Multipoint temperature sensor
ATEX „e“ / „t“ for use in areas with an explosion hazard

Persons concerned:
Experienced professional electricians
as per EU Directive 1999/92/EC and trained personnel

B 903530.0.0
Operating Manual

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Safety Information

General Information

This manual contains information that must be observed in the interest of your own safety and to avoid damage to assets. This information is supported by symbols which are used in this manual as follows. Please read this manual before commissioning the device. Keep the manual in a place accessible to all users at all times.

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Sales support service: 0892 700 733 (0,337 €/min)

If difficulties occur during commissioning, please refrain from carrying out any manipulations that could jeopardize your warranty rights.
## Contents

1 Equipment and intended application ........................................5

2 Marking .......................................................................................6

3 Safety notes ................................................................................6

4 Conformance with standards ....................................................7

5 Technical data, explanation and case study ...............................7
   5.1 Protection sleeve constant .......................................................7
   5.2 Increased safety Ex “e” protection ..........................................8
   5.3 Use in areas with a dust explosion hazard ...............................9

6 Installation ..................................................................................10

7 Maintenance ..............................................................................10

8 Connection for silos .................................................................11

9 Declaration of conformity, data sheet/detail drawing.............11
1 Equipment and intended application

The multipoint temperature sensors from Jumo are used for temperature measurement in storage of cereals, of flour, dried mud, sugar refinery, … as well as for dusts.

Resistance probes for silos may be anchored to the structure or to a concrete screed, as preferred.

Connection housings in aluminium or stainless steel with IP 6x protection indices allow the replacement of the measuring element when the silo is full.

Connection of the measuring cable to the IP 6x housing compliant with directive 94/9/EC. Pt100 or Pt1000 resistive elements compliant with standard EN60751 or NTC and PTC resistors offer high precision and repeatability of measurements.

- Electrostatic charges on polypropylene suspension cable

- The results of report 60033806-532988 of tests carried out from 17 to 24 May 2005 in LCIE provide a maximum spark energy value of < 0.8 mJ in the most severe case.

- The usual values for the MIE (Minimum Ignition Energy) of the different stored products are about a few tens or hundreds of mJ.

<table>
<thead>
<tr>
<th>Products</th>
<th>MIE (mJ)</th>
<th>Cloud SIT (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>160</td>
<td>500</td>
</tr>
<tr>
<td>Wheat flour</td>
<td>60</td>
<td>440</td>
</tr>
<tr>
<td>Starch</td>
<td>25</td>
<td>400</td>
</tr>
<tr>
<td>Malt</td>
<td>35</td>
<td>400</td>
</tr>
<tr>
<td>Refined sugar</td>
<td>30</td>
<td>370</td>
</tr>
<tr>
<td>Wood</td>
<td>40</td>
<td>470</td>
</tr>
</tbody>
</table>

Our suspension cable with polypropylene outer sheath satisfies entirely the application “temperature measurement in food storage silos”, in areas with a dust explosion hazard.

- Using the multipoint sensor with polypropylene sheath is strictly prohibited in zone (G) gases, this type of sheath does not meet the criteria of groups of gas explosions because the charge levels are > than the recommended 60nC by the C.4.2.4 appendix C of NF EN 13463-1 (2002). For this kind of application is the stainless steel sheath recommended.
2 Marking

Example of sensor marking:

JUMO 57075 METZ \(^{(1)}\)
Type: Multipoint \(^{(2)}\)
Manufacturing no.: 402743/0010 \(^{(3)}\)
Year of manufacture: 2014
CE0359 \(\text{Ex} \text{ II D} \) \(^{(6)}\)
Ex ta IIIC T85 °C Da \(^{(8)}\)
LCIE 00 ATEX 6015 X \(^{(7)}\)
Un ≤ 28V In ≤ 2mA

\(\Rightarrow\) WARNING – DO NOT OPEN UNDER VOLTAGE - SEE INSTRUCTIONS

\(^{(1)}\) Manufacturer’s address
\(^{(2)}\) Type of sensor
\(^{(3)}\) Manufacturing number: order number + position
\(^{(6)}\) Notified body: 0359 = Intertek
\(^{(8)}\) Ex marking for dust zone (IIIC, conductive dust)

3 Safety notes

The device is designed exclusively for use within the values indicated on the identification plate and in the technical specifications (see section on technical specifications in the operating manual or the technical data sheet).

