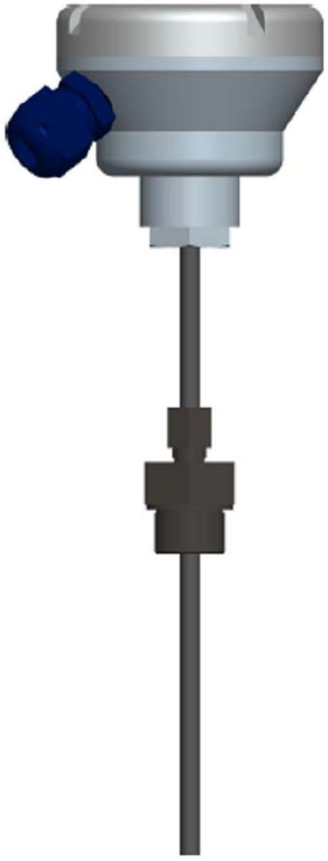
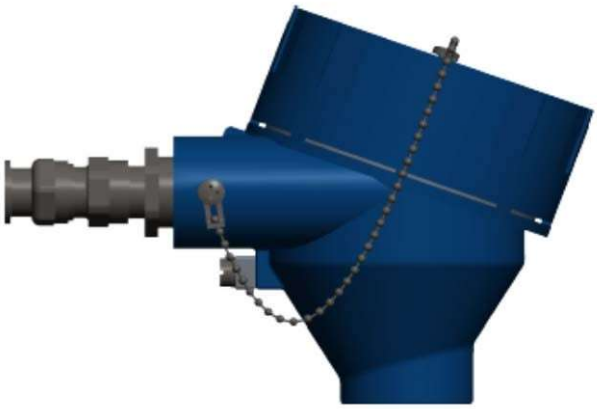
Temperature sensors with terminal head
Thermocouples and RTD

ATEX 'i', 'e', 't', 'd'
For use in areas with an explosion hazard
(Ex areas)





B 903510.0.2
B 903520.0.2
Operating Manual

V5.00/EN/00621124/2023-06-06-CN

Safety information

This manual contains information that must be observed in the interest of your own safety and to avoid material damage. This information is supported by symbols which are used in this manual as indicated.
Please read this manual before starting up the device.
Store this manual in a place that is accessible to all users at all times.
If difficulties occur during startup, please do not intervene in any way that could jeopardize your warranty rights!

Non-observance of these instructions and their contents may result in the loss of explosion protection.

Check whether the classification is suitable for the application. Observe the relevant national regulations.

Observe the information given in the applicable type examination certificate and the relevant regulations for installation and use in hazardous areas

Please read these Operating Instructions before commissioning the device.
Please assist us in improving these operating instructions where necessary.
Your comments will be appreciated.
Phone: 03 87 37 53 00 Fax: 03 87 37 89 00
Email: info.fr@jumo.net
Sales support service: **0892 700 733** (€ 0.337/min)

If any difficulties should arise during commissioning, you are asked not to undertake any unauthorized manipulations on the device. **This will endanger you rights under the device warranty!** Please contact your supplier or the main factory.

Contents

1 Object of these instructions and purpose of application

Object

Temperature sensors from Jumo are used as intrinsically safe equipment and/or equipment with flameproof enclosure, increased safety protection for temperature measurements in liquid and gaseous media as well as with dust.

The thermometers consist of a protection fitting with various process connections, a terminal head and, depending on the type, withor without an interchangeable measuring insert, wit or without transmitter, Field mounted HART temperature transmitter.

The protective sleeve is available in various lengths and with various process connections : fitting, flange, Clamp, weld in…and is made from steel, stainless steel, Hastelloy,etc and has a minimum wall thickness of 1 mm.
In case of a wall thickness less than 1 mm, the instrument may not be exposed to environmental conditions Which may negatively affect the partition wall.
A thermowell with a suitable minimum wall thickness can be used alternatively.

The measuring sensor consist of Pt100 temperature sensors according to EN/IEC 60751 and are used in the fittings in tolerance classes A or B in a two-wire, three-wire, or four-wire circuit.
The use of these sensors with a higher basic value (Pt500, Pt1000, Pt2000, or Pt5000) is possible.
Similarly, NTCs, such as KTY, or other PTCs can also be used. Versions with two or three measuring circuits are also possible.
A CERNOX or digital sensor can also be used but depending on the type.
For thermocouples, the measuring elements comply with EN 60584; see technical data sheet 903510.

