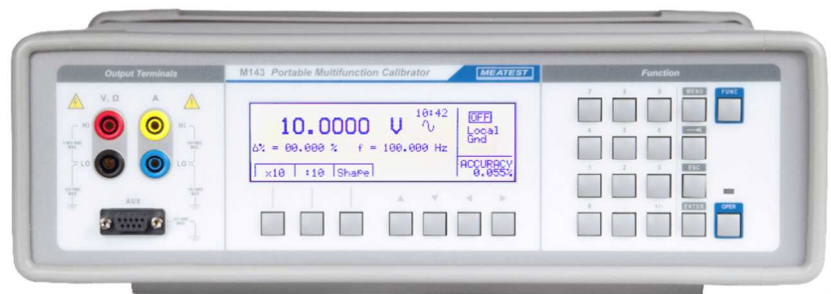


M143

Portable Multifunction Calibrator



HIGHLIGHTS

- AC/DC voltage/current to 1000V/20A
- Basic accuracy 60 ppm
- Sinusoidal & Non-sinusoidal waveforms
- Small dimensions, overall weight 11 kg

DESCRIPTION

M143/143i 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 M143/143i is fully compatible with Meatest calibration SW package CALIBER/WinQbase

SPECIFICATION

Specifications below describe 1-year absolute accuracy of this product including long-term stability, linearity, load and line regulation and reference standard measurement uncertainty as well as ambient conditions within specified limits.

GENERAL DATA

| | |
|-------------------------|---|
| Warm-up time | 60 minutes |
| Reference temperature | +21 °C – +25 °C |
| Operating temperature | +10 °C – +40 °C |
| Storage temperature | -10 °C – +55 °C |
| Temperature coefficient | 15 % of accuracy / °C outside Tref |
| Max relative humidity | -10 – 30 °C: 80 % 30 – 40 °C: 70 % 40 – 55 °C: 40 % |
| Power supply | 115/230V - 50/60 Hz, 250 VA max |
| Dimensions (W x H x D) | 325 x 111 x 316 mm |
| Weight | 11 kg |
| Interfaces | RS232, IEEE488 (optional) |

DC/AC Voltage

| | |
|-----------------------------------|--|
| Voltage range summary | DC: 0 mV – 1000 V AC sine: 1 mV – 1000 V Non-sine: 1 mVpk – 10 Vpk |
| Internal ranges | 100 mV, 1 V, 10 V, 100 V, 1000 V |
| Frequency range | Sine <10 V: 20 Hz – 10 kHz Sine >10 V: 40 Hz – 1 kHz Non-sine <10 V: 20 Hz – 80 Hz |
| Frequency accuracy and resolution | 0.01%, 5 digit |
| Non-sine waveform types | saw, triangle, square, truncated sin |
| Non-sine amplitude accuracy | 0.3 % of peak value |

Ranges, resolution, 1 year accuracy [% of value]

| Range | DC | 20 Hz – 400 Hz | 400 Hz – 10 000 Hz |
|------------------------|---------------|-----------------------------|----------------------------|
| 1.0000 mV – 10.0000 mV | 0.05 + 7 µV | 0.2 + 25 µV | 0.2 + 30 µV |
| 10.000 mV - 100.000 mV | 0.01 + 7 µV | 0.1 + 50 µV | 0.15 + 70 µV |
| 0.10000 V - 1.00000 V | 0.006 + 10 µV | 0.05 + 50 µV | 0.07 + 100 µV |
| 1.0000 V – 10.0000 V | 0.006 + 50 µV | 0.05 + 500 µV | 0.07 + 3 mV |
| 10.000 V – 100.000 V | 0.006 + 1 mV | 0.05 + 10 mV ^{*1} | 0.07 + 30 mV ^{*1} |
| 100.00 V – 1000.00 V | 0.01 + 20 mV | 0.07 + 200 mV ^{*1} | 0.1 + 300 mV ^{*1} |

*1 Limited to 40 Hz – 1 kHz, sine waveform only.

Auxiliary parameters

| Range | THD ^{*2} | Max. DC/AC Current | Max. load capacitance | Output impedance | Overload protection |
|--------|-------------------|--------------------|-----------------------|------------------|---------------------|
| 10 mV | 0.05 % + 200 µV | 3 / 3 mA | 3 nF | < 10 mΩ | 60 Vpk |
| 100 mV | 0.05 % + 300 µV | 5 / 5 mA | 3 nF | < 10 mΩ | 60 Vpk |
| 1 V | 0.1 % | 20 / 10 mA | 3 nF | < 10 mΩ | 60 Vpk |
| 10 V | 0.1 % | 50 / 50 mA | 10 nF | < 10 mΩ | 60 Vpk |
| 100 V | 0.1 % | 20 / 10 mA | 10 nF | < 100 mΩ | 250 Vpk |
| 1000 V | 0.2 % | 2 / 1.5 mA | 3 nF | < 100 mΩ | 1500 Vpk |

*2 Includes non-linear distortion and non-harmonic noise up to 100 kHz.

