Multifunction Calibrator
35ppm / Year OCM9010

- ✓ DC and AC Voltages to 1050V
- ✓ Basic Accuracy 35ppm/Year
- ✓ DC und 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

OCM9010 is mainly dedicated for laboratory calibration of precision Instruments for measurement of electrical values.

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 und clear settings von 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 ºC ± 2 ºC 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	100kH-300kHz
1 mV - 20 mV	220 + 3 µV (1)	2000 + 30 µV	2000 + 40 µV	10000 + 100 µV	50000 + 900 µV
20 mV - 200 mV	45 + 3 µV (1)	1000 + 80 µV	1500 + 120 µV	3000 + 300 µV	5000 + 1 mV
200 mV - 2 V	35 + 10 µV	250 + 120 µV	500 + 300 µV	2000 + 1 mV	5000 + 1 mV
2 V - 20 V	35 + 40 µV	250 + 700 µV	500 + 1,5 mV	2000 + 10 mV	NA
20 V - 100 V	42 + 250 µV	270 + 5 mV	500 + 15 mV	NA	NA
100 V - 280 V (2)	42 + 500 µV	300 + 12 mV	500 + 50 mV	NA	NA
280 V - 1050 V (3)	50 + 7 mV	420 + 85 mV	NA	NA	NA

(1) Inaccuracy in a passive Mode. In the active mode is the inaccuracy 220ppm + 30 µV respectively 45ppm + 20 µV
(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 µV	0,05 % +300mV	0,15%	0,15%	0,15%	0,15%	0,25%
	45Hz-10kHz	0,05 % +200 µV	0,05 % +300 µV	0,05%	0,05%	0,05%	0,05%	0,20%
	10kHz-30kHz	0,25 % +200 µV	0,25 % +300 µV	0,12%	0,15%	0,3%	0,3%	NA
	30kHz-100kHz	0,35 % +230 µV	0,35 % +300 µV	0,22%	0,3%	NA	NA	NA
	100kHz-300kHz	1,5 % +500 µV	1, % +700 µV	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	100Ω min. Load	100Ω min. Load	1mA	NA	NA	NA	NA

(4) THD to 500 kHz or 10 lowest harmonics

DC / AC Currents

Current Range:	DC:	0.0000 µA - 20.00000 A
	AC Sine:	10.0000 µA - 20.00000 A $_{RMS}$
	AC non Sine:	100.0000 µA - 2.000 000 A $_{RMS}$
Internal Ranges:	200 µA, 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 µA $_{RMS}$	

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

Range	DC	15Hz - 1kHz	1kHz-5kHz	5kHz-10kHz
0 - 200 µA	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 µA	0,5 + 1,4 µA
2 - 20 mA	0,015 + 600 nA	0,05 + 2 µA	0,2 + 10 µA	0,5 + 14 µA
20 - 200 mA	0,015 + 6 µA	0,05 + 20 µA	0,2 + 100 µA	0,5 + 140 µA
0,2 - 2 A	0,02 + 130 µA	0,07 + 200 µA	0,2 + 500 µA	NA
2 - 20 A	0,025 + 2 mA	0,1 + 6 mA	NA	NA

Distortion and Load Characteristics

Parameter	Range	200 µA	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 µH
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 µW - 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, $\varphi = 0°$	15 Hz - 200 Hz, $\varphi = 60°$
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 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
0 - 10 Ω	300 + 1 mΩ	300 + 131 mΩ
10 - 33 Ω	250 + 1 mΩ	250 + 131 mΩ
33 - 100 Ω	150 + 1 mΩ	150 + 131 mΩ
100 - 1000 Ω	100 + 3 mΩ	100 + 133 mΩ
1 - 10 kΩ	100 + 30 mΩ	100 + 160 mΩ
10 - 100 kΩ	100 + 300 mΩ	100 + 430 mΩ
100 - 300 kΩ	100 + 3 Ω	100 + 3 Ω
300 - 1000 kΩ	150 - 3 Ω	150 + 3 Ω
1 - 3,3 MΩ	--	150 + 30 Ω
3,3 - 10 MΩ	--	200 + 30 mΩ
10 - 33 MΩ	--	1000 + 300 Ω
33 - 100 MΩ	--	2000 + 300 Ω
100 - 330 MΩ	--	3000 + 300 Ω
330 - 1000 MΩ	--	7000 + 1 kΩ

Firm values	4W	2W
0 Ω	< 0,2 mΩ	0,2 Ω
1 Ω	200	0,05Ω
10 Ω	20	0,05Ω
100 Ω	15	150
1 kΩ	15	15
10 kΩ	15	15
100 kΩ	15	15
1 MΩ	--	30
10 MΩ	--	500
100 MΩ	--	1000
1 GΩ	--	2500

Capacitance

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

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

Firm values	Inaccuracy
1 nF	2,5 %
10 nF	0,35 %
100 nF	0,25 %
1 µF	0,25 %
10 µF	0,25 %
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_0 Range	20 - 2000 Ω	
T/C	B,C,D,E,G_2,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 120 mV, 1.2 V, 12 V	50 ppm + 3 µV 50 ppm + (5 - 500) µV
DC - I	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 (7)	2 kΩ - 20 kΩ	200 ppm + 5 ppm from range
RTD Temperature (7)	Pt3850, Pt3851, Pt3926, Ni120	0.08 - 0.42 °C
TC Temperature	B,C,D,E,G_2,J,K,M,N,R,S,T	0.22 - 1 °C

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

Frequency / Oscilloscope Option

HF Mode levelled sine Amplitude Range: 1.400 mV $_{p-p}$ - 1.5000 V $_{p-p}$

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 μV_{p-p}	2 %	2.5 %	3.3 %	3.7 %

LF Mode (DC, square)	High Voltage	up to 200V $_{p-p}$ @ 1kHz, 0.3% Amplitude inaccuracy
	Low Voltage	up to 10,5V_{p-p} @ 100 kHz, 0.1-0.2% Amplitude inaccuracy
Pulse width and Time Marker	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
	Rise Time	< 1 ns
Trigger Mode	Amplitude	> 1V pp
	Division Ratio	off, /1, /10, /100
	Rise Time	< 1ns

High Voltage Resistance Option

Range	Max. Test Volateg	Resistance inaccuracy	Test Voltae uncertaintyt
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	1150V 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 %	1.0 % + 5 V
100 GΩ 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 °C		
Working Temp.:	13 - 33 °C		
Storage Temp.:	-10 ... 55 °C @ max. 70 % r.h.	Supply:	115/230V, 50-60Hz, 450 VA @ max. Load
Temp. Coefficient:	10% of accuracy / °C	Dimensions:	450 x 480 x 150 mm, weight 24 kg .

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