



▶ SECTION 6: STATOR WINDING SENSORS

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

Section 6: Stator RTDs

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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 trippouts.

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.

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.

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

Specifications

Temperature limit:

Class H: 180°C (356°F)

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.

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)
- Ex rated sensors for equipment in hazardous areas. See page 7-2 for more information.
- Electrically conductive coating
- Special leadwire or cable
- Larger body sizes
- Side lead exit

▼ = STANDARD OPTIONS
Specifications subject to change

Stator Winding RTDs

Configure the sensor to best fit application needs

RTD Sensing Element

Code	Element	TCR Ω/Ω/°C
CA	Copper, 10 Ω ±0.2% (10.02/9.98) at 25°C	0.00427
NA	Nickel, 120 Ω ±0.5% (120.60/119.40) at 0°C	0.00672
PA	Platinum, 100 Ω ±0.50% (100.50/99.50) at 0°C	0.00392
PD	Platinum, 100 Ω ±0.12% (100.12/99.98) at 0°C (Meets EN60751, Class B)	0.00385
PE	Platinum, 100 Ω ±0.50% (100.50/99.50) at 0°C	0.00385
PF	Platinum, 1000 Ω ±0.12% (1001.2/998.8) at 0°C (Meets EN60751, Class B)	0.00385
PM	Platinum, 100 Ω ±0.06% (100.06/99.94) at 0°C (Meets EN60751, Class A)	0.00385

S300xx Example of Model Number

S300	Base Model Number	
1	Number of sensing elements: 1 = 1 wire-wound element (single) 2 = 2 wire-wound elements (dual)	
1	Thickness T: 1 = .030", AWG 30 leadwires 2 = .030", AWG 26 leadwires 3 = .030", AWG 22 leadwires 4 = .050", AWG 26 leadwires	5 = .078", AWG 22 leadwires 6 = .098", AWG 22 leadwires 7 = .118", AWG 22 leadwires 8 = .138", AWG 22 leadwires 9 = .157", AWG 22 leadwires
PD	Sensing element (from RTD Sensing Element Table)	
100	Body length L in .1" increments (100 = 10.0") MIN L = 20 (2.0") MAX L = 232 (23.2")	
T	Lead insulation: T = PTFE K = Polyimide (only available in N leadwire configuration)	
344	Body width W in .001" increments (344 = .344") MIN W = 219 (.219") (S3001_ models); 2 or 3 lead MIN W = 320 (.320") (S3001_ models); 4 lead MIN W = 425 (.425") (S3002_ models) MAX W = 956 (.956")	
Z	Number of leads and lead color: <u>Single Element</u> Y = 2 leads, RW Z = 3 leads, RWW (Minco U.S. lead colors) W = 3 leads, WRR (IEC 60751 lead colors) X = 4 leads, RRWW	<u>Dual Element</u> Y = 2 leads per element, RW/BIY (Minco U.S. lead colors) V = 2 leads per element, WR/YBk (IEC 60751 lead colors) Z = 3 leads per element, RWW/BIYY (Minco U.S. lead colors) W = 3 leads per element, WRR/YBk (IEC 60751 lead colors)
360	Lead length B in inches	
B	Leadwire configuration/covering: N = Straight leads, insulated with no covering T = Twisted leads, insulated with no covering F = FEP jacket over leads	S = Stainless steel braid over leads R = FEP jacket over stainless steel braid B = FEP jacket over silver plated copper braid with drainwire E = FEP jacket over silver plated copper braid and drainwire with elastomer fill
10	Cable jacket and/or braid removal length C in .1" increments (10 = 1.0") (Specify "0" for N and T options) otherwise, MIN C = 5 (.5")	
S30011PD100T344Z360B10 = Sample part number		

Calibration data (resistance measurements) may also be ordered. Contact Minco sales team for details.

Hazardous Area RTDs



IECEx



SIL

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
CCC/NEPSI Ex e 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
CCC/NEPSI Ex ia IIC Ga

Overview

Insert these thin, laminated RTDs in stator 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.

Agency Certifications

Tri-certified to satisfy European (EN), International (IEC), and North American (U.S. and Canada) standards for electrical apparatus in potentially explosive atmospheres (Ex):

- ATEX Directive 2014/34/EU
- EN/IEC/UL/CSA 60079-0: Equipment - General requirements
- EN/IEC/UL/CSA 60079-7: Equipment protection by increased safety “e”
- EN/IEC/UL/CSA 60079-11: Equipment protection by intrinsic safety “i”
- National and Canadian Electrical Codes as Class I, Division 1, Groups ABCD intrinsic safety “ia”
- EN 50495: Safety devices required for the safe functioning of equipment with respect to explosion risks, SIL capable up to a safety level of SIL2 or SIL3

Conforms with China standards GB 3836.1-2010 (General requirements), GB 3836.3-2010 (increased safety “e”), and GB 3836.4-2010 (intrinsic safety “ia”).

Specifications

Temperature limit: -50 to 180°C (-58 to 356°F), class H.

Body material: High temperature epoxy glass.

