



## Features

- Works with ANSI type J,K,T, and E thermocouples
- Selectable Celsius, Fahrenheit or Kelvin measurement units
- Bright 0.45" (11.4mm) LED display visible up to 20 feet (6 meters)
- Long-life contactless touch-sensor controls
- Peak and valley measurement modes
- Digital filter option for measurements in noisy environments
- Solid-state alarm relay with programmable trip-point and hysteresis
- Convenient mounting options
- Operates from 9 to 32 VDC
- Low current consumption; 40mA typical at 12VDC
- Two year warranty

## PRODUCT OVERVIEW

The DMR30-TC1 digital panel meter performs precision temperature measurements when used in conjunction with an external thermocouple. Supported thermocouples include ANSI types J, K, E and T. This meter features a highly visible, 0.45" (11.4mm) high, 5 character+sign alphanumeric LED display which can provide up to 4 digits of measurement resolution. Configuration is made easy by a contactless touch-sensor front-panel user interface, eliminating the need for jumpers, potentiometers, or DIP switches. The meter is powered from an external 9-32VDC supply and typically requires only 40mA when operated at 12V. An isolated solid-state relay can be set to close at user-defined trip-points, providing external signaling capability. The meter features a rugged polycarbonate housing that is mountable in a round hole using the supplied nut and gasket, or by using 3 #4-40 (M3) screws. The DMR30-TC1's features make it ideal for use in laboratory instrumentation, factory automation, and other applications requiring precise temperature monitoring.

## ORDERING INFORMATION:

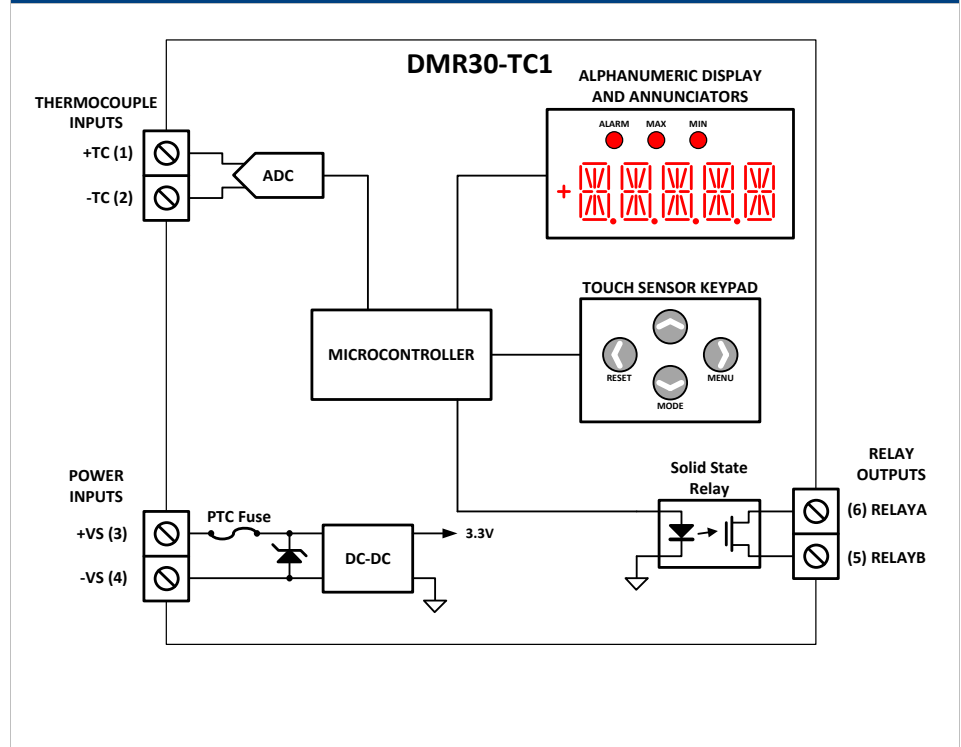
DMR30-TC1-1-DC4-R-C	Thermocouple meter, alarm output, red display
DMR30-TC1-1-DC4-G-C *	Thermocouple meter, alarm output, green display
DMR30-TC1-1-DC4-B-C *	Thermocouple meter, alarm output, blue display

\*Contact factory for availability.

