



3 1/2 Digit 0.56" LED

TM-35JC
TM-35KC
TM-35JF
TM-35KF

Panel Temperature Meters

A low cost LED temperature meter for 'J' or 'K' thermocouples, °C or °F, 5V DC powered with screw terminal or edge connector inputs.

General Features

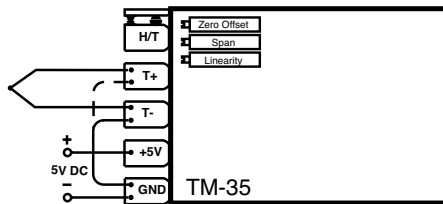
Texmate's popular TM-35 Series of 5V DC powered temperature meters are available with an LED or LCD display.

The meters are supplied factory-configured either for 'J' or 'K' thermocouples, and scaled for °C or °F. On site re-scaling for °C or °F is possible. A selectable °C/°F descriptor is included with every meter. The unique differential input configuration facilitates operation with both grounded and ungrounded probes and allows several meters, operating with grounded thermocouples, to be powered by the same non-isolated 5VDC supply.

Typical Application Connections

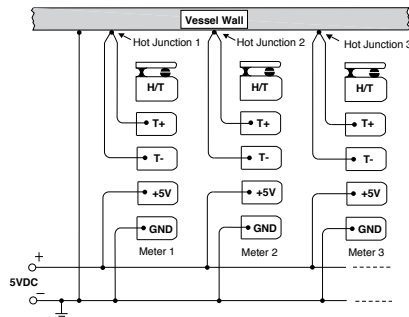
Single-Ended Input

For optimum noise rejection, either the + or - lead of the thermocouple should be connected to power supply ground.



Differential Input with Grounded Thermocouples

The unique differential input of the TM-35 Series enables the use of grounded thermocouples by several meters powered from the same 5V DC supply.



For additional connection information see page 3.

Specifications

Input Configuration:..... True differential and single ended
Thermocouple Ranges:.....0 to 760°C } 'J' Thermocouple
 0 to 1400°F

0 to 1260°C } 'K' Thermocouple
 0 to 1999°F
 (consult factory for other types)

Resistance Effect: 20µV per 10Ω of lead resistance.

Compensation (RJC):..... Automatic, ±0.1°C/°C.

Input Protection:..... 25V AC/DC.

Normal Mode Rejection: ..>40dB above 50Hz.

Common Mode Rejection:>90dB (inputs shorted).

Common Mode Voltage:...±4V referred to power supply ground.

Conformity Error: ±(2°C + 1 Count) typical
 ±(4°C + 1 Count) maximum

±(3°F + 1 Count) typical
 ±(5°F + 1 Count) maximum

Resolution:..... 1°C or 1°F

Warm-up Time:..... One minute to specified accuracy

Conversion Rate:..... 3 readings per second

Display:..... 0.56" high efficiency LED "Display Hold" & °C/°F descriptor

Over-range Indication:..... Most Significant "1" digit and polarity symbol are displayed with all other digits blank.

Power Supply:..... +4.75 to +5.25V DC at 225mA

Operating Temperature:... 0°C to +50°C

Storage Temperature:..... -20°C to +70°C

Relative Humidity: 95% (non-condensing)

Case Dimensions: Bezel 2.76" X 1.17" (69.75 X 29.7mm)
 Depth behind Bezel 3.32" (84mm) plus 0.68" (17.27mm) for connector

Weight:..... 156 gms (5.5 oz) when packed

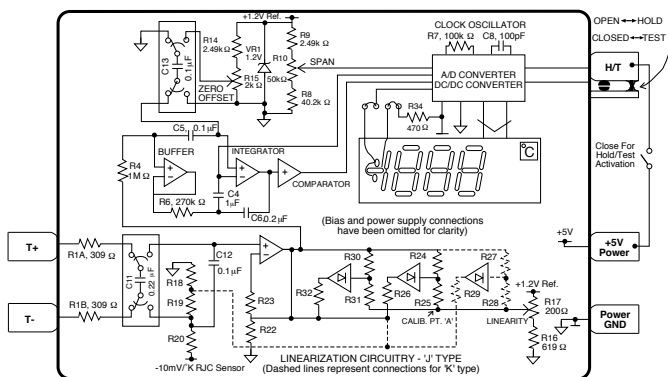
TM-35 Series LED Displays

- TM-35JC**3.5 digit LED-Type J °C Thermocouple, 5VDC Pwr
- TM-35JF**3.5 digit LED-Type J °F Thermocouple, 5VDC Pwr
- TM-35KC**3.5 digit LED-Type K °C Thermocouple, 5VDC Pwr
- TM-35KF**3.5 digit LED-Type K °F Thermocouple, 5VDC Pwr