- The maximum service temperature may not be exceeded.
- The permissible ambient temperature may not be exceeded.
- The protection type of the device must be followed during the implementation. Upon installation, sensor connection must comply with the electrical values determined in Ex attestations.

It is not permissible to make any alterations to the sensors. In such a case, proper fault-free operation is no longer assured. The guarantee is also invalidated by any alterations. When exchanging measuring inserts, use only original JUMO replacement parts of the same type.

Make sure the cable or insulation are not damaged while mounting the sensor on the process. The cable is to be installed so as to be fixed. While mounting, removing or operating the sensor, make sure that no pulling force or pressure above 17 Newton is applied on the cable. The technical data that are relevant to the use of the device in an area with an explosion hazard (Ex area) are presented in the corresponding data sheet.

In order to prevent temperature rises due to the accumulation or transfer of heat, keep away from hot parts of the installation and thermal insulation systems, and provide for heat dissipation through unhampered air circulation. The national and international safety and accident prevention regulations must be followed for installing and working on or with the devices. Furthermore, the operator of the plant or installation is responsible for the observance of legal requirements.
4 Conformance with standards

<table>
<thead>
<tr>
<th>Type</th>
<th>ATEX type examination</th>
<th>EN standards</th>
<th>Protection type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multipoints</td>
<td>LCIE 00 / ATEX 6015 X</td>
<td>EN 60079-39 (2012)</td>
<td>protection by enclosures “t”</td>
</tr>
<tr>
<td>Multipoints</td>
<td>LCIE 00 / ATEX 6015 X</td>
<td>EN 60079-7(2007)</td>
<td>Increased safety, Ex “e” protection</td>
</tr>
</tbody>
</table>

5 Technical Data

⇒ **CAUTION**: for specific data, see the attached technical data sheet/detail drawing and/or the label that is affixed to theses operating instructions.

5.1 Protection sleeve constant

**Electrical values**

\[ U_n \leq 28 \text{ V} \quad I_n \leq 2 \text{ mA} \]

The sensing element in a RTD temperature probe carries a current or a leakage current during measurement.

The surface heating itself is influenced by the design of the temperature probe, by the ambient conditions (thermal coupling with the medium being measured) and the power that is applied. The self-heating behavior of the thermometer is characterized by the thermowell constant \( SK \) (in °C/W), which represents the increase in the surface temperature (in still air) above the ambient temperature as a function of the applied power. The thermowell constant \( SK \) is determined by JUMO, and can be found in the attached technical data sheet or on the affixed label. The user must determine whether the thermometer is suitable for the measurement application and the connected equipment under the given conditions. The maximum permissible measured temperature at the probe tip can be derived from the following equation:

\[ T_s = T_K - P_l \times SK \]

- \( T_s \): Maximum permissible temperature at the probe tip
- \( T_K \): Maximum permissible surface temperature, depending on the temperature class
- \( P_l \): Power in the certified intrinsically safe circuit
- \( SK \): Protection sleeve constant (see technical data sheet)
The following diagram illustrates the self-heating of the probe surface of a thermocouple as a function of the applied power and thus the temperature arising within the probe. (Self-heating is independent of the protection type, and also applies to the flameproof enclosure).

![Diagram of self-heating of thermocouple probe](image)

Protection sleeve constant from the multipoint sensor with polypropylene suspension cable:
Pt 100 Ω : 10,5 K/W
Pt 1000 Ω : 12 K/W

**Self-heating of a Pt100 RTD temperature probe Pt100**

**Example:**

Protection sleeve constant SK = 10,5K/W
Maximum power in the circuit P = 0,5 K
TS = 85 °C – 0,5 W x 10,5 K/W
TS = 85 °C – 5,25 K = 79.5 °C
So the maximum temperature (the medium temperature being measured) on the probe tip must not exceed 79,5 °C, since in the event of a fault it is possible that the limit for the temperature class will be exceeded. **DANGER OF EXPLOSION!**

**5.2 Increased safety Ex “e” protection**

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 sparks inside or on the outer parts of the electrical equipment that do not occur in normal service or in the event of failure. Increased safety 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

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 ground must be connected to the earth or integrated into the equipotential bonding of the site.
5.3 Use in areas with an explosion hazard caused by dust

The following temperature values must be taken into account for applications in areas with a dust explosion hazard:

Applicable to all zones:
The surface temperature of the equipment must not rise to a level that could ignite swirling dust or dust deposits on the equipment. This is achieved through the following regulations:

No dust deposit
The surface temperature must not exceed 2/3 of the ignition temperature (in °C) for the corresponding dust-air mixture.

