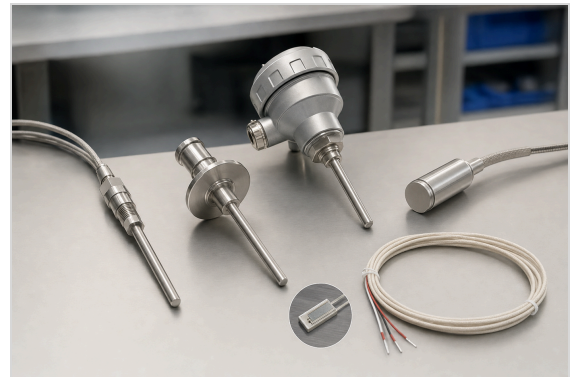


**RTD SPECIFICATION, SOURCING, AND MEASUREMENT  
CONFIDENCE**

# Precision Temperature Measurement Is a System

What NOAA (National Oceanic and Atmospheric Administration) publicly documents through the U.S. Climate Reference Network, and what it teaches engineers and buyers about specifying RTDs for measurement-critical applications.

Terminology note: the industry-standard name is RTD, short for resistance temperature detector. NOAA's source documents use the term platinum resistance thermometer, or PRT, for the same type of platinum RTD used in this application.



Representative Thermometrics RTD assemblies. Product configuration depends on the application, temperature range, environment, and documentation requirements.

**For engineers**

Translate sensor specs into measurement confidence.

**For buyers**

Reduce wrong-fit purchases, rework, and undocumented substitutions.

**For quality teams**

Ask for the documentation that makes data defensible.

# Small Temperature Errors Become Expensive

In measurement-critical systems, the problem is rarely just the temperature element. The defensibility of a reading depends on the full measurement chain: sensing element, sheath construction, mounting geometry, environment, leadwire exposure, calibration, data handling, and maintenance.

NOAA's U.S. Climate Reference Network is useful because its public documentation shows this chain clearly. NOAA identifies Thermometrics Corporation PT1000 RTDs in the USCRN air-temperature measurement system, using the source-document term platinum resistance thermometer. The larger lesson is how the sensors are specified, installed, sampled, checked, and maintained.

For engineers, the lesson is technical: a stable RTD still needs the right construction, installation, and validation model. For buyers, the lesson is commercial: the lowest-cost part number can be expensive if it creates bad data, failed field replacements, missed documentation, or preventable downtime.

## POSITIONING NOTE

This paper does not claim NOAA endorsement. It uses NOAA's public documentation as a reference case for system-level temperature measurement discipline.

**The right question is not only "Which RTD should we buy?" It is "What measurement risk are we trying to remove?"**

Thermometrics Corporation perspective for engineers, buyers, and quality teams.

## PUBLIC EVIDENCE

NOAA's public archive identifies the Thermometrics PT1000 RTD by manufacturer and model in a national climate measurement application.

## SYSTEM DISCIPLINE

The documented system uses three independent RTDs, fan-aspirated shields, frequent sampling, comparison logic, calibration, and ongoing monitoring.

## BUSINESS RISK

When the measurement matters, a small unnoticed bias can undermine years of decisions, audits, product history, or customer trust.

## A Public Reference Point: NOAA USCRN

NOAA describes the U.S. Climate Reference Network as a system of weather observing stations built for long-term, high-quality observations of temperature, precipitation, soil moisture, and soil temperature in stable settings. The public overview states that USCRN data supports weather forecasting, research, and commercial activities.

**3**

Independent RTDs per station for air temperature measurement.

**2 sec**

Documented temperature sampling interval for each RTD.

**5 min**

Averaging period used by the station datalogger.

**1.5 m**

Approximate installation height above ground for the shield openings.