TM-35 Series LCD Displays

- TM-35XJC**3.5 digit LCD-Type J °C Thermocouple, 5VDC Pwr
- TM-35XJF**3.5 digit LCD-Type J °F Thermocouple, 5VDC Pwr
- TM-35XKC**3.5 digit LCD-Type K °C Thermocouple, 5VDC Pwr
- TM-35XKF**3.5 digit LCD-Type K °F Thermocouple, 5VDC Pwr

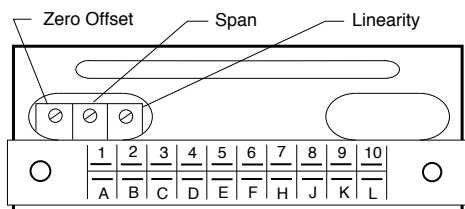
Functional Diagram



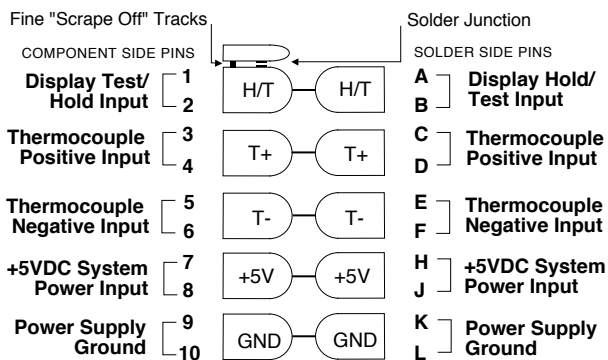
Connector Pinouts

The Texmate TM-35 interconnects using the screw terminal blocks supplied with the meter. Alternatively a standard PC board edge connector may be used, having two rows of 10 pins each, spaced on 0.156" centers. Connectors are available from Texmate or from almost any connector manufacturer.

CAUTION: This meter employs high impedance CMOS inputs. Although internal protection has been provided for several hundred volt overloads, the meter will be destroyed if subjected to the high kilovolts of static discharge that can be produced in low humidity environments. Always handle the meter with ground protection.



METER REAR WITH PCB EDGE CONNECTOR MOUNTED



Pins (A,B) & (1,2) - Display Test/Display Hold Input: All numeric display segments will operate when Pins (A,B) & (1,2) are connected to +5VDC System Power Input Pins (H,J) & (7,8). The function of this input may be re-configured to operate as Display Hold by scraping off the fine track adjacent to Pin 1 (re-bridge, if required, at solder junctions). To initiate Display Hold in this configuration, connect Pins (A,B) & (1,2) to +5VDC Power Supply Input Pins (H,J) & (7,8) and the meter will latch up; A/D conversions will continue but the display will not be updated until Pins (A,B) & (1,2) are released.

Pins (C,D) & (3,4) - Thermocouple Positive Input: The thermocouple positive output is applied to these pins (refer to Table 2 for color codes). Maximum overvoltage protection is 25V AC/DC.

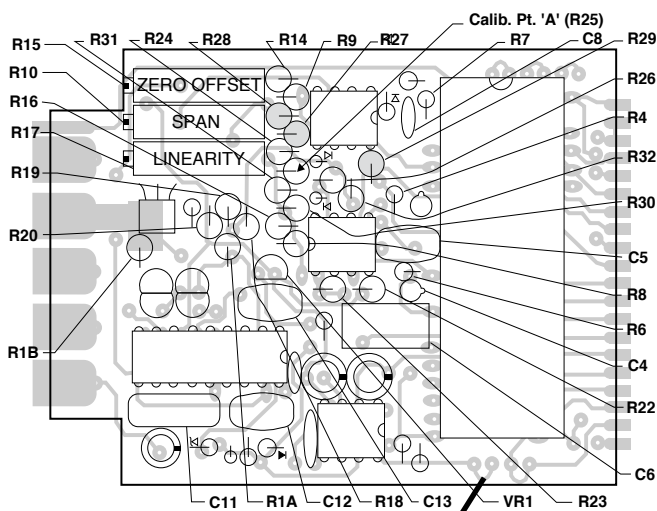
Pins (E,F) & (5,6) - Thermocouple Negative Input: The thermocouple negative output is applied to these pins (refer to Table 2 for color codes). Maximum overvoltage protection is 25V AC/DC.

