

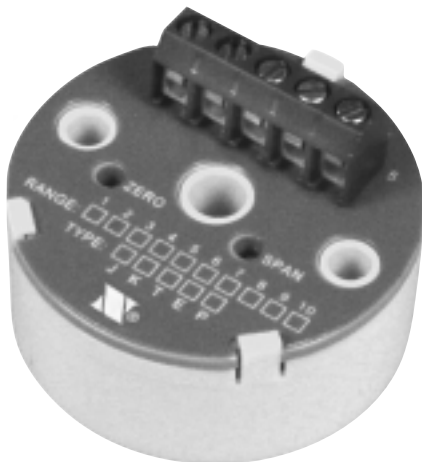


MTX-J, K, T, E

4-20 mA

MINI TEMPERATURE TRANSMITTER

Operator's Manual



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WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

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This device is marked with the international caution symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.

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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 nearest Customer Service Department, as listed on the cover of this manual.

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 Safety and EMC Considerations

This instrument is a Class III device (8 to 50 Vdc).

Always use a power supply, which complies with EN 60950 safety standard.

- 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.

EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

Failure to follow all instructions and warnings may result in injury!

1.3 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 an 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 when the unit is energized from a 24 Vdc source because of the small compliance voltage needed by the unit.

1.4 Available Ranges

As specified in Table 1-1, the 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 3.0, Calibrating the Transmitter, for more details).

Table 1-1. Range/Models

Range	Model			
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

1.5 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-J02 = Transmitter with thermocouple type J and a temperature range of -0 to 300°F.

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

1.6 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.

SECTION 2 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.

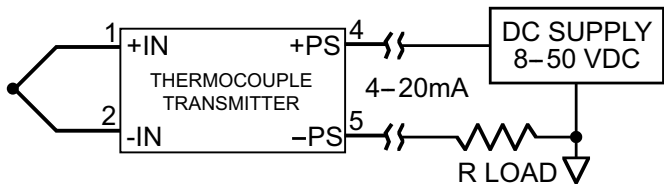


Figure 2-1 Power Input Setup

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

SECTION 2 CONNECTING POWER AND SIGNAL INPUTS (continued)

Table 2-1. Screw-Terminal Pin Assignment

1	+ Thermocouple
2	- Thermocouple
3*	Earth Ground
4	+Power/Signal Output
5	-Power/Signal Output

Note ENR

* For improved EMC performance, connect Pin 3 to Earth Ground.

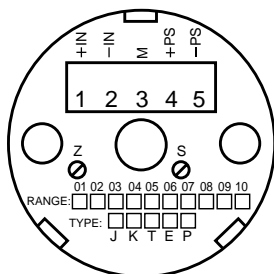


Figure 2-2 Pin Assignment

3.0 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 bath just becomes slush, but not enough to float the ice.
3. Insert the reference thermocouple.

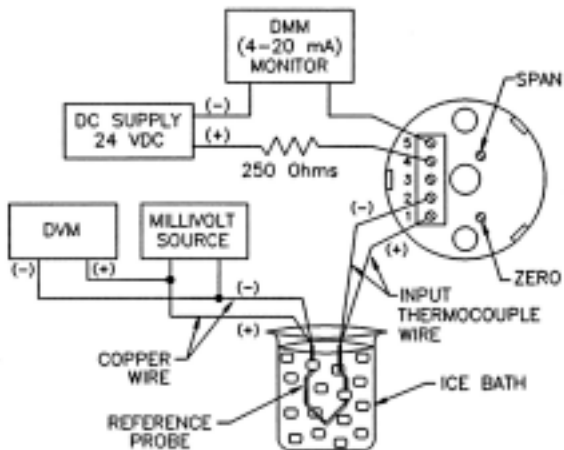


Figure 3-1. Calibration Setup using a Millivolt Source

3.0 CALIBRATING THE TRANSMITTER (Continued)

To calibrate the transmitter, follow these steps (refer to Figure 3-1):

1. Locate the model number in Table 3-1 or 3-2 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 20.00mA.
4. Calculate the Corrected Top Current (CTC) using the following equation (generally this will not equal 20.00mA):

$$CTC = 16 \times ITC / (ITC - 4 \text{ mA})$$

5. Adjust the Span potentiometer to obtain the CTC on the milliammeter.
6. Now re-adjust 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.
6. When calibration is complete, remove the transmitter from the setup.

