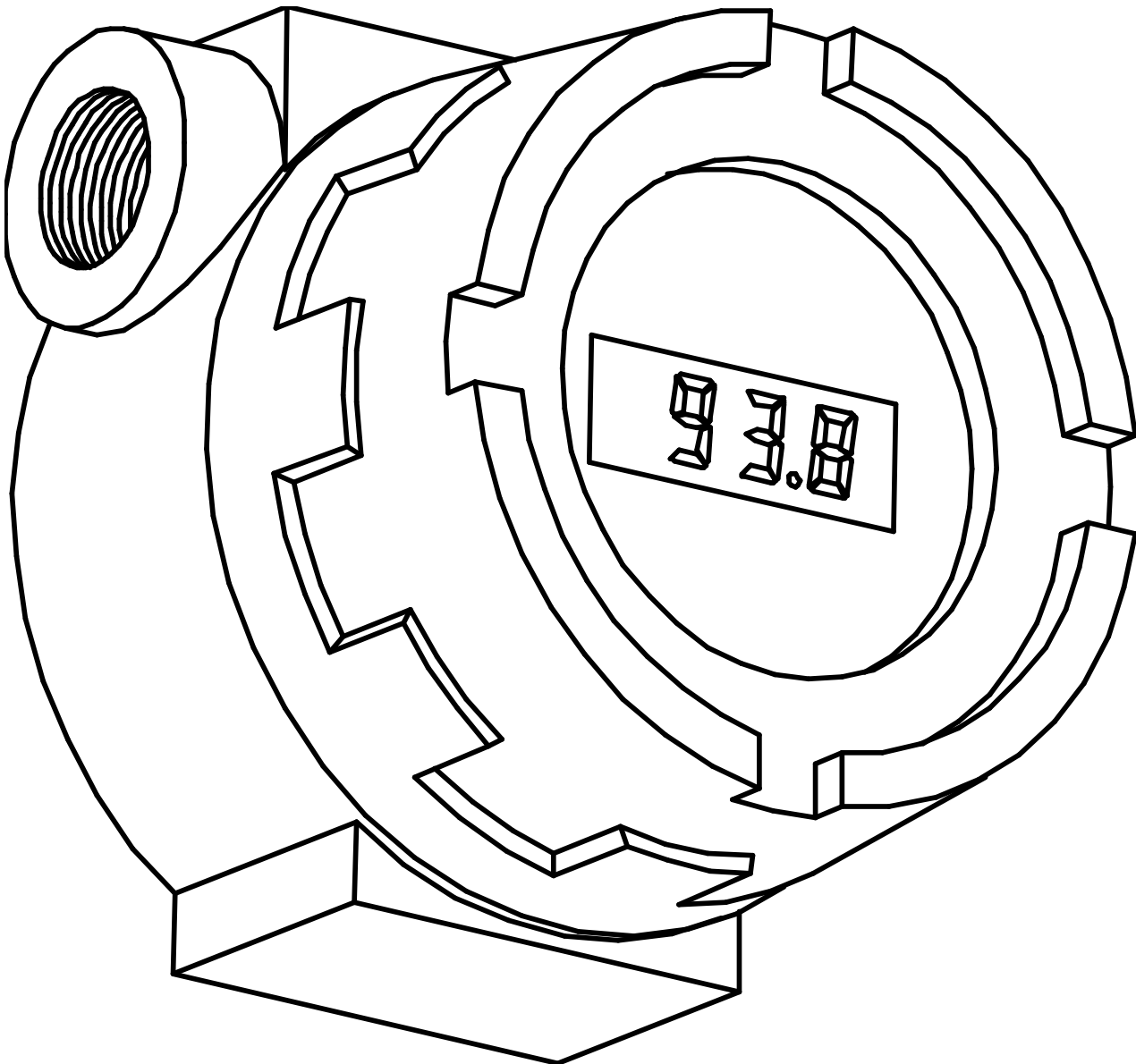




**MODEL TI196**  
**Current Loop Meter**  
**Installation and Operation Instructions**



## Description

The Minco TI196 is a two-wire, loop-powered digital meter that accepts a 4 to 20 milliamp DC signal. The meter measures the input current and accurately displays the corresponding temperature in °C or °F. The meter derives power from the current loop, so no external power supply is required. With only a 2.8 volt drop across the meter, it can operate from lower-voltage DC power supplies and you can connect the meter in series with other loop-powered devices.

