



An OMEGA Technologies Company

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## **TX250 Series Two-Wire T/C Transmitter**



### WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **two (2) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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### RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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## 1.0 Introduction

### TX250 Series Thermocouple Input

The TX250 Series are non-isolated two-wire transmitters which convert the T/C thermoelectric voltage into a standardized load-independent, 4-20 mA, process current.

The TX250 Series are housed in metal enclosures and fit into NB1 connection heads. The transmitter's enclosure provides excellent RFI immunity.

The transmitter calibration is set by six dip-switches located behind the top cover. There are three basic models which cover the various T/C types. TX251 is for T/C types K, T and J; TX252 is for type E and TX253 is for type R and S.

Dip-switch arrays select the T/C type, and set the "Zero" course level and the "Span" course range.

Zero and Span trimmers provide the fine tuning calibration.

## 1.1 Specifications

Output Current:	4-20 mA, 28 mA, limited
Supply Voltage:	10-36 Vdc (24 Vdc recommended)
Supply Variation Effect:	<0.001%/1V change
Accuracy:	Better than 0.1% of span
Load Resistance:	$R_{max} (\Omega) = (V_{supply} - 10) / .02$
Temperature Stability:	<0.01% of span/1°C
Operating Temperature:	-20 to +70°C
Humidity:	5-95% relative, non condensed
Housing:	Die-cast zinc alloy

**Dimensions:** Diameter: 44mm (1.7"); Height: 32.5 mm (1.3") including the terminal block.

**Input:** TX251: thermocouple type K, T, J; TX252: thermocouple type E; TX253: thermocouple type R, S

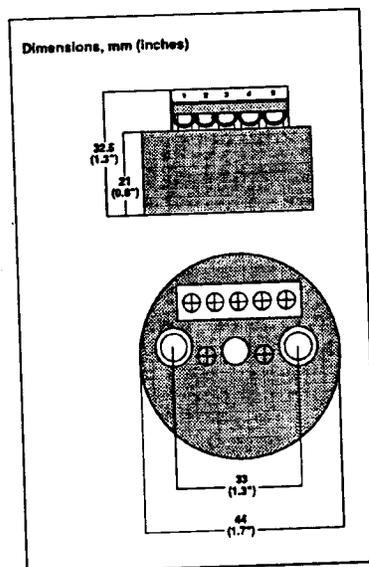
**Calibration:** Two "Zero" DIP switches, three "Span" DIP switches and two fine-tuning trimmers

**Cold Junction Error:** Typical  $\pm 0.7^{\circ}\text{C}$  for  $0.6^{\circ}\text{C}$  change (R & S) type  $\pm 3^{\circ}\text{C}$

**Linearity (refer to mV input):**  $< 0.08\%$  of span

NOTE: Transmitters are linear to the mV input from the thermocouple not to temperature.

Model No.	Input Type	Range and Span Table		
		Span Range	Minimum Span	Zero Offset Range
TX251	J	-100 to 750°C -148 to 1380°F	85°C 155°F	-100 to 50°C
	K	-100 to 1350°C -148 to 2440°F	105°C 190°F	-100 to 100°C
	T	-100 to 400°C -148 to 750°F	100°C 180°F	-100 to 100°C
TX252	E	-100 to 1000°C -148 to 1832°F	75°C 135°F	-100 to 30°C
TX253	R	0 to 1750°C 32 to 3180°F	600°C 1080°F	0 to 750°C
	S	0 to 1750°C 32 to 3180°F	600°C 1080°F	0 to 750°C

