

Instructions: Stator Winding Resistance Temperature Detectors (RTDs) Increased Safety Stator Winding RTDs

⊕ II 2 G Ex eb IIC Gb

IECEX Ex eb IIC Gb

CSA/US Class I, Zone 1, Ex/AEx eb IIC Gb

Intrinsic Safety Stator Winding RTDs

⊕ II 1 G Ex ia IIC Ga

IECEX Ex ia IIC Ga

CSA/US Class I, Zone 0, Ex/AEx ia IIC Ga

CSA/US Class I, Division 1, Groups A, B, C, D

SPI 00-0935 Rev H (Document 2188862)

1. Description

The Resistance Temperature Detectors (RTDs) for Stator Windings, Type B217137, are intended to be built into the stator slots of rotating electrical machines.

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) for Stator Windings, Type B217137.

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

ATEX Directive 2014/34/EU

EN 60079-0:2012+A11:2013* 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"

EN 50495:2010 Safety devices required for the safe functioning of equipment with respect to explosion risks – SIL2 capable

EN 61508:2010 Functional safety of electrical/electronic/programmable electronic safety-related systems – Parts 1 to 6

IEC 60079-0:2011+ISH1:2013* Explosive atmospheres - Part 0: Equipment - General requirements

IEC 60079-7:2006* 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. 60079-0:15 Explosive Atmospheres - Part 0: Equipment - General requirements

CAN/CSA C22.2 No. 60079-7:16 Explosive atmospheres - Part 7: Equipment protection by increased safety "e"

CAN/CSA C22.2 No. 60079-11:14 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

CAN/CSA C22.2 No. 61010-1-12 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

UL 60079-0:2013 Explosive atmospheres - Part 0: Equipment - General requirements

UL 60079-7:2017 Explosive atmospheres - Part 7: Equipment protection by increased safety "e"

UL 60079-11:2014 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

UL 61010-1:2012 Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements

CCC China GB/T 3836.1-2021, GB/T 3836.3-2021, GB/T 3836.4-2021 (CCC Certificate 2026322315007226)

***NOTE:** The harmonized standards EN IEC 60079-0:2018 and EN IEC 60079-7:2015+A1:2018 have been compared to the standards used for certification purposes and no changes in the "state of the art" apply to the product. The standards IEC 60079-0:2017, IEC 60079-7:2017, IEC 60079-11:2023 have been compared to the standards used for certification purposes and no changes in the "state of the art" apply to the product.

Certificate DEKRA 15ATEX0027 U

Certificate IECEX DEK 15.0018U

Certificate CSA.18.70197724

Certificate CSA 12.2533905**

**Models certified only to this CSA certificate, with no US certification: S102040, S100050 to S100055, S200050 to S200055, S207977, MS_200_, MS_251_, MS_302_, MS_353_, MS_404_, and MS_455_.

DEKRA Certification B.V. (0344)

Meander 1051
6825 MJ Arnhem
The Netherlands

Rob Bohland 29 January 2026
Rob Bohland, Ex Authorized Person
Minco Products, Inc
7300 Commerce Lane
Minneapolis, MN 55432 USA

3. Mounting Instructions

Type of protection increased safety "e" for the RTDs 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 60079-7, flameproof enclosure "d" per EN 60079-1 or pressurized apparatus "p" per EN 60079-2.

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

The apparatus must be installed in the stator slots, and must be impregnated or sealed within the windings (e.g. Vacuum Pressure Impregnation), of rotating electrical machines where non-metallic surfaces are not in contact with the atmosphere.

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

4. Electrical Data – Increased Safety Ex eb

Measuring current:	≤10 mA
Power (under fault conditions):	≤1,5 W
Voltage:	≤20 V
Test voltage dielectric strength test:	5000 V rms, duration 1 minute (Standard) 3200 V rms, duration 1-3 seconds (Optional - depending on customer requirements) 3200 V rms, duration 1 minute (Optional - depending on customer requirements)

5. Electrical Data – Intrinsic Safety Ex ia

Maximum Input Voltage:	20 V
Maximum Input Power:	0,17 W
Cable for a length of 3 meters:	Ci = 84 pF Li = 4 μH Ri = 0,48 Ω

6. Special Conditions for Safe Use – Intrinsic Safety 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:

Ui = 20 V and Pi = 170 mW.