The TI196 is housed in an explosion-proof enclosure with your choice of two ½" or two ¾" NPT pipe thread connections.

## Wiring

Do not expose the electronics to static electricity. This device incorporates components which are vulnerable to damage via static charges. Before handling any of the electronics, it is recommended to use a grounded work station and an ESD-safe wrist strap. Always hold the boards by the edges and avoid touching component contacts.

Use this meter to monitor temperature anywhere from the control room to the sensing location. Wire it into the current loop anywhere observing the +/- polarity of the loop. Mount meter in an area whose ambient temperatures stay within the range of 32 to 122°F (0 to 50°C). Remove cover from explosion-proof housing. Remove screws which hold the front cover in place. Pull terminal block off from PC board, screw wires onto block then re-plug block onto board. On the meter, terminal 1 is positive and terminal 2 is negative. Wiring in Figure 1 below is typical.

°F and the °C stickers are supplied and can be applied to the front of the case.

Most Minco transmitters can be mounted inside the meter's housing. For more information about the use of Temptran™ current transmitters, request Minco Application Aid #15.

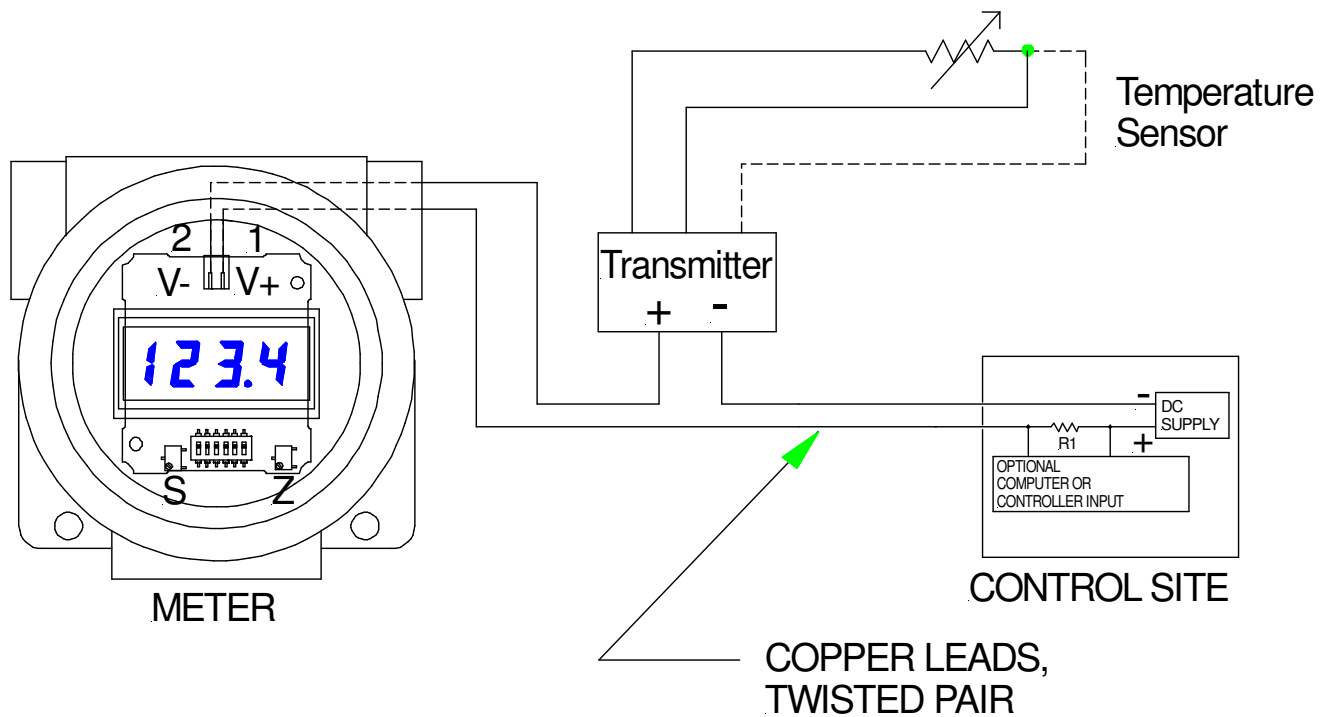


Figure 1

## Calibration

### Calibration Method 1

Equipment: 24 VDC Power Supply  
Small slotted screwdriver

Note: The procedure below is for meter calibration to a different range. If re-calibrating the meter to the same range, perform steps 1 and 4-7 only.

### Procedure

1. Hook-up the equipment as shown in the Figure 2. Unthread the case by rotating it counter clockwise. Remove thumbscrews that secure the blue bezel and remove the bezel. Remove the two nylon 3/8" tall hex standoffs that hold the meter in the housing and lift out the meter. Pull terminal block off from PC board, screw wires onto block, then re-plug block onto board.

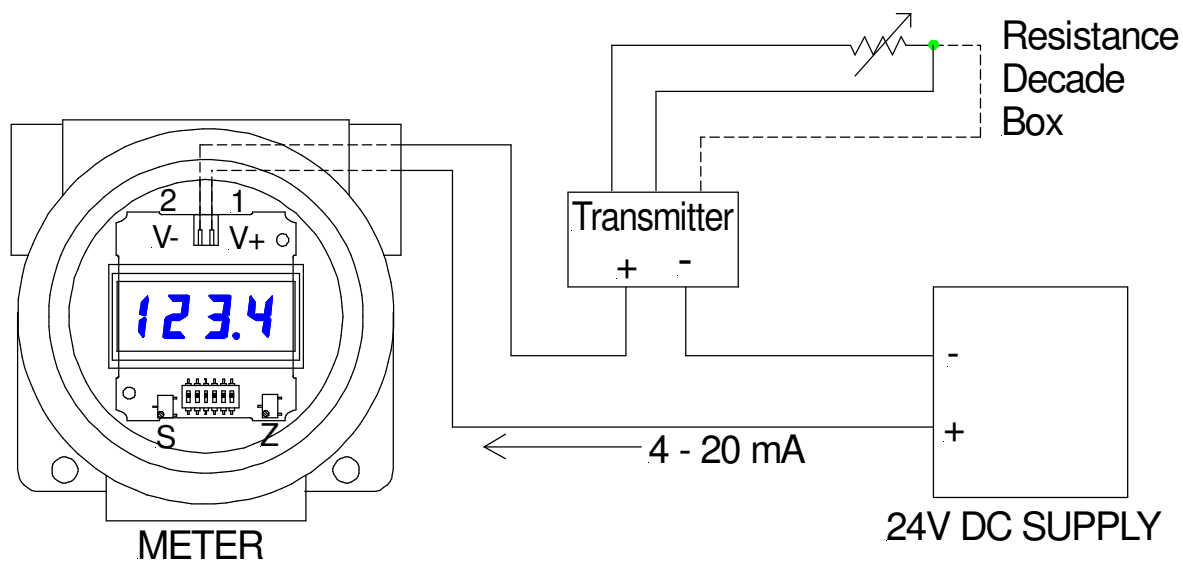


Figure 2

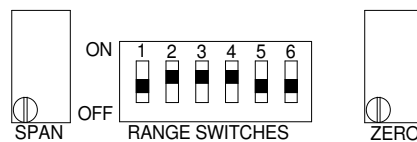


Figure 3

- Range switches 5 and 6 are for coarse adjustment of the zero (4 mA). Set switches 5 and 6 for where your low-end reading falls according to Table 1. Tenth-degree resolution can only display temperatures from -199.9 to 199.9. For tenth-degree resolution set switch 4 to the ON position (*this simply turns on the decimal point*), then multiply your desired zero and span temperatures by 10 and choose switch values from both Tables 1 and 2 using these multiplied counts.

