MC143/MC143i Portable

Powertek

1000 V and 20 A in such a small housing

- *Wide voltage range from 0 to 1000 V DC/AC with accuracy 0.007 %*
- *Extended current range from 0 to 20 A DC/AC with accuracy 0.02 % in version MC143, range from 0 to 2 A AC/DC in version MC143i*
- *Extended current range to 1000 A using Meatest Option 140-50 Current coil for calibration of clamp ammeters*
- *Sinusoidal & Non-sinusoidal waveforms*
- *Fix standard resistors 10 Ω to 100 MΩ in decimal values with calibration accuracy 0.02 %*
- *Thermocouple temperature sensor simulation R, S, B, J, T, E, K, N in range from 250 °C to 1850 °C*
- *Cold junction automatic compensation using external Pt1000 sensor*
- *RTD temperature sensor simulator as option*
- *Power supply voltage 115/230V at 50/60 Hz*
- *Interface RS 232, IEEE488 (optionally)*
- *Small dimensions, overall weight 9 kg*

MC143/143i Multifunction calibrator is cost saving solution for calibration of meters of electric quantities up to 1000 V and 20 A. It offers basic accuracy 0.01% in DC voltage needed for calibration of 3½ and 4½ digit multimeters. Resistance function is covered by eight fix resistors in range from 10 Ω to 100 MΩ. The calibrator offers TC temperature sensor simulation. It can be delivered optionally as well with RTD temperature sensor simulator. Thanks to its small dimensions and low weight the calibrator can be applied easily for field calibrations.

The calibrator main application field are production lines of panel meters, multimeters, transducers, measuring amplifiers, thermometers, and calibration laboratories where the calibrator can be applied as source of standard value for calibrations, verifications and adjustments of units under test.

Interface RS-232 and optionally GPIB interface bus enable automated operation in remote mode offering time saving automatic calibrations. Model MC143/143i is fully compatible with Meatest calibration SW package CALIBER/WinQbase.

Technical data

DC / AC SINE Wave Voltage

Voltage range summary: 0.0000 mV – 1000.00 V DC, 1.0000 mV – 1000.00 V AC
Internal ranges: 10 mV, 100 mV, 1 V, 10 V, 100 V, 1000 V
Resolution: 5½ digit
Frequency range in AC mode: 1 mV - 10 V from 20 Hz to 10 kHz, 10 V – 1000 V from 40 Hz to 1 kHz
Accuracy of frequency: 0.01%
Resolution of frequency setting: 5½ digit

Voltage accuracy

DC Voltage		***AC Voltage***		
Range	***% of value + % of range***	***Range***	***% of value + % of range***	***% of value + % z range***
			20.000 Hz – 400.000 Hz	*400.000 Hz -10 000.00 Hz*[*1]
0.0000 mV – 10.0000 mV	0.050 + 0.070	1.0000 mV – 10.0000 mV	0.20 + 0.25	0.20 + 0.30
10.000 mV – 100.000 mV	0.010 + 0.0070	10.000 mV – 100.000 mV	0.10 + 0.05	0.15 + 0.07
0.10000 V – 1.00000 V	0.006 + 0.0010	0.10000 V – 1.00000 V	0.05 + 0.005	0.07 + 0.03
1.0000 V – 10.0000 V	0.006 + 0.0005	1.0000 V – 10.0000 V	0.05 + 0.005	0.07 + 0.03
10.000 V – 100.000 V	0.006 + 0.0010	10.000 V – 100.000 V	0.05 + 0.010	0.07 + 0.03
100.00 V – 1000.00 V	0.010 + 0.0020	100.00 V – 1000.00 V	0.07 + 0.020	0.10 + 0.03

[*1] voltage ranges 100 and 1000V from 40 Hz to 1kHz

Auxiliary parameters

range	***10mV***	***100mV***	***1V***	***10V***	***100V***	***1000V***
THD[*2]	0,05% + 200 μV	0,05% + 300 μV	0,10%	0,10%	0,10%	0,20%
Maximal output current	3 mA[*3]	5 mA[*3]	20 mADC 10 mAAC	50 mADC 50 mAAC	20 mADC 10 mAAC	2 mADC, 1.5 mAAC
Output impedance	< 10 mΩ	< 10 mΩ	< 10 mΩ	< 10 mΩ	< 100 mΩ	< 100 mΩ
Maximal capacitance load	500 pF	500 pF	500 pF	500 pF	300 pF	150 pF

