



**tCAL**

**TC12+**

**Temperature Calibrator**



tCAL model TC12+ Temperature Calibrator is the compact, rugged and easy to use hand held device with graphical user interface for precise measuring and sourcing of electrical and physical parameters.

Masibus TC12+ Temperature Calibrator is designed to provide the best accuracy in all modes of operation.

TC12+ has Source and Measurement capability with independent parameter and range selection for Source and Measure. TC12+ has mA/ V/ mV/ mA (2W)/ Switch-test / RTD/ TC/ measurement capability and also has Resistance/ RTD/ TC/ source capability. There is an isolation between measure and source/ measure sections.

TC12+ Temperature Calibrator has easy to operate short cut keys SCR1 and SCR2 for input selection for measure and source/ measure respectively.

Automatic step/ ramp output with Auto/ Man selection, data logging, Max/ Min/ Average values, scaling to engineering units and filter settings enhances the use of Temperature Calibrator.

It has been designed to give maximum Battery life on full charge, the backlight is adjustable for power saving and the display can be programmed to automatically enable the glance screen when not in use.

TC12+ comes with a Mini USB connector for charging, logged data retrieval and firmware upgrade. Standard accessories provided are patch cables, charger, USB cable, instruction manual, logged data retrieval software CD and calibration certificate, all in an attractive carrying case.

## Features

- Compact, handheld, user friendly menu
- Easy to read color graphical TFT LCD display
- Rechargeable lithium ion battery with enhanced power control for prolonged battery life
- Measure: mA/ V/ mV/ mA (24V)/ Switch-test / RTD/ TC
- Source: Resistance/ RTD/ TC
- 24 VDC Loop power supply to power transmitters and loops
- Step/Ramp functions with auto/ man selection
- Universal Serial Bus (USB) communication port for charging, data retrieve and firmware upgrade
- Data logging to measure long time drift
- Other Features: Max/ Min/ Average, filter settings, tare facility, adjustable backlight, alarm annunciation (on display and buzzer), glance screen mode
- Continuity test
- Pulsed RTD transmitter compatible
- HART loop resistor

## Applications

- Calibrating and checking temperature indicator/ controllers, recorders, temperature transmitters, signal conditioners, etc.
- Laboratory and site calibration purpose
- Measure and simulate for thermocouple
- Calibration of Transmitters and Transducers
- Drift test of Transmitters and Transducers

