Multifunction Calibrator
10ppm / Year OCM9010+

- ✓ DC and AC Voltages to 1050V
- ✓ Basic Accuracy 10ppm/Year
- ✓ DC and AC Currents to 30A
- ✓ Power and Energy Calibration
- ✓ RTD and Thermocouples
- ✓ Resistors to 1 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 30A. 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

OCM9010+ 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 of Values, Menu Parameters and Test Steps in calibration of Load Cells, Pressure Gauges and Transducers. The feedback signals is 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 are available 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 4W - 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 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: 0 mV – 1050 VDC 1 mV - 1050 VAC Sine, 1mV - 200V non Sine
Internal Ranges: 20 mV, 200 mV, 2 V, 20 V, 280 V, 1050 V
Frequency Range: 15 Hz – 300 kHz
Frequency Accuracy: 10 ppm, Resolution 5 Digits

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

Range	DC	15Hz-10kHz	10kHz-30kHz	30kHz-100kHz	100kH-300kHz
0 mV - 20 mV	30 + 1,5 µV (1)	800 + 8 µV	1000 + 20 µV	2000 + 25 µV	5000 + 150 µV
20 mV - 200 mV	15 + 1,5 µV (1)	280 + 8 µV	350 + 15 µV	600 + 25 µV	5000 + 300 µV
200 mV - 2 V	12 + 5 µV	165 + 90 µV	250 + 100 µV	600 + 200 µV	5000 + 800 µV
2 V - 20 V	10 + 35 µV	160 + 700 µV	250 + 1,0 mV	500 + 1,5 mV	NA
20 V - 100 V	15 + 150 µV	200 + 5 mV	300 + 12 mV	NA	NA
100 V - 280 V (2)	15 + 400 µV	200 + 10 mV	300 + 40 mV	NA	NA
280 V - 1050 V (3)	20 + 3,5 mV	300 + 15 mV	NA	NA	NA

(1) Inaccuracy in a passive Mode. In the active mode is the inaccuracy 100 ppm + 10 µV respectively 15 ppm + 10 µV
(2) Above 200 V is the Frequency limited to 15 Hz - 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)	15-45 Hz	0,05 % +200 µV	0,05 % +300mV	0,15%	0,15%	0,15%	0,15%	0,25%
	45 Hz-10 kHz	0,05 % +200 µV	0,05 % +300 µV	0,05%	0,05%	0,05%	0,05%	0,20%
	10 kHz-30 kHz	0,25 % +200 µV	0,25 % +300 µV	0,12%	0,15%	0,3%	0,3%	NA
	30 kHz-100 kHz	0,35 % +230 µV	0,35 % +300 µV	0,22%	0,3%	NA	NA	NA
	100 kHz-300 kHz	1,5 % +500 µV	1 % +700 µV	0,7%	NA	NA	NA	NA
	DC Active	1 mA	5 mA	30 mA	50 mA	50 mA	50 mA	5 mA
Load Current	45 Hz-10 kHz	0,5 mA_{rms}	4 mA_{rms}	30 mA_{rms}	50 mA_{rms}	50 mA_{rms}	40 mA_{rms}	3 mA_{rms}
	10 kHz-30 kHz	0,5 mA_{rms}	4 mA_{rms}	10 mA_{rms}	10 mA_{rms}	10 mA_{rms}	10 mA_{rms}	NA
	30 kHz-100 kHz	0,5 mA_{rms}	2 mA_{rms}	5 mA_{rms}	5 mA_{rms}	NA	NA	NA
	100 kHz-300 kHz	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 - 30.00000 A
	AC Sine:	10.0000 µA - 30.00000 A $_{RMS}$
	AC non Sine:	100.0000 µA - 2.000 000 A $_{RMS}$
Internal Ranges:	200 µA, 2mA, 20mA, 200mA, 2A, 30A	
Frequency Accuracy:	10 ppm, resolution 5 Digits	
Non -Sine Signals:	Saw tooth, Triangle, Square, truncated Sine, max. 1 kHz	
Amplitude Accuracy:	0.21% from range + 0.7 µA p-p	

DC and AC Currents 1 year inaccuracy (ppm of value)

