



LAPP AUTOMAATIO T-M / W-M Mineral Insulated Insert With Connection Head User Manual

[Home](#) » [LAPP AUTOMAATIO](#) » LAPP AUTOMAATIO T-M / W-M Mineral Insulated Insert With Connection Head User Manual 



EPIC® SENSORS

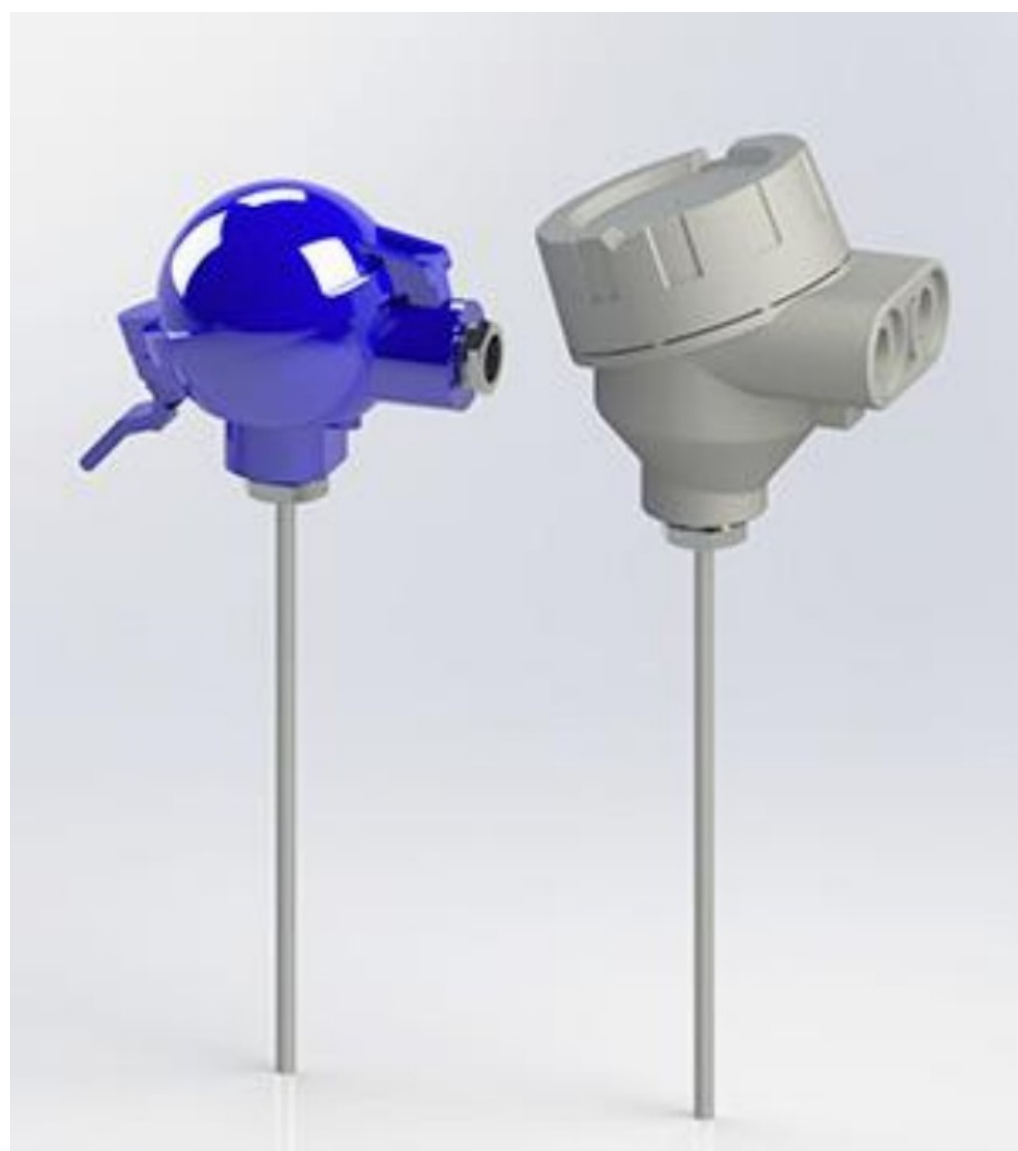
MINERAL INSULATED INSERT WITH CONNECTION HEAD

TYPE T-M / W-M

DATA SHEET 12

INSTALLATION INSTRUCTIONS

AND USER MANUAL



Contents

- 1 Product description and intended use
- 2 Temperatures, measuring
- 3 Temperatures, ambient
- 4 Temperatures, Ex versions
- 5 Code key
- 6 Technical data
- 7 Materials
- 8 Dimensional drawing
- 9 Installation instructions and example
- 10 Tightening torques
- 11 Installation of accessories
- 12 Opening the connection head, standard and Ex i versions
- 13 Opening the connection head, Ex d versions
- 14 Pt100; connection wiring
- 15 Pt100; measuring current
- 16 TC; connection wiring
- 17 TC; non-grounded or grounded types
- 18 TC; thermocouple cable standards (color table)
- 19 Type label of standard versions
- 20 Serial number information
- 21 Ex d data (only for types with Ex d approval)
- 22 Ex i data (only for types with Ex i approval)
- 23 Ex i type label
- 24 EU Declaration of Conformity
- 25 Manufacturer contact information
- 26 Document history
- 27 Documents / Resources
 - 27.1 References
- 28 Related Posts

Product description and intended use

Sensor types T-M (thermocouple, TC) and W-M (resistance, RTD) are mineral insulated inserts with connection head, constructed according to DIN 43721.

Sensors are intended for various industrial measuring applications, to be immersed without thermowell, typically with compression fitting, to achieve adjustable immersion length. Standard material is AISI316L or INCONEL 600, others on request. Sensor length can be produced according to customer needs.

Mineral insulated inserts are used in applications, where there is no need for heavy thermowells to protect against mechanical load caused by installation or process medium.

Inserts are mineral insulated (MI) elements, which are bendable and vibration proof. Elements can be TC or RTD elements, standard versions are K-type thermocouple (for T-M) and 4-wire Pt100 (for W-M). Tailored versions are produced on request.

Sensors are available with ceramic connection block (type designation: “-CB”) or with open wire ends to be connected to temperature transmitter inside the sensor head (type designation: “-TR”). The latter can be delivered with a transmitter.

Also available as ATEX and IECEx approved protection type Ex d and Ex i versions.

Please see sections Ex d data and Ex i data.

EPIC® SENSORS temperature sensors are measuring devices intended for professional use. They should be mounted by professionally capable installer who understands the installations surroundings. The worker should understand mechanical and electrical needs and safety instructions of the object installation. Suitable safety gear for each installation task must be used.

Temperatures, measuring

Allowed measuring temperature range for sensor tip is:

With Pt100	-200...+550 °C, depending on materials and length
With TC	-200...+1200 °C, depending on TC type, materials, and length.

Temperatures, ambient

Allowed ambient temperature range for connection head, including connection wires, is:

Without transmitter (element type -CB)	-40...+135 °C
With transmitter (element type -TR)	according to transmitter manufacturers data.

NOTE! This sensor type has no neck pipe for cooling purposes. The process connection (compression fitting) can be very close to the connection head.

Make sure the process temperature is not too much for the connection head and/or to the transmitter inside.