Pins (H,J) & (7,8) - +5VDC System Power Input: The meter requires a regulated low-ripple 5VDC power supply applied to these pins.

Pins (K,L) & (9,10) - Power Supply Ground: Power supply ground return.

Component Layout

'J' Thermocouple Shown Below
Additional Components for 'K' Shown Shaded



Cut to disable "+" polarity indication

Signal Conditioning Components

ZERO **ZERO Potentiometer (Pot)**
To the Left Front
Turn Clockwise to Increase Reading
The ZERO pot is on the left (as viewed from the back of the meter). Typically it enables the input signal to be offset $\pm 5\%$ of full scale.

SPAN **SPAN Potentiometer (Pot)**
To the Right Front
Turn Clockwise to Increase Reading
The 15 turn SPAN pot is middle pot (as viewed from the back of the meter). Typical adjustment is 20% of the input signal range.

LINEARITY **LINEARITY Potentiometer (Pot)**
To the Right Front
Use to set voltage at Calibration Point "A"
The Linearity pot is used to set the voltage at the calibration Point "A" and is located on the right (as viewed from the back of the meter). The Linearity Pot is adjusted at the factory and does not normally need to be re-adjusted by the user.

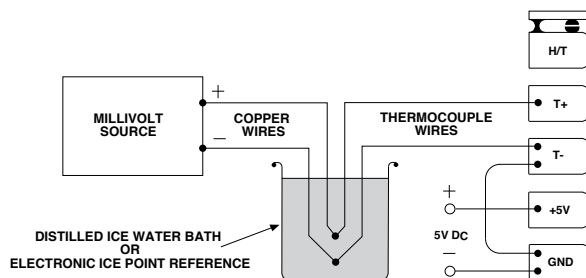
Calibration Instructions

POINTS TO NOTE

The TM-35 has been factory calibrated for optimum performance and should not normally require further calibration or adjustment. If the need for on-site re-calibration is determined, follow the procedure below and verify that the voltage and meter display are incorrect before disturbing potentiometer settings.

Note: The potentiometer settings are sealed at the factory. Any user modification of these settings may, at the discretion of Texmate, void the warranty.

Re-calibration requires either a thermocouple simulator or a precision millivolt source, thermocouple reference junction, and an ice point reference. A digital voltmeter is also required. The calibration arrangement used should completely simulate normal thermocouple connections to the meter. The drawing below illustrates the connection details when using a millivolt source and an ice point reference.



Calibration Instructions Continued

Before calibration, determine the values for linearity, zero offset, and span adjustment from the table. As an example, the values appropriate for a TM-35JC ('J' thermocouple, °C scaling) are: 760° (linearity), 0° (zero offset), and 760° (span). Having determined these values, follow the steps described below:

NOTE: For re-scaling between °C/F, linearity re-calibrated (Step1) may be omitted.

1. Calibrate the LINEARITY

Apply the linearity calibration voltage to the TM-35. Connect the voltmeter to calibration point 'A' (shown on the component layout). Adjust the LINEARITY potentiometer (R17) until the voltage at point 'A' is exactly 1.000V.

2. Calibrate the ZERO OFFSET

Apply the zero offset calibration voltage to the TM-35. Adjust the zero offset potentiometer (R15) to make the meter display zero. The optimal setting is achieved when the polarity sign alternates between '+' and '-'.

3. Check the calibration

Apply the span calibration voltage to the TM-35. Adjust the span potentiometer (R10) until the meter display matches the value shown in table one.

4. Selection of the °C/°F Descriptor

Refer to the "Descriptor Re-Selection" procedure on page 4. This should only be necessary if the meter is re-scaled between °C and °F.