**Table 1**

Zero Reading (Counts)			
Switch	-500 to 0	0 to 500	500 to 1000
<b>4</b>	0.1 degree = ON, 1 degree = OFF		
<b>5</b>	ON	OFF	OFF
<b>6</b>	OFF	OFF	ON

- Switches 1 and 2 are for coarse adjustment of the span (20 mA). To determine the correct switch settings, subtract the span temperature (the 20 mA temperature marked on the side of the transmitter) from the zero temperature (the 4 mA temperature marked on the side of the transmitter). *Example: If your span (20mA) temperature is 200°F and your zero temperature (4mA) is -100°F, then the Span Reading value is (200°F) - (-100°F) = 300°F. Per Table 2 below, the appropriate switch settings are then 1=ON, 2=ON.*

**Table 2**

Span Reading (Counts)				
Switch	0 to 500	500 to 1000	1000 to 1500	1500 to 1999
<b>1</b>	ON	OFF	ON	OFF
<b>2</b>	ON	ON	OFF	OFF

If these switch settings do not allow calibration, use the settings in the neighboring column.

Note: Switch 3 is not used.

- Fine adjustments: Set the resistance decade box to the resistance value corresponding to the 4 mA resistance printed on the side of the Minco temperature transmitter.
- Using a small slotted screwdriver, adjust the Zero potentiometer (Figure 3) until the desired temperature is shown on the display.
- Set the decade box to the resistance value corresponding to the 20 mA resistance printed on the side of the temperature transmitter.
- Adjust the Span potentiometer until the desired temperature is shown on the display.
- Repeat Steps 4 – 7 until no further adjustment is necessary.

## Calibration Method 1

Equipment: Current calibrator ( $\pm 0.02\%$  accuracy &  $1\mu\text{A}$  resolution)  
Small slotted screwdriver

### Procedure

1. Hook-up the equipment as shown in Figure 4. Remove thumbscrews that secure the meter bezel. Remove the two hex screws that hold the meter in the housing. Pull terminal block off from PC board, screw wires onto block, then re-plug block onto board.