## ACCESSORIES

DMRTCJ24FEP2C	Type 'J' Thermocouple probe, 2m length, FEP Insulation
DMRTCK24FEP2C	Type 'K' Thermocouple probe, 2m length, FEP Insulation

## SIMPLIFIED BLOCK DIAGRAM



For full details go to  
<https://www.murata-ps.com/rohs>

MEASUREMENT PERFORMANCE		Min.	Typ.	Max.	Units
Supported Thermocouple Types		J, K, E, T			
Meter Measurement Range: (note 1)	J type thermocouple	-200		1900	°C
	K type thermocouple	-270		1370	°C
	E type thermocouple	-270		1000	°C
	T type thermocouple	-270		400	°C
Meter Measurement Accuracy: (notes 2,3,4)	J type thermocouple (-200°C to +600°C)		±2		°C
	K type thermocouple (-25°C to +1200°C)		±2		°C
	E type thermocouple (-25°C to +700°C)		±2		°C
	T type thermocouple (-200 °C to +200°C)		±2		°C
Notes:					
1) Measurement range is defined by range of internal measurement system and linearization tables and will generally exceed the recommended application temperature range for a given thermocouple type.					
2) Meter Accuracy is the meter's contribution to the measurement error. Variation in thermocouple sensors used with the meter may significantly increase the total system measurement error.					
3) Typical accuracy with meter at 25 °C.					
4) Characterized against calibrated thermocouple simulator.					

POWER SUPPLY CHARACTERISTICS.		Min.	Typ.	Max.	Units
Operating Supply Voltage		9		32	VDC
Absolute Maximum Supply Voltage		-1		35	VDC
Operating Supply Current			40		mA
12V operation		-	25	-	
24V operation		-			

USER INTERFACE	
Display Type and Size	5 Digit Alphanumeric LED, 11.4mm (0.45in) Height 3 LED Annunciators ('Alarm', 'Max', 'Min')
User Controls	Four capacitive touch sensors <UP> <DOWN> <LEFT> <RIGHT>
Measurement Units	°C, °F, °K, user selectable
Display Modes	Current Temp (Normal), Max Temp, Min Temp,
Over-range Indication	Flashing Value
Open-Thermocouple Indication	Flashing 'OPEN' prompt
Display Update Rate	2.5 updates/sec.
Decimal Point Selection	Automatically Set
Main Menu Password	<RIGHT> <UP> <RIGHT> <UP> <RIGHT>

RELAY OUTPUT		Min.	Typ.	Max.	Units
'Off'-state voltage (measured across REALYA to RELAYB) terminals		-40		+40	V
'On'-state current		-250		+250	mA
'On' state resistance			1		Ω

TERMINAL BLOCKS (TB1, TB2, TB3)	
Wire Size	14-24 AWG
Insulation Strip Length	6mm (0.24 in.)
Screw Tightening Torque	0.4 N-m (3.5 lb-in)

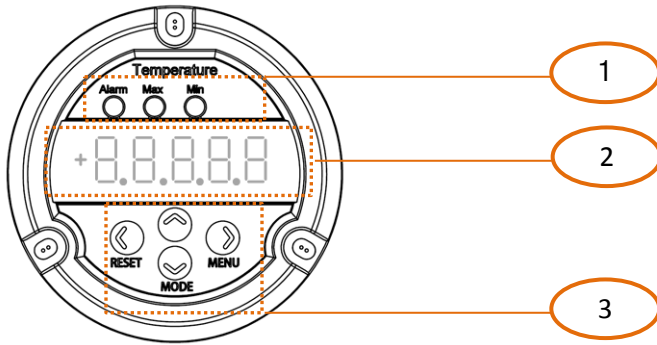
PHYSICAL/ENVIRONMENTAL		Min.	Typ.	Max.	Units
Operating Temperature		0		+50	°C
Storage Temperature		-40		+75	°C
Humidity (non-condensing)		0		85	%
Dimensions		See Mechanical Specifications Drawing			
Weight		64g (2.2 oz.)			

**OPERATION:**

Measurement Type and Capabilities

DMR30-TC1 series temperature meters employ precision ADCs and a low-power microcontroller to measure and display temperature. Accurate linear measurement, over a wide temperature range relies on internal compensation tables to precisely convert measured thermocouple voltage to temperature. See [additional details](#). Further enhancement is made possible by adapting ‘cold-junction’ compensation, whereby the thermocouple terminal block temperature is measured by a sensor located on the PCB near the connector.

**FRONT PANEL & FRONT PANEL LAYOUT AND FUNCTION**



1. **Annunciator LEDs:** This cluster of 4 LEDs is used to indicate various meter states, such the status of the alarm relay, measurement modes, and units.
2. **Display:** This is a 5-character + sign alphanumeric LED display is used to indicate measurements, informational prompts, and meter setup parameter values.
3. **Touch-Sensor Control Buttons:** Four capacitive touch-sensors are provided to support meter control and configuration. These four buttons will be referred to in this document as <UP>, <DOWN>, <LEFT>, and <RIGHT> reflecting their printed arrow directions.