Temperatures, Ex versions

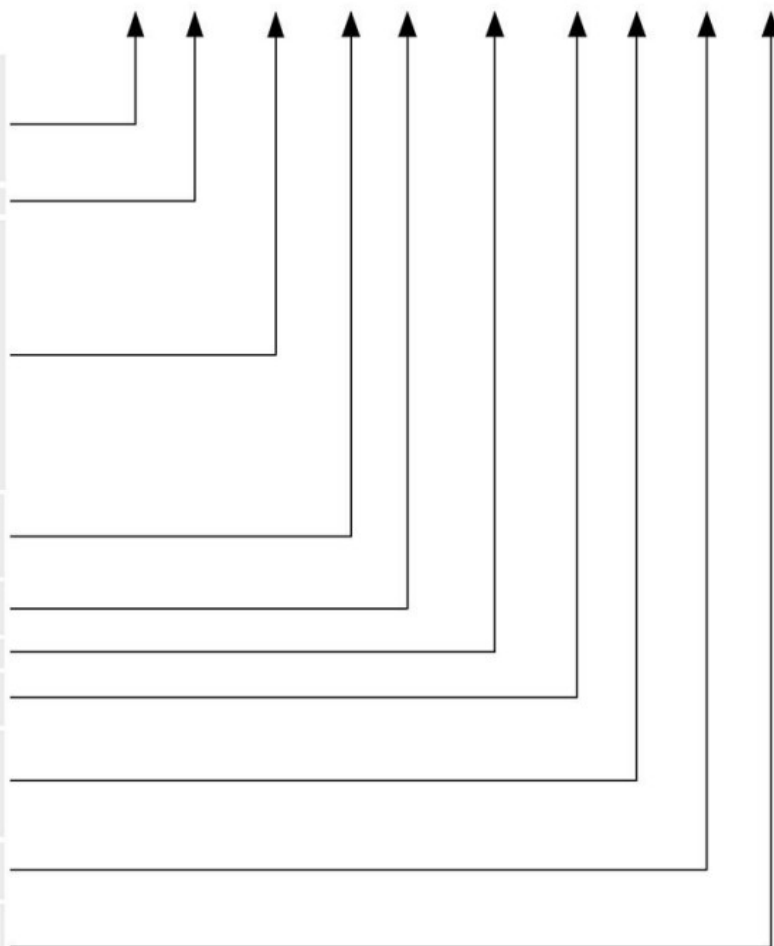
For Ex versions only (type designations -EXD- and -EXI-), specific temperature conditions apply according to the ATEX and IECEx certificates. For more details, please see sections:

- Ex d data (only for types with Ex d approval), sensor type designation -EXD-
- Ex i data (only for types with Ex i approval), sensor type designation -EXI-.

Code key

Example code: T – M – HST – L / 6 / 1000 – K – 1 – CB – X

W	= Pt100 resistance thermometer
2xW	= 2 x Pt100 resistance thermometer
T	= thermocouple
2xT	= 2 x thermocouple
M	= mineral insulated sensor (constant in code)
B	= connection head B
D/H	= connection head with snap lock
D/H/D	= connection head with snap lock and double barrel (2x cable gland)
D/W/H	= high cover connection head with snap lock
D/W/H/D	= high cover connection head with snap lock and double barrel (2x cable gland)
EXD	= ATEX-compatible connection head
HST	= acid proof connection head
N	= connection head N
empty	= no compression fitting
L	= with height adjustable compression fitting (see installation examples picture)
6, 8	= outer diameter of sensor element (ØOD) [mm] (other diameters on request)
1000	= length, L [mm]
4,3,2	= Pt 100 wire count
K,N,J	= thermocouple type
A,B	= Pt 100 accuracy class, (class A as standard delivery)
1,2,3	= thermocouple accuracy class, (class 1 as standard delivery)
TR	= wires for transmitter connection
CB	= with ceramic terminal block
EXI	= Ex i certified sensor
X	= additional details on the text line



T-M-D/W/H-6/5000-N-1-TR= Thermocouple, mineral insulated sensor type with connection head D/W/H, no thread between the sensor element and connection head, no compression fitting in the sensor element, the sensor element's diameter is 6 mm and length 5000 mm, thermocouple type N with accuracy class 1, connection head suitable for mA current transmitter housing.

Technical data

Materials	AISI 316L, maximum temperature +550 °C, temporarily +600°C, INCONEL 600, maximum temperature +1100 °C, temporarily +1200 °C Other materials on request
Tolerances Pt100 (IEC 60751)	A tolerance $\pm 0.15 + 0.002 \times t$, operating temperature -100...+450°C B tolerance $\pm 0.3 + 0.005 \times t$, operating temperature -196...+600°C B 1/3 DIN, tolerance $\pm 1/3 \times (0.3 + 0.005 \times t)$, operating temperature -196...+600 °C B 1/10 DIN, tolerance $\pm 1 / 10 \times (0.3 + 0.005 \times t)$, operating temperature -196...+ 600 00
Tolerances thermocouple (IEC 60584)	Type J tolerance class 1 = -40...375 °C ± 1.5 °C, 375...750 °C $\pm 0.004 \times t$ Type K and N tolerance class 1 = -40...375 00 ± 1.5 00, 375...1000 °C $\pm 0.004 \times t$
Temperature range Pt100	-200...+550 °C, depending on sensor element material and length
Temperature range thermocouple	-200...+1200°C, depending on thermocouple type, sensor element material and length
Approvals	ATEX, IECEx, EAC Ex, EAC EMC, METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 and ISO 14001:2015 issued by DNV
IP rating	IP65, higher IP rating on request

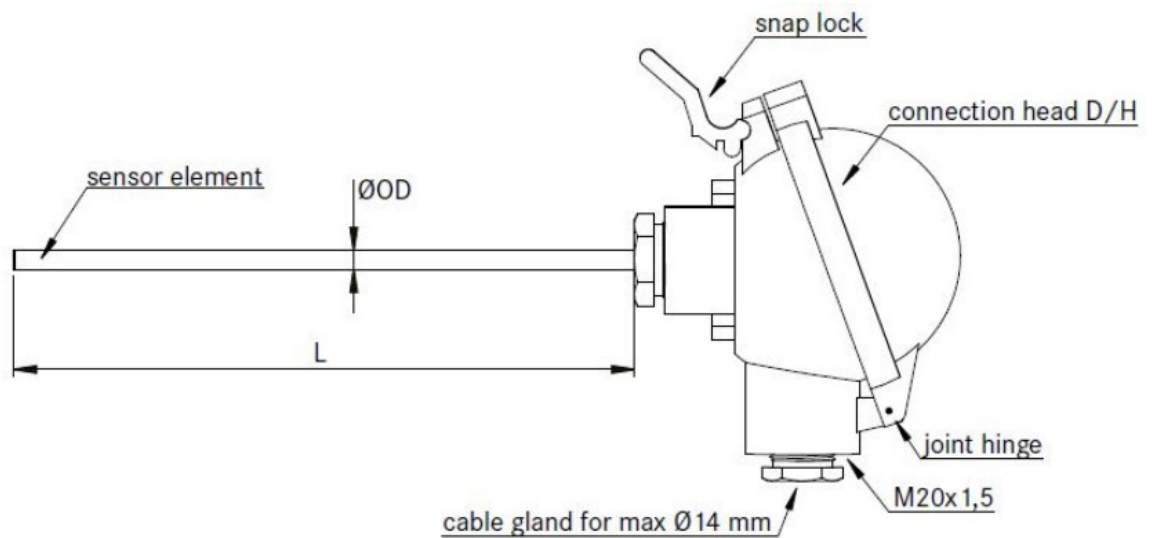
Materials

These are the standard materials of components for the sensor types T-M / W-M.

