

RIGOL

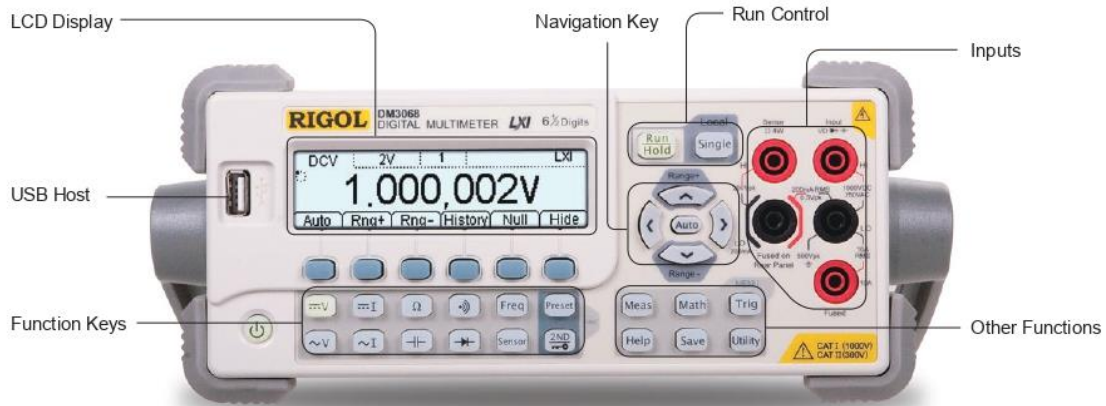


DM3068 $6\frac{1}{2}$ digits Digital Multimeter

- Real $6\frac{1}{2}$ digits readings resolution (2,200,000 Count)
- Up to 10 K rdgs/s of measurement speed and 512 K rdgs Volatile Memory
- True-RMS AC Voltage and Current measurement
- Built-in 10 groups data storage, 10 groups setup storage
- Built-in Thermcouple compensate in Cold terminal, support customized any sensor measurement and 3 types of temperature sensors: TC, RTD and THERM
- Clone or backup all the configurations within instrument into other DM3068 via U-disc
- UltraSensor software: easy, convenient and flexible to support "Any sensor" measurements
- Real time Trend and Histogram Display functions
- Standard interface: USB Device, USB Host, LAN, RS-232, GPIB, support U-disc storage
- Remote control with SCPI commands
- 256 × 64 LCD
- Support double display, waveform display, Chinese and English menu
- Push-help makes information acquire more easier
- File management (support for U-disc and local storage)

DM3068 is a digital multimeter designed with $6\frac{1}{2}$ digits readings resolution especially fitting to the needs of high-precision, multifunction and automatic measurement. It adopts many today's new technologies to achieve high performance, abundant features in the same class. It's designed to aim at the requirements of the largest DMM market from the research, education, industrial electronics, consumer electronics and automotive industries with its innovative technology, industry leading specifications, powerful measurement functions and broad analysis capabilities.

DM3068 6½ Digits Digital Multimeter



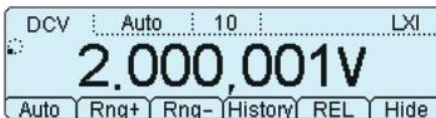
Size (W×H×D):231.6 mm×107.0 mm×29.5 mm Weight: ~3.2 kg (Without package)



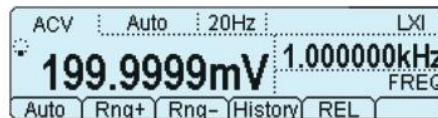
Standard interfaces: USB Device,RS-232,GPIB,LAN(LXi-C)

