



MTX-J, K, T, E *4-20 milliampere* **MINI TEMPERATURE TRANSMITTERS**

11843ML-01

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SECTION 1 GETTING STARTED

1.1 Unpacking

Remove the packing list and verify that you have received all equipment. If you have any questions, contact the NEWPORT Customer Service Department at 1-800-NEWPORT (800-639-7678) or (714) 540-4914.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

Note: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing materials and carton in the event reshipment is necessary.

1.2 General Description

The MTX Series transmitter accepts thermocouple sensor types J, K, T, and E and will produce a standard 4-20 mA output signal proportional to that produced by its attached thermocouple millivolt input. The transmitter does NOT provide isolation between its input and the 4-20 mA output; therefore, an ungrounded thermocouple junction is suggested to prevent possible ground loops.

The transmitter provides cold reference junction compensation for the thermocouple types as well as amplification, common-mode rejection and controlling the current drawn from a 8-to-50 Vdc source to produce the 4-to-20 mA output

signal. As much as 800 ohms dropping resistance may be used in the power leads of the MTX-J, K, T, E when the unit is energized from a 24 Vdc source because of the small compliance voltage needed by the unit.

1.3 Available Ranges

As specified in Table 1-1, the MTX transmitter has 10 ranges. Depending upon the range, the transmitter can measure temperature span as narrow as 160°F or as wide as 1000°F. A multi-turn, top-accessible potentiometer provides fine span tuning. A second top-accessible, multi-turn potentiometer provides a zero adjustment which allows placement of the 4-mA output temperature within +/- 25% for Fahrenheit and +/- 10% for Celsius of nominal span (refer to Section 4.0, Calibrating the Transmitter, for more details).

1.3 Available Ranges (Continued)

Table 1-1. Range/Models

Range	Model			
	J	K	T	E
0 to 200°F	J01	K01	T01	E01
0 to 300°F	J02	K02	T02	E02
0 to 500°F	J03	K03	T03	E03
0 to 750°F	J04	K04	T04	E04
0 to 1000°F	J05	K05	N A	E05
-0 to 100°C	J06	K06	T06	E06
-0 to 150°C	J07	K07	T07	E07
-0 to 250°C	J08	K08	T08	E08
-0 to 400°C	J09	K09	T09	E09
-0 to 500°C	J10	K10	N A	E10

1.4 Ordering Guide

The model number describes the functionality of the transmitter.

Model		Temperature Range
MTX		
	J	
	K	
	T*	
	E	
	01	-0 to 200 °F
	02	-0 to 300 °F
	03	-0 to 500 °F
	04	-0 to 750 °F
	05	-0 to 1000 °F
	06	-0 to 100 °C
	07	-0 to 150 °C
	08	-0 to 250 °C
	09	-0 to 400 °C
	10	-0 to 500 °C
		Option:
	FS**	Factory Scaling

*0 to 1000°F (0 to 500°C) is not available for type T thermocouple.

**Factory Scaling available for additional charge. Consult factory.

To order additional transmitters, write MTX followed by the model letter and number. For example:

MTX-J01 = Transmitter with thermocouple type J and a temperature range of -0 to 200°F.

MTX-E09= Transmitter with thermocouple type E and a temperature range of -0 to 400°C

1.5 Shock Resistance

Lightweight MTX transmitter circuit boards are fabricated from rigid, shock resistant materials with the components soldered to the circuit board.

The MTX transmitter's small size permits mounting into thermowells or wall mounting in confined areas.

2.0 SAFETY CONSIDERATIONS

CAUTION: Do not expose the transmitter to rain or condensing moisture. Do not operate the transmitter in flammable or explosive atmosphere. As with any electronic instrument, you may encounter high voltage exposure when installing, calibrating or removing parts of the transmitter.

3.0 CONNECTING POWER AND SIGNAL INPUTS

- * Verify that the transmitter is connected for the correct power voltage rating.
- * The transmitter has no power-on switch, so it will be in operation as soon as you apply power.

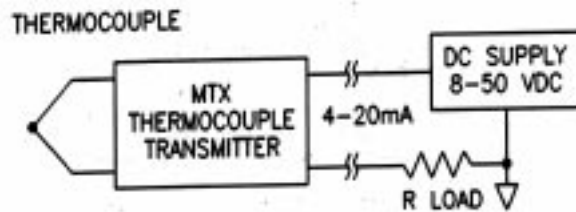


Figure 3-1. Power Input Setup

+PS and -PS screws accept 2 mm (13 gauge) or lighter wire. Input range is 8-50 Vdc.

