Bolt-On and Embedment Temperature Sensors for Space Applications

Platinum PT100 and PT1000 RTD in Easy-install Case

Product Overview

Minco's bolt-on and embedment temperature sensors are available in a variety of rugged metallic case styles designed for quick and secure installation. Built to endure the extreme temperatures, vibration, and vacuum conditions of space, these miniature potted sensors are offered as commercial off-the-shelf products or fully customized designs to meet specific mission requirements.

Minco sensors are designed to meet the rigorous requirements of space applications. The S240890-S240893 series incorporates testing based on NASA EEE-INST-002, Section T1, Table 2, Level 2, covering the most common test parameters used for resistance temperature detectors (RTDs) in space flight applications. Section T1 establishes baseline criteria for thermistors, which is the closest applicable category for RTDs.

For over half a century, Minco has engineered rugged temperature sensors and heaters to withstand the harshest environments of space. We partner with mission teams to define and perform screening and qualification testing to meet or exceed reliability requirements. Minco offers tailored products and test plans to align with program-specific needs, including extended qualification testing per EEE-INST-002, Section T1, Table 3, or testing aligned with ESCC Generic Specification No. 4006.

Product Features

Characteristic	Details
Temperature Range	-196°C to 200°C
Resistance at 0°C	100 Ω or 1000 Ω (IEC60751 Class B)
Temperature Coefficient of Resistance	0.003851 Ω/Ω/°C from 0°C to 100°C
Excitation Current	1 mA MAX recommended
Screening Testing	Based on NASA EEE-INST-002, Section T1, Table 2
Construction	Multiple case options for easy installation
Outgassing	Meets NASA low outgassing requirements
Wiring Options	2-, 3-, or 4-wire AWG 26 leads
Lead Customization	Variable lead length and insulation (PTFE or polyimide)
Configurability	Customizable specifications and screening/testing levels

Model Number Options

	Model Number	Case Dimensions	Case material
	S240890	0.50 x 0.375 x 0.188” w/ 0.166” diameter hole (12.7 x 9.5 x 4.8mm w/ 4.2mm diameter hole)	Stainless steel
	S240891	1/4- 20 x 3/8” long thread w/ 7/16” hex head	Stainless steel
	S240892	M6 x 1 thread, 10mm long, w/ 10mm hex	Stainless steel
	S240893	Case Style C Case length: 0.300” (7.6 mm) Case diameter: 0.125” (3.2 mm)	Stainless steel

Specification Options

S240890	Model Number from Table
PD	Sensing element: PD: Platinum 100 Ω +/- 0.12% at 0C IEC 60751 Class B PF: Platinum 1000 Ω +/- 0.12% at 0C IEC 60751 Class B
Z	Number of leads: Y: 2 (AWG 24) Z: 3 (AWG 26) X: 4 (AWG 30)
T	Leadwire insulation/shield: T = PTFE K = Polyimide S = Stainless steel braid over PTFE E = ETFE
40	Lead length in inches
S240890PDZT40 = Sample part number	

Resistance/Temperature Characteristics

Element	R_Z[1]	-196°C[2]	-50°C	0°C	+25°C	+75°C	+100°C	+200°C
PD	Nom. (Ω)	20.25	80.31	100.00	109.73	128.99	138.51	175.86
PF	Nom. (Ω)	202.5	803.1	1000.0	1097.3	1289.9	1385.1	1758.6
PD, PF	Tol. (±%)	5.45	0.27	0.12	0.15	0.20	0.22	0.27
	Tol. (±°C)	2.56	0.55	0.30	0.43	0.68	0.80	1.30

[1] R_Z = Zero Power Resistance. Measured with 1 mA maximum excitation current. The minimal effects of self-heating are included in measurements for RTDs.
[2] IEC 60751 does not define class B (F 0.3) tolerance at temperatures below -50°C for thin-film elements. The stated tolerance at -196°C is based on double the tolerance allowed for wire wound elements per IEC 60751 at the minimum temperature.

Summary of Screening Testing

Inspection/Test	Test Parameters	Acceptance Criteria
Preconditioning	5 cycles 25C +10/-5C; 5 minutes MIN -196C +/- 5C; 30 seconds MIN	N/A
Visual	Weld quality prior to potting	Minco visual inspection criteria
Zero Power Resistance	0°C	Resistance/Temperature Characteristics Table
Thermal Shock	MIL-STD-202, Method 107 10 cycles -65C +0/-5C; 30 minutes MIN 25C +10/-5C; 5 minutes MAX 200C +5/-0C; 30 minutes MIN 25C +10/-5C; 5 minutes MAX	N/A
High Temperature Storage	MIL-STD-202, Method 108 200°C +/- 10°C 100 +10/-0 hours	N/A
Zero Power Resistance	0°C	Resistance/Temperature Characteristics Table
Insulation Resistance	MIL-STD-202, Method 301	1,000 megohms minimum at 500 V DC
Visual	Potting, workmanship, and appearance	Minco visual inspection criteria
Dimensional	Measure dimensions	Specification Drawing
Resistance Ratio Characteristic	R100°C/R0°C	1.3862 MAX/1.3838 MIN
Resistance Temperature Characteristic *Optional Testing:* *Must add "-RT" to end of the part number to include this test item*	-196°C, -50°C, 0°C, 100°C, 200°C	Resistance/Temperature Characteristics Table
Percent Defective Allowable	Cumulative defects from testing	10%

Minco's bolt-on and embedment temperature sensors deliver precise, reliable measurements in rugged cases built for the extremes of space. With customizable configurations and testing aligned to NASA or ESCC standards, they provide mission-critical performance trusted for demanding spaceflight applications.