meatest

EN-2022

ELECTRICAL CALIBRATION

detailed specifications

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RANGE OF PRODUCTS

COMPANY PROFILE

Meatest company was founded in 1991 and first designs date back another decade. With almost 40 years of experience in electrical metrology we make calibration and measurement equipment with long lasting reliability, user-friendliness and high performance at the very top of our priorities.

Development is focused on robust and flexible solutions matching everyone's needs and making your work easier. Meatest developers account for full 25 % of Meatest staff. Utilizing decades of experience, sophisticated design, premium parts and ISO 9001:2015 framework we create unique instruments some of which don't have their counterpart anywhere in the world.

MADE TO LAST

Product reliability and dependable customer support are key for Meatest equipment. More than 50 representatives all over the world are at your service to find the best solution to your needs.
2–5 year warranty plans as well as swift recalibration and service times keep cost of ownership to an absolute minimum.

9010+
9010

MULTIFUNCTION CALIBRATORS

HIGHLIGHTS

- AC/DC voltage/current up to 1050 V/30 A
- Basic uncertainties 10 ppm and 35 ppm
- AC/DC power, energy, resistance, capacitance, frequency, TC, RTD
- 400 MHz and 1.1 GHz scope options available
- High voltage resistance option for 1.5 kV insulation testers
- Built-in process multimeter
- Interface RS232, LAN, USB, GPIB

DESCRIPTION

Multifunction calibrators 9010+ and 9010 are designed as universal calibration tools for electrical calibration laboratories, covering most of their workload like multimeters clamp meters, ohm meters, power meters and power analyzers, energy meters, transducers, insulation testers, process meters, scopes and many others. High load capacity of both voltage (up to 50 mA) and current output allows for calibration of high-consumption analogue meters. Installed harmonic and non -harmonic shape signals allow for testing meter sensitivity to distorted signals by a signal with various crest factor.

Advancing from previous M14x calibrator series, 9010 can now calibrate even 400MHz o-scopes and 1.5kV insulation testers while keeping popular features like transducer and external sensor calibration (strain gauge, pressure, torsion, strength, etc.) using built-in multimeter option. Fixed resistor and capacitor series allows for calibration of more accurate ohm meters than competitive calibrators would.
9010+ further improves 9010 series performance to cover 6½ digit DMMs and 1.1GHz o-scopes. Voltage and current amplifier redesign in 9010+ extends power function ranges to 1050 V and 30 A.

9010 and 9010+ calibrators can be fully integrated into commonly used calibration automation platforms. Unique camera readout module CamOCR, available in Meatest's SW package Caliber/WinQbase, allows for semi-automated calibrations of multimeters with no remote control interface.

SPECIFICATION

DC/AC Voltage

Frequency accuracy and resolution	10 ppm, 5 digit (9010+) 25 ppm, 5 digit (9010)
Non-sine waveform types	saw, triangle, square, truncated sin; 200 V_{RMS}, 1 kHz max
Non-sine amplitude uncertainty	0.21 % of range + 70 μV_{PK}
Voltage output modes	passive 50Ω output up to 200 mV_{DC} active output in all DC and AC ranges

9010 – Ranges, resolution, 1 year uncertainty [ppm of value + absolute]

Range	DC	15 Hz – 10 kHz	10 kHz – 30 kHz	30 kHz – 100 kHz	100 kHz – 300 kHz
0.00000 – 20.00000 mV	220 + 3 µV*1	2000 + 30 µV	2000 + 40 µV	10000 + 100 µV	50000 + 900 µV
20.0001 – 200.0000 mV	45 + 3 µV*1	1000 + 80 µV	1500 + 120 µV	3000 + 300 µV	5000 + 1 mV
0.200001 – 2.000000 V	35 + 10 µV	250 + 120 µV	500 + 300 µV	2000 + 1 mV	5000 + 1 mV
2.00001 – 20.00000 V	35 + 40 µV	250 + 700 µV	500 + 1.5 mV	2000 + 10 mV	N/A
20.0001 – 100.0000 V	42 + 250 µV	270 + 5 mV	500 + 15 mV	N/A	N/A
100.0001 – 280.0000 V*2	42 + 500 µV	300 + 12 mV	500 + 50 mV	N/A	N/A
280.001 – 1050.000 V*3	50 + 7 mV	420 + 85 mV	N/A	N/A	N/A

9010+ – Ranges, 1 year uncertainty [ppm of value + absolute]

Range	DC	15 Hz – 10 kHz	10 kHz – 30 kHz	30 kHz – 100 kHz	100 kHz – 300 kHz
0.00000 – 20.00000 mV	30 + 1.5 µV*1	1500 + 25 µV	1500 + 30 µV	2500 + 35 µV	5000 + 300 µV
20.0001 – 200.0000 mV	15 + 1,5 µV*1	350 + 40 µV	500 + 60 µV	800 + 100 µV	5000 + 500 mV
0.200001 – 2.000000 V	12 + 5 µV	165 + 90 µV	250 + 100 µV	600 + 200 µV	5000 + 800 mV
2.00001 – 20.00000 V	10 + 35 µV	160 + 700 µV	300 + 12 mV	500 + 4 mV	N/A
20.0001 – 100.0000 V	15 + 150 µV	180 + 5 mV	400 + 14 mV	N/A	N/A
100.0001 – 280.0000 V*2	15 + 400 µV	180 + 10 mV	300 + 40 mV	N/A	N/A
280.001 – 1050.000 V*3	20 + 3,5 mV	300 + 30 mV	N/A	N/A	N/A

*1 Uncertainty in passive mode. Active mode uncertainty is 220 ppm + 20 µV and 45 ppm + 20µV respectively in 9010, 100 ppm + 10 µV and 15 ppm + 10 µV respectively in 9010+.
*2 Frequency is limited to 15 – 10 kHz above 200 V.
*3 Frequency is limited to 20 – 1 kHz.

9010 and 9010+ Distortion and Load Characteristics

Parameter	Range	20 mV	200 mV	2 V	20 V	100 V	280 V	1050 V
THD + noise*4	15 – 45 Hz	0.05 % + 200 µV	0.05 % + 300 µV	0.15 %	0.15 %	0.15 %	0.15 %	0.25 %
	45 – 10000 Hz	0.05 % + 200 µV	0.05 % + 300 µV	0.05 %	0.05 %	0.05 %	0.05 %	0.20 %
	10 – 30 kHz	0.25 % + 200 µV	0.25 % + 300 µV	0.12 %	0.15 %	0.3 %	0.3 %	N/A
	30 – 100 kHz	0.35 % + 230 µV	0.35 % + 300 µV	0.22 %	0.3 %	N/A	N/A	N/A
	100 – 300 kHz	1.5 % + 500 µV	1 % + 700 µV	0.7 %	N/A	N/A	N/A	N/A
Burden current	DC active	1 mA	5 mA	30 mA	50 mA	50 mA	50 mA	5 mA
	45 – 10000 Hz	0.5 mA_{RMS}	4 mA_{RMS}	30 mA_{RMS}	50 mA_{RMS}	50 mA_{RMS}	40 mA_{RMS}	3 mA_{RMS}
	10 – 30 kHz	0.5 mA_{RMS}	4 mA_{RMS}	10 mA_{RMS}	10 mA_{RMS}	10 mA_{RMS}	10 mA_{RMS}	N/A
	30 – 100 kHz	0.5 mA_{RMS}	2 mA_{RMS}	5 mA_{RMS}	5 mA_{RMS}	N/A	N/A	N/A
	100 – 300 kHz	100 Ω min. load	100 Ω min. load	1 mA	N/A	N/A	N/A	N/A

*4 THD in bandwidth up to 500 kHz or 10 lowest harmonics.

DC/AC Current

Frequency accuracy and resolution	10 ppm, 5 digit (9010+) 25 ppm, 5 digit (9010)
Non-sine waveform types	saw, triangle, square, truncated sin; 2 A_{RMS}, 1 kHz max
Non-sine amplitude uncertainty	0.21 % of range + 0.7 μA_{PK}

9010 – Ranges, resolution, 1 year uncertainty [ppm of value + absolute]

Range	DC	15 Hz – 1 kHz	1 kHz – 5 kHz	5 kHz – 10 kHz
0.00000 – 200.0000 µA	500 + 20 nA	1500 + 150 nA	3000 + 200 nA	5000 + 500 nA
0.200000 – 2.000000 mA	280 + 100 nA	850 + 300 nA	2000 + 1 µA	5000 + 1.4 µA
2.00000 – 20.00000 mA	150 + 600 nA	500 + 2 µA	2000 + 10 µA	5000 + 14 µA
20.0000 – 200.0000 mA	150 + 6 µA	500 + 20 µA	2000 + 100 µA	5000 + 140 µA
0.200000 – 2.000000 A	200 + 130 µA	700 + 200 µA	2000 + 500 µA	N/A
2.00000 – 20.50000 A	250 + 2 mA	1000 + 6 mA	N/A	N/A

9010+ – Ranges, resolution, 1 year uncertainty [ppm of value + absolute]

Range	DC	15 Hz – 1 kHz	1 kHz – 5 kHz	5 kHz – 10 kHz
0.00000 – 200.0000 µA	200 + 20 nA	1250 + 80 nA*5	3000 + 150 nA*5	5000 + 200 nA*5
0.200000 – 2.000000 mA	150 + 50 nA	850 + 200 nA	1500 + 500 nA	4000 + 600 µA
2.00000 – 20.00000 mA	100 + 600 nA	400 + 2 µA	1000 + 4 µA	2000 + 6 µA
20.0000 – 200.0000 mA	100 + 5 µA	400 + 20 µA	1000 + 50 µA	2000 + 100 µA
0.200000 – 2.000000 A	160 + 50 µA	480 + 100 µA	1000 + 500 µA	N/A
2.00000 – 20.50000 A	250 + 500 mA	750 + 4 mA	N/A	N/A
20.500000 – 30.000000 A*6	1000 + 750 µA	1200 + 5 mA	N/A	N/A

*5 Accuracy not specified below 10 µA.
*6 300s maximum continuous output time.

9010 and 9010+ Distortion and Load Characteristics

Parameter	Range	200 µA	2 mA	20 mA	200 mA	2 A	20.5 A/30 A
Max. inductive load	15 Hz – 10 kHz	1 H	100 mH	100 mH	10 mH	1 mH	500 µH
THD + noise*7	15 – 1000 Hz	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %	0.3 %
	1 – 5 kHz	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %	N/A
	5 – 10 kHz	0.5 %	0.4 %	0.4 %	0.4 %	N/A	N/A
Compliance voltage*8	DC	5 V	5 V	10 V	10 V	5 V	5 V
	15 – 1000 Hz	4 V_{RMS}	4 V_{RMS}	5 V_{RMS}	5 V_{RMS}	3.5 V_{RMS}	3 V_{RMS}
	1 – 5 kHz	4 V_{RMS}	4 V_{RMS}	5 V_{RMS}	5 V_{RMS}	3.5 V_{RMS}	N/A
	5 – 10 kHz	2 V_{RMS}	2 V_{RMS}	2 V_{RMS}	2 V_{RMS}	N/A	N/A

*7 THD in bandwidth up to 100 kHz.
*8 Additional uncertainty for compliance voltage above 0.5 V_{RMS}.

