EPIC® SENSORS

Temperature sensor & IoTKey® products and services

LAPP AUTOMAATIO

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EPIC® SENSORS PRODUCTION PROGRAM

Lapp Automaatio has manufactured temperature sensors for more than 20 years. We have wide experience of producing sensors for oil and gas, pulp&paper, machine building, power plants, Ex-areas and hygienic industry.

We manufacture vibration-proof resistance and thermocouple sensing elements which are mineral insulated. Our standard product line consists of 23 basic structures, which can be altered according to customer specification. In addition to the wide standard products range we also provide individual, customer specific total solutions. The principles of our services are high quality sensors, fast deliveries, cost-effectiveness and low risk for the customer.

Our own manufacturing guarantees short delivery times also for the application-specific special sensors, e.g. for our range of ATEX and IECEx certified sensors for potentially explosive areas. All demanding precision welding is performed with laser welding equipment at our production facilities in Finland.

PRODUCED EPIC® SENSORS TEMPERATURE SENSORS

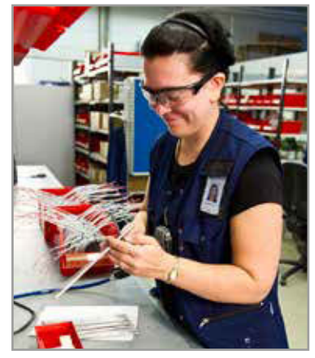
- Pt100 (2xPt100, 3xPt100)
- Pt1000
- Thermocouples
- Thermowells
- Flanged thermowells
- Pt100 with silicon well
- Cable probes
- Bayonet probes
- Ceramic sensors
- Coated thermowells
- Multi-point temperature sensors
- Ex-approved sensors
- Bearing temperature sensors
- Temperature sensors with magnet
- Immersible 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 Q 006 product quality assurance notification
- EESF 18 ATEX 052X 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

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 five year product warranty for EPIC® SENSORS temperature sensors.



The very latest production techniques are used the sensor manufacturing, for eg. laser welding machines.

ENERGY AND PULP & PAPER INDUSTRIES

The long-term tradition of Finnish pulp and paper plants with their self-contained power production has taught us to deal with extreme materials, temperatures and scale of machinery.

Even in 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, Petrochemical Industry and Biodiesel Plants. We have delivered temperature instrumentation solutions for:

- Columns
- Trace heating
- Reactor temperature measurements (inside reactor, single point, multi-point and surface)
- Furnaces
- Pipelines
- Laboratories
- Oil tanks
- Ethylene plants
- Underground oil reservoirs
- Biodiesel manufacturing and pyrolysis processes
- Flare temperature measurement.

HYGIENIC INDUSTRY

We have a wide range of products for different hygienic applications; e.g. food and beverage, pharmaceutical, medical machinery and clean room solutions.

Our range of temperature sensors include many products designed specifically for hygienic applications.
EPIC® SENSORS temperature sensors can be customized for all kinds of cleaning processes. Hygienic solutions are used in the food, beverages and pharmaceuticals industry, the medical equipment industry and clean room solutions, for example.

MACHINE BUILDING INDUSTRY

A wide variety of solutions for the machine building applications.

The features to watch out for in temperature measurement related to machine building are vibration, thermal stability and screening. We have developed sensor variations, which especially suit the machine building designs; confined installation spaces, easy assembly and cost effective solutions.

We have accumulated experience concerning the stators of electric motors, different kinds of energy transfer chain applications, circuit boards, gear oil and bearing measurements, and transformer measurements, for example. We design and manufacture temperature measurement sensors, be the applications small or large.

SENSORS FOR EX-AREAS

EPIC® SENSORS temperature sensors are also manufactured for different kind of potentially explosive areas and zones.

We have customized temperature measurement sensors for areas with explosion danger. The danger of explosion can arise from the presence of flammable liquids, gases or dust. We have taken responsibility for temperature measurement related to many types of equipment 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 d - ATEX- / IECEx-certified
- Increased safety - Ex e - ATEX- / IECEx-certified
- Dust protection by housing
  - Ex t - 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 0,39 Ω/1 °C/year
- 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 (1x Pt100, 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.

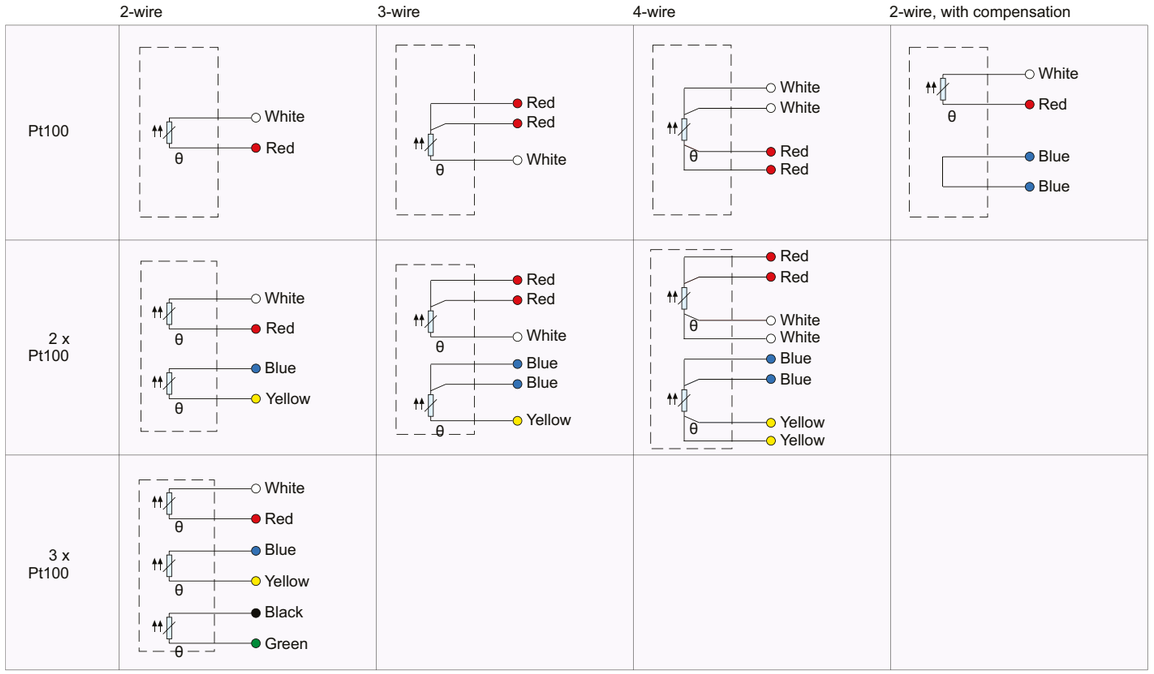
CABLE PROBES

- Diameter and length according to specification (AISI 316)
- Various cable options
- As thermocouples
- As Pt100 probes (1xPt100, 2xPt100, 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.

BAYONET PROBES

- Diameter 6 and 8mm (AISI 316)
- Various cable options
- As thermocouples
- As Pt100 probes (1xPt100, 2xPt100, 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.

PT100 CONNECTIONS



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

For wire wound resistors		For film resistors		Tolerance value
Tolerance class	Temperature range of validity °C	Tolerance class	Temperature range of validity °C	
W 0.1	-100 to +350	F 0.1	0 to +150	± (0.1 + 0.0017 | t |)
W 0.15	-100 to +450	F 0.15	-30 to +300	± (0.15 + 0.002 | t |)
W 0.3	-196 to +660	F 0.3	-50 to +300	± (0.3 + 0.005 | t |)
W 0.6	-196 to +660	F 0.6	-50 to +600	± (0.6 + 0.001 | t |)
a | t | = modulus of temperature in °C without regard to sign.				

EPIC® SENSORS Pt100 sensors are usually manufactured with wire wound resistors of tolerance class A. Other classes and resistor types on request.

TOLERANCE CLASSES FOR PT100 THERMOMETERS ACCORDING TO STANDARD IEC 60751

Tolerance class	Temperature range of validity °C		Tolerance value
	Wire wound resistors	Film resistors	
AA	-50 to +250	0 to +150	± (0.1 + 0.0017 | t |)
A	-100 to +450	-30 to +300	± (0.15 + 0.002 | t |)
B	-196 to +600	-50 to +500	± (0.3 + 0.005 | t |)
C	-196 to +600	-50 to +600	± (0.6 + 0.001 | t |)
a | t | = modulus of temperature in °C without regard to sign.			

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

$$\frac{1/3}{\pm 0.3} \quad \frac{1/10}{\pm 0.3} \quad \begin{matrix} \text{DIN} \\ 0°C \end{matrix}$$

$$\frac{}{3} \quad \frac{}{10}$$

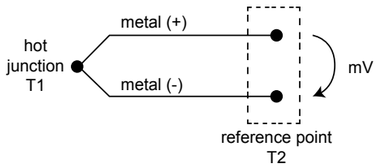
The fractional values are not valid for the total measurement range, only at point 0 °C.

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 (thermo wires) 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 COMPENSATING (CJC)

Temperature transmitter or measuring systems need information of the reference point (cold junction) temperature T2. Variations of reference point temperature are compensated with CJC measuring (Cold Junction Compensation). Temperature transmitters CJC measuring can be an internal function or a measuring resistance integrated in connectors. If the reference point is far away from the transmitter, a separate temperature measuring of that point has to be implemented and wired to transmitter as compensation signal.

VIBRATION-PROOF THERMOCOUPLES, SHEATH CONSTRUCTION

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

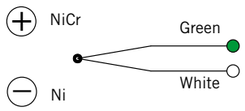
TEMPERATURE RANGES AND TOLERANCES OF THERMOCOUPLE TYPES

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

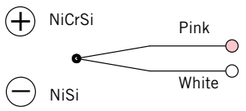
* Type L is defined in standard DIN 43710, all other types in standard IEC 60584.

THERMO ELEMENT CONNECTIONS

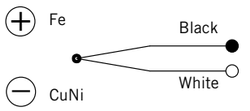
Thermocouple, Type K, Class 1,
According to standard IEC 60584



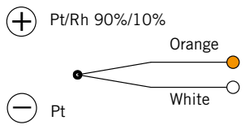
Thermocouple, Type N, Class 1,
According to standard IEC 60584



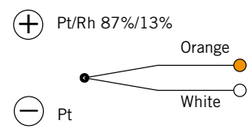
Thermocouple, Type J, Class 1,
According to standard IEC 60584



Thermocouple, Type S, Class 1,
According to standard IEC 60584



Thermocouple, Type R, Class 1,
According to standard IEC 60584



WIRELESS FOR INDUSTRIAL APPLICATIONS

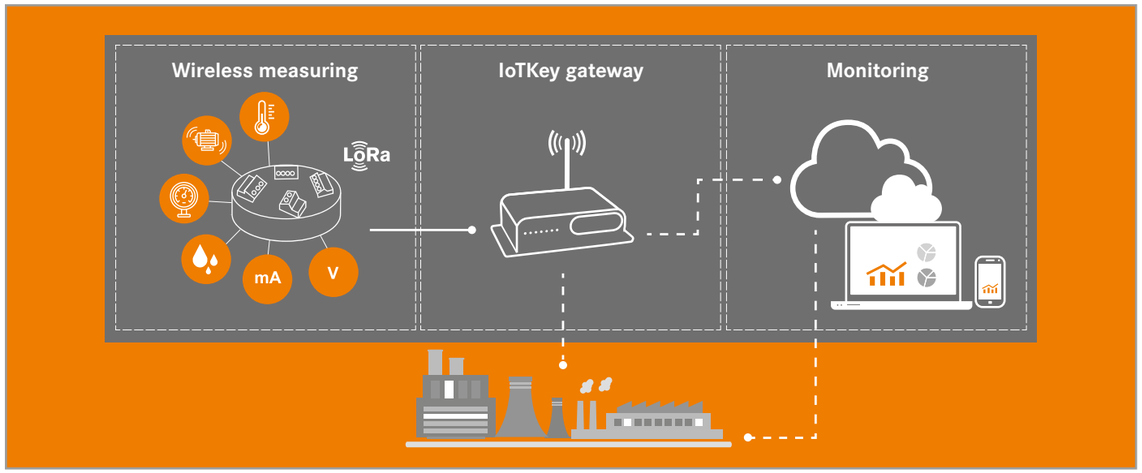
- Industry grade turn-key solution for cost efficient wireless measurements
- Fast and simple setup also for retro-fit and temporary installations
- Reliable, long range, low power wireless data communication with excellent immunity to interference even in demanding conditions.

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

ENERGY

WATER & INFRASTRUCTURE

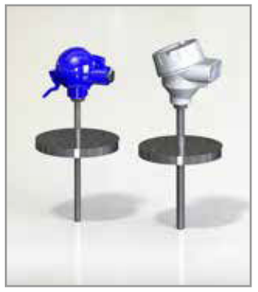
LoRa Alliance Certified™

1 Threaded temperature sensor without cooling neck T-B-ØK / W-B-ØK

page 14-15

2 Threaded temperature sensor with cooling neck T-B-Ø / W-B-Ø

page 16-17

3 Flanged temperature sensor T-F / W-F

page 18-19

4 Welded temperature sensor T-D / W-D

page 20-21

5 Temperature sensor with cooling neck without thermowell W-H-12 / T-H-12

page 22-23

6 Indoor/outdoor Resistance Sensor W-K-F

page 24-25

7 Mineral insulated resistance or thermocouple sensing element T-M-Ø / W-M-Ø

page 26-27

8 Immersible temperature sensor T-A-Ø / W-A-Ø or T-A-Ø-U / W-A-Ø-U

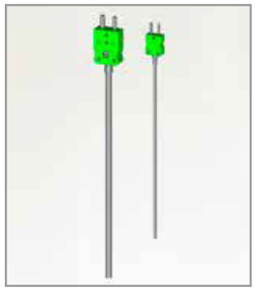
page 28-29

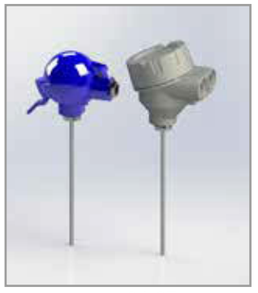
9 Immersible thermocouple sensor T-K / T-AKK

page 30-31

10 Mineral insulated thermocouple or resistance sensing insert with cable T-M-303 / W-M-303

page 32-33

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

page 34-35

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

page 36-37

13 Stainless steel resistance sensor W-E-6-HST / W-CLAMP-6-HST

page 38-39

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

page 40-41

15 Surface temperature sensor W-M-P / T-M-P or W-P / T-P

page 42-43

16 Temperature sensor W-CABLE or T-CABLE

page 44-45

17 Bayonet temperature sensor W-BAJO or T-BAJO

page 46-47

18 Magnet temperature sensor W-MAGN/T-MAGN

page 48-49

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

page 50-51

20 Bearing temperature sensor W-BTD / T-BTD

page 52-53

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

page 54-55

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

page 56-57

23 Trace heating sensor W-M-TRACE, 2x W-M-TRACE

page 58-59

24 Silicone patch sensor W-SIL-PATCH, T-SIL-PATCH, 2xW-SIL-PATCH, 2xT-SIL-PATCH

page 60-61

25 Mineral insulated multipoint temperature sensor nxT-MP-303

page 62-63

IoTKey® transmitter WLT 310

page 64-65

EPIC® SENSORS T-B-ØK / W-B-ØK

Threaded temperature sensor without cooling neck

According to DIN 43772 form 2

Features

- Temperature range -40...+250 °C
- Pt100 or thermocouple
- Thermowell material according to the application
- Pt100, accuracy class A, as a standard, more accurate on request. TC, class 1 as a standard
- Replaceable inner element, MI-construction
- Tailored solutions according to specific needs
- ATEX-version Ex db also available.