### PUBLIC OPERATING EXAMPLE

NOAA's sensor-data page for the CA Santa Barbara 11 W USCRN station shows the three air-temperature sensor channels operating side by side, with Sensor #1, Sensor #2, Sensor #3, and a calculated temperature reported across the hour. The same page also reports diagnostic fan-speed values, connecting the temperature readings to the aspirated-shield system around the RTDs.

### WHAT NOAA DOCUMENTS

- Air temperature is measured with three platinum RTDs in fan-aspirated solar radiation shields.
- Each station transmits independent observed values; NCEI derives the official hourly value after the data arrives.
- Fan-speed data is recorded so operating condition can be reviewed with the measurement.
- Instruments are calibrated or verified annually, aging sensors are routinely replaced, and station measurements are monitored daily.

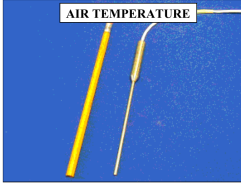
### WHY BUYERS SHOULD CARE

- Independent sensors reduce dependence on a single channel.
- Installation details reduce environmental bias.
- Diagnostics turn field conditions into reviewable evidence.
- Calibration and maintenance planning protect the value of the measurement over time.

### PRACTICAL TAKEAWAY

NOAA's documentation is not just a component list. It is a measurement architecture. That is the right standard for industrial applications where temperature readings drive control, quality, warranty, safety, or compliance decisions.

# The NOAA-Documented Thermometrics PT1000 RTD



**Sensor:** Surface Air Temperature  
**Manufacturer/Model:** Thermometrics Corporation PT1000 Platinum Resistance Thermometer  
**Description:** The platinum resistance thermometer (PRT) is a precision temperature sensor with the following specifications:  
**Type:** Platinum 1000 ohm  $\pm 0.04\%$  at 0°C (per IEC-751, Class A accuracy)  
**Temperature Coefficient:** 0.00385 (per IEC-751 and ASTM E-1137)  
**Range:** -60°C to +300°C  
**Sheath:** Type 316 stainless steel, 0.125 inches diameter  $\pm 0.010$  inches (per ASTM A632) by 4 inches long, filled with MgO powder and vibro-compacted; sealed with epoxy at the leads.  
**Repeatability and Stability:** Better than  $\pm 0.01^\circ\text{C}$  per year  
**Accuracy:**  $\pm 0.04\%$  over full range  
**Time Constant:** 63% of thermal response in 13 sec when immersed from 20°C air into 50°C water flowing at 0.2 m/s  
**How is it installed?**  
 Three completely independent PRTs are used. Each PRT probe is installed in a pair of clips inside its own mechanically (fan) aspirated radiation shield (Met One model 0760/7308). Each shield is mounted vertically downward from its own 3 m long cross-member arm, about 1.5 m above the surface of the ground. Each shield is leveled and held in position by set screws.  
**Why measure this parameter?**  
 Surface Air Temperature is one of the primary measurements for USCRN.

NOAA public sensor documentation identifies the surface-air-temperature sensor as a Thermometrics Corporation PT1000 RTD, using the source-document term Platinum Resistance Thermometer.

The public NOAA sensor sheet identifies the Thermometrics PT1000 RTD and summarizes the construction and performance values below. These values should be understood as the public documentation for this application, not as a universal quotation for every Thermometrics RTD build.

| Documented characteristic | Published value   |
|---------------------------|---|
| Sensor type               | Platinum 1000 ohm, IEC-751 Class A accuracy                               |
| Temperature coefficient   | 0.00385, per IEC-751 and ASTM E-1137                                      |
| Range                     | -60°C to +300°C   |
| Sheath                    | Type 316 stainless steel, 0.125 in diameter, 4 in long                    |
| Internal construction     | MgO powder filled and vibro-compacted; epoxy sealed at the leads          |
| Stability                 | Better than $\pm 0.01^\circ\text{C}$ per year                             |
| Accuracy                  | $\pm 0.04\%$ over full range  |
| Time constant             | 63% response in 13 seconds under the documented water-flow test condition |

Standards note: the archived NOAA document uses historical IEC-751 language. Current RTD discussions may reference IEC 60751. Thermometrics will confirm the applicable standard, tolerance class, calibration points, and build requirements for each application.

