Multifunction Calibrator
10ppm / Year   OCM-142

- ✓ DC and AC Voltages up to 1000V
- ✓ DC and AC Currents up to 30A
- ✓ Power and Energy Calibration
- ✓ cos φ free selectable
- ✓ Digital Camera automatic Calibration
- ✓ RTD, Ni and Thermocouples
- ✓ Resistors and Capacitors
- ✓ Frequency generation
- ✓ IEEE 488, RS232

OCM-142 is mainly dedicated for laboratory calibration of precision Instruments for measurement of electrical values.

Model OCM-142 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 1000V DC and AC and currents from 0mA to 30A. By using a current transformer 140-50 with 50 winding also Clamp Meters can be calibrated up to 1000A.

The highest precision is 10ppm at DC, 180ppm at AC Voltages and 100ppm at DC, 500ppm at AC Currents.

OCM142 permits also the generation of electric DC and AC Power with a variable cos φ from -1 to +1. This permits calibration of Wattmeters and Watt Transmitters up to 240V and 20A.

RTD Thermometers Pt and Ni as well as DIN Thermocouple R, S, B, J, T, E, K, N can be simulated. The cold junction can be set from the keyboard. By using the Option 140-01 the ambient temperature is measured and the junction automatically compensated. The best accuracy is 0.07ºC/year for RTD- Simulation and 0.4ºC for T/C. The RTD Simulation contains all Pt and Ni Types.

The build-in Multimeter can measure signals from Transmitters under test supplied by signals from the calibrator.

Non harmonic signals for testing of instruments with Non-Zero Distortion measurements are available with variable frequency, amplitude and PWM ratio.

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 some more.

The Display shows the most important information. The function can be controlled from the keyboard or via RS232 or GPIB Data Bus.

VOLTAGE and CURRENT
The basic function is the generation of DC and AC voltages from 1mV to 1000V and DC and AC Currents from 1µA to 30A. By using a current transformer 140-50 with 50 winding also Clamp Meters can be calibrated up to 1000A.

The voltage is adjustable in a frequency range DC to 100 kHz.

POWER and ENERGY
Energetic packages for calibration of instrument for Energy measurements with separated voltage and current inputs, such as Wattmeter, Electrometer and Transmitter can be set from 0.2V to 240V and from 2mA to 20A DC, 40Hz up to 400Hz. The time is adjustable from 10 seconds to 1999 seconds.

The Phase is selectable from -1 to +1 with a resolution of 0, 1% in a frequency range between 40Hz and 400Hz.

The voltage output can be loaded by up to 30mA. This permits the calibration of analogue Wattmeters.

DIGITAL CAMERA
For calibration of multimeters with LCD display a digital camera is available. The LCD display of the multimeter is scanned by the camera and the measurements directly incorporated into the calibration software. By using *WinQbase* and *Caliber* Software an automatic calibration system with generation of calibration protocols can be achieved.

OTHER FUNCTIONS
Non-harmonic periodical signals with defined crest factor can be generated and used for the calibration of multimeters intended for measurement of distorted AC signals.

Resistors and capacitors can be simulated between 0 Ohm and 1000 MOhm and 700 pF to 100 µF.

Also the simulation of RTD Thermometers and DIN Thermocouples R, S, B, J, K, T, E, and N are standard functions.

The cold junction can be set with the keyboard directly as temperature or can be compensated automatically at the input terminals.

Precision frequency output 0.1Hz to 20MHz with adjustable amplitude 1mV to 10V is suitable for calibration of input characteristics of instruments, analogue circuits, signal conditioners etc.

SPECIFICATIONS

The stated errors are defined for an ambient temperature of 23 ºC ± 2 ºC and after a warm-up time of 60 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 – 1000V
Frequency Range: 20Hz – 100 kHz
Resolution: 6½ Digits

DC / AC Voltage + 1 Year Accuracy (ppm)				
RANGE	DC	20 Hz - 10 kHz	10 kHz - 50 kHz	50 kHz - 100 kHz
1 mV - 20 mV	50 + 6 µV	2000 + 30 µV	2000 + 30 µV	1.0 + 30 µV
20 mV - 200 mV	15 + 8 µV	1000 + 80 µV	1500 + 120 µV	0.3 + 120 µV
200 mV - 2 V	12 + 10 µV	180 + 100 µV	500 + 200 µV	0.2 + 1 mV
2 V - 20 V	10 + 50 µV	180 + 1 m µV	50 + 6 mV	0.2 + 10 mV
20 V - 240 V	20 + 500 µV	180 + 20 mV	---	---
240 V - 1000 V	50 + 20 mV	300 + 200 mV (*)	---	---

(*) Max. Frequency 1000 Hz   By using the Current Transformer (Option 140-50) the corresponding ranges have to be multiplied by 50 and 0.3% has to be added to the value.