CALIBRATION

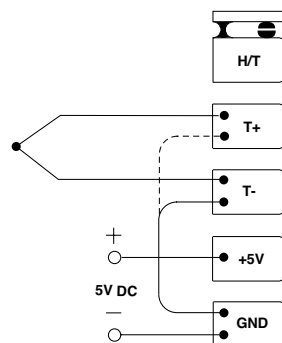
Separate potentiometers are provided for adjustment of linearity, zero offset, and span. Calibration involves the application of various voltages representing temperatures according to the thermocouple type and meter scaling. These values are summarized in the table below in terms of temperature and equivalent thermocouple voltage output.

		'J' Type		'K' Type	
		°C	°F	°C	°F
Linearity (R17) <i>Calib. Pt. 'A' = 1.000V</i>	T/C Simulator	760	1400	1260	1990
	Millivolt Source	42.922mV	42.922mV	50.990mV	44.645mV
Zero Offset (R15) <i>Zero Adjustment</i>	T/C Simulator	0	0	0	0
	Millivolt Source	0.000mV	-0.885mV	0.000mV	-0.701mV
Span (R10) <i>Full Scale Adjustment</i>	T/C Simulator	760	1400	1260	1990
	Millivolt Source	42.922mV	42.922mV	50.990mV	44.645mV

Thermocouple Color Codes

		GB	F	D	USA	JPN
		BRITAIN BS 1843	FRANCE NF C42-323	GERMANY DIN 43714	U.S.A. ANSI/ MC964	JAPAN JIS C 1610- 1981
'J'	Positive	Yellow	Yellow	Red	White	Red Yellow Sheath
	Negative	Blue	Black	Blue	Red	White
'K'	Positive	Brown	Yellow	Red	Yellow	Red Blue Sheath
	Negative	Blue	Purple	Green	Red	White

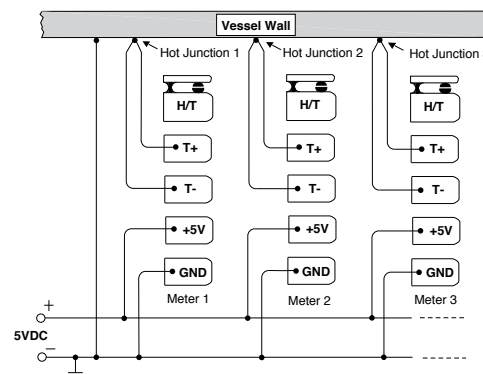
Single-Ended Meter



The TM-35 may be configured for single-ended operation by connecting the thermocouple positive or negative input to power supply ground. This configuration is recommended for operation using an ungrounded (isolated) thermocouple.

Note: This circuit is also suitable for use with a grounded thermocouple, provided that the supply powering the meter is isolated with respect to ground. In this case, a separate 5V supply should be used for each meter, or the meter should be used in a differential configuration.

Differential-Input Meter



The differential input feature of the TM-35 facilitates temperature measurement using grounded thermocouples. In this configuration, an indirect ground return path is still required to prevent the common mode range of the inputs from being exceeded, but the circuit differs from the single-ended configuration in that the power supply ground is connected to the thermocouple junction common point, rather than to the thermocouple positive or negative input on the meter. This avoids the introduction of circulating currents in the thermocouple wires arising from ground loops, which may otherwise result in erroneous or noisy readings. Several meters may be cascaded in this configuration all powered by the same 5VDC supply, as shown above.