**Default Measurement Mode**

DMR30-TC1 meters normally operate in ‘measurement mode’, in which the meter displays the current value of the measured temperature. If the measured input value falls outside of the meter’s acceptable measurement range, either over-range or under-range, the display will flash. If the meter’s alarm functions are enabled, the ALARM annunciator is lit whenever the alarm relay is activated (closed).

**Alternate Measurement Modes**

In addition to displaying the current value of the measurement, the meter can also display historical high and low values. To perform these operations, the meter offers a number of alternate measurement modes:

1. In MAX mode, the meter displays the highest value which has been measured since the last time the user pressed the <LEFT> button (RESET). MAX mode is active when the MAX LED is illuminated.
2. In MIN mode, the meter displays the lowest value which has been measured since the last time the user pressed <LEFT> button (RESET). MIN mode is active when the MIN LED is illuminated.

These alternate measurement modes may be selected by repeatedly pressing the <DOWN> button until the desired mode LED is illuminated. The alternate modes may be disabled by repeatedly pressing the <DOWN> button until all mode LEDs are off and the meter is returned to normal operating in which it will display the current measurement.

Access to the alternate measurement modes may be disabled by setting the MODES setting to OFF using the configuration menu. If alternate modes are disabled, then pressing either the <DOWN> or <LEFT> buttons will result in an ‘ERROR’ message being briefly displayed before resuming normal operation.

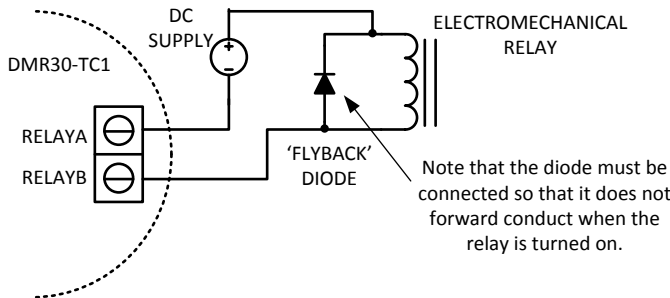
**ELECTRICAL CONNECTIONS:**

Screw terminal Location:	Terminal #	Name	Function
	1	+TC	<a href="#">Thermocouple inputs</a>
	2	-TC	
	3	+VS	<a href="#">Power supply inputs</a> (9VDC - 32VDC)
	4	-VS	
	5	RELAYB	<a href="#">Solid-state relay alarm outputs</a>
	6	RELAYA	

Note: It is important to tighten all screw-terminals to their torque specification of 4.5 lbf-in (0.51Nm). Proper tightening will help ensure reliable operation. Applications subject to vibration should use stranded wire.

[Alarm Relay Connections](#) (back to operation section)

DMR30-TC1 provides a solid-state relay output that ‘closes’ upon alarm condition detection. This circuit is electrically isolated from the meter’s measurement circuitry and power supply inputs providing a high degree of application flexibility. Caution is required when driving loads having high inrush current such as incandescent lamps, or inductive loads such as electromechanical relays since associated current and voltage spikes may damage the meter. When used to drive an inductive load, such as an electromechanical relay, a ‘flyback’ diode should be connected across the relay coil (ensuring correct polarity so that it will not forward conduct under normal use) to suppress high transient voltages that may damage the DMR30-TC1, as shown in the following illustration:



**Notes:**

- The alarm relay circuit’s isolation is not intended for use as a safety isolation barrier. The maximum voltage between the alarm relay terminals (RELAYA or RELAYB) and the thermocouple input terminals (+TC, -TC) or power supply terminals (+VS, -VS) must be limited to +/-48VDC. The alarm relay is intended to provide an informational signal of over-temperature/under-temperature conditions; for example driving a piezoelectric siren or LED lamp to signal the condition.
- The DMR30’s alarm output relay must not be used in the control loop of any type of system where it either directly or indirectly signals that a heating or cooling element is to be turned on or off, or used as a safety limit switch.

[Power Supply Connections](#)

The meter is powered by connection of an external 9VDC to 32VDC source to the +VS and -VS terminals. Additionally:

- **Isolation:** Thermocouple terminals (+TC, -TC) are electrically isolated from the power supply terminals (+VS, -VS). The maximum voltage between the power supply terminals and the thermocouple input terminals must be limited to +/-48VDC.
- **Protection:** The DMR30 series of meters incorporates protection against momentary applications of both overvoltage and reverse polarity to the power supply (+VS, -VS) terminals. Depending on regulatory and application requirements it may also be necessary for the user to add external fusing.