► Features and Benefits

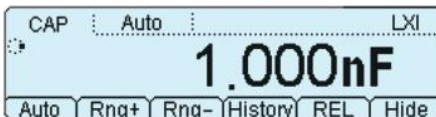
Real 6½ digits readings resolution



Easy to measure AC signal with double display



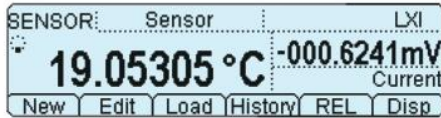
Standard Capacitor measurement function



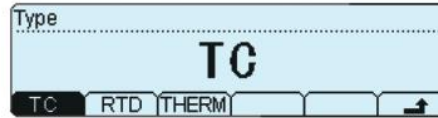
10 groups Preset function



"Any sensor" function



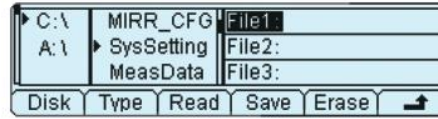
Support multiple temperature sensors



Support multiple commands



File management (support for U-disc and local storage)



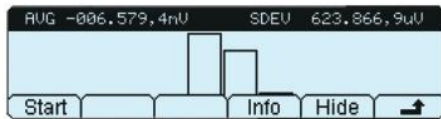
Math function



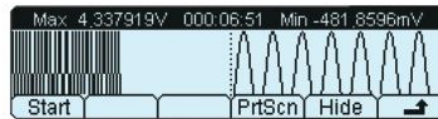
Statistic function



Histogram display

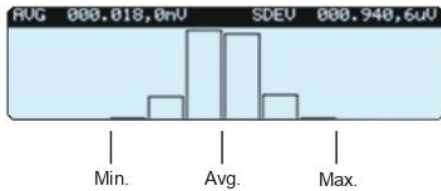


Trend display

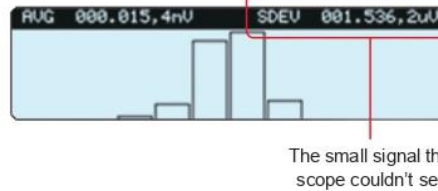


► Application example

Use the histogram function searching for abnormal signal :



White Noise Histogram



The small signal that scope couldn't see



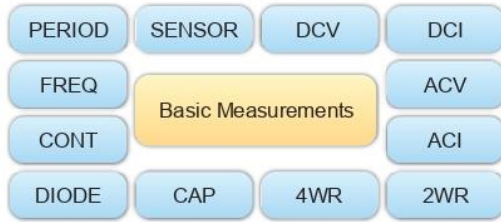
Submerged Pulse Noise Histogram

Use Trend graphics to detect temperature trends during a long time:



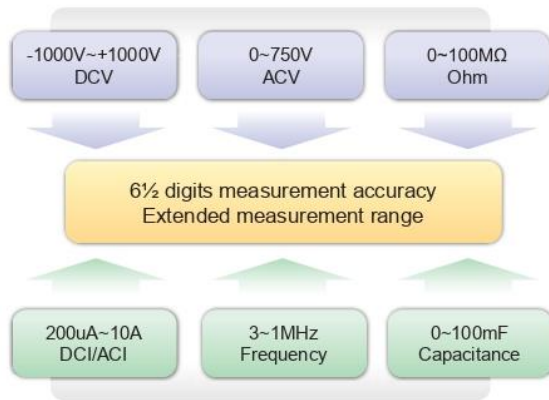
Long term trends

Abundant basic measurement functions:

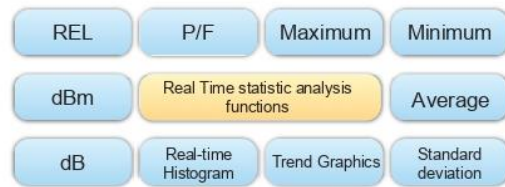


DCV Range: -1000 V ~ 1000 V
 DCI Range: -10 A ~ 10 A
 ACV Range(True-RMS): 0 V ~ 750 V
 ACI Range(True-RMS): 0 A ~ 10 A
 R Range: 0 Ω ~ 100 MΩ
 C Range: 0 F ~ 100 mF
 F Range: 3 Hz ~ 1 MHz

