr>
</tbody>
</table>

Tolerances Pt100 (IEC 60751)

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>Operating Temperature</th>
<th>± Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-100...+450 °C</td>
<td>+0.15 °C</td>
</tr>
<tr>
<td>B</td>
<td>-196...+600 °C</td>
<td>±0.3 °C</td>
</tr>
</tbody>
</table>

Temperature range Pt100

-40…+450 °C, temporarily +550 °C

Sensing element class

- II 2 GD Ex e T1-T6
- Ex d A21 IIP66 T 60 °C, T amb (max) -40…+125/550 °C

Length

1000 or 2000 mm as standard delivery, other lengths on request

Diameter

3 or 6 mm, other diameters on request

Enclosure dimensions

160x160x90 mm (WxDxH)

Enclosure material

Glass-reinforced polyester as standard delivery, other materials on request

Enclosure classification

- II 2 GD Ex e IIC T6 Ga (Ta = -55...+90 °C, +55 °C or +65 °C)
- Ex e IIC T4 Ga (Ta = -55...+90 °C)
- Ex lb IIC T6 Ga (Ta = -55...+90 °C, +55 °C or +65 °C)
- Ex lb IIC T4 Ga (Ta = -55...+90 °C)
- Ex tb IIC T85 °C Db (Ta = -65...+48 °C, +55 °C, +60 °C or +65 °C)
- Ex tb IIC T100 °C Db (Ta = -65 °C, +90 °C)

Box temperature range

-40...+80 °C

Cable glands

Product with 2 sensing elements: 1 x cable gland, M25x1.5, for cable diameters 6-13 mm
Product with 1 sensing element: 2 x cable glands, M25x1.5, for cable diameter 6-13 mm

Approvals

ATEX Ex e compatible components, assembly not certified

Quality certificate

ISO 9001:2015 issued by DNV

IP rating

IP66 or IP67, other IP rating on request

Example code:

W = Pt100 resistance thermometer
2xW = 2 x Pt100 resistance thermometer
M-TRACE = mineral insulated trace heating sensor (constant in code)
3, 4 = pt100 wire count
1, 2 = Pt100 accuracy class, (class A as standard delivery)
empty = no Ex e-approval
EX = Ex e-approved
A, B = Pt100 accuracy class,
X = additional details on the last line
EPIC® SENSORS T-SIL-PATCH / W-SIL-PATCH or 2xT-SIL-PATCH / 2xW-SIL-PATCH

Silicone patch sensor

Features
- Temperature range: -40...+180 °C
- Pt100 or thermocouple as sensing element
- Pt100 accuracy class A as standard delivery
- Thermocouple accuracy class 1 as standard delivery
- EMI shielded version available
- ELASTOSIL® RT 607 A/B silicone material
- Aluminum tape on measuring surface as option
- Tinned fine stranded copper wires
- Supplied with cable or twisted wires
- Tailored solutions according to customer specific needs.

Typical Applications
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery and vessel construction
- Manufacturing industry.

Technical data

Tolerances Pt100 (IEC 60751)
- A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C
- B tolerance ±0.3 + 0.005 x t, operating temperature -196...-600 °C
- B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
- B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C

Tolerances thermocouple (IEC 60584)
- Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t
- Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t

Cable materials
- SIL = silicone, max. +180 °C
- FEP = Teflon®, max. +205 °C
- GGD = glass silk cable/metal braid jacket, max. +350 °C
- DDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C
- TDT = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
- FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C
- FS = FEP wire insulation/silicone jacket, max. +180 °C

Wire materials
- 2 wires = FEP insulated twisted wires 2x0.22/Q.200 °C
- 3 wires = FEP insulated twisted wires 3x0.22/Q.200 °C
- 4 wires = FEP insulated twisted wires 4x0.22/Q.200 °C

Temperature range
- -40...+180 °C

(Note: range is for silicone sensor head, cable range according to selection)

Approvals
- METROLOGICAL PATTERN APPROVAL
- Quality certificate
- ISO 9001:2015 issued by DNV

IP rating
- IP65, higher IP rating on request
EPIC® SENSORS nxT-MP-303

Mineral insulated temperature sensor for multipoint measurement

Features
• according to DIN 43721
• temperature range -200...+1200 °C
• AISI 316L or INCONEL 600 as standard delivery material, other materials on request
• customer specific lengths
• customer specific amount of measurement points
• MI cable structured sensor element
• bendable
• vibration proof
• thermocouple as sensing element
• thermocouple accuracy class 1 as standard delivery
• EMI shielded version available.

Typical applications
• steel industry, chill moulds
• energy and power plant technology
• process industry
• chemical industry
• machinery and vessel construction
• manufacturing industry.