Voltage from current

Voltage range	5.00000 mV – 5.000000 V
Waveform	DC, 15.000 Hz – 400.00 Hz sine
Amplitude uncertainty	0.05 % + 0.04 % of range
Distortion	< 0.1 % in 100 kHz bandwidth
Source impedance	2.2, 22 or 220 Ω

Current coil (option 140 – 50)

Applicable multiplier	2 – 200
Max. simulated current	multiplier × 20.5 A (9010) multiplier × 30 A (9010+)
Frequency range	45 – 65 Hz
Additional uncertainty	0.3 % with 140-50 Current Coil

Resistance

Resistance range summary	0.0000 Ω – 100.0000 kΩ in 4W 0.0000 Ω – 1.000000 GΩ in 2W
Modes	2W and 4W continuous range 2W and 4W fixed decadic standards 100 GΩ High Voltage Resistance (optional)

Variable resistance mode ranges and 1 year uncertainty [ppm of value + absolute]

Continuous range mode	9010+		9010	
	4 W	2 W	4 W	2 W
0 – 10 Ω	300 + 2 mΩ	300 + 32 mΩ	300 + 2 mΩ	300 + 32 mΩ
10 – 33 Ω	250 + 2 mΩ	250 + 32 mΩ	250 + 2 mΩ	250 + 32 mΩ
33 – 100 Ω	150 + 3 mΩ	150 + 33 mΩ	300 + 2 mΩ	300 + 32 mΩ
100 – 1000 Ω	100 + 3 mΩ	100 + 33 mΩ	130 + 3 mΩ	130 + 33 mΩ
1 – 10 kΩ	90 + 30 mΩ	90 + 60 mΩ	130 + 30 mΩ	130 + 60 mΩ
10 – 100 kΩ	90 + 300 mΩ	90 + 330 mΩ	130 + 300 mΩ	130 + 330 mΩ
100 – 330 kΩ	100 + 3 Ω	100 + 3 Ω	130 + 3 Ω	130 + 3 Ω
330 – 1000 kΩ	150 + 3 Ω	150 + 3 Ω	150 + 3 Ω	150 + 3 Ω
1 – 3.3 MΩ	–	150 + 30 Ω	–	300 + 30 Ω
3.3 – 10 MΩ	–	200 + 30 Ω	–	300 + 30 Ω
10 – 100 MΩ	–	2000 + 300 Ω	–	2000 + 300 Ω
100 – 330 MΩ	–	3000 + 3 kΩ	–	3000 + 3 kΩ
330 – 1100 MΩ	–	10000 + 10 kΩ	–	10000 + 10 kΩ

Fixed resistance mode ranges and 1 year uncertainty [ppm of value + absolute]

Nominal standard value	9010+		9010	
	4 W	2 W	4 W	2 W
0 Ω	< 0.5 mΩ	25 mΩ	< 0.5 mΩ	25 mΩ
100 mΩ	0.5 mΩ	25 mΩ	–	–
1 Ω	0.5 mΩ	25 mΩ	0.5 mΩ	25 mΩ
10 Ω	1 mΩ	30 mΩ	2 mΩ	30 mΩ
100 Ω	3 mΩ	30 mΩ	4 mΩ	30 mΩ
1 kΩ	15 ppm	40 ppm	15 ppm	40 ppm
10 kΩ	15 ppm	20 ppm	15 ppm	20 ppm
100 kΩ	15 ppm	15 ppm	15 ppm	15 ppm
1 MΩ	–	30 ppm	–	30 ppm
10 MΩ	–	130 ppm	–	500 ppm
100 MΩ	–	1000 ppm	–	1000 ppm
1 GΩ	–	2500 ppm	–	2500 ppm

Capacitance

Capacitance range summary	0.800000 nF – 120.0000 mF in 2W
Modes	2W continuous range 2W fixed decadic standards

9010 and 9010+ capacitance modes, 1 year uncertainty and frequency limits

Continuous range mode	Uncertainty
0.8 – 3.3 nF	0.5 % + 15 pF
3.3 nF – 10 µF	0.5 %
11 – 20 mF	3 %
20 – 120 mF	5 %

Nominal standard value	Uncertainty
1 nF	1.25 %
10 nF	0.35 %
100 nF	0.25 %
1 µF	0.25 %
10 µF	0.35 %
100 µF	0.45 %

Temperature (RTD, TC)

RTD temperature standards	Pt3850, Pt3851, Pt3916, Pt3926, Ni120, custom
RTD R0 range	20 Ω – 2 kΩ
Thermocouple types	B, C, D, E, G2, J, K, M, N, R, S, T
TC cold junction compensation	Manual or automatic with adapter 91
Uncertainty	0.03 °C – 0.18 °C in RTD 0.18 °C – 0.96 °C in TC

AC/DC Power & Energy

Voltage range	0.2 V – 280 V (9010) 0.2 V – 1050 V (9010+)
Current range	0.2 mA – 20.5 A (9010) 0.2 mA – 30 A (9010+)
Frequency range	DC, 15 – 1000 Hz
Phase shift uncertainty	0.15° up to 200 Hz 0.25° above 200 Hz
Energy period uncertainty	0.01% + 0.3 s
Additional features	Harmonic distortion, voltage from current, current coil multiplication

9010 – Total 1 year uncertainty overview [% of value]

Current range	DC	15 Hz – 1 kHz, φ = 0°	15 Hz – 200 Hz, φ = 60°
2 mA	0.035 – 0.079 %	0.11 – 0.25 %	0.47 – 0.52 %
20 mA, 200 mA	0.021 – 0.047 %	0.073 – 0.18 %	0.46 – 0.49 %
2 A	0.029 – 0.086 %	0.090 – 0.19 %	0.46 – 0.49 %
20.5 A	0.037 – 0.13 %	0.14 – 0.41 %	0.47 – 0.61 %

9010+ – Total 1 year uncertainty overview [% of value]

Current range	DC	15 Hz – 1 kHz, φ = 0°	15 Hz – 200 Hz, φ = 60°
2 mA	0.020 – 0.041 %	0.102 – 0.194 %	0.47 – 0.49 %
20 mA, 200 mA	0.016 – 0.041 %	0.061 – 0.152 %	0.46 – 0.48 %
2 A	0.021 – 0.042 %	0.064 – 0.114 %	0.46 – 0.47 %
20.5 A	0.029 – 0.051 %	0.074 – 0.166 %	0.46 – 0.48 %
30 A	0.103 – 0.104 %	0.141 – 0.157 %	0.48 – 0.48 %

Harmonic distortion (all AC functions)

Number of products	50
Fundamental harmonic uncertainty	amplitude: ≥ 0.2% of range frequency: 25 ppm phase shift: 0.2 – 0.5 °
Frequency range	1st product: 15 – 1000 Hz 2nd – 50th product: 30 – 5000 Hz
Harmonic product amplitude range	0 – 30 % of fundamental
Harmonic product phase shift unc.	5 µs (typical)

GENERAL DATA

Warm-up time	30 minutes
Reference temperature	+21 °C – +25 °C
Temperature coefficient	10 % of accuracy/°C outside T_{REF}
Dimensions (W × H × D)	435 × 175 × 620 mm
Weight	24 kg
Interfaces	RS232, IEEE488, USB, Ethernet

9010 and 9010+ options overview

Option	Workload	Features
SCO	Oscilloscopes	400 MHz sine & PWM, input impedance measurement
SC1 (9010+ only)	Oscilloscopes	1.1 GHz sine, 400 MHz PWM, input impedance measurement
HVR	Insulation testers, megohmmeters	Resistance up to 100 GΩ, 1.5 kV, test signal measurement
MER	Transducers, process meters	DCV, DCA, resistance, TC, RTD and frequency measurement

SCO Frequency/Scope option

HF mode amplitude range 1.4 mV_{PK} – 1.5 V_{PK}

HF mode frequency range	20 Hz – 100 kHz	100 – 500 kHz	0.5 – 10 MHz	10 – 100 MHz	100 – 400 MHz
Harmonic distortion	-55 dB	-38 dB	-38 dB	-38 dB	-30 dB
Flatness	< 0.2 %	< 0.5 % + 100 μV_{PK}	< 1.2 % + 100 μV_{PK}	< 2.0 % + 100 μV_{PK}	< 2.5 % + 100 μV_{PK}
Amplitude uncertainty	0.5 % + 350 μV_{PK}	2.0 % + 250 μV_{PK}	2.5 % + 250 μV_{PK}	3.3 % + 250 μV_{PK}	3.7 % + 250 μV_{PK}

LF mode (DC, square wave)

High voltage range	up to 200 V_{PK} at 1 kHz, 0.3 % amplitude uncertainty
Low voltage range	up to 10.5 V_{PK} at 100 kHz, 0.1–0.2 % amp. uncertainty

PULSE WIDTH and TIME MARKER modes

Frequency range	0.1 Hz – 400 MHz
Frequency uncertainty	2.5 ppm
Amplitude ranges	50 mV_{PK}, 100 mV_{PK}, 500 mV_{PK}, 1 V_{PK}
Duty cycle ratios	1 %, 10 %, 20 %, 30 %, 40 %, 50 %
TM waveforms	PWM up to 25 MHz, 2 ns spike otherwise
Jitter	< 2 ns
Rise time	< 1 ns

TRIGGER mode

Amplitude	> 1 V_{PK}
Division ratio	off, /1, /10, /100
Frequency range	15 Hz – 400 MHz
Rise time	< 1 ns

Input impedance measurement

Ranges	100 Ω, 2 MΩ
Measurement accuracy	0.1 % in 10 – 100 % of range

SC1
Frequency/Scope option (9010+ only)

HF mode amplitude range: 1.400 mV_{PK} – 1.5000 V_{PK} up to 1 GHz
1.400 mV_{PK} – 1.0000 V_{PK} above 1 GHz

HF mode frequency range	15 Hz – 100 kHz	100 – 500 kHz	0.5 – 10 MHz	10 – 100 MHz	100 – 600 MHz	600 – 1100 MHz
Harmonic distortion	-55 dB	-33 dB (< 10 dBm)	-33 dB (< 10 dBm)	-33 dB (< 10 dBm)	-30 dB (< 10 dBm)	-30 dB (< 10 dBm)
Flatness	< 0.2 %	< 0.7 % + 100 μV_{PK}	< 1.2 % + 100 μV_{PK}	< 2.0 % + 100 μV_{PK}	< 2.5 % + 100 μV_{PK}	< 4.5 % + 100 μV_{PK}
Amplitude uncertainty	0.5 % + 350 μV_{PK}	2.0 % + 250 μV_{PK}	2.5 % + 250 μV_{PK}	3.3 % + 250 μV_{PK}	3.7 % + 250 μV_{PK}	6.5 % + 300 μV_{PK}

PULSE WIDTH and TIME MARKER modes

Frequency range	0.1 Hz – 400 MHz square wave 400 – 1100 MHz sine
Frequency uncertainty	0.1 ppm
Amplitude ranges	50 mV_{PK}, 100 mV_{PK}, 500 mV_{PK}, 1 V_{PK}
Duty cycle ratios	1 – 50 %
TM waveforms	PWM up to 25 MHz, 2 ns spike otherwise
Jitter	< 2 ns
Rise time	< 1 ns

LF mode, TRIGGER mode and Input impedance measurement function specifications are the same as in SCO option.

HVR
High Voltage Resistance option

Range	Maximum test voltage	Resistance uncertainty	Test voltage uncertainty
100 – 200 kΩ	800 V_{DC}	0.2 %	0.3 % + 2 V
200 kΩ – 1 MΩ	1100 V_{DC}	0.2 %	0.3 % + 2 V
1 – 10 MΩ	1150 V_{DC}	0.3 %	0.5 % + 5 V
10 MΩ – 1 GΩ	1575 V_{DC}	0.5 %	0.5 % + 5 V
1 – 10 GΩ	1575 V_{DC}	1.0 %	1 % + 5 V
100 GΩ (fixed standard)	1575 V_{DC}	3.0 %	1.5 % + 5 V

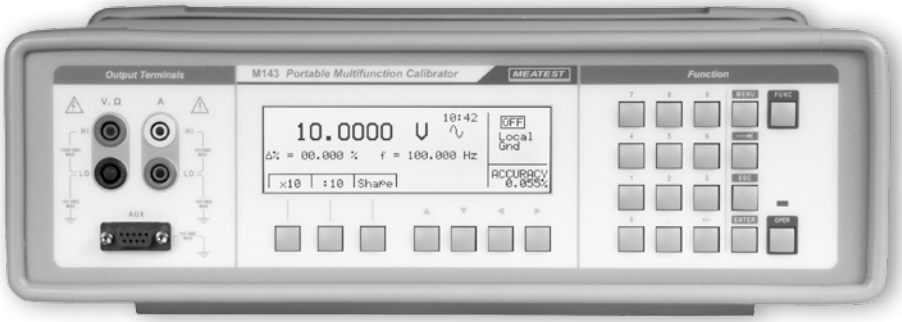
MER
Multimeter option

Measurement function	Range	Uncertainty
DC voltage	12 mV 120 mV, 1.2 V, 12 V	50 ppm + 3 µV 50 ppm + [5 – 500] µV
DC current	100 µA, 1 mA 2.4 mA, 24 mA	200 ppm + [20 – 100] nA 150 ppm + 800 nA
Frequency	0.1 Hz – 100 kHz	50 ppm
Resistance *9	2 kΩ, 20 kΩ	200 ppm + [10 – 50] mΩ
RTD temperature *9	Pt3850, Pt3851, Pt3916, Pt3926, Ni120, custom	0.08 – 0.42 °C
TC temperature	3.0 %	0.22 – 1 °C

*9 Using 9000-60 4W measurement adapter (comes as standard with MER option).