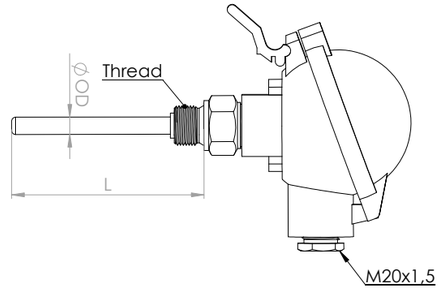
Typical applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Thermowell material	AISI 316L, max. temp. +250 °C, temporarily +300 °C
Standard thread options	G, R, NPT, M, others 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 TC (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 TC **TC = thermocouple**	-40...+250 °C depending on thermocouple type
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

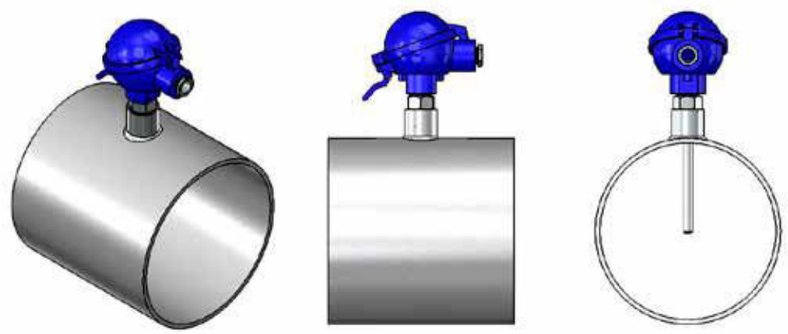
□-□-□-K□ - □ - □ - □ - □ - □

Example code: W - B - 9K - D / H - 160 - G½" - 4 - A - TR - X

Well + Pt100/Thermocouple Sensing Element

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
B	= coupling thread
9	= ØOD = well diameter (mm)
K	= no cooling neck
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
160	= L = immersion depth (mm)
G½"	= thread size
4,3,2	= Pt 100 number of connection wires
K,N,J	= TC type of thermocouple
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS T-B-Ø / W-B-Ø

Threaded temperature sensor with cooling neck

According to DIN 43772 form 2G

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Thermowell material according to the application
- Pt100, accuracy class A as a standard, more accurate on request
- TC, class 1 as a standard
- Replaceable inner element, MI-construction
- Tailored solutions according to specific needs
- ATEX-version Ex db also available
- Standard cooling neck length 145 mm, others on request.

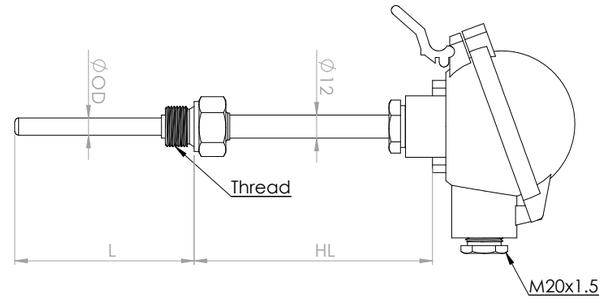
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Thermowell material	AISI 316L, max. temp. +550 °C, temporarily +850 °C Heat-resistant steel 1.4841, max. temp. +1100 °C, temporarily +1200°C
Standard thread options	G, R, NPT, M, others 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 TC (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 TC	-200...+1200 °C depending on thermocouple type HL = 250 mm -> temp. max. +750 °C HL = 300 mm -> temp. max. +1000 °C HL = 350 mm -> temp. max. +1200 °C TC = thermocouple HL = cooling neck
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

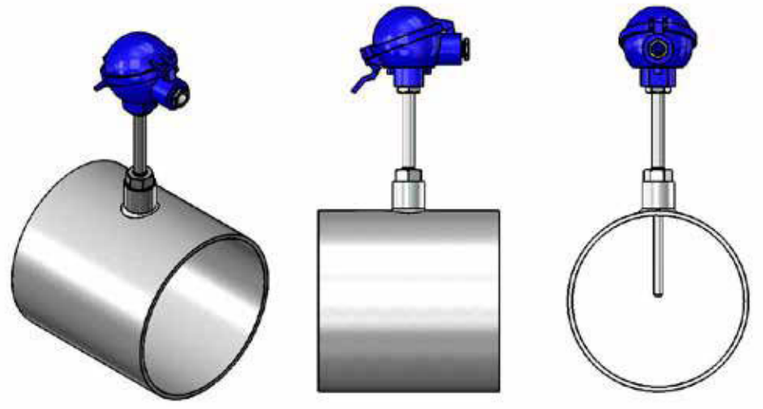
□-□-□-□□□□-□□□-□□□-□-□-□-□

Example code: W - B - 9 - D / W / H - 160 - G½" - 4 - A - TR - X

Well + Pt100/Thermocouple Sensing Element

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
B	= coupling thread
9	= ØOD = well diameter (mm)
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
160	= L = immersion depth (mm)
G½"	= thread size
4,3,2	= Pt 100 number of connection wires
K,N,J	= TC type of thermocouple
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS T-F / W-F

Flanged temperature sensor

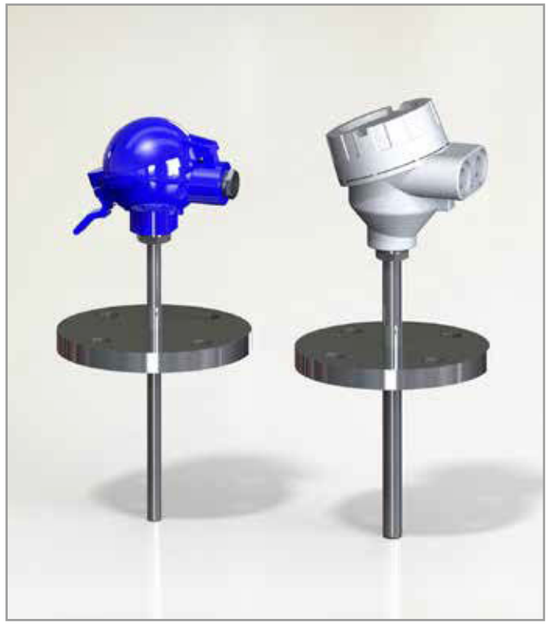
According to DIN 43772 2F

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Sensor parts in contact with the measured medium, are chosen accoring to the application
- Pt100, accuracy class A as a standard, more accurate on request
- TC, class 1 as standard
- Replaceable inner element, MI-construction
- Flange size and type according to the application
- Tailored solutions according to specific needs
- ATEX-version Ex db also available
- Cooling neck 145 mm as standard, others on request.

Typical Applications

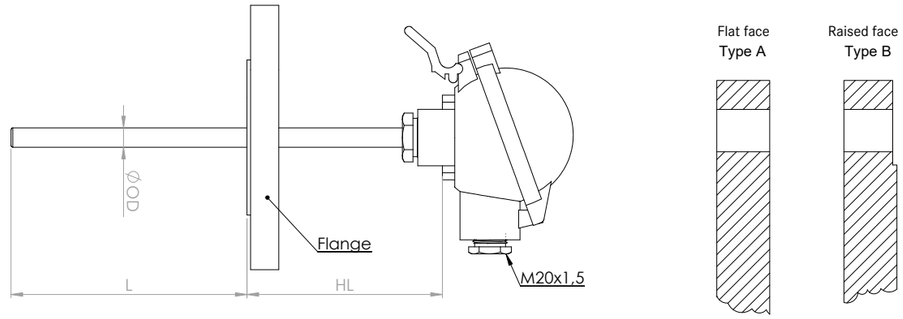
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.



Technical data

Thermowell material	AISI 316L, max. temp. +550 °C, temporarily +850 °C Heat-resistant steel 1.4841, max. temp. +1100 °C, temporarily +1250 °C
Flange	DIN EN 1092 -1, type 05A, DIN EN 1092-1, type 05B, others on request A = flat (Standard) B = raised face
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 TC (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 TC	-200...+1200 °C depending on thermocouple type HL = 250 mm -> temp. max. +750 °C HL = 300 mm -> temp. max. +1000 °C — TC = thermocouple HL = 350 mm -> temp. max. +1200 °C — HL = cooling neck
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

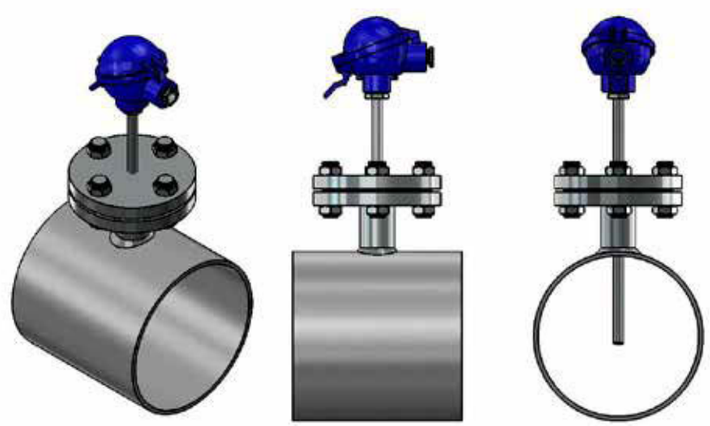
□-□-□-□-□-□-□-□-□-□

Example code: W - F - 9 - D / W / H - 160 - DN50/PN40 - 4 - A - TR - X

Flanged Well + Pt100/Thermocouple Sensing Element

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
F	= coupling with flange
9	= ØOD = well diameter (mm)
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
160	= L = immersion depth (mm)
DN50/PN40	= flange size
4,3,2	= Pt 100 number of connection wires
K,N,J	= TC type of thermocouple
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS T-D / W-D

Welded temperature sensor

According to DIN 43772 form 4

Features

- Temperature range - 200...+1200 °C
- Pt100 or thermocouple
- With welded thermowell
- Thermowell material according to the application
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- Replaceable inner element, MI-construction
- Tailored solutions according to specific needs
- ATEX-version Ex db also available
- Standard cooling neck length 145 mm, others on request.

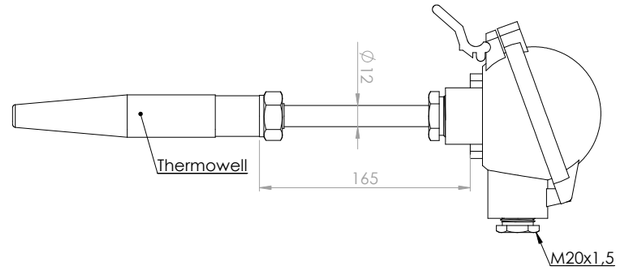
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Thermowell material	K = AISI 316L max. temp. +550 °C L = 13CrMo44/1.7335 max. temp. +550 °C M = 10CrMo910/1.7380 max. temp. +580 °C O = 16Mo3/1.5415 max. temp. +480 °C 1.4462 SMO254 1.4307 Ti Gr2 Other materials available on request
Thermowell type	D1/D2, D4/D5, D3/D6 according to DIN 43772 Form 4 , others 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 TC (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 TC	-200...+1200 °C depending on thermoelement type and thermowell material
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

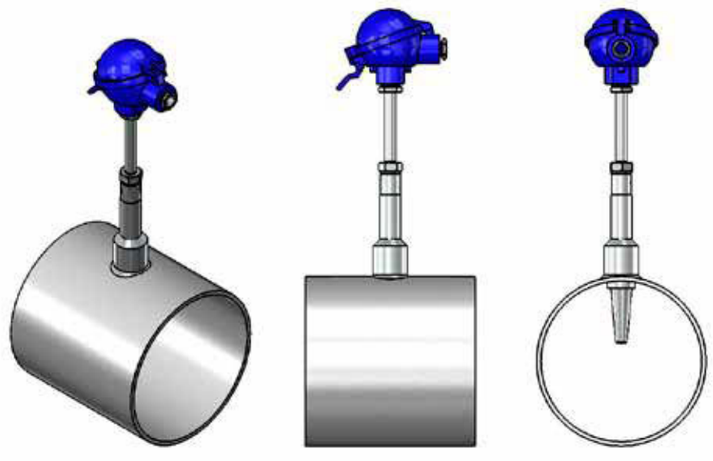
□ - □ - □ - □ - □ - □ - □ - □

Example code: W - D - D1/K - D / W / H - 4 - A - TR - X

Welded Well + Pt100/Thermocouple Sensing Element

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
D	= welded well
D1	= thermowell size (D1, D2, D4, D5)
K	= AISI 316L
L	= 13CrMo44/1.7335
M	= 10CrMo910/1.7380
O	= 16Mo3/1.5415
	other materials available on request
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
4,3,2	= Pt 100 number of connection wires
K,N,J	= TC type of thermocouple
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS W-H-12 / T-H-12
Threaded temperature sensor

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Fits to welded well
- Length of sensing insert 315, 375 or 435mm, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- Replaceable inner element, MI-construction
- Tailored solutions according to specific needs
- ATEX-version Ex db also available
- Standard cooling neck length 145 mm, others on request.

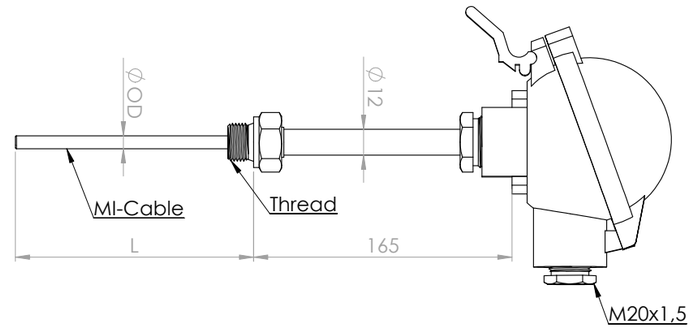
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Connection thread	M14x1.5, M18x1.5, others on request.
Inner element diameter	3, 6 or 8 mm.
Tolerances Pt100 (IEC 60751)	A, tolerance +/- 0.5 + 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 TC (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 TC	-200...+1200 °C depending on thermocouple type and thermowell material
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

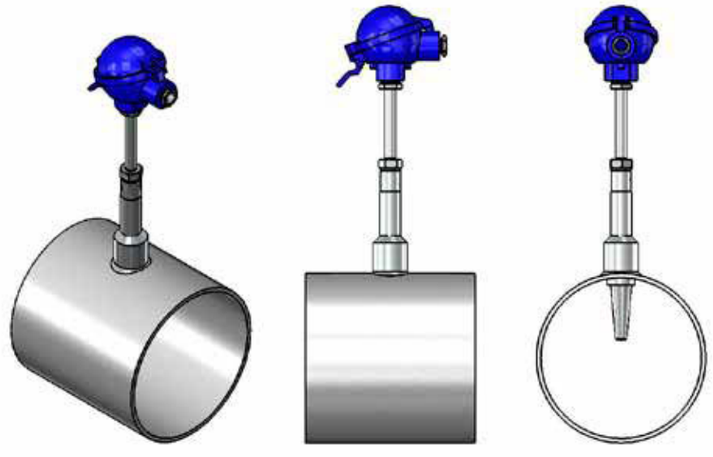
□-□-□-□-□-□-□-□-□-□-□

Example code: W - H - 12 - D / W / H - G½" - 6 / 375 / 200 - 4 - A - TR - X

Cooling neck
+ Pt100/Thermocouple Sensing Element

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
H	= cooling neck with thread
12	= cooling neck diameter (mm)
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
M18x1.5	= thread size
6	= ØOD = diameter of sensing element (mm)
375	= length of element (mm)
200	= L = immersion depth (mm)
4,3,2	= Pt 100 number of connection wires
K,N,J	= TC type of thermocouple
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS W-K-F

Indoor/outdoor resistance sensor

Features

- Temperature range -40...+80 °C
- Pt100, accuracy class A, as a standard, more accurate on request
- TC on request
- Sensing insert made of acid proof steel, highly polished, quick response time
- With or without transmitter
- Available with plastic or metal housing
- Tailored solutions according to specific needs
- ATEX-version Ex db also available.

