

Instructions: Stator Winding Temperature Sensors

Intrinsic Safety

 II 1 G Ex ia IIC Ga
IECEX Ex ia IIC Ga

Increased Safety

 II 2 G Ex e IIC Gb
IECEX Ex e IIC Gb
CSA Ex e IIC Gb

Document 1006213 (SPI 00-1221) Rev. F

1. Description

The Resistance Temperature Detectors (RTDs) or Thermistors for Stator Windings are intended to be built into the stator slots of rotating electrical machines in types of protection Ex e II, Ex p II, Ex d II C, or Ex ia.

Versions for 2-, 3- or 4-wire measurement circuits are available.

Operating temperature range: -50°C to +180°C.

2. Attestation of Conformity

This Attestation of Conformity is issued under the sole responsibility of the manufacturer.

Resistance Temperature Detectors (RTDs) or Thermistors for Stator Windings Type: S102040, TS102052, S100050 to S100055, S200050 to S200055, MS__200_, MS__251_, MS__302_, MS__353_, MS__404_, MS__455_, and S207977.

The product defined above is in conformity with the following relevant legislation:

ATEX Directive 2014/34/EU

EN 60079-0:2009* Explosive atmospheres - Part 0: Equipment - General requirements

EN 60079-7:2007 Explosive atmospheres - Part 7: Equipment protection by increased safety "e"

EN 60079-11:2012 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

IEC 60079-0:2011 Explosive atmospheres - Part 0: Equipment - General requirements

IEC 60079-7:2006-07 Explosive atmospheres - Part 7: Equipment protection by increased safety "e"

IEC 60079-11:2011 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

CAN/CSA C22.2 No. 60079-0:11 Electrical Apparatus for Explosive Gas Atmospheres - Part 0: General Requirements

CAN/CSA C22.2 No. 60079-7:12 Electrical Apparatus for Explosive Gas Atmospheres - Increased safety "e"

**NOTE: The revised standard has been compared to the standard used for certification purposes and no changes in the "state of the art" apply to the product.*

Certificate KEMA 03ATEX2240 U

Certificate IECEX DEK 12.0057 U

Certificate CSA 2533905

DEKRA Certification B.V. (0344)

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3. Installation Instructions

Type of protection increased safety "e" for the temperature sensors is obtained by the construction of the measuring element and its fit in slots of the stator windings of rotating electrical machines with a rated insulation voltage of up to 11 kV in type of protection increased safety "e" per EN/IEC 60079-7, flameproof enclosure "d" per EN/IEC 60079-1, or pressurized apparatus "p" per EN/IEC 60079-2.

For type of protection increased safety "e", the temperature sensor, mounted in the rotating electrical machine, must be subjected to the dielectric strength tests, required for the rotating electrical machine.

The temperature sensor must be installed in such a way that it is protected against mechanical danger.

The leads of the temperature sensor, for connection to the measuring circuit, must be connected to suitable Ex e terminals in a suitable Ex e enclosure.

4. Special Conditions of Safe Use – Ex ia

The equipment is intrinsically safe and can be used in potentially explosive atmospheres.

The apparatus must be only connected to certified associated intrinsically safe equipment and this combination must be compatible as regards to intrinsic safety rules.

The electrical parameters of the associated intrinsically safe equipment must not exceed any of the following values: $U_i = 20\text{ V}$ and $P_i = 170\text{ mW}$.

The connection of the cable must be effected in an enclosure with a minimum protection degree IP20 per paragraph 6.1 of EN 60079-11:2012.

The apparatus must be installed in the stator slots of rotating equipment where non-metallic surfaces are not in contact with the atmosphere.

For a temperature class T6, T5, T4 or T3 per EN 60079-0:2009, the maximum ambient temperature depends on the power dissipated in the temperature sensor as listed in the following table:

Power Dissipated in the Sensor (W)	Maximum Temperature Class T6	Maximum Temperature Class T5	Maximum Temperature Class T4	Maximum Temperature Class T3
0.01	78°C	93°C	128°C	180°C
0.05	70°C	85°C	120°C	180°C
0.10	60°C	75°C	110°C	175°C
0.17	45°C	60°C	95°C	160°C

5. Temperature Classes and Calculations – Ex ia

See table below for the temperature class matching the maximum ambient temperature for electrical apparatus in group II per EN 60079-0.