Technical data

Materials
AISI 316L, maximum temperature +550 °C, temporarily +600 °C,
INCONEL 600, maximum temperature +1100 °C, temporarily +1200 °C
Other materials on request
(Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Tolerances thermocouple (IEC 60584)
Type J tolerance class 1 = -40...375 °C ±1,5 °C, 375...750 °C ±0,004 x t
Types K and N tolerance class 1 = -40...375 °C ±1,5 °C, 375...1000 °C ±0,004 x t

Cable materials
SIL = silicone, max. +180 °C
FEP = Teflon®, max. +205 °C
GDD = glass silk cable/metal braid jacket, max. +350 °C
FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C
SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C
TDF = Teflon® wire insulation/braid shield/Teflon® jacket, max. +205 °C
FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C
FS = FEP wire insulation/silicone jacket, max. +180 °C
CON = no cable, individual single wires, FEP wire insulation, max. +205 °C
(Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Temperature range
-200...+1200 °C depending on thermocouple type and cable material
(Note: max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)

Quality certificate
ISO 9001:2015 issued by DNV

IP rating
IP65, higher IP rating on request


Example code:
2XT = nx thermocouple
(n = amount of measurement points)
MP-303 = multipoint sensor (constant in code)
2.7 = outer diameter of sensor element (ØOD) [mm]
2750 = MI cable (sensor 1) length, L [mm]
50CL40L = MI cable (sensor 2) length, L1 [mm]
AISI = AISI316L, max. temp. +550 °C, temporarily +600 °C,
INCO = Inconel 600, max. temp. +1100 °C, temporarily +1200 °C
(Note. max. safe temperature +100 °C for the sealant tube in cable to sensor element transition)
5000 = cable length, CL [mm]
SIL, FEP, GDD, FDF, TDF, SDS, FDS, FS, CON = cable material (for more information, look technical data on first page of the datasheet)
K, NJ = thermocouple type
1, 2, 3 = thermocouple accuracy class,
(Note class 1 as standard delivery)
X = additional details on the text line
Wireless LoRa transmitter
A configurable, energy efficient LoRa 868 MHz (EU) transmitter for industrial grade wireless measuring and IoT systems using the LoRaWAN® protocol.
• Three configurable sensor inputs
• Self adjusting transmit power
• Battery or external power supply
• Self diagnostics including battery monitoring
• Configurable measurement intervals and alarm limits.

The IoTKey® WLT 310 transmitter has two inputs for temperature and Lin.R measurements. A third analog input can be configured as voltage or current input, or as a humidity sensor input.

The main power supply is a C sized Lithium primary cell battery, 3.6 V nominal 8.5 Ah. The device operates also on an external, 12 or 24 V DC power supply.

Technical data

<table>
<thead>
<tr>
<th>Weight</th>
<th>39 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>25 mm</td>
</tr>
<tr>
<td>Diameter</td>
<td>57 mm</td>
</tr>
<tr>
<td>Wire size</td>
<td>1 x 1.0 mm² stranded wire</td>
</tr>
</tbody>
</table>

The product is CE marked, and the compliance standards are:

- EN 60068-2-6 Vibration
- EN 300 220-1 v2.4.1 RF
- EN 61326-1:2013 and EN 301489

The expected lifetime is more than 10 years in temperature range -25 to +60 °C.

Assembly examples

Temperature sensor inputs

<table>
<thead>
<tr>
<th>PT100/PT1000 input, RTD (S1/S2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One or two of the temperature sensor inputs can be configured as PT100/PT1000 inputs. The connection type can be configured to 2, 3 or 4 wires. Inputs can also detect a short and open sensor.</td>
</tr>
<tr>
<td>Temperature measurement range</td>
</tr>
<tr>
<td>Temperature coefficient</td>
</tr>
</tbody>
</table>

Thermocouple input, TC (S1/S2)

<table>
<thead>
<tr>
<th>Thermocouple types</th>
</tr>
</thead>
<tbody>
<tr>
<td>E, J, K, N, R, S, T, B, L and U are supported</td>
</tr>
<tr>
<td>Measurement temperature range</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
</tbody>
</table>

Humidity sensor input (AUX)

The analog input connector can be configured as a humidity sensor input. Sensors with an output up to 10 V are supported. There is a supply voltage output for 5 V and 10 V sensors. The input accuracy is similar to the analog voltage input.

Humidity measurement range | ≤ ± 0.5 % of span / °C |
Temperature measurement range | ≤ ± 0.5 % of span / °C |
Supply for humidity sensor | 5 V and 10 V |
Output voltage accuracy       | 5 % |
Maximum load                  | 1 mA |

The supply generation circuit is switched on only during the humidity measurement (under SW control).