M143

PORTABLE MULTIFUNCTION CALIBRATOR



HIGHLIGHTS

- AC/DC voltage/current up to 1000 V/20 A
- Basic accuracy 60 ppm, cold junction compensation
- Calibration of clamp meters up to 1000 A using 140-50 Current Coil
- Non-sinusoidal waveforms, resistance, frequency, TC, RTD
- Fixed standard resistors from 10 Ω to 100 MΩ
- GPIB and RS-232 interface
- Compact dimensions, overall weight 11 kg

DESCRIPTION

M143/143i Multifunction calibrator is cost saving solution for calibration of meters of electric quantities up to 1000 V and 20 A. Basic accuracy of 60 ppm in DC voltage is more than enough for calibration of 3½ and 4½ digit multimeters. Resistance function is covered by eight fix resistors in range from 10 Ω to 100 MΩ, other features are TC temperature sensor simulation and optionally RTD temperature sensor simulation. Thanks to its small dimensions and low weight the calibrator is ideal for field calibrations.
M143 was designed for automated calibrations at production lines of panel meters, multimeters, transducers, measuring amplifiers, thermometers, and calibration laboratories where the calibrator can be applied as source of standard value for calibrations, verifications and adjustments of units under test.

RS-232 and optionally GPIB interface allow for remote control of the calibrator and time saving automated calibrations using SW package CALIBER/WinQbase..

Model	Description
M143	1000 V/20 A model with RS232
M143i	1000 V/2 A model with RS232
RTD option	adds RTD simulator
GPIB option	adds GPIB interface

SPECIFICATION

DC/AC Voltage

Voltage range summary	DC: 0 mV – 1000 V AC sine: 1 mV – 1000 V Non-sine: 1 mV_{PK} – 10 V_{PK}
Internal ranges	100 mV, 1 V, 10 V, 100 V, 1000 V
Frequency range	Sine <10 V: 20 Hz – 10 kHz Sine >10 V: 40 Hz – 1 kHz Non-sine <10 V: 20 Hz – 80 Hz
Frequency accuracy and resolution	0.01 %, 5 digit
Non-sine waveform types	saw, triangle, square, truncated sin
Non-sine amplitude accuracy	0.3 % of peak value

Voltage accuracy

Range	% of value + % of range		
	DC	20 – 200 Hz	0.2 – 10 kHz
10.0000 mV – 10.0000 mV	0.050 + 0.070	0.20 + 0.25	0.20 + 0.30
10.000 mV – 100.000 mV	0.010 + 0.0070	0.10 + 0.05	0.15 + 0.07
0.10000 V – 1.00000 V	0.006 + 0.0010	0.05 + 0.005	0.07 + 0.01
1.0000 V – 10.0000 V	0.006 + 0.0005	0.05 + 0.005	0.07 + 0.03
10.000 V – 100.000 V*1	0.006 + 0.0010	0.05 + 0.010	0.07 + 0.03
100.00 V – 1000.00 V*1	0.010 + 0.0020	0.07 + 0.020	0.10 + 0.03

*1 Limited to 40 Hz –1 kHz, sine waveform only.

Current accuracy

Range	% of value + % of range		
	DC	20 – 200 Hz	0.2 – 1 kHz
10.000 µA – 200.000 µA	0.050 + 0.010	0.25 + 0.010	0.20 + 0.10
0.20000 mA – 2.00000 mA	0.025 + 0.005	0.10 + 0.010	0.10 + 0.02
2.0000 mA – 20.0000 mA	0.015 + 0.003	0.07 + 0.005	0.10 + 0.02
20.000 mA – 200.000 mA	0.015 + 0.003	0.07 + 0.005	0.10 + 0.02
0.2000 A – 2.0000 A	0.015 + 0.005	0.10 + 0.005	0.15 + 0.05
2.0000 A – 20.000 A*2	0.1 + 0.01	0.20 + 0.015	0.25 + 0.05

*2 20 A range in M143 model only..

Resistance

Nominals	0.1000 Hz – 2.00000 MHz
Accuracy	0.005 %

TC Simulation

Sensor types	B, C, D, E, G2, J, K, M, N, R, S, T
Waveform type	0.2 – 2.7 °C

RTD Simulation (option)

RTD types	Pt, Ni
R0 range	100 – 1000 Ω
Accuracy	0.1 – 0.2 °C

Frequency

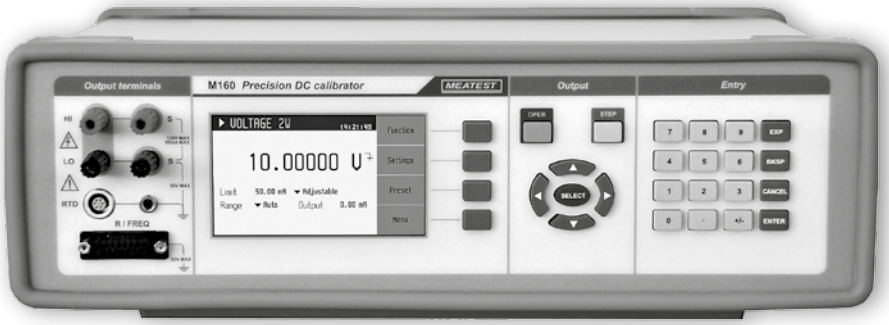
Frequency range	0.1000 Hz – 2.00000 MHz
Frequency accuracy	0.005 %
Waveform type	positive squarewave, 5 V_{PK} ±10 %

GENERAL DATA

Warm-up time	60 minutes
Reference temperature	+21 °C – +25 °C
Temperature coefficient	15 % of accuracy / °C outside T_{REF}
Max relative humidity	-10 – 30 °C: 80 %
Dimensions (W × H × D)	325 × 111 × 316 mm
Weight	11 kg
Interfaces	RS232, IEEE488 (optional)

M160

PRECISION DC CALIBRATOR



HIGHLIGHTS

- DC Voltage up to 100.0000 V, 20 ppm
- DC Current up to 50.0000 mA, 50 ppm
- Reference temperature range 13 – 33 °C
- Resistance, frequency, RTD
- TC simulation R, S, B, J, T, E, K, N, M, C, D, G2
- GPIB, USB, RS-232 and ethernet interface

DESCRIPTION

Precision DC calibrator M160 is a portable source of industrial process signals including DC voltage, DC current, thermocouple and RTD simulation, resistance and frequency. Unlike most of the other process calibrators, the M160 comes with exceptional 20 ppm accuracy over 20 °C-wide reference temperature range. All these features are combined with user friendly interface multi-interface remote control and robust design make this calibrator ideal for both calibration laboratories as well as industry professionals. Main parameters of both generated and measured signals are displayed on large LCD together with function-specific tooltip, providing auxiliary information like range, accuracy or load limit. Instrument can be connected to different ATE systems via RS232, USB, LAN or GPIB interface.

M160 is sophisticated instrument with its own recalibration procedure. The procedure enables to correct any deviation without mechanical adjustment.

Model	Description
M160	Voltage, Current, TC, Frequency, Resistance, RTD
M160i	Voltage, Current, TC, Frequency
RTD option	adds RTD simulator
GPIB, USB & LAN option	adds GPIB, USB & LAN interface

SPECIFICATION

DC Voltage ranges, resolution and 1 year accuracy ±[ppm of value + absolute offset]

Range	Accuracy Autocal. on	Autocal. off	24h stability*1	Typical noise		CMRR	Max. current
				0.1 – 10 Hz	10 Hz – 100 kHz	50/60 Hz	
300.0000 mV	15 + 2.5 µV	20 + 3 µV	3 + 1.5 µV	2 μV_{PP}	150 μV_{PP}/25 μV_{RMS}	>120 dB	50 mA
3.000000 V	15 + 10 µV	20 + 20 µV	3 + 5 µV	2 μV_{PP}	150 μV_{PP}/25 μV_{RMS}	>120 dB	50 mA
30.00000 V	15 + 100 µV	20 + 200 µV	3 + 50 µV	20 μV_{PP}	400 μV_{PP}/50 μV_{RMS}	>130 dB	50 mA
100.0000 V	15 + 500 µV	20 + 1 mV	3 + 200 µV	40 μV_{PP}	600 μV_{PP}/80 μV_{RMS}	>130 dB	25 mA

*1 24 hour stability applies at a constant temperature (± 1°C) and autocalibration off.

DC Current ranges, resolution and 1 year accuracy ±[ppm of value + absolute offset]

Range	Accuracy Autocal. on	Autocal. off	Typical noise		CMRR	Max. voltage
			0.1 – 10 Hz	10 Hz – 100 kHz	50/60 Hz	
25.0000 mA	35 + 1 µA	50 + 1 µA	0.3 μA_{PP}	10 μA_{PP}/2 μA_{RMS}	>50 nA/V	100 V
50.0000 mA	35 + 1 µA	50 + 1 µA	0.3 μA_{PP}	10 μA_{PP}/2 μA_{RMS}	>50 nA/V	30 V

Frequency

Source range summary	10.0000 mHz – 15.00 kHz
Source accuracy	50 ppm up to 2 kHz, 0.01 – 0.15 % above 2 kHz
Measurement range summary	10.0000 mHz – 100.000 kHz
Measurement accuracy	50 ppm

TC Simulation

TC types	R, S, B, J, T, E, K, N, M, C, D, G2
Resolution	0.01 °C
Accuracy	0.1 – 0.8 °C, see user's manual for detailed specification
External RJ accuracy	0.02 °C (option)

RTD Simulation (option)

RTD types	Pt, Ni
Resolution	0.01 °C
Accuracy	0.1 – 0.2 °C, see user's manual for detailed specification

Resistance (option)

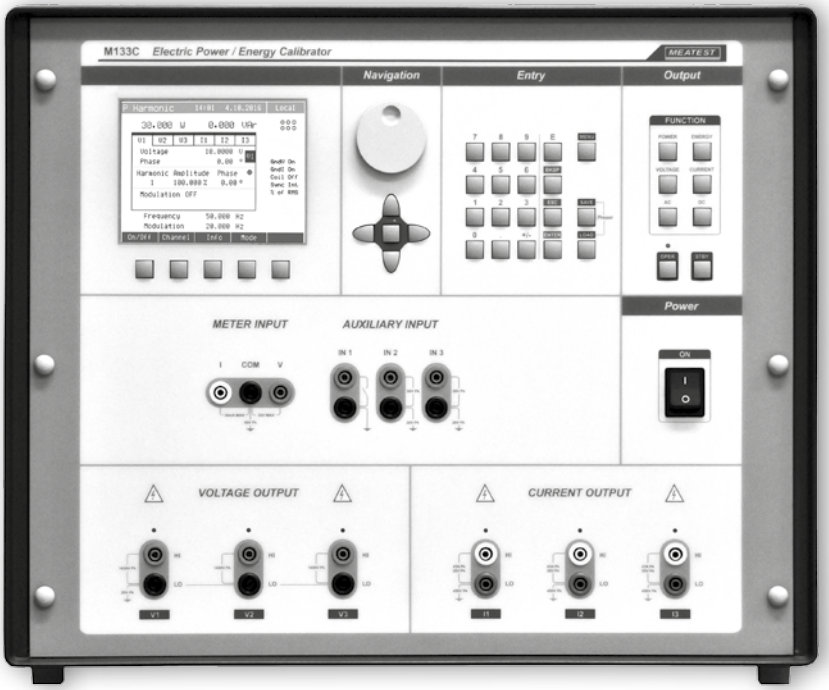
Resistance range	10 Ω – 300 kΩ, continuous
Resolution	from 0.0001 Ω
Accuracy	0.02 %

GENERAL DATA

Warm-up time	30 minutes
Reference temperature	+13 °C – +33 °C
Remote control	RS232 interface (optionally USB, LAN, IEEE488)
Dimensions (W × H × D)	390 mm × 128 mm × 310 mm
Weight	5,5 kg

M133C

POWER / ENERGY CALIBRATOR



HIGHLIGHTS

- Power quality and energy functions
- Three and single phase versions
- Phase accuracy 0.01°, frequency range 15 – 1000 Hz
- AC power up to 3x 18 kVA, DC up to 25.2 kW
- Optical scanning head, built-in multimeter
- Floating current outputs for 3-wire power meters
- Current coil for clamp meters up to 2250 A

DESCRIPTION

M133C is electric AC/DC power and energy calibrator for calibration of power meters, power transducers, power quality analyzers and generally all kinds of power measuring devices.