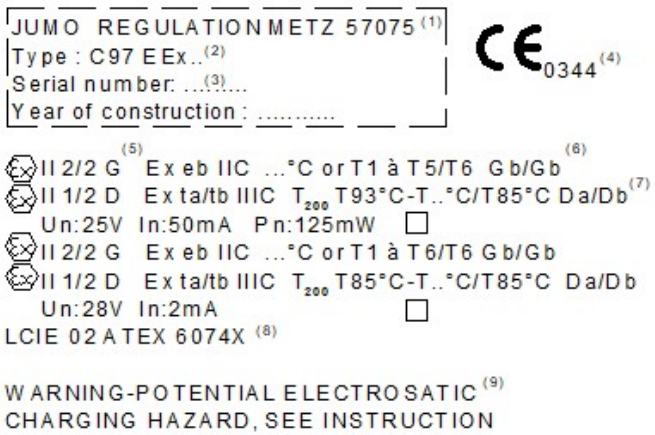
Specifications and applications
Table 1

TEMPERATURE SENSOR SPECIFICATIONS					
TYPE	**Measuring element**	**Type of protection**	**Reference**	**Marking ATEX and IECEx**	**REMARKS**
I.I.R **I.T.C**	RTD probe Thermocouple	Ex “ia”	**903520/10** **903510/10**	II 1 G Ex ia IIC T6 …T1 Ga II 1/2 D Ex ia IIIC T_{200}85°C…T_{200}450°C Da/ Ex ia IIIC T85°C…T135°C Db	Terminal head
I.I.R.420 **I.T.C.420**	RTD probe Thermocouple	Ex “ia”	**903520/10** **903510/10**	II 1/2 G Ex ia IIC T6… T1 Ga/Gb II 1/2 D Ex ia IIIC T_{200}85°C…T_{200}450°C Da/ Ex ia IIIC T85°C…T135°C Db	Terminal head
I.I.R.420 **I.T.C.420**	RTD probe Thermocouple	Ex “ia”	**903520/15** **903510/15**	II 1/2 G Ex ia IIC T6 …T1 Ga/Gb II 1/2 D Ex ia IIIC T_{200}85°C…T_{200}450°C Da/ Ex ia IIIC T85°C…T135°C Db	Ex Field mounted HART temperature transmitter Digital display
C97 EEx	RTD probe Thermocouple	Ex “eb” Ex”ta/tb”	**903520/20** **903510/20**	II 2 G Ex eb IIC ..°C or T1 to T6/T6 Gb/Gb II 2 G Ex eb IIC ..°C or T1 to T5/T6 Gb/Gb II ½ D Ex ta/tb IIIC T20093°C to T..°C/ T85°C Da/Db II ½ D Ex ta/tb IIIC T20085°C to T..°C/ T85°C Da/Db	Terminal head
TB97-XD-R **TB97-XD-T**	RTD probe Thermocouple	Ex “db” Ex”ta/tb”	**903520/30** **903510/30**	II 2 G Ex db IIC T6…T1 Gb II 1/2 D Ex ta IIIC T_{200}85°C…T_{200}450°C Da/ Ex tb IIIC T85°C…T135°C Db	Terminal head
TB97-XD-R.420 **TB97-XD-T.420**	RTD probe Thermocouple	Ex “db” Ex”ta/tb”	**903520/35** **903510/35**	II 2 G Ex db IIC T6…T1 Gb II 1/2 D Ex ta IIIC T_{200}85°C…T_{200}450°C Da/ Ex tb IIIC T85°C…T135°C Db	Ex Field mounted HART temperature transmitter Digital display

Technical data sheet 903510: thermocouples for industrial processes with ATEX UE TypeExamination Attestation and/or IECEx certification
Technical data sheet 903520: resistance probes for industrial processes with ATEX UE TypeExamination Attestation and/or IECEx certification.

2 Marking

Example of sensor marking:



⇨ **WARNING – POTENTIAL HAZARD OF ELECTROSTATIC CHARGES (10)**
SEE INSTRUCTIONS

(1) Manufacturer's address
(2) Type of sensor
(3) Manufacturing number: order number + position
(4) Notified body: 0344 = DEKRA
(5) Ex marking of group and category
(6) Ex marking for G zone
(7) Ex marking for dust zone (IIIC, conductive dust)
(8) Ex attestation number
(9) If the plunger is coated (heat-shrinking or sprayed coating), please see the specific instructions

3 Safety notes

The relevant technical data for using the device in potentially explosive areas are listed in the relevant drawing, the relevant data sheet, and/or on the label stuck into this operating manual.

Operate all RTD temperature probes according to the intended use, only when they are in an Undamaged and clean condition !

No modifications may be made to the RTD temperature probes. Otherwise, it may no longer be possible to ensure error-free functioning. Moreover, all warranty claims will be invalidated.
When replacing interchangeable measuring inserts, only JUMO original parts of the same type should be used.

The national and international safety and accident prevention regulations must be observed during installation, during work on and with the RTD temperature probes, as well as during mounting at the installation location. Furthermore, the plant operator is responsible for compliance with the legal regulations. If connecting cable extensions are used, the specific length-dependent capacitance and inductance must be observed.

The used transmitters/digital displays, cable gland, terminal head… shall be provided with their own EU-type examination certificate in accordance with IEC/EN 60079-0, IEC/EN 60079-11, IEC/EN 60079-1 and IEC/EN60079-31.

The installation conditions, electrical connection values, temperature classes resp. the maximum surface temperatures of instruments for the use in explosive dust atmospheres and the permissible ambient temperature shall be taken from the corresponding EU-type examination certificates and shall be considered.

When using a transmitter/digital display, note and follow:

- The contents of the operating manual of the transmitter/digital display
- The relevant regulations for installation and use of electrical systems
- The regulation and guidelines regarding explosion protection

The maximum ambient temperature Ta specified for the terminal head, transmitter or Ex field mounted HART transmitter must not be exceed.