Current Range: 0 – 30A
Frequency Range: 20Hz – 10 kHz
Resolution: 6½ Digits

DC / AC Currents + 1 Year Accuracy (ppm)				
RANGE	DC	20 Hz - 1 kHz	1 kHz - 5 kHz	5 kHz - 10 kHz
1 µA - 200 µA	500 + 20 nA	1500 + 20 nA	3000 + 220 nA	---
200 µA - 2 mA	200 + 100 nA	700 + 200 nA	2000 + 1 µA	5000 +1400 nA
2 mA - 20 mA	100 + 600 nA	500 + 1 µA	2000 + 10 µA	5000 + 14 µA
20 mA - 200 mA	100 + 6 µA	500 + 10 µA	2000 + 100 µA	5000 +140 µA
200 mA - 2 A	150 + 100 µA	500 + 100 µA	---	---
2 A - 30 A	200 + 2 mA	1000 + 6 mA	---	---

(*) I is the current value set.

FUNCTION SHAPE (Non Harmonic Signals)

Voltage Range: 1mV to 200V
Current Range: 100µA to 2A
Output Shape: Square positive, negative, symmetrical, Saw, Triangle, Disturbed Sine wave k=13.45%.
Amplitude Accuracy: 0.3%
Display: Peak value, calculated true RMS value
Frequency Range: 1000Hz for AC Voltage, 120Hz for AC Current

The lowest frequency value for square wave signals is 0.1Hz. 20Hz for other waveforms.

RESISTORS (Resolution 4 Digits)

Ranges: 0 Ohm - 1000 MOhm

CAPACITY (Resolution 4 Digits)

Ranges: 700 pF - 100 µF

RESISTORS and CAPACITORS					
RANGE	ACURACY ppm from Wert		RANGE	ACURACY ppm from Wert	
0 Ω - 10 Ω	300 + 5 mΩ		700 pF - 1 nF	0.5 + 15pF	
10 Ω - 33 Ω	150 + 5 mΩ		1 nF - 3.3 nF	0.5 + 5pF	
33 Ω - 330 Ω	100 + 5 mΩ		3.3 nF - 100 nF	0.5	
330 Ω - 1 MΩ	100		100 nF - 1 µF	1	
1 MΩ - 3.3 MΩ	200		1 µF - 10 µF	1.5	
3.3 MΩ - 10 MΩ	500		10 µF - 100 µF	2	
10 MΩ - 33 MΩ	1000				
33 MΩ - 100 MΩ	2000				
100 MΩ - 1 GΩ	5000				
Max. permitted voltage 10 - 20V p-p			Max. permitted voltage 5,5V p-p		

FREQUENCY

Frequency Range:	0.1Hz to 20MHz
Resolution:	6 Digits
Accuracy:	0.005%
Functions:	- PWM Square wave with calibrated Ratio, Frequency and Amplitude.
	- HF Square wave with calibrated Frequency and Amplitude.

TYPE	RANGE	ACCURACY	AMPLITUDE	ACCURACY	RATIO	ACCURACY
PWM (pos, neg, sym)	0.1 Hz-100 kHz	0.005 %	1 mV - 10 V	0.1%	0.1 - 0.99	0.0005%
HSO	0.1 Hz - 20 MHz	0.005%	5 Vp-p	10%	---	---

ELECTRIC POWER and ENERGY

Voltage Range: 0.2V to 240V
Current Range: 2mA to 20A
Power Range: 0.0004 to 4.8kVA
Time Setting Range: 1.1 to 1999 sec.
Frequency Range: DC, 40Hz to 400Hz

FUNCTION	RANGE	ACCURACY
DC Voltage	0.2 - 240 V	40 - 150 ppm
DC Current	2 mA - 20 A	500 - 1500 ppm
AV Voltage	0.2 - 240 V	300 - 1200 ppm
AC Current	2 mA - 20 A	500 - 1500 ppm
Frequency	20 - 400 Hz	50 ppm
Power Factor	- 1 … + 1	0.005 - 0.0005
Phase	0 - 360°	0.15 - 0.25
Range of Adjustment	10 sec - 1999 sec	0.1 sec