An thermocouple calibrator may be used in place of the millivolt source - refer to Figure 3-2.

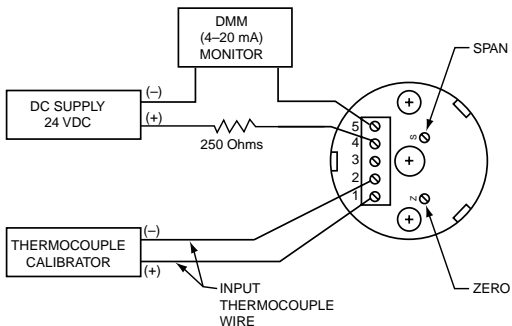


Figure 3-2. Calibration using a Thermocouple Simulator

3.0 CALIBRATING THE TRANSMITTER (Continued)

Table 3-1. Fahrenheit Temperature to Millivolt Conversion Chart

Value	Model Number/Range				
MTX-	J01	J02	J03	J04	J05
	(0 to 200°F)	(0 to 300°F)	(0 to 500°F)	(0 to 750°F)	(0 to 1000°F)
LO IN	-0.885	-0.885	-0.885	-0.885	-0.885
HI IN	4.906	7.947	14.108	21.785	29.515
MTX-	K01	K02	K03	K04	K05
	(0 to 200°F)	(0 to 300°F)	(0 to 500°F)	(0 to 750°F)	(0 to 1000°F)
LO IN	-0.692	- 0.692	- 0.692	- 0.692	- 0.692
HI IN	3.819	6.092	10.560	16.349	22.251
MTX-	T01	T02	T03	T04	-
	(0 to 200°F)	(0 to 300°F)	(0 to 500°F)	(0 to 750°F)	-
LO IN	-0.674	- 0.674	- 0.674	- 0.674	-
HI IN	3.967	6.647	12.572	20.801	-
MTX-	E01	E02	E03	E04	E05
	(0 to 200°F)	(0 to 300°F)	(0 to 500°F)	(0 to 750°F)	(0 to 1000°F)
LO IN	-1.026	- 1.026	- 1.026	- 1.026	- 1.026
HI IN	5.869	9.708	17.942	28.854	40.056

3.0 CALIBRATING THE TRANSMITTER (Continued)

Table 3-2. Celsius Temperature to Millivolt Conversion Chart

Value	Model Number/Range				
MTX-	J06	J07	J08	J09	J10
	(0 to 100°C)	(0 to 150°C)	(0 to 250°C)	(0 to 400°C)	(0 to 500°C)
LO IN	0.000	0.000	0.000	0.000	0.000
HI IN	5.268	8.008	13.553	21.846	27.388
MTX-	K06	K07	K08	K09	K10
	(0 to 100°C)	(0 to 150°C)	(0 to 250°C)	(0 to 400°C)	(0 to 500°C)
LO IN	0.000	0.000	0.000	0.000	0.000
HI IN	4.095	6.137	10.151	16.395	20.640
MTX-	T06	T07	T08	T09	-
	(0 to 100°C)	(0 to 150°C)	(0 to 250°C)	(0 to 400°C)	-
LO IN	0.000	0.000	0.000	0.000	
HI IN	4.277	6.702	12.011	20.869	-
MTX-	E06	E07	E08	E09	E10
	(0 to 100°C)	(0 to 150°C)	(0 to 250°C)	(0 to 400°C)	(0 to 500°C)
LO IN	0.000	0.000	0.000	0.000	0.000
HI IN	6.317	9.787	17.178	28.943	36.999

4.0 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 ohms for specified performance

OUTPUT

Linear range:	4 to 20 mAdc
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 FS
Linearity with respect to input:	$\pm 0.1\%$ of FS
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)