[Link to additional notes](#)

## ELECTRICAL CONNECTIONS: (continued)

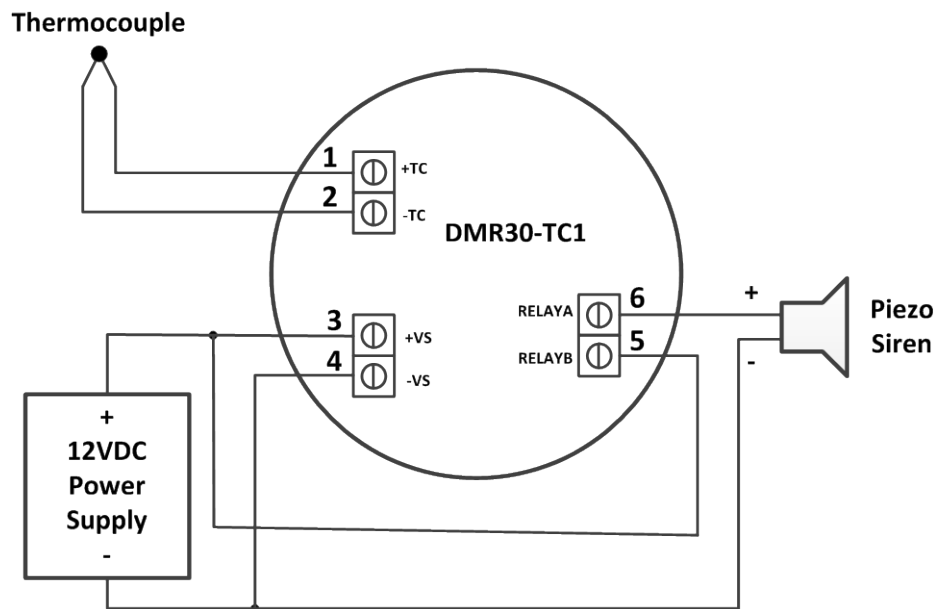
### Thermocouple Inputs

DMR30-TC1 is designed for a wide range of applications and accept a wide range of industry standard probe types: 'J', 'K', 'E', and 'T'. For accurate measurements it is important to connect the thermocouple leads correctly and configure the meter as follows:

- **Polarity must be correct:** The thermocouple “+” and “-” must match the same polarity of the meters input terminal. For ANSI color-coded thermocouple wire, proper connections are shown in [APPENDIX A](#).
- **Meter configuration must match:** Ensure the internal meter setting matches actual probe type connected ([see menu details](#)). The default setting is type “J”
- **Thermocouple length:** To minimize risk of external noise pickup and subsequent degradation of the measurement quality, keep length of thermocouple wire as short as possible.
- **Operation with open thermocouple:** Indicated on the display as display a flashing ‘OPEN’.

## CONNECTION EXAMPLE

The following shows a DMR30-TC1 application where the alarm relay is used to drive a piezoelectric siren. In this example, a 12VDC power supply is connected to the +VS and -VS terminals, the voltage to be measured is connected to the +TC and -TC inputs, and the alarm relay is used to control a piezoelectric siren, which is also powered from the +12VDC power supply.



