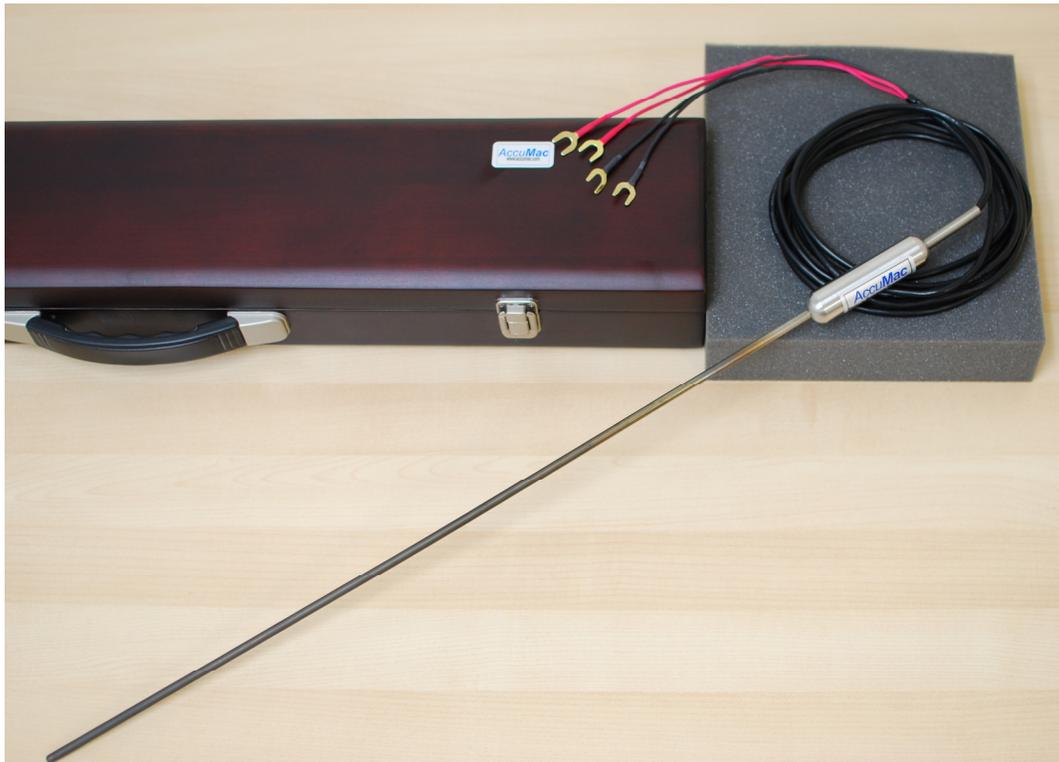


AM1880 Standard Platinum Resistance Thermometer User's Guide



AccuMac

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Before you start ---- Please read to avoid possible warranty invalidation!

- ❖ **Before unpacking:** Report any damages caused by transportation right away!

- ❖ **Warnings:** Follow these guidelines to avoid personal injury.
 1. Only use this instrument in the manufacture specified temperature range.
 2. The handle of this instrument can become hot when it is used to measure high temperatures for extended periods of time.
 3. DO NOT submerge SPRT handle when taking measurement.
 4. DO NOT use this instrument to measure the temperature of any hazardous live component.
 5. Follow all other safety guidelines listed in this user's guide.

- ❖ **Cautions:** Follow these guidelines to avoid possible damage to the instrument.
 1. Avoid mechanical shocks. DO NOT drop or slam the probe in any way. This will cause damage to the probe internally and affect its calibration and accuracy. Do NOT use this SPRT in an environment where there is vibration and mechanical shock.
 2. Read Section entitled "Care and Handling Guidelines" before removing the SPRT from the shipping box. Incorrect handling can damage the SPRT and void the warranty.
 3. Store the SPRT with its carrying case in a designated place.
 4. Keep the shipping container in case to return the SPRT. Incorrect packaging of the SPRT for shipment can cause irreparable damage.
 5. Calibration Equipment should only be used by Trained Personnel.

1 Introduction

1.1 Main Application

AM1880 Standard Platinum Resistance Thermometers (SPRT) interpolates temperature in the range from -200°C to 670°C on the International Temperature Scale of 1990 (ITS-90). It is designed as a primary or secondary standard thermometer to calibrate other thermometers and to measure temperature precisely in primary and secondary laboratories.

