# DUAL-LINE TEMPERATURE METER

## Model TT7000


- J, K, T, E, R, S, B, N, C Thermocouples
- 100 or 1000 Ω Platinum, 10 Ω Copper, 120 Ω Nickel RTDs
- 1° or 0.1° Resolution
- Averages up to 10 RTD Sensors
- Automatic Cold Junction Compensation
- NEMA 4X, IP65 Front
- Universal 85-265 VAC or 12/24 VDC Input Power
- Large Dual-Line 6-Character Display, 0.60" & 0.46"
- Programmable Displays & Function Keys
- Sunlight Readable Display
- 2 or 4 Relays + Isolated 4-20 mA Output Options
- External 4-Relay & Digital I/O Expansion Modules
- RS-232, RS-422/485 Serial Communication Options
- Modbus® RTU Protocol Standard
- -20 to 65°C Operating Temperature Range

## INTRODUCTION

The TT7000 meter boasts specifications and functionality that clearly makes it one of the most advanced temperature meters available. Its dual-line 6-character display, function keys, and optional expansion modules are only a few of the features you will find on the TT7000.

### Versatile

The TT7000 accepts many more thermocouple types and RTDs than earlier models. It can be configured to have either a 1 or 0.1 degree display resolution on any type of sensor input. The second line of display makes configuration simpler. The display itself is quite configurable. There are many relay functions for up to 8 relays; including an Interlock Relay function. The 4-20 mA output can represent up to 11 different parameters/variables. This makes the TT7000 one of the most versatile meters on the market.

## FRONT PANEL DISPLAY

### Precise, Accurate, and More Informative

TT7000's large 0.6" main display provides an accurate and precise 4 or 5-digit view of your temperature measurement.

### Configurable

The main display can be programmed to indicate current temperature, maximum or minimum temperature, alternating maximum/minimum temperatures, or one of eight alarm set points. The secondary display can also be configured to display engineering units, setpoints, user defined legends, or simply turned off.


### Function Keys

There are three function keys available to the user. These keys can be programmed to trigger certain events (i.e. acknowledge alarms, reset max and/or min, disable/enable output relays, or hold current relay states), provide direct menu access points, and more.

### Easy to Use


The user friendly dual-line display makes the TT7000 easy to set up & configure. Setup & configuration is done via the front panel. Three levels of password protection help maintain the reliability of the configuration.

### Rugged

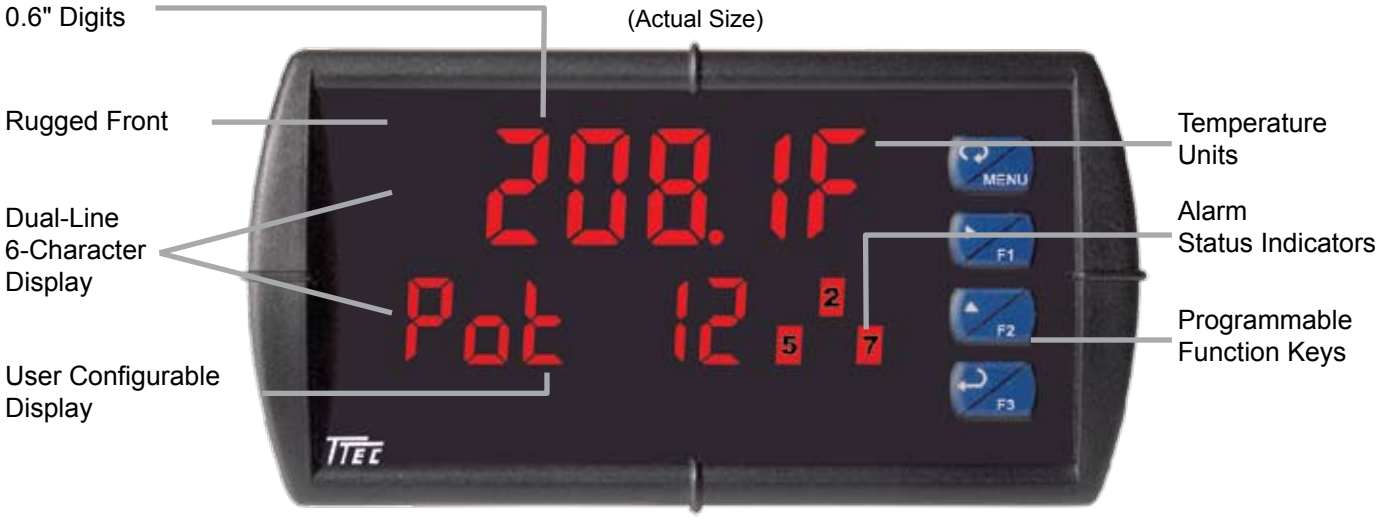
A unique front panel design makes the TT7000 nearly impenetrable in typical applications. Here, the TT7000 easily survives a direct hit on the display from a heavy 2" solid stainless steel ball dropped from eight feet.

