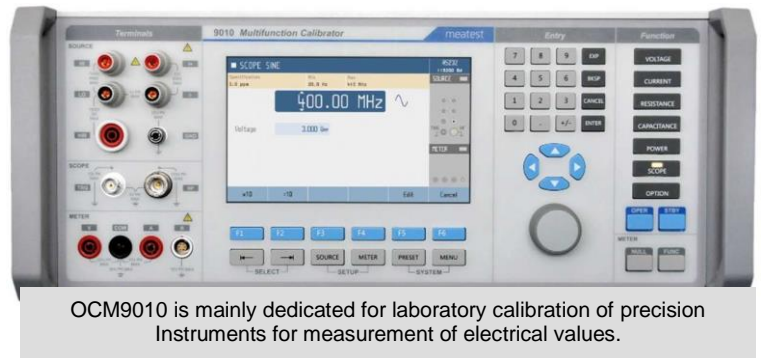




# Multifunction Calibrator

## 35ppm / Year OCM9010

- ✓ DC and AC Voltages to 1050V
- ✓ Basic Accuracy 35ppm/Year
- ✓ DC and AC Currents to 20A
- ✓ Power and Energy Calibration
- ✓ RTD and Thermocouples
- ✓ Resistors to 10 GΩ
- ✓ Capacitors to 120 mF
- ✓ Calibration Frequencies to 300 kHz
- ✓ GPIB and RS232 Ports
- ✓ Oscilloscope Function to 400 MHz



**Model OCM9010** is a bus compatible Multifunction Calibrator for accurate generation of electric units. The instrument is mainly dedicated for calibration laboratories and permits generation of voltages from 0 to 1050V DC and AC and currents from 0mA to 20A. It is suitable for calibration of measuring instruments such as Multimeter, Ohmmeter, Power Meter, Energy Analysers, Isolation Meters, Process Controllers, Transmitters, Oscilloscopes and many others.

By using a current transformer 140-50 with 50 winding also Clamp Meters can be calibrated up to 4000A. Large current load of 50mA of the voltage output permits calibration of analogue gauges.

Additional functions are included such as selection of harmonic and inter-harmonic distortions with variable Crest adjustment for control of Mains Analysers, calibration of oscilloscopes to 400MHz, testing of Isolation to 1500 V and calibration of Power-Meters to 1MW

The calibrator contains further functions which facilitate the operation during the calibration such as the setting of the Relative Deviation of the set value, Displaying of the momentary Accuracy, state of the automatic Calibration, Calibration steps and many more.

The sophisticated Software permits simple and clear settings of Values, Menu Parameters and Test Steps in calibration of Load Cells, Pressure Gauges and Transducers. The feedback signals will be measured and displayed at the internal Multimeter showing the inaccuracy of the tested sample.

OCM9010 is fully compatible with the Software Package CALIBER / WinQbase for automatic calibration. Four Data ports can be used for communication.

Standard functions are integrated which simplify the operation during calibrations, such as entry of the absolute and relative Deviation of the selected signal, display of the actual Error Band of the output value, the test frequency, the four wire terminals etc.

The display shows the menu steps, generated parameters and the additional function. Some of the keys are directly assigned to most used functions.

OC9010 contains RS232 and IEEE488 ports and is suitable for automatic calibrations and tests.

## SPECIFICATIONS

The stated errors are defined for an ambient temperature of  $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  and after a warm-up time of 30 minutes. They contain the long-time stability, the temperature coefficient, the load characteristics, the mains stability and the traceability to the national standards. The parameters are valid for 12 month.

Voltage Range: 0mV – 1050VDC 1mV - 1050VAC Sine, 1mV - 200V non Sine  
 Internal Ranges: 20mV, 200mV, 2V, 20V, 280V, 1050V  
 Frequency Range: 15Hz – 300kHz  
 Frequency Accuracy: 25ppm, Resolution 5 Digits