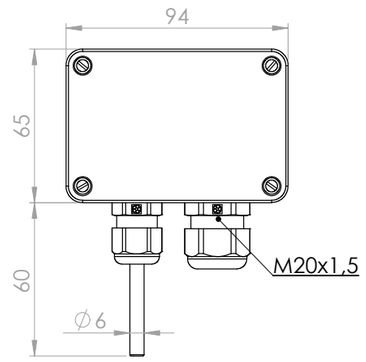
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

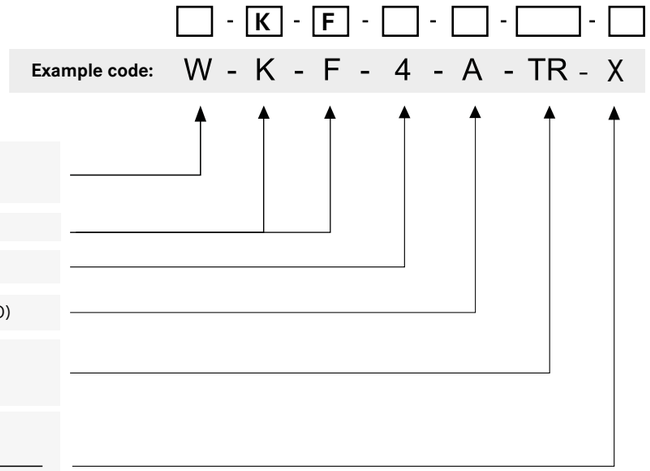
Technical data

Dimensions of housing	W x H x D 96x64x57. Others 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
Temperature range Pt100	-40...+80 °C. Others on request.
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



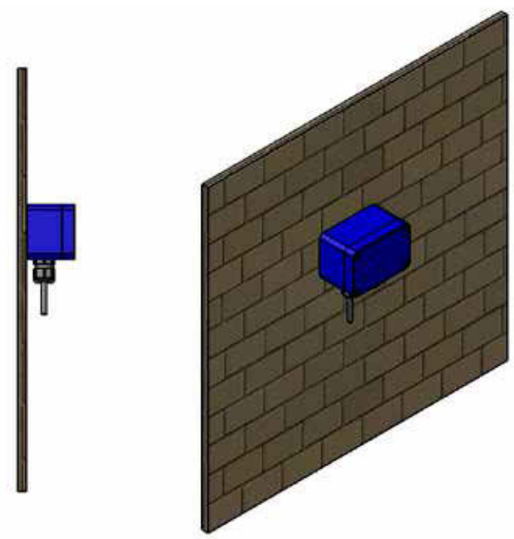
Product code key



Indoor/Outdoor sensor

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
K-F	= indoor or outdoor sensor
4	= Pt 100 number of connection wire
A, B	= Pt100 precision class A (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS T-M-Ø / W-M-Ø

Mineral insulated resistance or thermocouple inner element

Similar to DIN 43762

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Standard materials AISI 316L or INCONEL 600, others on request
- Pt100, accuracy class A, as a standard, more accurate on request.
- TC, class 1 as a standard
- MI-construction, bendable
- Tailored solutions according to specific needs.

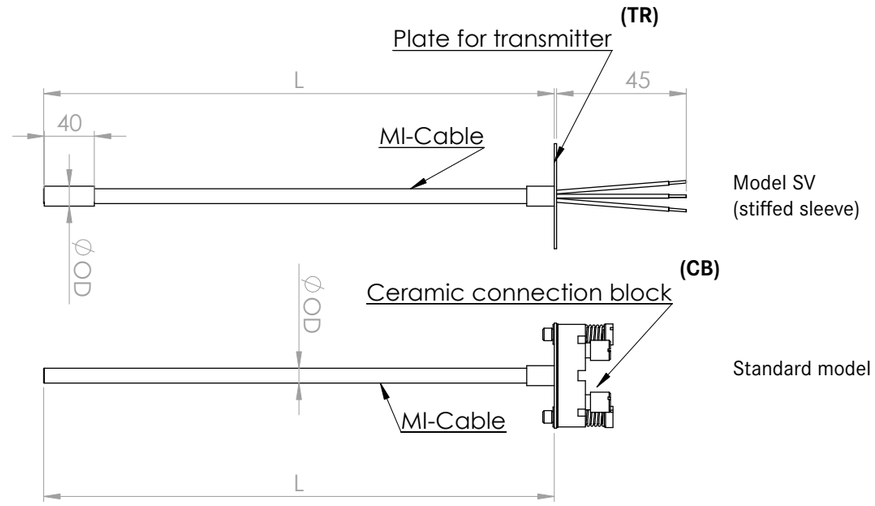
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C. INCONEL 600, max. +1100 °C, temporarily +1200 °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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 application and material
Temperature range TC **TC = thermocouple**	-200...+1200 °C depending on thermocouple type
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

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Example code: W - M - 6 - [ ] / 315 - 4 - A - TR - X

Sensing Element

W	= Pt100 resistance sensor
2xW	= 2 x Pt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
M	= mineral insulated
6	= ØOD = sensor diameter
[Blank]	= even thickness (Standard)
SV	= stiffed sleeve on measuring end
SVH	= improved vipration proof construction
315	= L = immersion depth (mm)
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

EPIC® SENSORS T-A-Ø / W-A-Ø or T-A-Ø-U / W-A-Ø-U

Immersible temperature sensor

According to DIN 43772 form 1

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Standard materials AISI 316L, heat-resistant steel (W 1.4749 etc.), others on request
- Available also with solid tip (length 200 mm)
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- Replaceable MI-construction inner element
- Tailored solutions according to specific needs
- ATEX-version Ex db also available.

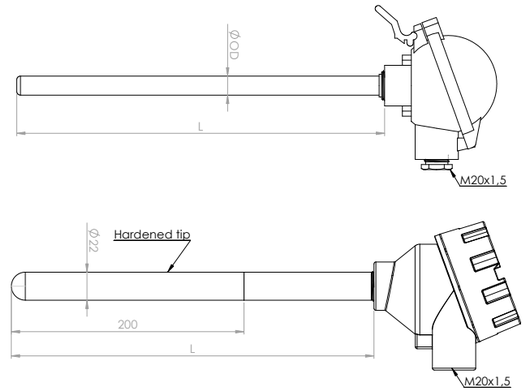
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Thermowell material	AISI 316L max. temp. +550 °C Heat-resistant steel 1.4749 or 1.4841 or 1.4845, max. temp. +1100 °C, temporarily +1200 °C, other materials available on request
Thermowell tip material	AISI 316L max. temp. +550 °C Heat-resistant steel 253MA or 1.4845 or, 1.4841, max. temp. +1100 °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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 TC	-200...+1200 °C depending on thermocouple type and thermowell material
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

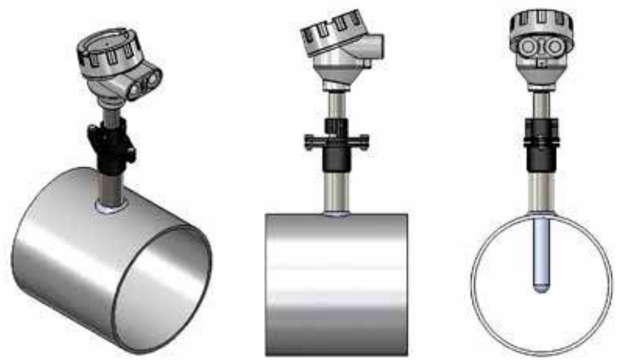
□-□-□-□-□-□-□-□-□-□-□

Example code: T - A - 22 - D/H - U / 1000 / 1.4845 - K - 1 - TR - X

Immersible Well + Sensing Element

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
A	= immersible temperature sensor
22	= ØOD = sensor diameter
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
[Blank]	= whitout hardened tip
U	= with hardened tip standard 200 mm, 1.4404, 1.4828, 1.4845, 253MA other material or dimensions on request
1000	= L = immersion depth (mm)
1.4845	= well material
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= Additional details on the text line _____

Installation examples



EPIC® SENSORS T-K / T-AKK

Immersible termocouple sensor

Similar to DIN 43733

Features

- Temperature range -200...+1800 °C
- TC, class 1 as a standard
- Thermocouple with ceramic well, standard material C799/C610, others on request
- Fixing with welded flanges, adjustable flange or gas tight compression fitting
- ATEX-version Ex db also available.

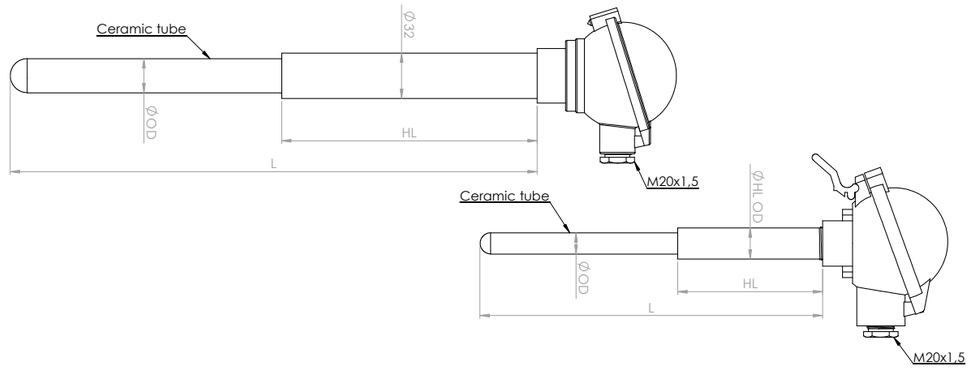
Typical Applications

- All high temperature applications
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Thermowell material	C610 max. temp. +1600 °C C799 max. temp. +1800 °C (gas tight) Other materials available on request
Tolerances Pt100 (IEC 60751)	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...+1800 °C depending on thermocouple type
Approvals	ATEX, IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

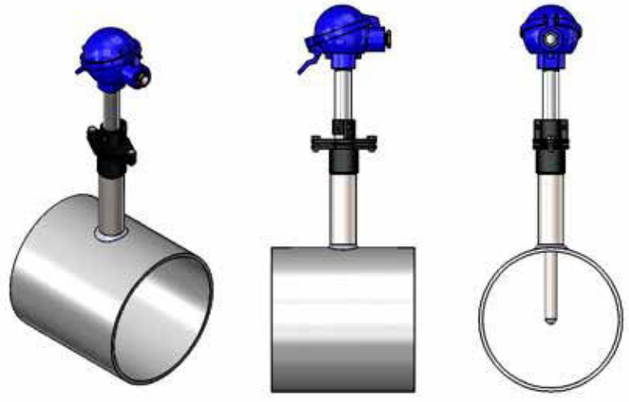
□ - □ - □ - □ - □ - □ - □ - □ - □

Example code: T - AKK - 24 - D/H - 1000 - S/0,5 - 1 - CB - X

Ceramic Well + Thermo element sensing element

T	= Thermocouple
2xT	= 2 x Thermocouple
K	= gas tight ceramic well
AKK	= flame proof ceramic outer tube gas tight internal well
10	= ØOD = gas tight ceramic 799, HL = 80 mm
15	= ØOD = gas tight ceramic 799 Ø,HL = 150 mm
24	= ØOD = flame proof ceramic outer tube 610 Ø 24 mm and gass tight internal ceramic tube 799 Ø 15 mm, HL = 200 mm. Other materials and diameters available on request.
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
1000	= immersion length
J,K,N, S,R,B	= thermo element type
0,5	= platinum sensor wire diameter 0.5 mm as standard
1,2,3	= accuracy class
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= Additional details on the text line

Installation examples



EPIC® SENSORS T-M-303 / W-M-303

Mineral insulated thermocouple or resistance sensing insert with cable

According to DIN 43721

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Standard materials AISI 316L or INCONEL 600, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- MI-construction, bendable, vibration proof
- ATEX-version Ex e also available.

Typical Applications

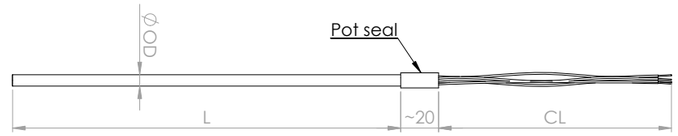
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

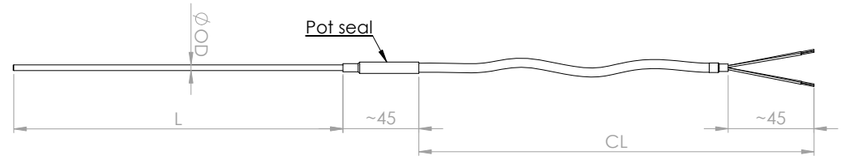
Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C. INCONEL 600, max. +1100 °C, temporarily +1200 °C.
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C
Tolerances Pt100 (IEC 60751)	A, tolerance +/- 0.15 + 0.002 x t, operating 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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 application and material. Max. temperature of transition sleeve +100 °C.
Temperature range TC **TC = thermocouple**	-200...+1200 °C depending on thermocouple type and material. Max. temperature of transition sleeve +100 °C.
Approvals	ATEX, IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing

Model 302



Model 303



Product code key

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Example code: T - M - 303 - 3 / 1000 - 3000 / SIL - K - 1 - X

Mineral Insulated Thermocouple or Resistance Sensing Insert with cable

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
M	= mineral insulated
303	= MI-constructured sensing insert with cable
302	= MI-constructured sensing insert with flexible wires
3	= diameter
1000	= immersion depth (mm)
3000	= cable length (mm)
SIL	= cable insulation material
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
X	= additional details on the text line

Installation examples

EPIC® SENSORS T-M-313 or T-M-314

Mineral insulated thermocouple sensing insert with connector

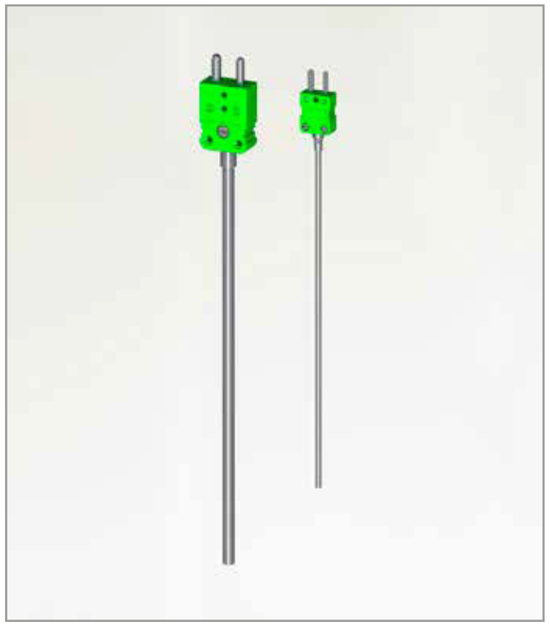
According to DIN 43721

Features

- Temperature range -200...+1200 °C
- Thermocouple, class 1 as a standard
- Available with standard or mini-plug
- Standard material INCONEL 600, others on request
- MI-construction, bendable, vibration proof
- Tailored solutions according to specific needs.

Typical Applications

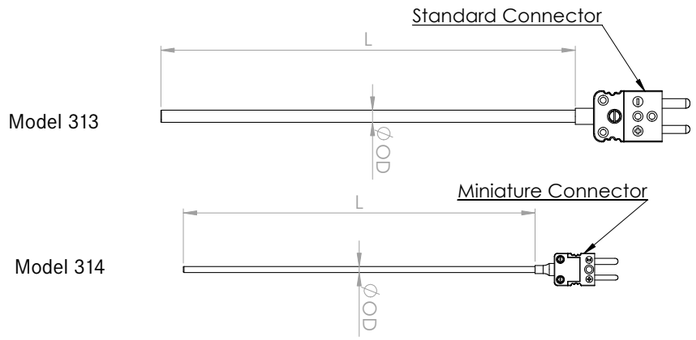
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.



