9010/SC Frequency / Scope option

HF mode (levelled sine)

	20 Hz – 100 kHz	100 kHz – 50 MHz	50 MHz – 400 MHz
Amplitude range	1 mV – 5 V pk-pk	1 mV – 3.5 V pk-pk	1 mV – 3.5 V pk-pk
Harmonic distortion	-55 dB	-55 dB	-38 dB
Flatness	< 0.1 %	< 0.5 %	< 2 %
Uncertainty	2.5 %	3.5 %	6 %

LF mode (DC, square wave)

High voltage:	up to 1 kHz at 200 V pk, 0.1 % amplitude uncertainty
Low voltage:	up to 100 kHz at 10.5 V pk, 0.02 – 0.1 % amp. uncert.

PULSE WIDTH mode

Frequency range:	0.1 Hz – 40 MHz
Frequency uncertainty:	2.5 ppm
Amplitude range:	50 mV, 100 mV, 500 mV, 1 V pk
Pulse width range:	5 s – 10 ns
Jitter:	< 2 ns
Rise time:	< 1 ns

TIME MARKER mode

Frequency range:	0.1 Hz - 400 MHz
Frequency uncertainty:	2.5 ppm
Amplitude range:	50 mV, 100 mV, 500 mV, 1 V pk
Waveform:	spike up to 4 MHz, 50% duty cycle square wave
Jitter:	< 4 ns
Rise time:	< 1 ns

TRIGGER mode

Amplitude:	> 1 V pk
Division ratio:	off, /1, /10, /100, /1000
Rise time:	< 1 ns

9010/HR High Voltage Resistance option

Range	Maximum voltage	Uncertainty
100 – 200 kΩ	800 V dc	0.2 %
200 kΩ - 1 MΩ	1100 V dc	0.2 %
1 – 10 MΩ	1150 V dc	0.3 %
10 MΩ – 1 GΩ	1575 V dc	0.5 %
1 – 10 GΩ	1575 V dc	1.0 %
100 GΩ (fixed)	1575 V dc	3.0 %

Zelezna 3 | 619 00 Brno | Czech Republic | +420 543 250 886 | meatest@meatest.com | www.meatest.com

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9010 Multifunction Calibrator

HIGHLIGHTS

- **AC/DC voltage/current up to 1050V/20A**
- **Basic uncertainty 35 ppm**
- **AC/DC power, energy, phase shift, resistance, capacitance, frequency, TC, RTD**
- **Scope option up to 400 MHz**
- **High voltage resistance option for 1.5 kV insulation testers**
- **Built-in process multimeter**
- **Interface RS232, LAN, USB, GPIB**

DESCRIPTION

Multifunction calibrator 9010 is designed as universal calibration tool for electrical calibration laboratories, covering most of their workload like multimeters clamp meters, ohm meters, power meters and power analysers, energy meters, transducers, insulation testers, process meters, scopes and many others. High load capacity of both voltage (up to 50 mA) 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 400 MHz scopes, 1.5 kV insulation testers and 1 MW power meters. On the other hand we kept all the popular functions including complete transducer and external sensor calibration (strain gauge, pressure, torsion, strength, etc.) using built-in multimeter, automatic uncertainty calculation, remote control and easy recalibration.

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SPECIFICATION

99% confidence level

DC/AC Voltage Ranges & 1 year Uncertainty [ppm]

Range	DC	15 Hz – 10 kHz	10 kHz – 30 kHz	30 kHz – 100 kHz	100 kHz – 400 kHz
1 mV – 20 mV	80 + 3 µV*	2 000 + 30 µV	2 000 + 40 µV	10 000 + 40 µV	5 000 + 50 µV
20 mV – 200 mV	45 + 3 µV*	1 000 + 80 µV	1 500 + 120 µV	3 000 + 300 µV	5 000 + 200 µV
200 mV – 2 V	35 + 10 µV	250 + 120 µV	500 + 300 µV	2 000 + 1 mV	5 000 + 800 µV
2 V – 20 V	35 + 40 µV	250 + 1.2 mV	500 + 5 mV	2 000 + 10 mV	–
20 V – 100 V	42 + 250 µV	300 + 12 mV	500 + 50 mV	–	–
100 V – 280 V	42 + 500 µV	300 + 12 mV	500 + 50 mV	–	–
280 V – 1050 V	50 + 7 mV	420 + 55 mV**	–	–	–

* Uncertainty in passive mode. Active mode uncertainty is 220 ppm + 20 µV and 45 ppm + 20 µV respectively.
** 1050 V range limited to 20 Hz – 1 kHz.