Table 3-1. Screw-Terminal Pin Assignment

1	+ Thermocouple
2	- Thermocouple
3	N/C
4	+ Power/Signal Output
5	- Power/Signal Output

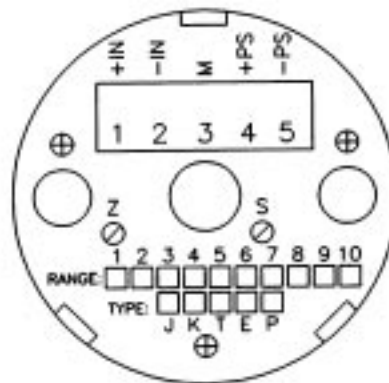


Figure 3-2. Pin Assignment

4.0 CALIBRATING THE TRANSMITTER

Calibration Setup:

To prepare the ice bath:

1. Fill a glass beaker with crushed ice made from distilled water.

2. Fill the beaker with enough distilled water so that the ice just become slush, but not enough to float the ice.
3. Insert the reference thermocouple.

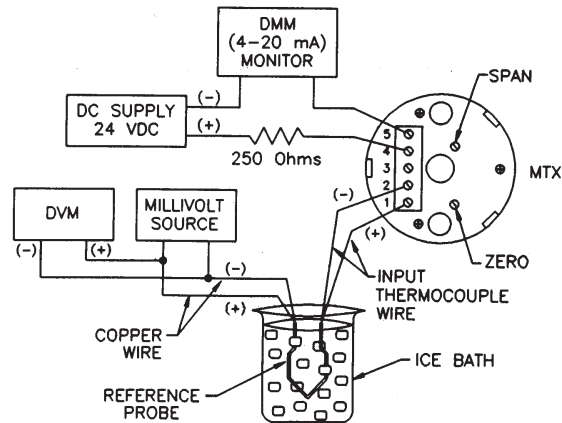


Figure 4-1. Calibration Setup Using a Millivolt Source

Figure 4-1. Calibration Setup Using a Millivolt Source

To calibrate the MTX transmitter, follow these steps (refer to Figure 4-1):

1. Locate the model number in Table 4-1 or 4-2 and set the millivolt source to the LO-IN value.
2. Adjust the Zero potentiometer until the milliammeter reads 4.00 mA.
3. Set the millivolt source to the HI-IN value (in your appropriate table) and read the output current on the milliammeter. This current level is designated Initial Top Current (ITC), normally not equal to 20.00 mA.
4. Calculate the Corrected Top Current (CTC) using the following equation (generally this will not equal 20.00 mA):

$$CTC = 16 \times ITC / (ITC - 4 \text{ mA})$$
5. Adjust the Span potentiometer to obtain the CTC on the milliammeter.
6. Now readjust the Zero potentiometer so that the milliammeter reads 20.00 mA.
7. Set the millivolt source to LO-IN millivolts. If the output current is not 4.00 mA, repeat steps 2 through 7.
8. When calibration is complete, remove the transmitter from the setup.

4.0 CALIBRATING THE TRANSMITTER (Continued)

A thermocouple calibrator may be used in place of the millivolt source - refer to Figure 4-2.