Technical data

Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C INCONEL 600, max. +1100 °C, temporarily +1200 °C.
Connectors	Construction ”313” = plug with round pins, STD Construction ”314” = plug with flat pins, mini
Diameter	0.5 / 1.0 / 1.5 / 2.0 / 3.0 / 4.5 / 6.0 mm
Color of plug/connector	according to EN 60584
Tolerances TC (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 TC **TC = thermocouple**	-200...+1200 °C depending on thermocouple type and material.
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Product code key

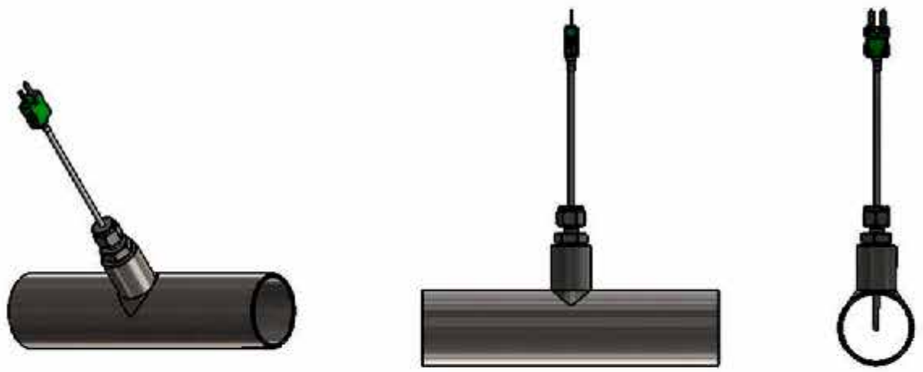
□-□-□□-□-□□□-□-□-□

Example code: T - M - 313 - 3 / 1000 - K - 1 - X

Mineral insulated sensing insert with connector

T 2xT	= Thermocouple = 2 x Thermocouple
M	= mineral insulated
313 314	= MI-constructured sensing insert with standard TC connector = MI-constructured sensing insert with miniature TC connector
3	= ØOD = diameter
1000	= L = immersion depth (mm)
K,N,J	= TC type
1,2,3	= TC accuracy class 1 (STANDARD)
X	= additional details on the text line

Installation examples



EPIC® SENSORS T-M-N / W-M-N

Mineral insulated sensing insert with connection head

According to DIN 43721

Features

- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Standard materials AISI 316L or INCONEL 600, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as standard
- MI-construction, bendable and vibration proof
- Fixing with welded flanges, adjustable flange or compression fitting
- Adjustable immersion length due to sliding mounting
- Tailored solutions according to specific needs
- ATEX-version Ex db also available.

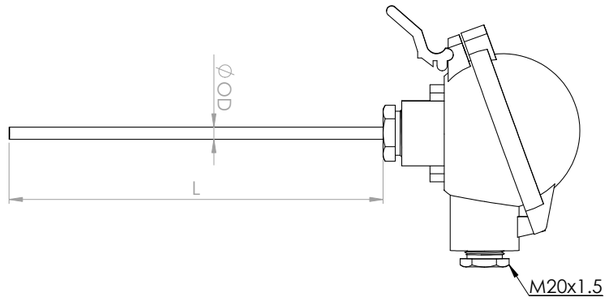
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C INCONEL 600, max. +1100 °C, temporarily +1200 °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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 application and material
Temperature range TC **TC = thermocouple**	-40...+1200 °C depending on thermocouple type
Approvals	ATEX, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



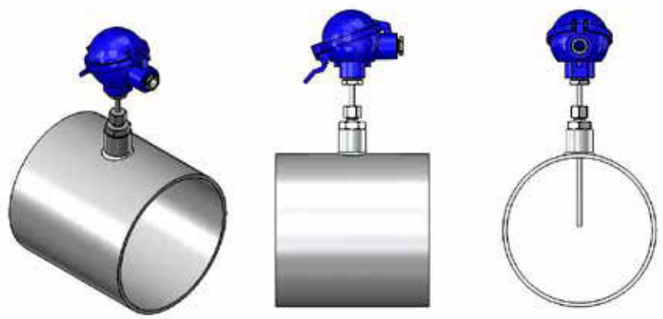
Product code key

Pt100/TC Mineral Insulated Sensing Element with Connection Head

Example code: T - M - N - G½ - L / 6 / 500 - K - 1 - TR - X

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
M	= mineral insulated
B	= connection head BL
D	= connection head DAN
D/H	= connection head DAN, cover with snap lock (standard)
D/W/H	= connection head high, cover with snap lock
EXD	= connection head ATEX
HST	= acid proof connection head
N	= connection head NA
G½	= thread alternatives G, R, NPT: 3/4, 1/2, 1/4, 1/8"
[blank]	= without thread
L	= movable compression fitting
[blank]	= without compression fitting
6	= ØOD = diameter
500	= L = immersion depth (mm)
4,3,2	= Pt 100 number of connection wires
K,N,J	= TC type
A,B	= Pt 100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1(STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples



EPIC® SENSORS W-E-6-HST-S / W-E-6-HST-CLAMP

Acid proof resistance sensor

Features

- Temperature sensor for hygienic installations
- All parts made of acid proof steel
- Temperature range -200...+550 °C
- Pt100 accuracy class A as a standard, more accurate on request
- Mounting by welding or with clamp connection
- Thermowell material according to the application
- Replaceable inner element, MI-construction, vibration proof
- Tailored solutions according to specific needs.

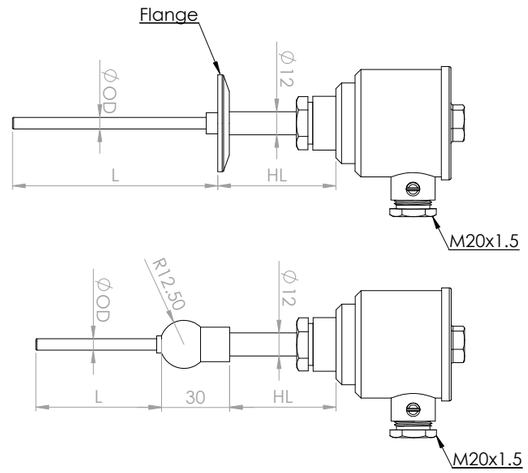
Typical Applications

- Food industry
- Pharmaceutical industry
- Chemical industry
- Process industry
- Energy and power plant technology
- Machinery, plant and vessel construction.

Technical data

Thermowell Material	AISI 316L, max. temp. +550 °C, temporarily +600 °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
Temperature range Pt100	-200...+550 °C
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Sensor with clamp flange thermowell

Sensor with welded thermowell

Product code key

Example code: W - E - 6 - HST - S - 500 - 4 - A - TR - X

Hygienic Well + Pt100 Sensing Element

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
E	= sensor for hygiene applications
6	= ØOD = diameter
D	= connection head DAN
N	= connection head NA
EXD	= connection head ATEX
HST	= acid proof connection head
B	= connection head BL
W	= connection head high
[blank]	= standard
H	= cover with snap-lock
S	= welded ball thermowell
CLAMP	= clamp flange size
500	= L = immersion depth (mm)
4,3,2	= Pt100 number of connection wires
A,B	= Pt100 precision class A (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
X	= additional details on the text line

Installation examples

EPIC® SENSORS W-RO or T-RO
Pipe surface temperature sensor

Features

- Temperature sensor for measuring surface temperature, from pipelines, tanks etc.
- Temperature range -200...+1000 °C
- Pt100 or thermocouple
- Standard materials AISI 316L or INCONEL 600, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- MI-construction, bendable, vibration proof
- ATEX-version Ex e also available
- Tailored solutions according to specific needs.

Typical Applications

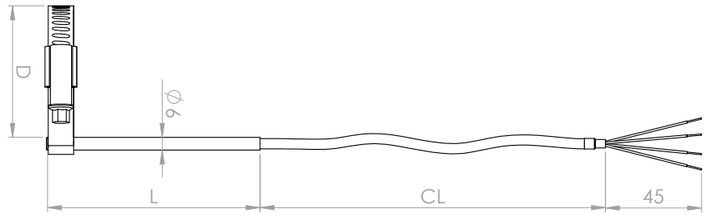
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

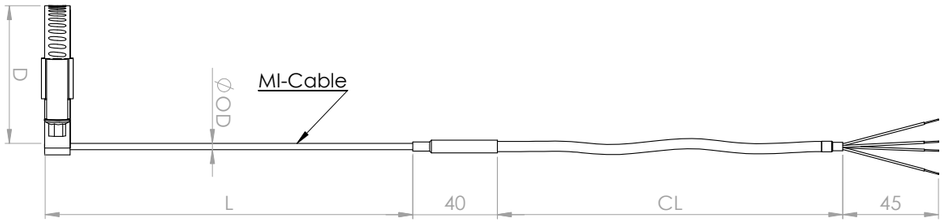
Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C INCONEL 600, max. +1000 °C, temporarily +1200 °C.
Fits to pipe sizes	0...1000 mm, others on request.
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C
Tolerances Pt100 (IEC 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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 application and material.
Temperature range TC **TC = thermocouple**	-200...+1000 °C depending on thermocouple type and material.
Approvals	ATEX. IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing

Model W-RO



Model W-RO-M



Product code key

□-□-□-□-□□□-□□□-□-□-□-□-□

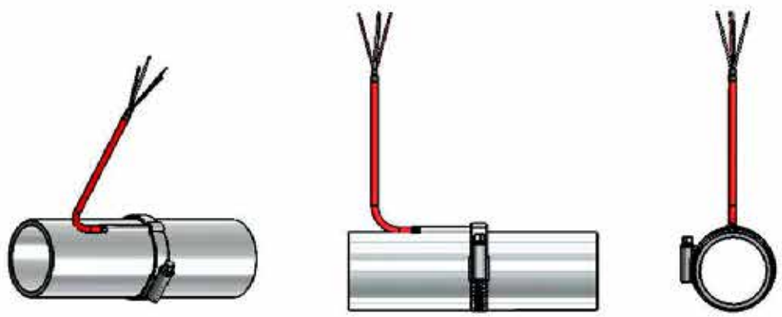
Example code: W- RO - M - 3 / 500 - 5000 / SIL - 4 - A D=25 - X

Pipe Surface Temperature Sensor

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
RO	= surface censor with tube collar
Blank	= without Mineral insulation cable
M	= mineral insulated construction
3	= ØOD = diameter
500	= L = length of MI-cable or steele sleeve (mm)
5000	= cable length (mm)
SIL	= cable Insulation material
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC precision class 1 (STANDARD)
D=25	= diameter of process pipe
X	= additional details on the text line

*NOTE! Pipe collar not welded if not specifically asked.

Installation examples



EPIC® SENSORS W-M-P / T-M-P or W-P / T-P
Surface temperature sensor

Features

- Temperature sensor for measuring surface temperatures
- Temperature range -200...+1250 °C
- Pt100 or thermocouple
- Standard materials AISI 316L or INCONEL 600, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- MI-construction, bendable, vibration proof
- ATEX-version Ex e also available
- Tailored solutions according to specific needs

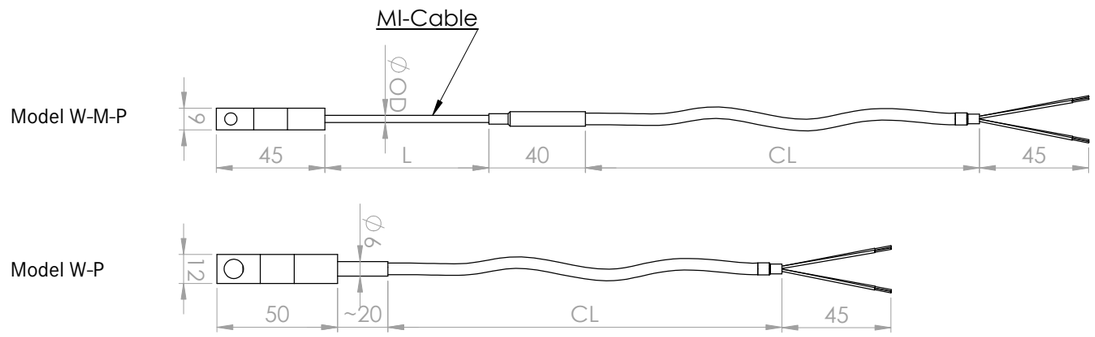
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction

Technical data

Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C INCONEL 600, max. +1100 °C, temporarily +1250 °C.
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C
Size of the surface mounting part (W, H, L)	5x9x45 or 12x12x50. Others on request.
Tolerances Pt100 (IEC 60751)	A, tolerance +/- 0,.5 + 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 TC (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 application and material.
Temperature range TC TC = thermocouple	-200...+1250 °C depending on thermocouple type and material.
Approvals	ATEX, IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Product code key

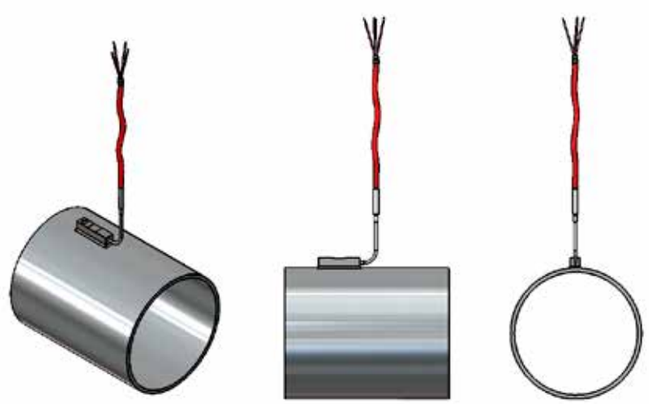
W- M - P - 5x9x45 - 3 / 500 - 5000 / SIL - 4 - A - X

Example code: W- M - P - 5x9x45 - 3 / 500 - 5000 / SIL - 4 - A - X

Surface temperature sensor

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
Blank	= without mineral insulation cable
M	= mineral insulated construction
P	= surface temperature sensor
5x9x45	= dimensions of heat cunductor part (mm)
3	= ØOD = diameter
500	= L = length of MI-cable (mm)
5000	= CL= cable length(mm)
SIL	= cable Insulation material
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC precision class 1 (STANDARD)
X	= additional details on the text line

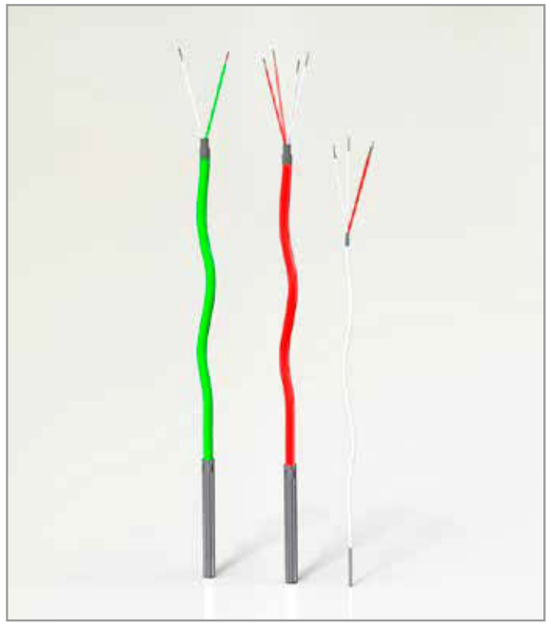
Installation examples



EPIC® SENSORS W-CABLE or T-CABLE
Temperature sensor with cable

Features
- Temperature sensor for multiple temperature measurement purposes
- Temperature range -200...+300 °C
- Pt100 or thermocouple
- Standard materials AISI 316L, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- Tailored solutions according to specific needs
- ATEX-version Ex e available.

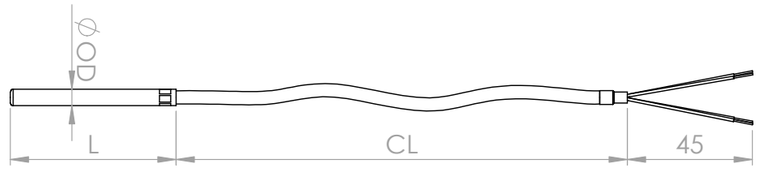
Typical Applications
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.



