



# Universal Calibrator for Instrumentation MCS-12

- Measures and generates mA, mV, volts, ohms, RTD, TC and Hz.
- Simultaneous input and output operation.
- Isolated input and output.
- Interface with a Windows-based Calibration Software to provide a true Computer-Aided Calibration System with documenting capability.
- Real-time data acquisition capability when connected to a computer.
- Callendar-Van Dusen coefficients for Probe input.

MCS-12 Universal Calibrator enables measurement and generation of signals used in instrumentation and Process Control. It is a high-accuracy instrument, having high stability features in temperature changes and long-term aging conditions. The Probe input calculates the temperature based on international standard tables, in IPTS-68 and ITS-90 scales, and also has algorithms that calculate temperatures using Callendar-Van Dusen coefficients from a calibrated sensor. It contains useful items allowing its on field and workbench use. The calibrator also incorporates concepts of automatic checking and calibration via computer, such as report and certificate issues, automatic work management, data archiving for an overall coverage of quality procedure requirements. Additionally, various optional modules are available, intended to perform pressure and temperature measurements.

### Specifications - Inputs

Input Ranges	Resolution	Accuracy	Remarks
<b>millivolt</b>			
-150 mV to 150 mV	0.001 mV	± 0.01 % FS ***	R <sub>input</sub> > 10 MΩ
-500 mV to -150 mV	0.01 mV	± 0.02 % FS	auto-range
150 mV to 2450 mV	0.01 mV	± 0.02 % FS	
<b>volt</b>			
-10 V to 11 V	0.0001 V	± 0.02 % FS	R <sub>input</sub> > 1 MΩ
11 V to 45 V	0.0001 V	± 0.02 % FS	
<b>mA</b>			
-5 mA to 24.5 mA	0.0001 mA	± 0.02 % FS	R <sub>input</sub> < 160 Ω
<b>frequency *</b>			
0 to 600 Hz	0.01 Hz	± 0.02 Hz	R <sub>input</sub> > 50 kΩ
600 to 1300 Hz	0.1 Hz	± 0.2 Hz	Voltage DC <sub>maximum</sub> = 30 V
1300 to 10000 Hz	1 Hz	± 2 Hz	AC Signal from 0.3 to 30 V auto-range
<b>counter *</b>			
0 to 10 <sup>8</sup> -1 count	1 count	—	Same remark as frequency
<b>resistance</b>			
0 to 400 Ω	0.01 Ω	± 0.01 % FS	Pulse Frequency < 3000 Hz
400 to 2500 Ω	0.01 Ω	± 0.03 % FS	Excitation current 0.85 mA, auto-range
<b>Pt-100</b>			
-200 to 850 °C / -328 to 1562 °F	0.01 °C / 0.01 °F	± 0.1 °C / ± 0.2 °F	IEC-60751
<b>Pt-1000</b>			