Power supply

<table>
<thead>
<tr>
<th>Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>• main power supply is a C size Lithium primary cell battery, 3.6 V nominal 8.5 Ah</td>
</tr>
<tr>
<td>• the battery input is polarity protected</td>
</tr>
<tr>
<td>• battery life time depends of configuration typically min. 1-2 years</td>
</tr>
<tr>
<td>• electricity consumption &lt; 100 mA. *</td>
</tr>
</tbody>
</table>

External DC supply

<table>
<thead>
<tr>
<th>Operating temperature range when powered by external DC supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>-24 to +60 °C</td>
</tr>
</tbody>
</table>

Environmental specifications

<table>
<thead>
<tr>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>RH for device</td>
</tr>
<tr>
<td>Storage</td>
</tr>
<tr>
<td>Transportation</td>
</tr>
</tbody>
</table>

The expected lifetime is more than 10 years in temperature range -40 to +80 °C.

* Power consumption is affected by transmission density, coupled sensors and the quality of the transmitter and gateway connection. Typical current consumption 0.5 ... 50 mA.
THERMOWELLS WITH FLANGE

Flanged thermowells are used when it must be possible to replace the thermowell during process maintenance. Thanks to flanged thermowells, all welding work can be avoided.

Thermowells with flanges, as components (without sensing elements), according to DIN 43772 Form 2F.

IMMERSIBLE THERMOWELLS

Immersible thermowells are used for e.g. in channel sensors. The immersion depth can be adjusted upon installation with gas-tight threaded couplings or adjustable flanges.

With special TC sensing elements and heat-resistant well materials, the measuring range can reach as high as +1200 °C.

To increase wear resistance, the wells can be manufactured as a solid tip version (code key letter U).

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>For sensing element diameter/length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>915188</td>
<td>F-11-D/H-250-DN25/PN40</td>
<td>6/405</td>
</tr>
<tr>
<td>1220269</td>
<td>F-11-D/H-1000-DN25/PN40</td>
<td>6/1155</td>
</tr>
</tbody>
</table>

Other types and dimensions are quoted upon request.

Flanged sensors/wells can also be coated to increase acid resistance features.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>For sensing element diameter/length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>5118915</td>
<td>A-15-D/H-500</td>
<td>8/525</td>
</tr>
<tr>
<td>5118916</td>
<td>A-15-D/H-710</td>
<td>8/735</td>
</tr>
<tr>
<td>915323</td>
<td>A-15-D/H-1000</td>
<td>8/1025</td>
</tr>
<tr>
<td>915324</td>
<td>A-15-D/H-1400</td>
<td>8/1425</td>
</tr>
<tr>
<td>5118919</td>
<td>A-15-D/H-500/1.4841</td>
<td>8/525</td>
</tr>
<tr>
<td>916323</td>
<td>A-15-D/H-710/1.4841</td>
<td>8/735</td>
</tr>
<tr>
<td>916484</td>
<td>A-22-D/H-710</td>
<td>8/735</td>
</tr>
<tr>
<td>916486</td>
<td>A-22-D/H-1400</td>
<td>8/1425</td>
</tr>
<tr>
<td>916479</td>
<td>A-22-D/H-500/1.4749</td>
<td>8/525</td>
</tr>
<tr>
<td>916480</td>
<td>A-22-D/H-710/1.4749</td>
<td>8/735</td>
</tr>
<tr>
<td>916481</td>
<td>A-22-D/H-1000/1.4749</td>
<td>8/1025</td>
</tr>
<tr>
<td>916482</td>
<td>A-22-D/H-1400/1.4769</td>
<td>8/1425</td>
</tr>
<tr>
<td>916326</td>
<td>A-22-D/H-U/710/4204</td>
<td>6/735</td>
</tr>
<tr>
<td>916327</td>
<td>A-22-D/H-U/1000/4304</td>
<td>6/1025</td>
</tr>
<tr>
<td>1015021</td>
<td>A-22-D/H-U/710/1.4845</td>
<td>6/735</td>
</tr>
<tr>
<td>1015022</td>
<td>A-22-D/H-U/1000/1.4845</td>
<td>6/1025</td>
</tr>
<tr>
<td>1059823</td>
<td>A-22-D/H-U/1000/253MA</td>
<td>6/1025</td>
</tr>
</tbody>
</table>

Other types, dimensions and materials are quoted upon request.
**THREADED THERMOWELL**

- AISI 316L as standard delivery material, other materials on request
- length according to customer needs
- suitable for housing MI cable structured sensor element
- thread fittings for process or enclosure attachment
- HEX key shape for tightening purposes
- special coatings available
- tailored solutions according to customer specific needs.

**THREADING WELLS WITH COOLING NECK**

Threaded thermowells with a cooling neck are used on pipes/containers which are insulated. The cooling neck’s length should be selected so that the sensor head is left outside the insulation layer. Another reason for using a cooling neck is to increase the distance from the hot measurement point to the coupling head, which often has a transmitter installed.

Threaded wells with cooling neck, as components (without sensing elements), according to DIN 43772 Form 2G, are available according to the below table:

**PRODUCT CODE KEY**

- TPIE = thermowell type (constant in code)
- G½ = thread 1, external thread
- G½ = thread 2, internal thread
- 9 = external diameter (ØOD)
- 100 = immersion depth, L [mm]
- X = additional details on the text line

**THREADING WELLS WITHOUT COOLING NECK**

Threaded thermowells without a cooling neck are used when there is no insulation layer on the surface of installation thread. A connection head with a transmitter or cable close to the thread is not exposed to high temperatures.