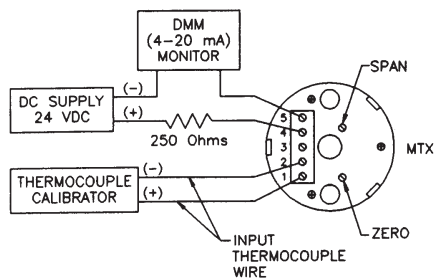


Figure 4-2. Calibration Using a Thermocouple Simulator

Table 4-1. Fahrenheit Temperature to Millivolt Conversion Chart

Value	Model Number/Range				
MTX -	J01 (0% to 200°F)	J02 (0% to 300°F)	J03 (0% to 500°F)	J04 (0% to 750°F)	J05 (0% to 1000°F)
LOIN	-0.885	-0.885	-0.885	-0.885	-0.885
HIN	4.906	7.947	14.108	21.785	29.515
MTX -	K 01 (0% to 200°F)	K 02 (0% to 300°F)	K 03 (0% to 500°F)	K 04 (0% to 750°F)	K 05 (0% to 1000°F)
LOIN	-0.692	-0.692	-0.692	-0.692	-0.692
HIN	3.819	6.092	10.560	16.349	22.251
MTX -	T01 (0% to 200°F)	T02 (0% to 300°F)	T03 (0% to 500°F)	T04 (0% to 750°F)	----
LOIN	-0.674	-0.674	-0.674	-0.674	----
HIN	3.967	6.647	12.572	20.801	----
MTX -	E01 (0% to 200°F)	E02 (0% to 300°F)	E03 (0% to 500°F)	E04 (0% to 750°F)	E05 (0% to 1000°F)
LOIN	-1.026	-1.026	-1.026	-1.026	-1.026
HIN	5.869	9.708	17.942	28.854	40.056

Table 4-2. Celsius Temperature to Millivolt Conversion Chart

Value	Model Number/Range				
MTX -	J06 (0% to 100°C)	J07 (0% to 150°C)	J08 (0% to 250°C)	J09 (0% to 400°C)	J10 (0% to 500°C)
LOIN	0.000	0.000	0.000	0.000	0.000
HIN	5.268	8.008	13.553	21.846	27.388
MTX -	K 06 (0% to 100°C)	K 07 (0% to 150°C)	K 08 (0% to 250°C)	K 09 (0% to 400°C)	K 10 (0% to 500°C)
LOIN	0.000	0.000	0.000	0.000	0.000
HIN	4.095	6.137	10.151	16.395	20.640
MTX -	T06 (0% to 100°C)	T07 (0% to 150°C)	T08 (0% to 250°C)	T09 (0% to 400°C)	----
LOIN	0.000	0.000	0.000	0.000	----
HIN	4.277	6.702	12.011	20.869	----
MTX -	E06 (0% to 100°C)	E07 (0% to 150°C)	E08 (0% to 250°C)	E09 (0% to 400°C)	E10 (0% to 500°C)
LOIN	0.000	0.000	0.000	0.000	0.000
HIN	6.317	9.787	17.178	28.943	36.999

5.0 SPECIFICATIONS

INPUT

Configuration:	Non-isolated thermocouple input
Thermocouple types:	J, K, T or E
Thermocouple current:	1 μ A max
Burnout indication:	Upscale over-range indication, 40 mA max.
Thermocouple lead resistance:	To 500 Ω for specified performance

OUTPUT

Linear range:	4 to 20 mA dc
Current output limits:	<2 to >40 mA (open TC)
Compliance (supply voltage):	8 to 50 Vdc
Reverse polarity protection:	350 V peak
Maximum loop resistance:	(Supply Voltage - 8V)/20 mA

ACCURACY

Hysteresis and repeatability:	Within $\pm 0.1\%$ of Span
Linearity with respect to input:	$\pm 0.1\%$ of Span
Power supply effect:	Within $\pm 0.01\%/V$
Temperature effect:	Zero and Span: Within $\pm 0.1\%$ FS/ $^{\circ}$ F

ENVIRONMENTAL

Operating temperature:	-40 to 185 $^{\circ}$ F (-40 to 85 $^{\circ}$ C)
Storage temperature:	-50 to 250 $^{\circ}$ F (-45 to 121 $^{\circ}$ C)
Humidity:	To 90% (non-condensing)

MECHANICAL

Weight:	Less than 1.2 oz (34g)
Diameter:	1.75 in (44.34 mm)
Height (including barriers):	1.25 in (31.75 mm)

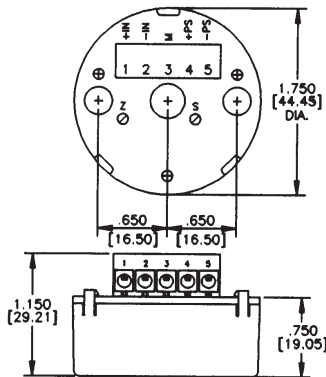


Figure 5-1. Case Dimensions

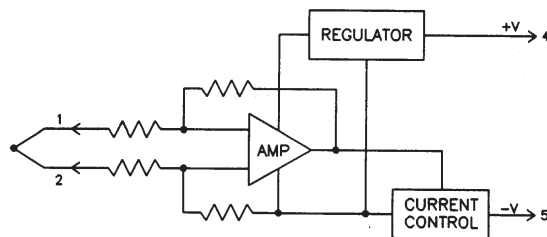


Figure 5-2. MTX Transmitter Block Diagram