RTD 100 Ohm Installation Manual

Resistance Temperature Detectors Assemblies, together with their accessories, are sensitive instruments which must, be handled carefully. They contain, even if not visible from the outside, *glass* and or *ceramic* parts which are susceptible to damage. Therefore, always handle them with care.

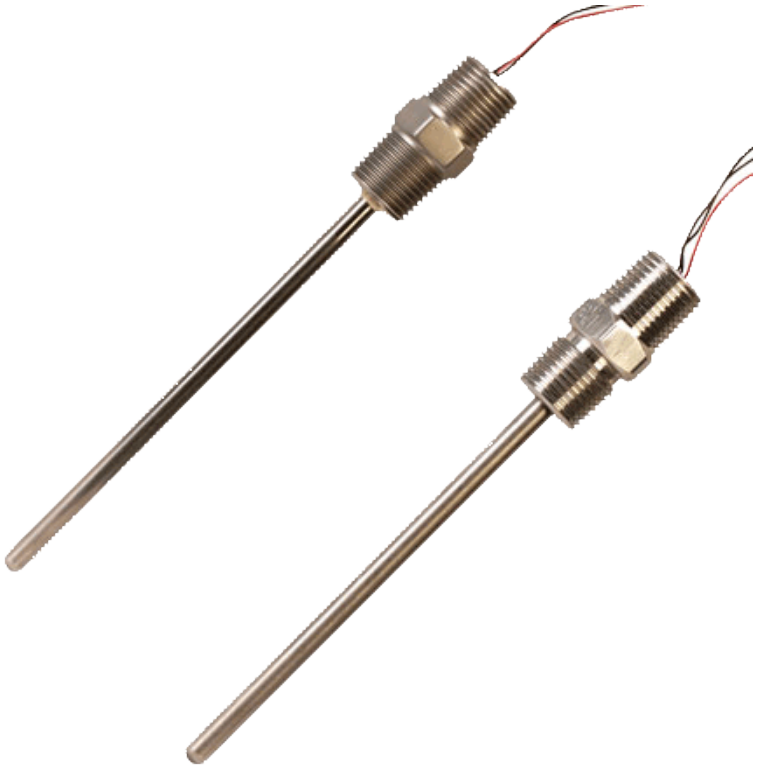


TABLE OF CONTENTS

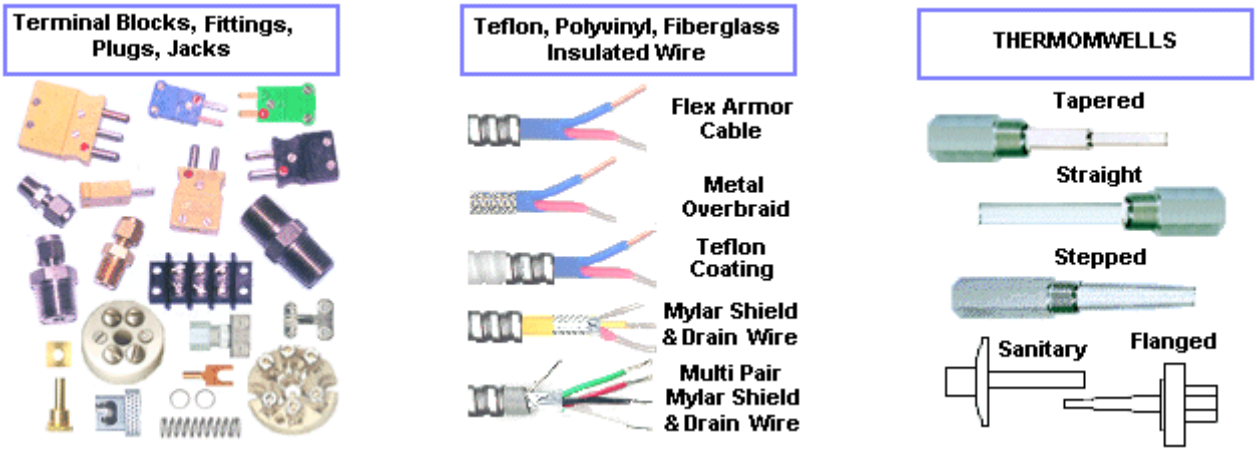
1.0 Introduction 3

2.0 Specifications 3

3.0 Installation 4

4.0 Repair and Maintenance . . . . . .5 - 7

Thermometrics manufactures and stocks a variety of products to meet your temperature measurement requirements



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1.0 Introduction

Thermometrics Corporation Resistance Temperature Detectors (RTD's) are manufactured to conform to;

American (.00385), European (.00385), Japanese (.003916), Balco (.00518,) Copper (.00427), or Nickel (.00672) temperature coefficients. Temperature sensor types include 10, 100,120, 500 and 1000 ohm instruments.

