



## ▶ SECTION 8: STATOR WINDING SENSORS

- Install between stator windings for continuous protection of motors and generators
- Increased safety sensors for use in hazardous areas
- Single and dual elements offer high reliability
- Sensor dimensions to fit any machine
- Class F or Class H

|                                    |            |
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# Increased Safety Stator Winding Temperature Sensors



EC-Type Examination Certificate  
KEMA 03ATEX2240 U

## Overview

Insert these thin, laminated RTDs in winding slots to detect high temperatures before insulation damage occurs. RTD temperature sensors continuously monitor conditions and provide the long term trend data that is necessary for making adjustments before unexpected alarms occur. These models are designed for use in hazardous areas, where there may be a presence of flammable gas under normal operating conditions. Strict construction guidelines prevent arcing. Certified as "increased safety" devices, these RTDs have component approval for Zone 1, Groups IIA, IIB, and IIC.

- Pt100, Ni100, or U.S. curves
- CENELEC EEx e II certified
- Tested and certified by N.V. KEMA
- EC-Type Examination Certificate KEMA 03ATEX2240 U
- Complies with European standards for electrical apparatus for potentially explosive atmospheres: ATEX Directive 94/9/EC  
EN 50 014: 1997, General requirements  
EN 50 019: 2000, Increased safety

## Specifications

**Temperature limit:** 180°C (356°F), class H

**Body material:** High temperature epoxy glass.

**Leadwires:** 2, 3, or 4 leads, stranded copper, AWG #22 (0.35 mm<sup>2</sup>, with TFE or polyimide insulation).

**Dielectric strength:** 3,200 VRMS at 60 Hz, 1 mA maximum leakage current, tested momentarily (1–5 seconds), between the leads and external flat body surface.

## Specification and order options

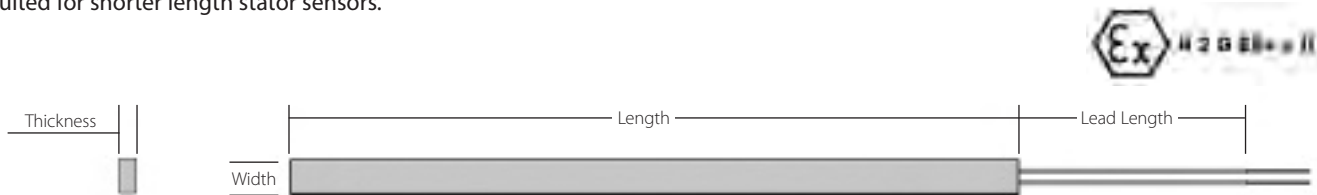
|   |   |
|---|---|
| S100050 PD                                | Model number from table on next page  |
| 79  | RTD length in .1" increments:<br>Example: 79 = 7.9" (200 mm)<br>Minimum length = 20 (2.0" [51 mm])<br>Maximum length = 232 (23.2" [590 mm])   |
| T   | Lead insulation:<br>T = TFE<br>K = Polyimide film   |
| 394                                       | RTD width in .001" increments:<br>Example: 394 = .394" (10 mm)<br>Minimum width<br>= .219" (5.6 mm) for 2 or 3 leads;<br>= .285" (7.25 mm) for 4 leads<br>Maximum width = .956" (25.4 mm) |
| Z   | Number of leads:<br>Y = 2 leads<br>Z = 3 leads<br>X = 4 leads   |
| 15  | Lead length in inches   |
| F   | Lead configuration:<br>T = Twisted leads<br>F = Flat leads  |
| N   | Lead covering:<br>N = No jacket<br>S = FEP jacket overall (available only with twisted lead configuration option "T")   |
| S100050PD79T394Z15FN = Sample part number |   |

Specifications subject to change

## Wire-wound or thin-film RTD element

Wire-wound RTDs, embedded in stator slots, are the most common method for measuring winding temperature in large motors. The wire-wound element extends through most of the body length and measures the average temperature of the winding.