Threaded wells without cooling neck, as components (without sensing elements), according to DIN 43772 Form 2.
SENSORS AND THERMOWELLS WITH SPECIAL COATING

COATING MATERIALS
We can manufacture all metal surface sensors or thermowells, also with special coatings.

- FEP known as Teflon®, good for low temperatures, exhaust gases or various acids, resistant to sunlight
- PFA very similar to FEP, slightly better than FEP in thermal stability and resistance to high temperatures
- METCO hard metal coating, specially for applications where sensors are exposed to grinding, like crude oil pipes (sand/stones), rock wool blasting etc.
- DIAMALLOY corrosion protection, hard surface
- STELLITE® no 6 - good wear resistance
- Other materials upon request.

The allowed temperatures vary from -200 ... + 1200 °C, depending on the material.

THE MOST COMMON SENSOR TYPES FOR COATING
- 1 Threaded temperature sensor without cooling neck
- 2 Threaded temperature sensor with cooling neck
- 3 Flanged temperature sensor
- 8 Immersible temperature sensor.

Coating material | Material thickness | Temperature resistance
AR-223 PFA     | approx. 500 µm    | approx. +260 °C
AR-310 HALAR   | approx. 600 µm    | approx. +400 °C

WELDED THERMOWELLS
For welded applications, we offer welded wells with a separate cooling neck which has a connection head. We also have welded root sleeves for installing threaded sensors.

The welded well and root sleeve materials are heat-resistant
- L = 13CrMo44 / 1.7335 / 550 °C
- M = 10CrMo910 / 1.7380 / 580 °C
- O = 16Mo3 / 1.5415 / 480 °C
- K = AISI 316L / 800 °C.

Individual components are presented below.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>For sensing element diameter/length (mm)</th>
<th>Inner thread L (mm)</th>
<th>La (mm)</th>
<th>Da (mm)</th>
<th>Lb (mm)</th>
<th>Db (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1025319</td>
<td>E-6/55*</td>
<td>3/145</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1090956</td>
<td>E-6/115*</td>
<td>3/205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>911966</td>
<td>D1-L</td>
<td>6/315</td>
<td>M18×1.5</td>
<td>140</td>
<td>50</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911144</td>
<td>D4-L</td>
<td>6/375</td>
<td>M18×1.5</td>
<td>200</td>
<td>110</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911968</td>
<td>D5-L</td>
<td>6/435</td>
<td>M18×1.5</td>
<td>260</td>
<td>110</td>
<td>24h7</td>
<td>125</td>
</tr>
<tr>
<td>911907</td>
<td>D1-M</td>
<td>6/315</td>
<td>M18×1.5</td>
<td>140</td>
<td>50</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911165</td>
<td>D4-M</td>
<td>6/375</td>
<td>M18×1.5</td>
<td>200</td>
<td>110</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911457</td>
<td>D5-M</td>
<td>6/435</td>
<td>M18×1.5</td>
<td>260</td>
<td>110</td>
<td>24h7</td>
<td>125</td>
</tr>
<tr>
<td>911890</td>
<td>D1-K</td>
<td>6/315</td>
<td>M18×1.5</td>
<td>140</td>
<td>50</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911161</td>
<td>D4-K</td>
<td>6/375</td>
<td>M18×1.5</td>
<td>200</td>
<td>110</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911967</td>
<td>D5-K</td>
<td>6/435</td>
<td>M18×1.5</td>
<td>260</td>
<td>110</td>
<td>24h7</td>
<td>125</td>
</tr>
<tr>
<td>911906</td>
<td>D1-O</td>
<td>6/315</td>
<td>M18×1.5</td>
<td>140</td>
<td>50</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911145</td>
<td>D4-O</td>
<td>6/375</td>
<td>M18×1.5</td>
<td>200</td>
<td>110</td>
<td>24h7</td>
<td>65</td>
</tr>
<tr>
<td>911969</td>
<td>D5-O</td>
<td>6/435</td>
<td>M18×1.5</td>
<td>260</td>
<td>110</td>
<td>24h7</td>
<td>125</td>
</tr>
<tr>
<td>912066</td>
<td>D1S-L</td>
<td>3/315</td>
<td>M14×1.5</td>
<td>140</td>
<td>50</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>911164</td>
<td>D4S-L</td>
<td>3/375</td>
<td>M14×1.5</td>
<td>200</td>
<td>110</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>912067</td>
<td>D1S-M</td>
<td>3/315</td>
<td>M14×1.5</td>
<td>140</td>
<td>50</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>911166</td>
<td>D4S-M</td>
<td>3/375</td>
<td>M14×1.5</td>
<td>200</td>
<td>110</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>912065</td>
<td>D1S-K</td>
<td>3/315</td>
<td>M14×1.5</td>
<td>140</td>
<td>50</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>911162</td>
<td>D4S-K</td>
<td>3/375</td>
<td>M14×1.5</td>
<td>200</td>
<td>110</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>912068</td>
<td>D1S-O</td>
<td>3/315</td>
<td>M14×1.5</td>
<td>140</td>
<td>50</td>
<td>18h7</td>
<td>65</td>
</tr>
<tr>
<td>911163</td>
<td>D4S-O</td>
<td>3/375</td>
<td>M14×1.5</td>
<td>200</td>
<td>110</td>
<td>18h7</td>
<td>65</td>
</tr>
</tbody>
</table>