4 Compliance with standards

Table 2

TYPE	ATEX Type examination	EN Standards	IECEx certificates	IEC Standards
I..	QPS 23ATEX5004X	EN IEC 60079-0 (2018) EN60779-11 :2012	IECEx QPS 23.0009X	IEC 60079-0 (2017, édition 7) IEC 60079-11 :2012 EN 60079-26
TB 97-XD	QPS 23ATEX5004X	EN IEC 60079-0 (2018) EN 60079-1 :2014 EN 60079-31 (2014)	IECEx QPS 23.0009X	IEC 60079-0 (2017, édition 7) IEC 60079-1 :2014 IEC 60079-31 (2013 édition 2)
C97 EEx	LCIE 02 ATEX 6074 X / 02	EN IEC 60079-0 (2018) EN 60079-7 (2015 + A1 :2018) EN 60079-31 (2014)	IECEx LCIE 13.0064 X / 03	IEC 60079-0 (2017, édition 7) IEC 60079-7 (2017 édition5.1) IEC 60079-31 (2013 édition 2)

5 Technical data, explanations and case examples

CAUTION: for specific data, see the data sheet/drawing, and/or the label stuck into this operating manual

5.1 Thermal data

In an RTD temperature probe, the measuring current (or in the case of a malfunction, the fault current) flows through the sensor element. Self-heating of the element occurs and, ultimately, a temperature increase on the surface of the protection fitting also occurs.

Surface heating is determined by the temperature probe design, by the environmental influences (thermal coupling to the measurement medium), as well as the power fed in.

This increase must be taken into account for the process temperature difference and the temperature class.
It must be ensured that the limit of the specified temperature class is not exceeded.
The operator must determine whether the thermometer is suitable for the measurement task for the relevant application and the connected equipment.

5.2 Relation ship between process temperature and temperature class according to zones

The self-heating at the sensor tip or thermowell tip depends upon the sensor type (resistance thermometer/thermocouple), the sensor diameter, and the power supplied to the temperature transmitter in the event of a failure.

The maximum admissible measurement temperature on the tip of the probe is determined using the following equation:
$\Delta t = Rth \times Pi$
Rth= Thermal resistance of the montage see table 9
Pi: Power of the electrical circuit

Empirical value for the thermal resistance of temperature sensors
Table 3

EMPIRICAL VALUES FOR THE THERMAL RESISTANCE OF TEMPERATURE SENSORS			
Measuring insert	**D mm**	**Scope of validity**	**Thermal resistance K/W**
RTD sensor simple	3	From d=3 to d=5mm	198
RTD sensor duplex	3	From d=3 to d=5mm	370
RTD sensor simple	6	From d=6 to d=9mm	75
RTD sensor duplex	6	From d=6 to d=9mm	140
RTD sensor simple	10	≥ 10mm	50
RTD sensor duplex	10	≥ 10mm	95
Cernox	3	≥ 3mm	195
Thermocouple	3	From d=3 to d=5mm	15
Thermocouple	6	From d=6 to d=9mm	5
Digital sensor	6	>=6mm	60

These values are taken from the test report RTATEX01

Example 1:
RTD sensor simple d=3 - Rth 198K/W and Pi:140mW
Δt = Rth x Pi = 198K/W x 0,14W = 27,8 K
In the case of a malfunction, or fault current, an increase of **27,8K** is generated
(this value must be deducted from the maximum surface temperature for the temperature classes T1 to T6)

Category 2: in the case of temperature classes T1 and T2, a 10 °C safety deduction must be applied, and in the case of temperature classes T3 to T6, a 5 °C safety deduction must be applied.

A thermometer is to be used in temperature class T4 (maximum temperature 135 °C, limit is to be reduced by 5 K for safety);
Tp (Process temperature) maxi : 135°C-5°C-27,8°C = 102,2°C

Example 2:
The same thermometer is to be used in the same application case as above. However, the maximum power with the JUMO dTRANS T01 transmitter is considerably lower, which significantly increases the maximum measurement temperature and results in a larger application spectrum.
Rth: 198K/W
Maximum power of the electrical circuit Pi (≙ Po) = 0.011 W (JUMO transmitter type 707015)
Δt = Rth x Pi = 198K/W x 0,011W = 2.2 K
Tp (Process temperature) maxi : 135°C-5°C-2.2°C = 127,8°C

Category 1: according to EN 1127-1:2011, point 6.4.2 (hot surfaces), the temperatures of all surfaces of devices...for use in zone 0 - must not exceed...80 % of the ignition temperature
⟹ Temperature class less 20 %
ubsequently, another 10 °C must be subtracted in temperature classes T1 and T2, and another 5 °C in temperature classes T3 to T6.

5.3 Maximum surface temperature in Dust

The maximum surface temperature T_{200}85 °C ... T_{200}450 °C rise as a function of electrical circuit power °C.