Thin-film RTDs are identical, except for the size of the sensing element. Because the thin-film element is small, approximately 0.08" x 0.09" (2.0 mm x 2.3 mm), it senses the temperature in only one small spot of the winding. Thin-film elements are best suited for shorter length stator sensors.



### Wire-wound RTD elements

| Thickness       | Platinum (0.00385 TCR)<br>100Ω ±0.12 at 0°C<br>Meets IEC 751, Class B | Platinum (0.00385 TCR)<br>100Ω ±0.5 at 0°C | Nickel (0.00618 TCR)<br>100Ω ±0.2 at 0 C<br>Meets DIN 43760 | Platinum (0.00392 TCR)<br>100Ω ±0.5 at 0°C |
|-----------------|---|--|---|--|
| 0.079" [2.0 mm] | S100050PD   | S100050PE                                  | S100050NB   | S100050PA                                  |
| 0.098" [2.5 mm] | S100051PD   | S100051PE                                  | S100051NB   | S100051PA                                  |
| 0.118" [3.0 mm] | S100052PD   | S100052PE                                  | S100052NB   | S100052PA                                  |
| 0.138" [3.5 mm] | S100053PD   | S100053PE                                  | S100053NB   | S100053PA                                  |
| 0.157" [4.0 mm] | S100054PD   | S100054PE                                  | S100054NB   | S100054PA                                  |
| 0.177" [4.5 mm] | S100055PD   | S100055PE                                  | S100055NB   | S100055PA                                  |

### Thin-film RTD elements

| Thickness       | Platinum (0.00385 TCR)<br>100Ω ±0.12 at 0°C<br>Meets IEC 751, Class B | Platinum (0.00385 TCR)<br>100Ω ±0.5 at 0°C | Nickel (0.00618 TCR)<br>100Ω ±0.2 at 0 C<br>Meets DIN 43760 | Platinum (0.00392 TCR)<br>100Ω ±0.5 at 0°C |
|-----------------|---|--|---|--|
| 0.079" [2.0 mm] | S200050PD   | S200050PE                                  | S200050NB   | S200050PA                                  |
| 0.098" [2.5 mm] | S200051PD   | S200051PE                                  | S200051NB   | S200051PA                                  |
| 0.118" [3.0 mm] | S200052PD   | S200052PE                                  | S200052NB   | S200052PA                                  |
| 0.138" [3.5 mm] | S200053PD   | S200053PE                                  | S200053NB   | S200053PA                                  |
| 0.157" [4.0 mm] | S200054PD   | S200054PE                                  | S200054NB   | S200054PA                                  |
| 0.177" [4.5 mm] | S200055PD   | S200055PE                                  | S200055NB   | S200055PA                                  |

STATOR RTDs

Specifications subject to change

# Single Element Stator Winding RTDs



## Overview

Flat, laminated “stick” RTDs fit in slots between stator windings to monitor temperature rise and prevent overheating. The National Electrical Manufacturers Association (NEMA) recognizes embedded detectors as a standard protection for motor and generator insulation. Unlike on-off devices, RTDs provide continuous sensing for earlier warning without unnecessary tripouts.

The sensing elements of stator RTDs extend through most of the body length to provide an average temperature reading. This eliminates the danger of a point-type sensor missing a localized hot spot. Six sensors are recommended for each motor, two per phase. Locate sensors near the hottest point of the windings for best performance.

Minco stator RTDs meet the specifications of ANSI C50.10-1990, general requirements for synchronous motors.

## Custom designs

Minco designs and builds custom models for many applications. We offer unmatched capabilities because we control all steps of the production from element to finished product. Examples of special options include:

- Thermocouple elements
- Thermistor elements (PTC or NTC)
- Dual sensors with different elements (for example, one copper and one platinum element)
- EEx rated sensors for equipment in hazardous areas. See page 8-2 for more information.
- Electrically conductive coating
- Special leadwire or cable

## Specifications

### Temperature limit:

Class F: 155°C (311°F)  
Class H: 180°C (356°F).

