LAPP AUTOMAATIO

EPIC® SENSORS

BAYONET TEMPERATURE SENSOR
TYPE T-BAJO, T-M-BAJO / W-BAJO, W-M-BAJO, WT-BAJONETTI-…-EX
DATA SHEET 17

INSTALLATION INSTRUCTIONS AND USER MANUAL

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ANNEX A: Ex i specifications and special conditions for use

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Product description and intended use

Sensor types T-BAJO, T-M-BAJO (thermocouple, TC) and W-BAJO, W-M-BAJO (resistance, RTD) are temperature sensors for bayonet installation.

Sensors are intended for various industrial measuring applications. The construction allows very quick installation and replacing. Spring-loaded bayonet connection is secure and vibration proof. The most common bayonet connector size is 12 mm, with connector cap inner diameter 12.2 mm. Spring length is 200 mm as standard, other sizes on request.

Sensor element protection tube material can be chosen, and element / cable length can be produced according to customer needs. Wire and cable sheath materials can be chosen.

Measuring elements are either bendable MI elements (type designation -M-BAJO-) or rigid, non-bendable versions (type designation -BAJO-). Elements can be TC or RTD elements, standard versions are K-type thermocouple (for T-BAJO, T-M-BAJO) and 4-wire Pt100 (for W-BAJO, W-M-BAJO). Tailored versions are produced on request.

Also available as ATEX and IECEx approved versions:

- Ex e: for protection type Ex e sensor versions, please see section *Ex e data*.
- Ex i: for protection type Ex i sensor versions, please see section *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:

For models T-BAJO / W-BAJO (rigid, non-bendable structure):

- With Pt100 -200…+260 °C, depending on materials
- With TC -200…+260 °C, depending on materials.

For models T-M-BAJO / W-M-BAJO (bendable MI-structure)

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

Allowed maximum temperature for the sealant tube*:

- Max. safe temperature +100 °C

*Sealant tube is the transition point between cable and sensor MI-element, please see *Dimensional drawing*.

Temperatures, ambient

Allowed maximum ambient temperature for wires or cable, according to cable type, is:

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

Note! Max. safe temperature +100 °C for the sealant tube in cable to sensor MI-element transition.

Make sure the process temperature is not too much for the cable.

Temperatures, Ex i versions

For Ex i versions only (type designations -EXI-), specific temperature conditions apply according to the ATEX and IECEx certificates. For more details, please see section: *Ex i data* (only for types with Ex i approval).

Temperatures, Ex e versions

The Ex e approved RTD bayonet sensor type is **WT-BAJONETTI-…-EX**. It is a rigid, non-bendable sensor structure, similar to standard version W-BAJO.

For Ex e bayonet sensor versions only, specific conditions apply according to the ATEX certificates.

For type WT-BAJONETTI-…-EX, certificate number EESF 18 ATEX 054X Issue 1:

The process temperature shall not exceed allowed maximum ambient temperature limits for Groups IIC and IIIC.

Allowed maximum ambient temperature ranges for Group IIC according to T Class ranges T6...T3 are:

