

9000

Portable Multifunction Calibrator



HIGHLIGHTS

- All-round calibrator for 3.5 and 4.5 digit multimeters
- 1050 V, 20.5 A, resistance, capacitance, TC, RTD and frequency
- Basic accuracy 60 ppm
- Terminal layout eliminates need for cable switching
- Compact, light, ideal for onsite calibrations

DESCRIPTION

9000 Portable Multifunction Calibrator is designed specifically for calibration of 3½ and 4½ digit multimeters. Advancing from M143 predecessor, the 9000 comes with much wider frequency ranges, capacitance function and stronger outputs to cover modern day handheld workload, including LoZ function calibration, panel meters, process meters and more.

The 9000 is the same size as a briefcase and weighs just 11 kgs so it's ideal for onsite calibrations. Large control zones of 8" touchscreen display are forgiving to inaccurate inputs and well-thought-out touch control design make the 9000 easy for operators to work with.

USB, Ethernet and IEEE488 interfaces enable remote control and automation in calibration labs as well as industrial test rigs. The 9000 is fully compatible with Meatest calibration SW package CALIBER/WinQBase, including CamOCR Camera Readout Module which makes handheld multimeter calibration incredibly effective.

Option	Description
GPIB	Adds IEEE488 (GPIB) and RJ45 (Ethernet) interfaces.
20A	Extends current output range to 20.5 A.
RC	Adds Resistance, Capacitance and RTD functions.

SPECIFICATION

All absolute uncertainty specifications in this document are defined at a confidence interval of 95%, extension coefficient $k = 2$. Product specifications include 12-month stability, resolution (in measurement functions if any), temperature and humidity effects (within specified limits), linearity, load and line regulation and uncertainty of calibration standards (calibration traceability).

GENERAL DATA

Warm-up time	30 minutes
Reference temperature	+21 °C – +25 °C
Operating temperature	+13 °C – +33 °C
Storage temperature	-10 °C – +55 °C
Temperature coefficient	10 % of accuracy / °C outside Tref
Max relative humidity	-10 – 30 °C: 80 % 30 – 40 °C: 70 % 40 – 55 °C: 40 %
Power supply	115/230V ± 10 % - 50/60 Hz, 450 VA max
Dimensions (W x H x D)	390 x 128 x 430 mm
Weight	11 kg
Interfaces	USB; IEEE488 and Ethernet are optional

DC/AC Voltage

Voltage range summary	DC: 0 mV – 1050 V AC sine: 1 mV – 1050 V Non-sine: 1 mV _{pk} – 14.1 V _{pk}
Internal ranges	Auto, 10 mV, 100 mV, 1 V, 10 V, 100 V, 1050 V
Frequency uncertainty and resolution	5 ppm, 6 digit
Non-sine waveform types	symmetrical square, ramp up, ramp down, triangle, truncated sinus, 1 kHz max.
Non-sine amplitude accuracy	0.21 % of value + 0.1% of range + 20 μV _{pk}

Ranges, resolution, 1 year accuracy [% of value + % of range]

Range	DC	10 Hz – 1 kHz	1 kHz – 10 kHz	10 kHz – 20 kHz	20 kHz – 100 kHz
0.0000 – 10.0000 mV	0.020 + 0.060	0.10 + 0.20	0.20 + 0.30	0.35 + 0.40	0.50 + 0.60
10.000 – 100.000 mV	0.010 + 0.0060	0.10 + 0.05	0.15 + 0.07	0.30 + 0.15	0.50 + 0.20
0.10000 – 1.00000 V	0.006 + 0.0010	0.05 + 0.005	0.07 + 0.01	0.15 + 0.04	0.50 + 0.10
1.0000 – 10.0000 V	0.006 + 0.0005	0.05 + 0.005	0.07 + 0.03	0.15 + 0.08	0.50 + 0.20
10.000 – 100.000 V ¹	0.006 + 0.0010	0.05 + 0.010	0.15 + 0.03	N/A	N/A
100.00 – 1050.00 V ²	0.009 + 0.0015	0.07 + 0.020	0.2 + 0.06	N/A	N/A

¹ 100V range starts at 40 Hz.

² 1050V range is limited to 40 – 5000 Hz below 500 V and 40 – 2500 Hz above 500 V.