### Body material:

Class F: Epoxy glass  
Class H: High temperature epoxy glass.

### Standard sizes (others available):

|                                       |  |   |   |   |
|---------------------------------------|--|---|---|---|
| Thickness<br>inches (mm)              | 0.030 (.76)  | 0.050 (1.3)                             | 0.078 (2.0)                             | 0.125 (3.2)                             |
| Length<br>inches (cm)                 | 6.0 (15)   | 10.0 (25)                               | 11.0 (28)                               | 12.0 (30)                               |
| Standard<br>body width<br>inches (mm) | 0.219 (5.6)<br>0.344 (8.7)<br>0.563 (14)<br>1.000 (25) | 0.260 (6.6)<br>0.406 (10)<br>0.656 (17) | 0.305 (7.7)<br>0.455 (12)<br>0.750 (19) | 0.315 (8.0)<br>0.500 (13)<br>0.875 (22) |

Note: Custom order any width from 0.219" (5.6mm) to 2.500" (64mm)

**Leadwires:** 2, 3, or 4, stranded copper with PTFE or polyimide insulation. Other leadwire coverings available.

- 0.125" thick: AWG 18.
- 0.078" thick: AWG 22.
- 0.050" thick: AWG 26.
- 0.030" thick: AWG 30 (no lead bulge);  
AWG 18 (0.110" lead bulge);  
Cable (0.110" lead bulge).

**Dielectric strength:** 3200 VRMS at 60 Hz, tested between the leads and external flat body surface for 1 to 5 seconds.

Specifications subject to change

## Class F (155°C) RTDs

| Element   | Model thickness:     |                   |                   |                   |
|---|----------------------|-------------------|-------------------|-------------------|
|   | 0.030"<br>(.76mm)    | 0.050"<br>(1.3mm) | 0.078"<br>(2.0mm) | 0.125"<br>(3.2mm) |
| Platinum (0.00392 TCR)<br>100 Ω ±0.5% at 0°C                              | S1320PA <sup>1</sup> | S7682PA           | S11PA             | S8015PA           |
| Platinum (0.00385 TCR)<br>100 Ω ±0.12% at 0°C<br>(Meets EN60751, Class B) | S8009PD <sup>1</sup> | S8013PD           | S8011PD           | S8015PD           |
| Platinum (0.00385 TCR)<br>100 Ω ±0.5% at 0°C                              | S8009PE <sup>1</sup> | S8013PE           | S8011PE           | S8015PE           |
| Copper (0.00427 TCR)<br>10 Ω ±0.2% at 25°C                                | S1120CA <sup>1</sup> | S23CA             | S3CA              | S8015CA           |
| Nickel (0.00672 TCR)<br>120 Ω ±0.5% at 0°C                                | S1140NA <sup>1</sup> | S24NA             | S4NA              | S8015NA           |

## Class H (180°C) RTDs

| Element   | Model thickness:   |                   |                   |                   |
|---|--|-------------------|-------------------|-------------------|
|   | 0.030"<br>(.76mm)  | 0.050"<br>(1.3mm) | 0.078"<br>(2.0mm) | 0.125"<br>(3.2mm) |
| Platinum (0.00392 TCR)<br>100 Ω ±0.5% at 0°C                              | S1420PA <sup>1</sup>   | S7401PA           | S13PA             | S8016PA           |
| Platinum (0.00385 TCR)<br>100 Ω ±0.12% at 0°C<br>(Meets EN60751, Class B) | S8010PD <sup>1</sup><br>S100305PD <sup>2</sup><br>S100415PD <sup>3</sup> | S8014PD           | S11016PD          | S8016PD           |
| Platinum (0.00385 TCR)<br>100 Ω ±0.5% at 0°C                              | S8010PE <sup>1</sup>   | S8014PE           | S8012PE           | S8016PE           |
| Copper (0.00427 TCR)<br>10 Ω ±0.2% at 25°C                                | S1220CA <sup>1</sup>   | S7401CA           | S18CA             | S8016CA           |
| Nickel (0.00672 TCR)<br>120 Ω ±0.5% at 0°C                                | S1240NA <sup>1</sup>   | S7401NA           | S15NA             | S8016NA           |

### Notes:

<sup>1</sup> Leadwires: AWG 30; lead bulge: 0.045" thick, extending into the body a maximum of 0.62".