Full version of M133C calibrator can generate four types of power distortion: harmonic up to 50 products, interharmonic up to 5 kHz, amplitude modulation using symmetrical sine or square wave envelope and finally dip/swell amplitude modulation using custom square wave envelope. All the parameters including distortion can be set independently for each phase.

M133C is more than just a sophisticated power source. Using built-in process multimeter, both transducer inputs and outputs can be handled by the M133C at the same time so you can calibrate it more easily, using no other calibration equipment. Floating current outputs can be connected directly with voltage outputs o allow for 3-wire power meter calibration. One calibrator, many applications – saving your time, space and costs.

SPECIFICATION

DC/AC Voltage

Voltage range summary	DC: 1 V – 280 V AC sine: 1 V_{RMS} – 600 V_{RMS}
Internal ranges	10 V, 30 V, 70 V, 140 V, 280 V, 600 V
Frequency range and accuracy	15 Hz – 1000 Hz, 50 ppm
Frequency resolution	≤ 500 Hz: 1 mHz > 500 Hz: 10 mHz
Total harmonic distortion	< 0.05 %

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

Range	DC	40 – 70 Hz	15 – 40 Hz 70 – 1000 Hz	Maximum burden current *1
1.0000 – 10.0000 V	0.015 + 0.01	0.012 + 0.01	0.016 + 0.01	100 mA
10.0001 – 30.0000 V	0.015 + 0.01	0.012 + 0.01	0.016 + 0.01	200 mA
30.001 – 70.000 V	0.015 + 0.01	0.012 + 0.01	0.016 + 0.01	300/200 mA
70.001 – 140.000 V	0.015 + 0.01	0.012 + 0.01	0.016 + 0.01	300/200 mA
140.001 – 280.000 V	0.015 + 0.01	0.012 + 0.01	0.016 + 0.01	200/150 mA
280.001 – 600.000 V*2	N/A	0.016 + 0.01	0.024 + 0.01	60/50 mA

*1 In 40 – 70 Hz AC/otherwise. Sum of all currents from three phases is limited to 400 mA.
*2 Frequency is limited to 20 – 1 kHz.

DC/AC Current

Current range summary	DC: 5.000 mA – 30.0000 A AC Sine: 5.000 mA_{RMS} – 30.0000 A_{RMS}
Internal ranges	300 mA, 1 A, 2 A, 5 A, 10 A, 30 A
Frequency range and accuracy	15 Hz – 1000 Hz, 50 ppm
Frequency resolution	≤ 500 Hz: 1 mHz > 500 Hz: 10 mHz
Current output isolation	Up to 450 V_{PK} against GND
Total harmonic distortion	< 0.1 %

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

Range	DC	40 – 70 Hz	15 – 40 Hz 70 – 1000 Hz	Compliance voltage*3
0.005000 – 0.300000 A	0.0175 + 0.01	0.0175 + 0.01	0.021 + 0.02	8 V_{PK}/5 V_{PK}
0.30001 – 1.00000 A	0.0175 + 0.01	0.0175 + 0.01	0.021 + 0.02	8 V_{PK}/5 V_{PK}
1.00001 – 2.00000 A	0.0175 + 0.01	0.0175 + 0.01	0.021 + 0.02	8 V_{PK}/5 V_{PK}
2.00001 – 5.00000 A	0.0175 + 0.01	0.0175 + 0.01	0.021 + 0.02	5 V_{PK}
5.0001 – 10.0000 A	0.021 + 0.015	0.021 + 0.015	0.028 + 0.02	5 V_{PK}
10.0001 – 30.0000 A	0.0245 + 0.015	0.0245 + 0.015	0.035 + 0.02	5 V_{PK}

*3 In DC or 40 – 70 Hz AC/otherwise.

Current coil (option 151-25)

Applicable multiplier	25 or 50
Max. simulated current	multiplier · 90 A (2250 A with 151-25 Current Coil)
Frequency range	DC, 15 – 100 Hz
Additional accuracy	0.3 %

DC/AC Power & Energy

Power range summary	DC: 5 mW – 25.2 kW AC: (3×) 5 mVA – 18 kVA
Total accuracy	based on voltage, current, phase shift and energy period specifications.
Phase shift accuracy (I_X to U_X and U_X to U_1)	≤ 70 Hz, 0.1 – 10 A: 0.01° ≤ 70 Hz, V channels: 0.01° ≤ 70 Hz, otherwise: 0.05° 70 – 400 Hz: 0.1° > 400 Hz: 0.4°
Energy period range and accuracy	1 s – 100 Ms, 0.01 % of value + 0.1 s

Total 1 year power accuracy overview – best and worst cases [% of value]

Current range	DC	15 Hz – 1 kHz, φ = 0°	15 Hz – 400 Hz, φ = 60°
300 mA*4	0.038 – 0.628 %	0.037 – 1.227 %	0.047 – 1.263 %
1 A, 2 A, 5 A	0.038 – 0.126 %	0.037 – 0.146 %	0.047 – 0.336 %
10 A	0.045 – 0.126 %	0.043 – 0.135 %	0.053 – 0.331 %
30 A	0.048 – 0.135 %	0.046 – 0.150 %	0.158 – 0.338 %

*4 Worst case scenario at bottom of the range (5 mA) and maximum frequency (1 kHz).

Total 1 year power accuracy in common applications [% of value]

Set current	EU grid power (230 V, 50 Hz)	US grid power (115 V, 60 Hz)	Aircraft onboard power (115 V, 400 Hz)	Ship onboard power (440 V, 60 Hz)
100 mA	0.054 %	0.054 %	0.086 %	0.057 %
1 A	0.038 %	0.038 %	0.051 %	0.042 %
10 A	0.045 %	0.045 %	0.057 %	0.048 %
30 A	0.047 %	0.047 %	0.063 %	0.050 %

Voltage from current

Voltage range	1.000 mV – 5.00000 V
Waveform	DC, 15.000 Hz – 400.00 Hz sine
Amplitude accuracy	0.05 % + (0.02 – 0.1) % of range
Distortion	< 0.1 %
Source impedance	1 or 18 Ω

Harmonic & interharmonic distortion

Max. number of products	63 harmonic or 1 interharmonic
Harmonic product frequency range	30 – 5000 Hz
Interharmonic product frequency range	15 – 1000 Hz
Product amplitude accuracy	≤ 3 kHz: 0.1 – 0.2 % of range > 3 kHz: 0.2 – 0.8 % of range

Modulation (Flicker)

Modulation envelope shapes	Sine, squarewave
Modulation frequency range	1 mHz – 50 Hz
Amplitude accuracy	0.2 % of range

Dip/Swell

Amplitude range	100 mV – 280 V, 1 mA – 30 A
Amplitude accuracy	0.2 % of range
Time period ranges	transition: 0.1 ms – 60 s other states: 2 ms – 60 s

Multimeter

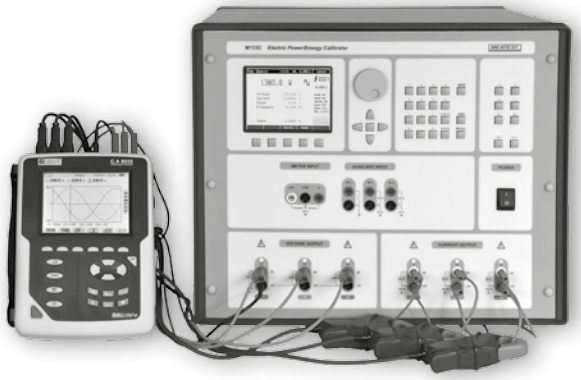
Measurement function	Measurement function	Accuracy
DC voltage	0.0000 – 12.0000 V	100 ppm + 1 mV
DC current	0.0000 – 25.0000 mA	100 ppm + 2.5 µA
Frequency	1.00000 Hz – 15.0000 kHz	50 ppm

GENERAL DATA

Warm-up time	60 minutes
Reference temperature	+21 °C – +25 °C
Temperature coefficient	10 % of accuracy/°C outside T_{REF}
Dimensions (W × H × D)	520 × 430 × 500 mm
Weight	59 kg
Interfaces	RS232, IEEE488, Ethernet

APPLICATION

Power analyzer calibration



Clampmeter calibration with 151-25 Current Coil

Power transducer calibration

M151

CURRENT CALIBRATOR

HIGHLIGHTS

- AC/DC current 8 mA – 120 A, 15 – 1000 Hz
- Total accuracy 275 – 900 ppm in all ranges
- Floating output up to 450 V_{PK}, compliance voltage 8 V_{PK}
- Calibration of clamp meters up to 3000 A
- Real and simulated transconductance amplifier
- GPIB and RS-232 come as standard

DESCRIPTION

Model M151 is a stable high current calibrator up to 120 A. Basic accuracy is 275 ppm. Instrument can be controlled via RS232 or GPIB interface. Calibrator can work in a simulated amplifier mode to increase current ranges of any multifunction calibrator. It is suitable for power meter's calibration because M151 can be synchronized with the input signal not only in amplitude but also in frequency and phase. Current terminals are isolated up to 450 V_{PK} against case (protective earth). M151 is a sophisticated instrument with its own recalibration procedure. The procedure enables to adjust any deviation directly from the front panel. Calibrator is designed for checking parameters of amp meters. With current coil it can be used for calibration of clamp meters.