Temperature Class	Maximum Ambient Temperature	Security Factor
T3	+200°C	5°C
T4	+135°C	5°C
T5	+100°C	5°C
T6	+85°C	5°C

Temperature class changes are function of the ambient temperature. Under no conditions may the surface temperature of the sensor exceed the temperature class. The surface temperature includes the temperature increase caused by the power dissipation plus the ambient temperature. There is also a security factor based on the ambient temperature that must be considered. The security factor is 5°C for ambient temperatures below or equal to 200° (T6, T5, T4, T3 classes).

To determine the temperature class you must calculate the maximum surface temperature of the sensor.

Example:

The above table can be rewritten for temperature class calculations at higher temperatures. The right column gives you the surface temperature increase due to the power dissipation.

Power Dissipated in the Sensor (W)	Maximum Ambient Temperature for a Temperature Class T6	Temperature Increase Due to Power Dissipation
0.01	+78°C	2°C (80°C – 78°)
0.05	+70°C	10°C (80°C - 70°)
0.10	+60°C	20°C (80°C - 60°)
0.17	+45°C	35°C (80°C - 45°)

The maximum surface temperature is calculated as follows: $T_{\text{surface}} = T_{\text{ambient}} + T_{\text{power dissipation}}$

If the explosive atmosphere is 45°C and the power is 0.17W the surface temperature is:

$$T_{\text{surface}} = 45 + 35 = 80^{\circ}\text{C}$$

The temperature class must be greater than the surface temperature plus the security factor:

$$T_{\text{surface}} + T_{\text{security factor}} = 80 + 5 = 85^{\circ}\text{C}$$

The lowest temperature class that meets this requirement is T6 (85°C) per EN 60079-0.

6. Electrical Data

Electrical Data – Ex e

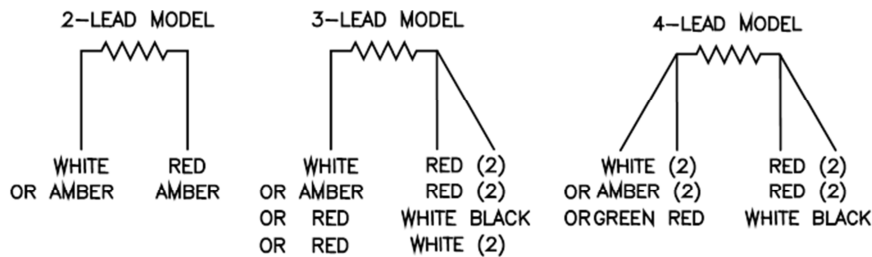
Measuring current:	≤ 10 mA
Power (under fault conditions):	≤ 1.5 W
Test voltage dielectric strength test:	3200 Vrms, duration 1-3 seconds, 3200 Vrms, duration 1 minute, or 5000 Vrms, duration 1 minute (depending on type)

Electrical Data - Ex ia

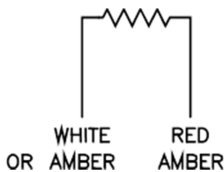
Maximum Input Voltage:	20 V
Maximum Input Power:	0.17 W
Cable for a length of 3 meters:	Ci = 84 pF Li = 4µH Ri = 0.48 Ω

7. Electrical Connections

RTD Connections



Thermistor Connections



8. Marking Examples

Sensor stator body

MINCO MPLS, MN S100050
PLATINUM 100 OHMS AT 0 C
123456--*--*



Label

MINCO
0344  II 2G Ex e IIC Gb KEMA 03ATEX2240 U
II 1G Ex ia IIC Gd IECEX DEK12.00057 U
 CSA Ex e IIC Gb CSA 12.2533905