<sup>2</sup> Leadwires: AWG 18; lead bulge: 0.110" thick, extending into the body a maximum of 1.75".

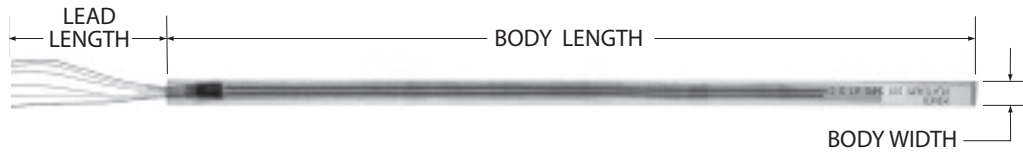
<sup>3</sup> Leadwires: AWG 30 with PTFE jacket overall; lead bulge: 0.110" thick, extending into the body a maximum of 1.75".

## Specification and order options

|                                     |  |
|-------------------------------------|--|
| S3CA                                | Model number from table  |
| 110                                 | <b>Body length:</b><br>Specify in 0.1" increments (Example: 110 = 11.0 inches)   |
| T                                   | <b>Leadwire insulation:</b><br>T = PTFE<br>K = Polyimide   |
| 344                                 | <b>Body width:</b><br>Specify in 0.001" increments (Example: 344 = 0.344 inches)<br>Minimum body widths:<br>S8015, 2 or 3-lead: 320<br>S8015, 4-lead: 420<br>S8016, 2 or 3-lead: 320<br>S8016, 4-lead: 420<br>S100305: 310<br>S100415: 310<br>All other 4-lead models: 320 |
| Z                                   | <b>Number of leads:</b><br>Y = 2 leads (PA, PE, NA only)<br>Z = 3 leads<br>X = 4 leads   |
| 36                                  | Lead length in inches  |
| S3CA110T344Z36 = Sample part number |  |

Specifications subject to change

# Dual Element Stator Winding RTDs



## Overview

Dual element stator winding RTDs provide extra protection for motors and generators. The second element can be a back up in case of damage, or use one element for input to a temperature display at the machine and the other for control room monitoring.

Standard models are available with thickness options of 0.030" to 0.125", with sensing elements to match most instrumentation.

## Custom designs

Minco designs and builds custom models for many applications. We offer unmatched capabilities because we control all steps of the production from element to finished product. Examples of special options include:

- Thermocouple elements
- Thermistor elements (PTC or NTC)
- Dual sensors with different elements (for example, one copper and one platinum element)
- EEx rated sensors for equipment in hazardous areas. See page 8-2 for more information.
- Electrically conductive coating
- Special leadwire or cable

## Specifications

**Temperature limit:** 180°C (356°F), class H.

**Body material:** High temperature epoxy glass.

### Standard sizes:

| Thickness (inches)  | 0.030 (.76mm)  | 0.050 (1.3mm) | 0.078 (2.0mm) | 0.125 (3.2mm) |
|---------------------|--|---------------|---------------|---------------|
| Length (inches)     | 2.0 to 35.0" (51 to 899 mm)  |               |               |               |
| Body width (inches) | Models S9078 and S9125:<br>0.425 to 2.500 (10.8 to 63.5 mm)<br>Models S9030 and S9050:<br>0.425 to 1.065 (10.8 to 27.0 mm) |               |               |               |

**Leadwires:** 2 or 3 (per element) stranded copper with PTFE or polyimide insulation. Other leadwire coverings available.

0.125" thick: AWG 18.

0.078" thick: AWG 22.

0.050" thick: AWG 26.

0.030" thick: AWG 30.