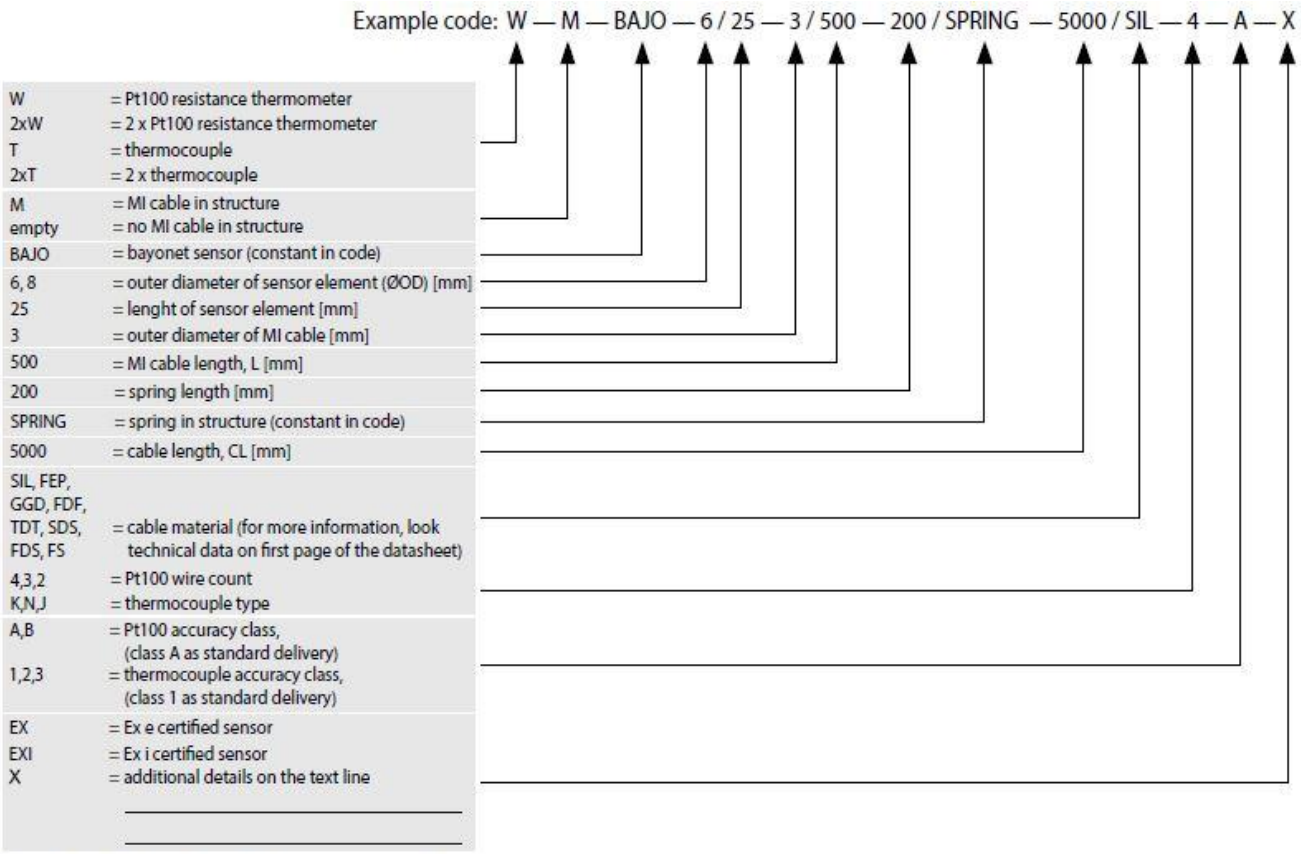
T6: -40 °C ≤ T_{amb} ≤ +80 °C
T5: -40 °C ≤ T_{amb} ≤ +95 °C
T4: -40 °C ≤ T_{amb} ≤ +130 °C
T3: -40 °C ≤ T_{amb} ≤ +185 °C

Allowed maximum ambient temperature ranges for Group IIIC according to T Class ranges T60 °C...T200 °C are:

T60 °C: -40 °C ≤ T_{amb} ≤ +60 °C
T200 °C: -40 °C ≤ T_{amb} ≤ +200 °C
For intermediate values, the maximum surface temperature T** °C shall be equal to maximum T_{amb} value.

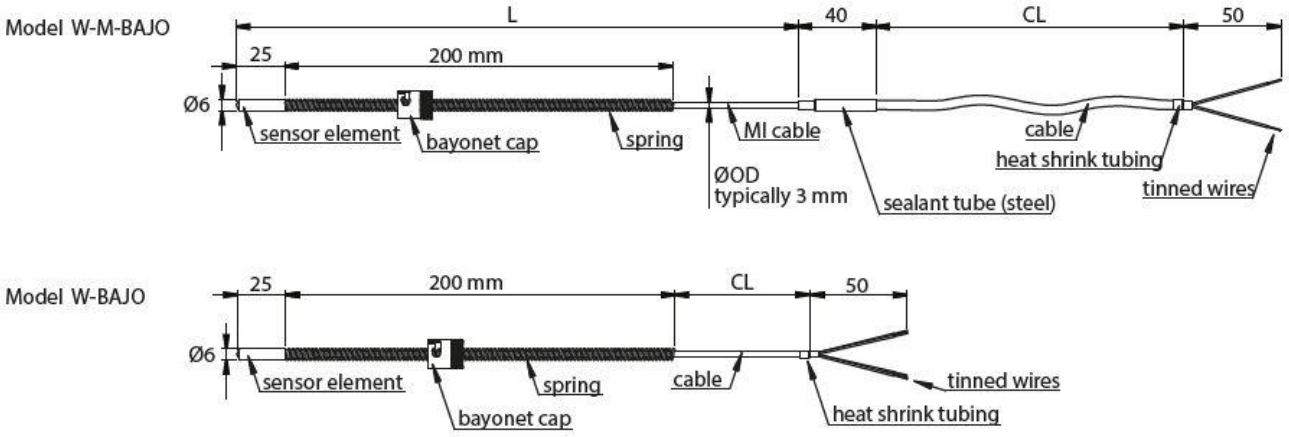
Please see also section *Ex e data*.