TECHNICAL SPECIFICATIONS

| Measurement & Simulation Range                                                                                                                                                                                       |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------|--------------------|-------------|--|
| Parameters                                                                                                                                                                                                           | Range                                                                                                    | Resolution                                     | Accuracy                                                                             |                                           |                                                                                                          |                 |                    |             |  |
| Resistance (Ohms)                                                                                                                                                                                                    | 0 to 400 Ω                                                                                               | 0.01Ω                                          | 4 Wire Measurement ±0.02% of reading ±0.01Ω<br>Simulation: ±0.02% of reading ± 0.02Ω |                                           |                                                                                                          |                 |                    |             |  |
|                                                                                                                                                                                                                      | 400 to 4000Ω #                                                                                           | 0.1Ω                                           | 4 Wire Measurement: ±0.02% of reading ±0.1Ω<br>Simulation: ±0.02% of reading ± 0.15Ω |                                           |                                                                                                          |                 |                    |             |  |
| Pt10 to Pt1000                                                                                                                                                                                                       | -200 to 200 °C                                                                                           | Pt10 to Pt400: 0.01°C<br>Pt500, Pt1000: 0.1 °C | 4 wire Measurement: ±0.15°C, Simulation*: ±0.15 °C                                   |                                           |                                                                                                          |                 |                    |             |  |
|                                                                                                                                                                                                                      | 200 to 600 °C                                                                                            |                                                | 4 wire Measurement: ±0.2 °C, Simulation*: ±0.25 °C                                   |                                           |                                                                                                          |                 |                    |             |  |
|                                                                                                                                                                                                                      | 600 to 850 °C                                                                                            |                                                | 4 wire Measurement: ±0.3 °C, Simulation*: ±0.35 °C                                   |                                           |                                                                                                          |                 |                    |             |  |
| Ni100                                                                                                                                                                                                                | -60 to 180 °C                                                                                            | 0.01 °C                                        | 4 wire Measurement: ±0.1 °C                                                          |                                           |                                                                                                          |                 |                    |             |  |
| Ni120                                                                                                                                                                                                                | -80 to 260 °C                                                                                            | 0.01 °C                                        | Simulation*: ±0.15 °C                                                                |                                           |                                                                                                          |                 |                    |             |  |
| Cu10 to Cu100                                                                                                                                                                                                        | -200 to 260 °C                                                                                           | 0.01 °C                                        | 4 wire Measurement: ±0.2°C, Simulation*: ±0.8°C                                      |                                           |                                                                                                          |                 |                    |             |  |
| Note: # For 4 wire Resistance measurement 0.01 Ω resolution available in 0 to 1600 ohm range                                                                                                                         |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| *Accuracy is valid with an excitation current >0.2mA (0...400 ohm), >0.1mA (400...4000 ohm)                                                                                                                          |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| ** Read accuracy is based on 4-wire input. For 3-wire RTD measurements assuming all three RTD leads are matched, add 1.0°C (Pt10 and Cu10), 0.6°C (Pt50 and Cu50), and 0.4°C (other RTD types) to the specifications |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Electrical Measurement Parameters & Accuracy                                                                                                                                                                         |                                                                                                          |                                                |                                                                                      | Compatible RTD Types                      |                                                                                                          |                 |                    |             |  |
| Parameter                                                                                                                                                                                                            | Range                                                                                                    | Resolution                                     | Accuracy                                                                             |                                           | Pt10 (385)                                                                                               | Pt400 (385)     | Ni100 (672)        | Cu10 (427)  |  |
| V                                                                                                                                                                                                                    | 0 to 30.00 VDC                                                                                           | 0.001 V                                        | ±0.02% of reading ± 2 count                                                          |                                           | Pt50 (385)                                                                                               | Pt500 (385)     | Ni100 (618)        | Cu50 (427)  |  |
| mA                                                                                                                                                                                                                   | 0 to 24.000 mA                                                                                           | 0.001 mA                                       | ±0.02% of reading ± 2 count                                                          |                                           | Pt100 (385)                                                                                              | Pt1000 (385)    | Ni120 (672)        | Cu100 (427) |  |
| Thermocouple/mV Measurement/Simulation Resolution & Accuracy@20-30°C                                                                                                                                                 |                                                                                                          |                                                |                                                                                      |                                           | Pt200 (385)                                                                                              | Pt100 (3926)    |                    |             |  |
| TC Type                                                                                                                                                                                                              | Range                                                                                                    | Resolution                                     | Accuracy^                                                                            |                                           | Long term drift for 1 year                                                                               |                 |                    |             |  |
| E                                                                                                                                                                                                                    | -200.0 to 1000.0 °C                                                                                      | 0.1 °C                                         | 0.3 °C± 4uV                                                                          |                                           | V/mA measurement mode                                                                                    |                 | ±0.02% of reading  |             |  |
| J                                                                                                                                                                                                                    | -200.0 to 1200.0 °C                                                                                      | 0.1 °C                                         | 0.3 °C± 4uV                                                                          |                                           | E,J,K,T,N                                                                                                |                 | ±0.3 °C of reading |             |  |
| K                                                                                                                                                                                                                    | -200.0 to 1372.0 °C                                                                                      | 0.1 °C                                         | 0.3 °C± 4uV                                                                          |                                           | B,R,S                                                                                                    |                 | ±0.5°C of reading  |             |  |
| T                                                                                                                                                                                                                    | -200.0 to 400.0 °C                                                                                       | 0.1 °C                                         | 0.3 °C± 4uV                                                                          |                                           | mV                                                                                                       |                 | ±0.02% of reading  |             |  |
| B                                                                                                                                                                                                                    | 450.0 to 1800.0 °C                                                                                       | 0.1 °C                                         | 0.5 °C± 4uV                                                                          |                                           | Resistance measurement and simulation                                                                    |                 | ±0.02% of reading  |             |  |