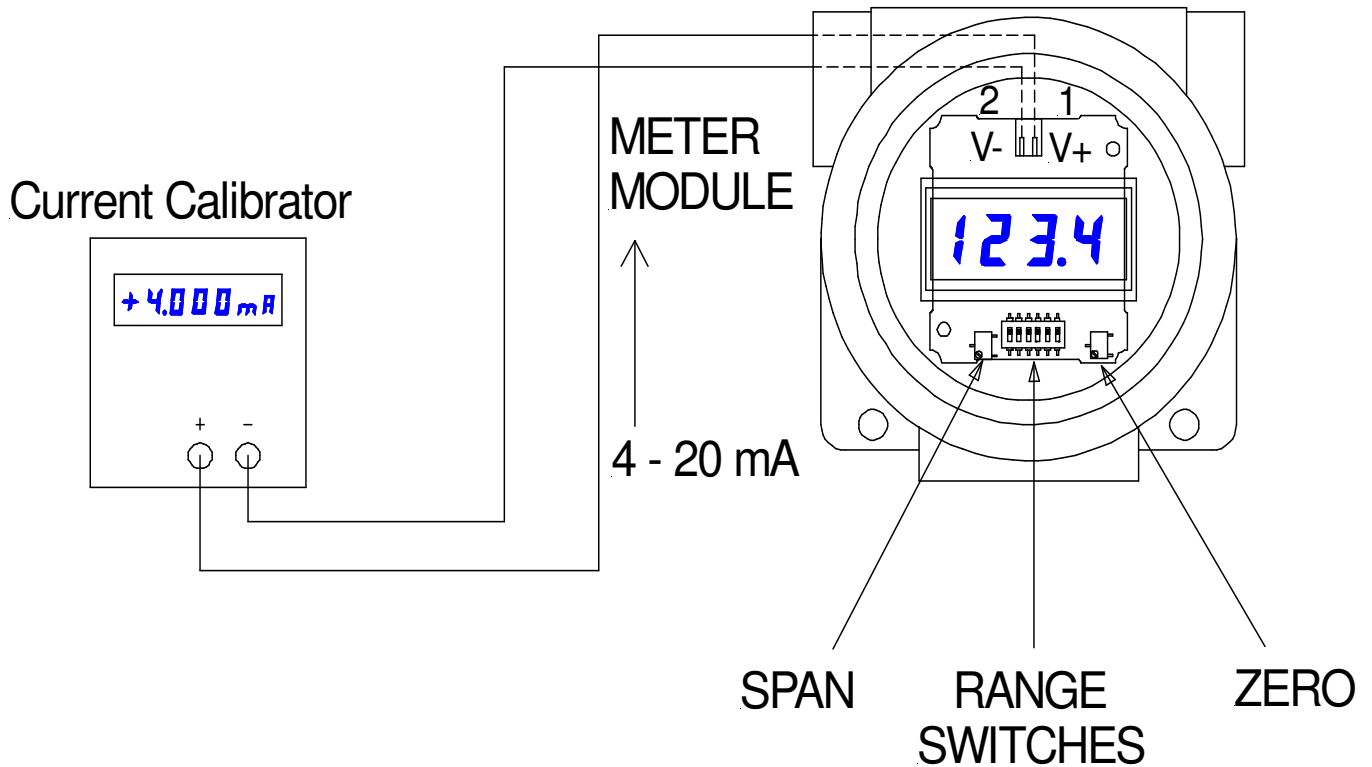


Figure 4

2. Determine and set the meter's switch settings to correspond to your desired temperature range as described in *Method 1, steps 2 and 3*.
3. Set the calibrator to output 4.000 mA.
4. Adjust the meter's Zero potentiometer (Fig. 3) until the meter reads your low end (Zero) temperature.
5. Set the calibrator to output 20.000mA.
6. Adjust the Span potentiometer until the meter reads your high end (Span) temperature.
7. Repeat Steps 3 – 6 until no further adjustment is necessary.

## Troubleshooting

Symptom	Possible cause	Check	Action Required
No display on the meter	Current loop wiring is miswired or broken, or power supply is not on	Check wiring and power supply. Check for the necessary 2.6 to 2.8 VDC across meter terminals 1 and 2.	Repair wires
Meter display is higher or lower than expected and the reading is steady	Temperature sensor does not match the type which the transmitter requires	Check for the correct temperature sensor type	Replace with correct temperature sensor
	Temperature of the temperature sensor may be higher or lower than the Temptran™ transmitter's temperature range	Verify the sensor's operating temperature and that this temperature is within the range of the transmitter	Replace transmitter with a range suitable for the temperatures; recalibrate meter to match new range
	Wiring flaw in the current loop	Check wires of the 4-20 mA loop	Repair wires
	Wiring flaw to the temperature sensor	Check wires between sensor and transmitter	Repair wires
	Temperature sensor may be burned out	Examine the temperature sensor and wires for damage.  Disconnect sensor from transmitter and ohm the RTD; 100 ohm Platinum RTD's are about 110 ohms at room temperature and 1000 ohm Platinum RTD's are about 1100 ohms at room temperature.	Replace bad sensor
"1 " displayed	Valid or invalid loop current signal causing meter reading to exceed maximum of +1999	Figure out what should be displayed based on meter setup and current flowing in loop. Check for open or shorted temperature sensor.  An open temperature sensor will not necessarily cause an overrange display of "1 "; for example, when you have set the meter for a 0 to 500 °F display, but a wiring problem causes the transmitter to put out its overrange signal of 25 mA, the meter will display about "656."	If loop current is correct, adjust meter range.  If meter range is correct, fix condition causing too high a loop current.
"-1 " displayed	Valid or invalid loop current signal causing meter reading to be below minimum of -1999	Figure out what should be displayed based on meter setup and current flowing in loop.  When wiring to an RTD temperature sensor is accidentally shorted it causes the Temptran to produce a current between 3 and 4 mA. For example, when you have set the meter for a 0 to 500 °F display, it may give a reading like "-25" for a 3 mA current, not a "-1 ".	If loop current is correct, adjust meter range.  If meter range is correct, fix condition causing too low a loop current.

