AM1760/1762 Secondary Standard Platinum Resistance Thermometer User's Guide

AccuMac

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Before you start ---- Warnings & Cautions

❖ **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 PRT 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.
2. Read Section entitled "Care and Handling Guidelines" before removing the PRT from the shipping box. Incorrect handling can damage the PRT and void the warranty.
3. Keep the shipping container in case it is necessary to ship the PRT. Incorrect packaging of the PRT for shipment can cause irreparable damage.
4. Calibration equipment should only be used by trained personnel.

1 Introduction

1.1 Main Application

AM1760/1762 Secondary Standard Platinum Resistance Thermometer (SPRT) interpolates temperature in the range from -200 °C to 670 °C on the International Temperature Scale of 1990 (ITS-90). It works together with a readout device to measure temperature or change of temperature. It is designed as a secondary standard thermometer to calibrate other thermometers and to measure temperature precisely in metrology labs.

1.2 Main Features

- High accuracy: ±0.006 ºC at 0.01 °C
- Temperature range: : -200 °C to 670 °C
- Rtpw Drift < 4 mK after 100 hours at 661 °C

1.3 Calibrations

As a temperature reference standard, each SPRT must be calibrated. Manufacturer recommends calibration interval to be one year. In between annual calibrations, user can check the drift rate by comparing Rtpw against the last calibration results. Refer to specifications section for normal drift rate.

2 Specifications

2.1 Specifications

Temperature Range	-200 °C to 670 °C
Resistance at 0 °C	1760 - Nominal 100 Ω 1762 – Nominal 25 Ω
Temperature Coefficient	0.003925 Ω/ Ω/°C
Accuracy	±0.007 °C at -196 °C ±0.006 °C at 0.01 °C ±0.015 °C at 420 °C ±0.025 °C at 661 °C
Drift*	±0.004 °C at TPW after 100 hours at 661 °C
Short Term Stability	±0.002 °C
Thermal Shock	±0.002 °C after 10 times thermal cycles from minimum to maximum temperatures
Self-heating	0.0015 °C at 1 mA current
Response Time	9 seconds for 63% response to step change in water moving at 3 feet per second
Measurement Current	1 mA
Sensor Length	42 mm
Sensor Location	5 mm from tip
Insulation Resistance	>1000 MΩ at room temperature
Sheath Material	Inconel[tm]
Dimension	1760/1762-12: 0.25 inch X 12 inch (6.35 mm X 305 mm) 1760/1762-20: 0.25inch X 20 inch (6.35 mm X 500 mm)
External Leads	Teflon[tm] – insulated copper wire, 4 leads, 2.5 meters
Handle Dimension	15 mm (OD) X 65 mm (L)
Handle Temperature Range**	-50 °C to 180 °C
Optional Calibration	NIST traceable calibration and data available per request: Ordering # 5007

*Long-term drift rate is for reference only. It could be affected by such facts as handling, application, and maintenance, etc.
**Handle temperature outside this range will cause damage to the probe.

3 General Operations

3.1 Connecting to the readout device

The AM1760/1762 is equipped with a four-wire cable (see Figure 1). Four lead wires are used to cancel lead wire resistance. For best results, the readout device should be equipped to handle four-terminal resistors. The lead wires can be distinguished by insulation colors. Lead wire pairs attached to each end of the sensor are identified by red/black and white/blue insulation.

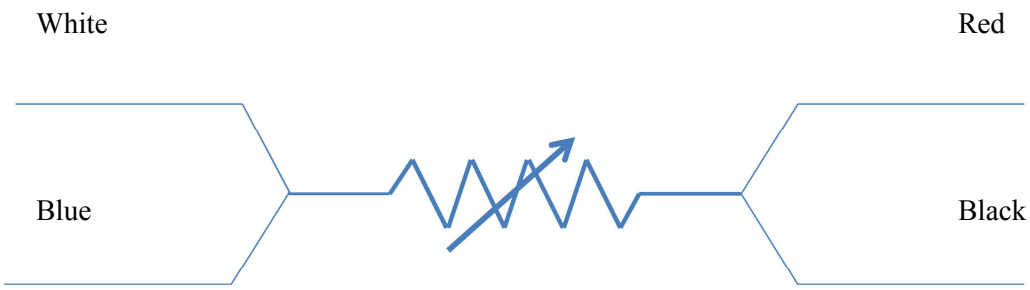

Figure1

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 PRT 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.

3.6 Over Heating

The sensing element of AM1760/1762 SPRT is sealed inside an Inconel^{tm} 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 PRT to any physical shocks and vibrations.
    a. When not using the PRT, 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 PRT, 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 PRT move up and down smoothly.

2. DO NOT subject the PRT to any contaminations.
    a. Keep the PRT as clean as possible. Avoid contaminations as much as possible.

3. DO NOT over heat.
    a. Do not use PRT above the manufacture specified temperature range.
    b. Do not expose the PRT handle and lead wires to extreme temperatures.

5 Troubleshooting

5.1 Troubleshooting

If the PRT 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 PRT available.

5.2 Problem Causes and Solutions

a. R0/Rtpw becomes higher significantly. This is likely caused by mechanical shocks. The PRT should be annealed to release the stress of platinum wires and to recover R0/Rtpw value. Measure R0/Rtpw of the PRT after annealing to verify.

b. R0/Rtpw 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 PRT may be damaged.

6 Limited Warranty & Limitation of Liability

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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 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:

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