°C/°F Descriptor Re-Selection

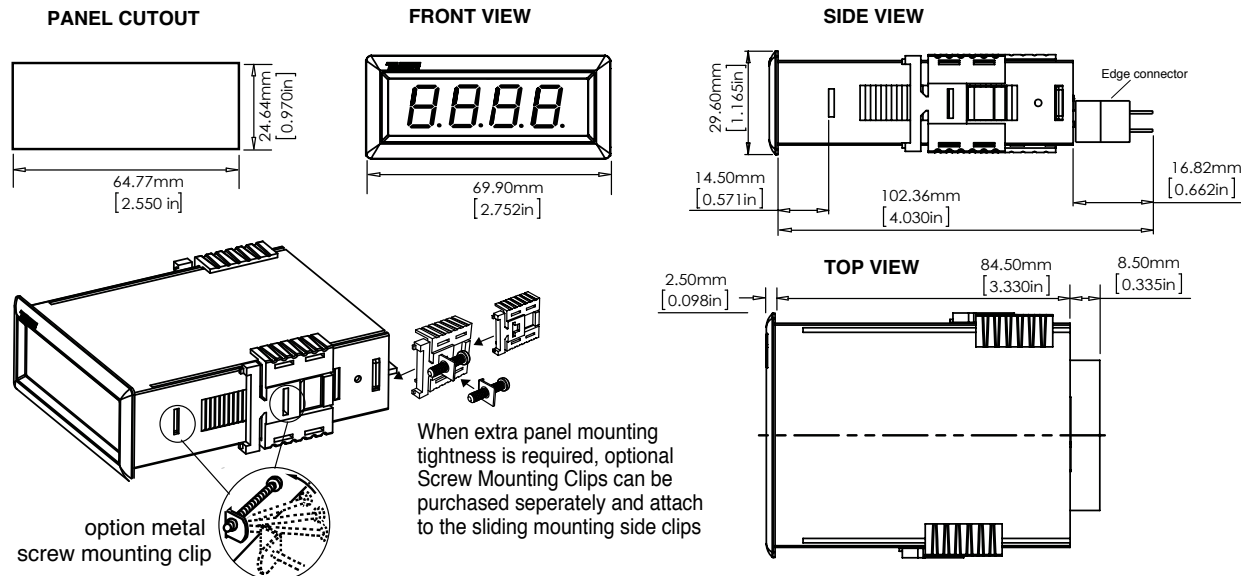
A removable folded film insert is supplied with legends for °C and °F scalings. The sharp tip of the insert fits between the LED and the black heat-shrink band that encases the LED. Its orientation is factory selected for °C or °F illumination as appropriate.

INVERT

If the meter is recalibrated on-site to a different scaling, remove the meter from the case. Invert the folded film insert with fingers or tweezers so that the °C or °F descriptor legend aligns with the square descriptor LED and insert the sharp tip of the insert between the black heat-shrink band and the LED.

CAUTION - ELECTRICAL SHOCK HAZARD All internal parts of the meter may be at the same electrical potential as the input signal and power supply. A suitable high voltage warning notice should be affixed to those meters where there is any possibility that the meter could be removed from its case, or the internal components accessed, concurrent with the existence of a high voltage input signal.

TM Case Dimensions and Panel Cutouts



PCB Edge Connector

PCB Edge Connector

A standard 20-pin edge connector (two rows of 10 pins on 0.156" centers) is used to connect all TM-35 meters.

Order part no. CN-L10.



TB-Kit Screw Connectors



*Not Included

Texmate's individual screw terminal blocks offer a convenient alternative to edge connectors for many applications, allowing complete installation, configuration and calibration without the need for soldering.

Slide each terminal block over the PCB until the hole aligns. Insert the retaining screw to secure.

Each kit includes: 3 plastic blocks with metal contacts, 4 screws with spade connectors, 1 metal contact and 3 quick disconnects.

Ordering Information

Standard Options for this Model Number

Part Number	Description
► BASIC MODEL NUMBER	
TM-35JC.....	3.5 digit LED-Type J °C Thermocouple, 5VDC Pwr
TM-35JF.....	3.5 digit LED-Type J °F Thermocouple, 5VDC Pwr
TM-35KG.....	3.5 digit LED-Type K °C Thermocouple, 5VDC Pwr
TM-35KF.....	3.5 digit LED-Type K °F Thermocouple, 5VDC Pwr

Special Options and Accessories

Part Number	Description
► ACCESSORIES	
CN-L10.....	Edge Connector with Solder eyelet, 10 Pin Dual
TB-KIT.....	Terminal Block Connector Kit (3)

WARRANTY

Texmate warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment. Texmate's obligations under this warranty are limited to replacement or repair, at its option, at its factory, of any of the products which shall, within the applicable period after shipment, be returned to Texmate's facility, transportation charges pre-paid, and which are, after examination, disclosed to the satisfaction of Texmate to be thus defective. The warranty shall not apply to any equipment which shall have been repaired or altered, except by Texmate, or which shall have been subjected to misuse, negligence, or accident. In no case shall Texmate's liability exceed the original purchase price. The aforementioned provisions do not extend the original warranty period of any product which has been either repaired or replaced by Texmate.

USER'S RESPONSIBILITY

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