Technical data

Probe material	AISI 316L, max. temp. +250 °C, temporarily +300 °C.
Probe diameter	3, 4, 5, 6 or 8mm. Others on request.
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C FDF = Fep with shield, max 205 °C SDS = Sil/Shield/Sil, only 2-wire cable, max 180 °C FDS = Fep/Shield/Sil, max 180 °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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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...+350 °C depending on application and material.
Temperature range TC **TC = thermocouple**	-200...+350 °C depending on thermocouple type and material.
Approvals	ATEX, IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Product code key

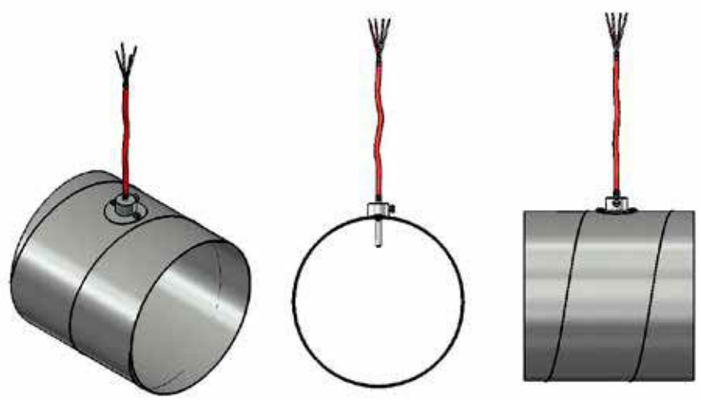
□ - □ - □ - □ - □ - □ - □ - □ - □

Example code: W - CABLE - 6 / 100 - 5000 / SIL - 4 - A - X

Cable temperature sensor

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
CABLE	= cable sensor with sleeve
6	= ØOD = diameter
100	= L = sleeve length (mm)
5000	= cable length (mm)
SIL	= Silicon, max +180 °C
FEP	= Teflon®, max +205 °C
GGD	= Glass silk/metal braid, max +350 °C
FDF	= Fep with shield, max 205 °C
SDS	= Sil/Shield/Sil, only 2-wire cable, max 180 °C
FDS	= Fep/Shield/Sil, max 180 °C
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC precision class 1 (STANDARD)
X	= additional details on the text line

Installation examples



EPIC® SENSORS W-BAJO or T-BAJO
Bayonet temperature sensor

Features

- Spring-loaded bayonet sensor for measuring temperature of bearings or other applications where vibration might occur or quick installation is needed
- Very easy and quick installation due to bayonet connection
- Temperature range -200...+300 °C
- Pt100 or thermocouple
- Standard materials AISI 316L, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as a standard
- Tailored solutions according to specific needs
- ATEX-version Ex e available.

Typical Applications

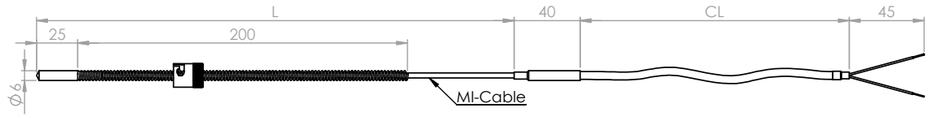
- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

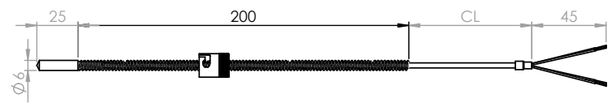
Probe material	AISI 316L, max. temp. +250 °C, temporarily +300 °C.
Sensor tip diameter	6 or 8mm. Others on request
Bayonet cap ID	12,2 mm. Others on request
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C
Tolerances Pt100 (IEC 60751)	A, tolerance +/- 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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 application and material.
Temperature range TC **TC = thermocouple**	-200...+300 °C depending on thermocouple type and material.
Approvals	ATEX, IECEx, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing

Model W-BAJO-6/3



Model W-BAJO-6



Product code key

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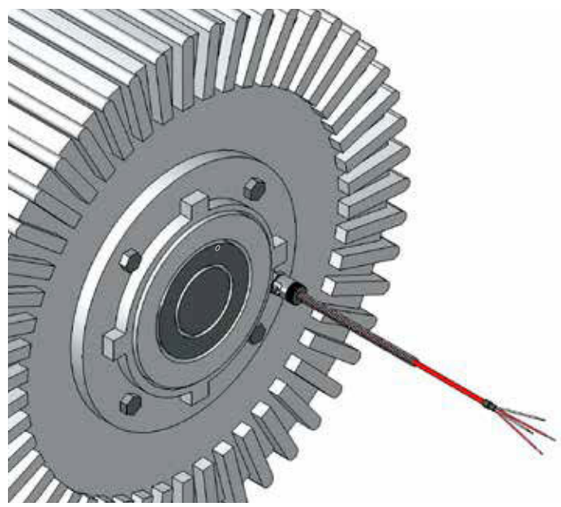
Example code: W- BAJO - 6 / 3 / 500 - 200/SPRING - 5000 / SIL - 4 - A - X

Bayonet temperature sensor

W 2xW T 2xT	= Pt100 resistance sensor = 2XPt100 resistance sensor = Thermocouple = 2 x Thermocouple
BAJO	= bayonet temperature sensor
6	= dimension of bayonet sleeve (mm)
Blank 3	= without mineral insulation cable = dimension of mineral insulated cable (mm)
500	= L = length of sleeve or MI- cable
Blank 200	= 200 mm = spring length Note! Only needed in MI- cable version
5000	= CL = cable length (mm)
SIL	= cable insulation material
4,3,2 K,N,J	= Pt100 number of connection wires = TC type
A,B 1,2,3	= Pt100 precision class A (STANDARD) = TC precision class 1 (STANDARD)
X	= Additional details on the text line _____ _____

Installation examples



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

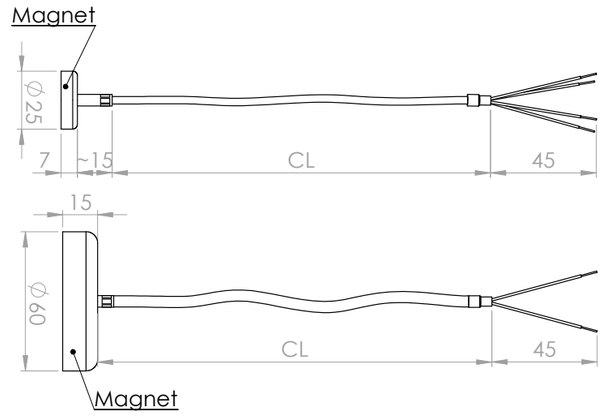
Features
- Temperature sensor with magnet for easy and quick installation
- Temperature range -200...+450 °C
- Pt100, accuracy class A, as a standard, more accurate on request
- Standard materials AISI 316L, others on request
- Tailored solutions according to specific needs.

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

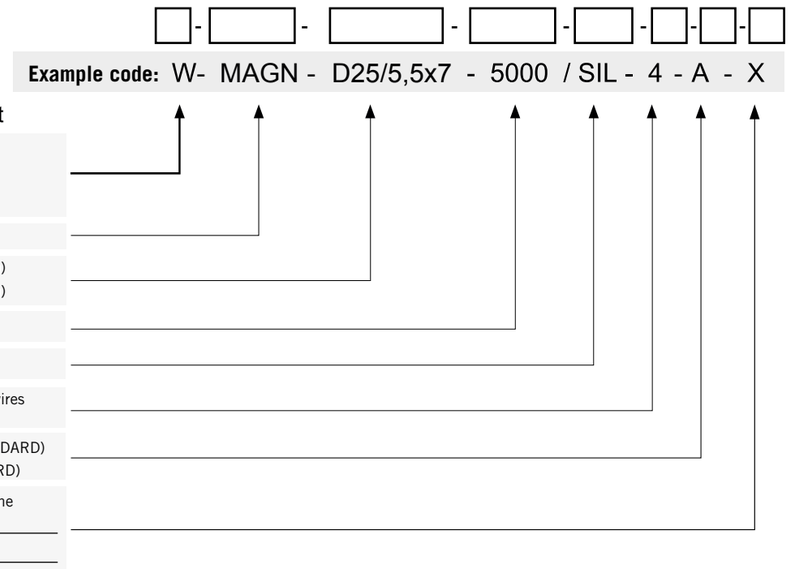
Technical data

Probe material	AISI 613L, max. temp. +250 °C, temporarily +300 °C.
Magnet size	Outer diameter 25 mm / height 7 mm Outer diameter 60 mm / height 15 mm Others on request.
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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...+350 °C, depending on application and material.
Temperature range TC **TC = thermocouple**	-200...+350 °C depending on thermocouple type and material.
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Product code key



EPIC® SENSORS W-106 / T-106

Temperature sensor for food industry

Features

- Temperature sensor with sharp tip and handle
- Temperature range -200...+300 °C
- Pt100, accuracy class A, as a standard, more accurate on request
- Standard materials AISI 316L
- Available also from totally acid proof materials
- Tailored solutions according to specific needs.

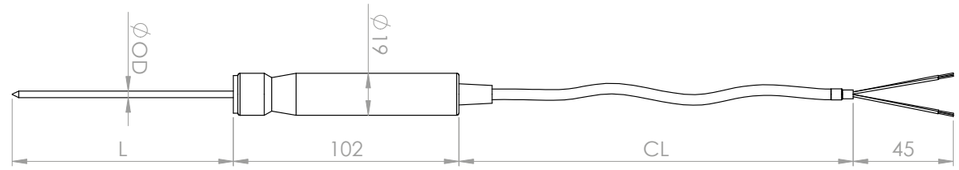
Typical Applications

- Food industry
- Chemical industry.

Technical data

Probe material	AISI 316L
Sensor tip diameter	3, 4 or 6 mm. Others on request
Sensor handle material	Plastic max. temp. + 110 °C (standard) or acid proof stainless steel
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °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 B 1/10 DIN, tolerance +/- 1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances TC (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 application and material.
Temperature range TC **TC = thermocouple**	-200...+300 °C depending on thermocouple type and material.
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Product code key

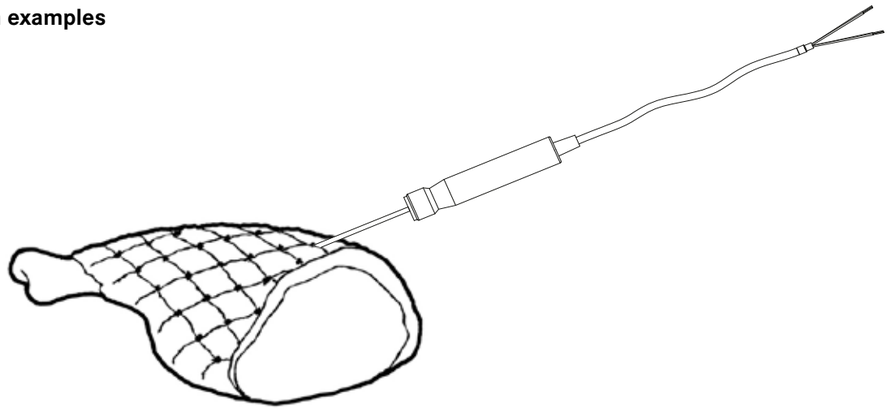
□-□-□ -□-□-□-□-□-□

Example code: W- 106 - 4 / 100 - 5000 / SIL - 4 - A - X

Temperature sensor for food industry

W 2xW T 2xT	= Pt100 resistance sensor = 2XPt100 resistance sensor = Thermocouple = 2 x Thermocouple
106	= temperature sensor for food industry
4	= ØOD = diameter (mm)
100	= L = spike length (mm)
5000	= CL = cable length (mm)
SIL	= cable insulation material
4,3,2 K,N,J	= Pt100 number of connection wires = TC type
A,B 1,2,3	= Pt100 precision class A (STANDARD) = TC accuracy class 1 (STANDARD)
X	= additional details on the text line _____

Installation examples



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

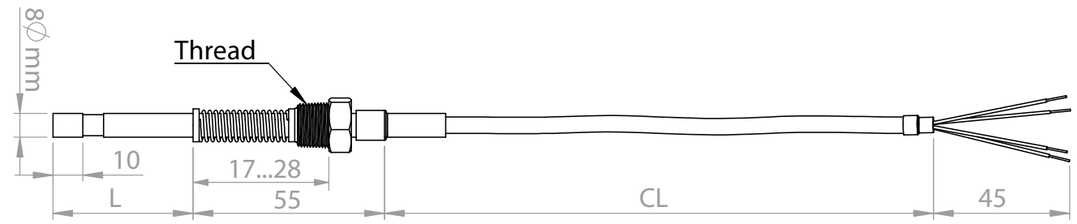
Features
- Suitable for bearing temperature measurement
- Temperature sensor with flat tip and spring-loaded screw
- Temperature range -200 oC...+300 °C
- Pt100, accuracy class A, as a standard, more accurate on request
- Standard materials AISI 316L and brass tip
- Tailored solutions according to specific needs.

Typical Applications
- Machinery
- Motor manufacturing industry
- Gear manufacturing industry.

Technical data

Probe material	AISI 316L/brass
Sensor tip diameter	8 mm, the sensor tube is tapered from tip portion to reduce the heat conduction. Others on request
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/Metal braid, max +350 °C PUR = Excellent oil resistance, max + 80 °C FDS = Fep/Shield/Sil, max 180 °C
Standard thread options	R3/8" standard, R1/2" optional
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 TC (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 application and material.
Temperature range TC **TC = thermo couple**	-40...+250 °C depending on thermocouple type
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Product code key

□ - □ - □ - □ - □ - □ - □

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

Bearing temperature sensor

W	= Pt100 resistance sensor
2xW	= 2xPt100 resistance sensor
T	= Thermocouple
2xT	= 2 x Thermocouple
BTD	= bearing sensor
Pt100A	= Pt100 precision class A (STANDARD)
TC-K1	= TC-K/N/J 1
L30	= L-length (immersion depth L + 17...28 mm)
4M	= CL = cable length (m)
SIL	= Silicon, max. +180 °C
FEP	= Teflon®, max. +205 °C
GGD	= Glass silk/Metal braid, max. +350 °C
PUR	= Excellent oil resistance, max. +80 °C
FDS	= Fep/Shield/Sil, max. 180 °C
X	= Additional details on the text line

EPIC® SENSORS W-MP / T-MP / W-MPT / T-MPT

Multi-point temperature sensor

Features

- Multi-point measurement
- Temperature range -200...+1200 °C
- Pt100 or thermocouple
- Standard materials AISI 316L or INCONEL 600, others on request
- Available with a connection box
- Pt100, accuracy class A, as standard, more accurate on request
- Thermocouple, class 1 as standard
- MI-construction, bendable, vibration proof
- Flexible stainless steel conduit version available, with changeable measurement elements
- Tailored solutions according to specific needs
- ATEX-version Ex e available.