Code key



W-BAJO–6/25-200/SPRING-2000/FDF-4-A-X
Pt 100 resistance thermometer for 4 wire measurement with accuracy class A, bayonet sensor without MI cable, sensor element with diameter 6 mm and tip length 25 mm, spring length 200 mm, delivered with 2 meters long FEP insulated and shielded cable, for cable maximum temperature +205°C. X stands for additional details and customizations in product according to customer specific needs.

Dimensional drawing



Drawing showing Ø6 mm sensor type. Bayonet cap inner diameter 12.2 mm.

Technical data

Materials	AISI 316L, max. temperature +250 °C, temporarily +300 °C, other materials on request
Sensor diameter	6 or 8mm, other diameters on request
Bayonet cap diameter	12.2 mm, other diameters on request
Cable material	SIL = silicone, max. +180 °C FEP = fluoropolymer, max. +205 °C GGD = glass silk cable/metal braid jacket, max. +350 °C FDF = FEP wire insulation/braid shield/FEP jacket, max. +205 °C SDS = silicone wire insulation/braid shield/silicone jacket, only available as 2 wire cable, max. +180 °C TDT = fluoropolymer wire insulation/braid shield/fluoropolymer jacket, max. +205 °C FDS = FEP wire insulation/braid shield/silicone jacket, max. +180 °C FS = FEP wire insulation/silicone jacket, max. +180 °C
IP rating	IP56, higher IP rating on request IP20 for GGD glass silk cable version
Tolerances Pt100 (IEC 60751)	A tolerance ±0.15 + 0.002 x t, operating temperature -100...+450 °C B tolerance ±0.3 + 0.005 x t, operating temperature -196...+600 °C B 1/3 DIN, tolerance ±1/3 x (0.3 + 0.005 x t), operating temperature -196...+600 °C B 1/10 DIN, tolerance ±1/10 x (0.3 + 0.005 x t), operating temperature -196...+600 °C
Tolerances thermocouple (IEC 60584)	Type J tolerance class 1 = -40...375 °C ±1.5 °C, 375...750 °C ±0.004 x t Type K and N tolerance class 1 = -40...375 °C ±1.5 °C, 375...1000 °C ±0.004 x t
Temperature range Pt100	Model W-BAJO: -200...+260 °C, depending on materials, Model W-M-BAJO: -200...+300 °C, depending on materials and MI element length.
Temperature range thermocouple	Model T-BAJO: -200...+260 °C, depending on thermocouple type and materials, Model T-M-BAJO: -200...+300 °C, depending on thermocouple type, materials and MI element length.
Approvals	ATEX, IECEx, EAC Ex (Ex e), METROLOGICAL PATTERN APPROVAL
Quality certificate	ISO 9001:2015 and ISO 14001:2015 issued by DNV

Materials

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

- Cable/wires — please see *Technical data*
- Heat shrink tube — Irradiated Modified Polyolefin (max. +125 °C), only on request, not used as standard
- Sealant tube — AISI 316L
- Sealant — Epoxi (max. +100 °C)
- Sensor element / MI cable sheath — for Pt100: AISI 316L, for TC: Inconel 600 or AISI 316L (depending on TC type)
- Spring — Stainless Steel
- Bayonet connector (cap) — Nickel-plated Brass

Other materials can be used on request.