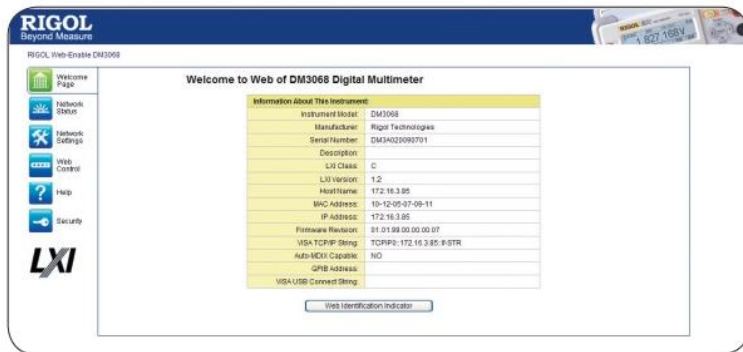
Extended Measurement Ranges



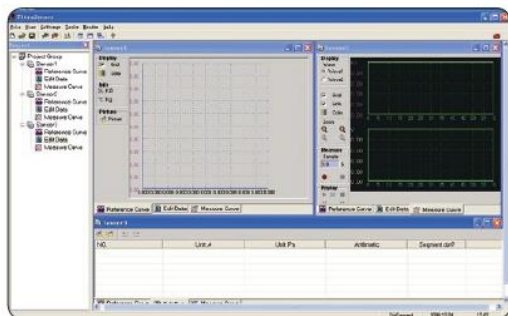
Real Time statistic analysis functions



► LXI Certificate



► UltraSensor Software for any types of electrical sensor measurements



► Specifications

DC Characteristics

Accuracy Specifications: \pm (% of reading + % of range)^[1]

| Function | Range ^[2] | Test Current or Burden Voltage | 24 Hour ^[3] $T_{CAL} \text{ } ^\circ\text{C} \pm 1 \text{ } ^\circ\text{C}$ | 90 Day $T_{CAL} \text{ } ^\circ\text{C} \pm 5 \text{ } ^\circ\text{C}$ | 1 Year $T_{CAL} \text{ } ^\circ\text{C} \pm 5 \text{ } ^\circ\text{C}$ | Temperature Coefficient 0 $^\circ\text{C}$ to ($T_{CAL} \text{ } ^\circ\text{C} - 5 \text{ } ^\circ\text{C}$) ($T_{CAL} \text{ } ^\circ\text{C} + 5 \text{ } ^\circ\text{C}$) to 50 $^\circ\text{C}$ |
|---------------------------|--------------------------|--------------------------------|---|---|---|--|
| DC Voltage | 200.0000mV | | 0.0020 + 0.0020 | 0.0030 + 0.0025 | 0.0040 + 0.0025 | 0.0005 + 0.0005 |
| | 2.000000V | | 0.0015 + 0.0005 | 0.0020 + 0.0006 | 0.0035 + 0.0006 | 0.0005 + 0.0001 |
| | 20.00000V | | 0.0020 + 0.0004 | 0.0030 + 0.0005 | 0.0040 + 0.0005 | 0.0005 + 0.0001 |
| | 200.0000V | | 0.0020 + 0.0006 | 0.0040 + 0.0006 | 0.0050 + 0.0006 | 0.0005 + 0.0001 |
| | 1000.000V ^[4] | | 0.0020 + 0.0006 | 0.0040 + 0.0010 | 0.0055 + 0.0010 | 0.0005 + 0.0001 |
| DC Current | 200.0000uA | <0.03V | 0.010 + 0.012 | 0.040 + 0.015 | 0.050 + 0.015 | 0.0020 + 0.0030 |
| | 2.000000mA | <0.25V | 0.007 + 0.003 | 0.030 + 0.003 | 0.050 + 0.003 | 0.0020 + 0.0005 |
| | 20.00000mA | <0.07V | 0.007 + 0.012 | 0.030 + 0.015 | 0.050 + 0.015 | 0.0020 + 0.0020 |
| | 200.0000mA | <0.7V | 0.010 + 0.002 | 0.030 + 0.003 | 0.050 + 0.003 | 0.0020 + 0.0005 |
| | 2.000000A | <0.12V | 0.050 + 0.020 | 0.080 + 0.020 | 0.100 + 0.020 | 0.0050 + 0.0010 |
| | 10.00000A ^[5] | <0.6V | 0.100 + 0.010 | 0.120 + 0.010 | 0.150 + 0.010 | 0.0050 + 0.0020 |
| Resistance ^[6] | 200.0000 Ω | 1mA | 0.0030 + 0.0030 | 0.008 + 0.004 | 0.010 + 0.004 | 0.0006 + 0.0005 |
| | 2.000000k Ω | 1mA | 0.0020 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0006 + 0.0001 |
| | 20.00000k Ω | 100uA | 0.0020 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0006 + 0.0001 |
| | 200.0000k Ω | 10uA | 0.0020 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0006 + 0.0001 |
| | 1.000000M Ω | 2uA | 0.002 + 0.001 | 0.010 + 0.001 | 0.012 + 0.001 | 0.0010 + 0.0002 |
| | 10.00000M Ω | 200nA | 0.015 + 0.001 | 0.030 + 0.001 | 0.040 + 0.001 | 0.0030 + 0.0004 |
| | 100.0000M Ω | 200nA 10M Ω | 0.300 + 0.010 | 0.800 + 0.010 | 0.800 + 0.010 | 0.1500 + 0.0002 |
| Diode Test | 2.0000V ^[7] | 1mA | 0.002 + 0.010 | 0.008 + 0.020 | 0.010 + 0.020 | 0.0010 + 0.0020 |
| Continuity Test | 2000.0 Ω | 1mA | 0.002 + 0.010 | 0.008 + 0.020 | 0.010 + 0.020 | 0.0010 + 0.0020 |