*Welded thermowell ball without a connection head. Other sizes and materials are quoted upon request.
COOLING NECK AND CONNECTION HEAD FOR WELDED WELLS

If the process already has a welded thermowell, a suitable cooling neck and connection head can be purchased as a separate component. After that the D1S/D4/D4S/D5 type thermowell is welded on the root sleeve. The root sleeve material needs to be the same as the welded thermowell.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>For well type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1025309</td>
<td>18-K</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>1025312</td>
<td>18-L</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>918138</td>
<td>18-O</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>912333</td>
<td>24-K</td>
<td>D1, D4 and D5</td>
</tr>
<tr>
<td>912331</td>
<td>24-L</td>
<td>D1, D4 and D5</td>
</tr>
<tr>
<td>912332</td>
<td>24-M</td>
<td>D1, D4 and D5</td>
</tr>
<tr>
<td>912334</td>
<td>24-O</td>
<td>D1, D4 and D5</td>
</tr>
</tbody>
</table>

COOLING NECK AND CONNECTION HEAD FOR WELDED WELLS

If the process already has a welded thermowell, a suitable cooling neck and connection head can be purchased as a separate component.

Cooling necks have outer threads which can be applied to D-wells:
- M14×1.5 for D1S and D4S
- M18×1.5 for D1, D4 and D5

Cooling necks and connection heads, as components (without wells, without sensing elements):

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>Overall length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1025314</td>
<td>G1/2”</td>
<td>L=30</td>
</tr>
<tr>
<td>1002689</td>
<td>G1/2”</td>
<td>L=70</td>
</tr>
<tr>
<td>1003144</td>
<td>G1/2”</td>
<td>L=100</td>
</tr>
<tr>
<td>1028394</td>
<td>G1”</td>
<td>L=70</td>
</tr>
</tbody>
</table>

Other materials and sizes are quoted upon request.

WELDED ROOT SLEEVES FOR WELDED WELLS

The root sleeve is first welded on the process pipe or container, and then bored to precise inner dimensions. After that the D1S/D4/D4S/D5 type thermowell is welded on the root sleeve. The root sleeve material needs to be the same as the welded thermowell.

WELDED THREAD SLEEVES

A threaded sleeve is first welded on the process pipe or container, and then the threaded well is installed to the sleeve. As standard, the threaded sleeve material to be welded is acid-proof AISI 316L.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>For well type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1025310</td>
<td>18-K</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>1025312</td>
<td>18-L</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>1025313</td>
<td>18-M</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>918138</td>
<td>18-O</td>
<td>D15 and D4S</td>
</tr>
<tr>
<td>912333</td>
<td>24-K</td>
<td>D1, D4 and D5</td>
</tr>
<tr>
<td>912331</td>
<td>24-L</td>
<td>D1, D4 and D5</td>
</tr>
<tr>
<td>912332</td>
<td>24-M</td>
<td>D1, D4 and D5</td>
</tr>
<tr>
<td>912334</td>
<td>24-O</td>
<td>D1, D4 and D5</td>
</tr>
</tbody>
</table>

WELDED THERMOWELLS ACCESSORIES

GAS-TIGHT COUPLINGS

Gas-tight threaded couplings are used with 15 mm or 22 mm diameter wells, when a threaded connection is needed, and it is necessary to adjust the sensor immersion depth. A gas-tight coupling has Teflon® ferrules inside. As the coupling is tightened, the ferrule is pressed on the thermowell surface. The connection is gas-tight, but not pressure-resistant.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type - thread - inner diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>917347</td>
<td>Gas-tight threaded coupling G1”-15mm</td>
</tr>
<tr>
<td>999562</td>
<td>Gas-tight threaded coupling G1”-22mm</td>
</tr>
</tbody>
</table>

Other types are quoted upon request.