Installation instructions and example

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

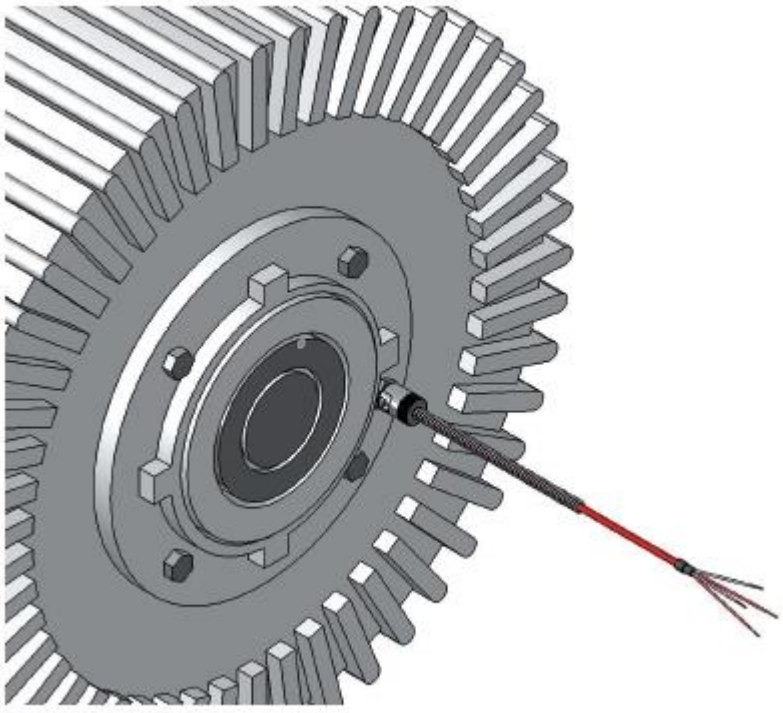
Make sure the cable type matches the temperature and chemical requirements of the site.

Ensure the bayonet connector size and sensor dimensions are correct.

Installation phases (please see also *Dimensional drawing*):

- Install the sensor element tip in the bayonet adaptor of the process.
- Never bend the sensor element, it is rigid, non-bendable protective tube structure.
- MI cable part of types -M-BAJO- can be bended, with minimum bending radius of 2 x ØOD.
- Make sure there is no excess bending force loading the cable.
- Mount extra strain relief, e.g. cable tie, for cable, if necessary.

Image below: this example shows sensor installed to a bayonet adaptor of a machine.



Installation of accessories

Bayonet adaptors:

Bayonet adaptors, matching the sensors bayonet connector, are available as accessories. Most common versions are size M12, for sensing elements max. Ø8 mm, options are listed below.

Installation phases are:

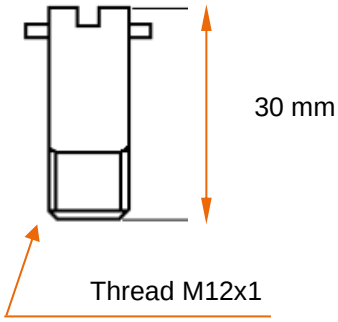
- Bore a hole and prepare a female thread (e.g. M12x1).
- Screw in the adaptor by twisting it clockwise, and securely tighten it.
- Install the sensor by immersing the sensing element through the adaptor
- You can adjust the spring force by moving the connector cap up or down on spring turns, to obtain a required spring force to push the sensor reliably on surface to be measured.
- Finish the installation by twisting the sensors bayonet connector cap clockwise, behind the locking taps, and let the spring hold the sensor in its place.

Available accessories are:

Product number	***Type***
1062617	BAYONET ADAPTOR G1/4-30-8
1027652	BAYONET ADAPTOR M10x1-30-6
999032	BAYONET ADAPTOR M10x1-8,1MM
915836	BAYONET ADAPTOR M12x1-30-8
1000101	BAYONET ADAPTOR M12x1-60-8

Other sizes are quoted on request.

