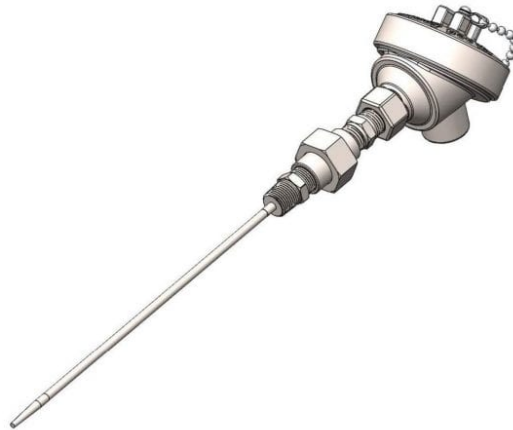


## Product Data Sheet

### N9004 – Fast Time Response RTD Assembly



The model N9004 fast time response RTD is designed to be installed in a compatibly designed thermowell for rapid detection of temperature changes in the Hot and Cold legs of the reactor coolant loops (RCS) of PWRs (pressurized water reactors). The N9004 RTD is currently installed in many operating PWR nuclear plants, with some of the original installations occurring in the early 1980's. There is little drift of either calibration or time response associated with normal operating conditions. Thus, the RTD assembly has low maintenance costs. Also, due to unique design features, ALARA amounts are reduced during installation and removal, especially when a Quick Disconnect Connector (QDC) is used. Other applications include:

- Reactor Coolant Pumps
- RCS Wide Range
- Feedwater Systems
- RHR/SIS systems

# Specifications

NAME	DESCRIPTION
<b>Maximum Operating Temperature</b>	0°F to 750°F (-18°C to 400°C)
<b>Element Type</b>	Platinum (Wire-Wound)
<b>Accuracy/Interchangeability</b>	IEC 60751 Class B is standard. IEC 60751 Class A is available upon request. Other special accuracies are also available. RTD accuracy shall be within $\pm 0.3^{\circ}\text{F}$ ( $\pm 0.17^{\circ}\text{C}$ ) of the values provided in the specific resistance versus temperature interpolation table, including the effects of repeatability, but excluding hysteresis.
<b>Hysteresis</b>	Hysteresis is the difference in the element resistance when the measurement temperature is decreasing compared to when it is increasing. Hysteresis shall not exceed $0.8^{\circ}\text{F}$ ( $0.44^{\circ}\text{C}$ ) for a temperature span of $32^{\circ}\text{F}$ to $625^{\circ}\text{F}$ ( $0^{\circ}\text{C}$ to $330^{\circ}\text{C}$ ).
<b>Calibration Points</b>	Standard calibration points are $32^{\circ}$ , $212^{\circ}$ and $554^{\circ}\text{F}$ ( $0^{\circ}$ , $100^{\circ}$ and $290^{\circ}\text{C}$ ).
<b>Drift/Stability</b>	Sensor drift is less than $\pm 0.2^{\circ}\text{F}$ ( $\pm 0.11^{\circ}\text{C}$ ) shift per year up to a maximum of $0.5^{\circ}\text{F}$ ( $0.28^{\circ}\text{C}$ ) for the qualified life. These values were determined based on pre and post qualification test data.
<b>Insulation Resistance</b>	At room temperature and dry external surfaces, the insulation resistance between any wire and the sensor case will be at least $100\text{ M}\Omega$ with $100\text{ VDC}$ applied for a minimum of 30 seconds prior to measurement.

NAME	DESCRIPTION
<b>Response Time (installed in Ultra Electronics, Energy thermowell)</b>	The response time for each sensor is normally 5 seconds or less in Ultra Electronics Energy thermowell as verified by a plunge test in accordance with ASTM E644 for a 63.2% of a step change from room temperature air to water flowing transverse to the assembly at 3 ft/s (~1m/s) at 180°F. Actual response time provided will vary depending on final design of the associated thermowell.
<b>Operating Current</b>	Standard operating current is 1 to 4 mA continuous. A continuous current of 20 mA (RMS) or less will not damage the sensor. A short duration or pulsed current of 40 mA maximum will not damage the sensor.
<b>Self-Heating Error</b>	In 154°F (68°C) water flowing transverse to the sensor sheath at 3 ft/s (~1 m/s), with a sheath diameter of 0.25 inches (6.35 mm), the RTD is capable of dissipating 10 mW/°C without causing the indicated temperature to rise more than 0.36°F (0.2°C).
<b>Qualification</b>	RTD assemblies are qualified to Class 1E requirements of IEEE 323-1974/1983 and IEEE 344-1975/1987. Original qualification reports are 548-8854-001 and 06-8680-003.
<b>Quality Standards</b>	RTD assemblies are supplied in accordance with Ultra Electronics Energy QA/QC Quality Assurance & Control Manual 100-1 which meets the requirements of 10 CFR 50 Appendix B, 10 CFR Part 21, ISO 9001, ASME NQA-1 and ANSI N45.2.
<b>Sheath Material</b>	Stainless Steel
<b>External Leadwire Material</b>	Stranded Constantan insulated with Polyolefin
<b>Sheath internal insulation</b>	MgO