-200 to 400 °C / -328 to 752 °F	0.1 °C / 0.1 °F	± 0.1 °C / ± 0.2 °F	IEC-60751
<b>Cu-10</b>			
-200 to 260 °C / -328 to 500 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	MINCO 16-9
<b>Ni-100</b>			
-60 to 250 °C / -76 to 482 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	DIN-43760
<b>Probe **</b>			
-200 to 850 °C / -328 to 1562 °F	0.01 °C / 0.01 °F	± 0.1 °C / ± 0.2 °F	IEC-60751
<b>TC-J</b>			
-210 to 1200 °C / -346 to 2192 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	IEC-60584
<b>TC-K</b>			
-270 to -150 °C / -454 to -238 °F	0.1 °C / 0.1 °F	± 0.5 °C / ± 1.0 °F	IEC-60584
-150 to 1370 °C / -238 to 2498 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	
<b>TC-T</b>			
-260 to -200 °C / -436 to -328 °F	0.1 °C / 0.1 °F	± 0.6 °C / ± 1.2 °F	IEC-60584
-200 to -75 °C / -328 to -103 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	
-75 to 400 °C / -103 to 752 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	
<b>TC-B</b>			
50 to 250 °C / 122 to 482 °F	0.1 °C / 0.1 °F	± 2.5 °C / ± 5.0 °F	IEC-60584
250 to 500 °C / 482 to 932 °F	0.1 °C / 0.1 °F	± 1.5 °C / ± 3.0 °F	
500 to 1200 °C / 932 to 2192 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	
1200 to 1820 °C / 2192 to 3308 °F	0.1 °C / 0.1 °F	± 0.7 °C / ± 1.4 °F	
<b>TC-R</b>			
-50 to 300 °C / -58 to 572 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	IEC-60584
300 to 1760 °C / 572 to 3200 °F	0.1 °C / 0.1 °F	± 0.7 °C / ± 1.4 °F	
<b>TC-S</b>			
-50 to 300 °C / -58 to 572 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	IEC-60584
300 to 1760 °C / 572 to 3200 °F	0.1 °C / 0.1 °F	± 0.7 °C / ± 1.4 °F	
<b>TC-E</b>			
-270 to -150 °C / -454 to -238 °F	0.1 °C / 0.1 °F	± 0.3 °C / ± 0.6 °F	IEC-60584
-150 to 1000 °C / -238 to 1832 °F	0.1 °C / 0.1 °F	± 0.1 °C / ± 0.2 °F	
<b>TC-N</b>			
-260 to -200 °C / -436 to -328 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	IEC-60584
-200 to -20 °C / -328 to -4 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	
-20 to 1300 °C / -4 to 2372 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	
<b>TC-L</b>			
-200 to 900 °C / -328 to 1652 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	DIN-43710
<b>TC-C</b>			
0 to 1500 °C / 32 to 2732 °F	0.1 °C / 0.1 °F	± 0.5 °C / ± 1.0 °F	W5Re / W26Re
1500 to 2320 °C / 2732 to 4208 °F	0.1 °C / 0.1 °F	± 0.7 °C / ± 1.4 °F	W5Re / W26Re