## Warranty

Items returned within one year from the date of sale, transportation prepaid, which Minco Products, Inc. (the "seller") reasonably determines to be faulty by reason of defective materials or faulty workmanship will be replaced or repaired at the seller's discretion, free of charge.

This remedy is to be the sole and exclusive remedy available to the buyer in the event of a breach by the seller. Items that show evidence of mishandling or misapplication may be returned by the seller at the customer's expense.

Furthermore, the seller is not to be held responsible for consequential damages caused by this product except as required under Minnesota Statutes, Section 336.1-719 (3).

This warranty is in lieu of any other expressed warranty or implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability of the seller or its employees or agents.

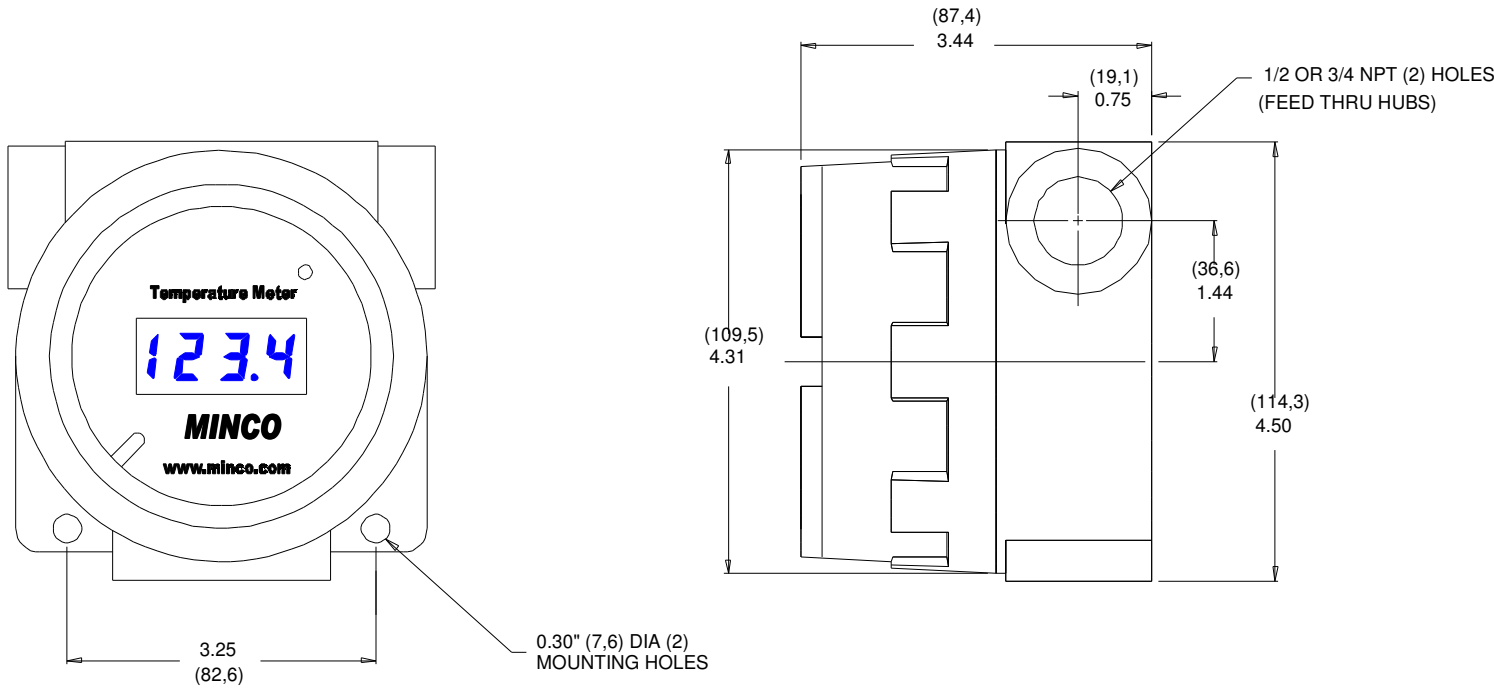
## How to Order

T1196	Model Number: T1196 meter in explosion proof case
P2	Pipe Thread Code: P2 = ¾ -14 Sensor/Conduit Thread P3 = ½ -14 Sensor/Conduit Thread
(-25/200)	Temperature Range (4 mA Temp/20 mA Temp): Specify temperature range in either °C or °F. For example, -25° to +200°C = 4 to 20 mA.
C	Display Mode: C = Celsius (standard) F = Fahrenheit
T1196P2(-25/200)C ← Sample part number	

## Specifications

<b>Input:</b>	4 – 20mA DC series connection to current loop