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

For a temperature class T6, T5, T4 or T3 per EN 60079-0:2012+A11:2013, the maximum ambient temperature depends on the power dissipated in the RTD 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

As a safety device in accordance with EN 50495, the RTD is used as a component of a full system, and the safety parameters are calculated for the RTD only. The entire safety chain (the complete security device with RTD included) must fulfill the requirements of the safety function, according to table 1 of EN 50495:

For use in category 2 (zone 1 with Ex eb) a SIL=2 with a HFT=0 (single RTD) is required.

For use in category 1 (zone 0 with Ex ia) a SIL=2 with a HFT=1 (dual RTD or two RTDs in same motor phase) is required.

The following table indicates results for a maintenance interval of 20 years:

Parameter	Single Sensor RTD with detection of open and short circuit	Two Single Sensor RTDs installed in same motor phase with detection of open and short circuit	Dual Sensor RTD with detection of open, short circuit, and drift
HFT	0	1	1
SFF	83%	83%	90%
PFD _{avg}	7.18 x 10 ⁻³	< 7.18 x 10 ⁻³	9.45 x 10 ⁻⁴
PFH [1/h]	82 x 10 ⁻⁹	< 82 x 10 ⁻⁹	11 x 10 ⁻⁹
SIL	2	2	3

Ordinary industrial RTDs typically drift less than 0.1°C/year. This drift may be positive or negative, but worse case would be a drift of ±2.0°C based on 0.1°C*20 year life used in MTBF.

7. Temperature Classes and Calculations – Intrinsic Safety Ex ia

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°C (T6, T5, T4, T3 classes).

To determine the temperature class, you must calculate the maximum surface temperature of the sensor. See the following example.

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:

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

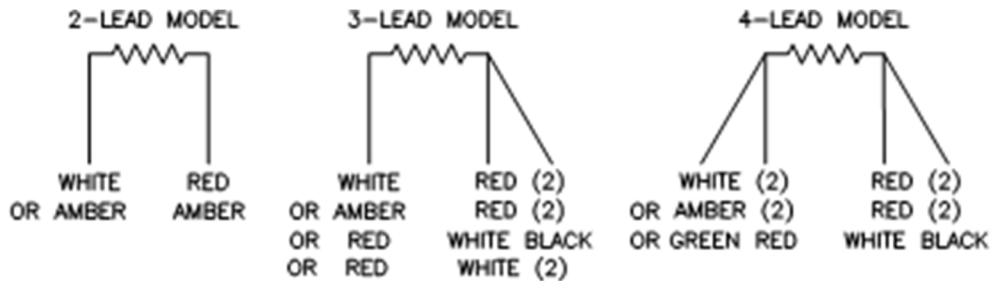
The temperature class must be greater than the surface temperature plus the security factor:

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

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

8. Electrical Connections

RTD Connections



The above color code is Minco's standard colors, but alternatives can be used. Refer to the model specification drawing for the actual color code.

9. Marking Examples

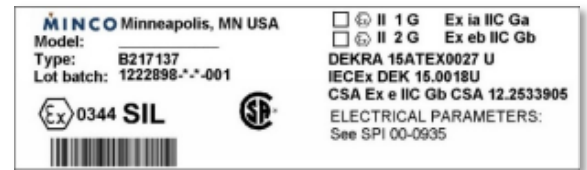
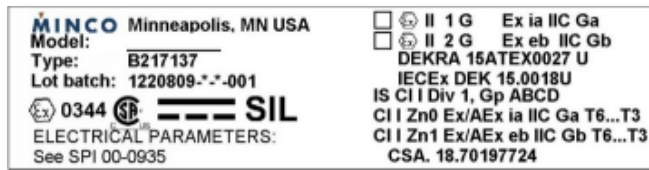
The polyester label, adhered to sensor leads, shall always be inside the motor or terminal enclosure.