[1] Specifications are for 90-minute warm-up and 100NPLC integration time. For integration time <100NPLC, add the appropriate "RMS Noise Adder" listed in the following table.

[2] 10% overrange on all ranges except DCV 1000V and DCI 10A range.

[3] Relative to calibration standards.

[4] For each additional volt over \pm 500 V, add 0.03mV error.

[5] For continuous current > 7A DC or 7AAC RMS, 30 seconds ON and 30 seconds OFF.

[6] Specifications are for 4-wire resistance measurement or 2-wire resistance measurement using REL operation. Without REL operation, add 0.2 Ω additional error in 2-wire resistance measurement.

[7] Accuracy specifications for the voltage measured at the input terminal only. 1 mA test current is typical. Variation in the current source will create some variation in the voltage drop across a diode junction.

Performance Versus Integration Time – 50 Hz (60 Hz) Power-line Frequency

| Integration Time Number of Power line Cycles (NPLC) | Resolution ^[1] (ppm Range) | NMRR ^[2] (dB) | Readings/s ^[3] | | RMS Noise Adder ^[4] (% of Range) | | | |
|--|--|-----------------------------|---------------------------|-------|---|--|------------------------|---|
| | | | 50Hz | 60Hz | DCV 20V | DCV 2V 200V Resistance 2 k Ω | DCV 1000 V DCI 2 mA | DCV 200 mV Resistance 200 Ω DCI 10 A |
| 0.006 | 2.7 | 0 | 10000 | 10000 | 0.0006 | 0.0007 | 0.0015 | 0.0040 |
| 0.02 | 1.6 | 0 | 2500 | 3000 | 0.0004 | 0.0004 | 0.0008 | 0.0025 |
| 0.06 | 1 | 0 | 833 | 1000 | 0.0003 | 0.0003 | 0.0006 | 0.0025 |
| 0.2 | 0.5 | 0 | 250 | 300 | 0.0001 | 0.0002 | 0.0003 | 0.0015 |
| 1 | 0.22 | 60 | 50 | 60 | 0 | 0.0001 | 0.0002 | 0.0004 |
| 2 | 0.17 | 60 | 25 | 30 | 0 | 0 | 0.0001 | 0.0003 |
| 10 | 0.08 | 60 | 5 | 6 | 0 | 0 | 0 | 0.0002 |
| 100 | 0.035 | 60 | 0.5 | 0.6 | 0 | 0 | 0 | 0 |

[1] Typical value. Resolution is defined as the typical 20V range RMS noise (using auto zero "Once").