# MODEL TT7000 • DUAL-LINE TEMPERATURE METER

## Feature Rich and Flexible

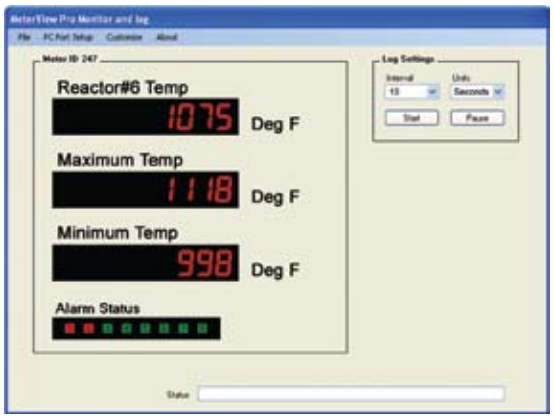
**UV Resistant**
**Sunlight Readable**

**Front Panel**
**NEMA 4X Rated**




## METERVIEW PRO

MeterView Pro can be used to configure, monitor, any TT7000 model from a PC. Save/recall configurations to/from PC.




## FIELD EXPANSION MODULES

Add functionality to the TT7000 in the field with easy-to-install external expansion modules. Add RS-232 or RS-422/485 communications, I/O modules (up to 2), or 4-relay expansion module. The menu items for these modules do not appear until the module is connected, simplifying the basic menu. Relay and digital I/O modules are shown above with optional DIN rail mounting kit, P/N TTA1002.

### Communications Module (Modbus®)

Serial communications on the TT7000 can be added anytime with external RS-232 or RS-422/485 communication adapters. Modbus® protocol is standard on all TT7000's at no extra charge.

### I/O Expansion Module

Four digital inputs and four digital outputs are available per expansion module. The TT7000 meter will accept two of these modules. External digital inputs can function similarly to the front panel function keys. They can be configured to trigger certain events (i.e. acknowledge/reset alarms, reset max and/or min values, disable/enable all output relays, and hold current relay states), provide direct menu access point, or mimic front panel keys.

Digital outputs can be used to remotely monitor TT7000's alarm relay output states, or the states of a variety of actions and functions executed by the meter.

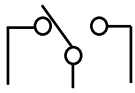
### Relay Expansion Module

An external module containing four 3 amp Form A (SPST) relays can be added to the TT7000 at anytime. Removable screw terminal blocks accept 12 to 22 AWG wire.

## METER COPY

The Copy feature is used to copy (or clone) all the settings from one TT7000 to other TT7000 meters in about 20 seconds! The Copy function is a standard feature on all meters. It does not require a communications adapter, only an optional cable assembly, P/N TTA1200. See the ordering information for

complete details.



# OUTPUTS

## Relay Outputs

The TT7000 has up to four 3 A Form C relays (SPDT), giving you more fail-safe options upon power loss. Set ON and OFF time delays when needed. Up to eight front panel indicators show alarm and/or relay state. Can be configured for 0-100% deadband.

## Relay Operation/Configuration

There are powerful relay functions that can be configured in the TT7000 meter, including:

- Automatic reset only (non-latching)
- Automatic + manual reset at any time (non-latching)
- Latching (manual reset only)
- Latching with clear (manual reset only after alarm condition has cleared)
- User selectable fail-safe operation
- Relay action upon sensor break
- Time delay (on and off), independent for each relay
- Manual control mode

*Front panel button or digital input may be assigned to acknowledge relays programmed for manual reset.*