Range	DC	15Hz - 1kHz	1kHz-5kHz	5kHz-10kHz
0 - 200 µA	200 + 20 nA	1250 + 80 nA (5)	3000 + 150 nA (5)	5000 + 200 nA (5)
0,2 - 2 mA	150 + 50 nA	850 + 200 nA	1500 + 500 nA	4000 + 600 nA
2 - 20 mA	100 + 600 nA	400 + 2 µA	1000 + 4 µA	2000 + 6 µA
20 - 200 mA	100 + 5 µA	400 + 20 µA	1000 + 50 µA	2000 + 100 µA
0,2 - 2 A	160 + 50 µA	480 + 100 µA	1000 + 500 µA	NA
2 - 20 A	250 + 500 µA	550 + 2 mA	NA	NA
20 A - 30 A (6)	1000 + 750 µA	1200 + 5 mA	NA	NA

(5) Accuracy not specified below 10 µA
(6) 300s maximum continuous current

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	100 mH	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
	DC	5V	5V	10V	10V	5V	5V
Compliance Voltage	15 Hz - 1 kHz	4 V_{rms}	4 V_{rms}	5 V_{rms}	5 V_{rms}	3,5 V_{rms}	3 V_{rms}
	1 kHz -5 kHz	4 V_{rms}	4 V_{rms}	5 V_{rms}	5 V_{rms}	3,5 V_{rms}	NA
	5 kHz - 10 kHz	2 V_{rms}	2 V_{rms}	2 V_{rms}	2 V_{rms}	NA	NA

(5) THD up 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 % of range
	Distortion	< 0.1% in 100 kHz bandwidth
	Source impedance	2.2, 22 or 220 Ohm
Current coil (Option140-50)	Multiplier	2 - 200
	Maximum current	Multiplier x 30A (1500A with Current Coil 140-50)
	Frequency range	45 - 65 Hz
	Uncertainty	0.3% with Current Coil 140-50

DC/AC Power & Energy

Range	Power	40 µW - 30 kW
	Voltage	0.2V - 1050 V
	Current	0,2mA - 30 A
	Frequency	DC, 15 - 1000 Hz
	Time period	2 s - 1 hour
Uncertainty	based upon Voltage and Current specifications, Phase Shift and Energy Period specifications.	
Phase shift uncertainty	0.15° to 200Hz, 0.25° above 200Hz, 0.5° in 1050V range, 20 - 500 Hz.	
Energy period	0.01% + 0.3 s inaccuracy	

Total 1 year uncertainty in common applications (% of value)

Set Current	EU Grid Power 230V, 50Hz	US Grid Power 115V, 60Hz	Aircraft on Board Power 115V, 400Hz	Ship on Board Power 440V, 60Hz
100mA	0,071 %	0,073 %	0,073 %	0,075 %
1A	0,070 %	0,071 %	0,071 %	0,073 %
10 A	0,084 %	0,086 %	0,086 %	0,087 %
30 A	0,142 %	0,143 %	0,143 %	0,144 %

Harmonic distortion (all AC Functions)

Number of products	50	
Fundamental harmonic uncertainties	Amplitude:	≥ 0.2% from range
	Frequency:	25 ppm
	Phase shift:	0.2 - 0.5°
Frequency Range	1st product:	15 - 1000 Hz
	2nd -50th product:	30 - 5000 Hz
Harmonic products Amplitude range	0 - 30 % of fundamental	
Harmonic products Phase Shift	5 µs (typical)	

MER - Multimeter Option

Function	Range	Inaccuracy
DC - V	12 mV	50 ppm + 3 µV
	120 mV, 1.2 V, 12 V	50 ppm + (5 - 500) µV
DC - I	100 µA, 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 (9)	2 kΩ - 20 kΩ	200 ppm + 5 ppm from range
RTD Temperature (9)	Pt3850, Pt3851, PT3916, Pt3926, Ni120, custom	0.08 - 0.42 °C
TC Temperature	B,C,D,E,G_2,J,K,M,N,R,S,T	0.22 - 1 °C

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

HVR - 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	1500 V DC	0.5 %	0.5 % + 5 V
1 - 10 GΩ	1500 V DC	1.0 %	1.0 % + 5 V
100 GΩ firm value	1500 V DC	3.0 %	1.5 % + 5 V

Resistance

Range:	0.0000 Ω - 100.0000 kΩ,	4W
	0.0000 Ω - 1.100000 GΩ,	2W
Modes:	2W and 4W	free selectable, continuous range
	2W and 4W	firm decade standards
	100 GΩ	Option: High Voltage Resistance