COMPRESSION FITTINGS AISI 316

Compression fittings are used with sensing inserts or sensors when thermowells are not needed. The immersion depth of the sensor can be adjusted when installed. The compression fitting has a metal ferrule inside. The ferrule is made of stainless steel SS316L (other materials and sizes upon request). Single or double ferrules are used depending on the inner diameter. By tightening the compression fitting, the ferrule is permanently pressed on the sensing element. This connection is pressure-resistant.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type - thread - inner diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>875823</td>
<td>Compression fitting G½-6mm</td>
</tr>
<tr>
<td>1001171</td>
<td>Compression fitting G½-12mm</td>
</tr>
<tr>
<td>914413</td>
<td>Compression fitting G½-15mm</td>
</tr>
<tr>
<td>1010922</td>
<td>Compression fitting G¾-1.5mm</td>
</tr>
<tr>
<td>91898</td>
<td>Compression fitting G¾-3mm</td>
</tr>
<tr>
<td>91897</td>
<td>Compression fitting G¾-4.5mm</td>
</tr>
<tr>
<td>920701</td>
<td>Compression fitting G½-4mm</td>
</tr>
<tr>
<td>920587</td>
<td>Compression fitting G½-10mm</td>
</tr>
<tr>
<td>919178</td>
<td>Compression fitting G¾-1.5mm</td>
</tr>
<tr>
<td>10099257</td>
<td>Compression fitting G¹/₈-1.5mm</td>
</tr>
<tr>
<td>1062720</td>
<td>Compression fitting M6x1.5mm</td>
</tr>
<tr>
<td>919098</td>
<td>Compression fitting M6x1.3mm</td>
</tr>
<tr>
<td>1040461</td>
<td>Compression fitting NPT1/₄-3mm</td>
</tr>
<tr>
<td>914237</td>
<td>Compression fitting NPT1/₄-4mm</td>
</tr>
<tr>
<td>1066586</td>
<td>Compression fitting NPT1/₄-6mm</td>
</tr>
<tr>
<td>1001559</td>
<td>Compression fitting NPT1/₈-3mm</td>
</tr>
<tr>
<td>1066584</td>
<td>Compression fitting NPT1/₈-4mm</td>
</tr>
</tbody>
</table>

Other types are quoted upon request.
CONNECTION HEADS

Connection heads for EPIC® SENSORS temperature sensors can be purchased as accessories. The D/H types come with a quick release clip and blue epoxy varnish finishing as standard, but other connection heads for different applications are also available.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>Code key letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1018378</td>
<td>Adjustable</td>
<td></td>
</tr>
<tr>
<td>1018382</td>
<td>Adjustable</td>
<td></td>
</tr>
<tr>
<td>1018383</td>
<td>Adjustable</td>
<td></td>
</tr>
<tr>
<td>911984</td>
<td>Welded</td>
<td></td>
</tr>
<tr>
<td>911985</td>
<td>Adjustable</td>
<td></td>
</tr>
<tr>
<td>911986</td>
<td>Adjustable</td>
<td></td>
</tr>
</tbody>
</table>

Other sizes are quoted upon request.

ADJUSTABLE FLANGES

Welded and adjustable flanges are mainly used for installing different sized thermowells. The flange design allows adjusting of the sensor immersion depth. Thanks to the design, the sensor can be mounted precisely in the process, at just the right depth.

<table>
<thead>
<tr>
<th>Product number</th>
<th>Type</th>
<th>Code key letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1020864</td>
<td>SS316 M24</td>
<td></td>
</tr>
<tr>
<td>911970</td>
<td>BL M24</td>
<td></td>
</tr>
<tr>
<td>1027082</td>
<td>NA M24 Epoxy</td>
<td></td>
</tr>
<tr>
<td>1006145</td>
<td>DAN/H M24 Epoxy</td>
<td></td>
</tr>
<tr>
<td>917962</td>
<td>DAN/D</td>
<td></td>
</tr>
<tr>
<td>1006146</td>
<td>DAN/W/H M24 Epoxy</td>
<td></td>
</tr>
<tr>
<td>1180999</td>
<td>DAN/W/H</td>
<td></td>
</tr>
<tr>
<td>5105631</td>
<td>XD-AB M20x1,5, ATEX</td>
<td></td>
</tr>
<tr>
<td>1078902</td>
<td>LAA 3,2,5MM Epoxy</td>
<td></td>
</tr>
</tbody>
</table>

CLAMP FITTING

- AISI 316L as standard delivery material, other materials on request
- clamping fitting for process pipe attachment
- thread fitting for enclosure attachment
- available for various pipe sizes
- special coatings available
- tailored solutions according to customer specific needs.