# From Probe To Defensible Measurement

NOAA's air-temperature workflow shows why precision measurement is not just a sensor purchase. The USCRN station uses three independent Thermometrics RTDs, each in its own aspirated shield. Each RTD is sampled every two seconds. The datalogger computes five-minute averages. The independent values are compared and used to derive the official hourly temperature value.

## 1. Sensor construction

Element, tolerance class, coefficient, sheath, fill, seal, and response time.

## 2. Installation control

Mounting, insertion depth, air flow, thermal contact, vibration, and exposure.

## 3. Environmental protection

Shielding, sheath material, moisture control, radiation effects, and abrasion.

## 4. Sampling and signal path

Leadwire, extension, transmitter, datalogger, averaging, and noise control.

## 5. Calibration and validation

Traceability, calibration points, acceptance criteria, and comparison checks.

## 6. Lifecycle discipline

Documentation, spare planning, replacement schedule, and failure review.

## ENGINEERING LESSON

A well-built RTD can still produce poor data when the installation, leadwire exposure, shielding, or calibration path is wrong. The specification should begin with the application, not the part number.

## PROCUREMENT LESSON

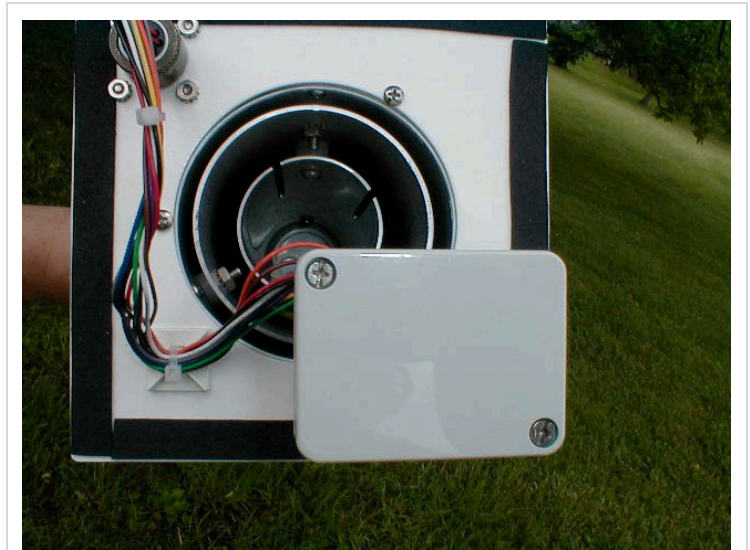
A cheaper substitute may look acceptable on resistance value alone while failing on sheath alloy, moisture sealing, transition temperature, calibration evidence, or documentation. These are not small details when a line is down or an audit is open.

## The System Around The RTD Matters

The NOAA shield documentation explains the measurement problem directly: solar radiation can warm the sensor during the day, while outgoing infrared radiation can cool it at night. A fan-aspirated shield helps keep the internal sampling environment close to ambient air temperature.

The same principle applies outside climate stations. Industrial ovens, bearing housings, process vessels, HVAC systems, test stands, and OEM equipment all have local thermal effects. The right RTD build should account for those effects before the quote is finalized.

| Specification area     | Risk if ignored  |
|------------------------|--|
| Sheath material        | Corrosion, abrasion, process incompatibility, early failure  |
| Immersion and mounting | Poor thermal contact, slow response, measurement bias        |
| Leadwire temperature   | Insulation failure, intermittent signals, field replacement  |
| Moisture and sealing   | Drift, shorts, failed insulation resistance checks           |
| Calibration points     | Unclear acceptance criteria at actual operating temperatures |



NOAA shield documentation includes this interior image of the aspirated shield sampling chamber. The source document explains the role of fan aspiration, shielding, and monitored fan operation in the air-temperature measurement system.