CCC (China)



IMPORTANT: On the marking label, the user must check the box () corresponding to the selected protection mode for ATEX/IECEx installations.

ATEX / IECEx / North America



NOTES:

- These models listed will include label shown on the left: S110 to S145. Other models may be available.
- These models listed will include label shown on the right: S102040, S100050 to S100055, S200050 to S200055, S207977, MS__200__, MS__251__, MS__302__, MS__353__, MS__404__, and MS__455__.

说明：定子绕组电阻温度检测器

增强安全型定子绕组 RTD

Ex II 2 G Ex eb IIC Gb

IECEX Ex eb IIC Gb

CSA/US I 类，1 区，Ex/AEx eb IIC Gb

内在安全型定子绕组 RTD

Ex II 1 G Ex ia IIC Ga

IECEX Ex ia IIC Ga

CSA/US I 类，0 区，Ex/AEx ia IIC Ga

CSA/US I 类，1 分区，组 A、B、C 或 D

SPI 00-0935 修订版 H（文件 2188862 修订版 H）

1. 描述

用于定子绕组的 B217137 型电阻温度检测器 (RTD) 可内置在旋转电机的定子槽中。

提供 2 线、3 线或 4 线测量电路版本。

工作温度范围：-50°C 至 +180°C。

2. 合格证明

此合格证明的颁发由制造商全权负责。

用于定子绕组的 B217137 型电阻温度检测器 (RTD)

上文定义的产品符合以下相关法规：

ATEX 指令 2014/34/EU

EN 60079-0:2012+A11:2013* 爆炸性气体环境 - 第 0 部分：设备 - 一般要求

EN 60079-7:2007* 爆炸性气体环境 - 第 7 部分：增强安全型“e”设备保护

EN 60079-11:2012 爆炸性气体环境 - 第 11 部分：内在安全型“i”设备保护

EN 50495:2010 涉及爆炸风险的设备安全运行所需的安全装置 - 通过 SIL2 认证

EN 61508:2010 电气/电子/可编程电子安全相关系统的功能安全 - 第 1 到 6 部分

IEC 60079-0:2011+ISH1:2013* 爆炸性气体环境 - 第 0 部分：设备 - 一般要求

IEC 60079-7:2006* 爆炸性气体环境 - 第 7 部分：增强安全型“e”设备保护

IEC 60079-11:2011 爆炸性气体环境 - 第 11 部分：内在安全型“i”设备保护

CAN/CSA C22.2 No. 60079-0:15 爆炸性气体环境 - 第 0 部分：设备 - 一般要求

CAN/CSA C22.2 No. 60079-7:16 爆炸性气体环境 - 第 7 部分：增强安全型“e”设备保护

CAN/CSA C22.2 No. 60079-11:14 爆炸性气体环境 - 第 11 部分内在安全型“i”设备保护

CAN/CSA C22.2 No. 61010-1-12 测量、控制和实验室用电气设备的安全要求 - 第 1 部分：一般要求

UL 60079-0:2013 爆炸性气体环境 - 第 0 部分：设备 - 一般要求

UL 60079-7:2017 爆炸性气体环境 - 第 7 部分：增强安全型“e”设备保护

UL 60079-11:2014 爆炸性气体环境 - 第 11 部分：内在安全型“i”设备保护

UL 61010-1:2012 测量、控制和实验室用电气设备；第 1 部分：一般要求

CCC China GB/T 3836.1-2021, GB/T 3836.3-2021, GB/T 3836.4-2021 (CCC Certificate 2026322315007226)

*注意：标准 EN IEC 60079-0:2018 和 IEC 60079-0:2017 已与用于认证目的的标准进行了比较，“最新技术”没有任何变化适用于产品。已将标准 EN IEC 60079-7:2015+A1:2018 和 IEC 60079-7:2017 和 IEC 60079-11:2023 与用于认证目的的标准进行了比较，“最新技术”方面的变化均不适用于本产品。