With dust deposit
Surfaces on which a dangerous accumulation of smolderable dust cannot be prevented must not have a temperature that is higher than 75K below the smoldering temperature of the dust concerned. If layers thicker than 5 mm occur, a further reduction of the surface temperature 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 operator of the plant or system!!
6 Installation

The valid European and national regulations must be observed for installation and operation. The generally accepted state of the art and these operating instructions must be applied.

Temperature sensors from JUMO are used to measure temperature within areas with an explosion hazard, containing flammable or non-flammable liquids, gases or gas-air mixtures or potentially explosive dusts.

The feed wire of the RTD temperature probe must be fixed in position when mounted to containers or pipelines that contain potentially explosive gas/air mixtures (zone 0, 1G or EPL Ga) or dust (zone 20, 1D or EPL Da).

The equipotential bonding (earth connection of the device) include the entire wiring of the measuring circuit! Metallic connector housings must be grounded via the connecting cables, for equipotential bonding. Non-metallic connector housings must not exceed the max. surface area specified by EN 60079-26.

Norm EN 60079-14 "Explosive atmospheres - Part 14: Electrical installations design, selection and erection" needs to be observed!

Caution: In all cases, zoning is the responsibility of the plant/system operator, and not of the manufacturer/supplier of the equipment!

<table>
<thead>
<tr>
<th>Zone separation</th>
<th>Gases, mists, vapors</th>
<th>Dusts</th>
<th>Potentially explosive atmosphere present</th>
<th>Guide values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 0</td>
<td>Zone 20</td>
<td></td>
<td>continually, long-term, or frequently</td>
<td>1000 hours/year</td>
</tr>
<tr>
<td>Zone 1</td>
<td>Zone 21</td>
<td></td>
<td>occasionally</td>
<td>10 – 1000 hours/year</td>
</tr>
<tr>
<td>Zone 2</td>
<td>Zone 22</td>
<td></td>
<td>infrequently, short-term</td>
<td>10 hours/year</td>
</tr>
</tbody>
</table>

7 Maintenance

The valid European and national regulations must be observed for maintenance, servicing and testing. During maintenance, all parts must be tested that are relevant for the Ex (explosion protection) rating.

In addition, thermometers with a plastic terminal head as well as all plastic components (e.g. connectors and the like) must only be cleaned with a damp cloth, to avoid building up an electrostatic charge.

The deterioration of components such as the housing, cable seal or joints cancels the class of protection IP of the multipoint temperature sensor.
8 Connection for silos
(appplies to Pt500 and Pt1000, for JUMO resistance probes with cable connecting head)

Measuring points on sensors of silos

Pt100 3-wire circuit

<table>
<thead>
<tr>
<th>High</th>
<th>Pt1000 2-wire circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring point 6</td>
<td>Blue/purple - grey</td>
</tr>
<tr>
<td>Measuring point 5</td>
<td>2 x red/yellow</td>
</tr>
<tr>
<td>Measuring point 4</td>
<td>2 x black/yellow</td>
</tr>
<tr>
<td>Measuring point 3</td>
<td>2 x orange/Blue</td>
</tr>
<tr>
<td>Measuring point 2</td>
<td>2 x green/purple</td>
</tr>
<tr>
<td>Measuring point 1</td>
<td>2 x white/ grey</td>
</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cable PVC/PVC. Thermoplastic</td>
</tr>
<tr>
<td></td>
<td>18 x 0,14 mm² + 1 yellow/green</td>
</tr>
<tr>
<td></td>
<td>Part no : 00422034</td>
</tr>
</tbody>
</table>

Measuring point 9 | purple/purple   |
Measuring point 8 | green/green     |
Measuring point 7 | red/red         |
Measuring point 6 | Orange/orange   |
Measuring point 5 | black/black     |
Measuring point 4 | yellow/yellow   |
Measuring point 3 | grey/grey       |
Measuring point 2 | Blue/Blue       |
Measuring point 1 | white/white     |

Low

Cable PVC/PVC Thermoplastic
18 x 0,14 mm² + 1 yellow/green
Part no : 00422034

9 Attestations and certificates

Download Ex attestations and IECEx certificates from our website:

www.jumo.fr