1.2 Main Features

- Bird-Cage Design - Improved Resistance to Mechanical Shock
- Platinum Capsule - High Temperature Contamination Protection
- Metal Sheath - For Harsh Environments
- Temperature Range: From -200°C To 670°C
- 5.56 mm Diameter - Faster Responses

1.3 Calibrations

As a temperature standard, each AM1880 SPRT must be calibrated. It is highly recommended that the calibration is traceable to a recognized national standards laboratory.

Manufacturer recommends calibration interval to be one year. In between annual calibrations, user can check the drift rate by comparing the Rtpw value against the last calibration results. Refer to specifications section for normal drift rate.

2 Specifications and Construction

2.1 Specifications

Temperature Range	-200 °C to 670 °C
R_{tpw}	Nominal 25.5 Ω
Resistance Ratio	W(Ga) ≥ 1.11807 W(Hg) ≤ 0.844235
Drift at 0.01 °C*	< 0.006 °C/year, < 0.003 °C/year typical
Repeatability	< 0.001 °C
Thermal Shock	< 0.001 °C after 10 times thermal cycles from minimum to maximum temperatures
Self-heating	< 0.0015 °C at 1 mA current
Measurement Current	1 mA
Sensor Length	42 mm
Insulation Resistance	> 1000 MΩ at room temperature
Sheath Material	Inconel™
Dimension	5.56 mm (OD) X 500 mm (L)
External Leads	Insulated copper wire, 4 leads, 2.5 meters
Termination	Gold-plated Spade
Handle Dimension	21 mm (OD) X 80 mm (L)
Optional Calibration	NVLAP/ISO17025 accredited calibration and data available per request
Accessories	Carrying Case included

*Long-term drift rate is for reference only. It could be affected by such facts as handling, application, and maintenance, etc.

2.2 Construction

As illustrated in Figure 1 below, AM1880 construction consists of a 500 mm long Inconel sheath, handle assembly and 2.5 meters of external cable. Inside the sheath, a platinum capsule houses the 42 mm sensing element to minimize high temperature contaminations. The platinum lead wires connecting sensing element and handle assembly are insulated by multiple single-bore ceramic tubes and 4-bore ceramic insulation disks. The sheath is hermetically sealed inside the handle assembly.

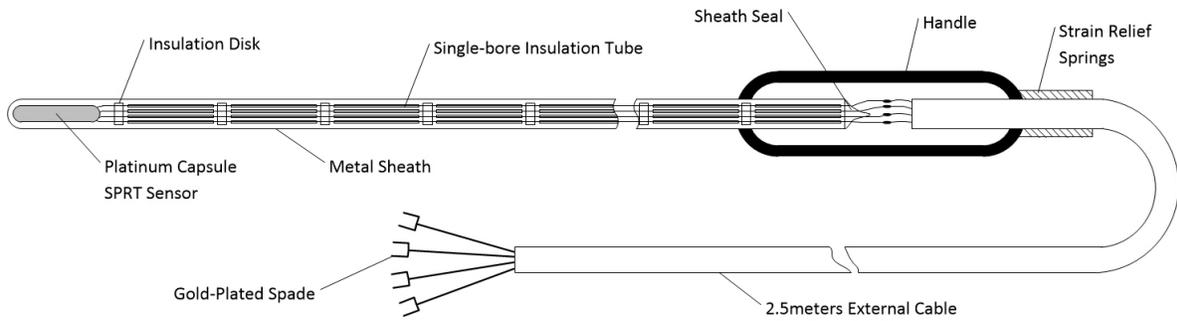


Figure 1. AM1880 Construction Chart

Inside the platinum capsule a ceramic tube is used to house the sensing element, which is comprised of a high purity platinum wire, wound strain-free through multiple cylindrical ceramic tubes. See Figure 2 below.