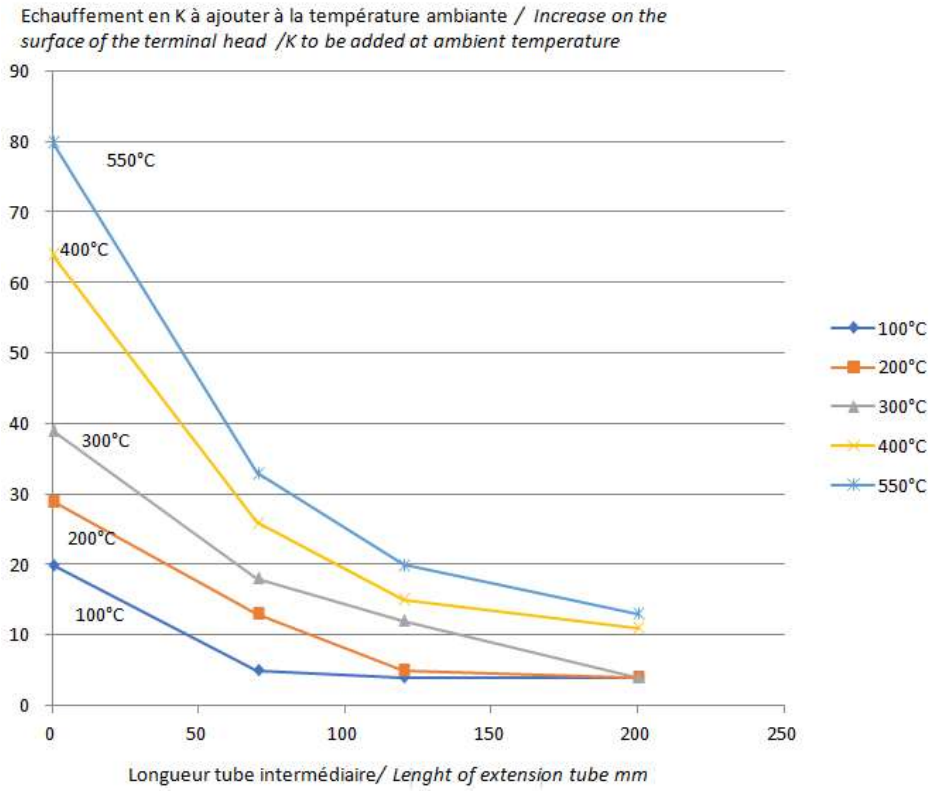
Meausuring insert Diametre Ø	Pi ≤ 25 mW	Pi ≤ 50 mW	Pi ≤ 75 mW	Pi ≤ 100 mW	Pi ≤ 125m W	Pi ≤ 140mW
	Temperature rise as a function of electrical circuit power °C					
RTD sensor simple Ø 3	6	14	20	27	33	36
RTD sensor duplex Ø 3	13	24	34	44	54	60
RTD sensor simple Ø 6	3	8	12	16	20	23
RTD sensor duplex Ø 6	7	14	21	27	34	37
Digital sensor Ø 6	3	8	12	16	20	23

5.4 Compliance with the ambient temperature at the terminal head

A reverse heat flow from the process exceeding the permissible ambient temperatureof the transmitter, digital display or terminal head is not allowed and shall be avoided by a suitable thermal insulation or a suitable extension tube between process connection and terminal head.

Table 4

	Temperature rise °C as a function of extension tube length			
Process temperature	**0mm**	**70mm**	**120mm**	**200mm**
100 °C	**20**	**5**	**4**	**4**
200°C	**29**	**13**	**5**	**4**
300°C	**39**	**18**	**12**	**4**
400°C	**64**	**26**	**15**	**11**
550°C	**80**	**33**	**20**	**13**



These values are taken from the test report RTATEX02

Example :
Temperature sensor I.I.R.420 – with Jumo transmitter Jumo 707015 dTrans T01 Ex
For categorie 1 – T6 : ambient temperature = -40..+55°C

The maximum permissible ambient temperature at the terminal head is:
Tamb = 55-13=**42°C**

5.5 Intrinsically safe connection, ignition protection type Ex "i"

An electrical circuit is intrinsically safe if no ignitable sparks occur in normal cases and in the case of malfunction due to a short circuit of the electrical circuit, or the surface of the devices does not heat up above the specified temperature class due to the current flowing (see also EN 60079-11 and paragraph 5.2).

In order that an electrical circuit can be designated as intrinsically safe, all devices in the circuit must be designed to be intrinsically safe. Furthermore, it must be ensured that the interconnection of intrinsically safe devices meets the requirements for an intrinsically safe electrical circuit.
The interconnection of any intrinsically safe devices does not ensure an intrinsically safe circuit in itself.
It must be ensured that the limit of the specified temperature class is not exceeded (see also paragraph 5.2).

Explanation:
The following safety reserves must **also be complied with:**

Category 1: according to EN 1127-1:2011, point 6.4.2 (hot surfaces), the temperatures of all surfaces of devices...for use in zone 0 - must not exceed...80 % of the ignition temperature
→ Temperature class less 20 %
ubsequently, another 10 °C must be subtracted in temperature classes T1 and T2, and another 5 °C in temperature classes T3 to T6

Category 2: in the case of temperature classes T1 and T2, a 10 °C safety deduction must be applied, and in the case of temperature classes T3 to T6, a 5 °C safety deduction must be applied

Calculation for self-heating at the sensor/ thermowell tip must be carried out according to paragraph 5.2

The intrinsic safety loop must be calculated.
To provide evidence of intrinsic safety, the electrical boundary values must comply with the attestations covering the equipment.
The conditions are verified by comparing with the permissible boundary values of the electrical equipment

Electrical date without built in transmitter :