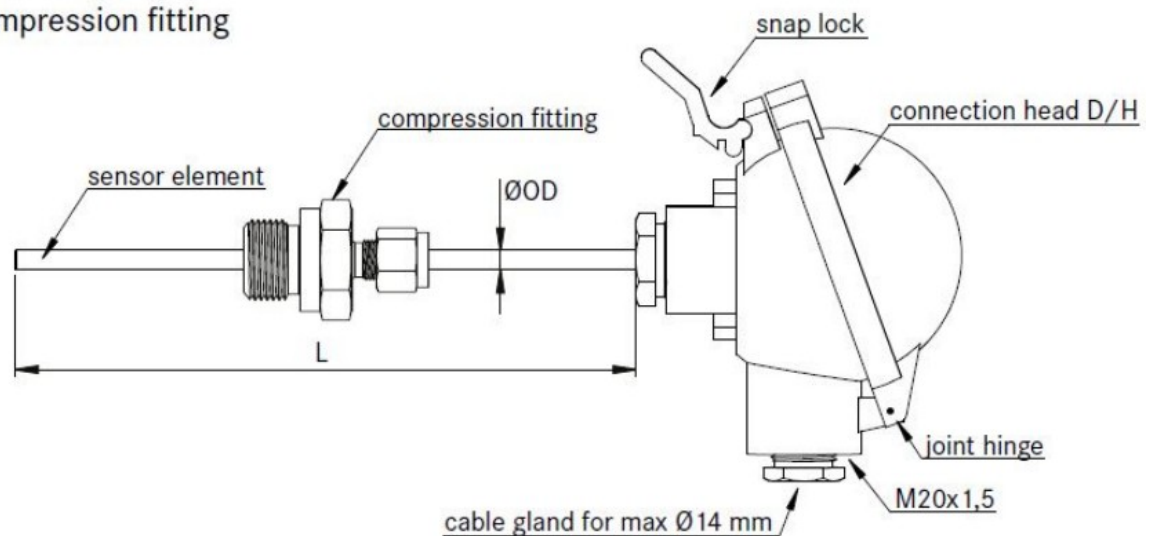
- Connection head:
 - Standard or Ex i – Aluminum
 - Ex d (type designation EXD) – Aluminum or Stainless Steel (DIN 1.4401, AISI 316)
- Connection head cover sealing (standard) – Silicone
- Sealing (sensor to connection head) – Silicone
- Nut M24 (sensor to connection head) – AISI 316
- Sensor element / MI cable sheath – AISI 316L or INCONEL 600

Other materials can be used on request.

Dimensional drawing



Model with compression fitting



Installation instructions and example

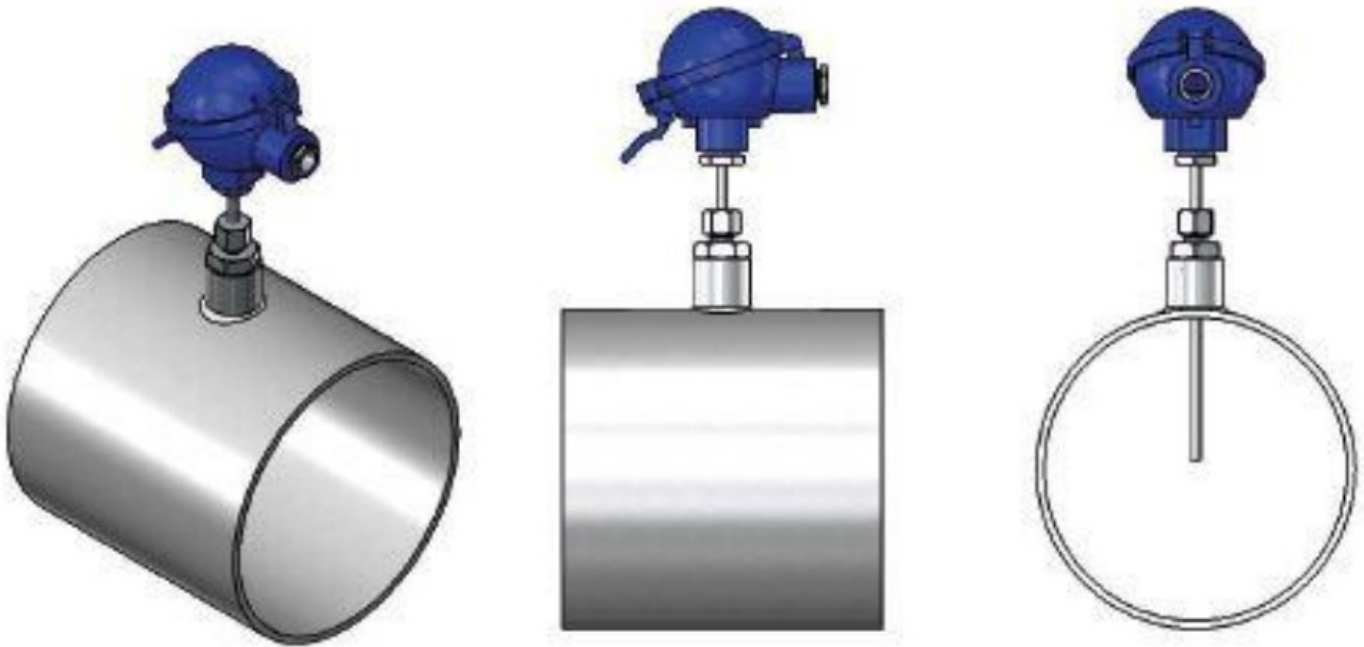
Before any installation, make sure the target process/machinery and site are safe to work!

Make sure the process thread matches the thread of the sensor to be installed.

Installation phases when using a compression fitting:

- Screw the coupling in an applicable thread hole.
- Tighten securely with the lower nut.
- Insert the sensor element as far as needed through the coupling.
- During installation, remember the MI element minimum bending radius is $2 \times \varnothing OD$ of the element.
- Do not bend the MI element tip (30 mm length from sensing tip) of a RTD sensor element.
- **NOTE!** After next phase there is no coming back, the tightened connection is permanent!
- If you are absolutely sure about the depth, screw down the cap (upper nut) to fix the depth.
- For tightening use only enough force needed. Excess force may damage the sensor element and lower the tightness of the connection.

Image below: this example shows a sensor installed with an adjustable compression fitting, on a welded threaded sleeve on process piping.



Tightening torques

Use only tightening torques allowed in applicable standards of each thread size and material.

Installation of accessories

Adjustable gland couplings AISI 316:

As accessories there are adjustable gland couplings available, for occasions where the sensor should be installed to a threaded hole in process.

Gland couplings – a.k.a. 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. Compression fittings have metal ferrules inside. Ferrules are made of stainless steel SS316L (other materials and sizes available 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.

Installation phases:

- Screw the coupling in an applicable thread hole.
- Tighten securely with the lower nut.
- Insert the sensor element as far as needed through the coupling.
- **NOTE!** After next phase there is no coming back, the tightened connection is permanent!
- If you are absolutely sure about the depth, screw down the cap (upper nut) to fix the depth.
- For tightening use only enough force needed. Excess force may damage the sensor element and lower the tightness of the connection.