**Dielectric strength:** 3200 VRMS at 60 Hz, tested between the leads and external flat body surface for 1 to 5 seconds.

## Class H (180°C) RTDs

| Element   | Model for thickness: |           |           |           |
|---|----------------------|-----------|-----------|-----------|
|   | 0.030" *             | 0.050"    | 0.078"    | 0.125"    |
| Platinum (0.00392 TCR)<br>100 Ω ±0.5% at 0°C                              | S9030PAPA            | S9050PAPA | S9078PAPA | S9125PAPA |
| Platinum (0.00385 TCR)<br>100 Ω ±0.12% at 0°C<br>(Meets EN60751, Class B) | S9030PDPD            | S9050PDPD | S9078PDPD | S9125PDPD |
| Platinum (0.00385 TCR)<br>100 Ω ±0.5% at 0°C                              | S9030PEPE            | S9050PEPE | S9078PEPE | S9125PEPE |
| Copper (0.00427 TCR)<br>10 Ω ±0.2% at 25°C                                | S9030CACA            | S9050CACA | S9078CACA | S9125CACA |
| Nickel (0.00672 TCR)<br>120 Ω ±0.5% at 0°C                                | S9030NANA            | S9050NANA | S9078NANA | S9125NANA |

\*Model has a lead bulge 0.045" (0.11mm) thick, extending into the body a maximum of 0.62" (1.6mm).

## Specification and order options

|  |   |
|--|---|
| S9078PAPA                                | Model number from table   |
| 120                                      | <b>Body length:</b><br>Specify in 0.1" increments (Ex: 120 = 12.0")                 |
| T  | <b>Leadwire insulation:</b><br>T = PTFE<br>K = Polyimide                            |
| 500                                      | <b>Body width:</b><br>Specify in 0.001" increments (Ex: 500 = 0.500")               |
| Z  | <b>Number of leads per element:</b><br>Y = 2 leads (PA, PE, NA only)<br>Z = 3 leads |
| 36                                       | <b>Lead length in inches</b>  |
| S9078PAPA120T500Z36 = Sample part number |   |

Specifications subject to change

# Corona Resistant Stator RTD

## Overview

Motor manufacturers that use variable speed drives for flexibility and high performance can experience corona related problems. PWM inverters can create high voltage spikes exceeding 1600 volts. Minco has answered the call with a corona resistant RTD. This RTD is specifically designed for the latest generation of variable frequency drives for AC motors. Minco uses special materials and manufacturing techniques to create an RTD that is virtually corona-proof, eliminating the need for expensive reactors or filters for the sensors.\*\*

- Designed for AC motors with variable frequency drives (VFD)
- Proprietary design\* resists detrimental effects of corona
- Protect expensive motors with an inexpensive overtemperature warning system
- Tested to 10,000 VAC without failure
- Widths from 0.305" to 1.25"
- Lengths from 7" to 30"

## Specifications - Model S8025

**Temperature:** 180°C (356°F); Class H.

**Thickness:** 0.030" (0.075" max. thickness over lead bulge).

**Length:** 7" to 30".

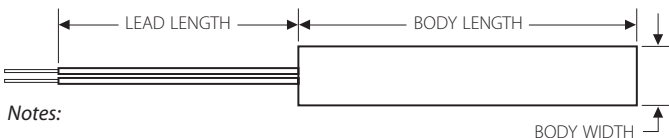
**Width:** 0.305" to 1.25" (2 and 3 lead models); 0.344" to 1.25" (4 lead models).