<b>Range:</b>	Zero : -500 to 1000 counts Span: 10 to 1999 counts
<b>Accuracy:</b>	+/- (0.1% reading + 1 count)
<b>Temperature Coefficient:</b>	Zero: +/- 0.075 counts/°C typ. Span: +/-0.005% of span/°C typ.
<b>Linearity:</b>	+/- (0.1% of span + 1 count)
<b>Forward Voltage Drop:</b>	2.8 volts DC maximum
<b>Display:</b>	3½ digit LCD (Liquid Crystal Display)
<b>Display Mode:</b>	Celsius or Fahrenheit
<b>Display Update:</b>	3 times per second
<b>Underrange Indication:</b>	-1 in MSD (Most Significant Digit)
<b>Overrange Indication:</b>	1 in MSD
<b>Decimal:</b>	User programmable to 1 position or absent. (i.e. 1XX.X or 1XXX)
<b>Ambient Temperature</b>	Operating: 0 to 50 °C (32 to 122°F)
<b>Range:</b>	Storage: -20 to 65 °C (-4 to 149°F)
<b>Weight:</b>	3 lb 2 oz. (1150 g)

# Dimensions



**Figure 5 TI196 dimensions**

**Minco (Main Office)**  
 7300 Commerce Lane  
 Minneapolis, MN  
 55432  
 USA  
 Tel: 1.763.571.3121  
 Fax: 1.763.571.0927

**Customer Service/  
 Order Desk:**  
 Tel: 1.763.571.3123  
 Fax: 1.763.571.0942  
[custserv@minco.com](mailto:custserv@minco.com)  
[www.minco.com](http://www.minco.com)

**Minco S.A.**  
 Usine et Service  
 Commercial, Z.I.  
 09310 Aston, France  
 Tel: (33) 5 61 03 24 01  
 Fax: (33) 5 61 03 24 09

**Minco EC**  
 Hirzenstrasse 2  
 CH-9244 Niederuzwil  
 Switzerland  
 Tel: (41) 71 952 79 89  
 Fax: (41) 71 952 79 90

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