2.0 Specifications

STANDARD SPECIFICATIONS FOR THERMOMETRICS RTD's

Unless otherwise specified, Resistance Temperature Detectors conform to the following specifications:

- Platinum 100 ohm ± 0.12% @ 0°C (per IEC-751, Class B Accuracy).
- Temperature Coefficient = .00385 (per IEC-751 and ASTM E-1137).
- Temperature Range: 0 to 250°C.
- 3-Wire configuration: 22 AWG Ag Coated Cu Stranded.
- Teflon Insulation.
- Lead length = 12" ± ½" .
- Lead wire ends stripped and tinned approximately ½" long.
- Stainless steel sheath; 0.25" O.D. +.004" / -0.00" per ASTM A632.
- Sheath Length = 12" long ± 0.10".
- Sheath will be filled with MgO powder and vibro-compacted.
- Lead egress will be epoxy sealed to inhibit the intrusion of moisture.
- Each probe will be etched with lot number to provide traceability.
- Repeatability / Stability better than ± 0.01°C / year *.
- Response time: Approximately 63% of thermal response within 13 seconds when
- immersed from 20°C air into 50°C water flowing at 0.2 m/sec.

Changes can be made to;

- temperature range,
- nominal resistance at 0°C,
- accuracy, (DIN Class A or B)
- wiring configuration,
- sheath material,
- sheath diameter,
- sheath length,
- wire material,
- lead length,
- a variety of fittings are also available.

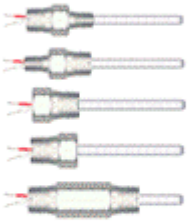
FLEX ARMOR SENSORS



BAYONET SENSORS



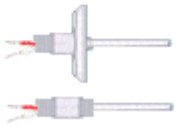
FIXED FITTING SENSORS



WELD PAD SENSORS



SANITARY SENSORS



COIL CORD SENSORS



ENGINE SENSORS



Explosion Proof Head conforms to the following;

Complies with NEC/CED:
Class 1, Division 1 & 2, Groups C, D, Explosion Poof
Class II, Division 1, Groups E, F, G, Dust Ignition Proof
Class II, Division 2, Groups F, G, Rain Tight
Class III, Wet Locations
UL Standard 886, ANSI Standard C33.27, CSA Standard C22.2 No 30
NEMA /EEMAC 3, 4
Design changes may affect performance specifications.
Probe must be kept between 0°C and +100°C, and cannot be subjected to fast thermal quench or chemical contamination.

Thermometrics manufactures a wide variety of sensors for all applications. Examples can be viewed on our web site at the following url; **http://www.thermometricscorp.com/sensorpictures.html**

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3.0 Installation

Thermometrics supplies complete RTD's and Thermowell Assemblies ready for immediate use. These should be installed, in the medium whose temperature is to be measured, to such a depth that the heat transfer along the assembly, taking heat away from the source, is kept to a minimum. An immersion of the order 6 to 15 times the diameter of the assembly thermowell or pocket is recommended.

However, in the case of installations where only a small depth of immersion is possible, at least 1 to 1 1/2 times the length of the resistance element winding should be immersed. In pipes of small diameter this can often only be achieved by installing the assembly at an angle or bend. In such cases the unit should always be directed against the fluid flow.

If the assembly has a ceramic outer protecting tube, this should be protected against impact with other solids in order to avoid mechanical breakage and or excessive mechanical stresses.

For all assemblies, vertical installation is to be preferred, especially for long assemblies, in order to avoid sagging of the metal or ceramic protecting tubes.

Flame contact should be avoided in all cases.

Ceramic protecting tubes should always be heated up slowly, preferably being installed with the temperature source cold so that both are heated up together. If this is not possible then ceramic protecting tubes must be pre-heated before installation in order to avoid damage by thermal shock.

Connection head temperatures should never exceed 200°C.

