



## tCAL

## TC12<sup>+</sup>

# Temperature Calibrator

**tCAL** model TC12<sup>+</sup> 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<sup>+</sup> Temperature Calibrator is designed to provide the best accuracy in all modes of operation.

TC12<sup>+</sup> has Source and Measurement capability with independent parameter and range selection for Source and Measure. TC12<sup>+</sup> 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<sup>+</sup> 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<sup>+</sup> 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 Simulation: ±0.02% of reading ± 0.02Ω
	400 to 4000Ω <sup>#</sup>	0.1Ω	4 Wire Measurement: ±0.02% of reading ±0.1Ω Simulation: ±0.02% of reading ± 0.15Ω
Pt10 to Pt1000	-200 to 200 °C	Pt10 to Pt400: 0.01°C 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 0.01Ω 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

Parameter	Range	Resolution	Accuracy
V	0 to 30.00 VDC	0.001 V	±0.02% of reading ± 2 count
mA	0 to 24.000 mA	0.001 mA	±0.02% of reading ± 2 count

## Compatible RTD Types

Pt10 (385)	Pt400 (385)	Ni100 (672)	Cu10 (427)
Pt50 (385)	Pt500 (385)	Ni100 (618)	Cu50 (427)
Pt100 (385)	Pt1000 (385)	Ni120 (672)	Cu100 (427)
Pt200 (385)	Pt100 (3926)		

## Thermocouple/mV Measurement/Simulation Resolution & Accuracy@20-30°C

TC Type	Range	Resolution	Accuracy <sup>▲</sup>
E	-200.0 to 1000.0 °C	0.1 °C	0.3 °C± 4uV
J	-200.0 to 1200.0 °C	0.1 °C	0.3 °C± 4uV
K	-200.0 to 1372.0 °C	0.1 °C	0.3 °C± 4uV
T	-200.0 to 400.0 °C	0.1 °C	0.3 °C± 4uV
B	450.0 to 1800.0 °C	0.1 °C	0.5 °C± 4uV
R	0.0 to 1750.0 °C	0.1 °C	0.5 °C± 4uV
S	0 to 1750.0 °C	0.1 °C	0.5 °C± 4uV
N	-200.0 to 1300.0°C	0.1 °C	0.3 °C± 4uV
mV	-10.000 to 80.000 mV	0.001 mV	±0.02% of reading ± 4uV
	-10.00 to 250.00 mV	0.01mV	±0.02% of reading ± 0.02mV

Note: Temperature standard ITS-90

▲ Degree equivalent to 4uV against respective readings to be added to above mentioned accuracy for TC input.

## Long term drift for 1 year

V/mA measurement mode	±0.02% of reading
E,J,K,T,N	±0.3 °C of reading
B,R,S	±0.5°C of reading
mV	±0.02% of reading
Resistance measurement and simulation	±0.02% of reading
Pt10 to Pt100	
-200 to 600 measurement and simulation mode	±0.2°C
600 to 800 measurement and simulation	±0.3°C
Ni100 and Ni120	
measurement and simulation mode	±0.15°C
Cu10 and Ni100	
measurement mode	±0.2°C
simulation mode	±0.8°C

## General Specifications

Display Mode	Measure: mA/ V/ mV/ mA(2W)/ Switch-test / RTD/ TC Source: Resistance/ RTD/ TC
Supported units for RTD/ TC type	°C/ °F/ °K
RTD Measurement Current	300 uA
Maximum Resistance excitation current (simulation-Resistance/ RTD mode)	3 mA (0...650 Ω) Iexc 2.0V/ Rsim (650...4000Ω)
Settling time (pulsed currents RTD Simulation)	>1 ms
CJC error (For Thermocouple)	≤± 0.5 °C
Internal Reference Junction	
CJC selection	Manual/ Internal/ External <sup>(1)</sup>
Max. input voltage (EM Terminal)	30 VDC
Temperature Coefficient	≤30 ppm
Input Impedance	TC/ mV/ V >1MΩ 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 Periodic logging: 150000 readings max
Communication Interface	USB 2.0

<sup>(1)</sup>with RTD sensor at RTD terminal for External CJC

## Display & Keys

Display	"2.4" TFT LCD, Color Graphical 42.72 mm x 60.26 mm, 240x320 pixels, White LED Backlight
Keys	9 Membrane Keys

## Special Features

Loop power output	24V DC, ±10% (24mA maximum)
HART mA Loop Resistor	250 Ω ± 20%
Special Function	Step/Ramp functions: Automatic/Manual. √x, x <sup>2</sup> : for mA/V measure
Continuity Test	Audible sounds when resistance measure value crosses the specified threshold. (selectable up to 100Ω)
Automatic wire detection (RTD/Resistance)	2-wire, 3-wire or 4-wire
Switch Test	<ul style="list-style-type: none"> <li>Potential free contacts</li> <li>Trigger level : 24V, 24mA (2V)</li> <li>Voltage level detection</li> <li>Trigger level : 0 to 30V in 1V steps</li> </ul>

# 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) >17 hours	Relative Humidity	30% to 90% RH non-condensing
	Continuous operation (12mA (24V) measure) >9 hours	Warm-up time	5 Minutes
Battery Status Indication	Battery symbol displayed with % power remaining	<b>Accessories</b>	
Physical		Calibration Certificate	
Dimensions	161.7 mm (L) x 82.1 mm (W) x 39.5 mm (H)	User Guide	
Housing Material	ABS Plastic	2 Sets of 2mm to 2mm banana cable	
Electrical Terminals: Measure: V/mA/mA(24V)/ switch	Two nos., 2 mm safety sockets	2 Sets of 2mm Crocodile cable	
RTD Terminals: Measure /Source: Resistance/ RTD	Four nos., 2 mm safety sockets	1 Test lead Cu-Cu (Miniature TC Plug Cu type to 2mm test lead)	
TC Terminals: TC/mV (measure/Source)	Thermocouple minijack socket (cu type)	USB A Male to USB mini B Male cable for PC communication and charging.	
Weight	<300 grams	5 VDC@1A Charging Adaptor	
Protection	IP20	Carrying Bag	
		Data Logging Software CD - mCAL	

## Ordering Code

### Model

TC12\*