



WORK INSTRUCTION

Inspection Procedure for Temperature Sensors

REVISION: 00

PROCEDURE NO.: WI-8.2.4.55

DATE EFFECTIVE: 07/28/17

Objective

This procedure to be used to inspect temperature sensor assemblies (thermocouples, RTD's) to ensure products shipped to customer is free of defects.

This procedure contains two sections:

- 1.) Mechanical and physical inspection
- 2.) Electrical inspection

1. Mechanical and Physical Inspection

1.1 Diameter inspection — Diameter of probe measured with a micrometer to be within ± 0.003 " of diameter specified per print. A measurement must be taken at tip of probe at welded area. Any specified tolerances on print must be met.

1.2 Probe length (rigid section of assembly) inspection — Probe length to be measured with a caliper or tape measure. Following tolerances must be met. Any specified tolerances on print must be met.

<u>Probe diameter</u>	<u>Tolerance up to 18"</u>	<u>Tolerance over 18"</u>
Up to .038"	$\pm 3/8$ "	$\pm 2\%$
.038" to .065"	$\pm 1/4$ "	$\pm 1\frac{1}{2}\%$
Over .065"	$\pm 3/16$ "	$\pm 1\%$

1.3 Flexible length (lead wire or armor cable) inspection — Lead wire length to be measured with a tape measure. Unless otherwise specified per print, following tolerances must be met.

<u>Lead wire length</u>	<u>Tolerance</u>
Up to 120"	-0, +6"
120" and over -	0, +5%

1.4 Appearance and workmanship. — Parts to be inspected visually for appearance and workmanship. Thermocouple sheath must be clean and free of nicks. Welded junction end of thermocouple must be round (unless otherwise specified per print) and uniform with no pinholes, weld cracks or discoloration.

2. Electrical Inspection

2-1 Thermocouple Continuity Test — Using a multimeter check for continuity between positive and negative leads. There is continuity when resistance between two leads is a small number (usually less than 15 ohms depending on lead length and wire gauge). For grounded junctions, repeat the procedure by connecting one of the test leads to one or both thermocouple wires and the other test lead to thermocouple sheath. There must be continuity between sheath and thermocouple wire.



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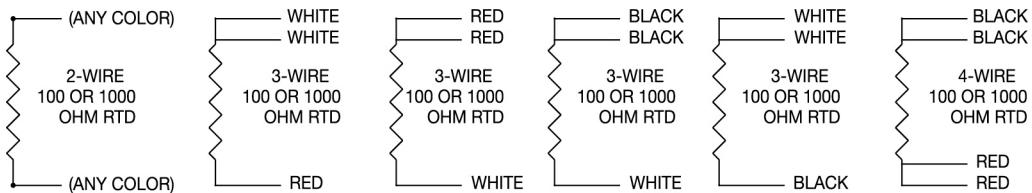
2-2 Thermocouple Polarity test — Unless otherwise specified per print, use the following guideline to check for polarity correctness. Using a multimeter set for millivolt reading, connect the positive lead to positive terminal, and negative lead to negative terminal on meter. Use following ANSI color code table to determine the polarity of leads.

CALIBRATION	ANSI STANDARDS		DIN STANDARDS		JIS STANDARDS	
	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE	POSITIVE	NEGATIVE
J	WHITE (MAGNETIC)	RED	RED (MAGNETIC)	BLUE	RED (MAGNETIC)	WHITE
K	YELLOW	RED (MAGNETIC)	RED	GREEN (MAGNETIC)	RED	WHITE (MAGNETIC)
T	BLUE	RED	RED	BROWN	RED	WHITE
E	PURPLE	RED	RED	BLACK	RED	WHITE
N	ORANGE	RED	RED	WHITE	RED	WHITE
R	BLACK	RED	RED	WHITE	RED	WHITE
S	BLACK	RED	RED	WHITE	RED	WHITE
B	BLACK	RED	RED	BLACK	RED	BLACK
C	WHITE	RED	NO STANDARDS		NO STANDARDS	

After connecting the leads, heat the junction of thermocouple using a torch or a heating block. Millivolt meter must indicate a positive voltage reading. If a negative voltage is recorded, parts to be rejected due to reverse wire connections or wrong PVC color-coding

2.3 RTD Resistance Test — To test a 2-wire RTD, check the resistance between the two wires (any color). The resistance at room temperature (25°C) should be approx. 110 ohms for a 100 ohm RTD and approx. 1100 ohms for a 1000 ohm RTD.
 To test a 3-wire RTD, check the resistance between one of the two same color wires and the single color wire. The resistance at room temperature (25°C) should be approx. 110 ohms for a 100 ohm RTD and approx. 1100 ohms for a 1000 ohm RTD. Check the resistance between the two same color wires and the resistance should be close to zero.
 To test a 4-wire RTD, check the resistance between any two different color wires and the resistance at room temperature (25°C) should be approx. 110 ohms for a 100 ohm RTD and approx. 1100 ohms for a 1000 ohm RTD. Check the resistance between any two same color wires and the resistance should be close to zero.

The following wiring diagram shows the possible RTD wire colors.



RTD WIRING DIAGRAMS



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2-4 Insulation Resistance Test (IR) for Thermocouples and RTD's: — This test to be performed on all ungrounded thermocouple junction thermocouples and RTD's. Using a MegOhm meter, connect the ground test lead of meter to thermocouple sheath and positive test lead to one or both of lead wires. Following minimum resistance requirements must be met.

<u>Diameter</u>	<u>Voltage</u>	<u>Resistance</u>
.062" or smaller	50	500 Meg
larger than .062"	500	500 Meg

REVISION HISTORY

REVISION LEVEL	DATE OF REVISION	SECTIONS	DESCRIPTION OF CHANGE
00	07/28/17	All	Initial release

AUTHORIZATION

POSITION	HELD BY	AUTHORIZATION SIGNATURE OR INITIALS
Prepared By: Product Engineering Manager	Ron Vafai	
Senior Management Representative/ Management Representative:	Abe Joseph	