[*2] parameter includes non-linear distortion and non-harmonic noise in frequency range to 100 kHz
[*3] load resistance higher than 50 Ω in frequency range 2 kHz to 10 kHz to meet accuracy specification

NON-SINE Wave Voltage

Voltage range: 1.0000 mV_{pk} – 10.0000 V_{pk}
Waveform type: saw, triangle, square sym, truncated sin
Frequency range: 20.000 to 80.000 Hz
Accuracy of frequency: 0.3 %

DC / AC SINE Wave Current

Current range summary: MC143: 0.000 μA – 20.000 A DC, 1.000 μA – 20.000 A AC
: MC143i: 0.000 μA – 2.000 A DC, 1.000 μA – 2.000 A AC
Internal ranges: 200 uA, 2 mA, 20 mA, 200 mA, 2 A, 20 A (MC143 only)
Frequency range in AC mode: 20 Hz to 1 kHz, accuracy of frequency 0.01%

Current accuracy

DC Current		***AC Current***		
Range	***% of value + % of range***	***Range***	***% of value + % of range***	***% of value + % z range***
			20.000 Hz – 200.000 Hz	***200.000 Hz -1000.00 Hz***
0.000 μA – 200.000 μA	0.050 + 0.010	1.000 μA – 200.000 μA	0.25 + 0.010	0.20 + 0.10
0.20000 mA – 2.00000 mA	0.025 + 0.005	0.20000 mA – 2.00000 mA	0.10 + 0.010	0.10 + 0.02
2.0000 mA – 22.0000 mA	0.015 + 0.003	2.0000 mA – 20.0000 mA	0.07 + 0.005	0.10 + 0.02
22.000 mA – 200.000 mA	0.015 + 0.003	20.000 mA – 200.000 mA	0.07 + 0.005	0.10 + 0.02
0.2000 A – 2.0000 A	0.015 + 0.005	0.2000 A – 2.0000 A	0.10 + 0.005	0.15 + 0.05
2.0000 A – 20.000 A [*4 *5]	0.1 + 0.01	2.0000 A – 20.000 A	0.20 + 0.015	0.25 + 0.05

[*4] continuous output ON in current range 10 A to 20 A is limited to 5 minutes max.
[*5] 20A range in MC143 model only

Auxiliary parameters

Range	***200 μA***	***2 mA***	***20 mA***	***200 mA***	***2 A***	***20 A***[*4]
Maximal inductive load	400 μH	400 μH	400 μH	400 μH	200 μH	200 μH
Maximal compliance voltage (pk)	2 V	2 V	2 VAC, 7 VDC	2 V	2 V	2 V

THD[*6]	0,15%	0,10%	0,10%	0,10%	0,20%	0,30%

[*6] parameter includes non-linear distortion and non-harmonic noise in frequency range to 100 kHz

NON-SINE Wave Current

Voltage range: 100.000 μA_{pk} – 2.000 00 A_{pk}
Waveform type: saw, triangle, square sym, truncated sin
Frequency range: 20.000 to 80.000 Hz
Amplitude accuracy: 0.3 %
Frequency accuracy: 0.01 %

Resistance

Number of resistances: 8
Range: 10 Ω to 100 MΩ
Calibration value resolution: 5 dig
Maximal test voltage: 50 V_{rms} or 0.1W, what is lower
Type of connection: two-wire

Accuracy

Nominal value (Ω)	10	100	1 k	10 k	100 k	1 M	10 M	100 M
Max. calibration difference to nominal value (%)	5	1	0.5	0.5	0.5	0.5	1	5
Accuracy of calibration value (%)	0.03 + 25 mΩ	0.05	0.02	0.02	0.02	0.05	0.05	0.5

TC / RTD[*7] Temperature Sensor Simulation

TC sensor types: R, S, B, J, T, E, K, N
TC temperature simulation range: -250.0 °C to +1820.0 °C depending on type
TC cold junction compensation: fixed in range -5.0 °C to 50.0 °C
automatic using external temperature sensor
TC compensation accuracy: 0.2 °C

RTD sensor types: Pt 1.385, Pt 1.392, Ni
RTD temperature simulation range: -200.0 °C to +850.0 °C depending on sensor type
Range of R0 coefficient: 100 Ω to 1000 Ω
Type of connection: four-terminal