SPECIFICATION

DC/AC Current

Frequency range	DC, 15.000 Hz – 1000.00 Hz
Frequency synchronization	Internal, external, power supply
Simulated amplifier gain	0.5 – 10 A/V (transconductance amplifier) 50 – 1000 A/A (current amplifier)
Transconductance amplifier phase shift (typical delay in µs)	7 × DUT impedance [Ω] × range [A] + 3,5
Output terminals isolation	Up to 450 V_{PK} against GND

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

Range	DC	40 – 70 Hz	15 – 40 Hz 70 – 1000 Hz	Max. compliance voltage		
				DC	15 – 400 Hz	400 Hz – 1 kHz
0.008000 – 0.300000 A	0.0175 + 0.01	0.0175 + 0.01	0.025 + 0.02	8 V	5.5 V	3.5 V
0.30001 – 1.00000 A	0.0175 + 0.01	0.0175 + 0.01	0.025 + 0.02	8 V	5.5 V	3.5 V
1.00001 – 2.00000 A	0.0175 + 0.01	0.0175 + 0.01	0.025 + 0.02	8 V	5.5 V	3.5 V
2.00001 – 5.00000 A	0.0175 + 0.01	0.0175 + 0.01	0.025 + 0.02	5 V	3.5 V	3.5 V
5.0001 – 10.0000 A	0.021 + 0.015	0.021 + 0.015	0.04 + 0.02	5 V	3.5 V	3.5 V
10.0001 – 30.0000 A	0.025 + 0.015	0.025 + 0.015	0.05 + 0.02	5 V	3.5 V	3.5 V
30.0001 – 60.0000 A	0.025 + 0.015	0.025 + 0.015	0.05 + 0.02	5 V	3.5 V	3.5 V
60.0001 – 120.000 A	0.025 + 0.015	0.025 + 0.015	0.05 + 0.02	5 V	3.5 V	3.5 V

Built in process multimeter

Function	Range	Accuracy % of value + % of range
AC voltage < 1 kHz	0 – 20 V	0.02 % + 0.02 %
AC voltage > 1 kHz	0 – 20 V	0.05 % + 0.05 %
DC voltage	±20 V	0.01 % + 0.01 %
AC current < 1 kHz	0 – 200 mA	0.02 % + 0.02 %
AC current > 1 kHz	0 – 200 mA	0.05 % + 0.05 %
DC Current	±200 mA	0.01 % + 0.01 %
Frequency	1 Hz – 10 kHz	0.005 % + 0.00 %

Option 151-25 Current Coil

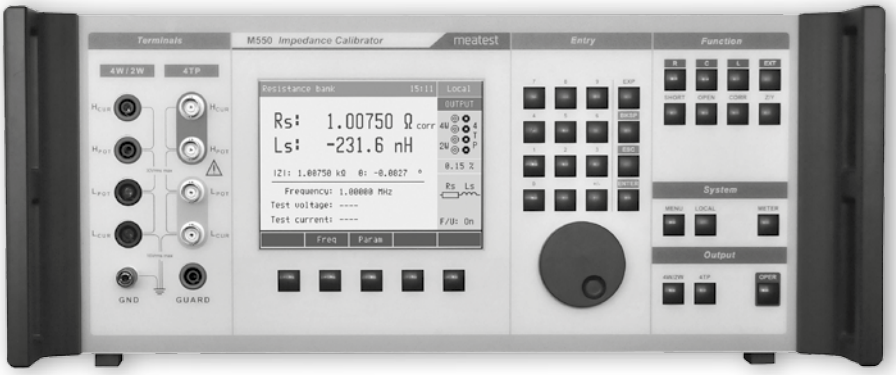
Actively cooled 25-turn current coil for calibration of clamp ammeters up to 3000 A.

GENERAL DATA

Warm-up time	15 min
Reference temperature	20 °C – +26 °C
Temperature coefficient	10 % of specification / °C (in range 5 °C – 20 °C and 26 °C – 40 °C)
Dimensions (W × H × D)	538 × 283 × 540 mm
Weight	42 kg
Interfaces	RS232, IEEE488

M 550

IMPEDANCE CALIBRATOR



HIGHLIGHTS

- Automated LCR meter calibration
- Calibration data from 20 Hz to 1 MHz
- GPIB and RS-232 interface
- Four-terminal pair, 4W and 2W configurations
- Open, Short and Load compensation

DESCRIPTION

Idea behind M550 Impedance Calibrator is to replace countless single value LCR standards with one calibrator that can switch between the standards like a CD changer in your car. The calibrator contains stable and temperature independent resistance standards, partial capacitance standards and partial inductance standards, simulated by RC T-type passive network. Calibration values of both complex parameters of partial standards are displayed on large LCD screen in preselected pairs of parameters as well as voltage, current and frequency readouts from built-in test signal meter. OPEN and SHORT reference positions are available as well.

The philosophy of M550 is based on remote control and automated calibration. For this reason, the calibrator is equipped with RS-232 and GPIB interfaces and of course, supported in CALIBER/WinQbase calibration software. Easy recalibration systems offers either full recalibration in all spot frequency points or simplified offset calibration.

SPECIFICATION

	Modes	4TP four pair terminal, 4 W four terminal 2 W two terminal
	Output terminals	4x BNC connectors for coaxial output (4TP) 4x banana terminal for non-coaxial output (2 W/4 W)
	Frequency range	20 Hz to 1 MHz
	Reference correction positions	SHORT, OPEN
Resistance	Resistance range summary	0.1 Ω – 100 MΩ in 4TP and 4W mode, 1 Ω – 10 MΩ in 2W mode
	Frequency range	20 Hz – 1 MHz
	Available parameter pairs	Z/θ, Y/θ, Rs/Ls, Rs/Cs, Rp/Cp, Rp/Lp, R/X, G/B
Capacitance	Capacitance range summary	10 pF – 100 µF in 4TP mode, 100 pF – 100 µF otherwise
	Frequency range	20 Hz – 1 MHz
	Tolerance at 1 kHz	5 % in 4TP mode, 10 % otherwise
	Available parameter pairs	Z/θ, Y/θ, Cs/D, Cs/Rs, Cp/D, Cp/Rp, Cp/G
Inductance	Inductance range summary	10 µH – 10 H in 4TP mode
	Frequency range	20 Hz – 100 kHz
	Tolerance at 1 kHz	15 %
	Typical 1-year stability	0.01 %
	Temperature coefficient	50 ppm/K
	Available parameter pairs	Z/θ, Y/θ, Ls/Q, Ls/Rs
Test level meter	Frequency measurement	20 Hz – 100 kHz accuracy: 0.01 % + 1 mHz
	Voltage measurement	0.2 – 10 V_{RMS} accuracy: 2 % above 1V, 5 % otherwise
	Current indication	1 nA – 500 mA

GENERAL DATA

Warm-up time	15 minutes
Reference temperature	+21 °C – +25 °C
Output terminals	4TP mode: 4 BNC connectors 4W & 2W modes: 4 banana sockets
Dimensions (W × H × D)	450 × 150 × 430 mm
Weight	12 kg
Interfaces	RS232, IEEE488

LCR BRIDGE CALIBRATION

(application)

MTE

LF IMPEDANCE STANDARDS

HIGHLIGHTS

- Four package types for various applications
- Custom nominal values and terminals upon request
- Low time constant and temperature coefficient

DESCRIPTION

MTE series resistance and capacitance standards are designed for calibration of ohmmeters, LCR meters and insulation testers. Alternatively, MTE standards can be used as transfer standards, keeping traceability between primary and secondary laboratories.

MTE standards come in four terminal configurations to fit every application. OPEN and SHORT standards for zero calibration of LCR meters as well as custom nominals and terminal configurations are available upon request.

Terminal configurations

Case type	Application	Terminals	Example
HV	megohmmeters, insulation testers	3x banana socket with extra insulation (2W measurement + case ground)	
A	ohmmeters, multimeters	4x banana socket	
B	LCR bridges – wired connection	4x female BNC	
C	LCR bridges – direct connection	4x male BNC	

SPECIFICATION

Resistance

Construction	up to 1 MΩ: Foil resistor above 1 MΩ: Ceramic resistor
Frequency range	DC – 20 kHz
Available packages	up to 1 MΩ: A, B and C above 1 MΩ: HV; DC applications only

MTE RP Resistance Standards

Nominal value	Max. deviation	Uncertainty DC, 1-year	Temperature coefficient	Rating *1
100 mΩ	0.1 %	0.05 %	10 ppm/K	3 W
1 Ω	0.05 %	0.01 %	1 ppm/K	3 W
10 Ω	0.01 %	0.005 %	1 ppm/K	300 mW
100 Ω	0.01 %	0.005 %	1 ppm/K	300 mW
1 kΩ	0.01 %	0.005 %	1 ppm/K	300 mW
10 kΩ	0.01 %	0.005 %	1 ppm/K	50 V
100 kΩ	0.01 %	0.005 %	1 ppm/K	150 V
1 MΩ	0.01 %	0.005 %	1 ppm/K	500 V
10 MΩ	0.05 %	0.01 %	100 ppm/K	2.5 kV
100 MΩ	0.5 %	0.1 %	100 ppm/K	2.5 kV
1 GΩ	1 %	0.3 %	100 ppm/K	5 kV
10 GΩ	3 %	0.5 %	100 ppm/K	5 kV

*1 Maximum dissipation power at 23 °C or maximum voltage.

Capacitance

Construction	up to 100 nF: Multi-layer mica capacitor above 100 nF: PP film capacitor
Maximum voltage	30 V_{RMS}
Available packages	B and C

MTE CP Capacitance Standards

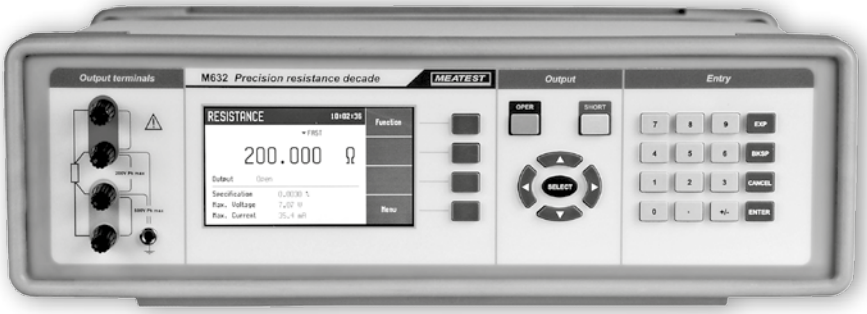
Nominal value	Max. deviation	Frequency range	Uncertainty at 1 kHz, 1-year	Temperature coefficient	Dissipation factor
10 pF	2 %	20 Hz – 20 kHz	0.1 %	30 ppm/K	< 0.001
100 pF	0.5 %	20 Hz – 20 kHz	0.05 %	30 ppm/K	< 0.001
1 nF	0.1 %	20 Hz – 20 kHz	0.02 %	30 ppm/K	< 0.0005
10 nF	0.1 %	20 Hz – 10 kHz	0.02 %	30 ppm/K	< 0.0005
100 nF	0.1 %	20 Hz – 10 kHz	0.02 %	30 ppm/K	< 0.0005
1 µF	0.5 %	20 Hz – 10 kHz	0.02 %	30 ppm/K	< 0.005
10 µF	0.5 %	20 Hz – 10 kHz	0.1 %	30 ppm/K	< 0.005
100 µF	0.5 %	20 Hz – 10 kHz	0.1 %	30 ppm/K	< 0.005

GENERAL DATA

Reference temperature	+21 °C – +25 °C
Operating temperature	0 °C – +50 °C
Dimensions (W × H × D)	125 × 60 × 105 mm

M 63x
M 64x

REAL-RESISTANCE DECADE BOXES



HIGHLIGHTS

- Real resistors switched by relays
- Ranges as wide as 14 decades, resolution from 1 µΩ
- No parasitic resistances
- 20 ppm accuracy/5 W load capacity
- Six different languages, custom units

DESCRIPTION

The M6xx series programmable resistance decades and RTD simulators offer an exceptional accuracy, resolution and stability of real resistance simulation. Both M63x decades contain stable foil resistors with low temperature coefficient switched by low thermal voltage relays. Built-in software has also a function of RTD temperature sensor simulation with parameters according to IEC (DIN) or US standards and temperature setting in degree of Celsius or Fahrenheit. Instrument can be controlled via RS232, USB, LAN or GPIB interface.

M6xx series programmable decades are sophisticated instruments with their own recalibration procedures. The procedure lets the user to correct any deviation in resistance without any mechanical adjusting.