Some of the many available gland couplings are:

Product number	Type – thread – inner diameter
875823	Compression fitting G $\frac{1}{2}$ – 6 mm
1001171	Compression fitting G $\frac{1}{2}$ – 12 mm
914413	Compression fitting G $\frac{1}{2}$ – 15 mm
1010922	Compression fitting G $\frac{1}{4}$ – 1.5 mm
911898	Compression fitting G $\frac{1}{4}$ – 3 mm
911897	Compression fitting G $\frac{1}{4}$ – 4.5 mm
920701	Compression fitting G $\frac{1}{4}$ – 6 mm
920587	Compression fitting G $\frac{1}{8}$ – 1.5 mm
919178	Compression fitting G $\frac{1}{8}$ – 3 mm
1090957	Compression fitting G $\frac{1}{8}$ – 1 mm
1062720	Compression fitting M8x1 – 1.5 mm
911908	Compression fitting M8x1 – 3 mm
1040461	Compression fitting M18x1.5 – 6 mm
914237	Compression fitting NPT $\frac{1}{4}$ – 3 mm.
1066586	Compression fitting NPT $\frac{1}{4}$ – 6 mm
1001559	Compression fitting NPT $\frac{1}{8}$ – 3 mm
1066584	Compression fitting NPT $\frac{1}{8}$ – 6 mm



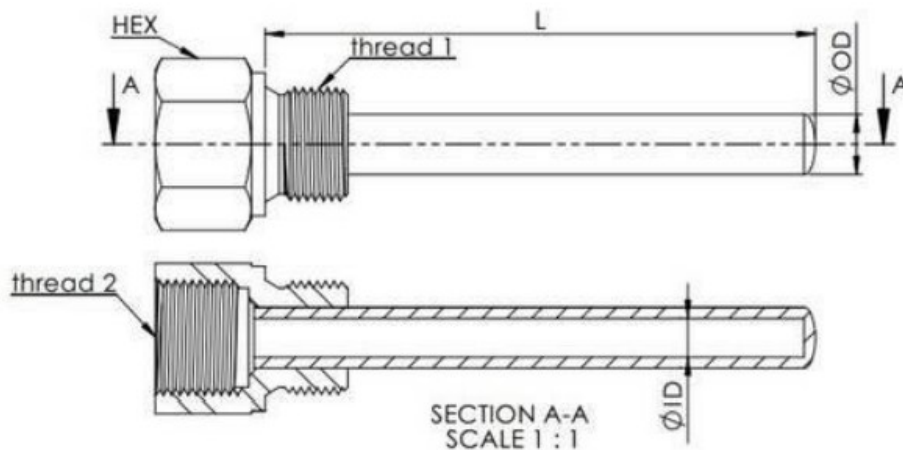
Threaded thermowells:

If sensors with compression fittings need to be installed with a thermowell, it can be done with the accessory well type TPIE. This thermowell type has both inner and outer threads, which can be produced according to customer specifications. The standard material is acid proof steel, but material can be chosen according to application, special coatings are available, and tailored solutions can be offered according to specific needs.

TPIE Code key: TPIE – G $\frac{1}{2}$ / G $\frac{1}{2}$ – 9 / 100 – X (example code)

- TPIE = thermowell model
- G $\frac{1}{2}$ = outer thread 1
- / G $\frac{1}{2}$ = inner thread 2
- 9 = outer diameter ØOD [mm] (ØID = 7 mm)*
- / 100 = immersion depth L [mm]
- X = additional details on the text line.

***NOTE:** inner diameter ØID is not visible in code.



Welded threaded sleeves:

As accessories there are welded threaded sleeves available, for occasions where the thread is not readily available.

The sleeve material must be chosen according to the process media and structure material to be welded on.

Before any installation, make sure the target process/machinery and site are safe to work!

Also, make sure there are no obstacles to welding work.



Installation phases:

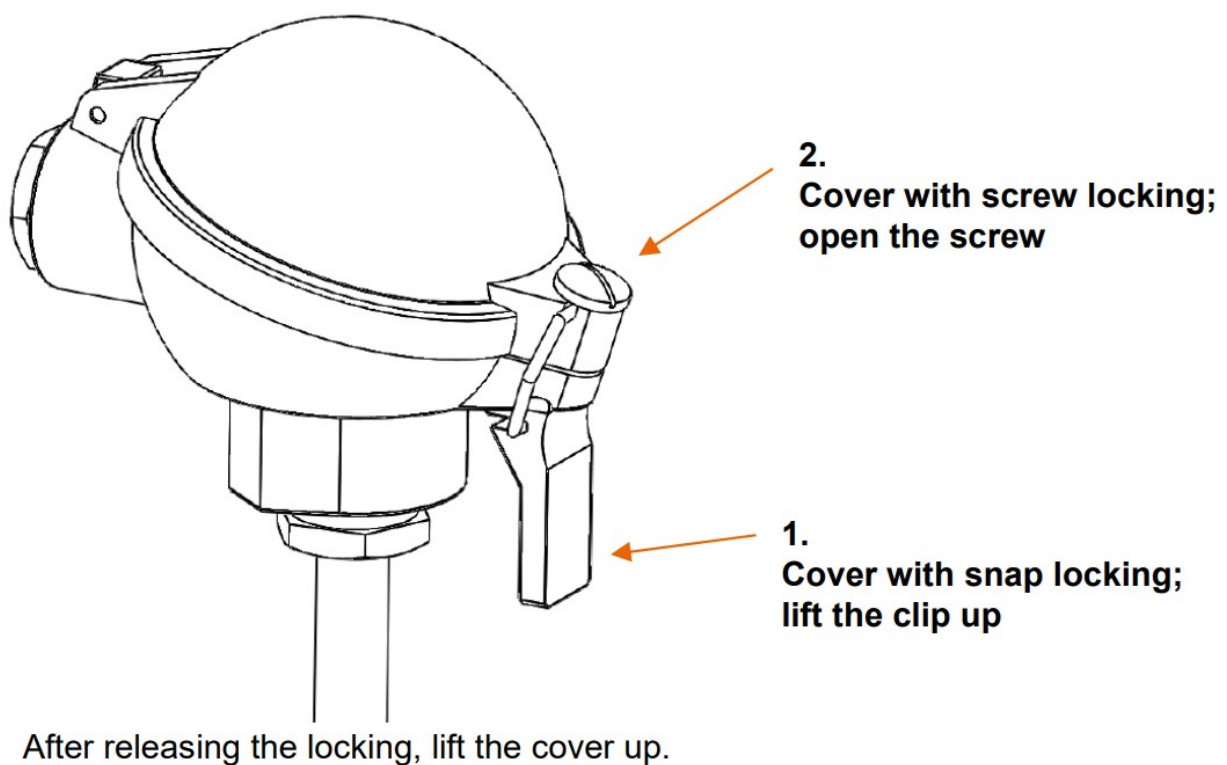
- First drill a hole large enough for the lower end of the sleeve to enter.
- Weld the sleeve securely to the process material.
- After cooling, finalizing the welding process and getting approved by inspectors (if needed), finally install the sensor to the welded thread, as presented on page Installation instructions.

Opening the connection head, standard and Ex i versions

Before any connection work the connection head has to be opened. Do not open the connection head cover if there is a risk of dirt or moisture/liquids entering the wiring space inside!

Image below: Opening the cover, when using a connection head...