## What To Specify Before An RTD RFQ

A useful RFQ does more than identify an ohm value. It describes the measurement, the installation, and the consequences of getting the measurement wrong. The checklist below gives engineers and buyers a practical starting point.

| Question   | Why it matters   | What Thermometrics can review  |
|--|--|--|
| What is the operating temperature range at the sensing tip and at the lead exit? | Element, potting, insulation, leadwire, and transition materials may have different limits.                          | RTD class, leadwire jacket, transition construction, and calibration points. |
| What medium or surface is being measured?  | Air, liquid, metal, bearing, pipe, gas stream, and process media create different response and durability issues.    | Sheath alloy, diameter, mounting style, thermowell or protective covering.   |
| How is the sensor mounted?   | Immersion length, spring loading, clamp-on contact, fittings, and head style affect accuracy and serviceability.     | Fittings, heads, bend radius, strain relief, and installation geometry.      |
| What documentation is required?  | Quality teams may need material traceability, calibration data, certificates, or controlled drawings.                | Calibration, inspection records, certificates, and drawing control.          |
| What happens if the reading is wrong?  | Criticality changes the sourcing decision. Some jobs justify redundancy, tighter tolerance, or higher documentation. | Application review, alternate builds, spares, and replacement planning.      |

### FOR ENGINEERS

Use the RFQ to define the measurement envelope. The more clearly the application is described, the easier it is to protect response time, stability, and service life.

### FOR BUYERS

Ask what is controlled beyond price and lead time: material, tolerance, documentation, calibration, and substitution rules.

## Where This Thinking Applies



Measurement confidence depends on build details and documentation, not resistance value alone.

NOAA's USCRN is an environmental monitoring example, but the same discipline applies wherever temperature data affects decisions, cost, or risk.

- Industrial machinery and rotating equipment
- Bearing RTDs and bearing thermocouples
- Heat treat, ovens, furnaces, and thermal processing
- Energy, power, and process equipment
- Aerospace, defense, and qualification testing
- Pharma, biotech, food, and validated environments
- Environmental and remote monitoring systems
- OEM instrumentation and packaged sensor assemblies

**The wrong sensor does not always fail immediately. Sometimes it quietly teaches the system to trust bad data.**

That is why the application review matters before the purchase order.

### APPLICABLE QUALITY SUPPORT

Thermometrics supports documentation-driven sensor programs where the quality record matters as much as the build.

- AS9100 and ISO 9001-aligned production controls
- NIST-traceable calibration workflows and reporting
- Material traceability, lot control, and dimensional inspection where required
- Hazardous-area certifications may apply to specific bearing-sensor configurations, including ATEX, IECEx, UKEX, NRTL, and CSA requirements

## Review The Application Before You Lock The Spec

Thermometrics helps engineering and procurement teams turn temperature range, environment, mounting, leadwire exposure, documentation, and quote requirements into a build that fits the real application.

[DISCUSS APPLICATION](#)[REQUEST QUOTE](#)[VIEW RTDS](#)



## References And Source Notes

- [1] NOAA National Centers for Environmental Information, U.S. Climate Reference Network Program Overview. <https://www.ncei.noaa.gov/access/crn/programoverview.html>
- [2] NOAA National Centers for Environmental Information, USCRN Station Instruments. <https://www.ncei.noaa.gov/access/crn/instruments.html>
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- [9] NOAA National Centers for Environmental Information, CA Santa Barbara 11 W Sensor Data. <https://www.ncei.noaa.gov/access/crn/sensors.htm?siteId=1529>

### USE NOTE

This white paper uses public NOAA documentation as an application reference. It does not imply NOAA sponsorship, approval, endorsement, or current procurement status. Thermometrics Corporation will confirm applicable specifications, standards, materials, tolerance classes, calibration requirements, and documentation requirements at the time of quotation or order review.

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