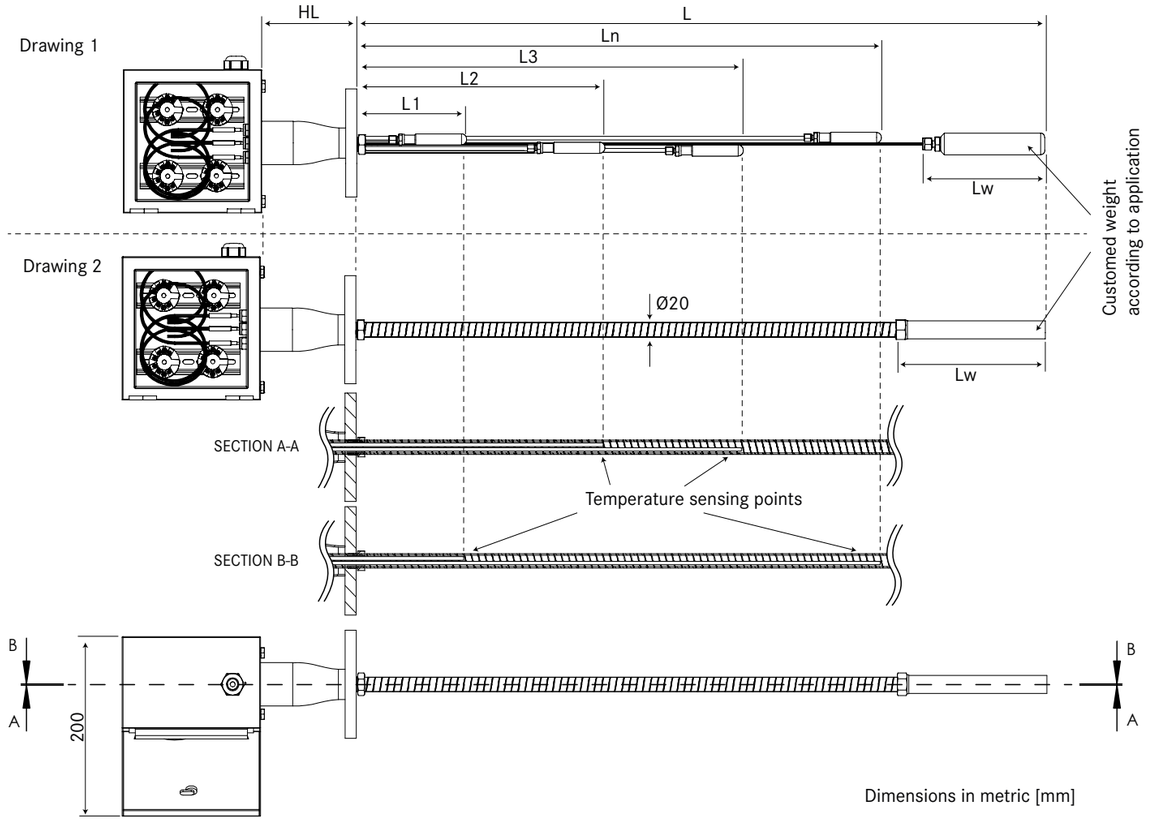
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Mi-wire material	AISI 316L, max. temp. +550 °C, temporarily +600 °C INCONEL 600, max. +1000 °C, temporarily +1200 °C
Flange material and type	AISI 316L others on request. Flange type according to ANSI, EN 1092-1, others on request
Elements	Made from MI-wire. Outer diameter 3 or 6 mm, others on request
Connection box	Material stainless steel, others on request
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C
Cable length	According to application
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 TC (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 application and material.
Temperature range TC **TC = thermocouple**	-200...+1200 °C depending on thermocouple type and material.
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV

Drawing



Dimensions in metric [mm]

Product code key

Example Code: 3XW – MPT – 3 / 2500/5000/7500 – DN50/PN16 – 4 – A – TR – BOX – X

W	= Pt100 resistance sensor
2xW	= 2XPt100 resistance sensor
nxW	= n times Pt100 resistance sensor
T	= thermocouple
2xT	= 2 x thermocouple
nxT	= n times thermocouple
MP	= multipoint sensor
MPT	= multipoint sensor with armoured pipe
3	= sensor diameter (mm)
2500/...	= sensor lengths (mm)
DN50/ PN16...	= flange type
4,3,2	= Pt100 number of connection wires
K,N,J	= TC type
A,B	= Pt100 precision class A (STANDARD)
1,2,3	= TC accuracy class 1 (STANDARD)
TR	= free wires for transmitter
CB	= with ceramic terminal block
BOX	= housing
X	= additional details on the text line

EPIC® SENSORS W-SCREW / T-SCREW

Threaded temperature sensor with cable

Features

- Temperature sensor for multiple temperature measurement purposes
- Temperature range -200...+300 °C
- Pt100 or thermocouple
- Standard materials AISI 316L, others on request
- Pt100, accuracy class A, as a standard, more accurate on request
- TC, class 1 as standard
- Tailored solutions according to specific needs.

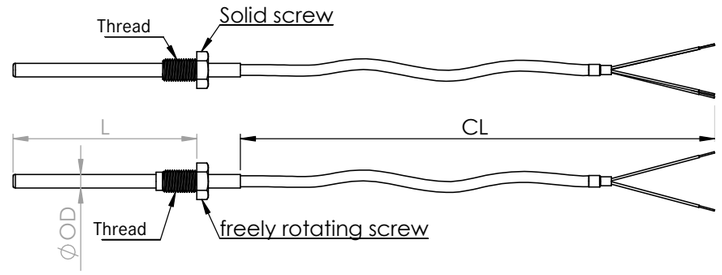
Typical Applications

- Process industry
- Chemical industry
- Machinery, plant and vessel construction.

Technical data

Probe material	AISI 316L, max. temp. +250 °C, temporarily +300 °C.
Probe diameter	3, 4, 5, 6 or 8mm. Others on request.
Thread size and length	According to request
Cable material	SIL = Silicon, max +180 °C FEP = Teflon®, max +205 °C GGD = Glass silk/Metal braid, max +350 °C FDF = Fep with shield, max 205 °C SDS = Sil/Shield/Sil, only 2-wire cable, max 180 °C FDS = Fep/Shield/Sil, max 180 °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 + 0005 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 TC (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 application and material.
Temperature range TC **TC = thermocouple**	-200...+300 °C depending on thermocouple type and material.
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 2015 by DNV

Drawing



Product code key

□ - SCREW - □ - □ - □ - □ - □ - □ - □ - □ - □ - □

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

Threaded Cable Temperature Sensor

W 2xW T 2xT	= Pt100 resistance sensor = 2XPt100 resistance sensor = Thermocouple = 2 x Thermocouple
SCREW	= cable sensor with screw
M6X1	= thread size
10	= thread length
6	= ØOD = diameter (mm)
100	= L = immersion depth
5000	= CL = cable length (mm)
SIL	= cable Insulation material
4,3,2 K,N,J	= Pt100 number of connection wires = TC type
A,B 1,2,3	= Pt100 precision class A (STANDARD) = TC precision class 1 (STANDARD)
X	= additional details on the text line

EPIC® SENSORS W-M-TRACE / 2x W-M-TRACE

Trace heating sensor

Features

- Sensing head operating temperature -40...+450 °C, temporarily +550 °C
- Connection box ambient temperature range -40...+80 °C
- 1 or 2 individual mineral insulated Pt100 sensing element(s)
- Pt100 accuracy class A, according to IEC 60751
- Replaceable sensing element(s)
- ATEX approved Ex e.

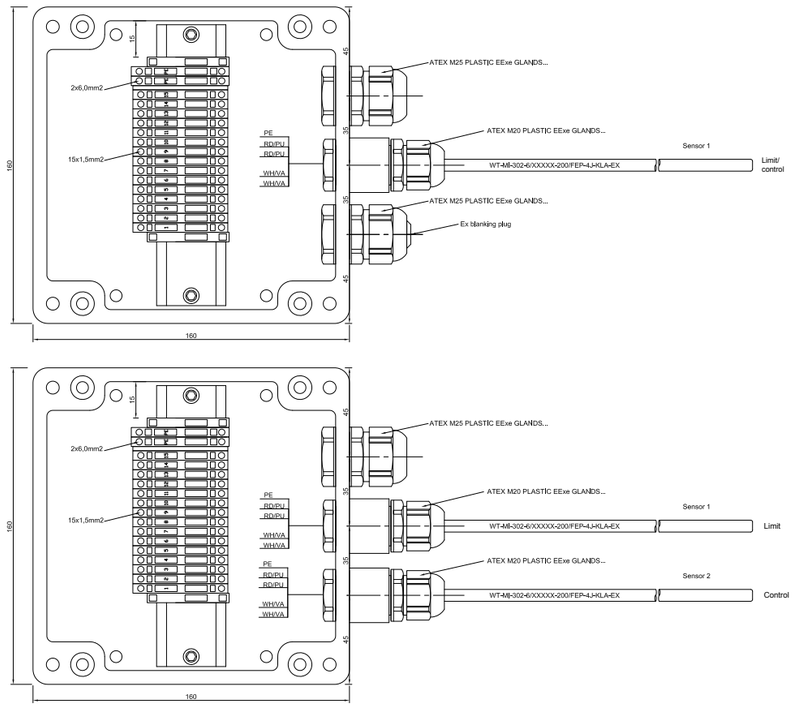
Typical Applications

- Energy and power plant technology
- Process industry
- Chemical industry
- Plant construction.

Technical data

Sensing element material	AISI 316L, max. temp. +450 °C, temporarily +550 °C
Tolerances Pt100 (IEC 60751)	A, tolerance +/- 0,.5 + 0.002 x t, operating temperature -100...+450 °C
Temperature range Pt100	-40...+450 °C, temporarily +550 °C
Sensing element device classification	II 2 GD Ex e T1-T6 Ex tD A21 IP66 T 60 °C T amb (max.) -40...+125/550 °C
Sensing element length	1000 mm, 2000 mm, other lengths on request
Sensing element diameter	3 or 6 mm
Box dimensions/material	160 x 160 x 90 mm, glass-reinforced polyester
Box device classification	II 2 GD Ex e IIC T6 Gb (Ta = -65...+40°C, +55°C, +60°C or +65°C) Ex e IIC T4 Gb (Ta = -65°C...+90°C) Ex Ib IIC T6 Gb (Ta = -65°C...+40°C, +55°C, +60°C or +65°C) Ex Ib IIC T4 Gb (Ta = -65°C...+90°C) Ex tb IIIC T85°C Db (Ta = -65°C...+40°C, +55°C, +60°C or +65°C) Ex tb IIIC T100°C Db (Ta = -65°C...+90°C)
Box temperature range	-40...+80 °C (ambient temperature)
Cable glands	2 sensing elements: 1 x M25x1.5, for cable diameters 6-13 mm 1 sensing element: 2 x M25x1.5, for cable diameter 6-13 mm
Approvals	ATEX
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP66/IP67

Drawing



Product code key

W - M - TRACE - ☐ - ☐ - 4 - A - EX - ☐

Example code: W - M - TRACE - 6 / 1000 - 4 - A - EX - X

Trace heating sensor

W 2xW	= mineral insulated Pt100 sensor = 2 x mineral insulated Pt100 sensor
M	= mineral insulated structure
TRACE	= trace heating sensor
3 or 6	= element diameter (mm)
1000	= element length (mm)
4	= number of Pt100 wires
A	= Pt100 tolerance class A
EX	= Ex e certified
X	= additional information

Installation examples

NOTE! Wires are not connected. Connections can be done according to customer specifications.

EPIC® SENSORS W-SIL-PATCH/T-SIL-PATCH/2xW-SIL-PATCH/2xT-SIL-PATCH

Silicone patch sensor

Features

- Temperature range -40...+180 °C
- Pt100 temperature sensor, accuracy class A, as a standard
- EMI shielded versions available
- ELASTOSIL® RT 607 A/B silicone material
- Silver plated fine strand copper wires
- Structured with cable or twisted wires

Optional features

- Aluminum tape on measuring surface
- Thermocouple instead of Pt100

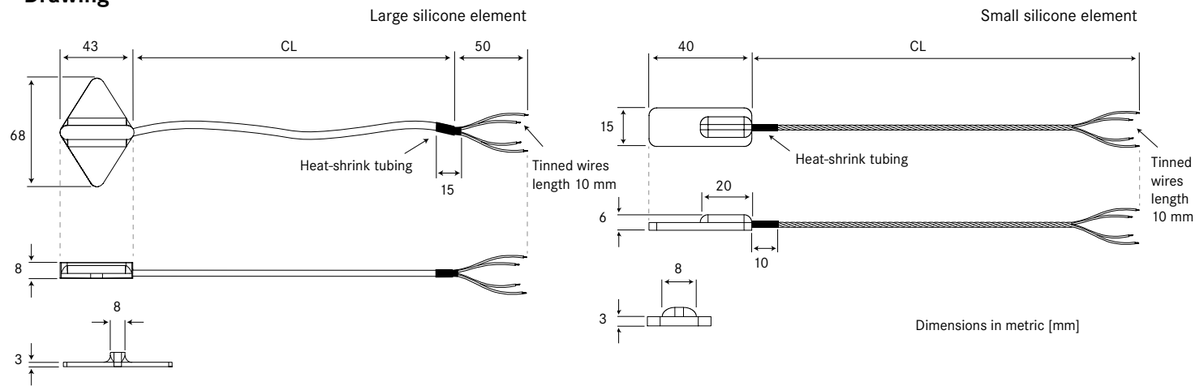
Typical Applications

- Energy and power plant engineering
- Process industry
- Chemical industry
- Machinery, plant and vessel construction

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 (t = temperature in °C)
Tolerances thermocouple (IEC 60584)	Type J tolerance class1 = -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 (t = temperature in °C)
Cable materials	SIL = 4,8/4x0,22/+180°C, silicone insulation on outer jacket FEP = 3,0/4x0,22/+205°C, FEP insulation on outer jacket and wires FDF = 3,4/4x0,22/+205°C, FEP insulation on outer jacket and wires, EMI shielded with silver plated copper wire braid, 90% nominal coverage SDS = Silicone insulated jacket, Shield, Silicone insulated wires, only 2 wire cable, +180°C FDS = FEP insulated jacket, Shield, Silicone insulated wires, +180°C
Wire materials (when no cable is being used)	2 wires = FEP insulated twisted wires 2x0,22/+205°C 3 wires = FEP insulated twisted wires 3x0,22/+205°C 4 wires = FEP insulated twisted wires 4x0,22/+205°C
Temperature range	-40...+180 °C (for sensor head)
Approvals	METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Product code key

□ – SIL – PATCH – □ – □ / □ – □ – □ – □ – □

Example code: W – SIL – PATCH – 40X15X3 – 5000 / SIL – 4 – A – Y – X

W = Pt100 temperature sensor
2xW = 2xPt100 temperature sensor
T = Thermocouple
2xT = 2xThermocouple

40X15X3 = Small Silicone Element
68X43X8 = Large Silicone Element

5000 = Cable length [mm]

CON = Instead of cable, multiple single wires is being used
SIL = Silicone jacket and FEP wires
FEP = FEP jacket and FEP wires
FDF = FEP with Shield
SDS = Silicone insulated jacket and wires with shield (only 2 wire cable)
FDS = FEP jacket with shield and silicone insulated wires

4,3,2 = Pt100 number of wires
K,N,J = TC type (2 wire construction)

A,B = Pt100 precision class A (STANDARD)
1,2,3 = TC precision class 1 (STANDARD)

Y = With aluminum foil
N = No aluminum foil

X = additional details on text line

_____

_____

Installation examples

EPIC® SENSORS nxT-MP-303

Mineral insulated multipoint temperature sensor

According to DIN 43721

Features

- Temperature range -200...+1200 oC
- Standard materials AISI 316L or INCONEL 600, others on request
- Customized lenghts
- Customised amount of measurement points
- MI-construction, bendable, vibration proof
- Thermocouple, class 1 as standard

Optional features

- EMI shielded cable

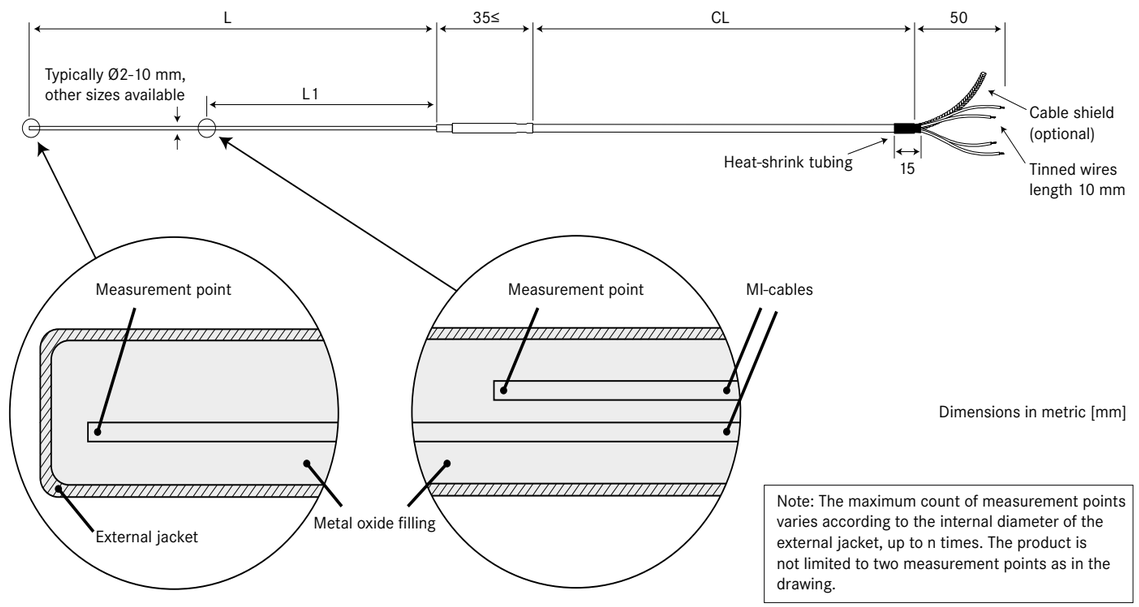
Typical Applications

- Steel industry, chill moulds
- Energy and power plant engineering
- Process industry
- Chemical industry
- Machinery, plant- and vessel construction

Technical data

MI-wire materials	AISI 316L, max. temp. +550 °C, temporarily +600 °C INCONEL 600, max. temp. +1100 °C, temporarily +1200 °C
Tolerances thermocouple (IEC 60584)	Type J tolerance class1 = -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 (t = temperature in °C)
Cable materials	SIL = Silicone, max +180°C FEP = Teflon®, max +205 °C GGD = Glass silk/metal braid, max +350 °C
Temperature range	-200...+1200 °C depending on thermocouple type and material max. temperature of transition sleeve +100 °C
Quality certificate	ISO 9001:2015 issued by DNV
IP-class	IP65, higher IP-class on request

Drawing



Dimensions in metric [mm]

Note: The maximum count of measurement points varies according to the internal diameter of the external jacket, up to n times. The product is not limited to two measurement points as in the drawing.