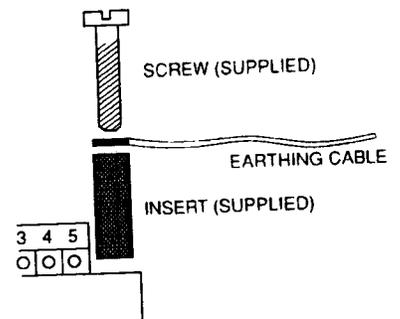


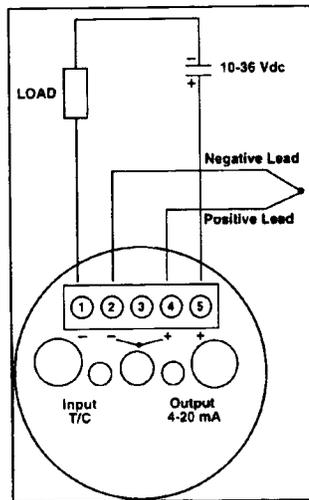
## 2.0 Dimensions & Mounting

**Caution:** The length of the cover screws is critical. Do not attempt to use longer screws as permanent damage will occur, thus voiding the warranty.

### Grounding (Earthing)

In cases when grounding the transmitter case is required, use the brass insert and fasten the ground lead to it, using the long screw supplied. The cover screws are not designed for this application.





### 3.0 Wiring

**NOTE:** These transmitters are not isolated, so if the output is grounded then care should be taken that the thermocouple is not grounded.

### 4.0 Calibration (Scaling) Instructions

#### TX251, TX252, TX253 Thermocouple Inputs

These units can be prescaled by OMEGA prior to shipment. If they have not been set up for a thermocouple and range by OMEGA they can be scaled in the field using the following procedure.

#### Calibration

To calibrate TCR-2 the limits must be defined. T<sub>min</sub>, often called T zero, is the temperature at which the transmitter output current is 4mA. T<sub>max</sub>, often called T span, is the temperature at which the transmitter output current is 20mA. The difference between T<sub>max</sub> and T<sub>min</sub> is defined as the Span of the transmitter.

An array of 6 DIP switches controls the transmitter coarse range. Set switches 1 & 2 according to the Zero (T<sub>min</sub>) table, switches 4 to 6 according to the Span table.

**NOTE:** "1" represents the switch-ON state.

If you are calibrating using an ice bath and millivolt source, find the millivolt values in a thermocouple reference table corresponding to the top and bottom of your temperature range. For example, for Type K 50 to 1000°C the millivolt input will be from 2.203 to 41.276 millivolts. If you are calibrating using a Thermocouple Calibrator/Simulator the above step is not necessary. This is because the output of the calibrator is given directly in units of temperature rather than in millivolts. In this example, the zero offset and span are within the allowable range.



Connect a T/C calibrator set to T<sub>min</sub> between terminals #2 and #4. Adjust the Zero trimmer to obtain an output current of 4.000mA. Next, set the calibrator to T<sub>max</sub> and then adjust the Span trimmer to obtain an output current of 20.000mA. Repeat this procedure until satisfactory results are achieved.

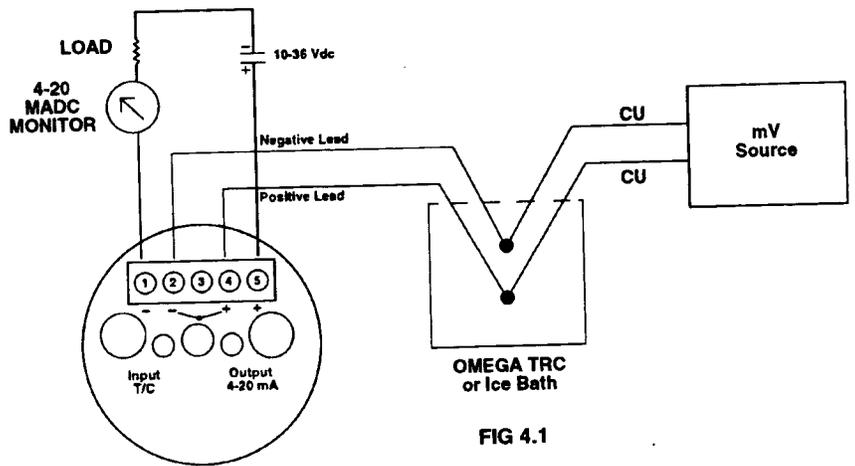
"Zero" Table					
SW1-SW2	K	J	T	E	R&S
00	-100..-27	-152..-88	-100..-28	-135..-84	-200..+100
01	-29..+31	-90..-38	-29..+31	-85..-40	+80..+360
10	+30..+86	-40..+8	+30..+84	-41..+2	+340..+59
11	+85..+143	+6..+54	+83..+133	0..+35	+570..+800
"Span" Table					
SW4-SW5-SW6	K	J	T	E	R&S
000	102..230	80..175	98..200	70..150	550..710
010					700..860
001	210..450	160..340	190..360	150..265	850..1160
011	400..850	300..620	340..400	265..475	1150..1560
111	750..1370	575..760		475..1000	1550..1750
Thermocouple Type Table					
SW3	TCR-2a		TCR-2b		TCR-2c
0	K,T		E		R,S
1	J				