(\*) Accuracy since frequency output is not configured. (\*\*) Probe is a spare input for a reference RTD in order to use as standard thermometer. The accuracy is related to calibrator only. (\*\*\*) FS = Full Scale.

### Specifications - Output

Output Ranges	Resolution	Accuracy	Remarks
<b>millivolt</b>			
-10 mV to 110 mV	0.001 mV	± 0.02 % FS	R <sub>output</sub> < 0.3 Ω
<b>volt</b>			
-0.5 V to 12 V	0.0001 V	± 0.02 % FS	R <sub>output</sub> < 0.3 Ω
<b>mA</b>			
0 to 24 mA	0.0001 mA	± 0.02 % FS	R <sub>maximum</sub> = 700 Ω
<b>Two-wire transmitter (XTR)</b>			
4 to 24 mA	0.0001 mA	± 0.02 % FS	V <sub>maximum</sub> = 60 V
<b>frequency</b>			
0 to 100 Hz	0.01 Hz	± 0.02 Hz	Peak Value: 22 V / 25 mA max.
0 to 10000 Hz	1 Hz	± 2 Hz	
<b>pulse</b>			
0 to 10 <sup>8</sup> -1 pulse	1 pulse	—	Peak Value: 22 V / 25 mA max. Pulse Frequency up to 10000 Hz
<b>resistance</b>			
0 to 400 Ω	0.01 Ω	± 0.02 % FS	For external excitation current of 1 mA
0 to 2500 Ω	0.1 Ω	± 0.03 % FS	
<b>Pt-100</b>			
-200 to 850 °C / -328 to 1562 °F	0.01 °C / 0.01 °F	± 0.2 °C / ± 0.4 °F	IEC-60751
<b>Pt-1000</b>			
-200 to 400 °C / -328 to 752 °F	0.1 °C / 0.1 °F	± 0.1 °C / ± 0.2 °F	IEC-60751
<b>Cu-10</b>			
-200 to 260 °C / -328 to 500 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	MINCO 16-9
<b>Ni-100</b>			
-60 to 250 °C / -76 to 482 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	DIN-43760
<b>TC-J</b>			
-210 to 1200 °C / -346 to 2192 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	IEC-60584
<b>TC-K</b>			
-270 to -150 °C / -454 to -238 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	IEC-60584
-150 to 1370 °C / -238 to 2498 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	
<b>TC-T</b>			
-260 to -200 °C / -436 to -328 °F	0.1 °C / 0.1 °F	± 1.2 °C / ± 2.4 °F	IEC-60584
-200 to -75 °C / -328 to -103 °F	0.1 °C / 0.1 °F	± 0.8 °C / ± 1.6 °F	
-75 to 400 °C / -103 to 752 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	
<b>TC-B</b>			
50 to 250 °C / 122 to 482 °F	0.1 °C / 0.1 °F	± 5.0 °C / ± 10.0 °F	IEC-60584
250 to 500 °C / 482 to 932 °F	0.1 °C / 0.1 °F	± 3.0 °C / ± 6.0 °F	
500 to 1200 °C / 932 to 2192 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	
1200 to 1820 °C / 2192 to 3308 °F	0.1 °C / 0.1 °F	± 1.4 °C / ± 2.8 °F	
<b>TC-R</b>			
-50 to 300 °C / -58 to 572 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	IEC-60584
300 to 1760 °C / 572 to 3200 °F	0.1 °C / 0.1 °F	± 1.4 °C / ± 2.8 °F	
<b>TC-S</b>			
-50 to 300 °C / -58 to 572 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	IEC-60584
300 to 1760 °C / 572 to 3200 °F	0.1 °C / 0.1 °F	± 1.4 °C / ± 2.8 °F	
<b>TC-E</b>			
-270 to -150 °C / -454 to -238 °F	0.1 °C / 0.1 °F	± 0.6 °C / ± 1.2 °F	IEC-60584
-150 to 1000 °C / -238 to 1832 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	
<b>TC-N</b>			
-260 to -200 °C / -436 to -328 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	IEC-60584
-200 to -20 °C / -328 to -4 °F	0.1 °C / 0.1 °F	± 0.8 °C / ± 1.6 °F	
-20 to 1300 °C / -4 to 2372 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	
<b>TC-L</b>			
-200 to 900 °C / -328 to 1652 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	DIN-43710
<b>TC-C</b>			
0 to 1500 °C / 32 to 2732 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	W5Re / W26Re
1500 to 2320 °C / 2732 to 4208 °F	0.1 °C / 0.1 °F	± 1.4 °C / ± 2.8 °F	W5Re / W26Re

Accuracy values are valid within one year and temperature range of 20 to 26 °C. Outside these limits add 0.001 % FS / °C, taking 23 °C as the reference temperature. For thermocouples using the internal cold junction compensation add a cold junction compensation error of ± 0.2 °C or ± 0.4 °F.

**Serial Communication:** Modbus® RTU Protocol (RS-232/RS-485).

**Dimensions:** 91 mm x 233 mm x 64 mm (HxWxD).

**Weight:** 1 kg approx.

**Warranty:** 1 year, except for rechargeable battery.

**Included Items:** carrying case, test leads, manual and battery charger.

#### Optional Accessories:

Cold Junction Compensation Block - Order Code: 06.22.0002-00;

Temperature Sensors: 1/5 DIN-R Probe - Order Code: 04.06.0001-21;

1/5 DIN-A Probe - Order Code: 04.06.0007-21;

1/5 DIN-A-L Probe - Order Code: 04.06.0002-21;

Communication Interface - Order Code: 06.02.0007-00.