## MENU AND CONFIGURATION [\(back to Product Overview\)](#)

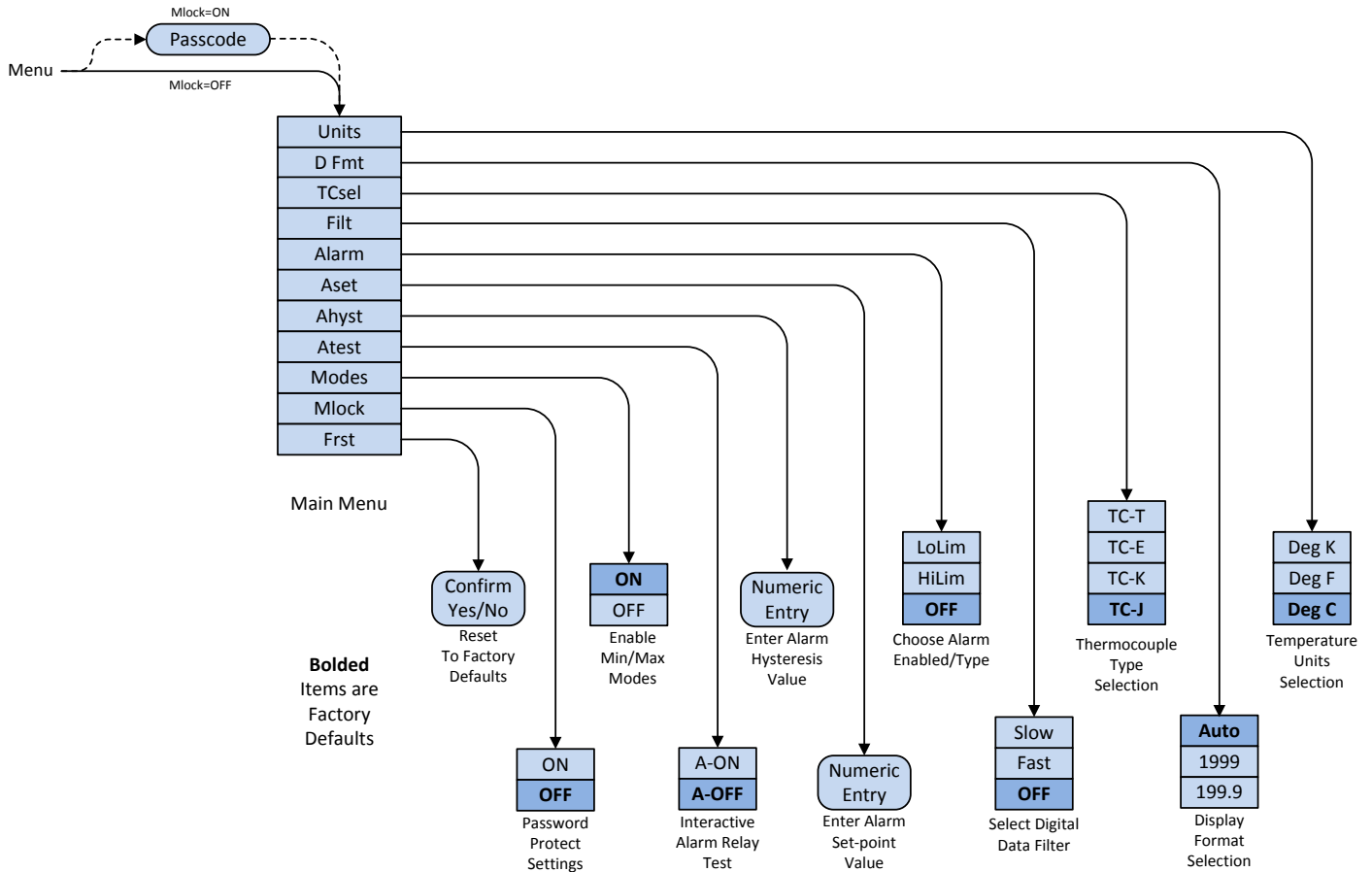
The DMR30 family incorporates an interactive menu system to support meter configuration. This system eliminates the need for jumpers, dipswitches or trim-pots, and also allows the meter be easily configured after it has been installed in an application.

### Entering and Navigating the Menu System

The DMR30's user configuration system is structured as a main menu from which individual configuration options are selected for editing. When in measurement mode, pressing the **<RIGHT>** button will cause the meter to enter the main menu, and display the first main menu entry – “Range”. To prevent accidental changes to the meter's configuration, entry to the main menu may optionally be password protected. If the password protection option is enabled (See [MLOCK](#) entry on pg.8 for details), then the user will be prompted to enter a series of five button-touches to enter the main menu.

Once in the main menu, the meter will display the currently selected entry. The **<UP>** and **<DOWN>** buttons may be used to change the active selection.

**MENU DIAGRAM: DMR30-TC1 (back to rear panel details)**



**USING THE MENU**

When the meter is displaying a main menu item, pressing the **<RIGHT>** button will display the submenu associated with that menu item. For example, if **D Fmt** is the currently selected main menu item, then pushing the **<RIGHT>** button will display the data format submenu, and display the currently selected data format. Exiting the main menu and return to measurement mode may be done in two ways. The first is to press the **<LEFT>** button. The second method is to simply do nothing – if the meter is in the menu system and no button presses are registered for approximately **60 seconds**, the meter will automatically return to measurement mode. The **<LEFT>** arrow also may be used to return from a submenu back to the main menu.

**The Main Menu**

The **DMR30-TC1** has the following MAIN MENU configuration options:

- **UNITS** – Selects the units the meter uses to display temperature, with available options of degrees Celsius, Fahrenheit, or Kelvin. The display UNITS setting is chosen by scrolling through the list of options (DEG C / DEG F / DEG K) using the **<UP>** and **<DOWN>** buttons. When the desired UNITS setting is displayed, pressing the **<RIGHT>** will update the UNITS option to the displayed value and return to the main menu, while pressing the **<LEFT>** button will return to the main menu without updating the option value.
- **D FMT** - The **D Fmt** submenu is used to select the number of digits used to display the measurement. The available options are **000.0** (tenths of a degree), **000** (degrees), or **AUTO**, which dynamically chooses the display format based on the measurement value. The **<UP>** and **<DOWN>** buttons are used to scroll through the available options. When the desired setting is displayed, pressing the **<RIGHT>** button will update the **D Fmt** option to the displayed value and return to the main menu, while pressing the **<LEFT>** button will return to the main menu without updating the option value.