NAME	DESCRIPTION
<b>Internal Leadwire Material</b>	Solid Constantan
<b>Terminal Block Material, if applicable</b>	Ceramic
<b>Quick Disconnect Electrical Connector (QDC), if applicable</b>	Quick disconnect bayonet (Gen 1 or Gen 3)
<b>Mounting Connections</b>	RTDs normally have a 150 lb S.S. union and schedule 80 minimum S.S. extension nipple with 1/2" NPT male threads for interface to the thermowell or protection tube. The terminal head conduit port has 3/4" NPT female threads as standard. The QDC will normally have 1/2" NPT male threads. Custom mounting connections are available upon request.
<b>Shipping Weight</b>	Approximately 5 lbs. Actual weight will depend upon configuration supplied.
<b>Identification Tags</b>	S.S. identification tag attached to the terminal head using SS braided cable. Custom configured tagging is available upon request.
<b>Storage Requirements</b>	RTDs are to be stored in accordance with ANSI N45.2 Level B requirements or better.

## FAQs

### Can I order the N9004 with a QDC?

Yes. Please contact Nuclear Sales to determine exact model number and configuration.

### Can I specify my own required calibration points?

Yes. Calibration at ice point (32°F/0°C) and boiling point (212°F/100°C) are required to determine the appropriate Alpha temperature coefficient. Up to 4 additional calibration points at higher temperatures can be specified. Data from only 3 of the actual calibration points (32°F/0°C, 212°F/100°C and a select third point) will be used to generate a custom temperature versus resistance table using the Callendar-Van Dusen equation.

### Can the N9004 RTD be ordered to meet special accuracy needs?

Yes. Please contact Nuclear Sales with the specific requirements so we may determine if we can meet your needs.

### Can I use my own thermowell with the N9004 RTD?

Yes, but response time will be adversely affected. The RTD to thermowell interface must be designed and manufactured correctly for the N9004 to achieve a fast response.

### Can Cross Calibration and LCSR (Loop Current Step Response) be performed on the N9004?

Yes. Cross calibration and LCSR testing is normally performed during either startup or shutdown sequence of the power plant. The maximum current allowed for LCSR testing is 40 mA.

### Is there a specification for insulation resistance at operating temperature?

The standard for high temperature insulation resistance for N9004 RTDs is the insulation resistance between any wire and the external case will be at least 20 MΩ with 100 VDC applied with the RTD sensing portion at a test temperature of 625°F (~330°C). The test voltage is normally applied for a minimum of 30 seconds prior to recording any measurement.

## Documents

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NAME	VIEW / DOWNLOAD
<b>N9004 Model Number Configurator</b>	<a href="#">View / Download</a>
<b>N9004 Head-Extension Code Configurator</b>	<a href="#">View / Download</a>
<b>QDC Model Number Configurator</b>	<a href="#">View / Download</a>
<b>N9004 Typical Assembly Configuration</b>	<a href="#">View / Download</a>
<b>N9004 Typical Wiring Diagram</b>	<a href="#">View / Download</a>
<b>N9004 Quick Disconnect Connector Wiring Diagram</b>	<a href="#">View / Download</a>
<b>N9004 Qualification Summary Report</b>	<a href="#">View / Download</a>

## Accessories

<b>Silicone Sealant</b>	Item No. 0102-004-0012T
<b>P1 Thread Sealant</b>	Item No. 0109-001-0113T
<b>PST 580 Thread Sealant</b>	Item No. 0109-001-0114T
<b>Viton Gasket for Terminal Head</b>	Item No. 0322-001-0023T
<b>6-Wire Terminal Block</b>	Item No. 0308-004-0006T
<b>8-Wire Terminal Block</b>	Item No. 0308-004-0009T
<b>Terminal Head - General Purpose Single Port</b>	Item No. 0342-002-0016T
<b>Terminal Head - General Purpose Dual Port</b>	Item No. 0342-002-0017T
<b>RTD Removal Tool</b>	Item No. 0125-003-0004
<b>RTD Insertion Tool</b>	Item No. 0125-003-0005
<b>Thermowell Cleaning Kit</b>	Item No. 0125-004-0001
<b>QDC O-Ring</b>	Item No. 0322-001-0070T