Leadwires: 2, 3, or 4 leads, stranded copper, AWG #22 (0.35 mm², 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.

Two Sensing Options

Choose between wire-wound or thin-film sensing elements:

- Wire-wound elements are the standard for use in stator winding temperature sensors since the temperature sensitive length extends nearly the entire sensor body length. This greatly increases the probability of detecting a localized hot spot within the motor or generator. In addition, Minco's proprietary element winding designs provide protection against electrical noise which can decrease sensor accuracy.
- Thin-film elements are effectively point sensors, with a temperature sensitive length of approximately 0.1". A hot spot located merely inches away from the thin-film element could delay detection, or worse – remain completely undetected. Thin-film elements are generally not recommended for stator sensors longer than 4", but are required for stator sensors under 2" long. These short sensors are also appropriate for installation within the motor/generator winding's end turns. Minco Thermal Ribbons and Thermal Tabs are also used for end turn installation.

Hazardous Area RTDs

Configure the sensor to best fit application needs

RTD Sensing Element

Code	Element	TCR Ω/Ω/°C
CA	Copper, 10 Ω ±0.2% (10.02/9.98) at 25°C	0.00427
NA	Nickel, 120 Ω ±0.5% (120.60/119.40) at 0°C	0.00672
PA	Platinum, 100 Ω ±0.50% (100.50/99.50) at 0°C	0.00392
PD	Platinum, 100 Ω ±0.12% (100.12/99.98) at 0°C (Meets EN60751, Class B)	0.00385
PE	Platinum, 100 Ω ±0.50% (100.50/99.50) at 0°C	0.00385
PF	Platinum, 1000 Ω ±0.12% (1001.2/998.8) at 0°C (Meets EN60751, Class B)	0.00385
PM	Platinum, 100 Ω ±0.06% (100.06/99.94) at 0°C (Meets EN60751, Class A)	0.00385

S1xx Example of Model Number

S1	Base Model Number	
1	Number of sensing elements: 1 = 1 wire-wound element (single) – Not available with PF element. 2 = 2 wire-wound elements (dual) – Not available with PF element. 3 = 1 thin-film elements (single) – Not available with CA or NA element. 4 = 2 thin-film elements (dual) – Not available with CA or NA element.	
0	Thickness T: 0 = .079" 1 = .098" 2 = .118" 3 = .138" 4 = .157"	
PD	Sensing element (from RTD Sensing Element Table)	
100	Body length L in .1" increments (100 = 10.0") MIN L = 20 (2.0") (S11_ or S12_ models) MIN L = 7 (0.7") (S13_ or S14_ models) MAX L = 232 (23.2")	
T	Lead insulation: T = PTFE K = Polyimide (only available in N leadwire configuration)	
344	Body width W in .001" increments (344 = .344") MIN W = 219 (.219") (S11_ or S13_ ; 2 or 3 leads) MIN W = 320 (.320") (S11_ or S13_ ; 4 leads) MIN W = 425 (.425") (S12_ or S14_) MAX W = 956 (.956")	
Z	Number of leads and lead color: Single Element Y = 2 leads, RW Z = 3 leads, RWW (Minco U.S. lead colors) W = 3 leads, WRR (IEC 60751 lead colors) X = 4 leads, RRWW	Dual Element Y = 2 leads per element, RW/BIY (Minco U.S. lead colors) V = 2 leads per element, WR/YBk (IEC 60751 lead colors) Z = 3 leads per element, RWW/BIYY (Minco U.S. lead colors) W = 3 leads per element, WRR/YBk (IEC 60751 lead colors)
360	Lead length B in inches	
B	Leadwire configuration/covering: N = Straight leads, insulated with no covering T = Twisted leads, insulated with no covering F = FEP jacket over leads	S = Stainless steel braid over leads R = FEP jacket over stainless steel braid B = FEP jacket over silver plated copper braid with drainwire E = FEP jacket over silver plated copper braid and drainwire with elastomer fill
10	Cable jacket and/or braid removal length C in .1" increments (10 = 1.0") (Specify "0" for N and T options) otherwise, MIN C = 5 (.5")	
S110PD100T344Z360B10 = Sample part number		

Certifications

Minco's S1xx series sensors are certified by multiple agencies. Consult the following list to learn more:

IECEX (IEC 60079):

Ex ia IIC Ga
Ex eb IIC Gb

ATEX (EN 60079):

II 1 G Ex ia IIC Ga
II 2 G Ex eb IIC Gb

CSA Canada (CSA C22.2):

Ex ia IIC Ga
Ex eb IIC Gb
IS Cl I, Div 1, Grp ABCD

CSA US (NFPA 70 Part 500 & 505):

Cl I, Zone 0 AEx ia IIC Ga
Cl I, Zone 1, AEx eb IIC Gb
IS Cl I, Div 1, Grp ABCD

CCC and NEPSI certified (China GB 3836 standards):

Ex ia IIC Ga
EX e IIC Gb



SIL IECEx

Calibration data (resistance measurements) may also be ordered. Contact Minco sales team for details.