Ui : 25V Ii : 95mA Pi : 140mW Ci=0nF, Li=0µF (RTD/Thermocouple)
Ui : 9V Ii : 95 mA Pi : 140mW (Cernox)
Ui : 9V Ii : 550mA Pi : 630mW (Digital sensor)

The internal inductance Li and capacitance Ci of the measuring insert are neglegebly small**.**
Only to be connected to intrinsically safe circuits with folowing outpout maxi values devices of group II
Uo = 25V - Io = 95mA - Po = 140mW (RTD/Thermocouple)
Uo = 9V - Io = 95mA – Po = 140mW (Cernox)
Uo = 9V – Io = 550mA – Po = 630mW (Digital sensor)

Electrical data with built in transmitter, digital display or Field mounted temperature transmitter :

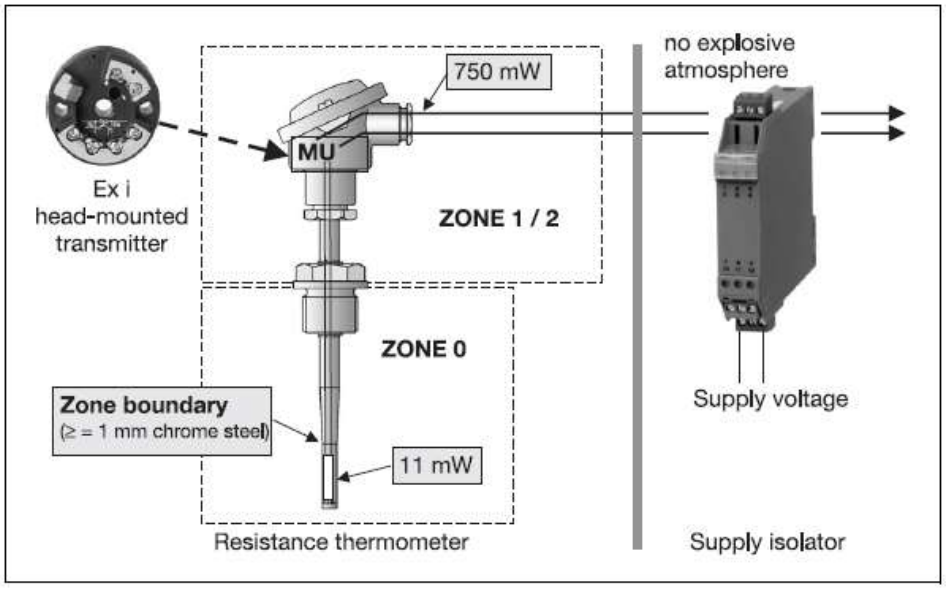
Sensor circuit in type protection Ex ia IIC, IIIC,
For the sensor circuit the above specified values corresponding to the group II resp group III apply.

Signal circuit in type of protection intinsic safety Ex ia, IIC resp. III
Ui = depending on the transmitter, digital display or field mounted temperature transmitter
Ii = depending on the transmitter, digital display or field mounted temperature transmitter
Pi = depending on the transmitter, digital display or field mounted temperature transmitter
Ci = depending on the transmitter, digital display or field mounted temperature transmitter
Li = depending on the transmitter, digital display or field mounted temperature transmitter

Upon comparing the values, it is obvious that it is permissible to connect these instruments to one another. However, the operator must also take into account the values for inductance and capacitance of the electrical connection

leads.

Example:



Measuring insert		Head built in transmitter Jumo 707015			Isolated barrier / supply
Ui:25V	≥	Uo:9,6V	Ui:30V	≥	Uo:25,2V
Ii:95mA	≥	Io:4,5mA	Ii:100mA	≥	Io:93mA
Pi:140mW	≥	Po:11mW	Pi:750mW	≥	Po:587mW
Ci:negligible	≤	Co:709 nF	négligible	≤	Co:107 nF
Li:negligible	≤	Lo: 4,5 mH	négligible	≤	Lo: 2mH

Electrical value Ex built in Transmitter
Table 5

Eletrical value Ex built in Transmitter						
Type	**Supplier reference**	**Ui**	**Ii**	**Pi**	**Ci**	**Li**
Jumo 707015 dTrans 01 Ex	00372362	30V	100mA	750mW	négligible	négligible
Jumo 707015 dTrans 01 Ex HART	00391004	30V	100mA	750mW	négligible	négligible
Jumo 707085/8-06 dTrans 07 Ex HART Jumo 707086/8-06 dTrans 07 Ex HART SIL	00672697 00672698	30V	130mA	800mW	négligible	négligible
ABB TTH200, TTH300	TTH200 TTH300	30V	130mA	800mW	0,57nF	160µH
PR Electronics	5333D 5334B 5335D 5337D	30V	120mA	840mW	1nF	10µH
Endress Hauser	iTEMP TMT182	30V	100mA	750mW	négligible	négligible
Any transmitter, digital display or Field mounted temperature transmitter compatible with the electrical values of the certificate either, Ui:25V Ii:95mA Pi:140mW						