Example: Range needed: T/C type K; T<sub>min</sub> = 50°C; T<sub>max</sub> = 1000°C

The Span is then 950°C; SW3 = 0 (K Type); From the above tables: 1001111

#### 4.1 Equipment Required

- Precision mV source, with 0.001 mV resolution and  $\pm 0.002$  mV accuracy or
- Precision DVM with  $\pm 0.002$  mV accuracy and an adjustable mV source with 0.001 mV resolution
- OMEGA TRC III Ice Point Reference (or stable ice bath)
- Temperature Reference Probe (OMEGA P/N: TRP-(\*))  
\*Thermocouple Type: J, K, T, E, R, S
- Thermocouple mV vs. temperature reference tables (refer to the OMEGA Temperature Measurement Handbook\*).



#### 4.2 Set-Up Equipment

To prepare the ice bath:

- a) Fill a glass beaker with crushed ice made from distilled water.
- b) Fill the beaker with enough distilled water so that the ice just becomes slush, but not enough to float the ice.
- c) Insert the reference thermocouple.

Figure 4-2 shows an alternate set-up. Here, a high precision thermocouple calibrator, such as the OMEGA Model CL511, replaces the DVM, ice bath, voltage source, etc.

The TX251, TX252 or TX253 is a multirange Thermocouple input transmitter. Behind the cover are located 6 DIP switches for T/C selection (SW3), coarse ranging, and the Zero & Span trimmers for fine tuning.

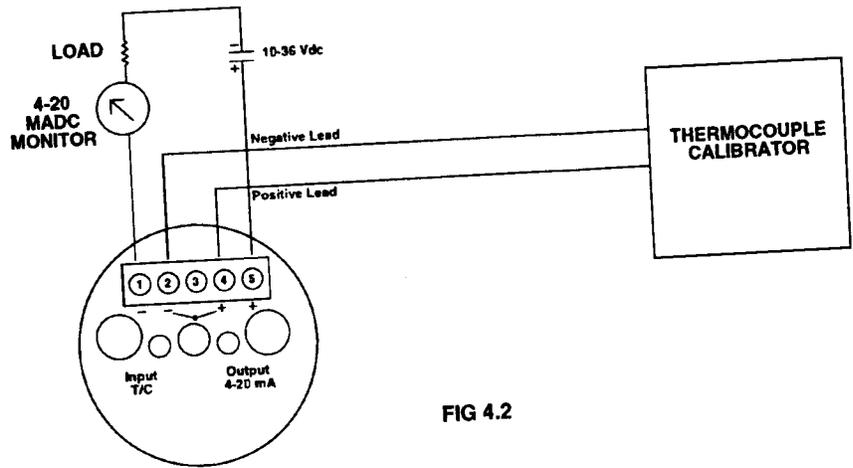


FIG 4.2



Notes



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