Model	Usage	Range	Resolution	Max. load	Accuracy
M632	Resistance Decade	1 Ω – 1.2 MΩ	10 µΩ	0.25 W	0.003 %
M642	Resistance Decade	0.1 Ω – 20 MΩ	1 µΩ	5 W	0.02 %
M631	RTD Simulator	16 Ω – 400 kΩ	0.001 °C	0.25 W	0.01 °C
M641	RTD Simulator	10 Ω – 300 kΩ	0.01 °C	5 W	0.1 °C

SPECIFICATION

M632 Resistance accuracy

Range/Resolution	Accuracy
1.000 00 Ω – 2.000 00 Ω	0.002 % + 2 mΩ
2.000 1 Ω – 20.000 0 Ω	0.002 % + 2 mΩ
20.001 Ω – 200.000 Ω	0.002 % + 2 mΩ
200.01 Ω – 2000.00 Ω	0.003 %
2.000 1 kΩ – 20.000 0 kΩ	0.003 %
20.001 kΩ – 200.000 kΩ	0.003 %
200.01 kΩ – 1200.00 kΩ	0.005 %

M631 Resistance accuracy

Range/Resolution	Accuracy
16.000 0 Ω – 20.000 0 Ω	0.002 % + 2 mΩ
20.001 Ω – 200.000 Ω	0.002 % + 2 mΩ
200.01 Ω – 1000.00 Ω	0.003 %
1000.1 Ω – 3000.0 Ω	0.005 %
3001 Ω – 10000 Ω	0.015 %
10.01 kΩ – 30.00 kΩ	0.03 %
30.1 kΩ – 100.0 kΩ	0.1 %
101 kΩ – 400 kΩ	0.4 %

M642 Resistance accuracy

Range/Resolution	Accuracy
100.000 mΩ – 200.000 mΩ	0.05 % + 15 mΩ
0.200 01 Ω – 2.000 00 Ω	0.05 % + 15 mΩ
2.000 1 Ω – 20.000 0 Ω	0.05 % + 15 mΩ
20.001 Ω – 200.000 Ω	0.05 % + 15 mΩ
200.01 Ω – 2 000.00 Ω	0.02 %
2.000 1 kΩ – 20.000 0 kΩ	0.02 %
20.001 kΩ – 200.000 kΩ	0.02 %
0.200 01 MΩ – 2.000 00 MΩ	0.02 %
2.000 1 MΩ – 20.000 0 MΩ	0.05 %
20.01 MΩ – 21.00 MΩ *1	0.1 %
21.01 MΩ – 22.00 MΩ *1	0.2 %

*1 Extended 22 MΩ range available only in -Vx2xx version.

M641 Resistance accuracy

Range/Resolution	Accuracy
10.000 0 Ω – 20.000 0 Ω	0.05 % + 15 mΩ
20.001 Ω – 200.000 Ω	0.05 % + 15 mΩ
200.01 Ω – 1000.00 Ω	0.02 %
1.0001 kΩ – 3.0000 kΩ	0.02 %
3.001 kΩ – 10.000 kΩ	0.02 %
10.01 kΩ – 30.00 kΩ	0.05 %
30.1 kΩ – 100.0 kΩ	0.1 %
101 kΩ – 300 kΩ	0.5 %

M63x Frequency response

AC/DC difference	M632						M631				
	1 Ω	10 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ	16 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ
100 Hz	0.01 %	0.01 %	0.01 %	0.05 %	0.50 %	5.00 %	0.01 %	0.01 %	0.03 %	0.30 %	3.00 %
1 kHz	0.02 %	0.01 %	0.05 %	0.50 %	5.00 %		0.01 %	0.03 %	0.30 %	3.00 %	
10 kHz	0.20 %	0.04 %	0.50 %	5.00 %			0.04 %	0.30 %	3.00 %		

M64x Frequency response

AC/DC difference	M642							M641				
	100 mΩ	1 Ω	10 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ	16 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ
100 Hz	0.05 %	0.02 %	0.01 %	0.01 %	0.06 %	0.60 %	6.00 %	0.01 %	0.01 %	0.04 %	0.40 %	4.00 %
1 kHz	0.20 %	0.10 %	0.02 %	0.01 %	0.60 %	6.00 %		0.01 %	0.05 %	0.40 %	4.00 %	
10 kHz	5.00 %	0.50 %	0.10 %	0.60 %	6.00 %			0.05 %	0.50 %	4.00 %		

M63x Pt simulation accuracy

Temperature Range	M632		M631	
	Pt10 – Pt99	Pt100 – Pt20000	Pt100 – Pt500	Pt501 – Pt1000
-200.000 – 0.000 °C	0.05 °C	0.01 °C	0.01 °C	0.01 °C
0.001 – 200.000 °C	0.06 °C	0.015 °C	0.015 °C	0.02 °C
200.001 – 500.000 °C	0.08 °C	0.03 °C	0.03 °C	0.04 °C
500.001 – 850.000 °C	0.1 °C	0.04 °C	0.04 °C	0.1 °C

M63x Ni simulation accuracy

Temperature Range	M632		M631	
	Ni10 – Ni99	Ni100 – Ni20000	Ni100 – Ni500	Ni500 – Ni1000
-60.000 – 0.000 °C	0.05 °C	0.01 °C	0.01 °C	0.01 °C
0.001 – 300.000 °C	0.05 °C	0.01 °C	0.01 °C	0.02 °C

M64x Pt simulation accuracy

Temperature Range	M642		M641
	Pt10 – Pt99	Pt100 – Pt20000	Pt100 – Pt1000
-200.00 – 0.000 °C	0.5 °C	0.15 °C	0.15 °C
-0.001 – 850.000 °C	1.0 °C	0.2 °C	0.2 °C

M64x Ni simulation accuracy

Temperature Range	M642		M641
	Ni10 – Ni99	Ni100 – Ni20000	Ni100 – Ni1000
-60.000 – 300.000 °C	0.4 °C	0.1 °C	0.1 °C

GENERAL DATA

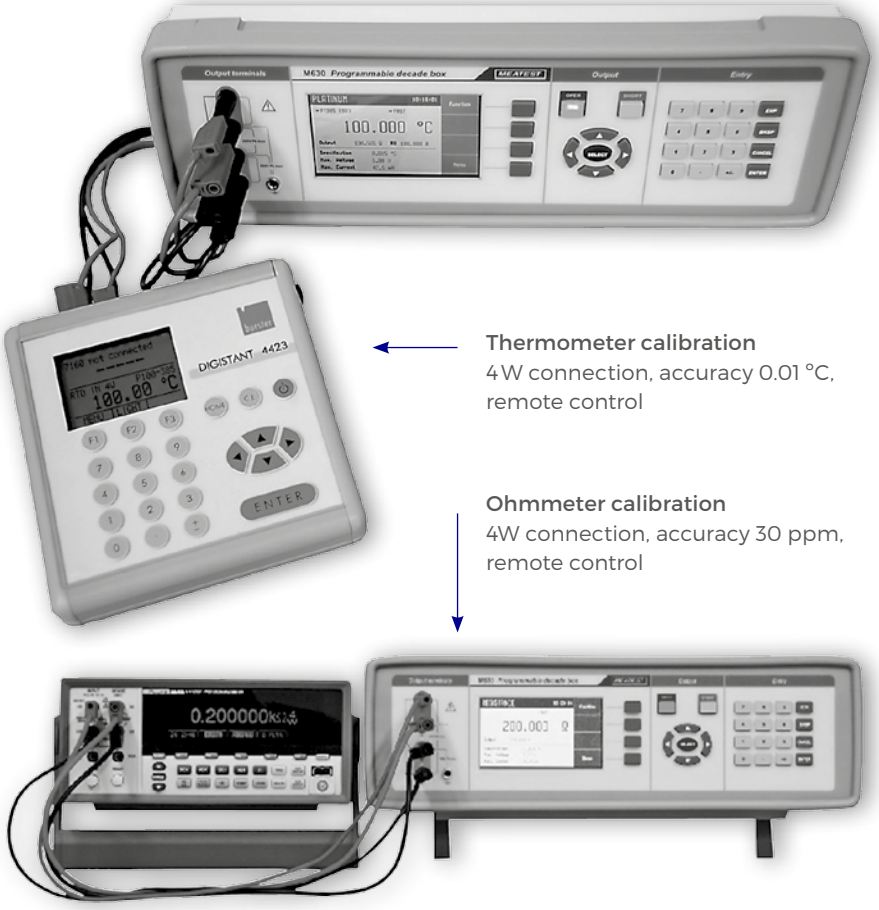
Warm-up time	10 minutes
Reference temperature	+21 °C – +26 °C
Temperature coefficient	10 % of specification per °C
Reaction time	6 ms
Dimensions (W × H × D)	W 390 mm, H 128 mm, D 310 mm
Weight	5.2 kg (M63x), 4.0 kg (M64x)
Interfaces	RS232 interface (optionally USB, LAN, IEEE488)
Maximum voltage	200 V_{PK}
Maximum current	500 mA
Total power dissipation	0.25 W (M63x), 5 W (M64x)

Ordering codes

Bus	M6xx-V1xxx – RS232 M6xx-V2xxx – RS232, USB, LAN, GPIB
Housing	M6xx-Vxx0x – table version M6xx-Vxx1x – module 19", 3HE
Other	M642-Vx2xx – 22 MΩ extension for M642

19" rack module

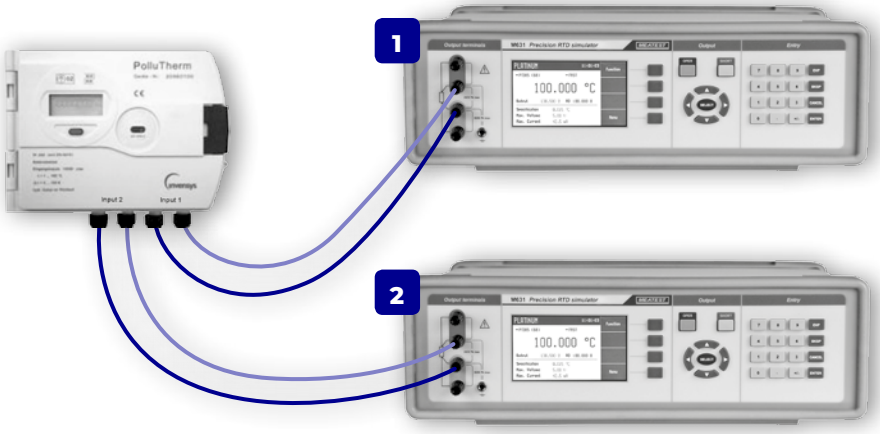
Calibration of resistance meters and evaluation units



Thermometer calibration
4 W connection, accuracy 0.01 °C, remote control

Ohmmeter calibration
4W connection, accuracy 30 ppm, remote control

Calibration of heat meters using two M631 RTD simulators



RTD simulators here simulate the temperatures of input and output water of the system.

M194

HIGH RESISTANCE DECADE BOX

HIGHLIGHTS

- Calibration of insulation testers and megohmmeters
- Resistance range 10.00 kΩ – 100.0 GΩ
- Maximum test voltage 6 kV
- Short current mA – meter
- Hot switching
- Timing function
- RS232 (optionally USB, IEEE488, Ethernet)

DESCRIPTION

M194 High Resistance Decade is based on M6xx Series Real-Resistance Programmable Decades, providing cutting-edge performance, user-friendly calibration of resistance ranges as well as test meter ranges, timer and short current testing of UUTs. Main feature of M194 is adjustable high resistance decade in continuous range from 10 kΩ to 100 GΩ with 4 digit resolution. Designed for maximum operating voltages of up to 6 kVDC this decade is great for calibration of meggers, megohmmeters and insulation testers. Accuracy from 0.1%.

Full remote control and automated calibration support is a standard for all Meatest instruments. On top of that, M194 comes with 4 interfaces (RS232, USB, LAN and GPIB) to match your system more easily.

SPECIFICATION

Resistance

MTE RP Resistance Standards

Range	Accuracy*1	Maximum DC test voltage*2
10.00 kΩ – 99.99 kΩ	0.1 %	65 V
100.0 kΩ – 999.9 kΩ	0.1 %	315 V
1.00 MΩ – 1.99 MΩ	0.1 %	1 250 V
2.00 MΩ – 9.999 MΩ	0.1 %	2 500 V
10.00 MΩ – 99.99 MΩ	0.1 %	6 000 V
100.0 MΩ – 999.9 MΩ	0.2 %	6 000 V
1.000 GΩ – 9.999 GΩ	0.5 %	6 000 V
10.00 GΩ – 100.0 GΩ *3	1.0 %	6 000 V

*1 Accuracy is valid within reference temperature range 23 ± 2 °C with RH < 50%.
*2 Maximum measured DC test voltage is 5% over the specified range.
*3 1 minute settling time for full accuracy.