1. with snap lock (quick release clip), connection head type designation -D/H-; lift the clip up.
2. with screw lock; open the screw by twisting it counter-clockwise.



Opening the connection head, Ex d versions

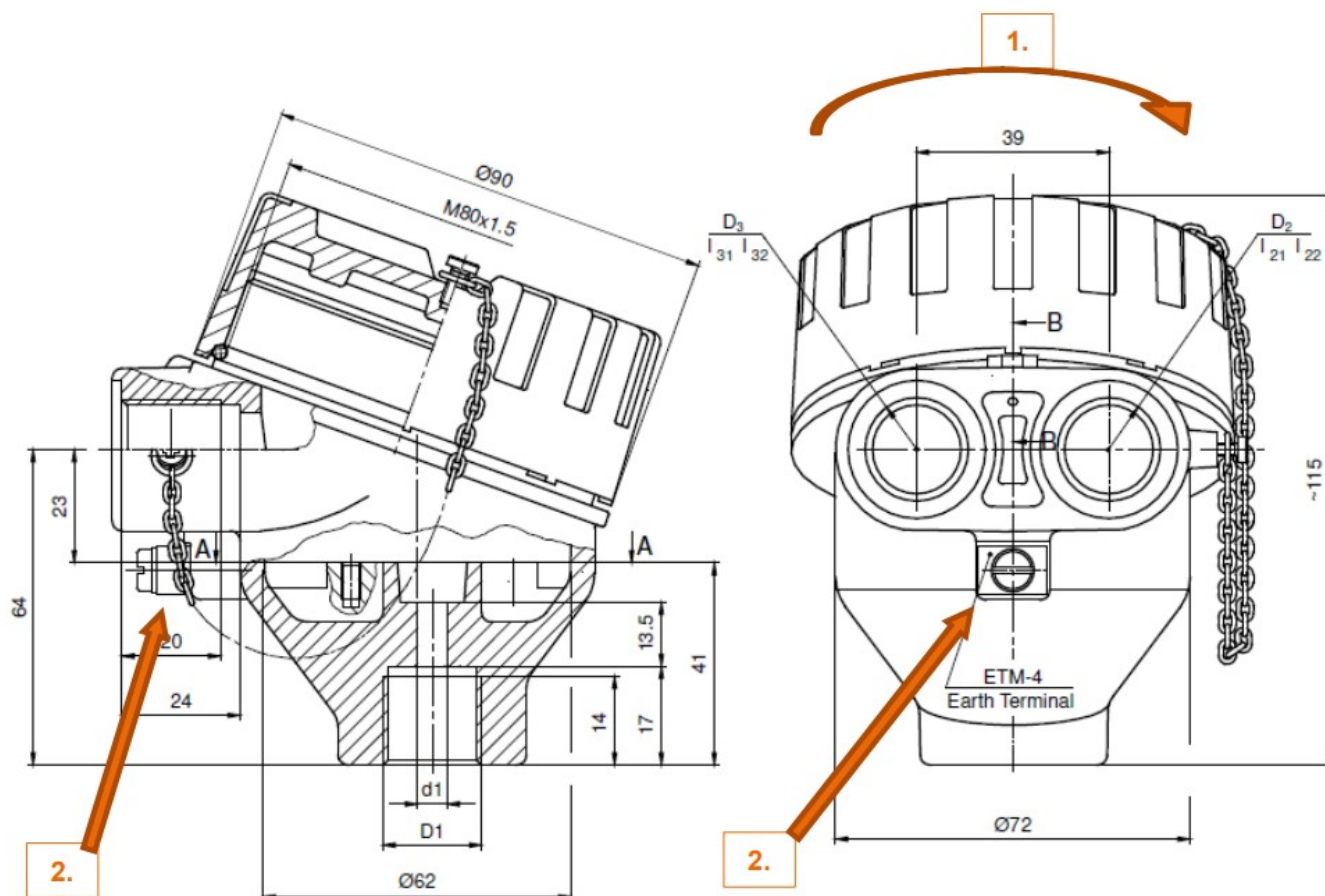
Do not open the connection head cover if explosive atmosphere is present!

Do not open the cover if there is a risk of dirt or moisture/liquids entering the wiring space inside!

The Ex d certified sensors head, type designation -EXD-, can be opened by twisting the cover counterclockwise.

Image below:

1. Opening the EXD sensor head, twisting cover ccw.
2. Earth terminal, ground connection screw.



Please see also section *Ex data*.

Pt100; connection wiring

Image below: These are the connection colors of Pt100 resistor connections, according to standard EN 60751.

	2-wire	3-wire	4-wire
Pt100			
2 x Pt100			

Other connections on request.

Pt100; measuring current

The highest allowed measuring current for Pt100 measuring resistors depends on resistor type and brand.

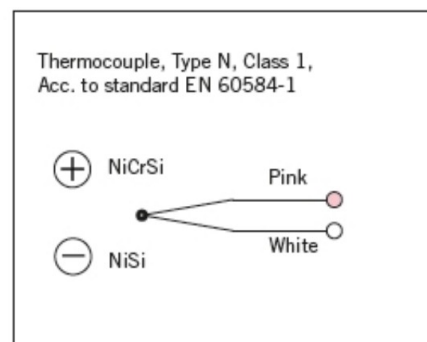
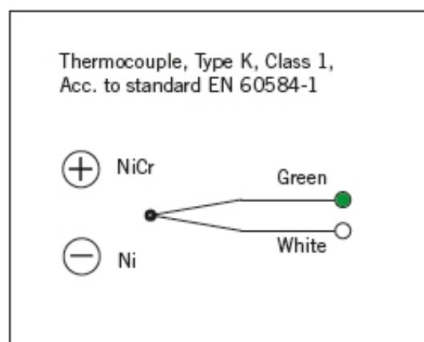
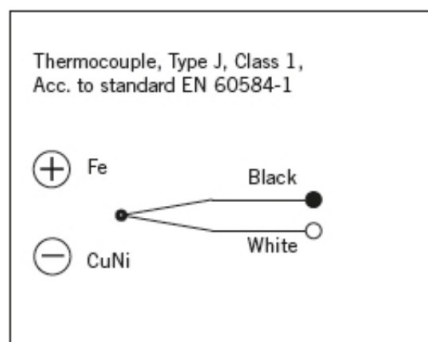
Normally the recommended maximum values are:

Pt100	1 mA
Pt500	0,5 mA
Pt1000	0,3 mA.

Do not use higher measuring current. It will lead to false measurement values and might even destroy the resistor. Above listed values are normal measuring current values. For Ex i certified sensor types, type designation -EXI-, higher values (worst case) are used for the self-heating calculation for safety reasons. For further details and calculation examples, please see ANNEX A.

TC; connection wiring

Image below: These are the connection colors of TC types J, K and N.



Other types on request.

TC; non-grounded or grounded types

Normally the thermocouple sensors are non-grounded, which means the MI cable sheath is not connected to the thermo material hot junction, where two materials are welded together.

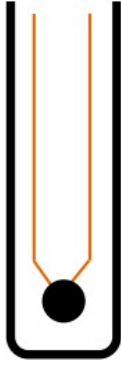
In special applications also grounded types are used.

NOTE! Non-grounded and grounded sensors cannot be connected to same circuits, make sure you are using the right type.

NOTE! Grounded TCs are not allowed for Ex i certified sensor types.

Image below: Non-grounded and grounded structures in comparison.