Image below: product 915836 dimensions, for sensor size max. Ø8 mm

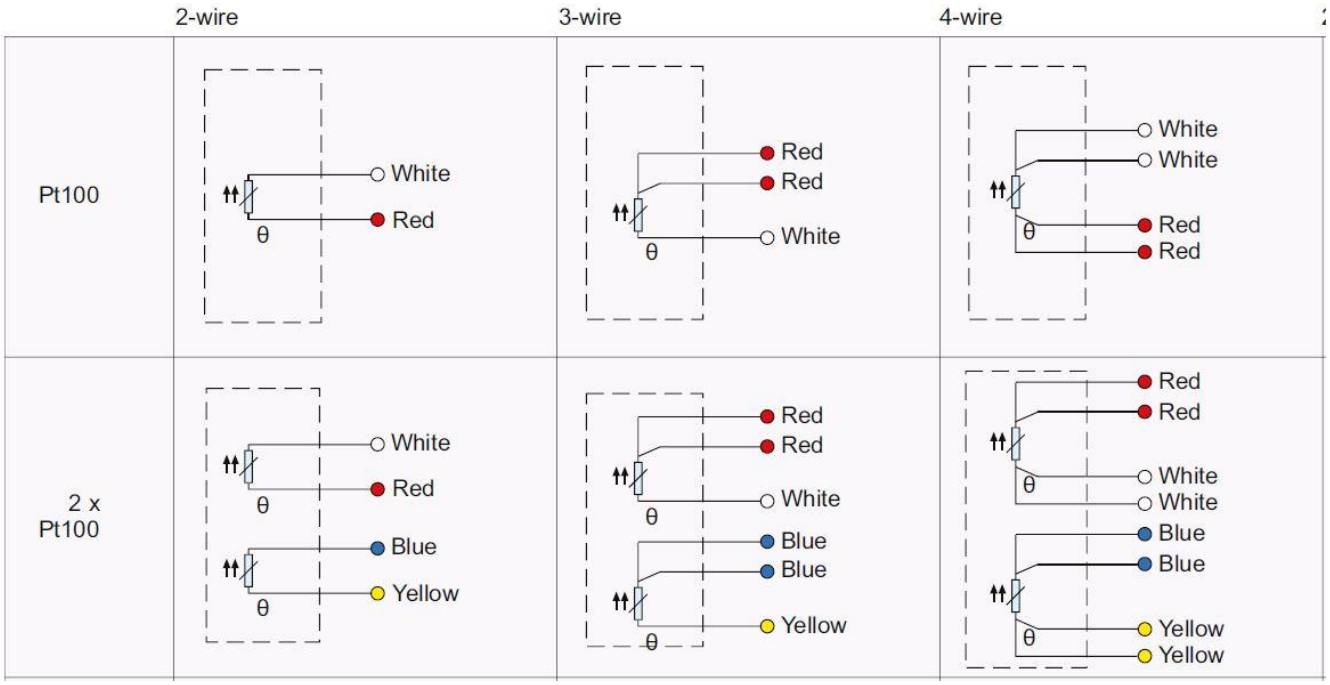


Tightening torques

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

Pt100; connection wiring

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



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:

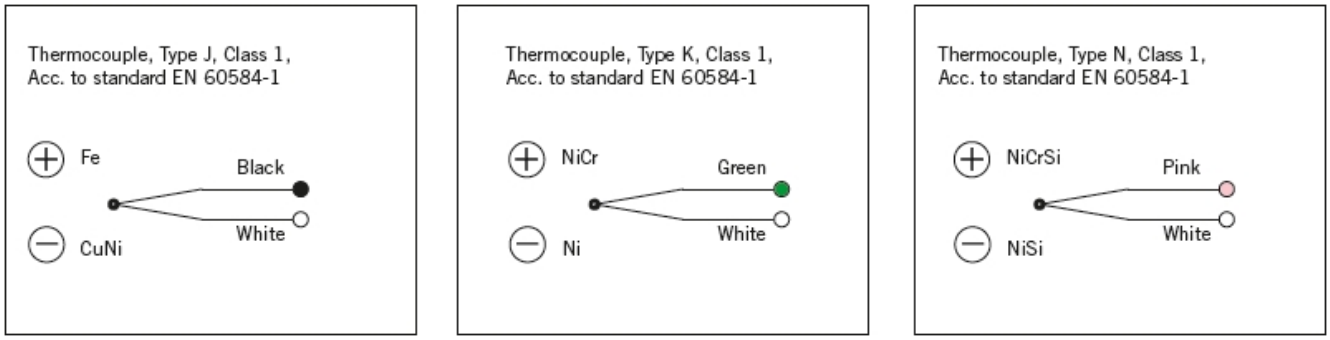
- Pt100 1 mA
- Pt500 0,5 mA
- Pt1000 0,3 mA.