<table>
<thead>
<tr>
<th>Material</th>
<th>Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>AISI 316L, maximum temperature +550 °C, temporarily +600 °C, other materials on request</td>
<td>typically G½, G, R, NPT, M available as standard delivery, other threads on request</td>
</tr>
</tbody>
</table>

CLAMP SIZES

<table>
<thead>
<tr>
<th>ØD (mm)</th>
<th>L (mm)</th>
<th>T (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>Ød (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3/8 in) 21,3</td>
<td>80</td>
<td>2</td>
<td>25</td>
<td>44</td>
<td>7,5</td>
</tr>
<tr>
<td>(5/8 in) 21,3</td>
<td>150</td>
<td>2</td>
<td>25</td>
<td>44</td>
<td>7,5</td>
</tr>
<tr>
<td>(1 in) 21,3</td>
<td>270</td>
<td>2</td>
<td>25</td>
<td>44</td>
<td>7,5</td>
</tr>
<tr>
<td>(1 1/16 in) 21,3</td>
<td>520</td>
<td>2</td>
<td>25</td>
<td>44</td>
<td>7,5</td>
</tr>
<tr>
<td>(1 1/4 in) 26,9</td>
<td>80</td>
<td>3</td>
<td>25</td>
<td>52</td>
<td>7,5</td>
</tr>
<tr>
<td>(1 1/2 in) 33,7</td>
<td>150</td>
<td>3</td>
<td>25</td>
<td>57</td>
<td>7,5</td>
</tr>
<tr>
<td>(2 in) 50,3</td>
<td>150</td>
<td>3</td>
<td>40</td>
<td>91</td>
<td>9,5</td>
</tr>
<tr>
<td>(6 in) 168,3</td>
<td>150</td>
<td>4</td>
<td>40</td>
<td>206</td>
<td>12</td>
</tr>
<tr>
<td>(6 in) 168,3</td>
<td>270</td>
<td>4</td>
<td>40</td>
<td>206</td>
<td>12</td>
</tr>
<tr>
<td>(11 in) 33,7</td>
<td>80</td>
<td>3</td>
<td>25</td>
<td>57</td>
<td>7,5</td>
</tr>
<tr>
<td>(13 in) 88,9</td>
<td>80</td>
<td>3</td>
<td>40</td>
<td>120</td>
<td>9,5</td>
</tr>
<tr>
<td>(4 in) 115,3</td>
<td>80</td>
<td>3</td>
<td>40</td>
<td>156</td>
<td>12</td>
</tr>
<tr>
<td>(6 in) 168,3</td>
<td>80</td>
<td>4</td>
<td>40</td>
<td>206</td>
<td>12</td>
</tr>
<tr>
<td>(8 in) 219,1</td>
<td>80</td>
<td>4</td>
<td>40</td>
<td>262</td>
<td>15</td>
</tr>
<tr>
<td>(2 in) 60,3</td>
<td>80</td>
<td>3</td>
<td>40</td>
<td>91</td>
<td>9,5</td>
</tr>
<tr>
<td>(10 in) 273,0</td>
<td>80</td>
<td>4</td>
<td>50</td>
<td>316</td>
<td>15</td>
</tr>
</tbody>
</table>

PRODUCT CODE KEY

Example code: TPIE-PANTA — ½” — G½ / 270 — X

- TPIE—PANTA = fitting type (constant in code)
- ½” = clamp diameter in inches (ØD) [in]
- G½ = thread (G½ as standard delivery)
- 270 = neck pipe length, L [mm]
- X = additional details on the text line
MINI CONNECTORS FOR THERMOCOUPLES

The connectors are available with male and female contacts and are always made of materials suitable for that type of thermocouple. The color of the connector housing depends on the type of thermocouple, e.g. the type K connector is normally green because the type K cable is green according to the IEC 60584 standard.

There are two different thermocouple connector sizes available, the standard type (STD) and the compact type (MINI).

### Products number | Type
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>911476</td>
<td>J-STD-Female</td>
</tr>
<tr>
<td>911475</td>
<td>J-STD-Male</td>
</tr>
<tr>
<td>911477</td>
<td>J-MINI-Female</td>
</tr>
<tr>
<td>911478</td>
<td>J-MINI-Male</td>
</tr>
<tr>
<td>911440</td>
<td>K-STD-Female</td>
</tr>
<tr>
<td>911439</td>
<td>K-STD-Male</td>
</tr>
<tr>
<td>911442</td>
<td>K-MINI-Female</td>
</tr>
<tr>
<td>911441</td>
<td>K-MINI-Male</td>
</tr>
<tr>
<td>1089977</td>
<td>N-STD-Female</td>
</tr>
<tr>
<td>1089978</td>
<td>N-STD-Male</td>
</tr>
<tr>
<td>1023763</td>
<td>S-STD-Female</td>
</tr>
<tr>
<td>1083322</td>
<td>S-STD-Female 350°C</td>
</tr>
<tr>
<td>1023764</td>
<td>S-STD-Male</td>
</tr>
<tr>
<td>1083323</td>
<td>S-STD-Male 350°C</td>
</tr>
<tr>
<td>1017789</td>
<td>Cable clamps for STD connectors</td>
</tr>
</tbody>
</table>

Other types are quoted upon request.