DC/AC Current Ranges & 1 year Uncertainty [ppm]

Range	DC	15 Hz – 1 kHz	1 kHz – 5 kHz	5 kHz – 10 kHz
1 µA – 200 µA	500 + 20 nA	1 500 + 20 nA	3 000 + 200 nA	5 000 + 500 nA
200 µA – 2 mA	280 + 100 nA	850 + 300 nA	2 000 + 1 µA	5 000 + 1.4 µA
2 mA – 20 mA	150 + 600 nA	500 + 2 µA	2 000 + 10 µA	5 000 + 14 µA
20 mA – 200 mA	150 + 6 µA	500 + 20 µA	2 000 + 100 µA	5 000 + 140 µA
200 mA – 2 A	200 + 130 µA	700 + 200 µA	2 000 + 100 µA	–
2 A – 20 A	250 + 2 mA	1 000 + 6 mA	–	–

Resistance and Capacitance 1 year Uncertainty

Range	ppm of value	Range	% of value
0 – 10 Ω	300 + 1 mΩ	220 pF – 3.3 nF	0.5 + 15 pF
10 – 33 Ω	250 + 1 mΩ	3.3 nF – 100 nF	0.5
33 – 100 Ω	150 + 1 mΩ	100 nF – 1 µF	1
100 Ω – 1 kΩ	100 + 3 mΩ	1 µF – 10 µF	1.5
1 – 10 kΩ	100 + 30 mΩ	10 µF – 33 µF	2
10 – 100 kΩ	100 + 300 mΩ	33 µF – 100 µF	2.5
100 – 330 kΩ	100 + 3 Ω	100 µF – 1 mF	3
330 kΩ – 1 MΩ	150 + 3 Ω	1 mF – 120 mF	5
1 – 3.3 MΩ	150 + 30 Ω		
3.3 – 10 MΩ	200 + 30 Ω		
10 – 33 MΩ	1 000 + 300 Ω		
33 – 100 MΩ	2 000 + 300 Ω		
100 – 330 MΩ	3 000 + 300 Ω		
330 MΩ – 1 GΩ	7 000 + 1 kΩ		

RTD Temperature Sensor Simulation

Types:	Pt, Ni, custom
Uncertainty:	0.03 °C – 0.18 °C
Range:	-200 – +850 °C
Range of R0:	20 Ω – 2 kΩ

Thermocouple Temperature Sensor Simulation

Types:	B,C,D,E,G_2,J,K,M,N,R,S,T
Uncertainty:	0.18 °C – 0.96 °C
CJ compensation:	auto, manual

AC/DC Power & Energy

Total range:	40 µW – 20 kW (1 MW with current coil 140-50)
Quantity:	W, VA, VAr
Frequency range:	15 – 1000 Hz
Phase angle range:	-180° to +180°
Phase uncertainty:	0.15° – 0.25°

Current range	Frequency		
	DC	15 Hz – 1 kHz, PF = 1.0	15 Hz – 200 Hz, PF = 0.5
200 µA – 2 mA	0.071 – 0.295 %	0.118 – 0.348 %	0.469 – 0.572 %
2 – 20 mA 2 – 20 A	0.046 – 0.136 %	0.074 – 0.177 %	0.460 – 0.487 %
20 mA – 200 mA 200 mA – 2 A	0.041 – 0.086 %	0.070 – 0.138 %	0.459 – 0.474 %

Voltage from current

Range:	5 mV – 5 V
Uncertainty:	0.05 % + 0.04% of range
Source impedance:	2.2, 22 or 220 Ω

Harmonic distortion

Harmonic products:	2^{nd} – 50^{th}
1^{st} harmonic range:	2 – 280 V, 0.02 – 10 A, 15 – 1000 Hz
1^{st} harmonic phase uncertainty:	0.2° – 1°
2^{nd} – 50^{th} harmonic range:	0 – 30 % of 1^{st}, 30 – 5000 Hz
Amplitude uncertainty:	0.2 % of range

Multimeter

Function	Range	Uncertainty
DC voltage	± 12 mV ± 120 mV ± 1.2 V ± 12 V ± 1 kV	50 ppm + 1 µV 50 ppm + 5 µV 50 ppm + 50 µV 50 ppm + 500 µV 50 ppm + 50 mV
DC current	± 2.4 mA ± 24 mA	150 ppm + 30 nA 150 ppm + 300 nA
Frequency	0.1 Hz – 150 kHz	50 ppm
Resistance	0 – 2 kΩ 2 – 20 kΩ	200 ppm + 10 mΩ 200 ppm + 50 mΩ
RTD temperature	-200 – +800 °C	0.08 – 0.36 °C
TC temperature	-250 – +1820 °C	0.4 – 2.5 °C

GENERAL DATA

Warm up time:	40 minutes
Storing conditions:	-10 – 55 °C, max. 70% RH at 28 °C
Reference temperature:	23 ± 2 °C
Dimensions & weight:	435 x 175 x 620 mm (W, H, D), 23 kg
Power supply:	115/230 V, 50/60 Hz
Max. power consumption:	400 VA
Interface:	RS232, GPIB, USB, RJ45

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