### DC and AC Voltage 1 year accuracy (ppm from value)

Range	DC	15Hz-10kHz	10kHz-30kHz	30kHz-100kHz	100kHz-300kHz
1 mV - 20 mV	220 + 3 $\mu\text{V}$ <sup>(1)</sup>	2000 + 30 $\mu\text{V}$	2000 + 40 $\mu\text{V}$	10000 + 100 $\mu\text{V}$	50000 + 900 $\mu\text{V}$
20 mV - 200 mV	45 + 3 $\mu\text{V}$ <sup>(1)</sup>	1000 + 80 $\mu\text{V}$	1500 + 120 $\mu\text{V}$	3000 + 300 $\mu\text{V}$	5000 + 1 mV
200 mV - 2 V	35 + 10 $\mu\text{V}$	250 + 120 $\mu\text{V}$	500 + 300 $\mu\text{V}$	2000 + 1 mV	5000 + 1 mV
2 V - 20 V	35 + 40 $\mu\text{V}$	250 + 700 $\mu\text{V}$	500 + 1,5 mV	2000 + 10 mV	NA
20 V - 100 V	42 + 250 $\mu\text{V}$	270 + 5 mV	500 + 15 mV	NA	NA
100 V - 280 V <sup>(2)</sup>	42 + 500 $\mu\text{V}$	300 + 12 mV	500 + 50 mV	NA	NA
280 V - 1050 V <sup>(3)</sup>	50 + 7 mV	420 + 85 mV	NA	NA	NA

(1) Inaccuracy in a passive Mode. In the active mode is the inaccuracy 220ppm + 30  $\mu\text{V}$  respectively 45ppm + 20  $\mu\text{V}$

(2) Over 200V is the Frequency limited to 15Hz - 10 kHz

(3) Frequency limited for 20Hz to 1 kHz

### Distortion and Load Characteristics

Parameter	Range	20mV	200mV	2V	20V	100V	280V	1000V
THD+Noise (4)	15-45Hz	0,05 % +200 $\mu\text{V}$	0,05 % +300mV	0,15%	0,15%	0,15%	0,15%	0,25%
	45Hz-10kHz	0,05 % +200 $\mu\text{V}$	0,05 % +300 $\mu\text{V}$	0,05%	0,05%	0,05%	0,05%	0,20%
	10kHz-30kHz	0,25 % +200 $\mu\text{V}$	0,25 % +300 $\mu\text{V}$	0,12%	0,15%	0,3%	0,3%	NA
	30kHz-100kHz	0,35 % +230 $\mu\text{V}$	0,35 % +300 $\mu\text{V}$	0,22%	0,3%	NA	NA	NA
	100kHz-300kHz	1,5 % +500 $\mu\text{V}$	1, % +700 $\mu\text{V}$	0,7%	NA	NA	NA	NA
Load Current	DC Active	1 mA	5 mA	30 mA	50 mA	50 mA	50 mA	5 mA
	45Hz-10kHz	0,5 mA	4 mA	30 mA	50 mA	50 mA	40 mA	3 mA
	10kHz-30kHz	0,5 mA	4 mA	10 mA	10 mA	10 mA	10 mA	NA
	30kHz-100kHz	0,5 mA	2 mA	5 mA	5 mA	NA	NA	NA
	100kHz-300kHz	100 $\Omega$ min. Load	100 $\Omega$ min. Load	1mA	NA	NA	NA	NA

(4) THD to 500 kHz or 10 lowest harmonics

## DC / AC Currents

Current Range:	DC:	0.0000 $\mu$ A - 20.00000 A
	AC Sine:	10.0000 $\mu$ A - 20.00000 A <sub>RMS</sub>
	AC non Sine:	100.0000 $\mu$ A - 2.000 000 A <sub>RMS</sub>
Internal Ranges:		200 $\mu$ A, 2mA, 20mA, 200mA, 2A, 20A
Frequency Accuracy:		25ppm, resolution 5 Digits
Non -Sine Signals:		Saw tooth, Triangle, Square, truncated Sine, max. 1 kHz
Amplitude Accuracy:		0.3% from range + 0.5 $\mu$ A <sub>RMS</sub>

## DC and AC Currents 1 year inaccuracy (% from value)

Range	DC	15Hz - 1kHz	1kHz-5kHz	5kHz-10kHz
0 - 200 $\mu$ A	0,05 + 20 nA	0,15 + 150 nA	0,3 + 200 nA	0,5 + 500 nA
0,2 - 2 mA	0,028 + 100 nA	0,085 + 300 nA	0,2 + 1 $\mu$ A	0,5 + 1,4 $\mu$ A
2 - 20 mA	0,015 + 600 nA	0,05 + 2 $\mu$ A	0,2 + 10 $\mu$ A	0,5 + 14 $\mu$ A
20 - 200 mA	0,015 + 6 $\mu$ A	0,05 + 20 $\mu$ A	0,2 + 100 $\mu$ A	0,5 + 140 $\mu$ A
0,2 - 2 A	0,02 + 130 $\mu$ A	0,07 + 200 $\mu$ A	0,2 + 500 $\mu$ A	NA
2 - 20 A	0,025 + 2 mA	0,1 + 6 mA	NA	NA

