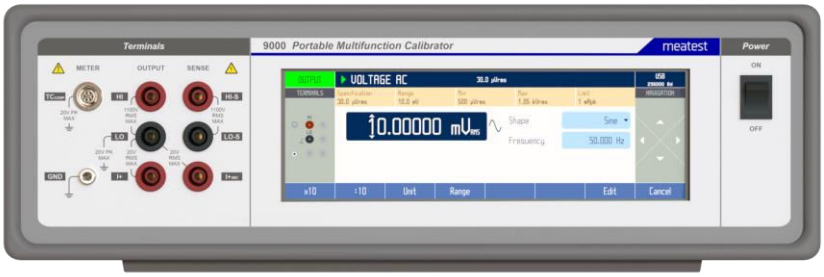
9000

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.

SPECIFICATION

Specifications below describe 1-year absolute accuracy of this product including long-term stability, linearity, load and line regulation and reference standard measurement uncertainty as well as ambient conditions within specified limits.

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 range	10 Hz – 100 kHz below 10 V 40 Hz – 10 kHz up to 100 V 40 Hz – 5 kHz up to 500 V 40 Hz – 2.5 kHz above 500 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 µA – 20.5 A *4 AC Sine: 1 µA – 20.5 A *4 Non-sine: 100 μA_{pk} – 2.83 A_{pk}
Internal ranges	auto, 200 µA, 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 µA	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 µA	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 µH
THD + noise *6	10 Hz – 1 kHz	0.1 % + 1 µA	0.1 % + 2 µA	0.1 % + 10 µA	0.1 % + 100 µA	0.2 % + 4 mA	0.3 % + 8 mA
	1 kHz – 5 kHz	0.2 % + 1 µA	0.2 % + 2 µA	0.2 % + 10 µA	0.2 % + 100 µA	0.5 % + 4 mA	N/A
	5 kHz – 10 kHz	0.2 % + 1 µA	0.2 % + 2 µA	0.2 % + 10 µA	0.2 % + 100 µA	0.6 % + 4 mA	N/A
	10 kHz – 20 kHz	0.5 % + 1 µA	0.5 % + 2 µA	0.5 % + 10 µA	0.5 % + 100 µA	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 µA/V	100 µA/V	500 µA/V
	10 Hz – 1 kHz	100 nA/V	150 nA/V	250 nA/V	2 µA/V	100 µA/V	N/A
	1 kHz – 10 kHz	2 µA/V	2 µA/V	2 µA/V	5 µA/V	200 µA/V	N/A
	10 kHz – 20 kHz	5 µA/V	5 µA/V	5 µA/V	10 µA/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 - 14.1Vpk (accuracy 0.5% +100 uV)

Temperature TC

Thermocouple types	B,C,D,E,G_2,J,K,M,N,R,S,T
TC cold junction compensation	Manual or automatic with adapter 91
Uncertainty	0.18 °C – 0.96 °C in TC

RC OPTION

Adds resistance, capacitance and RTD functions.

Resistance

Resistance range summary	0.0000 Ω – 600.0000 MΩ in 4W 0.0000 Ω – 600.0000 MΩ in 2W
Modes	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
0 – 10 Ω	500 + 10 mΩ
10 – 100 Ω	250 + 10 mΩ
100 – 1000 Ω	250 + 25 mΩ
1 -10 kΩ	150 + 50 mΩ
10 – 100 kΩ	150 + 500 mΩ
100 – 1000 kΩ	200 + 5 Ω
1 – 3.3 MΩ	600 + 100 Ω
3.3 – 10 MΩ	600 + 100 Ω
10 – 33 MΩ	5000 + 10 kΩ
33 – 120 MΩ	5000 + 10 kΩ
120 – 600 MΩ	20000 + 50 kΩ

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

Nominal standard value	4W	2W
0 Ω	1 mΩ	100 mΩ
10 Ω	10 mΩ	110 mΩ
33 Ω	10 mΩ	110 mΩ
100 Ω	15 mΩ	115 mΩ
330 Ω	15 mΩ	115 mΩ
1000 Ω	100 ppm	200 ppm
3300 Ω	100 ppm	200 ppm
10 kΩ	50 ppm	60 ppm
33 kΩ	50 ppm	60 ppm
100 kΩ	50 ppm	50 ppm
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 %

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

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

Continuous range mode	2W
2 – 10 nF	0.3 % + 15 pF
10 nF – 10 mF	0.35 %
10 – 120 mF	0.6 %

Nominal standard value	2W
1 nF	1.25 %
3.3 nF	0.75 %
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 %