Product code key

□ – MP – 303 – □ / □ / □ – □ / □ – □ – □ – □

Example Code: 2xT – MP – 303 – 2,7 / 750 / AISI – 5000 / SIL – K – 1 – X

nxT	= n times thermocouple
MP	= multipoint sensor
303	= MI-constructed sensing insert with cable
2,7	= external jacket diameter (mm)
750	= element length, L (mm)
AISI	= AISI 316L materials, max +550 °C
INCO	= INCONEL 600 materials, max +1100 °C
5000	= cable length, CL (mm)
SIL	= Silicone, max. +180 °C (cable materials)
FEP	= Teflon®, max +205 °C
GGD	= Glass silk/metal braid, max +350 °C
K, N, J	= thermocouple type
1,2,3	= thermocouple accuracy class 1 (STANDARD)
X	= additional details on the text line

EPIC® SENSORS WLT 310
IoTKey® transmitter

Wireless LoRa transmitter

- Configurable, energy efficient LoRa 868 MHz (EU) transmitter for industrial grade wireless measuring and IoT systems using 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.

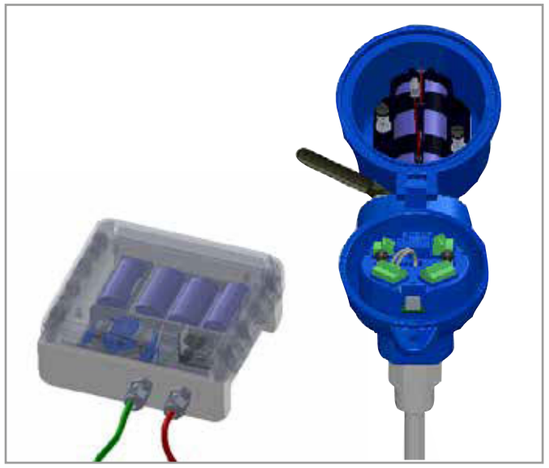
The IoTKey® WLT 310 transmitter has two inputs for temperature and Lin.R measurements. A third analog input can be configured as voltage or current input, or as a humidity sensor input.

The main power supply is a C size 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.

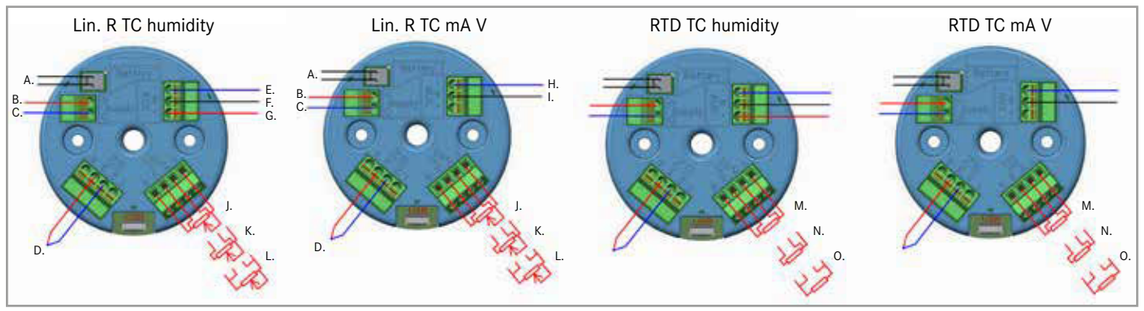
Technical data

Weight	39 g
Height	25 mm
Diameter	57 mm
Wire size	1 x 1.0 mm² stranded wire
Compliance standards	
EMC	EN 61326-1:2013 and EN 301489
RF	EN 300 220-1 v2.4.1
Vibration	EN 60068-2-6
LoRaWAN certified	

Assembly examples



Connection examples



A. Battery
B. Ext.Supply 12/24VDC
C. Ext.Supply gnd
D. TC
E. Humidity sensor gnd
F. Humidity sensor out
G. Humidity sensor 5V/10V
H. mA and V input gnd
I. mA and V input +
J. Lin.R 4wr
K. Lin.R 3wr
L. Lin.R 2wr
M. RTD 4wr
N. RTD 3wr
O. RTD 2wr

NOTE! Channels S1 and S2 are identical

Temperature sensor inputs

Pt100/Pt1000 input, RTD (S1/S2)	
One or two of the temperature sensor inputs can be configured as Pt100/Pt1000 inputs. The connection type can be configured to 2, 3 and 4 wires. Inputs can also detect a short and open sensor.	
Temperature measurement range	-200...+800 °C
Measurement accuracy	≤ ±0.3 °C
Temperature coefficient	≤ ± 0.01°C / °C

Thermocouple input, TC (S1/S2)	
One or two of the temperature sensor inputs can be configured as thermocouple sensor inputs. TC inputs can also detect an open sensor.	
Thermocouple types	E, J, K, N, R, S, T, B, L and U are supported
Measured temperature range depends on the thermocouple type	-200 to +1820 °C
Measurement accuracy for types E, J, K, N, T, U and L	≤ ±1°C
Temperature coefficient	
Measurement accuracy for types B, R and S	≤ ±2 °C
Cold junction temperature (CJC)	-40...+80 °C Accuracy ≤ ± 1°C

Linear resistance, Lin. R input (S1/S2)	
Resistance measurement range	0-3757 ohm
Measurement accuracy	≤ ± 0.1% of span
Temperature coefficient	≤ ± 0.01% of span / °C

Current/voltage input (AUX)

Current / Voltage input	
The analog input can be configured as voltage or current input, or as humidity sensor input.	
Current measurement range	0...20 mA (0 - 23mA)
Measurement accuracy	≤ ± 0.5 % of span
Temperature coefficient	≤ ± 0.01% of span / °C
Voltage measurement range	0...10 V (0 - 11 V)
Measurement accuracy	≤ ± 0.5 % of span
Temperature coefficient	≤ ± 0.01% of span / °C

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...100 % RH
Voltage measurement range	0...10 V (0 - 11 V)
Temperature coefficient	≤ ± 0.01% of span / °C
Measurement accuracy	≤ ± 0.5 % of span
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

Battery	• Main power supply is a C size Lithium primary cell battery, 3.6 V nominal 8.5 Ah • The battery input is polarity protected • Battery life time depends of configuration (typically min. 1-2 years) • Electricity consumption < 100 mA *)
External power supply	• The device operates on external nominal 12 or 24 V DC supply • The operating voltage range is 9 to 40 V (12-24V more than ± 30 %) • The power supply is isolated from the inputs. The isolation between the power supply/inputs is 1500 Vrms. • **Inputs are not isolated from each other!** • Electricity consumption < 70 mA *)

*) 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.

Environmental specifications

Operating temperature range when powered by battery)	-25 to +60 °C
Operating temperature range when powered by external DC supply	-40 to +80 °C
Plastic casing / protection class	IP20
Vibration resistance	Certification No 2.4 class B (DNV Standard)
Humidity	
RH for device	< 90 %, non-condensing
RH for WSB-Sensor	< 90 %, non-condensing
Storage	< 95 %, non-condensing
Transportation	< 95 %, non-condensing
The life time expectancy is more than 10 years in temperature range -40...+80 °C.	

**) Depends on the battery manufacturer's specifications.

THERMOWELLS WITH FLANGE

Flanged thermowells are used when removing and replacing the well must be possible during process maintenance. With flange installation all welding tasks can be avoided.

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

Product number	Type	For sensing element diameter/length [mm]
1119927	F-11-D/H-100-DN25/PN40	6/255
915187	F-11-D/H-160-DN25/PN40	6/315
915188	F-11-D/H-250-DN25/PN40	6/405
915189	F-11-D/H-400-DN25/PN40	6/555
915190	F-11-D/H-500-DN25/PN40	6/655
1220269	F-11-D/H-1000-DN25/PN40	6/1155

Other types and dimensions are quoted upon request.
Flanged sensors/wells can also be coated to increase acid resistance features.

IMMERSIBLE THERMOWELLS

Immersible thermowells are used for e.g. channel sensors. The immersion depth can be adjusted upon installation with gas-tight threaded couplings or adjustable flanges. Specially with 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 closed tip version (code key letter U).

Product number	Type	For sensing element diameter/length [mm]	Note
915321	A-15-D/H-500	8/525	
915322	A-15-D/H-710	8/735	
915323	A-15-D/H-1000	8/1025	
915324	A-15-D/H-1400	8/1425	
916322	A-15-D/H-500/1.4841	8/525	
916323	A-15-D/H-710/1.4841	8/735	
916324	A-15-D/H-1000/1.4841	8/1025	
916325	A-15-D/H-1400/1.4841	8/1425	
916483	A-22-D/H-500	8/525	
916484	A-22-D/H-710	8/735	
916485	A-22-D/H-1000	8/1025	
916486	A-22-D/H-1400	8/1425	
916479	A-22-D/H-500/1.4749	8/525	
916480	A-22-D/H-710/1.4749	8/735	
916481	A-22-D/H-1000/1.4749	8/1025	
916482	A-22-D/H-1400/1.4749	8/1425	
916326	A-22-D/H-U/710/A304	6/735	U = hardened tip
916327	A-22-D/H-U/1000/A304	6/1025	U = hardened tip
916381	A-22-D/H-U/1400/A304	6/1425	U = hardened tip
1015021	A-22-D/H-U/710/1.4845	6/735	U = hardened tip
1136232	A-22-D/H-U/1000/1.4845	6/1025	U = hardened tip
1136233	A-22-D/H-U/1400/1.4845	6/1425	U = hardened tip
1059821	A-22-D/H-U/710/253MA	6/735	U = hardened tip
1059823	A-22-D/H-U/1000/253MA	6/1025	U = hardened tip
1059824	A-22-D/H-U/1400/253MA	6/1425	U = hardened tip

Other types and dimensions are quoted upon request.

THREADED WELLS WITH COOLING NECK

Threaded thermowells with cooling neck are used on pipes/vessels which are insulated. Cooling neck length should be selected in order to leave sensor's connection head outside the insulation layer. Another reason for using neck versions is leaving more distance between hot installation thread and sensitive electronics in connection head - mainly transmitters.

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

Product number	Type	For sensing element diameter/length [mm]
915180	B-9-D/H-100-G½	6/255
915181	B-9-D/H-160-G½	6/315
915182	B-9-D/H-250-G½	6/405
915183	B-9-D/H-400-G½	6/555
920462	B-9/6-D/H-160-G½	3/315
1009711	B-9/6-D/H-250-G½	3/405
916857	B-11-D/H-160-G½	6/315
916865	B-11-D/H-250-G½	6/405
1015020	B-11-D/H-400-G½	6/555
915184	C-11-D/H-160-R1	6/315
915185	C-11-D/H-250-R1	6/405
915186	C-11-D/H-400-R1	6/555

Material of welded thread sleeves is - as standard - acid proof stainless steel AISI 316L. Other types, dimensions and materials are quoted upon request.

THREADED WELLS WITHOUT COOLING NECK

Threaded thermowells without cooling neck are used when there is no insulation layer on the surface of installation thread. Next to thread located connection head - with transmitter and/or cable inside - doesn't tolerate very high temperatures.

Threaded wells without cooling neck, as components (without sensing elements), according to DIN 43772 Form 2.

Product number	Type	For sensing element diameter/length [mm]
915112	B-6K-N-50-G½	3/95
915175	B-6K-N-100-G½	3/145
915176	B-9K-D/H-100-G½	6/145
915177	B-9K-D/H-160-G½	6/205

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 thermal stability and resistance to high temperatures than FEP
- METCO hard metal coating, especially for applications where sensors are exposed to grinding like crude oil pipes (sand/stones), rock wool blasting etc.
- HALAR for anti-corrosion applications
- DIAMALLOY corrosion protection, harder surface
- STELLITE® no 6 - good wear resistance
- Other materials upon request.

The allowed temperature can vary on the range of -200...+1200 °C depending on the coating 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. +140 ˚C

THERMOWELLS

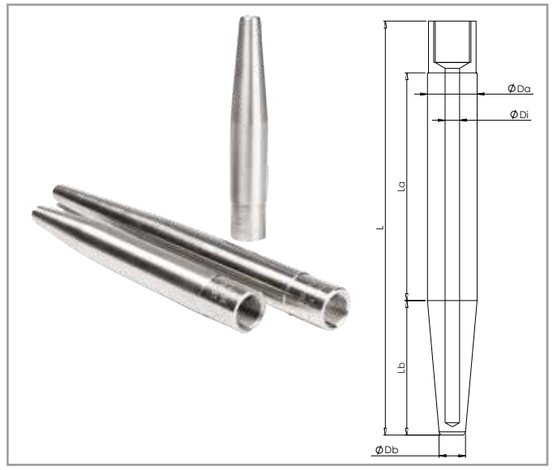
WELDED THERMOWELLS

For welded applications we offer welded wells, separate cooling neck with connection head for them and welded root sleeves for installing threaded wells.

Welded well and sleeve material temperature resistances

- 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.



Product number	Type	For sensing element diameter/ length [mm]	Inner thread	L (mm)	La (mm)	Da (mm)	Lb (mm)	Db (mm)
1025318	E-6/30	3/120						
1025319	E-6/55	3/145						
1090956	E-6/115	3/205						
911966	D1-L	6/315	M18×1.5	140	50	24h7	65	12.5
911144	D4-L	6/375	M18×1.5	200	110	24h7	65	12.5
911968	D5-L	6/435	M18×1.5	260	110	24h7	125	12.5
911907	D1-M	6/315	M18×1.5	140	50	24h7	65	12.5
911165	D4-M	6/375	M18×1.5	200	110	24h7	65	12.5
911457	D5-M	6/435	M18×1.5	260	110	24h7	125	12.5
911890	D1-K	6/315	M18×1.5	140	50	24h7	65	12.5
911161	D4-K	6/375	M18×1.5	200	110	24h7	65	12.5
911967	D5-K	6/435	M18×1.5	260	110	24h7	125	12.5
911906	D1-O	6/315	M18×1.5	140	50	24h7	65	12.5
911145	D4-O	6/375	M18×1.5	200	110	24h7	65	12.5
911969	D5-O	6/435	M18×1.5	260	110	24h7	125	12.5
912066	D1S-L	3/315	M14×1.5	140	50	18h7	65	9
911164	D4S-L	3/375	M14×1.5	200	110	18h7	65	9
912067	D1S-M	3/315	M14×1.5	140	50	18h7	65	9
911166	D4S-M	3/375	M14×1.5	200	110	18h7	65	9
912065	D1S-K	3/315	M14×1.5	140	50	18h7	65	9
911162	D4S-K	3/375	M14×1.5	200	110	18h7	65	9
912068	D1S-O	3/315	M14×1.5	140	50	18h7	65	9
911163	D4S-O	3/375	M14×1.5	200	110	18h7	65	9

Other sizes and materials are quoted upon request.