AC Power Accuracy: $dP = \sqrt{(dU^2 + dI^2 + dPF^2 + 0.03^2)}$ [%]
DC Power Accuracy: $P = \sqrt{(dU^2 + dI^2 + 0.01^2)}$ [%]
Cos φ - Accuracy: $dPF = (1 - \cos(\varphi + d\varphi)/\cos\varphi) * 100$ [%]

TEMPERATURE SENSORS (according to IST 90, PTS 68)

RTD: Pt 1.385, Pt 1.392, Ni   Temperate Range: -200 to +850 °C
Range of RO: 20 Ω to 2 kΩ   Temperature Accuracy: 0.07 °C to 0.4 °C

RTD				
TYP	-200 to 250 °C	250 to 850 °C	Sensor Types: DIN, US/JS, Ni	
Pt100	0.1 °C	0.3 °C	Range of R0: 20 Ω to 2 kΩ	
Pt200	0.1 °C	0.2 °C		
Pt1000	0.2 °C	0.4 °C		
Ni100	0.07 °C	- -		

Thermocouples: Types, Ranges and Accuracy

THERMOCOUPLES					
R	RANGE (°C)	-50 - 0	0 - 400	400 - 1000	1000 - 1767
	MAX. ERROR (°C)	1.8 - 1.4	1.4 - 0,7	0.7 - 0.6	0.6 - 0.5
S	RANGE (°C)	-50 - 0	0 - 250	250 - 1400	1400 - 1767
	MAX. ERROR (°C)	1.6 - 1.3	1.3 - 0.8	0.8 - 0.6	0.7 - 0.6
B	RANGE (°C)	400 - 800	800 - 1000	1000 - 1500	1500 - 1820
	MAX. ERROR (°C)	1.7 - 0.9	0.9 - 0.8	0.8 - 0.6	0.7 - 0.6
J	RANGE (°C)	-210 - -100	-100 - 150	150 - 700	700 - 1200
	MAX. ERROR (°C)	0.3 - 0.2	0.2 - 0.1	0.2 - 0.1	0.2
T	RANGE (°C)	-200 - -100	-100 - 0	0 - 100	100 - 400
	MAX. ERROR (°C)	0.4 - 0.3	0.2	0.2	0.1
E	RANGE (°C)	-250 - -100	-100 - 280	280 - 600	600 - 1000
	MAX. ERROR (°C)	0.7 - 0.2	0.2 - 0.1	0.1	0.1
K	RANGE (°C)	-200 - -100	-100 - 480	480 - 1000	1000 - 1372
	MAX. ERROR (°C)	0.5 - 0.2	0.2	0.3 - 0.2	0.3
N	RANGE (°C)	-200 - -100	-100 - 0	0 - 580	580 - 1300
	MAX. ERROR (°C)	0.7 - 0.3	0.3	0.2	0.2

BUILD - IN MULTIMETER

MULTIMETER		
TYPE	RANGE	ACCURACY
DC - Voltage (V)	0 ... ± 20 V	0.01 % + 500 µV
DC - Voltage (mV)	0 ... ± 2 V	0.02 % + 7µV
DC - Current	0 ... ± 25 mA	0.015 % + 300 nA
Frequency	1 Hz - 15 kHz	0.005 %
Resistor	0 ... 2.5 kOhm	0.02 % + 10 mΩ
Temperature (Pt)	-150 ... + 600 °C	0.1 °C
Temperature (TC)	-250 ... + 1820 °C	0.4 bis 2.5 °C
Tension Sensors	Sensor Range	0.05%+10µV+Sensor Error

ADDITIONAL SPECIFICATIONS

Warm-up Time: 60 min.   Ambient Pressure: 860 to 1060 HPa
Working Temperature: 23 ± 10 °C   Dimensions: 450 x 480 x 150 mm, Weight 22 kg
Storing Temperature: 0 to 40 °C @ max. 80 % r.h. Supply: 230V, ± 10%, 50-60Hz,
Reference Temperature: 23 °C ± 2 °C   250 VA at maximum load.

AUTOMATIC CALIBRATION with DIGITAL CAMERA

Automatic Calibration of Multimeters by using optional Digital Camera and WinQbase Software.

For calibration of multimeters with LCD display a digital camera is available. The LCD display of the multimeter is scanned by the camera and the measurements directly incorporated into the calibration software. By using *WinQbase* and *Caliber* Software an automatic calibration system with generation of calibration protocols can be achieved.