## MENU AND CONFIGURATION : (continued)

- TCSEL** – The **TCsel** submenu lets the user specify the type of thermocouple that is being used. The **DMR30-TC1** supports type J, K, E, and T thermocouples. The **<UP>** and **<DOWN>** buttons scroll through the available thermocouple options. To select the displayed option, press the **<RIGHT>** button. To return to the **MAIN MENU** without changing the option value, press the **<LEFT>** button. It is extremely important that this setting matches the thermocouple type that is connected to the meter. **Failure to correctly set this option may result in significant errors in temperature measurements.**
- FILT** – The **Filt** option selects the degree of digital filtering that is applied to the measured signal. The available options are (1) **OFF** - in which no filtering is used, (2) **Fast** – in which a small amount of filtering is applied to the signal, and (3) **Slow** – in which a larger amount of filtering is applied to the signal. The **<UP>** and **<DOWN>** buttons are used to scroll through the filter options. Pressing the **<RIGHT>** button will update the option to the displayed value and return to the main menu. Pressing the **<LEFT>** button will return to the main menu without updating the option.
- ALARM** – The **Alarm** submenu controls the operation of the alarm relay output. This submenu has three available options; (1) **OFF**, where the alarm output is disabled and always off (“open” state), (2) **HiLim**, where the alarm relay is turned on (“Closed” state) when the measured temperature is greater than the alarm set-point value, and (3) **LoLim**, where the alarm output is turned on when the measured temperature is less than the alarm set-point value. The **<UP>** and **<DOWN>** buttons may be used to scroll through these options. To update the setting to the selected option and return to the **MAIN MENU**, press the **<RIGHT>** button. To return to the **MAIN MENU** without updating the setting, press the **<LEFT>** button.
- ASET** – The **Aset** submenu is a numeric entry field used to set the alarm set-point value. On entry to this submenu, the current value of the alarm set-point is displayed and may be edited. Upon entering this option, the display will show the current alarm value, and set a blinking cursor at the sign character. The **<UP>** and **<DOWN>** buttons are used to set the sign or to increment/decrement the currently selected digit. The **<RIGHT>** button selects the next digit, or if at the rightmost digit, accepts the displayed value and returns to the **MAIN MENU**. The **<LEFT>** button can be used to move the cursor left, or if the cursor is set to the sign position, exits the submenu without changing the current alarm set-point value. **ASET** values are stored internally in degrees C and converted on-the-fly to the currently selected **UNITS** setting (C/F/K) when displayed and edited. Changing the **UNITS** setting will automatically convert the **ASET** value into the new units.
- AHYST** – This setting controls the alarm hysteresis value. When the alarm is set to **HILIM** mode, the hysteresis is subtracted from the alarm set-point to get a ‘turn-off’ threshold below which the alarm relay is opened. Similarly (but opposite), when the alarm is set to **LOLIM** mode, the hysteresis value is added to the set-point to provide a turn-off threshold above which the alarm relay is opened. The process for setting the alarm hysteresis value is similar to setting the alarm set-point value, with the buttons providing identical functionality. Unlike **ASET** values, however, **AHyst** values may only be set to values greater than or equal to zero. As is the case with **ASET** values, **AHyst** values are also stored internally as degrees C and converted on-the-fly for display and editing in the current **UNITS** setting (C/F/K).
- ATEST** – The **Atest** submenu allows the user to interactively test the alarm relay circuit without needing to adjust either the alarm set-point or the signal applied to the meter inputs. On entering this menu option, the **<UP>** button will turn the alarm relay **ON**, while the **<DOWN>** button will turn the alarm relay **OFF**. Either the **<LEFT>** or **<RIGHT>** buttons will exit this submenu, set the alarm relay to the **OFF** condition, and return to the **MAIN MENU**. Note that the alarm relay is set to the **OFF state** when the meter is in the menu system regardless of either the meter input signal alarm settings.
- MODES** – The **Modes** submenu is used to enable or disable the [alternate measurement modes](#). When the **Modes** option is set to **ON**, all available modes for the meter will be available from the front panel in operating mode. When this option is set to **OFF**, attempting to set the meter to an alternate measurement mode will result in an **ERROR** message being displayed.
- MLOCK** – The **Mlock** submenu is used to enable or disable password protection for the **MAIN MENU**. If **Mlock** option is set to **ON**, pressing the **<RIGHT>** button in operating mode results in a flashing cursor, prompting for the entry of a button-sequence password. The following password sequence must then be entered to access the **MAIN MENU**:

**<RIGHT> <UP> <RIGHT> <UP> <RIGHT>**

If the **Mlock** option is set to **OFF**, pressing the **<RIGHT>** button in operating mode will immediately enter the **MAIN MENU**. Note that the password is set at the factory and is not user-modifiable.

