

Bechtel Corporation

Your Order 8850-J-501-AC/C

Foxboro Order 70N-46993

THERMOCOUPLE INSTALLATION

General

The thermocouple is the temperature-sensitive element of the potentiometer circuit, and is located at the point where temperature is being measured. It is connected to the instrument with extension wires. In response to changes in the measured (or controlled) temperature, a greater or less E.M.F. is generated in direct proportion to the change in temperature of the thermocouple, thereby causing the instrument to indicate or record the temperature.

Thermocouple Installation

The thermocouple location must be carefully selected. Thermocouples must not be immersed, without the protection of a well or protection tube, in fluids or gases of a corrosive or erosive nature.

The thermocouple should extend into the medium whose temperature is being measured so that the measuring junction is subject to the actual temperature. Insufficient immersion may cause errors due to the conduction of heat to or away from the sensitive end of the thermocouple. A thermocouple with protection tube should be immersed in the heat zone to be measured to a depth of at least 4". Longer immersion is generally preferable; however, if the thermocouple passes through 6" or 8" of good insulating material, shorter immersion may prove to be satisfactory.

Platinum thermocouples with Flintex porcelain protection tubes can be installed vertically at temperatures up to 2800°F. When mounted horizontally, the practical allowable unsupported length of immersion varies inversely with the temperature. At 2600° F., the unsupported length should not exceed 6".

Most thermocouple assemblies are shipped completely assembled; however, parts for platinum thermocouple assemblies are generally packed separately in order to prevent breakage during shipment.

When two instruments are to read the same temperature, do not expect them to read alike if the thermocouples are in different locations — many times disagreement between instruments is remedied by installing the thermocouples in the same well.

Thermocouple Protection

Wells or protection tubes should be used for the following reasons:

1. To protect the thermocouple from erosion and corrosion, due to liquids or gases.
2. To protect the thermocouple from mechanical injury.
3. To protect the thermocouple at temperatures high enough to destroy its accuracy.
4. To make it convenient to remove the thermocouple from a location normally under pressure which cannot be relieved to atmosphere.

The connection head should not be subjected to temperatures in excess of about 400°F. In some cases it may be necessary to lengthen the protection tube in order to remove the head to a cooler location, thereby eliminating possible reference junction temperature errors.

Thermocouple Wiring

Extension wires, of the correct type for the particular thermocouple being employed, *must* be *used* in connecting the thermocouple to the instrument. In effect, they extend the thermocouple to the instrument binding posts, placing the cold or reference junction of each thermocouple at the instrument. Temperature variations at this cold junction are compensated for by a cold junction compensating coil located near the thermocouple binding posts on the instrument.

Where thermocouple connection heads are not supplied with short wires assembled to them, connect the extension wires directly into the connection head, following carefully the instructions on the instruction sheet describing the connection head. The positive wire (see color code on reverse side) must be connected to the positive side of the thermocouple and to the positive instrument binding post; and the negative wire is similarly connected to the negative side of the thermocouple and the negative instrument binding post. Be sure that the extension wires are the correct type to use with the thermocouple being employed by referring to the tag attached to the wires.

All connections throughout the thermocouple circuit must be tight, and all parts in contact must be clean before being joined together. Connections should be soldered and taped, or made with approved screw connectors. The wiring must be protected from moisture and mechanical injury. Wiring in conduit should preferably be rubber or polyvinyl plastic insulated and weatherproof, for all conduit pipe has a tendency to "sweat." Only first quality electrical and weatherproof insulation will prevent leakage between the wires and conduit wall.

Rubber insulated extension wires should not be exposed to temperatures in excess of approximately 175 F; plastic insulated, 220 F; asbestos insulated, 600 F; glass insulated, 1000 F.

COLOR CODES FOR EXTENSION WIRE INSULATIONS

Foxboro extension wires are furnished with insulations color-coded RED-NEGATIVE wires. The RED-NEGATIVE color code was first used in 1950 in accordance with industry standard practice.

RED-NEGATIVE COLOR CODE

For Thermocouples:	Positive	Negative
Copper-Constantan	Blue	Red
Iron-Constantan	White	Red
Chromel-Alumel	Green or Yellow	Red
Plat. Rhod.-Platinum	Black	Red

NUMBER OF DUPLEX WIRES IN CONDUIT

The approximate number of extension wires which may be run in conduit of a given size is as follows:

Wires		Conduit Size (inches)							
Insulation	Gauge	½	¾	1	1¼	1½	2	2½	3
Rubber and Weatherproof Braid	14	2	4	7	12	16	28	40	64
	16	3	5	9	16	22	36	52	80
Polyvinyl Plastic, Weatherproof Braid	14	3	5	9	16	22	36	52	80
	16	4	7	11	20	28	47	66	100
Polyvinyl Plastic, Lead Sheathed	14	1	1	1	3	5	7	10	20
	16	1	1	2	4	6	9	13	24
Asbestos, Twisted Pair	14	1	3	5	9	12	24	30	45
	16	1	3	6	10	14	26	34	50
Asbestos, Asbestos Braid	14	1	3	5	9	12	24	30	45
	16	1	3	6	10	14	26	34	50

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