证书 DEKRA 15ATEX0027 U

证书 IECEX DEK 15.0018U


证书 CSA.18.70197724

证书 CSA 12.2533905**

**仅通过此 CSA 认证但没有通过美国认证的型号：S102040、S100050 至 S100055、S200050 至 S200055、S207977、MS_200_、MS_251_、MS_302_、MS_353_、MS_404_ 和 MS_455_。

DEKRA Certification B.V. (0344)

Meander 1051
6825 MJ Arnhem
The Netherlands

 2026 年 01 月 29 日
防爆认证授权人 Rob Bohland
Minco Products, Inc
7300 Commerce Lane
Minneapolis, MN 55432 USA

3. 安装说明

该 RTD 具有独特的测量元件构造，可安装于额定绝缘电压最高为 11 kV 的旋转电机定子绕组的插槽中（保护类型为符合 EN 60079-7 的增强安全型“e”、符合 EN 60079-1 的隔爆外壳“d”或符合 EN 60079-2 的加压设备“p”），因此可实现增强安全型“e”的保护类型。

RTD 的安装方式必须能够防范机械危险。

该装置必须安装在定子槽中，并且必须浸渍或密封在非金属表面不与大气接触的旋转电机的绕组内（例如真空压力浸渍）。RTD 的引线（用于连接到测量电路）必须连接到合适的 Ex eb 外壳中合适的 Ex eb 端子。

用户不得自行更换该产品的零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生

产品的安装、使用和维护应同时遵守产品使用说明书、

GB/T 3836.13-2021 “爆炸性环境 第 13 部分：设备的修理、检修、修复和改造”、

GB 3836.15-2024 “爆炸性环境 第 15 部分：电气装置设计、选型、安装规范”、

GB 3836.16-2024 “爆炸性环境 第 16 部分：电气装置检查与维护规范”、

GB/T 3836.18-2024 “爆炸性环境 第 18 部分：本质安全电气系统”、

GB 50257-2014 “电气设备安装工程爆炸和火灾危险环境电气装置施工及验收规范”。

4. 电气数据 - 增强安全型 Ex eb

测量电流：	≤ 10 mA
功率（在故障条件下）：	≤ 1.5 W
电压：	≤ 20 V
测试电压介电强度测试：	5000 V rms，持续时间为 1 分钟（标准） 3200 V rms，持续时间为 1-3 秒（可选 - 取决于客户要求） 3200 V rms，持续时间 1 分钟（可选 - 取决于客户要求）

5. 电气数据 - 内在安全型 Ex ia

最大输入电压：	20 V
最大输入功率：	0.17 W
电缆长度为 3 米：	Ci = 84 pF Li = 4 μH Ri = 0.48 Ω

6. 安全使用的特殊条件 - 内在安全型 Ex ia

该设备具有内在安全性，可在潜在爆炸性气体环境中使用。

该装置只能连接到经过认证的相关内在安全型设备，并且此组合必须符合内在安全规则。

相关的内在安全型设备的电气参数不得超过以下任何值：

Ui = 20 V, Pi = 170 mW。

电缆的连接必须按照 EN 60079-11:2012 的第 6.1 条在最低防护等级为 IP20 的外壳中实施。

对于符合 EN 60079-0:2012+A11:2013 的 T6、T5、T4 或 T3 温度等级，最高环境温度取决于 RTD 中的耗散功率，如下表所示：

传感器中 的耗散功率 (W)	最高温度 T6 等级	最高温度 T5 等级	最高温度 T4 等级	最高温度 T3 等级
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

作为符合 EN 50495 的安全装置，RTD 可作为完整系统的一个组成部分，并且仅针对 RTD 计算安全参数。根据 EN 50495 的表 1，整个安全链（包括 RTD 在内的完整安全装置）必须满足安全功能方面的要求：要在类别 2（采用 Ex eb 的区域 1）中使用，要求 SIL=2 且 HFT=0（单 RTD）。要在类别 1（采用 Ex ia 的区域 0）中使用，要求 SIL=2 且 HFT=1（双 RTD 或者同一个电机相中有两个 RTD）。