**MENU AND CONFIGURATION : (continued)**

- **F RST** – The **Frst** submenu resets the meter configuration to the factory default values. To reset the meter, scroll to the **YES** option using the **<UP>** button and then press the **<RIGHT>** button to confirm. To quit this submenu without resetting the meter, press the **<LEFT>** button.

Factory Default Configuration			
MAIN MENU Item	Default Value	MAIN MENU Item	Default Value
Units	DEG C	Aset	0
D Fmt	AUTO	Ahyst	0.0
TCsel	TC J	Modes	ON
Filt	OFF	Mlock	OFF
Alarm	OFF		

**TECHNICAL NOTES** ([back to Rear Panel Connections](#))



**1. Calibration**

The DMR30-DCV1 is calibrated at the factory at manufacture. There are no user or field-adjustable calibration features.

**2. Wiring:**

Power supply and input wiring must be rated for the electrical and environmental conditions under which the meter will be operated. They must also comply with any regulatory or application-mandated requirements pertaining to the user's installation.

The terminal blocks can accommodate wire gauges ranging from #14 to #24 AWG. Wiring Insulation should be stripped to 6mm (0.24").

All wires must be inserted into the terminal block openings such that the screw terminal does not pinch any insulation. It is important to tighten all screw-terminals to their torque specification of 4.5 lbf-in (0.51Nm). Proper tightening will help ensure reliable operation.

Applications subject to vibration should use stranded wire. After final assembly, inspect all terminal block connections for shorts between adjacent conductors; this step is especially important when using stranded wire.

**3. Protection and Fusing:**

DMR30 meters' power supply leads (+VS, -VS) are protected against momentary overvoltage and reverse polarity conditions. Input terminals +TC and -TC are protected against noise and brief voltage transients. Protection, however, is not provided against sustained conditions exceeding the limits listed in in the [Performance & Functional Specifications Table](#). External fusing must be supplied by the user in accordance to applicable safety and regulatory requirements for the system in which the DMR30 is installed.

**4. Noisy Power Supplies**

Some power supplies contain high-frequency switching devices that may conduct and/or radiate significant noise onto the low-level signal developed across the measurement inputs. Even though the DMR30 incorporates built-in input filtering, some portion of this noise may be amplified and subsequently measured by its sensitive input circuitry. Limiting runs of wire to <3m is strongly recommended. Also, in systems with noisy power supplies, connecting an external, non-polarized capacitor across the +VS and -VS inputs can help reduce measurement errors. In certain situations, the use of twisted pair or shield wiring may be required.

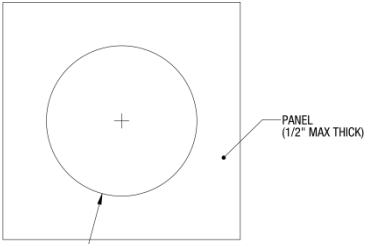
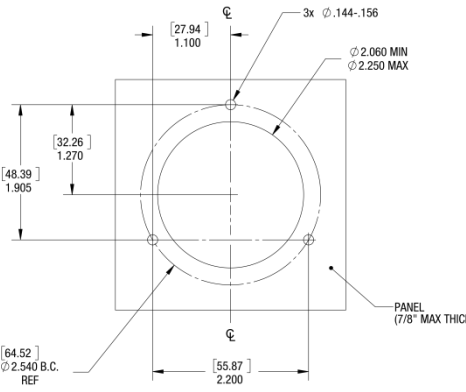
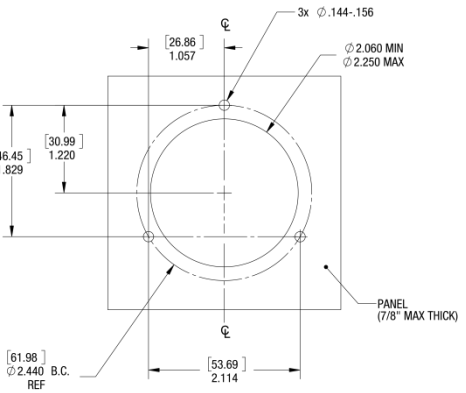
**5. Self-Diagnostics**

On power-on the meter performs a self-test and checks the integrity of calibration and configuration data stored in internal non-volatile memory. If the factory calibration data has been corrupted, the meter will display 'NoCal' on power-on and approximately once a minute thereafter to indicate that the meter is relying on default calibration factors and that displayed measurements may have more than the datasheet-specified amount of error. If the meter detects that its configuration data has been corrupted, it will display 'NoCFG' and attempt to reset itself to the default factory configuration.