DC/AC Current

| | |
|-----------------------------------|--|
| Voltage range summary | DC: 0 μ A – 20 A ^{*3} AC Sine: 1 μ A – 20 A ^{*3} Non-sine: 100 μ Apk – 2 Apk |
| Internal ranges | 200 μ A, 2 mA, 20 mA, 200 mA, 2 A, 20 A ^{*3} |
| Frequency range | Sine: 20 Hz – 1 kHz Non-sine <2A: 20 Hz – 80 Hz |
| Frequency accuracy and resolution | 0.01%, 5 digit |
| Non-sine waveform types | saw, triangle, square, truncated sin |
| Non-sine amplitude accuracy | 0.3% of peak value |

Ranges, resolution, 1 year accuracy [% of value]

| Range | DC | 20 Hz – 200 Hz | 200 Hz – 1 kHz |
|-----------------------------------|---------------------|-------------------|------------------|
| 1.000 μ A – 200.000 μ A | 0.05 + 20 nA | 0.25 + 20 nA | 0.2 + 200 nA |
| 0.20000 mA – 2.00000 mA | 0.025 + 100 nA | 0.1 + 200 nA | 0.1 + 400 nA |
| 2.0000 mA – 20.0000 mA | 0.015 + 600 nA | 0.07 + 1 μ A | 0.1 + 4 μ A |
| 20.000 mA – 200.000 mA | 0.015 + 6 μ A | 0.07 + 10 μ A | 0.1 + 40 μ A |
| 0.2000 A – 2.0000 A | 0.015 + 100 μ A | 0.1 + 100 μ A | 0.15 + 1 mA |
| 2.0000 A – 20.000 A ^{*3} | 0.1 + 2 mA | 0.2 + 3 mA | 0.25 + 10 mA |

*3 M143i version lacks 20A amplifier and so is limited to 2A.

Auxiliary parameters

| Range | THD ^{*4} | Max. DC/AC Voltage | Max. load Inductance | Overload protection |
|----------------------|---------------------|--------------------|----------------------|---------------------|
| 200 μ A | 0.15 % | 2 / 2 V | 400 μ H | 15 Vpk |
| 2 mA | 0.1 % | 2 / 2 V | 400 μ H | 15 Vpk |
| 20 mA | 0.1 % | 7 / 2 V | 400 μ H | 15 Vpk |
| 200 mA | 0.1 % | 2 / 2 V | 400 μ H | 15 Vpk |
| 2 A | 0.2 % | 2 / 2 V | 200 μ H | 15 Vpk |
| 20 A ^{*3*6} | 0.3 % ^{*5} | 2 / 2 V | 200 μ H | 15 Vpk |

*4 Includes non-linear distortion and non-harmonic noise up to 100 kHz.

*5 Up to 0.6% below 30 Hz.

*6 Continuous output up to 10 A is not time-limited. Maximum duration at 20 A is 5 minutes, 15 minutes at 10 A. Cooldown takes typically around 5 minutes.

Resistance (2W)

| Nominal value | Max. deviation | Accuracy |
|----------------|----------------|------------------------|
| 10 Ω | 5 % | 0.05 % + 50 m Ω |
| 100 Ω | 1 % | 0.05 % |
| 1 k Ω | 0.5 % | 0.02 % |
| 10 k Ω | 0.5 % | 0.02 % |
| 100 k Ω | 0.5 % | 0.02 % |
| 1 M Ω | 0.5 % | 0.05 % |
| 10 M Ω | 1 % | 0.05 % |
| 100 M Ω | 5 % | 0.5 % |

Compliance voltage 50 Vrms, maximum dissipation power 0.1 W.

RTD temperature sensor simulation (4W)^{*7}

| Type | Range | Accuracy |
|----------------|-------------------|--------------|
| Pt100 – Pt200 | -200.0 – 850.0 °C | 0.1 – 0.2 °C |
| Pt200 – Pt1000 | -200.0 – 850.0 °C | 0.1 °C |
| Ni100 – Ni200 | -60.0 – 300.0 °C | 0.1 – 0.2 °C |
| Ni200 – Ni1000 | -60.0 – 300.0 °C | 0.1 °C |

*7 RTD temperature sensor simulator is an optional extra. Pt standards: IPTS68 and ITS90.

TC temperature sensor simulation

| Type | Range | Accuracy ^{*8} |
|------|----------------|------------------------|
| R | -50 - 1767 °C | 1.2 - 2.5 °C |
| S | -50 - 1767 °C | 1.5 - 2.2 °C |
| B | 400 - 1820 °C | 1.3 - 2.7 °C |
| J | -210 - 1200 °C | 0.3 - 0.9 °C |
| T | -200 - 400 °C | 0.3 - 0.9 °C |
| E | -250 - 1000 °C | 0.2 - 1.7 °C |
| K | -200 - 1372 °C | 0.4 - 0.8 °C |
| N | -200 - 1300 °C | 0.5 - 1.3 °C |
| C | 0 - 2315 °C | 0.6 - 1.2 °C |
| D | 0 - 2315 °C | 0.6 - 1.1 °C |
| G2 | 0 - 2315 °C | 0.6 - 5.0 °C |
| M | -50 - 1410 °C | 0.2 - 0.3 °C |

*8 Accuracy is based on manual cold junction compensation. Add 0.2 °C for automatic compensation based on external temperature sensor. Compensation range is -5 - 50 °C.

Frequency

| | |
|--------------------|-------------------------|
| Frequency range | 0.1000 Hz - 2.00000 MHz |
| Frequency accuracy | 0.005 % |
| Waveform type | positive 5 Vpk |
| Amplitude accuracy | 10 % |
| Output resistance | 50 Ω ± 5 % |

Versions

| | |
|-------|---------------------------------|
| M143i | 2A base version |
| M143 | Full version with 20A amplifier |
| RTD | RTD simulator extension |
| GPIO | GPIO interface extension |

Multimeter calibration (application)



Clampmeter calibration with 140-50 Current Coil (application)