**Leadwires:** 2, 3, or 4 AWG #22, stranded copper; PTFE or polyimide insulation.

**Element:** Platinum; 100 Ω ±0.5% at 0°C; 0.00392 TCR.

**Body material:** Polyimide, corona resistant.

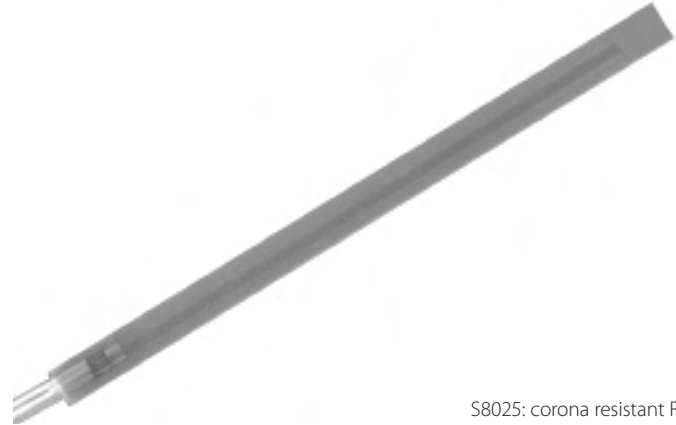
**Dielectric strength:** Body: 8000 VRMS at 60 Hz; Leads and leadwire exit (0.5" into body): 5000 VRMS at 60 Hz.



Notes:

\* Patent pending

\*\* Reducing the effects of corona on motor windings is the responsibility of the motor manufacturer



S8025: corona resistant RTD

## Specification and order options

|   |  |
|---|--|
| S8025                                   | Model Number   |
| PA                                      | Sensing element<br>PA = Platinum, 100 Ω ±0.5%, 0.00392   |
| 120                                     | Body length:<br>Specify in 0.1" increments<br>(Example: 120 = 12.0")<br>Minimum = 70; maximum = 300  |
| T                                       | Leadwire insulation:<br>T = PTFE<br>K = Polyimide  |
| 500                                     | Body width:<br>Specify in 0.001" increments<br>(Example: 500 = 0.500")<br>Minimum = 305 (2 and 3 lead models)<br>Minimum = 344 (4 lead models)<br>Maximum = 1250 |
| Z                                       | Number of leads per element:<br>Y = 2 leads<br>Z = 3 leads<br>X = 4 leads  |
| 36                                      | Lead length in inches  |
| F                                       | Leadwire configuration<br>F = Flat<br>T = Twisted  |
| S8025PA120T500Z36F = Sample part number |  |

STATOR RTDs

Specifications subject to change

# Machinery Protection Products

## CT224 12-channel temperature alarm/monitor

The CT224 consists of a 12-Channel Temperature Monitor and MincoSoft™ CT224 Software. It is the next generation in temperature monitoring equipment from Minco designed to meet the needs of electric machinery protection. The 12-channel scanning capability, standard RS485/RS232 interface and Windows-compatible software utility for system configuration and data logging provide overtemperature and undertemperature protection and critical feedback to safeguard expensive machinery.

- UL and cUL recognized to help meet regulatory compliance
- Mix and match sensor input types for freedom to adapt to pre-installed bearing and apparatus sensors
- Ability to monitor 12 inputs allows you to monitor stator sensors from two motors

See page 5-24 for details.



## End turn RTD

Model S3238 Thermal-Ribbon is designed to sense stator temperatures in motors and generators. With an alternative installation method to the "stick-type" sensors in this section, S3238 is used on the end turns of stator windings and provides an easy way to add overtemperature protection when the stator is not being rewound.



See page 10-5 for details.

## CT15 temperature alarm

- Alarm shuts down motor on over-temperature to prevent catastrophic failure
- Monitors single 100  $\Omega$  platinum RTD (PD or PE)
- 1 or 2 relays with independent trip points for warning and shutdown
- Microprocessor-based
- Front panel programmable with four security levels
- 100 to 240 VAC supply power
- Compact DIN case with water resistant front panel



See pages 5-26 for details.

## Anti-condensation space heaters

- Flexible silicone rubber insulation
- Mount on windings or housings to prevent moisture buildup
- 2.5 to 10 watts per square inch at 120 or 240 volts
- Variety of sizes to 60" (1.5 m)
- UL component recognition
- Available from stock



Go to [www.minco.com/heater/](http://www.minco.com/heater/) for more information.

*Specifications subject to change*