Electrical value Ex Field mounted HART temperature transmitter
Table 6

Electrical value Ex Field mounted HART temperature transmitter for type I.. et TB97-XD						
Type	**Supplier reference**	**Ui**	**Ii**	**Pi**	**Ci**	**Li**
Transm. HART 7501 Ex « ia » / Ex « d » PR Electronics	7501A	30V	120mA	840mW	2nF	0
Transm. HART 7501 Ex « ia » / Ex « d » PR Electronics	7501B	30V	120mA	840mW	2nF	0
Transm. YTA 610 Ex « ia » / Ex « d » Yokogawa	YTA 610	30V	200mA	1W	22nF	0
Transm. YTA 710 Ex « ia » / Ex « d » Yokogawa	YTA 710	30V	200mA	1W	22nF	0
Any transmitter, digital display or Field mounted temperature transmitter compatible with the electrical values of the certificate either, Ui:25V Ii:95mA Pi:140mW						

Ambient temperature range for temperature sensor serie I… :

For sensor without transmitter the temperature range is (-50°C) -40 to +100°C
(-50°C for CNI-3 and BEGF terminal head)

The ambient temperature limits Ta for I... series sensors without temperature transmitter for category 1 are as follows:

T6 : (-50°C) -40 ..+64°C
T5 : (-50°C) -40 ..+76°C
T4 : (-50°C) -40 ..+100°C

The ambient temperature limits Ta for I... series sensors without temperature transmitter for category 2 are as follows:

T6 : -40..+80°C
T5 : -40..+95°C
T4 : -40..+100°C

For sensor with transmitter :
- the minimum ambient temperature range is : -40°C
- the maximum ambient temperature range is the maximum ambient temperature range of the selected transmitter per table 5 or the maximum ambient temperature range of the selected Ex Field mounted HART temperature transmitter per table.

5.6 Increased safety, protection type Ex "e"

This protection mode consists in applying measures in order to prevent, using a high safety coefficient, the possibility of excessive temperatures and the occurrence of electric arcs or sparksinside or on the outer parts of the electrical equipment that do not occur in normal service or in theevent of failure.

Increased safety executions must not necessarily be connected to an intrinsically safe electrical circuit; however, care must be taken to ensure that the heating of the probe remains limited in all operating modes, as described in paragraph 5.1 and examples 1 and 2.

The Ex “e” increased safety alone is not sufficient for use in zone 0 (G) or 20 (D)! Two independent protection modes and/or a separating element to separate the zones are required.
The equipment has accessories (ATEX/IECEx housings, ATEX/IECEx terminal boxes or glands) in accordance with standard EN 60079-0/IEC 60079-0 and EN 60079-7/IEC 60079-7.

The transfer of the outer and/or inner ground must be connected to the earth or integrated into the equipotential bonding of the site.

Ambient temperature
The ambient temperature at the sensor connecting head must not exceed the following temperaturerange: -20 to +80 °C.

Electrical value
Un : 25 V In : 50 mA Pn : 125 mW
Un : 28V In : 2mA

Connection to an "e" and/or "t" certified device with electrical operating values lower than Un: 25V, In: 50mA, Pn: 125mW

The electrical circuit of the temperature probe must be limited to a maximum performance of 125 mW.

Temperature class :
Un :25V In :50mA Pn :125mW
T5 for G T_{200} 97°C for Dust

Temperature class :
Un :28V In :2mA
T6 for G

Table: Temperature class of probe
The heating value determined for group III (under the dust layer) was used, as it is the worst case: max measured value 16.8K.
For temperatures above T1, an additional margin of 10K (26.8K instead of 16.8K) was used. instead of the 16.8K heating considered was added.instead of the 16.8K heating considered) was adde

Table 7

Tp max	Gaz	Dust
60°C	T6	T85°C
70°C	T5	T100°C
110°C	T4	T135°C
170°C	T3	T200°C
270°C	T2	T300°C
420°C	T1	T450°C

Tp>440°C X°C (1) TX°C (1)
(1) X=Tp+26,8K

The tempertaure probe can be connected to a device certified “e“ and/or “t“ according to the harmonized standards and having electrical values less than U : 25 V, I : 50 mA et P : 125 mW. In this case, the electrical circuit of the temperature probe must be limited to a maximum performance of 125 mW.

5.7 Flameproof enclosure, protection type Ex”d”

The parts that can ignite a potentially explosive atmosphere are arranged in a pressure resistant housing (here terminal head with cable gland) that, in the event of an explosion of an explosive mixture, withstands the pressure inside and prevents the explosion from transferring to the potentially explosive atmosphere surrounding the housing. So the principle is the safe management of a potential explosion.

Temperature sensors without built in transmitter are usually equipped with terminal blocks.
Temperature sensors are equipped wit the built in transmitter listed in the table 5 or with standard analog / programmable transmitter.

The model XD-Addig (terminal head + LED display) certified Ex »d » and Ex »t » shall be provided with their own EU-type examination certificate in accordance with IEC/EN 60079-0, IEC/EN 60079-11 and IEC/EN60079-31.

Temperature sensor series TB97-XD without measuring insert are used with a thermowell/protective sleeve with

minimal thickness of 1mm ore made in mineral insulated cable.
For the model terminal head without thermowell, the smooth hole is foreseen to create a flameproof joint with folowing tolerance : Ø10,1 H7.
Assembly without replaceable measuring insert, mounting with compound plug, validate by the following type tests : IEC 60079-0:2017 clause 26.8, IEC 60079-0:2017 clause 26.9,IEC 60079-0:2017 clause 26.4.2 and IEC 60079- 1:2014 clause 15.2.3.2 (C.2.1.4). See section 5, Temperature sensor TB97-XD (Ex »d »/ »t ») specific Design.