Non-grounded TC



Thermo material hot junction and MI cable sheath are galvanically isolated from each other.

Grounded TC



Thermo material hot junction has galvanic connection with MI cable sheath.





















TC; thermocouple cable standards (color table)

New standards:

IEC 60584-3

DIN EN 60584

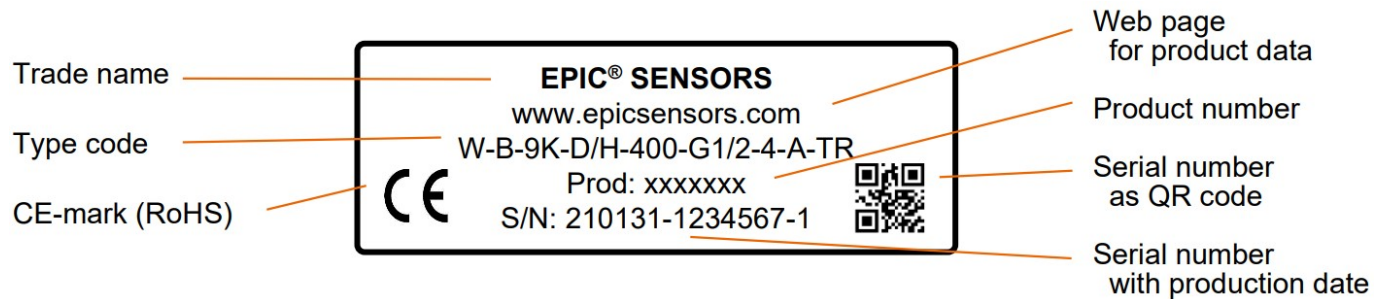
ISA MC 96.1

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

Type label of standard versions

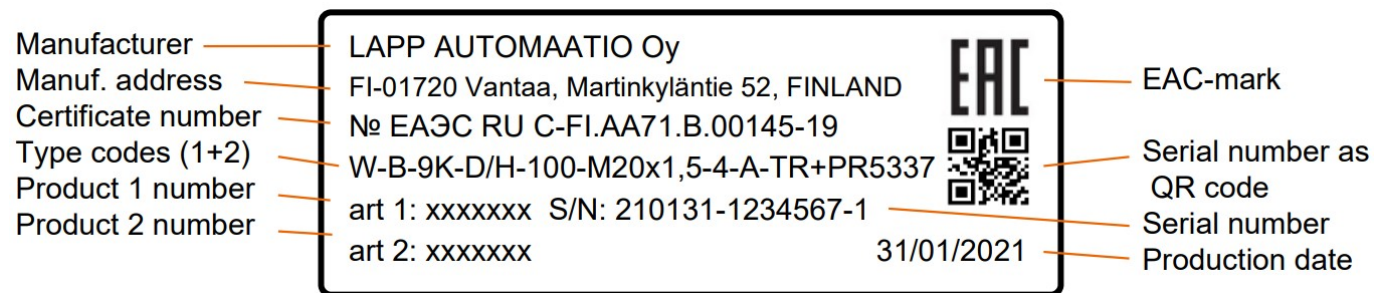
Each sensor has a type label attached to it. It is a moisture and wear proof industrial grade sticker, with black text on white label. This label has printed information of trade name, web page, type code, CE-mark, product number and serial number, including production date. For these sensors manufacturer contact information is printed on a separate label.

Image below: Example of a non-Ex sensor type label.



For EAC EMC-approved, sensor+transmitter combination versions, exported to Eurasian Customs Union area, there is a special type label.

Image below: Example of an EAC EMC-approved product type label, including sensor (1) and transmitter (2).



Serial number information

Serial number S/N is always printed on type label in the following form: yymmdd-xxxxxxx-x:

yymmdd	production date, e.g. "210131" = 31.1.2021
-xxxxxxx	production order, e.g. "1234567"
-x	sequential ID number within this production order, e.g. "1"

Ex d data (only for types with Ex d approval)

This sensor type is available also with ATEX, IECEx and EAC Ex d approvals. Assembly consists of a temperature sensor connected to a transmitter or ceramic terminal block in an Ex db certified enclosure (sensor head type designation -EXD-). All relevant Ex data is given below.

Ex d – Special Conditions for Use

For Ex d versions only (type designation -EXD-), specific conditions apply according to the ATEX and IECEx certificates:

Allowed ambient temperature range for the connection head without enclosure window:

-40 °C to + 60 °C with temperature class T6/T80 °C

-40 °C to + 75 °C with temperature class T5/T95 °C

Allowed ambient temperature range for the connection head with enclosure window:

-40 °C to + 60 °C with temperature class T6/T80 °C.

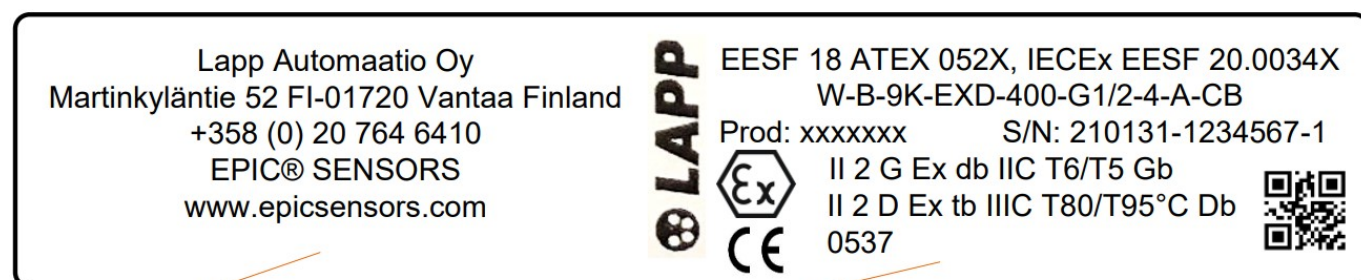
Ex d certificates and Ex markings

Certificate – Number	Issued by	Applicable area	Marking
ATEX – EESF 18 ATEX 052X	Eurofins Expert Services Oy, Finland, Notified Body Nr 0537	Europe	Ex II 2G Ex db IIC T6/T5 Gb Ex II 2D Ex tb IIIC T80°C/T95°C Db
IECEx – IECEx EESF 20.0034X	Eurofins Expert Services Oy, Finland, Notified Body Nr 0537	Global	Ex db IIC T6/T5 Gb Ex tb IIIC T80°C/T95 °C Db
EAC – № EA3C RU CFI.AA71. B.00130-19	Lenpromexpertiza OOO, Russia	Eurasian Customs Union (Belarus, Kazakhstan, Russia)	1 Ex d IIC T6/T5 Gb X Ex tb IIIC T800°C/T95°C Db X

Ex d type label

For ATEX, IECEx and KCs Ex d approved versions there is more information on the label, according to applicable standards.

Image below: Example of an ATEX and IECEx approved sensor type label.