[2] Normal mode rejection ratio for power-line frequency \pm 0.1%. For power-line frequency \pm 1%, subtract 20 dB. For \pm 3%, subtract 30dB.

[3] Maximum rate for DCV, DCI, 2-wire resistance and 4-wire resistance functions.

[4] The basic DC accuracy specifications include RMS noise at 100 NPLC. For <100 NPLC, add "RMS Noise Adder" to the basic DC accuracy specifications.

SFDR & SINAD^[1]

| Function | Range | Spurious-Free Dynamic Range (SFDR) | Signal-to-Noise-and-Distortion (SINAD) |
|----------|-------------|------------------------------------|--|
| DCV | 200 mV | 81 | 76 |
| | 2 V | 79 | 78 |
| | 20 V | 79 | 75 |
| | 200 V | 83 | 80 |
| | 1000 V | 86 | 82 |
| DCI | 200 μ A | 89 | 69 |
| | 2 mA | 86 | 81 |
| | 20 mA | 88 | 69 |
| | 200 mA | 81 | 79 |
| | 2 A | 69 | 64 |

[1] Typical value. -1dBFS, 1kHz single tone. 100 μ s aperture time, zero trigger delay, auto zero off and 4096 samples.

Measuring Characteristics

| | |
|--|--|
| DC Voltage | |
| Input Resistance | 200 mV, 2 V, 20 V ranges: Selectable 10 M Ω or > 10 G Ω (For these ranges, input beyond \pm 26V are clamped through 106 k Ω (typical) 200 V and 1000 V ranges: 10 M Ω \pm 1% |
| Input Protection | 1000 V |
| Input Offset Current | 50 pA, at 25 $^{\circ}$ C, typical |
| CMRR (common mode rejection ratio) | 140 dB for 1 k Ω unbalance in LO lead, \pm 500 VDC peak maximum |
| Resistance | |
| Measurement Method | Selectable 4-wire or 2-wire resistance |
| Open-circuit Voltage | Current source referenced to LO input Limited to < 10V |
| Max. Lead Resistance (4-wire) | 10% of range per lead for 200 Ω , 2 k Ω ranges, 1 k Ω per lead on all other ranges |
| Input Protection | 1000 V on all ranges |
| Offset Compensation | Available on 200 Ω , 2k Ω and 20 k Ω ranges |
| DC Current | |
| Shunt Resistor | 100 Ω for 200 μ A, 2 mA 1 Ω for 20 mA, 200 mA 0.01 Ω for 2 A, 10 A |
| Input Protection | Externally accessible 250 mA, 250 V fast blow fuse at the rear panel for 200 μ A, 2 mA, 20 mA and 200 mA ranges. Internal 10 A, 250 V slow blow fuse for 2 A and 10 A ranges |
| Continuity/Diode Test | |
| Response Time | 300 samples/sec, with audible tone |
| Continuity Threshold | Adjustable from 1 Ω to 2000 Ω |
| Autozero OFF Operation (typical value) | |
| Following instrument warm-up at the environment temperature \pm 1 $^{\circ}$ C and <5 minutes, add 0.0001 % range + 2 μ V for DCV and 2 m Ω for resistance. | |
| Settling Time Considerations | |
| Reading settling times are affected by source impedance, cable dielectric characteristics and input signal changes. The default measurement delay is selected to give first reading right for most measurements. | |
| Measurement Considerations | |
| Telon or other high-impedance, low-dielectric absorption wire insulation is recommended for these measurements. | |

AC Characteristics

Accuracy Specifications: \pm (% of reading + % of range)^[1]