Auxiliary parameters

Parameter	Range	10 mV	100 mV	1 V	10 V	100 V	1050 V
THD + noise ³	10 – 20 Hz	0.2 % + 100 μV	0.1 % + 100 μV	0.15 % + 200 μV	0.15 % + 400 μV	0.15 % + 4 mV	0.15 % + 40 mV
	20 – 1000 Hz	0.2 % + 100 μV	0.1 % + 100 μV	0.06 % + 200 μV	0.06 % + 400 μV	0.06 % + 4 mV	0.06 % + 40 mV
	1 – 10 kHz	0.2 % + 100 μV	0.1 % + 100 μV	0.06 % + 200 μV	0.06 % + 400 μV	0.1 % + 4 mV	0.15 % + 40 mV
	10 – 20 kHz	0.2 % + 100 μV	0.1 % + 100 μV	0.15 % + 200 μV	0.15 % + 400 μV	N/A	N/A
	20 – 100 kHz	0.4 % + 100 μV	0.2 % + 100 μV	0.25 % + 200 μV	0.5 % + 400 μV	N/A	N/A
Burden current	DC	50 Ω output	50 Ω output	30 mA	50 mA	20 mA	4 mA
	10 – 10 000 Hz	50 Ω output	50 Ω output	10 mA _{rms}	50 mA _{rms}	20 mA _{rms}	4 mA _{rms}
	10 – 100 kHz	50 Ω output	50 Ω output	10 mA _{rms}	50 mA _{rms}	N/A	N/A

³ Includes non-linear distortion and non-harmonic noise up to 500 kHz.

DC/AC Current

Current range summary	DC: 0 μ A – 20.5 A ^{*4} AC Sine: 1 μ A – 20.5 A ^{*4} Non-sine: 100 μ A _{pk} – 2.83 A _{pk}
Internal ranges	auto, 200 μ A, 2 mA, 20 mA, 200 mA, 2 A, 20.5 A ^{*4}
Frequency range	10 Hz – 20 kHz below 200 mA 10 Hz – 10 kHz for 200 mA – 2 A 10 Hz – 1 kHz above 2 A
Frequency uncertainty and resolution	5 ppm, 6 digit
Non-sine waveform types	symmetrical square, ramp up, ramp down, triangle, truncated sinus, 1 kHz max.
Non-sine amplitude accuracy	0.21 % of value + 0.1% of range + 700 nA _{pk}

Ranges, resolution, 1 year accuracy [% of value + % of range]

Range	DC	10 Hz – 1 kHz	1 kHz – 5 kHz	5 kHz – 10 kHz	10 kHz – 20 kHz
0.000 – 200.000 μ A	0.040 + 0.010	0.15 + 0.05	0.20 + 0.10	0.30 + 0.10	0.50 + 0.20
0.20000 – 2.00000 mA	0.020 + 0.005	0.10 + 0.010	0.10 + 0.02	0.15 + 0.02	0.30 + 0.05
2.0000 – 20.0000 mA	0.015 + 0.003	0.07 + 0.005	0.10 + 0.02	0.15 + 0.02	0.30 + 0.05
20.000 – 200.000 mA	0.015 + 0.003	0.07 + 0.005	0.10 + 0.02	0.15 + 0.02	0.30 + 0.05
0.2000 – 2.0000 A	0.015 + 0.005	0.10 + 0.005	0.15 + 0.05	0.30 + 0.05	N/A
2.000 – 20.500 A ^{*4*5}	0.05 + 0.01	0.20 + 0.015	N/A	N/A	N/A

^{*4} 20.5A range is optional.

^{*5} 30 min – 5 min maximum continuous output time. Depleted time regenerates 2x slower.

Auxiliary parameters

Parameter	Range	200 μ A	2 mA	20 mA	200 mA	2 A	20.5 A
Max. inductive load	10 Hz – 20 kHz	1 H	100 mH	100 mH	10 mH	1 mH	500 μ H
	10 Hz – 1 kHz	0.1 % + 1 μ A	0.1 % + 2 μ A	0.1 % + 10 μ A	0.1 % + 100 μ A	0.2 % + 4 mA	0.3 % + 8 mA
THD + noise ^{*6}	1 kHz – 5 kHz	0.2 % + 1 μ A	0.2 % + 2 μ A	0.2 % + 10 μ A	0.2 % + 100 μ A	0.5 % + 4 mA	N/A
	5 kHz – 10 kHz	0.2 % + 1 μ A	0.2 % + 2 μ A	0.2 % + 10 μ A	0.2 % + 100 μ A	0.6 % + 4 mA	N/A
	10 kHz – 20 kHz	0.5 % + 1 μ A	0.5 % + 2 μ A	0.5 % + 10 μ A	0.5 % + 100 μ A	N/A	N/A
Compliance voltage	DC	5 V	5 V	8 V	5 V	5 V	2 V
	10 Hz – 1 kHz	4 V _{rms}	4 V _{rms}	4 V _{rms}	4 V _{rms}	4 V _{rms}	2 V _{rms}
	1 kHz – 10 kHz	3 V _{rms}	3 V _{rms}	3 V _{rms}	3 V _{rms}	2 V _{rms}	N/A
	10 kHz – 20 kHz	2 V _{rms}	2 V _{rms}	2 V _{rms}	2 V _{rms}	N/A	N/A
Load adder ^{*7}	DC	100 nA/V	150 nA/V	250 nA/V	2 μ A/V	100 μ A/V	500 μ A/V
	10 Hz – 1 kHz	100 nA/V	150 nA/V	250 nA/V	2 μ A/V	100 μ A/V	N/A
	1 kHz – 10 kHz	2 μ A/V	2 μ A/V	2 μ A/V	5 μ A/V	200 μ A/V	N/A
	10 kHz – 20 kHz	5 μ A/V	5 μ A/V	5 μ A/V	10 μ A/V	N/A	N/A