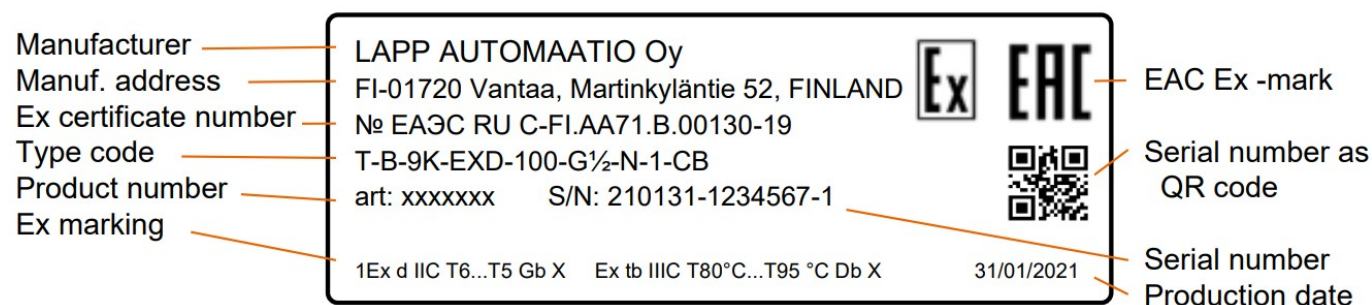


Manufacturer contact information.
For some sensor types, this may also be printed on a separate label for practical reasons.

Ex certificate number(s)
Type code
Product number Serial number with production date
Ex-mark (ATEX) Ex markings
CE-mark (ATEX and RoHS)
Notified body number Serial number as QR code
Special technical values (if needed)

For EAC Ex d approved sensor versions, exported to Eurasian Customs Union area, there is a special type label.

Image below: Example of an EAC Ex-approved sensor type label.



Ex i data (only for types with Ex i approval)

This sensor type is available also with ATEX and IECEx Ex i approvals. Assembly consists of a temperature sensor connected to a transmitter or ceramic terminal block in an enclosure (sensor type designation -EXI-). All relevant Ex data is given below.

Ex i – Special Conditions for Use

There are special specifications and conditions for use defined in certificates. These include e.g. Ex data, allowed ambient temperatures, and self-heating calculation with examples. These are presented in Annex A: Specification and special conditions for use – Ex i approved EPIC@SENSORS temperature sensors.

Ex i certificates and Ex markings

Certificate – Number	Issued by	Applicable area	Marking
ATEX – EESF 21 ATEX 043 X	Eurofins Electric & Electronics Finland Oy, Finland, Notified Body Nr 0537	Europe	Ex II 1G Ex ia IIC T6...T3 Ga Ex II 1/2G Ex ib IIC T6...T3 Ga/Gb Ex II 1D Ex ia IIIC T135 °C Da Ex II 1/2D Ex ib IIIC T135 °C Da/Db
IECEx – IECEx EESF 21.00 27X	Eurofins Electric & Electronics Finland Oy, Finland, Notified Body Nr 0537	Global	Ex ia IIC T6...T3 Ga Ex ib IIC T6...T3 Ga/Gb Ex ia IIIC T135 °C Da Ex ib IIIC T135 °C Da/Db

Note!

Name change of the Notified Body Nr 0537:

Until 31.3.2022, the name was:	Eurofins Expert Services Oy
As of 1.4.2022, the name is:	Eurofins Electric & Electronics Finland Oy.

Ex i type label

For ATEX and IECEx Ex i approved versions there is more information on the label, according to applicable standards.

Image below: Example of an ATEX and IECEx Ex i approved sensor type label.

Lapp Automaatio Oy
Martinkyläntie 52 FI-01720 Vantaa Finland
+358 (0) 20 764 6410
EPIC® SENSORS
www.epicsensors.com

LAPP

EESF 21 ATEX 043X, IECEx EESF 21.0027X
W-B-9K-D/H-400-G1/2-4-A-CB-EXI

Prod: xxxxxxxx S/N: 220231-1234567-1

II 1G Ex ia IIC T6...T3 Ga
II 1/2G Ex ib IIC T6...T3 Ga/Gb
II 1D Ex ia IIIC T135 °C Da
II 1/2D Ex ib IIIC T135 °C Da/Db



0537

Ui= Ii= Pi= Ci= Li=
Refer to User Manual for Specific Conditions of Use

Manufacturer contact information.
For some sensor types, this may
also be printed on a separate label
for practical reasons.

Ex certificate number(s)

Type code

Product number Serial number with production date

Ex-mark (ATEX) Ex markings

CE-mark (ATEX and RoHS)

Notified body number

Special technical values (if needed)

Serial number
as QR code

EU Declaration of Conformity

The EU Declaration of Conformity, declaring products' conformance to the European Directives, is delivered with products or sent on request.

Manufacturer contact information

Manufacturer HQ main office:	
Street address Postal address	Lapp Automaatio Oy Martinkyläntie 52 FI-01720 Vantaa, Finland
Production site and logistics:	
Street address Postal address	Lapp Automaatio Oy Varastokatu 10 FI-05800 Hyvinkää, Finland
Phone (sales)	+358 20 764 6410
Email	epicsensors.fi.lav@lapp.com
Https	www.epicsensors.com

Document history

Version / date	Author(s)	Description
20220822	LAPP/JuPi	Telephone number update
20220401	LAPP/JuPi	Original version

Although every reasonable effort is made to ensure the accuracy of the content of the operating instructions, Lapp

Automaatio Oy is not responsible for the way the publications are used or for possible misinterpretations by end users. The user must ensure that she or he has the latest edition of this publication.

We reserve the right to make changes without prior notice. © Lapp Automaatio Oy

ANNEX A – Specification and special conditions for use – Ex i approved EPIC® SENSORS temperature sensors

Annex A, page 1/4

Ex data for RTD (resistance temperature sensor) and TC (Thermocouple temperature sensor)

Sensor Ex data, maximum interface values, without transmitter or / and display.

Electrical values	For Group IIC	For Group IIIC
Voltage U_i	30 V	30 V
Current I_i	100 mA	100 mA
Power P_i	750 mW	550 mW @ $T_a + 100\text{ °C}$
		650 mW @ $T_a + 70\text{ °C}$
		750 mW @ $T_a + 40\text{ °C}$
Capacitance C_i	Negligible, *	Negligible, *
Inductance L_i	Negligible, *	Negligible, *

Table 1. Sensor Ex data.

* For sensors with long cable part, the parameters C_i and L_i must be included in the calculation.

Following values per meter can be used according to EN 60079-14: $C_{\text{cable}} = 200\text{ pF/m}$ and $L_{\text{cable}} = 1\text{ μH/m}$.

Allowed ambient temperatures – Ex i temperature class, without transmitter and/or display.

Marking, Gas Group IIC	Temperature class	Ambient temperature
II 1G Ex ia IIC T6 Ga II 1/2G Ex ib IIC T6-T3 Ga/Gb	T6	-40...+80 °C
II 1G Ex ia IIC T5 Ga II 1/2G Ex ib IIC T6-T3 Ga/Gb	T5	-40...+95 °C
II 1G Ex ia IIC T4-T3 Ga II 1/2G Ex ib IIC T6-T3 Ga/Gb	T4-T3	-40...+100 °C
Marking, Dust Group IIIC	Power P_i	Ambient temperature
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ib IIIC T135 °C Da/Db	750 mW	-40...+40 °C
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ib IIIC T135 °C Da/Db	650 mW	-40...+70 °C
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ib IIIC T135 °C Da/Db	550 mW	-40...+100 °C

Table 2. Ex i temperature classes and allowed ambient temperature ranges

Note!

The temperatures above are without cable glands.

The compatibility of cable glands must be according to the application specifications.

If the transmitter and/or display will be inside the transmitter housing, the specific Ex requirements of the transmitter and/or display installation must be noted.

The used materials must comply the needs of application, e.g., abrasion, and the temperatures above.