Temperature scale: IPTS68, ITS90
Temperature units: °C, °F
Resolution of temperature setting: 0.1 °C/°F

Accuracy

TC sensor simulation			***RTD sensor simulation*** [*7]		
Thermocouple type	***Temperature simulation range [°C]***	***Uncertainty [°C]***	***Temperature sensor type***	***Temperature range [°C]***	***Uncertainty [°C]*** [*8]
R	-50.0 to +1767.0	1.2 to 2.5	Pt100 - Pt200	-200.0 … 0.0	0.2
S	-50.0 to +1767.0	1.5 to 2.2	Pt100 - Pt200	0.0 … 850.0	0.1
B	400.0 to +1820.0	1.3 to 2.7	Pt200 - Pt1000	-200.0 … 0.0	0.1
J	-210.0 to +1200.0	0.3 to 0.9	Pt200 - Pt1000	0.0 … 850.0	0.1
T	-200.0 to +400.0	0.3 to 0.9	Ni100 - Ni200	-60.0 … 0.0	0.2
E	-250.0 to +1000.0	0.2 to 1.7	Ni100 - Ni200	0.0 … 300.0	0.1
K	-200.0 to +1372.0	0.4 to 0.8	Ni200 - Ni1000	-60.0 … 0.0	0.1
N	-200.0 to +1300.0	0.5 to 1.3	Ni200 - Ni1000	0.0 … 300.0	0.1

[*7] RTD sensor simulation is available as extra ordered option

[*8] Specification is valid for four-terminal connection

Frequency Output

Waveform type: positive 5V_{pk} (TTL)
Amplitude accuracy: 10 %
Output resistance: 50 Ω ± 5 %
Frequency range: 0.100 0 Hz to 2.000 00 MHz
Frequency accuracy: 0.01 %

Content of Delivery

MC143/MC143i Portable Multifunction Calibrator
Test Lead 1000V/20 A length 1m, 2 pcs

Power Line Cord
Meatest Calibration Certificate
Opt 143-60 RTD Simulator option (optionally)
Opt 143-90 Pt1000 External Temperature Sensor
RS232 Cable
Operation Manual

General data

Reference temperature range:	23 °C ± 2 °C (for above shown uncertainties)
Relative humidity:	<80 % to 30 °C, <70 % to 40 °C, <40 % to 50 °C
Temperature coefficient:	In extended temperature range +5 °C to +40 °C multiply uncertainty parameters 0.15x / °C
Absolute accuracy definition:	MC143 specifications include stability, temperature coefficient, linearity, line and load regulation, and the traceability of the external standards used for calibration.
Specification confidence interval:	99 %
Safety standards:	Complies with EN/IEC 61010-1:2001
Range of working temperatures:	+10 °C ... +40 °C
Range of storing temperatures:	- 20 °C ... +50 °C
Power supply:	115/230V - 50/60 Hz
Power consumption:	250 VA max
Dimensions (W x H x D):	390 x 128 x 430 mm
Weight:	9 kg
Interface:	RS232, (IEEE488 as option)

Models:

MC143	1000V/20A model with RS232	MC143(i) RTD	model with built-in RTD simulator
MC143i	1000V/2A model with RS232	MC143(i) GPIB	model with RS232 and GPIB interface

MC143 is equipped with blue display with wide viewing. The display contains basic data related to selected function. Three soft buttons with functionaly orientated meaning simplify manual control. Display shows always actual accuracy in set test point.

Presence of dangerous voltage over 100 V at the output terminals is always indicated by „Dangerous voltage" sign. Calibrator indicates dangerous voltage by beeping.

AC/DC maximal output current is 20 A.
Output current in range 10 to 20 A has limited period for which it can be continuously applied.

For temperature sensor simulation one of temperature sdscales PTS68 or ITS90 can be selected
Two types of Pt temperature sensors are predefined, PT 1.385 and PT 1.392.

Calibrator readjustment is simple and user-friendly.
Access to calibration values is protected by password.

Option 140-50 Current coil with multiplying coefficient x25 and x50 is a usefull tool for calibration of clamp ammeters up to 1000 A at 50/60 Hz signal frequency.

External temperature sensor Pt1000 can be used for automatic compensation of cold junction of simulated thermocouple sensors.

Option 143-60 Cable adapter is designed for simulation of RTD temperature sensors. The adapter is connected to the front panel AUX connector. Platinum and nickel sensors temperature dependency is predefined in the calibrator.

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