## Distortion and Load Characteristics

Parameter	Range	200 $\mu$ A	2 mA	20 mA	200 mA	2 A	20 A
Max. inductive Load	15 Hz - 10 kHz	1 H	100 mH	100mH	10 mH	1 mH	500 $\mu$ H
THD+Noise (5)	15 Hz - 1 kHz	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,3 %
	1 kHz - 5 kHz	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	NA
	5 kHz - 10 kHz	0,5 %	0,4 %	0,4 %	0,4 %	NA	NA
Load Current (6)	DC	5V	5V	10V	10V	5V	5V
	15 Hz - 1 kHz	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	0,3 %
	1 kHz - 5 kHz	0,2 %	0,2 %	0,2 %	0,2 %	0,2 %	NA
	5 kHz - 10 kHz	0,5 %	0,4 %	0,4 %	0,4 %	NA	NA

(5) THD to 100 kHz

(6) Additional inaccuracies at voltage above 0,5V

Voltage from Current	Voltage Range	5.00000 mV - 5.000 000 V
	Waveform	DC, 15,000 Hz - 400.00 Hz sine
	Amplitude uncertainty	0.05 % from value + 0.04 % from range
	Distortion	< 0.1% in 10 kHz bandwidth
	Source impedance	2.2, 22 or 220 Ohm

Current coil	Multiplier	2 - 200
	Maximum current	Multiplier x 20A
	Frequency range	45 - 65 Hz
	Uncertainty	0.25%

DC/AC Power & Energy	Range	Power	40 $\mu$ W - 5.6 kW	
		Voltage	0.2V - 280 V	
		Current	0,2mA - 20 A	
		Frequency	DC, 15 - 1000 Hz	
		Time period	10 s - 1999 s	
		Uncertainty	based upon Voltage and Current specifications.	
		Phase shift uncertainty	0.15 ° to 200Hz, 0.25 ° above 200Hz	
	Energy period	0.01% + 0.3 s inaccuracy		

## Total 1 year uncertainty

Current range	DC	15 Hz - 1 kHz, $\phi = 0^\circ$	15 Hz - 200 Hz, $\phi = 60^\circ$
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 A	0,037 - 0,13 %	0,14 - 0,41 %	0,47 - 0,61 %

## Resistance

Range:	0.0000 Ω - 100.0000 kΩ,	4W
	0.0000 Ω - 1.000 000 GΩ,	2W
Modi:	2W and 4W	free selectable
	2W and 4W	firm decade steps
	100 GΩ	Option: High Voltage Resistance

Resistors 1 Year uncertainty (ppm from value)

Free selectable values	4W	2W	Firm values	4W	2W
0 - 10 Ω	300 + 1 mΩ	300 + 131 mΩ	0 Ω	< 0,2 mΩ	0,2 Ω
10 - 33 Ω	250 + 1 mΩ	250 + 131 mΩ	1 Ω	200	0,05Ω
33 - 100 Ω	150 + 1 mΩ	150 + 131 mΩ	10 Ω	20	0,05Ω
100 - 1000 Ω	100 + 3 mΩ	100 + 133 mΩ	100 Ω	15	150
1 - 10 kΩ	100 + 30 mΩ	100 + 160 mΩ	1 kΩ	15	15
10 - 100 kΩ	100 + 300 mΩ	100 + 430 mΩ	10 kΩ	15	15
100 - 300 kΩ	100 + 3 Ω	100 + 3 Ω	100 kΩ	15	15
300 - 1000 kΩ	150 - 3 Ω	150 + 3 Ω	1 MΩ	--	30
1 - 3,3 MΩ	--	150 + 30 Ω	10 MΩ	--	500
3,3 - 10 MΩ	--	200 + 30 mΩ	100 MΩ	--	1000
10 - 33 MΩ	--	1000 + 300 Ω	1 GΩ	--	2500
33 - 100 MΩ	--	2000 + 300 Ω			
100 - 330 MΩ	--	3000 + 300 Ω			
330 - 1000 MΩ	--	7000 + 1 kΩ			

## Capacitance

Range:	0,800000 nF - 120.0000 μF	2W
Modes:	2W free selectable	
	2W firm values in decade steps	

Free selectable values	Inaccuracy	Firm values	Inaccuracy
0,8 - 3,3 nF	0,5 % + 15 pF	1 nF	2,5 %
3,3 nF - 10 μF	0,5 %	10 nF	0,35 %
10 - 33 μF	1,5 %	100 nF	0,25 %
33 - 100 μF	2,5 %	1 μF	0,25 %
0,1 - 1 mF	3 %	10 μF	0,25 %
1 - 120 mF	5 %	100 μF	0,35 %