For EPL Ga Group IIC the aluminium parts in connection heads are subject to sparking by impacts or friction.

For Group IIIC the maximum input power P_i shall be observed.

When the sensors are mounted across boundary between different Zones, refer to standard IEC 60079-26 section 6, for ensuring the boundary wall between different hazardous areas.

ANNEX A – Specification and special conditions for use – Ex i approved EPIC® SENSORS temperature sensors

Annex A, page 2/4

Considering sensor self-heating

Self-heating of the sensor tip shall be considered in respect with Temperature Classification and associated ambient temperature range and manufacturer's instructions for calculating tip surface temperature according to thermal resistances stated in the instructions shall be observed.

Allowed ambient temperature range of sensor head or process connection for Groups IIC and IIIC with different temperature classes are listed in Table 2. For Group IIIC the maximum input power P_i shall be observed.

The process temperature shall not adversely affect ambient temperature range assigned for Temperature Classification.

Calculation for self-heating of the sensor at the tip of sensor or the thermowell tip

When the sensor-tip is located at environment where the temperature is within T6...T3, it is needed to consider the self-heating of the sensor. Self-heating is of particular significance when measuring low temperatures.

The self-heating at the sensor tip or thermowell tip depends on the sensor type (RTD/TC), the diameter of sensor and structure of sensor. It is also needed to consider the Ex i values for the transmitter. The table 3. shows the R_{th} values for different type of sensors structure.

	Thermal resistance R_{th} [°C / W]					
Sensor type	Resistance thermometer (RTD)			Thermocouple (TC)		
Measuring insert diameter	< 3 mm	3...<6 mm	6...8 mm	< 3 mm	3...<6 mm	6...8 mm
Without thermowell	350	250	100	100	25	10
With thermowell made from tube material (e.g. B-6k, B-9K, B-6, B-9, A-15, A-22, F-11, etc)	185	140	55	50	13	5
With thermowell — solid material (e.g. D-Dx, A-0-U)	65	50	20	20	5	1

Table 3. Thermal resistance based on Test report 211126

Note!

If the measuring device for RTD-measuring is using measuring current > 1 mA, the maximum surface temperature of the temperature sensor tip should be calculated and taken to account. Please see next page.

If sensor type has multiple sensing elements included, and those are used simultaneously, note that the maximum power for all sensing elements should not be more than the allowed total power P_i . Maximum power must be limited to 750 mW. This must be guaranteed by process owner. (Not applicable for Multi-point temperature sensor types T-MP / W-MP or T-MPT / W-MPT with segregated Exi circuits).

ANNEX A – Specification and special conditions for use – Ex i approved EPIC® SENSORS temperature sensors

Annex A, page 3/4

Calculation for maximum temperature:

The self-heating of the sensor tip can be calculated from formula:

$$T_{\max} = P_o \times R_{th} + MT$$

(T_{max}) = Maximum temperature = surface temperature at the sensor tip

(P_o) = Maximum feeding power for the sensor (see the transmitter certificate)

(R_{th}) = Thermal resistance (K/W, Table 3.)

(MT) = Medium temperature.

Calculate the maximum possible temperature at the tip of sensor:

Example 1 – Calculation for RTD-sensor tip with thermowell

Sensor used at Zone 0

RTD sensor type: W-M-9K . . . (RTD-sensor with head-mounted transmitter).

Sensor with thermowell, diameter of Ø 9 mm.

Medium temperature (MT) is 120 °C

Measuring is made with PR electronics head mounted transmitter 5437D and isolated barrier PR 9106 B.

Maximum temperature (T_{max}) can be calculated by adding the temperature of the medium that you are measuring and the self-heating. The self-heating of the sensor tip can be calculated from the Maximum power (P_o) which is feeding the sensor and R_{th}-value of used sensor type. (See the Table 3.)

Supplied power by PR 5437 D is (P_o) = 23,3 mW (from the transmitter Ex-certificate)

Temperature class T4 (135 °C) must not be exceeded.

Thermal resistance (R_{th}) for the sensor is = 55 K/W (from Table 3).

Self-heating is 0.0233 W * 55 K/W = 1,28 K

Maximum temperature (T_{max}) is MT + self-heating: 120 °C + 1,28 °C = 121,28 °C

The result in this example shows that, the self-heating at the sensor tip is negligible.

The safety margin for (T₆ to T₃) is 5 °C and that must be subtracted from 135 °C; means that up to 130 °C would be acceptable. In this example the temperature of class T4 is not exceeded.

Example 2 – Calculation for RTD-sensor tip without the thermowell.

Sensor used at Zone 1

RTD sensor type: W-M-6/303 . . . (RTD-sensor with cable, without head-mounted transmitter)

Sensor without thermowell, diameter of Ø 6 mm.

Medium temperature (MT) is 40 °C

Measuring is made with rail-mounted PR electronics PR 9113D isolated transmitter/barrier.

Maximum temperature (T_{max}) can be calculated by adding the temperature of the medium that you are measuring and the self-heating. The self-heating of the sensor tip can be calculated from the Maximum power (P_o) which is feeding the sensor and R_{th}-value of used sensor type. (See the Table 3.)

Supplied power by PR 9113D is (P_o) = 40,0 mW (from the transmitter Ex-certificate)

Temperature class T3 (200 °C) must not be exceeded.

Thermal resistance (R_{th}) for the sensor is = 100 K/W (from Table 3).

Self-heating is 0.040 W * 100 K/W = 4,00 K

Maximum temperature (T_{max}) is MT + self-heating: 40 °C + 4,00 °C = 44,00 °C

The result in this example shows that, the self-heating at the sensor tip is negligible.

The safety margin for (T₆ to T₃) is 5 °C and that must be subtracted from 200 °C; means that up to 195 °C would be acceptable. In this example the temperature of class T3 is not exceeded.

ANNEX A – Specification and special conditions for use – Ex i approved EPIC® SENSORS temperature sensors

Annex A, page 4/4

Additional information for Group II devices: (acc. to EN IEC 60079-0: 2019 section: 5.3.2.2 and 26.5.1)

Temperature class for T3 = 200 °C

Temperature class for T4 = 135 °C

Safety margin for T3 to T6 = 5 K

Safety margin for T1 to T2 = 10 K.

Note!

This ANNEX is an instructional document on specifications.

For original regulatory data on specific conditions for use, always refer to ATEX and IECEx certificates:

EESF 21 ATEX 043X

IECEx EESF 21.0027X

Tekninen myynti/Technical sales:

P: +358 (0)20 764 6410

Avoimet tilaukset/Open orders:

P: +358 (0)20 764 6420

Kotipaikka/Domicile

Vantaa

Y-tunnus: 1107293-1

VAT: FI11072931


Lapp Automaatio on osa LAPP Groupia**A Lapp Group Company**

Lapp Insulator ei ole osa LAPP Groupia

Lapp Insulator is not affiliated
with the LAPP Group

User Manual – Type T-M / W-M

Documents / Resources

	<p>LAPP AUTOMAATIO T-M / W-M Mineral Insulated Insert With Connection Head [pdf] User Manual</p> <p>T-M W-M Mineral Insulated Insert With Connection Head, T-M W-M, Mineral Insulated Insert With Connection Head, Insulated Insert With Connection Head, Insert With Connection Head, Connection Head</p>
---	--

References

-  [Frontpage | EPIC® SENSORS](#)
-  [Lapp Automaatio | Lapp Automaatio](#)