| Function | Range ^[2] | Frequency Range | 24 Hour ^[3] T _{cal} °C \pm 1°C | 90 Day T _{cal} °C \pm 5°C | 1 Year T _{cal} °C \pm 5°C | Temperature Coefficient 0°C to (T _{cal} °C - 5 °C) (T _{cal} °C + 5 °C) to 50 °C |
|------------------------------------|---------------------------|-----------------|---|---|---|---|
| True RMS AC Voltage ^[4] | 200.0000 mV | 3Hz - 5Hz | 1.00 + 0.03 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.004 |
| | | 5Hz - 10Hz | 0.35 + 0.03 | 0.35 + 0.04 | 0.35 + 0.04 | 0.035 + 0.004 |
| | | 10Hz - 20kHz | 0.04 + 0.03 | 0.05 + 0.04 | 0.06 + 0.04 | 0.005 + 0.004 |
| | | 20kHz - 50kHz | 0.10 + 0.05 | 0.11 + 0.05 | 0.12 + 0.05 | 0.011 + 0.005 |
| | | 50kHz - 100kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | | 100kHz - 300kHz | 4.00 + 0.50 | 4.00 + 0.50 | 4.00 + 0.50 | 0.20 + 0.02 |
| | 2.000000 V | 3Hz - 5Hz | 1.00 + 0.02 | 1.00 + 0.03 | 1.00 + 0.03 | 0.100 + 0.003 |
| | | 5Hz - 10 Hz | 0.35 + 0.02 | 0.35 + 0.03 | 0.35 + 0.03 | 0.035 + 0.003 |
| | | 10Hz - 20kHz | 0.04 + 0.02 | 0.05 + 0.03 | 0.06 + 0.03 | 0.005 + 0.003 |
| | | 20kHz - 50kHz | 0.10 + 0.04 | 0.11 + 0.05 | 0.12 + 0.05 | 0.011 + 0.005 |
| | | 50kHz - 100kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | | 100kHz - 300kHz | 4.00 + 0.50 | 4.00 + 0.50 | 4.00 + 0.50 | 0.20 + 0.02 |
| | 20.00000 V | 3Hz - 5Hz | 1.00 + 0.03 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.004 |
| | | 5Hz - 10Hz | 0.35 + 0.03 | 0.35 + 0.04 | 0.35 + 0.04 | 0.035 + 0.004 |
| | | 10Hz - 20kHz | 0.04 + 0.04 | 0.07 + 0.04 | 0.08 + 0.04 | 0.008 + 0.004 |
| | | 20kHz - 50kHz | 0.10 + 0.05 | 0.12 + 0.05 | 0.15 + 0.05 | 0.012 + 0.005 |
| | | 50kHz - 100kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | | 100kHz - 300kHz | 4.00 + 0.50 | 4.00 + 0.50 | 4.00 + 0.50 | 0.20 + 0.02 |
| | 200.0000 V | 3Hz - 5Hz | 1.00 + 0.02 | 1.00 + 0.03 | 1.00 + 0.03 | 0.100 + 0.003 |
| | | 5Hz - 10Hz | 0.35 + 0.02 | 0.35 + 0.03 | 0.35 + 0.03 | 0.035 + 0.003 |
| | | 10Hz - 20kHz | 0.04 + 0.02 | 0.07 + 0.03 | 0.08 + 0.03 | 0.008 + 0.003 |
| | | 20kHz - 50kHz | 0.10 + 0.04 | 0.12 + 0.05 | 0.15 + 0.05 | 0.012 + 0.005 |
| | | 50kHz - 100kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | | 100kHz - 300kHz | 4.0 + 0.50 | 4.0 + 0.50 | 4.0 + 0.50 | 0.20 + 0.02 |