## Interlock Relay(s)

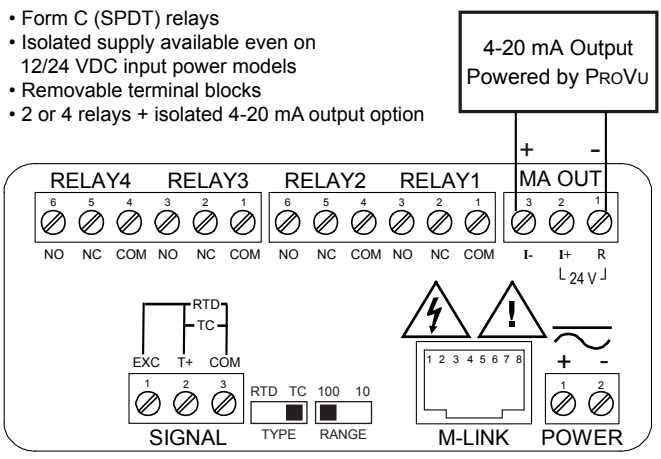
This feature allows a process to use a very low voltage input signal(s) or simple switch contact(s) to force closed N/O contacts of assigned internal relay(s) to “open” when an external switch contact (or any part of the circuit) is opened. One input can be used in series with a number of interlock switches, or up to eight inputs can be required to force-on one (or more) internal interlock relays. Please see Application Note AN-1007 on our website for more information. Requires TTA1044 Digital I/O module.

## Analog Output

The isolated analog retransmission signal can be configured to represent the measured temperature, maximum or minimum temperature, or any of the eight relay set points. While the output

# CONNECTIONS

- Form C (SPDT) relays
- Isolated supply available even on 12/24 VDC input power models
- Removable terminal blocks
- 2 or 4 relays + isolated 4-20 mA output option




- Universal 85-265 VAC or 12/24 VDC input power
- Thermocouple or RTD inputs
- M-Link for adding expansion modules

# Relays

**Rating:** 2 or 4 SPDT (Form C) internal and/or 4 SPST (Form A) external; rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 watts) @ 125/250 VAC for inductive loads such as contactors, solenoids, etc.
**Noise Suppression:** Noise suppression is recommended for each relay contact switching inductive loads.
**Deadband:** 0-100% of span, user programmable
**High or Low Alarm:** User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turned off).
**Relay Operation:** automatic (non-latching) or latching (requires manual acknowledge)
**Time Delay:** 0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay.
**Fail-Safe Operation:** Programmable and independent for each relay.
*Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.*
**Auto Initialization:** When power is applied to the meter, relays will reflect the state of the input to the meter.

# Isolated 4-20 mA Transmitter Output

**Output Source:** measured temperature, maximum temperature, minimum temperature, set points 1-8, or manual control mode
**Scaling Range:** 1.000 to 23.000 mA for any display range
**Calibration:** Factory calibrated 4-20 mA output
**Accuracy:** ± 0.1% of span ± 0.004 mA
**Temperature Drift:** 0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -20 to 0°C ambient
*Note: Analog output drift is separate from input drift.*
**Isolated Transmitter Power Supply:** Terminals I+ & R: 24 VDC ± 10% @ 40 mA maximum, may be used to power the 4-20 mA output or other devices. Present on both AC & DC powered units.
**External Loop Power Supply:** 35 VDC maximum
**Output Loop Resistance:**

| Power supply | Minimum | Maximum |
|---|---|---|
| 24 VDC | 10 Ω | 700 Ω |
| 35 VDC (external) | 100 Ω | 1200 Ω |

# Serial Communications

**Protocol:** Modbus® RTU
**Meter Address/Slave ID:** 1 - 247
**Baud Rate:** 300 - 19,200 bps
**Transmit Time Delay:** Programmable between 0 and 199 ms or transmitter always on for RS-422 communication
**Data:** 8 bit (1 start bit, 1 or 2 stop bits)
**Parity:** Even, odd, or none with 1 or 2 stop bits
**Byte-to-Byte Timeout:** 0.01 - 2.54 second

# Digital I/O Expansion Module

**Channels:** 4 digital inputs & 4 digital outputs per module
**System:** Up to 2 modules for a total of 8 inputs & 8 outputs
**Digital Input Logic: High:** 3 to 5 VDC **Low:** 0 to 1.25 VDC
**Digital Output Logic: High:** 4.75 to 5 VDC **Low:** 0 to 0.4 VDC
**Source Current:** 10 mA maximum
**Sink Current:** 1.5 mA minimum
**+5 V Terminal:** To be used as pull-up for digital inputs only.

# 4-Relay Expansion Module

**Relays:** Four Form A (SPST) rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 watts) @ 125/250 VAC for inductive loads.

## Disclaimer