下表显示了维护间隔为 20 年的结果：

参数	单传感器 RTD 具备 开路和短路检测功能	在同一电机相中安装两个单传感器 RTD 具备 开路和短路检测功能	双传感器 RTD 具备 开路和短路检测功能
HFT	0	1	1
SFF	83%	83%	90%
PFD _{avg}	7.18×10^{-3}	$< 7.18 \times 10^{-3}$	9.45×10^{-4}
PFH [1/h]	82×10^{-9}	$< 82 \times 10^{-9}$	11×10^{-9}
SIL	2	2	3

普通工业 RTD 的漂移通常低于 0.1°C/年。此漂移可能为正也可能为负，最糟糕的情况为：0.1°C 乘以 20 年寿命（按 MTBF 计算），即最终漂移达到 ±2.0°C。

7. 温度等级和计算 - 内在安全型 Ex ia

温度等级的变化与环境温度息息相关。在任何情况下，传感器的表面温度均不得超过温度等级。表面温度是在环境温度的基础上，加上由耗散功率引起的温度升高值。此外，还必须考虑基于环境温度的安全系数。对于低于或等于 +200°C 的环境温度（T6、T5、T4、T3 等级），安全系数为 5°C。

要确定温度等级，必须计算传感器的表面最高温度。请参见以下示例。

示例：
 可以针对更高温度下的温度等级计算来改写上表。右列给出了由于耗散功率而导致的表面温度升高。

传感器中的耗散功率 (W)	温度等级 T6 的最高环境温度	耗散功率导致的温度升高
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°)

表面最高温度的计算方式如下： $T_{\text{表面}} = T_{\text{环境}} + T_{\text{耗散功率}}$

如果爆炸性气体环境为 45° C 并且功率为 0.17W，则表面温度为：
 $T_{\text{表面}} = 45 + 35 = 80^{\circ} \text{C}$
 温度等级必须大于表面温度与安全系数之和：
 $T_{\text{表面}} + T_{\text{安全系数}} = 80 + 5 = 85^{\circ} \text{C}$
 依据 EN 60079-0，符合该要求的最低温度等级是 T6 (85°C)。

8. 电气连接

RTD 连接



以上颜色代码是 Minco 的标准颜色，但也可以使用其他颜色。有关实际的颜色代码，请参阅型号规格图。

9. 标记示例

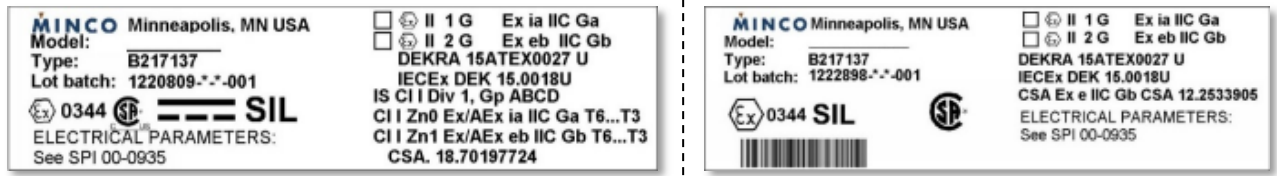
粘贴在传感器引线上的聚酯标签应始终位于电机或接线盒的内部。

CCC (中国)



重要事项: 用户必须根据为 ATEX/IECEX 安装选择的保护模式，在标记标签上选中相对应的框 (□)。

ATEX / IECEX / 北美



注意:

列出的车型将包括左侧所示的标签：S110 to S145. 可能还有其他型号可供选择.

右侧显示的标签涵盖以下型号：S102040、S100050 至 S100055、S200050 至 S200055、S207977、MS__200_、MS__251_、MS__302_、MS__353_、MS__404_ 和 MS__455_。