Basic resistors modes and 1 Year uncertainty (ppm from value + absolute)

Continuous mode	4W	2W
0 - 10 Ω	300ppm + 2 mΩ	300ppm + 32 mΩ
10 - 33 Ω	250ppm + 2 mΩ	250ppm + 32 mΩ
33 - 100 Ω	150ppm + 3 mΩ	150ppm + 33 mΩ
100 - 1000 Ω	100ppm + 3 mΩ	100ppm + 33 mΩ
1 - 10 kΩ	90ppm + 30 mΩ	90ppm + 60 mΩ
10 - 100 kΩ	90ppm + 300 mΩ	90ppm + 330 mΩ
100 - 330 kΩ	100ppm + 3 Ω	100ppm + 3 Ω
330 - 1000 kΩ	150ppm + 3 Ω	150ppm + 3 Ω
1 - 3,3 MΩ	--	150ppm + 30 Ω
3,3 - 10 MΩ	--	200ppm + 30 Ω
10 - 100 MΩ	--	0,2% + 300 Ω
100 - 330 MΩ	--	0,3% + 3 kΩ
330 - 1100 MΩ	--	1% + 10 kΩ

Firm Standards	4W	2W
0 Ω	< 0,5 mΩ	25 mΩ
100 mΩ	0,5 mΩ	25 mΩ
1 Ω	0,5 mΩ	25 mΩ
10 Ω	1 mΩ	30 mΩ
100 Ω	3 mΩ	30 mΩ
1 kΩ	15 mΩ	40 ppm
10 kΩ	15 mΩ	20 ppm
100 kΩ	15 mΩ	15 ppm
1 MΩ	--	30 ppm
10 MΩ	--	130 ppm
100 MΩ	--	1000 ppm
1 GΩ	--	2500 ppm

Capacitance

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

Capacitance Modes, 1 year uncertainty and frequency limits

Continuous Mode	Inaccuracy
0,8 - 3,3 nF	0,5 % + 15 pF
3,3 nF - 10 mF	0,5 %
10 - 20 mF	0,7 %
20 - 120 mF	1,0 %

Firm Standards	Inaccuracy
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 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

Frequency / Oscilloscope Option

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

Frequency Range	15Hz-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%+100µV$_{p-p}$	< 1,2%+100µV$_{p-p}$	< 2%+100µV$_{p-p}$	< 2.5%+100µV$_{p-p}$
Amplitude Uncertainty	0.5% + 350µV$_{p-p}$	2 % + 250µV$_{p-p}$	2.5 % + 250µV$_{p-p}$	3.3 % + 250µV$_{p-p}$	3.7 % + 250µV$_{p-p}$

LF Mode (DC, square wave)	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 - 400 MHz
	Freq. inaccuracy	2.5 ppm
	Amplitude Ranges	50 mV $_{p-p}$, 100 mV $_{p-p}$, 500 mV $_{p-p}$, 1 V $_{p-p}$
	Duty Cycle Ratios	1 % - 50 %
	TM Waveforms	PWM to 25 MHz, otherwise 2 ns spikes
	Jitter	< 2 ns
	Rise Time	< 1 ns
Trigger Mode	Amplitude	> 1V $_{p-p}$
	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	1500 V DC	0.5 %	0.5 % + 5 V
1 - 10 GΩ	1500 V DC	1.0 %	1.0 % + 5 V
100 GΩ firm value	1500 V DC	3.0 %	1.5 % + 5 V

GENERAL SPECIFICATIONS

Warm-up Time:	30 minutes	Data Ports:	RS232, IEEE488, USB, Ethernet
Reference Temp.:	21 - 25 °C	Supply:	115/230V, 50-60Hz, 450 VA @ max. Load
Working Temp.:	13 - 33 °C	Dimensions:	620 x 435 x 175 mm, weight 24 kg
Storage Temp.:	-10 ... 55 °C @ max. 70 % r.h.		
Temp. Coefficient:	10% of accuracy / °C outside the reference temperature		

ORBIT CONTROLS AG
Zürcherstrasse 137
CH-8952 Schlieren/ZH

Tel: +41 44 730 2753
orbitcontrols.ch
info@orbitcontrols.ch