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 protective tube / MI cable sheath is not connected to the thermo material hot junction, where two materials are welded together.

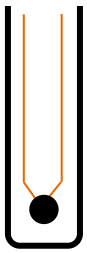
In special applications also grounded types are used.

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-

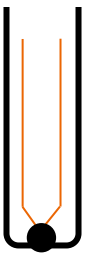
Image below: Non-grounded and grounded structures in comparison.

Non-grounded TC



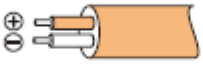
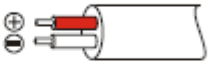
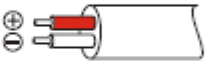
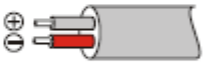
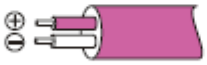
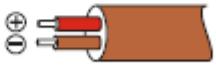
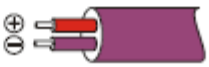
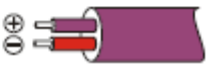
Thermo material hot junction and protective tube / MI cable sheath are galvanically isolated from each other.

Grounded TC



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

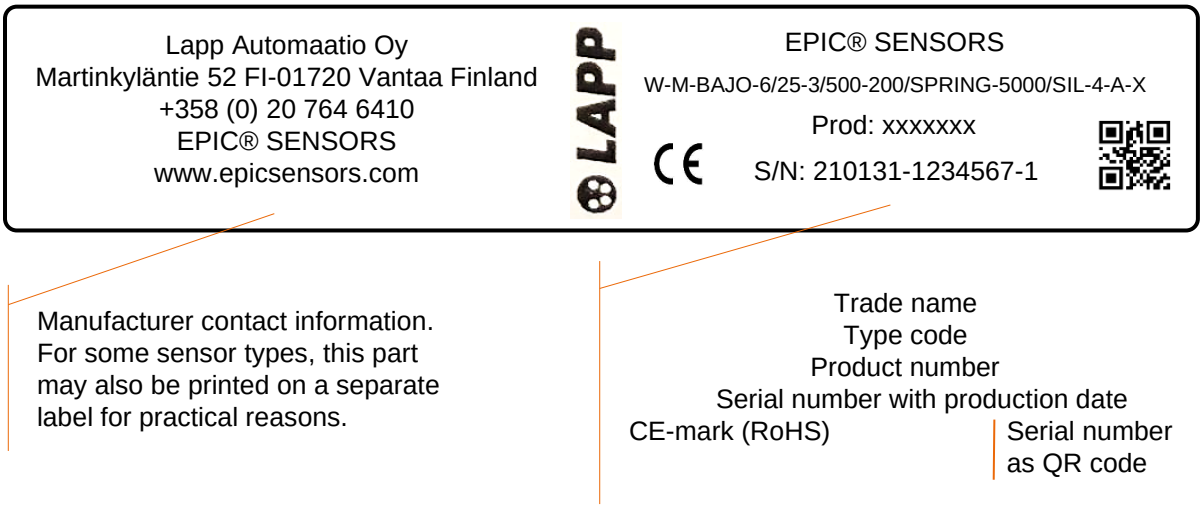
TC; thermocouple cable standards (color table)

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 is a moisture and wear proof industrial grade sticker, with black text on white label. This label has printed information as presented below.

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



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 e data (only for types with Ex e approval)

The Ex e approved bayonet sensor types, with RTD sensing element, are available with ATEX, IECEx, EAC Ex and KCs approvals. The approved types are special versions, with type designation **WT-BAJONETTI-…-EX**. Special data for use in Ex e applications is given in certificates.