WELDED ROOT SLEEVES FOR WELDED WELLS

The root sleeve is first welded on a process pipe/vessel, then bored to precise inner dimension and after that the D1/ D1S/D4/D4S/D5 well is welded on the root sleeve as shown in the installation example image beside. The root sleeve material should be chosen according to the material of the welded well.

Product number	Type	For well type
1025309	18-K	D1S and D4S
1025312	18-L	D1S and D4S
1025313	18-M	D1S and D4S
918138	18-O	D1S and D4S
912333	24-K	D1, D4 and D5
912331	24-L	D1, D4 and D5
912332	24-M	D1, D4 and D5
912334	24-O	D1, D4 and D5

WELDED THREAD SLEEVES

Welded thread sleeves are first welded on process pipes/ vessels and threaded wells are then screwed on. The material of welded thread sleeves is - as standard - acid proof stainless steel AISI 316L.

Product number	Type and inner thread	Overall length [mm]
1025314	G1/2”	L=30
1002689	G1/2”	L=70
1003144	G1/2”	L=100
1028394	G1”	L=70
Other materials and sizes are quoted upon request.		

COOLING NECK AND CONNECTION HEAD FOR WELDED WELLS

If you already have your well welded in to the process, you can buy the cooling neck and connection head for it, 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):

Product number	Type	For well types
915312	H-12-D/H-165/M18X1,5	D1, D4 and D5
915313	H-12-D/H-165/M14X1,5	D1S and D4S

Cooling neck and connection head equipped with sensing element - without welded well - is presented on Datasheet 5. Cooling neck and connection head equipped with sensing element and with welded well is presented on Datasheet 4.

GAS-TIGHT COUPLINGS

Gas-tight threaded couplings are used with Ø 15 mm or 22 mm wells, when the immersion depth has to be adjusted on thread installation. Gas-tight couplings have Teflon® ferrules inside. By screwing the cap down, the ferrule is pressed on the well. This connection is gas-tight, but not pressure resistant.

Product number	Type - thread - inner diameter
917347	Gas-tight threaded coupling G1”-15mm
999562	Gas-tight threaded coupling G1”-22mm

Other types are quoted upon request.

COMPRESSION FITTINGS AISI 316

Compression fittings are used with sensing inserts or sensors without wells. The immersion depth of sensing insert can be adjusted, when installing on a thread. Gland couplings have metal ferrules inside. Ferrules are made of stainless steel SS316L (other materials and sizes upon request). Single or double ferrules are used depending on the inner diameter. By screwing the cap down, the ferrule is permanently pressed on the sensing element. This connection is pressure resistant, which is also reason for the alias name; compression fitting.

Product number	Type - thread - inner diameter
875823	Compression fitting G½-6mm
1001171	Compression fitting G½-12mm
914413	Compression fitting G½-15mm
1010922	Compression fitting G¼-1.5mm
911898	Compression fitting G¼-3mm
911897	Compression fitting G¼-4.5mm
920701	Compression fitting G¼-6mm
920587	Compression fitting G1/8-1.5mm
919178	Compression fitting G1/8-3mm
1090957	Compression fitting G1/8-1mm
1062720	Compression fitting M8x1-1.5mm
911908	Compression fitting M8x1-3mm
1040461	Compression fitting MI8x1.5-6mm
914237	Compression fitting NPT1/4-3mm
1066586	Compression fitting NPT1/4-6mm
1001559	Compression fitting NPT1/8-3mm
1066584	Compression fitting NPT1/8-6mm

ADJUSTABLE FLANGES

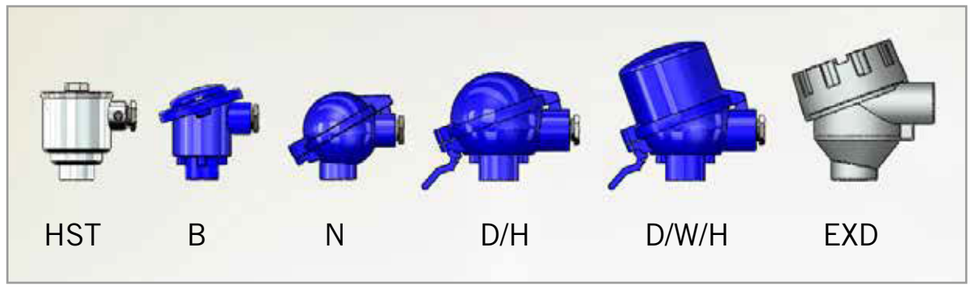
Welded and adjustable flanges are mainly used for installing different size thermowells. The structure of these flanges allows gliding immersion, i.e. well can be immersed to process precisely for the length needed.

Product number	Type - inner diameter
Adjustable	
1027877	Adjustable flange 6mm, Ø 50mm
1018378	Adjustable flange 15mm
1018382	Adjustable flange 22mm
1018383	Adjustable flange 32mm
Welded	
911984	Adjustable welded flange 15mm
911985	Adjustable welded flange 22mm
911986	Adjustable welded flange 32mm

Other sizes are quoted upon request.

CONNECTION HEADS

Connection heads of EPIC® SENSORS temperature sensors can be purchased also as accessories. Version D/H with quick release clip and blue epoxy lack finish is our standard, but for certain applications other types are better suited.



Product number	Type	Code key letters
1006145	DAN/H M24 Epoxy	D/H
1006146	DAN/W/H M24 Epoxy	D/W/H
1027082	NA M24 Epoxy	N
911970	BL M24	B
1020864	SS316 M24	HST
922665	XD-AD M20x1,5 ATEX	EXD
5105631	XD-AB M20x1,5 ATEX	EXD

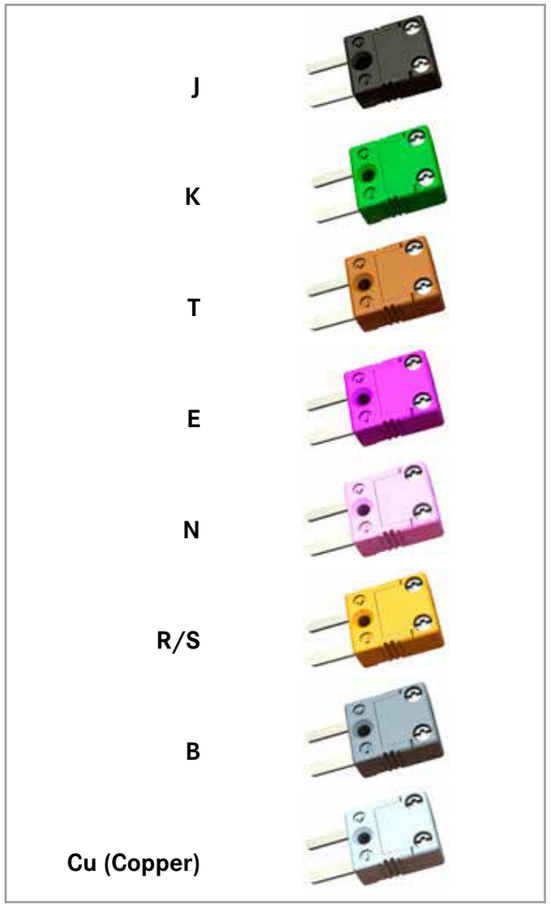
CONNECTORS FOR THERMOCOUPLES

These connectors have male or female contacts made of materials suitable for certain thermocouple type. The connector body is also colored depending on TC type, e.g. type K connector body is normally green, because type K cable sheath is green according to standard IEC 60584.

There are two sizes of TC connectors: standard (STD) and miniature (MINI).

Products number	Type
911476	J-STD-Female
911475	J-STD-Male
911477	J-MINI-Female
911478	J-MINI-Male
911440	K-STD-Female
911439	K-STD-Male
911442	K-MINI-Female
911441	K-MINI-Male
1089977	N-STD-Female
1089978	N-STD-Male
1023763	S-STD-Female
1083322	S-STD-Female 350°C
1023764	S-STD-Male
1083323	S-STD-Male 350°C
1017789	Cable clamps for STD connectors

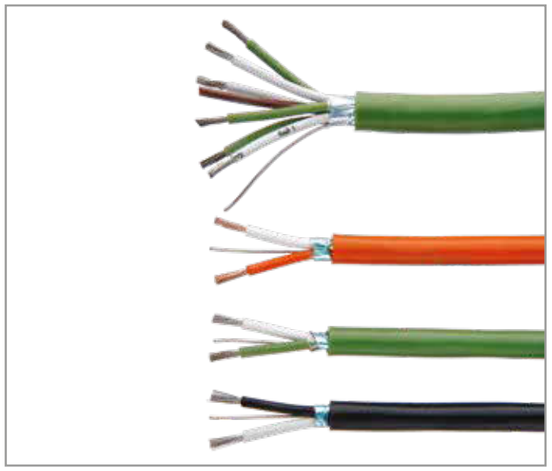
Other types are quoted upon request.



COMPENSATING CABLES FOR THERMOCOUPLE SENSORS

Thermocouple sensors must be wired with the right kind of materials between hot and cold junctions, in order to avoid measurement deviation caused by thermo voltages in connections of different materials. Cable types used are extension wires (X) or compensating cables (C).

Lapp Automaatio's stock items are silicon insulated compensating cables according to IEC 60584, with maximum temperature +180 °C. The wire structure of one pair cables for J, K and S type TC sensors is 2 × 1,5 mm².

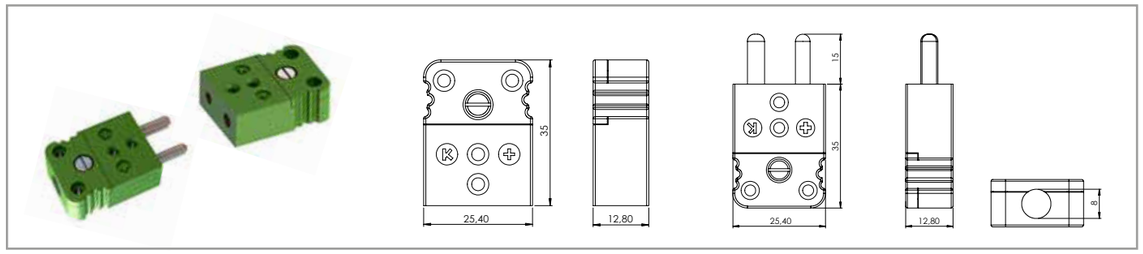


Stock items:

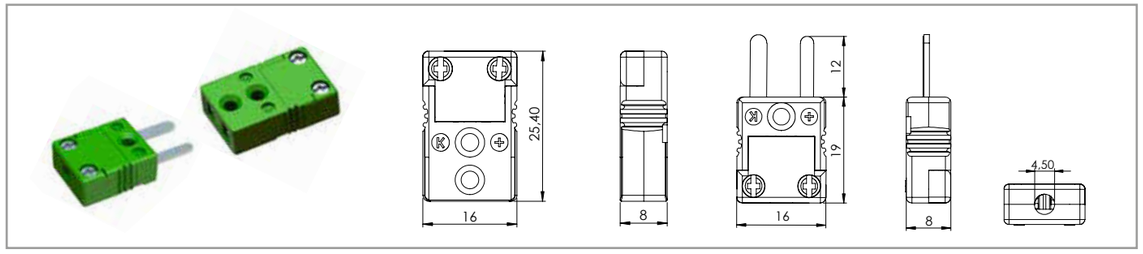
Product number	Designation	Number of cores and wire sizes	Colors +/–/ sheath	Outer diameter mm
903242	NiCr/Ni 2G ST 2G K	2x1.5	grn/wht/grn	7.50 (±0.15)
1084278	NiCr/Ni 2G ST 2G K	3x(2x1.5)	grn/wht/grn	9.50 (±0.15)
911884	NiCr/Ni 2G ST 2G K	6x(2x1.5)	grn/wht/grn	13.40 (±0.15)
1084281	NiCr/Ni 2G ST 2G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

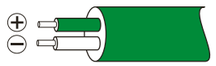
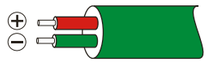
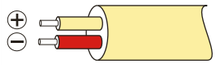
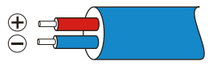
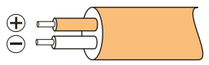
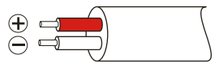
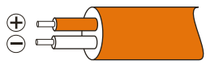
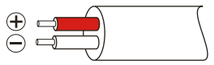
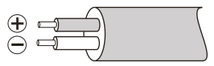
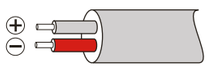
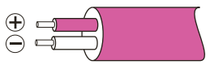
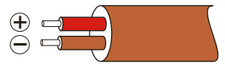
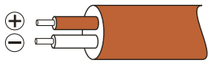
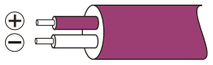
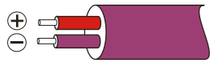
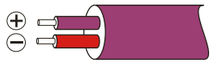
Color short forms: bck = black, grn = green, ora = orange, pnk = pink, wht = white.
Other cable types and wire structures can be delivered on request.

STD



MINI



New denominations:	IEC 60584-3	DIN EN 60584	ISA MC 96.1
Thermo Type	**IEC 584**	**DIN 43714**	**ANSI MC 96.1**
NiCr-Ni / K KCA: Fe-CuNi	 + green/ - white Jacket: green	 + red/ - green Jacket: green	 + yellow/ - red Jacket: yellow
Fe-CuNi / L		 + red/ - blue Jacket: blue	
Fe-CuNi / J	 + black/ - white Jacket: black		 + white/ - red Jacket: black
Pt10Rh-Pt / S SCA: E-Cu/A-Cu	 + orange/ - white Jacket: orange	 + red/ - white Jacket: white	 + black/ - red Jacket: green
Pt13Rh-Pt / R RCA: E-Cu/A-Cu	 + orange/ - white Jacket: orange	 + red/ - white Jacket: white	 + black/ - red Jacket: green
Pt30Rh-Pt6Rh / B BC: S-Cu/E-Cu	 + grey/ - white Jacket: grey		 + grey/ - red Jacket: grey
NiCrosil-Nisil / N NC: Cu-CuNi	 + pink/ - white Jacket: pink		
Cu-CuNi / U		 + red/ - brown Jacket: brown	
Cu-CuNi / T	 + brown/ - white Jacket: brown		
NiCr-CuNi / E	 + purple/ - white Jacket: purple	 + red/ - purple Jacket: purple	 + purple/ - red Jacket: purple

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 executed 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 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.

DESIGN AND ENGINEERING

We can assist you with designing, engineering and documenting of temperature sensors. Whether it is a detailed feature of one sensor or a complete solution, our know-how and practical experience are at your disposal.

Power plant applications

We have experience in designing special temperature measurement applications for power plants and their boilers. We have implemented many different measurement applications for soda, fluidized bed and grate boilers as well as waste incineration plants.

Metal processing applications

Temperature measurement for very demanding conditions in the different stages of metal processing is also our expertise. Ceramic and various coated thermos wells and their special applications have been executed in collaboration with customers.

Chemical industry applications

Highly corrosion-resistant temperature measurement in demanding conditions of chemical industry is our specialty. We have decades experience in designing multi-point temperature measurement for different types of tanks and basins.

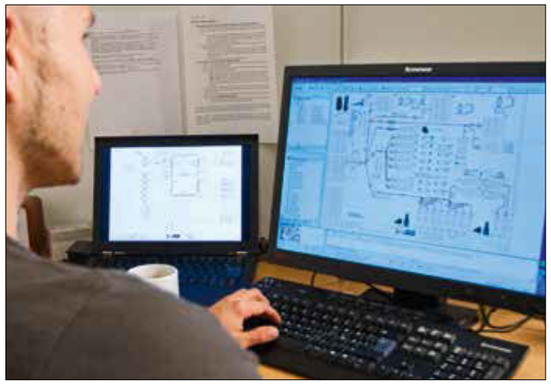
We have even designed a specific product suitable for trace heating temperature measurement. The trace heating sensor is qualified for high temperatures of MI-heating and explosive atmospheres.

Mechanical engineering applications

Customized and tailor-made temperature sensors according to customers' specifications are our know-how at its best.

Modeling

3D models can be created of any application as we use SolidWorks and AutoCAD design software. Just send us information of the desired measuring application and we are happy to help you.



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