^{*6} THD in bandwidth up to 500 kHz

^{*7} Additional uncertainty for compliance voltage above 0.5 V_{rms}

Frequency

Frequency range	0.10000 Hz – 2.000000 MHz (unspecified to 20 MHz)
Frequency accuracy	5 ppm
Waveform type	positive 5 V _{pk} , 1 V _{pk} , 100 mV _{pk}
Amplitude accuracy	20 %

Duty cycle

Frequency range	0.1 Hz up to 1 kHz (accuracy 5 ppm)
Range	0.1% up to 99.9% (accuracy 0.05%)
Voltage range	1 mV - 14.1V _{pk} (accuracy 0.5% +100 μ V)

Temperature TC

Thermocouple types
TC cold junction compensation
Uncertainty

B,C,D,E,G₂,J,K,M,N,R,S,T
Manual or automatic with adapter 91
0.18 °C – 0.96 °C in TC

RC OPTION

Adds resistance, capacitance and RTD functions.

Resistance

Resistance range summary
Modes

0.0000 Ω – 600.0000 MΩ in 4W
0.0000 Ω – 600.0000 MΩ in 2W
2W and 4W continuous range
2W and 4W fixed standards

Resistance modes and 1 year uncertainty [ppm of value + absolute]

Continuous range mode	Uncertainty ^{*8}	Nominal standard value	4W	2W
0 – 10 Ω	500 + 10 mΩ	0 Ω	1 mΩ	100 mΩ
10 – 100 Ω	250 + 10 mΩ	10 Ω	10 mΩ	110 mΩ
100 – 1000 Ω	250 + 25 mΩ	33 Ω	10 mΩ	110 mΩ
1 – 10 kΩ	150 + 50 mΩ	100 Ω	15 mΩ	115 mΩ
10 – 100 kΩ	150 + 500 mΩ	330 Ω	15 mΩ	115 mΩ
100 – 1000 kΩ	200 + 5 Ω	1000 Ω	100 ppm	200 ppm
1 – 3.3 MΩ	600 + 100 Ω	3300 Ω	100 ppm	200 ppm
3.3 – 10 MΩ	600 + 100 Ω	10 kΩ	50 ppm	60 ppm
10 – 33 MΩ	5000 + 10 kΩ	33 kΩ	50 ppm	60 ppm
33 – 120 MΩ	5000 + 10 kΩ	100 kΩ	50 ppm	50 ppm
120 – 600 MΩ	20000 + 50 kΩ	330 kΩ	75 ppm	75 ppm
		1000kΩ	-	100 ppm
		3300 kΩ	-	250 ppm
		10 MΩ	-	500 ppm
		33 MΩ	-	0.10 %
		100 MΩ	-	0.25 %
		330 MΩ	-	0.50 %

*8 Specification valid for 4W and 2W COMP. For 2W add 100 mΩ.

RTD temperature sensor simulation (4W)

Type	Range	Accuracy
Pt100 – Pt1000	-200.0 – 0.000 °C	0.15 °C
Pt100 – Pt1000	-0.001 – 850.000 °C	0.2 °C
Ni100 – Ni1000	-60.0 – 300.0 °C	0.1 °C

Capacitance

Capacitance range summary
Modes

2.00000 nF – 120.0000 mF
2W continuous range
2W fixed standards

Capacitance modes and 1 year uncertainty [% of value + absolute]

Continuous range mode	2W	Nominal standard value	2W
2 – 10 nF	0.3 % + 15 pF	1 nF	1.25 %
10 nF – 10 mF	0.35 %	3.3 nF	0.75 %
10 – 120 mF	0.6 %	10 nF	0.35 %
		33 nF	0.35 %
		100 nF	0.25 %
		330 μF	0.25 %
		1 μF	0.25 %
		3.3 μF	0.25 %
		10 μF	0.25 %