Ex e certificates and Ex markings

Type Certificate number	Issued by	Applicable area	Marking
WT-BAJONETTI-…-EX (non-bendable construction as standard type W-BAJO-…)			
ATEX EESF 18 ATEX 054X	Eurofins Expert Services Oy, Finland, Notified Body Nr 0537	Europe	Ex II 2G Ex e IIC T6…T3 Gb Ex II 2D Ex tb IIIC T60°C…T200°C Db
IECEx IECEx EESF 18.0026X	Eurofins Expert Services Oy, Finland, Notified Body Nr 0537	Global	Ex e IIC T6…T3 Gb Ex tb IIIC T60°C…T200°C Db
EAC Ex № ЕАЭС RU C-FI.AA71.B.00130-19	Lenpromexpertiza OOO, Russia	Eurasian Customs Union (Belarus, Kazakhstan, Russia)	1 Ex e IIC T6…T3 Gb X Ex tb IIIC T60°C..T200°C Db X
KCs 19-KA4BO-0463X	KTL Korean Testing Laboratory, South Korea	South Korea	Ex e IIC T6…T3

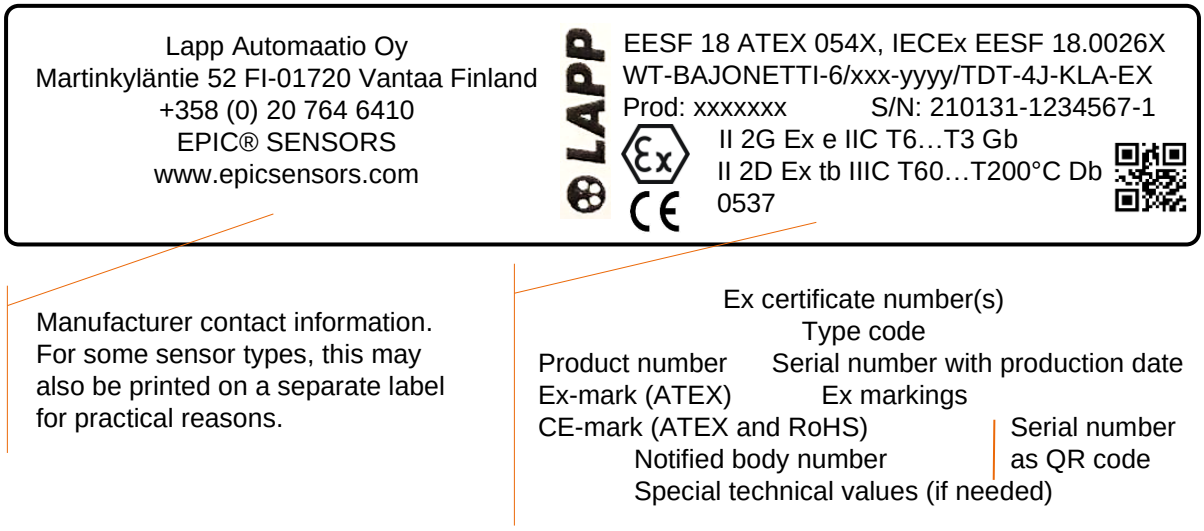
For certificate copies and special Ex e product data, please visit:

https://www.epicsensors.com/en/products/temperature-sensors/exe-extb-temperature-sensors/

Ex e type label

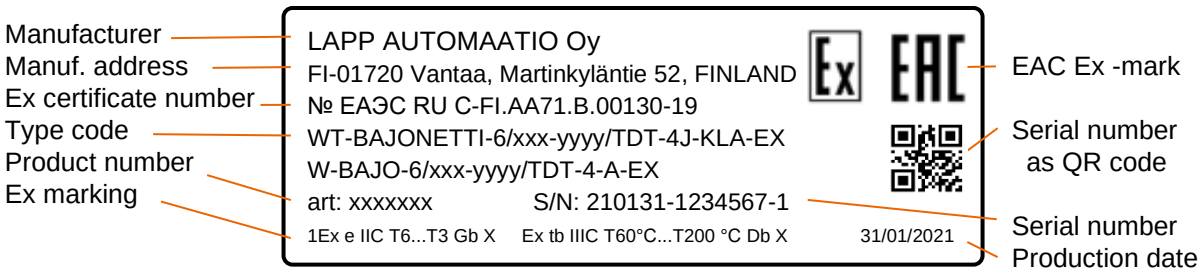
For ATEX, IECEx and KCs Ex e approved sensor versions there is more information on the label, according to applicable standards. This label has printed information as presented below.