Short current measurment

Current range	0.00 – 10.00 mA DC
Input resistance	100 Ω nom.
Current meter accuracy	0.2 % + 25 µA

Test voltage measrument

Voltage ranges	5 V – 400 V up to 1 MΩ 0.05 kV – 6 kV from 1 MΩ up to 100 GΩ
Uncertainty	0.5 % + 2 V up to 1 MΩ 0.5 % + 10 V from 1 MΩ up to 100 GΩ

GENERAL DATA

Warm-up time	15 minutes
Reference temperature	+21 °C – +25 °C
Temperature coefficient	10 % of accuracy / °C outside T_{REF}
Max relative humidity	< 70 % RH, < 50 % RH above 10 GΩ
Dimensions (W × H × D)	390 × 128 × 425 mm
Weight	4,5 kg
Interfaces	RS232, (optionally IEEE488, USB, Ethernet)

Ordering codes

Bus	M194-V1xxx – RS232 M194-V2xxx – RS232, USB, LAN, GPIB
Housing	M194-Vxx0x – table version M194-Vxx1x – module 19", 3HE

M109R

HIGH RESISTANCE DECADE BOX

HIGHLIGHTS

- Calibration of insulation testers and megohmmeters
- 1 MΩ – 12 GΩ range, resolution 1 MΩ
- Maximum test voltage 5 kV
- Floating Lo terminal
- Battery backup
- RS-232 as standard

DESCRIPTION

High resistance decade box is designed for calibrating of insulation meters and megohmmeters. It is suitable for calibration laboratories and service centres, where can be used also for testing or setting of high resistance meters. High voltage relays with extremely high insulation resistance are used for switching of resistance components.

M109R is equipped with indication of maximum voltage limit. Instrument is supplied from accumulator or power line adapter. Control is possible manually or remotely via serial interface RS-232.

SPECIFICATION

Resistance

Range summary	1 MΩ – 12.221 GΩ
Maximum voltage	5 kV DC between terminals H-L , H-⊥, L-⊥
Connection	Two-terminal, three-terminal (GUARD)
Type of terminals	High voltage terminals with ERTALYTE isolation
Isolation resistance of relays	> 10^{15} Ω
Surface resistance of ERTALYTE	> 10^{16} Ω

Decade	Nominal value accuracy	Voltage coefficient above 1 kV	Maximum voltage [VDC/RMS]
1 MΩ – 11 MΩ	0.1 %	1 ppm/V	1000/700
10 MΩ – 110 MΩ	0.2 %	1 ppm/V	2500/1700
100 MΩ – 1.1 GΩ	0.5 %	2 ppm/V	5000/3500
1 GΩ – 11 GΩ	1.0 %	2 ppm/V	5000/3500

GENERAL DATA

Warm up	1 hour
Reference temperature	23 °C ± 5 °C
Temperature coefficient	< 100 ppm/°C
Reference humidity	10–50 %
Dimensions (W × H × D)	390 × 128 × 310 mm
Weight	4 kg

APPLICATION

Calibration and verification of resistance meters with test voltage up to 5 kVDC – insulation testers, safety testers, megaohmmeters,...

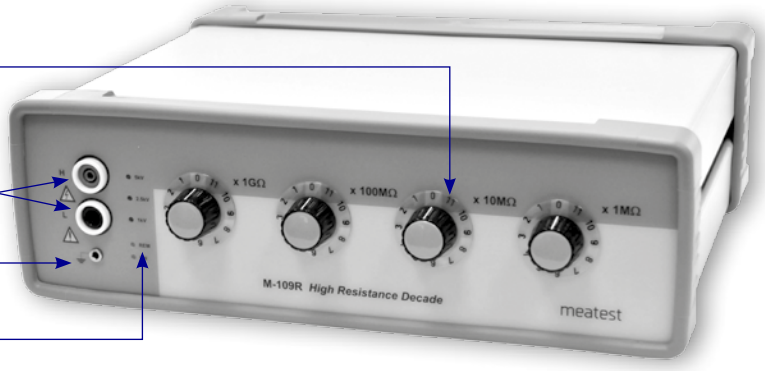
FRONT PANEL

Mechanical rotary knobs

Floating terminals, protected up to 5 kV

GND terminal (protection earth)

LED indication (max. allowed voltage, remote control, on/off)



M 525

CAPACITANCE DECADE BOX

HIGHLIGHTS

- Capacitance meter calibration and capacitive sensor simulation
- 100 pF – 100 µF, 4½ digit resolution
- 0.25 % accuracy at 1 kHz
- Grounded and floating modes with open corrections
- GPIB, USB, RS-232 and ethernet interfaces

DESCRIPTION

M525 Capacitance Decade box is programmable capacitance source that can be used either in calibration labs to calibrate capacitance ranges of multimeters and LCR meters or in production lines and repair centers to simulate capacitive sensors (f.e. proximity sensors) and variable capacitance in general. M525 uses high current relays to withstand up to 50V test signals and polypropylen capacitors for best performance.

Based on M6xx series, this programmable decade comes with similar benefits: large LCD showing relevant parameters including total accuracy, timed output sequences, customizable units, automatically compensated parasitic capacitances, easy recalibration procedure and extensive remote control connectivity via RS232, IEEE488, USB and Ethernet.

SPECIFICATION

Resistance

Range summary	100 pF – 100 µF
Frequency range	< 10 µF: 40 Hz – 1000 Hz > 10 µF: 40 Hz – 100 Hz
Maximum voltage	50 V_{PK}
Reaction time	normal mode: < 200 ms sequence mode: > 500 ms

Ranges, resolution, 1 year accuracy

Range	Accuracy 1 kHz	Accuracy 40 Hz – 1 kHz	Loss coefficient
0.100 nF – 10.000 nF	0.25 % ± 3pF	0.5 % ± 3pF	< 0.05
10.001 nF – 100.00 nF	0.25 %	0.5 %	< 0.005
100.01 nF – 1.0000 µF	0.25 %	0.5 %	< 0.005
1.0001 µF – 10.000 µF	0.25 %	0.5 %	< 0.05
10.001 µF – 100.00 µF	0.25 %*1	0.5 %*2	< 0.2*2

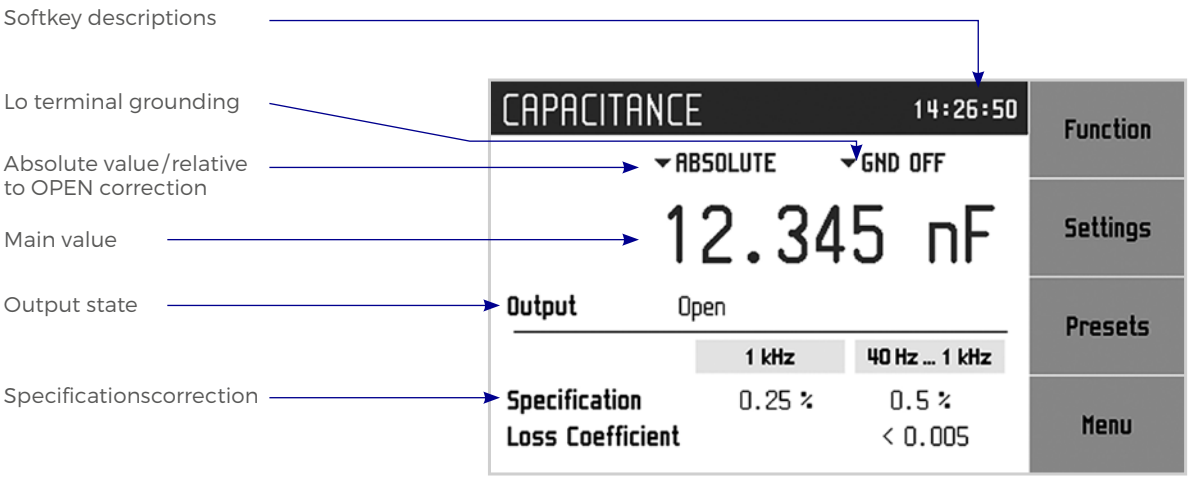
*1 For frequency 100 Hz
*2 For frequency range 40 – 100 Hz

GENERAL DATA

Warm-up time	10 minutes
Reference temperatures	+21 °C – +25 °C
Temperature coefficient	< 270 ppm / °C
Terminals	4mm gold plated
Dimensions (W × H × D)	390 × 128 × 310 mm
Weight	4 kg
Interfaces	RS232, IEEE488 + USB + Ethernet (optional)
Languages	English, German, French, Spanish, Russian, Czech

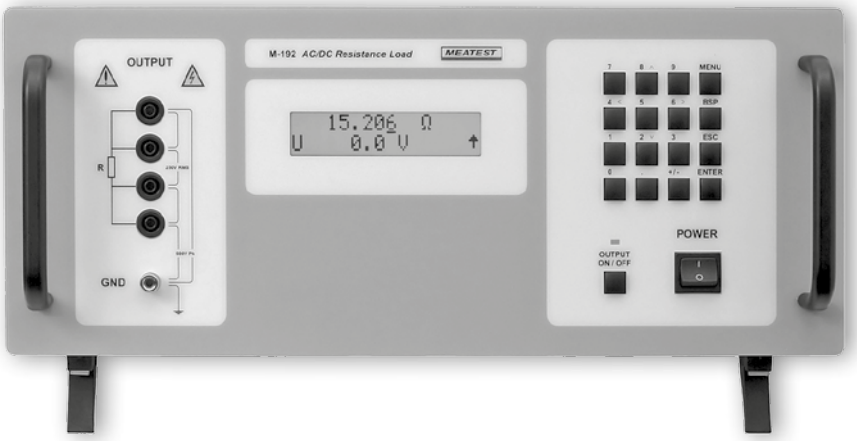
Ordering codes

Bus	M525-V1xxx – RS232 M525-V2xxx – RS232, USB, LAN, GPIB
Housing	M525-Vxx0x – table version M525-Vxx1x – module 19", 3 HE



M192

REAL-RESISTANCE DC/AC LOADS



HIGHLIGHTS

- Resistance range 15 Ω – 300 kΩ
- Maximum load 3 kW, 250 V_{RMS}
- Temperature coefficient < 10 ppm/K
- Real CR mode, simulated CP and CC modes
- RS232 and GPIB interface

DESCRIPTION

M192 is accurate high power resistance decade for testing of power supplies and batteries up to 3000 W and 250 V_{RMS}. Being a resistance decade rather than an electronic load, resistance function uses real resistance so it can be used with AC power sources as well. See datasheet for typical frequency responses. On top of that, M192A version has built-in test signal meter using which constant power and constant current functions can be simulated. Other advantages of the M192A are extended range up to 300 k3 and continuous resistance range rather than fixed values.

All decades' functions can be remotely controlled via RS232 or GPIB interface. This way you can introduce calibration/test stage directly into production line of any resistance based sensor and reduce time required for final quality tests dramatically.