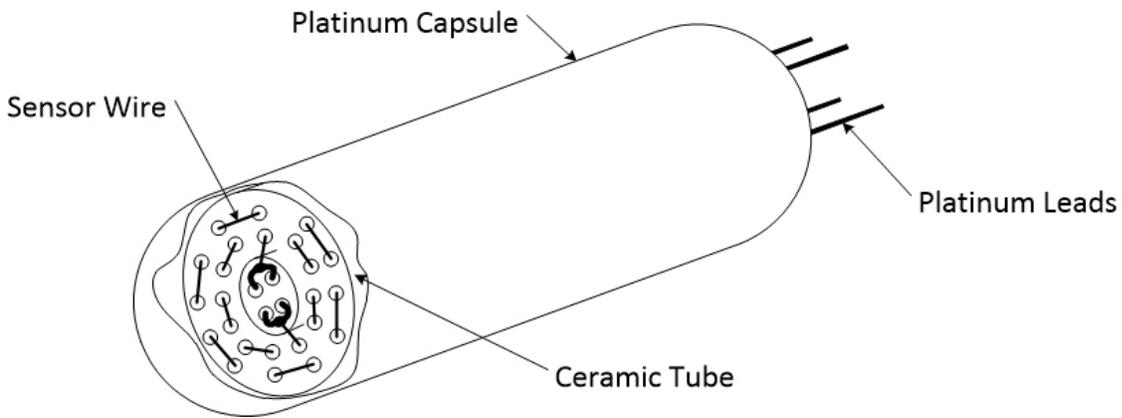


Figure 2. AM1880 Sensing Element

3 General Operations

3.1 Connecting to a readout device

Use the four-wire external cable of AM1880 to connect to a readout device. Four lead wires are used to cancel lead wire resistance. The lead wires can be distinguished by insulation colors as illustrated in Figure 3.



Figure 3. Circuit Schematic

3.2 Drive Current

AccuMac recommends 1mA as drive current to ensure the best measurement.

3.3 Stability of Readings

To achieve the best accuracy, allow sufficient time for SPRT to stabilize before taking the readings.

3.4 Immersion Requirements

Stem effect can cause measurement errors due to heat lost or gained by the sensing element through the thermometer stem. To minimize the error, appropriate immersion depths are required. A practical way to determine the minimum immersion depths is to change the depth gradually until the readings have significant changes after stabilization.

Do not submerge SPRT handle when taking measurement.

3.5 Thermal EMF

Each AccuMac SPRT has gone through an annealing process and stability test to minimize the thermal EMF, which is caused by either impurities of sensing element or temperature differentials at lead wires connection point.

The calibration equipment and readout device should be located in an environment with low radio frequency, magnetic or electrical interference.

3.6 Over Heating

The sensing element together with its platinum capsule of this SPRT is sealed inside an Inconel™ sheath to ensure the best stability and repeatability. The seal can be breached if the SPRT is over heated for an extended period of time.

4 Care and Handling Guidelines

1. DO NOT subject the SPRT to any physical shocks and vibrations.
 - a. When not using the SPRT, keep it in a place that's not prone to drop, slam, bang, vibration or other strong physical contacts. Use a protective box or a carrying case whenever possible.
 - b. When shipping the SPRT, use protective box and other protective packaging materials to minimize mechanical shocks as much as possible.
 - c. When using dry blocks, make sure the well diameter is appropriate to allow the SPRT move up and down smoothly.
 - d. Calibration equipment and readout device should be placed at an environment with minimal vibrations.

2. DO NOT subject the SPRT to any contaminations.
 - a. Keep the SPRT as clean as possible. Avoid contaminations as much as possible.
 - b. Clean the metal sheath with alcohol and dry it thoroughly.

3. DO NOT over heat.
 - a. Do not use SPRT above the manufacturer specified temperature range.
 - b. Do not expose the SPRT handle and lead wires to temperature above manufacturer specified range.

5 Troubleshooting

5.1 Troubleshooting

If the SPRT functions abnormally, it could be caused by several possible problem conditions that are described in this section. Try the solutions recommended and if the problems are still not solved, contact manufacture for warranty or repair service. Be sure to have the model number and serial number of your SPRT available.

5.2 Problem Causes and Solutions

- a. R_0/R_{tpw} becomes higher significantly. This is likely caused by mechanical shocks. The SPRT should be annealed to release the stress of platinum wires and to recover R_0/R_{tpw} value. Measure R_0/R_{tpw} of the SPRT after annealing to verify.
- b. R_0/R_{tpw} unstable during the measurement. This is likely caused either by bad connections or sensor coils short. Check the connections first and if the connections are good, the SPRT may be damaged.

6 Limited Warranty & Limitation of Liability

Each product from AccuMac Corporation is warranted to be free from defects in material and workmanship under normal use and service.

The warranty period is 1 year for the Platinum Resistance Thermometer. The warranty period begins on the date of the shipment. Parts, product repairs, and services are warranted for 90 days. The warranty extends only to the original buyer or end-user customer of an AccuMac authorized reseller. The warranty will not be extended to products that have been misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact AccuMac Corporation at:

90 N William Dillard Drive C-107

Gilbert, AZ 85233

USA

Tel: (480) 634-0603

Email: sales@accumac.com