| R                                                                                                                                                                                                                    | 0.0 to 1750.0 °C                                                                                         | 0.1 °C                                         | 0.5 °C± 4uV                                                                          |                                           | Pt10 to Pt100                                                                                            |                 |                    |             |  |
| S                                                                                                                                                                                                                    | 0 to 1750.0 °C                                                                                           | 0.1 °C                                         | 0.5 °C± 4uV                                                                          |                                           | -200 to 600 measurement and simulation mode                                                              |                 | ±0.2°C             |             |  |
| N                                                                                                                                                                                                                    | -200.0 to 1300.0°C                                                                                       | 0.1 °C                                         | 0.3 °C± 4uV                                                                          |                                           | 600 to 800 measurement and simulation                                                                    |                 | ±0.3°C             |             |  |
| mV                                                                                                                                                                                                                   | -10.000 to 80.000 mV                                                                                     | 0.001 mV                                       | ±0.02% of reading ± 4uV                                                              |                                           | Ni100 and Ni120 measurement and simulation mode                                                          |                 | ±0.15°C            |             |  |
|                                                                                                                                                                                                                      | -10.00 to 250.00 mV                                                                                      | 0.01mV                                         | ±0.02% of reading ± 0.02mV                                                           |                                           | Cu10 and Ni100 measurement mode                                                                          |                 | ±0.2°C             |             |  |
| Note: Temperature standard ITS-90                                                                                                                                                                                    |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          | simulation mode |                    | ±0.8°C      |  |
| ^Degree equivalent to 4uV against respective readings to be added to above mentioned accuracy for TC input.                                                                                                          |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| General Specifications                                                                                                                                                                                               |                                                                                                          |                                                |                                                                                      | Display & Keys                            |                                                                                                          |                 |                    |             |  |
| Display Mode                                                                                                                                                                                                         | Measure: mA/ V/ mV/ mA(2W)/ Switch-test / RTD/ TC<br>Source: Resistance/ RTD/ TC                         |                                                |                                                                                      | Display                                   | "2.4" TFT LCD,<br>Color Graphical 42.72 mm x 60.26 mm,<br>240x320 pixels, White LED Backlight            |                 |                    |             |  |
| Supported units for RTD/ TC type                                                                                                                                                                                     | °C/ °F/ °K                                                                                               |                                                |                                                                                      | Keys                                      | 9 Membrane Keys                                                                                          |                 |                    |             |  |
| RTD Measurement Current                                                                                                                                                                                              | 300 uA                                                                                                   |                                                |                                                                                      | Special Features                          |                                                                                                          |                 |                    |             |  |
| Maximum Resistance excitation current (simulation-Resistance/ RTD mode)                                                                                                                                              | 3 mA (0...650 Ω)<br>lexci 2.0V/ Rsim (650....4000Ω)                                                      |                                                |                                                                                      | Loop power output                         | 24V DC, ±10% (24mA maximum)                                                                              |                 |                    |             |  |
| Settling time (pulsed currents RTD Simulation)                                                                                                                                                                       | >1 ms                                                                                                    |                                                |                                                                                      | HART mA Loop Resistor                     | 250 Ω ± 20%                                                                                              |                 |                    |             |  |
| CJC error (For Thermocouple)                                                                                                                                                                                         | ±± 0.5 °C                                                                                                |                                                |                                                                                      | Special Function                          | Step/Ramp functions: Automatic/Manual.<br>√x, x² : for mA/V measure                                      |                 |                    |             |  |
| Internal Reference Junction                                                                                                                                                                                          |                                                                                                          |                                                |                                                                                      | Continuity Test                           | Audible sounds when resistance measure value crosses the specified threshold.<br>(selectable up to 100Ω) |                 |                    |             |  |
| CJC selection                                                                                                                                                                                                        | Manual/ Internal/ External(1)                                                                            |                                                |                                                                                      | Automatic wire detection (RTD/Resistance) | 2-wire, 3-wire or 4-wire                                                                                 |                 |                    |             |  |
| Max. input voltage (EM Terminal)                                                                                                                                                                                     | 30 VDC                                                                                                   |                                                |                                                                                      | Switch Test                               | • Potential free contacts<br>Trigger level : 24V, 24mA (2V)                                              |                 |                    |             |  |
| Temperature Coefficient                                                                                                                                                                                              | ≤30 ppm                                                                                                  |                                                |                                                                                      |                                           | • Voltage level detection<br>Trigger level : 0 to 30V in 1V steps                                        |                 |                    |             |  |
| Input Impedance                                                                                                                                                                                                      | TC/ mV/ V >1MΩ<br>mA: 10 Ω                                                                               |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Response time                                                                                                                                                                                                        | Input <100ms, Output <100ms                                                                              |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Load impedance                                                                                                                                                                                                       | >4.7KΩ for TC/mV                                                                                         |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Display update rate                                                                                                                                                                                                  | 10 readings / sec                                                                                        |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Isolation                                                                                                                                                                                                            | 500VDC between mA/V Measure and RTD /Ω /TC/mV                                                            |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Data logging                                                                                                                                                                                                         | Logged data is stored in a user defined file in internal memory<br>Periodic logging: 150000 readings max |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| Communication Interface                                                                                                                                                                                              | USB 2.0                                                                                                  |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |
| (1)with RTD sensor at RTD terminal for External CJC                                                                                                                                                                  |                                                                                                          |                                                |                                                                                      |                                           |                                                                                                          |                 |                    |             |  |