Electrical value

Electrical value of the sensor circuit:	**Un : 25V**	**In : 95mA**	**Pn : 140mW (RTD/Thermocouple)**
	Un : 9V	**In : 95mA**	**Pn : 140mW (Cernox)**
Electrical value for digital sensor :	**Un : 9V**	**In : 550mA**	**Pn : 630mW (Digital sensor)**

Ambient temperature range for temperature sensor serie TB97-XD :

For sensor without transmitter the temperature range is (-55°C) -50 to +60°C
(depending of the selected terminal head)

- Terminal head XD-AD, XD-SD et XD-Addig : -50...+60°C
- Terminal head TE200 / TE300: -55..+60°C

For sensor with transmitter :

- the minimum ambient temperature range is the minimumambient temperature range of the selected transmitter or Ex field mounted HART transmitter
- the maximum ambient temperature range is the maximum ambient temperature range of the selected transmitter or Ex field mounted HART transmitter

The temperature classes and safety clearances are equally applicable to both ignition protection types. It must also be observed how the temperature changes in the terminal head during the use of a possibly inbuilt transmitter.

Calculation for self-heating at the sensor/ thermowell tip must be carried out according to paragraph 5.2

The flameproof enclosure versions do not necessarily have to be connected to an intrinsically safe electrical circuit, although it is vital to ensure that the temperature increase of the thermometer is restricted, as described in detail in 5.2 and illustrated with the example cases.

In a potentially explosive atmosphere, the terminal head and/or connection terminals must not be opened when voltage flows if the ignition protection type "intrinsically safe" (Ex "i") is not also applied.

5.8 Use in areas that are potentially explosive due to dust

For use in areas that are potentially explosive due to dust, the following temperature values must be considered:

The following applies for all zones:
The equipment's surface temperature must not reach the point at which clouds of dust or dust deposited on equipment could ignite. This is achieved through the following conditions::

Without dust deposits
The surface temperature must not exceed 2/3 of the ignition temperature in °C of the respective dust/air mixture..

With dust deposits
Surfaces on which dangerous deposits of smolderable dust cannot be prevented must not have a surface temperature that is higher than 75 K below the smoldering temperature of the dust concerned. If layers thicker than 5 mm occur, a further reduction of the surface temperature is required.

Where a combination of swirling and deposited dust occurs, the lower of the temperature values derived above must be applied.

Note:

In this case, surface means the exterior surface of the equipment, see also 60079-14.
The ignition or smoldering temperature of the dust or dust/air mixture that is present must be defined or determined by the plant operator!
Note:
In this case, “surface” means the external surface of the equipment, see also EN 60079-14.

The ignition or smoldering temperature of the dust or dust-air mixture that is present must be defined or determined by the operator of the plant or system!

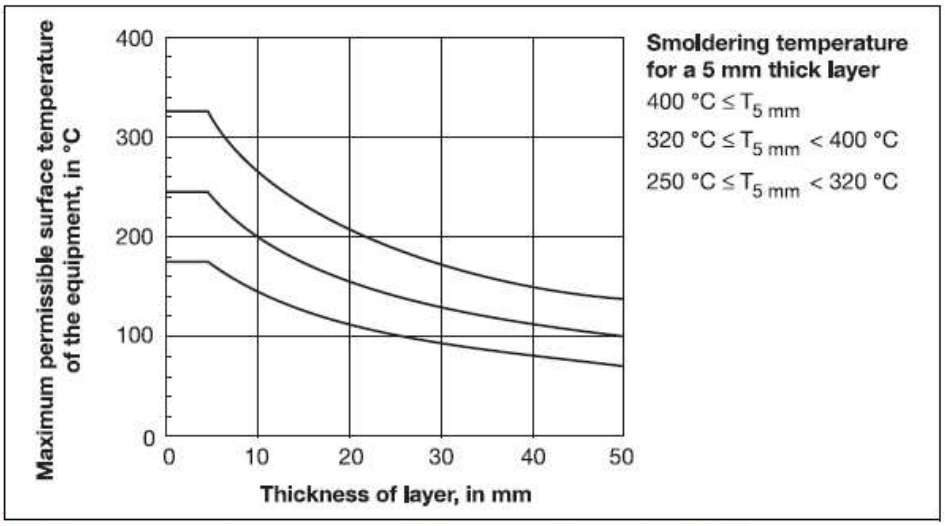


Figure 18: Reduction of the maximum permissible surface temperature with increasing thickness of the dust deposit

6 Specific parameters per protection mode

Follow the installation and safety instructions in the operating manual.

The used transmitters/digital displays, cable gland, terminal head… shall be provided with their own EU-type examination certificate in accordance with IEC/EN 60079-0, IEC/EN 60079-11, IEC/EN 60079-1 and IEC/EN60079-31.

The installation conditions, electrical connection values, temperature classes resp. the maximum surface temperatures of instruments for the use in explosive dust atmospheres and the permissible ambient temperature shall be taken from the corresponding EU-type examination certificates and shall be considered.