### Stock items

<table>
<thead>
<tr>
<th>Product number</th>
<th>Designation</th>
<th>Number of cores and wire sizes</th>
<th>Colors +/–/ sheath</th>
<th>Outer diameter mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>903242</td>
<td>Ni/Cr/Ni 2G ST 2G K</td>
<td>2x1.5</td>
<td>grn/wht/grn</td>
<td>7.50 (±0.15)</td>
</tr>
<tr>
<td>1084278</td>
<td>Ni/Cr/Ni 2G ST 2G K</td>
<td>3x(2x1.5)</td>
<td>grn/wht/grn</td>
<td>9.50 (±0.15)</td>
</tr>
<tr>
<td>911884</td>
<td>Ni/Cr/Ni 2G ST 2G K</td>
<td>6x(2x1.5)</td>
<td>grn/wht/grn</td>
<td>13.40 (±0.15)</td>
</tr>
<tr>
<td>1084281</td>
<td>Ni/Cr/Ni 2G ST 2G K</td>
<td>8x(2x1.5)</td>
<td>grn/wht/grn</td>
<td>14.90 (±0.15)</td>
</tr>
<tr>
<td>903256</td>
<td>PtRh/Pt 2G ST 2G S</td>
<td>2x1.5</td>
<td>ora/wht/ora</td>
<td>7.50 (±0.15)</td>
</tr>
<tr>
<td>1002534</td>
<td>PtRh/Pt 2G ST 2G S</td>
<td>2x(2x1.5)</td>
<td>ora/wht/ora</td>
<td>8.50 (±0.15)</td>
</tr>
<tr>
<td>903257</td>
<td>Fe/CuNi 2G ST 2G J</td>
<td>2x1.5 SIL</td>
<td>bck/wht/bck</td>
<td>7.50 (±0.15)</td>
</tr>
<tr>
<td>1210658</td>
<td>NiCrNi/NiCrNi 2G ST 2G N</td>
<td>2x1.5</td>
<td>bck/wht/pnk</td>
<td>7.50 (±0.15)</td>
</tr>
</tbody>
</table>

Color abbreviations bck = black, grn = green, ora = orange, pk = pink, wht = white.

Other cable types and wire structures can be delivered on request.

COMPENSATING CABLES FOR THERMOCOUPLE SENSORS

The thermocouple between the hot and cold ends of the sensor, must use the correct cable to avoid measurement errors due to different materials. The cables used are either extension cable type (X) or compensation cable type (C).

Our stock items are silicon insulated compensating cables according to the IEC 60584 standard, with a maximum temperature of +180 °C. The cable structure of the one pair cables for a J, K and S type thermocouple sensor is 2 x 1.5 mm².
New standards: IEC 60584-3 DIN EN 60584 ANSI MC 96.1

<table>
<thead>
<tr>
<th>Thermo Type</th>
<th>IEC 584</th>
<th>DIN 43714</th>
<th>ANSI MC 96.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>NiCr-Ni / K</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>KCA: Fe-CuNi</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Jacket: green</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>NiCr-Ni / L</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Fe-CuNi / J</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Pt10Rh-Pt / S</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>SCA: E-Cu/A-Cu</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Jacket: orange</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Pt13Rh-Pt / R</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>RCA: E-Cu/A-Cu</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Jacket: white</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Pt30Rh-Pt6Rh / B</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>BC: S-Cu/E-Cu</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>NiCrosil-Nsi / N</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>NC: Cu-CuNi</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Jacket: pink</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Cu-CuNi / U</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>Cu-CuNi / T</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
<tr>
<td>NiCr-CuNi / E</td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
<td>[Color]</td>
</tr>
</tbody>
</table>

**FACTORY CALIBRATION**

Factory calibrations are done with two calibration ovens, which perform in a temperature range of -25...+660 °C.
- Factory calibration is recommended to be done in two measuring points minimum.
- More calibration points can be used depending on the calibration temperature range.
- Factory calibration can be done for RTD and TC sensors.
- The minimum length of the sensor to be calibrated is 255 mm. This limitation does not apply to cable sensors.
- Factory calibration can be done for sensors with an outer diameter of 3 mm, 4 mm, 6 mm, 8 mm or 10 mm.
- The calibration devices are able to work with single sensors or a combination of a sensor and transmitter connected together.
- In the factory calibration service, customers get a calibration certificate which includes customer data, product data and calibration results with a measuring data table and graph.
- If the factory calibration is not an adequate proof of measuring value deviation, we can, on customers’ behalf have the sensors (and transmitters) send to an accredited laboratory for a third party laboratory calibration.

**WHAT IS CALIBRATION?**

Temperature sensor deviation in individual points of a measuring range is defined by comparing the readout of the sensor to be calibrated to another reference sensor, of which the readout accuracy is known. The objective of the calibration is to define the deviation between a measured value and a corresponding reference value.

**WHY CALIBRATE?**

Through calibration you can achieve many advantages besides measuring accuracy, for example:
- Traceability for temperature measuring results
- Certainty for temperature measuring results
- Optimizing production process quality, consistency and efficiency
- Energy savings due process control driven by accurate measurements
- Reduced pollution due process control driven by accurate measurements
- Savings in material costs
- Minimizing risk of unexpected repairs and changes of process machinery and sensors.