Assemblies will always be subjected to wear which will depend upon the field conditions and their handling.

Resistance Temperature Detector Connecting Leads.

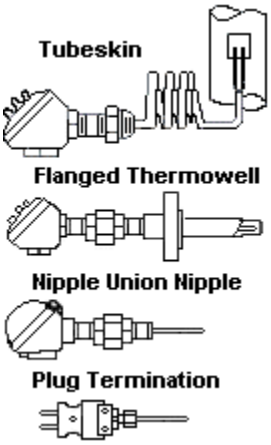
Connecting leads linking RTD's to the measuring instrument should be installed in accordance with the National Standards for electric cables relative to the country where the equipment is in use. Copper leads are recommended.

Special care should be taken on installation to minimize contact resistance, (acid free soldering), as the voltage present in resistance thermometer circuits is considerably smaller than normal line voltage and therefore will not penetrate oxide layers at bad connection points.

Poor contacts and insulation faults will simulate temperatures above or below the true value. Also, leads should not be run near to power lines.

In some cases where highly sensitive instruments are in use it will probably be necessary to utilize screened and twisted connecting leads in order to avoid pick-up.

Cable runs should preferably not be near to other electric cables in order to avoid induction problems. Where such difficulties are likely to arise, screened and twisted cable should be used.





Field Adjustable
RTD Sensors
Sheath Length Adjustment

1) Adjust the tubing cutter for a slight degree of cutting action.
2) Pull the lead wires taunt.
3) Turn the tubing cutter around the sheath. Do not cut fully through the sheath and use caution not to cut into the lead wires.
4) Bend the sheath back and forth until the sheath breaks off.
5) Use a small file to remove burrs from inside of the tubing.
6) Put the plastic grommet on the new end of the sheath.



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4.0 Repair and Maintenance

All assemblies should be checked at regular intervals to assess the level of erosion, corrosion or other possible damage to the Thermometer sheath and Thermowell.

Cable runs should also be examined along their entire lengths from time to time to check that no insulation defects are forming and that dampness is not affecting the insulation.

It is recommended that thermometers are calibrated on an annual basis. The calibration should cover the temperatures seen in the process.

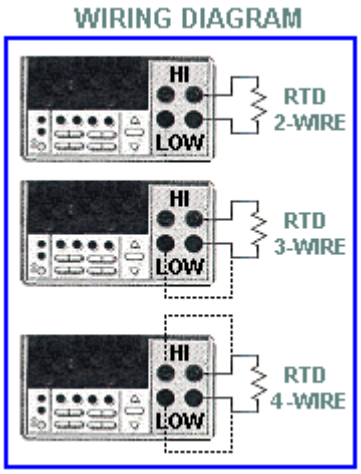
Maintenance Checks

The following procedure can be used to check the operation of the sensors;

1) Room temperature resistance testing. Each sensor with the same size and configuration shall indicate the same resistance measurement within +/- 3 ohms at room temperature. At 23°C the expected indication is 108.96Ω, at 24°C the expected indication is 109.35Ω, at 25°C the expected indication is 109.73Ω, at 26°C the expected indication is 110.12Ω, at 27°C the expected indication is 110.51Ω, Room temperature testing equipment is a Digital Multimeter with an accuracy of +/- .1% up to 200 KOhms.

2) Insulation resistance testing. Each sensor shall have an insulation resistance 100 megohms at 50 VDC at room temperature. Insulation resistance testing equipment is a Megohmeter with an accuracy of +/-3% Ohms and a test voltage potential of 50 to 500 VDC. Sensors whose insulation is inadequate or contaminated by moisture or by certain other impurities may under go large calibration changes or may fail catastrophically when they are heated to high temperatures.

3) Calibration testing. Sensors shall indicate within the tolerances specified in accordance with industry accepted standards. Calibration testing equipment is a calibration bath, or temperature furnace with a N.I.S.T. traceable SPRT or Type S thermocouple. This test will determine the accuracy of the measured temperature using your sensor.



Compression Fittings

Compression fittings are composed of four precision machined Stainless Steel parts;
1) body,
2) front ferrule,
3) back ferrule,
4) nut.