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



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

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



NOTE! After Ex approval processes our code key digits have changed to shorter form. Below please find a comparison of the old and new designations of one product type as an example.

Old: WT-BAJONETTI-6/xxx-yyyy/TDT-4J-KLA-EX (printed on current certificates)

New: W-BAJO-6/xxx-yyyy/TDT-4-A-EX (used in general product data).

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 for spring-loaded bayonet installation with cable for connection (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 043X	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 21.0027X	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

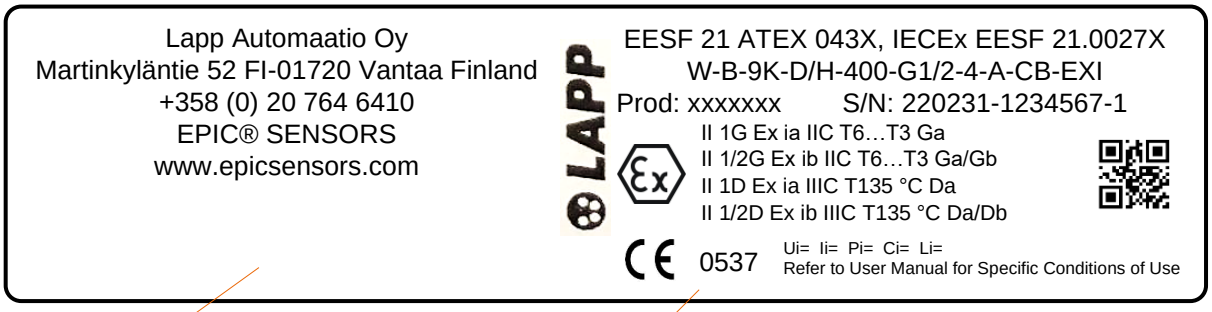
Note! Name change of the Notified Body Nr 0537:

- 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.



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:

	Lapp Automaatio Oy
Street address	Martinkyläntie 52
Postal address	FI-01720 Vantaa, Finland

Production site and logistics:

	Lapp Automaatio Oy
Street address	Varastokatu 10
Postal address	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
20220815	LAPP/JuPi	Material name text corrections
20220408	LAPP/JuPi	Minor text corrections
20220401	LAPP/JuPi	Original version

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

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 Ui	30 V	30 V
Current Ii	100 mA	100 mA
Power Pi	750 mW	550 mW @ Ta +100 °C
		650 mW @ Ta +70 °C
		750 mW @ Ta +40 °C
Capacitance Ci	Negligible, *	Negligible, *
Inductance Li	Negligible, *	Negligible, *

Table 1. Sensor Ex data.

* For sensors with long cable part, the parameters Ci and Li must be included in the calculation.
Following values per meter can be used according to EN 60079-14:
C_{cable} = 200 pF/m and L_{cable} = 1 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 Pi**	**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 gable 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 Pi 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.

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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 Pi 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 Rth values for different type of sensors structure.

	Thermal resistance Rth [°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-Ø-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 Pi.
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).

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Calculation for maximum temperature:

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

Tmax= Po × Rth + MT

(Tmax) = Maximum temperature = surface temperature at the sensor tip
(Po) = Maximum feeding power for the sensor (see the transmitter certificate)
(Rth) = 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 (Tmax) 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 (Po) which is feeding the sensor and Rth-value of used sensor type. (See the Table 3.)

Supplied power by PR 5437 D is (Po) = 23,3 mW (from the transmitter Ex-certificate)
Temperature class T4 (135 °C) must not be exceeded.
Thermal resistance (Rth) for the sensor is = 55 K/W (from Table 3).
Self-heating is 0.0233 W * 55 K/W = 1,28 K
Maximum temperature (Tmax) 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 (Tmax) 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 (Po) which is feeding the sensor and Rth-value of used sensor type. (See the Table 3.)

Supplied power by PR 9113D is (Po) = 40,0 mW (from the transmitter Ex-certificate)
Temperature class T3 (200 °C) must not be exceeded.
Thermal resistance (Rth) for the sensor is = 100 K/W (from Table 3).
Self-heating is 0.040 W * 100 K/W = 4,00 K
Maximum temperature (Tmax) 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.

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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