| 750.000 V ^[5] | 3Hz - 5Hz | 1.00 + 0.02 | 1.00 + 0.03 | 1.00 + 0.03 | 0.100 + 0.003 | |
| | 5Hz - 10Hz | 0.35 + 0.02 | 0.35 + 0.03 | 0.35 + 0.03 | 0.035 + 0.003 | |
| | 10Hz - 20kHz | 0.04 + 0.02 | 0.07 + 0.03 | 0.08 + 0.03 | 0.008 + 0.003 | |
| | 20kHz - 50kHz | 0.10 + 0.04 | 0.12 + 0.05 | 0.15 + 0.05 | 0.012 + 0.005 | |
| | 50kHz - 100kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 | |
| | 100kHz - 300kHz | 4.0 + 0.50 | 4.0 + 0.50 | 4.0 + 0.50 | 0.20 + 0.02 | |
| True RMS AC Current ^[6] | 200.0000 uA | 3Hz - 5Hz | 1.10 + 0.06 | 1.10 + 0.06 | 1.10 + 0.06 | 0.200 + 0.006 |
| | | 5Hz - 10Hz | 0.35 + 0.06 | 0.35 + 0.06 | 0.35 + 0.06 | 0.100 + 0.006 |
| | | 10Hz - 5kHz | 0.15 + 0.06 | 0.15 + 0.06 | 0.15 + 0.06 | 0.015 + 0.006 |
| | | 5kHz - 10kHz | 0.35 + 0.70 | 0.35 + 0.70 | 0.35 + 0.70 | 0.030 + 0.006 |
| | 2.000000 mA | 3Hz - 5Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |
| | | 5Hz - 10Hz | 0.30 + 0.04 | 0.30 + 0.04 | 0.30 + 0.04 | 0.035 + 0.006 |
| | | 10Hz - 5kHz | 0.12 + 0.04 | 0.12 + 0.04 | 0.12 + 0.04 | 0.015 + 0.006 |
| | | 5kHz - 10kHz | 0.20 + 0.25 | 0.20 + 0.25 | 0.20 + 0.25 | 0.030 + 0.006 |
| | 20.00000 mA | 3Hz - 5Hz | 1.10 + 0.06 | 1.10 + 0.06 | 1.10 + 0.06 | 0.200 + 0.006 |
| | | 5Hz - 10Hz | 0.35 + 0.06 | 0.35 + 0.06 | 0.35 + 0.06 | 0.100 + 0.006 |
| | | 10Hz - 5kHz | 0.15 + 0.06 | 0.15 + 0.06 | 0.15 + 0.06 | 0.015 + 0.006 |
| | | 5kHz - 10kHz | 0.35 + 0.70 | 0.35 + 0.70 | 0.35 + 0.70 | 0.030 + 0.006 |
| | 200.0000 mA | 3Hz - 5Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |
| | | 5Hz - 10Hz | 0.30 + 0.04 | 0.30 + 0.04 | 0.30 + 0.04 | 0.035 + 0.006 |
| | | 10Hz - 5kHz | 0.10 + 0.04 | 0.10 + 0.04 | 0.10 + 0.04 | 0.015 + 0.006 |
| | | 5kHz - 10kHz | 0.20 + 0.25 | 0.20 + 0.25 | 0.20 + 0.25 | 0.030 + 0.006 |
| | 2.000000 A | 3Hz - 5Hz | 1.10 + 0.06 | 1.10 + 0.06 | 1.10 + 0.06 | 0.100 + 0.006 |
| | | 5Hz - 10Hz | 0.35 + 0.06 | 0.35 + 0.06 | 0.35 + 0.06 | 0.035 + 0.006 |
| | | 10Hz - 5kHz | 0.15 + 0.06 | 0.15 + 0.06 | 0.15 + 0.06 | 0.015 + 0.006 |
| | | 5kHz - 10kHz | 0.35 + 0.70 | 0.35 + 0.70 | 0.35 + 0.70 | 0.030 + 0.006 |
| | 10.00000 A ^[6] | 3Hz - 5Hz | 1.10 + 0.08 | 1.10 + 0.10 | 1.10 + 0.10 | 0.100 + 0.008 |
| | | 5Hz - 10Hz | 0.35 + 0.08 | 0.35 + 0.10 | 0.35 + 0.10 | 0.035 + 0.008 |
| | | 10Hz - 5kHz | 0.15 + 0.08 | 0.15 + 0.10 | 0.15 + 0.10 | 0.015 + 0.008 |