A leak tight seal is achieved through the simple action of tightening the nut against the body. This provides the axial thrust required to compress the captively held ferrules against the outside diameter of the tubing. The front ferrule, as it is urged forward against the tapered area of the body is forced inward gripping and subsequently sealing the leading edge tightly onto tubing. Simultaneously the back ferrule, dove tailed directly behind the front ferrule, swages beneath its trailing edge affording the desired "coining" action and mechanical connection of tubing and fitting. It is this interaction of ferrules which provides the leak tight sealing capabilities under a wide variety of application variables. Compression fittings are supplied unassembled to allow customers to adjust the sensor to the proper depth prior to tightening the fitting. To secure the fitting, tightening the nut as much as possible by hand. This is referred to as finger tight. Secure the fitting body by holding its hex with a wrench and tighten the nut with another wrench an additional 3/4 turn for sizes 1/16" through 3/16" and 1 1/4 turn for sizes 1/4" through 1". Tubing is to be free of scratches or surface abrasions. Prior to pressuring any assembly, verify all fittings and plugs are tightened to manufactures recommended procedures. Use leak detection fluid to verify leak proof seal has been achieved.

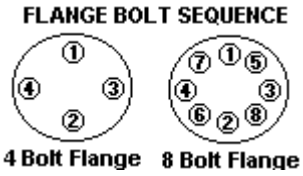
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Fault	Possible Cause	Remedy
Response time too long.	Assembly may be installed in the shadow of other equipment.	Select a different point for installation.
	Depth of immersion may be too low.	Immersion depth should be 6 to 15 times the diameter of the Thermowell or Assembly Pocket.
	Thermowell or Pocket may be too large in bore diameter and/or outside diameter.	Use smallest, technically safe, outside diameter for Thermowell or Pocket. Inset I.D. should have minimum clearance in Thermowell or Pocket bore. If the clearance is large, consideration should be given to filling bore with contact agent, i.e. oils, silicon grease for example.
	Thermowell or Pocket may have become coated with process deposits.	Remove assembly from process and clean. Also, consider changing point of installation to safeguard against recurrence.
Thermometer signal periodically interrupted.	Vibration.	Check that spring loading of thermometer is operating correctly, i.e. that thermometer is 'bottomed' in Thermowell or Pocket. Consider shorter assembly. Consider re-sitting assembly.
Badly corroded Thermowell or Pocket.	Wrong selection of Thermowell or Pocket material for application.	Check the process medium and the Thermowell or Pocket material for compatibility.
Temperature indicates changes gradually over period of days or months.	Suspect chemical influences on the sensor, especially if running temperature is high.	Oxygen, Sulphur, Silicon, Hydrocarbons, etc., all change the chemical structure of the sensor materials. Examine sensor at regular intervals and determine whether to change at set intervals to avoid problem or consider changed design of assembly - purge type etc.
Resistance Thermometer reads high although sensor known to be correct.	Cable resistance high and not compensated.	If connection system is 2-wire, consider changing to wires of greater cross-section. Alternatively change to 3 or 4 wire connection system. The latter may require change of instrument.
Signal from Thermometer breaks down.	Electrical / Magnetic pick-up along connecting leads to instrument.	**(a)** Ensure all compensating leads/wiring between sensor assembly and instrument are screened with wire braiding or metal foil. **(b)** Screening should be earthed at one point only. **(c)** If magnetic pick-up is the problem, ensure the connecting cable cores are twisted / intertwined along their length.
	Insulation to earth break-down.	Check the thermometer insulation to earth as dampness may have penetrated the seal. This can sometimes be cured by drying out in an oven and resealing. Alternatively, replace the measuring inset. Check if temperature is too high for rating of thermometer.

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Flange Bolting Procedures



1) Place the gasket on the flange surface to be sealed.
2) Bring the opposing flange into contact with the gasket.
3) Clean the bolts and lubricate them with a quality lubricant, such as an oil and graphite mixture.
4) Place the bolts into the bolt holes.
5) Finger-tighten the nuts.
6) Follow the bolting sequence in the diagrams above.
7) During the initial tightening sequence, do not tighten any bolts more than 30% of the recommended bolt stress. Doing so will cause cocking of the flange and the gasket will be crushed.
8) Upon reaching the recommended torque requirements, do a clockwise bolt-to-bolt torque check to make certain that the bolts have been stressed evenly.
9) Due to creep and stress relaxation, it is essential to pre-stress the bolts to ensure adequate stress load during operation.

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