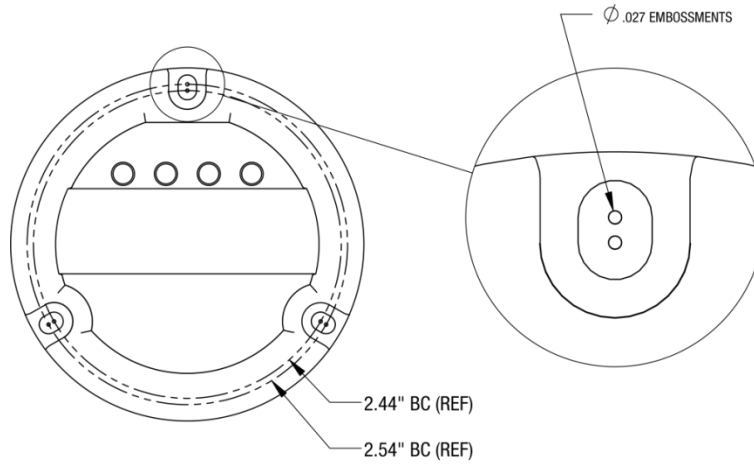


## PANEL INSTALLATION

### PANEL CUTOUT OPTIONS

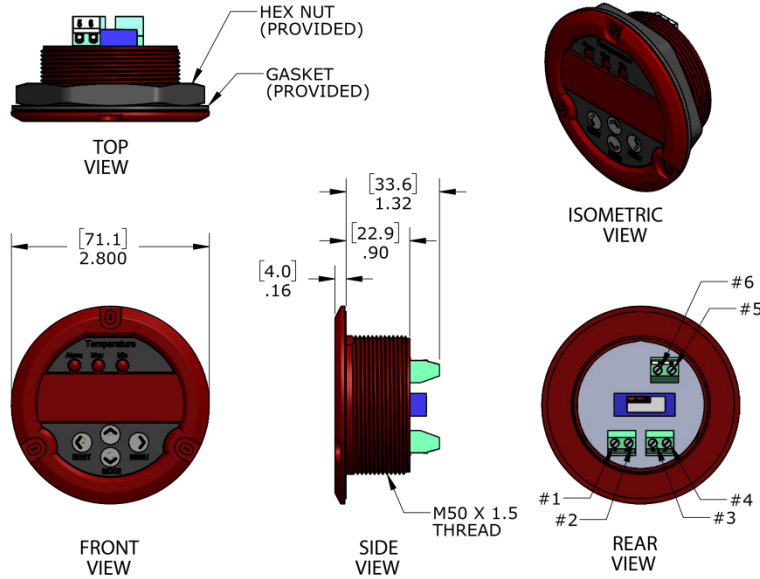
<p><u>Option 1</u> For mounting with single 50mm nut</p>	<p><u>Option 2</u> For mounting with 3x 64.5mmscrews</p>	<p><u>Option 3</u> For mounting with 3x 62mm screws</p>
 <p>IT IS RECOMMENDED THAT THIS HOLE BE AS SMALL AS POSSIBLE WITHIN THE RANGE SPECIFIED, ESPECIALLY IF MULTIPLE METERS ARE MOUNTED AND ALIGNED SIDE BY SIDE</p>	 <p>THIS OPTION REQUIRES THREE HOLES TO BE OPENED IN HOUSING</p>	 <p>THIS OPTION REQUIRES THREE HOLES TO BE OPENED IN HOUSING</p>

### Housing Flange Modifications for Mounting Options 1 and 2



1. SELECT DESIRED BOLT CIRCLE MOUNTING (2.54" OR 2.44")
2. DRILL THRU FLANGE WITH 1/16" PILOT DRILL THREE PLACES
3. OPEN THREE HOLES TO DESIRED DIAMETER  
( $\varnothing$  .125 RECOMMENDED FOR 4-40 OR M3 HARDWARE)
4. REMOVE BURRS AS NECESSARY
5. RECOMMENDED ATTACHMENT HARDWARE: 4-40 OR M3

## MECHANICAL SPECIFICATIONS



## APPENDIX A

### Thermocouple Polarity Table

ANSI Type	+TC Terminal	-TC Terminal
J	White	Red
K	Yellow	Red
E	Purple	Red
T	Blue	Red

Back to [thermocouple input details](#)

Murata Power Solutions, Inc.  
 129 Flanders Rd. Westborough, Ma 01581, USA.  
 ISO 9001 and 14001 REGISTERED



**This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:**

Refer to: <https://www.murata-ps.com/requirements/>

Murata Power Solutions, Inc. makes no representation that the use of its products in the circuits described herein, or the use of other technical information contained herein, will not infringe upon existing or future patent rights. The descriptions contained herein do not imply the granting of licenses to make, use, or sell equipment constructed in accordance therewith. Specifications are subject to change without notice.

©2019 Murata Power Solutions, Inc.