## Harmonic distortion

Number of products	50
Fundamental harmonic ranges	1 mV-200 V or 10 μA -2 A, 15 - 1000 Hz
Uncertainties	Amplitude > 0.2% from range
	Frequency 25 ppm
	Phase shift 0.2 - 0.5 °
Harmonic products Amplitude	0 - 30 % of fundamental
Frequency	30 - 5000 Hz
Phase	5 μs typical

## Temperature Sensors

RTD Standards	Pt 3850, Pt 3851, Pt 3916, Pt 3926, Ni 120, custom.
RTD R <sub>0</sub> Range	20 - 2000 Ω
T/C	B,C,D,E,G <sub>2</sub> ,J,K,M,N,R,S,T
Cold Junction	manual or automatic with adapter Option 91
Accuracy	0.03 °C - 0.18 °C RTD
	0.18 °C - 0.96 °C T/C

## Multimeter Option

Function	Range	Inaccuracy
DC - V	12 mV	50 ppm + 3 $\mu$ V
	120 mV, 1.2 V, 12 V	50 ppm + (5 - 500) $\mu$ V
DC - I	100 $\mu$ A, 1 mA	200 ppm + (20 - 100) nA
	2.4 mA, 24 mA	150 ppm + 800 nA
Frequency	0.1 Hz - 100 kHz	50 ppm
Resistance <sup>(7)</sup>	2 k $\Omega$ - 20 k $\Omega$	200 ppm + 5 ppm from range
RTD Temperature <sup>(7)</sup>	Pt3850, Pt3851, Pt3926, Ni120	0.08 - 0.42 $^{\circ}$ C
TC Temperature	B,C,D,E,G <sub>2</sub> ,J,K,M,N,R,S,T	0.22 - 1 $^{\circ}$ C

(7) By using adapter 9000-60 in 4W termination

## Frequency / Oscilloscope Option

HF Mode levelled sine Amplitude Range: 1.400 mV<sub>p-p</sub> - 1.5000 V<sub>p-p</sub>

Frequency Range	20Hz - 100kHz	100 - 500kHz	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 %	< 0,7 %	< 1,2 %	< 2 %	< 2.5 %
Uncertainty	0.5% + 350 $\mu$ V <sub>p-p</sub>	2 %	2.5 %	3.3 %	3.7 %

<b>LF Mode (DC, square)</b>	High Voltage	up to 200V <sub>p-p</sub> @ 1kHz, 0.3% Amplitude inaccuracy
	Low Voltage	up to 10,5V <sub>p-p</sub> @ 100 kHz, 0.1-0.2% Amplitude inaccuracy
<b>Pulse width and Time Marker</b>	Frequency Range	0.1 Hz - 200 MHz
	Freq. inaccuracy	2.5 ppm
	Amplitude Ranges	50 mV, 100 mV, 500 mV, 1 V
	Duty Cycle Ratios	1 %, 10 %, 20 %, 30 %, 40 %, 50 %
	TM Waveforms	PWM to 25 MHz, 2 ns spikes
	Jitter	< 2 ns
<b>Trigger Mode</b>	Rise Time	< 1 ns
	Amplitude	> 1V pp
	Division Ratio	off, /1, /10, /100
	Rise Time	< 1ns

## High Voltage Resistance Option

Range	Max. Test Voltage	Resistance inaccuracy	Test Voltage uncertainty
100 - 200 k $\Omega$	800 V DC	0.2 %	0.3 % + 2 V
200 k $\Omega$ - 1 M $\Omega$	1100 V DC	0.2 %	0.3 % + 2 V
1 - 10 M $\Omega$	1150V DC	0.3 %	0.5 % + 5 V
10 M $\Omega$ - 1 G $\Omega$	1575 V DC	0.5 %	0.5 % + 5 V
1 - 10 G $\Omega$	1575 V DC	1.0 %	1.0 % + 5 V
100 G $\Omega$ firm value	1575 V DC	3.0 %	1.5 % + 5 V

## GENERAL SPECIFICATIONS

Warm-up Time:	30 minutes	Data Ports:	RS232, IEEE488, USB, Ethernet
Reference Temp.:	22 - 24 $^{\circ}$ C		
Working Temp.:	13 - 33 $^{\circ}$ C		
Storage Temp.:	-10 ... 55 $^{\circ}$ C @ max. 70 % r.h.	Supply:	115/230V, 50-60Hz, 450 VA @ max. Load
Temp. Coefficient:	10% of accuracy / $^{\circ}$ C	Dimensions:	450 x 480 x 150 mm, weight 24 kg

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