SPECIFICATION

Resistance

Warm-up time	10 minutes
Resistance range summary	M192: 15 Ω – 4.7 kΩ, 64 discrete values M192A: 15 Ω – 300 kΩ, continuous range
Maximum dissipation power	3000 W
Maximum voltage	250 V_{RMS}
Reaction time in CP and CC modes (M192A only)	30 – 100 ms

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

Range	DC, 0 – 120 Hz	120 Hz – 1 kHz	1 – 10 kHz
15.000 – 99.999 Ω	0.1 + 30 mΩ	0.2 + 30 mΩ	0.2 + 30 mΩ
100.00 – 299.999 Ω	0.1	0.1	0.2
300.0 – 999.9 Ω	0.1	0.1	0.2
1000.0 – 2999.9 Ω	0.1	0.1	0.2
3000 – 9999 Ω	0.1	0.1	2.0
10.00 – 29.99 kΩ	0.1	0.1	2.0
30.1 – 100.0 kΩ	0.2	0.2	N/A
101 – 300 kΩ	0.5	2.0	N/A

Test voltage measurement (M192A only)

DC/AC voltage range	1.0 – 299.9 V
Frequency range	DC – 10 kHz
Measurement accuracy	DC: 0.1 % of value + 0.2 V AC: 0.2 % of value + 0.2 V

Typical frequency response of M192A

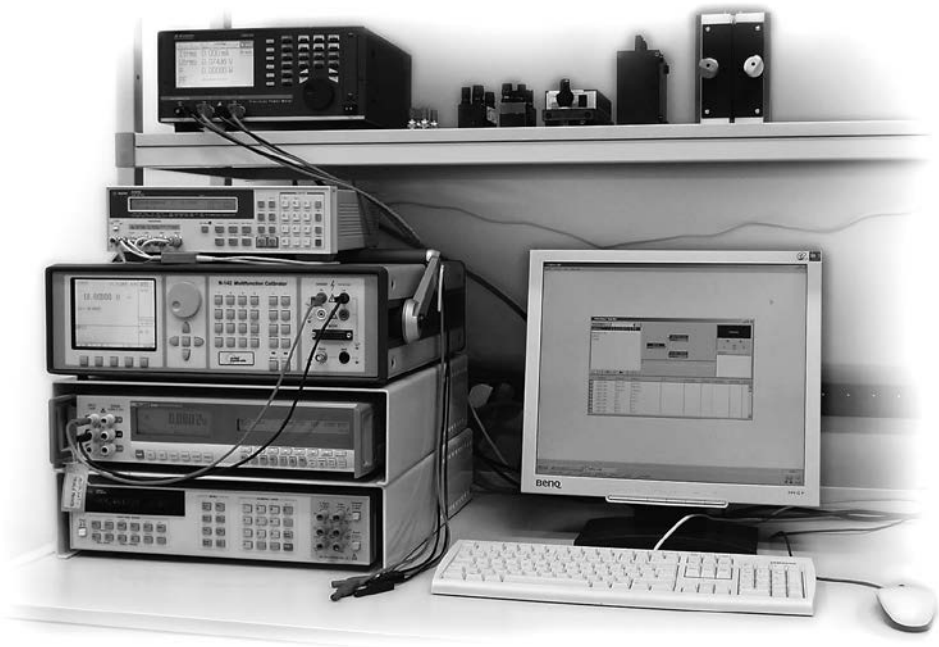
DC	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
15 Ω	15.00 Ω	15.00 Ω	15.00 Ω	15.03 Ω	15.15 Ω
100 Ω	100.00 Ω	100.01 Ω	100.02 Ω	99.97 Ω	91.5 Ω
330 Ω	330.00 Ω	330.02 Ω	330.03 Ω	329.73 Ω	301.30 Ω
1000 Ω	1000.0 Ω	1000.0 Ω	999.9 kΩ	997.0 kΩ	854.0 kΩ
10 kΩ	10.00 kΩ	10.00 kΩ	9.97 kΩ	9.21 kΩ	3.15 kΩ
100 kΩ	100.0 kΩ	99.8 kΩ	91.7 kΩ	27.0 kΩ	N/A

GENERAL DATA

Reference temperature	+18 °C – +28 °C
Temperature coefficient	< 10 – 25 ppm/K
Terminal – housing isolation	> 2 GΩ at 1000 V_{DC}
Dimensions (W × H × D)	460 × 190 × 440 mm
Weight	15 kg
Interfaces	RS232, IEEE488 (option)

CALIBER

AUTOMATED CALIBRATION SOFTWARE



HIGHLIGHTS

- Saves times, costs and prevents human errors
- Instrument control via RS232, GPIB, USB, RS485 or VISA ethernet
- Camera readout module
- Fully flexible, works with all kinds of instruments, any brand
- Uncertainty calculation according to metrology standards (EA 4/02)
- Easy creation of new procedures using Procedure wizard
- Up to 20 instruments per calibration point
- Runs on all Windows versions from 2000 to Windows 10
- EN, DE, RU, HU, SK and CZ language

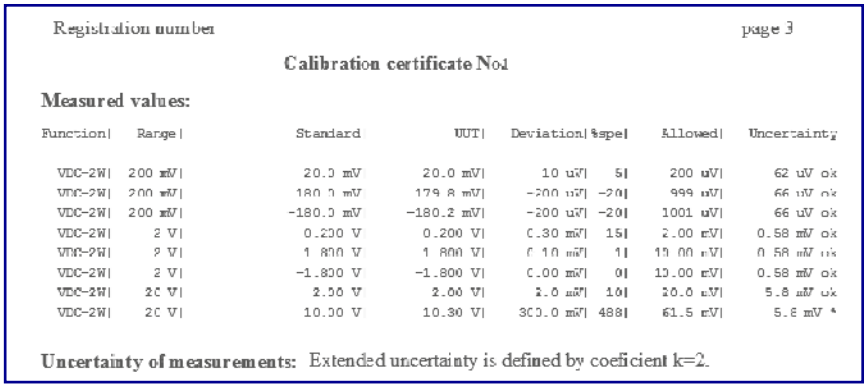
DESCRIPTION

Caliber software is designed for automated calibration and reporting. It does the same thing as you would with Excel spreadsheet and manual calibration but much faster, cheaper, doing no errors and not bothering you even a minute.

Caliber controls calibration instruments using RS232, GPIB or VISA interface where possible. Instruments with no such interfaces can be read by optical readout module CamOCR or operated manually altogether.

WinQbase-Caliber

Output of the CALIBER program represents a physically performed calibration with a calibration record – a table with measured and evaluated data (the test report).



Registration number page 3

Calibration certificate No1

Measured values:

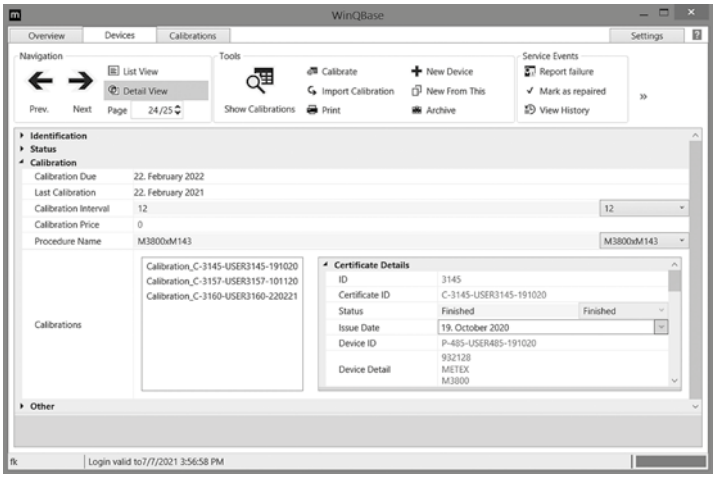
Function	Range	Standard	UUT	Deviation	%spe	Allowed	Uncertainty
VDC-2W	200 mV	20.0 mV	20.0 mV	10 uV	5	200 uV	62 uV ok
VDC-2W	200 mV	180.0 mV	179.8 mV	-200 uV	-20	999 uV	66 uV ok
VDC-2W	200 mV	-180.0 mV	-180.2 mV	-200 uV	-20	1001 uV	66 uV ok
VDC-2W	2 V	0.200 V	0.200 V	0.30 mV	15	2.00 mV	0.58 mV ok
VDC-2W	2 V	1.800 V	1.800 V	0.10 mV	1	10.00 mV	0.58 mV ok
VDC-2W	2 V	-1.800 V	-1.800 V	0.00 mV	0	10.00 mV	0.58 mV ok
VDC-2W	20 V	2.00 V	2.00 V	1.0 mV	10	20.0 mV	5.8 mV ok
VDC-2W	20 V	10.00 V	10.30 V	300.0 mV	488	61.5 mV	5.8 mV *

Uncertainty of measurements: Extended uncertainty is defined by coeficient k=2.

WinQbase-Caliber

To keep things organized, you can employ database software WinQbase to work in tandem with Caliber. WinQbase is designed specifically for calibration labs to keep detailed information of both standard units and UUTs, such as instrument serial number, inventory data, owner identification, calibration dates and methods, etc.

Calibrations done by Caliber software are automatically stored in WinQbase when online or synchronized later when you're out on site without connection to the database. Database is automatically backed up, uses password protected user accounts and logs every operation within the system so you can't ever lose your calibration data.



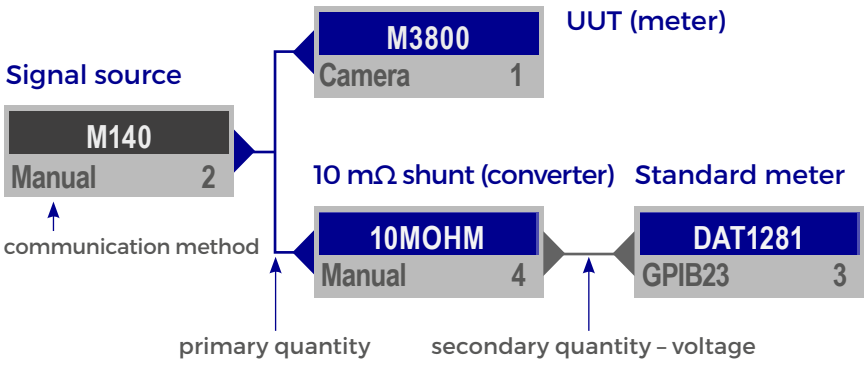
CamOCR (optional Camera module)

CamOcr camera module extends possibilities of MEATEST automatic calibration software Caliber. CamOcr is designed for scanning of 7 segment digital displays.

Instruments (UUT) without remote control interface can be "connected" using CamOcr to the computer. Instrument's display is scanned by digital video camera. It is very easy to do repeated measurements and calculate uncertainty type "A" for every calibration point.

Instruments scheme

Program uses special symbols for displaying different types of instruments in the "Instruments scheme" diagram. Up to 20 instruments can be used in one calibration point. Diagram below shows calibration of current function with standard meter measuring voltage at current shunt.



MAIN WINDOW

Camera – Optional camera module for digital display scanning

User prompt window
Clear instruction for calibration staff

Status line

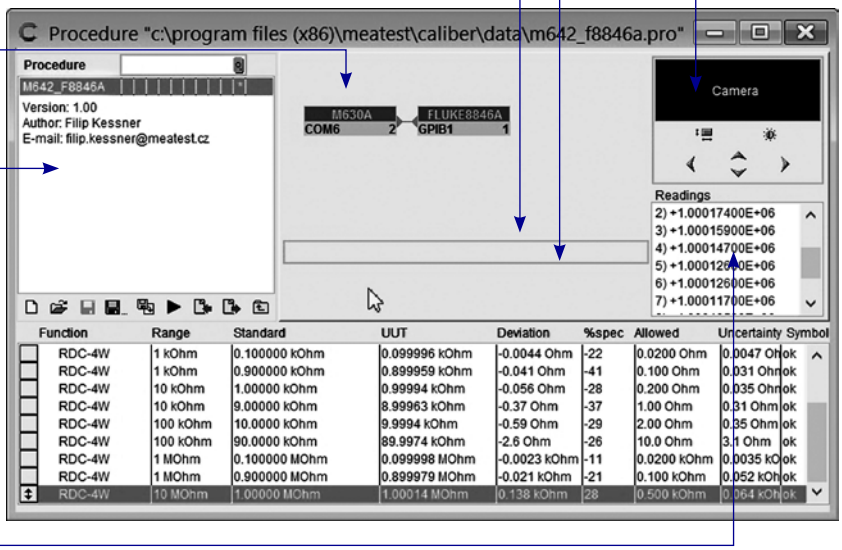
Instruments scheme
Instruments used in selected calibration point and their configuration

Procedure window
Functions, Ranges, Points, Active terminals connection, Exceptions

Direct keys
New/Open /Save, Reload Start, Calibration, Import/Export

Test report – Measured and evaluated values (measured deviation, maximum allowed deviation, measurement uncertainty...)

Readings – Instrument readouts



meatest

WHY MEATEST?

CERTIFIED BUSINESS

Our quality management system is certified to ISO 9001:2015 under UKAS certification rules. All new instruments are tested and calibrated with possibility of ISO 17025 certified calibration.

INNOVATION FOCUS

Continuous development is taken very seriously in Meatest. That's why developers account for more than a quarter of all Meatest workforce.

FLEXIBLE SOLUTIONS

Nothing on market to match your requirements? Or just missing critical feature in our instruments? Let us know and together we'll surely come up with solution.

INSTRUMENTS FOR PEOPLE

Our representatives are at your service all over the world. Would you like to consult your solution with us? Get a quote? Training? Service? Calibration? Let us know.

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