# TECHNICAL SPECIFICATIONS

| Power Supply                    |                                                 | Environmental                                                          |                              |
|---------------------------------|-------------------------------------------------|------------------------------------------------------------------------|------------------------------|
| Battery type                    | Rechargeable Li-ion battery pack, 2300mAh 3.7V  | Operating temperature                                                  | 0 to 55 °C                   |
| Charging time                   | <5 hours max                                    | Operating temperature while charging batteries                         | 0 to 45 °C                   |
| Charger supply                  | 100-240 VAC, 50/60 Hz; Output 5V DC@1A          | Storage temperature                                                    | -20 to 60 °C                 |
| Battery Life on full charge     | Continuous operation (measure or source)        | Relative Humidity                                                      | 30% to 90% RH non-condensing |
|                                 | >17 hours                                       | Warm-up time                                                           | 5 Minutes                    |
| Battery Status Indication       | Continuous operation (12mA (24V) measure)       | Accessories                                                            |                              |
|                                 | >9 hours                                        | Calibration Certificate                                                |                              |
| Battery Status Indication       | Battery symbol displayed with % power remaining | User Guide                                                             |                              |
|                                 |                                                 | 2 Sets of 2mm to 2mm banana cable                                      |                              |
| Physical                        |                                                 | 2 Sets of 2mm Crocodile cable                                          |                              |
| Dimensions                      | 161.7 mm (L) x 82.1 mm (W) x 39.5 mm (H)        | 1 Test lead Cu-Cu (Miniature TC Plug Cu type to 2mm test lead)         |                              |
| Housing Material                | ABS Plastic                                     | USB A Male to USB mini B Male cable for PC communication and charging. |                              |
| Electrical Terminals:           |                                                 | 5 VDC@1A Charging Adaptor                                              |                              |
| Measure: V/mA/mA(24V)/switch    | Two nos., 2 mm safety sockets                   | Carrying Bag                                                           |                              |
| RTD Terminals:                  |                                                 | Data Logging Software CD - mCAL                                        |                              |
| Measure /Source: Resistance/RTD | Four nos., 2 mm safety sockets                  |                                                                        |                              |
| TC Terminals:                   |                                                 |                                                                        |                              |
| TC/mV (measure/Source)          | Thermocouple minijack socket (cu type)          |                                                                        |                              |
| Weight                          | <300 grams                                      |                                                                        |                              |
| Protection                      | IP20                                            |                                                                        |                              |

## Ordering Code

|  |       |
|--|-------|
|  | Model |
|  | TC12+ |