4.0 SPECIFICATIONS (Continued)

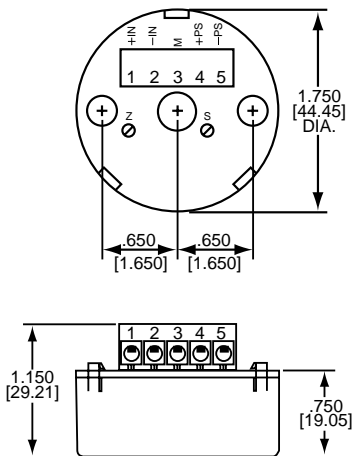


Figure 4-1. Case Dimensions

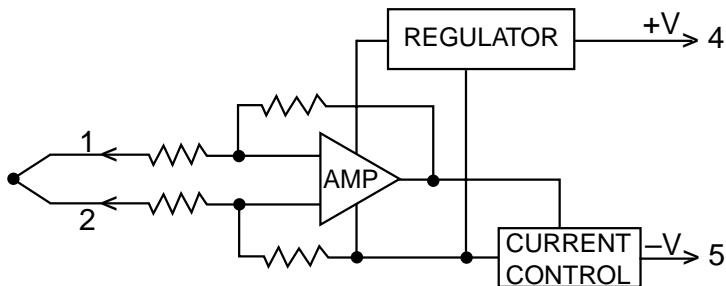


Figure 4-2. Transmitter Block Diagram

- NOTES -

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NEWPORT Electronics, Inc. warrants this unit to be free of defects in materials and workmanship for a period of one (1) year from the date of purchase. In addition to NEWPORT's standard warranty period, NEWPORT Electronics will extend the warranty period for one (1) additional year if the warranty card enclosed with each instrument is returned to NEWPORT.

If the unit should malfunction, it must be returned to the factory for evaluation. NEWPORT's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by NEWPORT, if the unit is found to be defective it will be repaired or replaced at no charge. NEWPORT'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 NEWPORT's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the NEWPORT Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO NEWPORT, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM NEWPORT'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 NEWPORT:

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 NEWPORT for current repair charges. Have the following information available BEFORE contacting NEWPORT:

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.

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For immediate technical or application assistance please call:

1-800-6397678®
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Newport Electronics, Inc.
2229 South Yale Street • Santa Ana, CA • 92704 • U.S.A.
TEL: (714) 540-4914 • FAX: (203) 968-7311
Toll Free: 1-800-639-7678 • www.newportUS.com • e-mail: info@newportUS.com
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Newport Technologies, Inc.
976 Bergar • Laval (Quebec) • H7L 5A1 • Canada
TEL: (514) 335-3183 • FAX: (514) 856-6886
Toll Free: 1-800-639-7678 • www.newport.ca • e-mail: info@newport.ca

Newport Electronics, Ltd.
One Omega Drive • River Bend Technology Centre
Northbank, Irlam • Manchester M44 5BD • United Kingdom
Tel: +44 161 777 6611 • FAX: +44 161 777 6622
Toll Free: 0800 488 488 • www.newportuk.co.uk • e-mail: sales@newportuk.co.uk

Newport Electronics B.V.
Postbus 8034 • 1180 LA Amstelveen • The Netherlands
TEL: +31 20 3472121 • FAX: +31 20 6434643
Toll Free: 0800 0993344 • www.newport.nl • e-mail: info@newport.nl

Newport Electronics spol s.r.o.
Frystatska 184, 733 01 Karviná • Czech Republic
TEL: +420 59 6311899 • FAX: +420 59 6311114
Toll Free: 0800-1-66342 • www.newport.cz • e-mail: info@newport.cz

Newport Electronics GmbH
Daimlerstrasse 26 • D-75392 Deckenpfronn • Germany
TEL: 49 7056 9398-0 • FAX: 49 7056 9398-29
Toll Free: 0800 / 6397678 • www.newport.de • e-mail: sales@newport.de

Newport Electronique S.A.R.L.
11, rue Jacques Cartier • 78280 Guyancourt • France
TEL: +33 1 61 37 29 00 • FAX: +33 1 30 57 54 27
Toll Free: 0800 466 342 • www.newport.fr • e-mail: sales@newport.fr

Mexico and Latin America
FAX: 001 (203) 359-7807
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