When using a transmitter/digital display, note and follow:
- The contents of the operating manual of the transmitter/digital display
- The relevant regulations for installation and use of electrical systems
- The regulation and guidelines regarding explosion protection

Calculation for self-heating at the sensor/ thermowell tip must be carried out according with example to paragraph 5.2.
The user must perform this calculation for each application.

The maximum ambient temperature Ta specified for the terminal head, transmitter or Ex field mounted HART transmitter must not be exceed.

Metallic connection housings must be grounded for potential equalization via the connecting cable.

Thermowell or protective sleeve : in case of a wall thickness less than 1 mm, the instrument may not be exposed to environmental conditions which may negatively affect the partition wall. A thermowell with a suitable minimum wall thickness can be used alternatively..

Mechanical shock or impacts between light metals are not permitted.

Use of I… and TB97-XD series sensors in a group IIIC equipment:
The terminal head will be located in zone 21 and the protective sleeve in zone 20

Temperature sensor series I… are certified for connection to intrinsically safe electrical circuits of category ib (for applications in zones 1 and 2, with separation element in zone 0) and of category ia (for use of the probe tube in zones 0, 1, and 2).

Temperature sensor series TB97-XD are also fitted with measuring inserts in an intrinsically safe version for connection to intrinsically safe electrical circuits.
When connecting to non-intrinsically safe electrical circuits, the power introduced must be restricted by the user to ensure that the maximum surface heating – according to the temperature class minus the safety clearance – is not exceeded!

Ambient temperature of the terminal head for Temperature sensors series I… and C97 EEx

Type	Supplier reference	Temperature range	Material	IP	Seal
JFR (BUZ72)	NAA1	-40..+100°C	Alu pressure die casting	IP68	Oil proof rubber
BFR (BUZ85) **BFR 2 cable entries**	DANA1 DAND1	-40..+100°C	Alu pressure die casting	IP68	Oil proof rubber
BUSH **BUSH 2 cable entries**	DANAW1 DANAD1	-40..+100°C	Alu pressure die casting	IP68	Oil proof rubber
DNAG	DNAG	-40..+100°C	Alu pressure die casting	IP68	Oil proof rubber
CNI-3		-30..+100°C	Stainless Steel (304,316..)	IP66	NBR Nitrile
		-50..+100°C			Silicone
BEGF		-50..+100°C	Stainless Steel (304,316..)	IP65	Silicone
AB7		-40..+100°C	Alu pressure die casting		Silicone
XI-DSN (1)	XI-DSN	-40..+100°C	Poyamide PA12 antistatic - Black	IP68	Oil proof rubber

XI-DSNW (1)	XI-DSNW	-40..+100°C	Poyamide PA12 antistatic - Black	IP68	Oil proof rubber

Ambient temperature of the terminal head for Temperature sensors series TB97-XD and C97 EEx

TERMINAL HEAD USED FOR TEMPERATURE SENSOR SERIES TB97-XD						
Type	**Supplier reference**	**Temperature range**	**Material**	**IP**	**Seal**	**Certification**
XD-AD - Limatherm	XD-AD	-50..+100°C	Alu pressure die casting	IP68	Silicone	FTZU 03 ATEX 0074U IECEx FTZU 14.0003U
XD-SD - Limatherm	XD-SD	-50..+100°C	Alu pressure die casting	IP68	Silicone	FTZU 03 ATEX 0074U IECEx FTZU 14.0003U
XD-Addig (Connection head + LED Display) Limatherm	XD-Addig	-50..+70°C	Alu pressure die casting	IP68	Silicone rubber	FTZU 03 ATEX 0074U IECEx FTZU 14.0003U
Ex »d » - Ex « t » certified alu. Connection head- FPL	TTE200 TTE300	-55..+60°C	Alu pressure die casting	IP69	Silicone rubber	CESI 08 ATEX 029U IECEx CES 14.0006U

7 Maintenance

The European and national regulations applicable to maintenance/repair/inspection must be adhered to. During maintenance, the parts upon which the ignition protection type depends must be checked in particular.

Furthermore, thermometers with a plastic terminal head and all plastic parts (e.g. plug connectors, etc.) must only be cleaned with a damp cloth in order to prevent electrostatic charge.

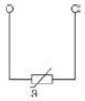
8 Connection for thermocouples

(applies to JUMO head-end and line thermocouples)

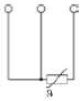
9 Connection of RTD temperature probes

(applies to Pt500 and Pt1000, for JUMO resistance probes with cable connecting head

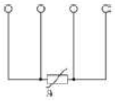
Two-wire circuit



Three-wire circuit

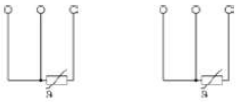


Four-wire circuit

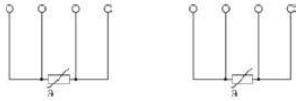


2× two-wire circuit

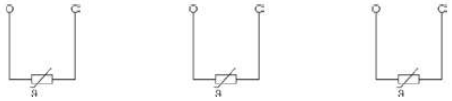
2× three-wire circuit



2× four-wire circuit



3× two-wire circuit



10 Attestations and certificates

Download Ex attestations and IECEx certificates from our website: www.jumo.fr

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