| Additional Low Frequency Errors (% of reading) | | | | Additional Crest Factor Errors (non-sinewave) [7] | |
|--|-----------|--------|------|---|----------------------|
| Frequency | AC Filter | | | Crest Factor | Error (% of reading) |
| | Slow | Medium | Fast | | |
| 10Hz - 20Hz | 0 | 0.74 | – | 1 - 2 | 0.05 |
| 20Hz - 40Hz | 0 | 0.22 | – | 2 - 3 | 0.2 |
| 40Hz - 100Hz | 0 | 0.06 | 0.73 | 3 - 4 | 0.4 |
| 100Hz - 200Hz | 0 | 0.01 | 0.22 | 4 - 5 | 0.5 |
| 200Hz - 1kHz | 0 | 0 | 0.18 | | |
| >1kHz | 0 | 0 | 0 | | |

[1] Specifications are for 90-minute warm-up, slow ac filter and sinewave input.

[2] 10% overrange on all ranges except ACV 750 V and ACI 10 A ranges.

[3] Relative to calibration standards.

[4] Specifications are for sinewave input >5% of range. For inputs within 1% and 5% of range and <50 kHz, add 0.1% of range additional error. For 50kHz to 100kHz, add 0.13% of range additional error.

[5] ACV 750 range limited to 8x10⁷ Volt-Hz. For input over 300V rms, add 0.7mV error for each additional volt.

[6] For continuous current > DC 7A or AC RMS 7A, 30 seconds ON and 30 seconds OFF.

[7] For frequency below 100 Hz, the specification of slow filter is only for sinewave input.

[8] Specifications are for sinewave input >5% of range. For inputs within 1% to 5% of range, add 0.1% of range additional error. Specifications are typical values for 200uA and 2mA, 2A and 10A ranges when frequency >1kHz.

Measuring Characteristics

| | |
|------------------------------------|--|
| True RMS AC Voltage | |
| Measurement Method | AC-coupled True-RMS measurement with up to 400 V DC of bias at on any range. |
| Crest Factor | ≤ 5 at full range |
| Input Impedance | 1MΩ ± 2% in parallel with <150pF capacitance on any range |
| Input Protection | 750V rms on all ranges |
| AC Filter Bandwidth | Slow: 3 Hz - 300 kHz Medium: 20Hz - 300kHz Fast: 200 Hz - 300 kHz |
| CMRR (common mode rejection ratio) | 70 dB, for the 1 kΩ unbalance in LO lead, < 60 Hz, ± 500 VDC peak maximum |
| True RMS AC Current | |
| Measurement Method | Direct coupled to the fuse and shunt; AC-coupled True RMS measurement (measure the AC component only). |
| Crest Factor | ≤ 3 at full range |
| Max. Input | DC + AC current peak value < 300% of range. The RMS current < 10 A rms including the DC component. |
| Shunt Resistor | 100Ω for 200uA, 2mA 1Ω for 20mA, 200mA 0.01Ω for 2A, 10A |
| Input Protection | Externally accessible 250mA, 250V fast blow fuse at the rear panel for 200uA, 2mA, 20mA and 200mA ranges. Internal 10A, 250 V slow blow fuse for 2A and 10A ranges. |

Settling Time Considerations

The default measurement delay is selected to give first reading right for most measurements. Make sure the RC circuit of input terminal has been fully settled (about 1s) before accurate measurement.

Applying > 300 Vrms (or > 5Arms) will cause self-heating in signal-conditioning components and these error are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be lower than 0.02% of reading and will generally dissipate within a few minutes.

Frequency and Period Characteristics

Accuracy Specifications: ±(% of reading)^{[1][2]}

| Function | Range | Frequency Range | 24 Hour ^[3] T _{CAL} °C±1°C | 90 Day T _{CAL} °C±5°C | 1 Year T _{CAL} °C±5°C | Temperature Coefficient 0°C to (T _{CAL} °C-5°C) (T _{CAL} °C+5°C) to 50°C |
|-------------------|--------------------|-----------------|---|-----------------------------------|-----------------------------------|--|
| Frequency, Period | 200 mV to 750 V | 3 Hz - 5 Hz | 0.07 | 0.07 | 0.07 | 0.005 |
| | | 5 Hz - 10 Hz | 0.04 | 0.04 | 0.04 | 0.005 |
| | | 10 Hz - 40 Hz | 0.02 | 0.02 | 0.02 | 0.001 |
| | | 40 Hz - 300 kHz | 0.005 | 0.006 | 0.007 | 0.001 |
| | | 300 kHz - 1 MHz | 0.005 | 0.006 | 0.007 | 0.001 |

Additional Low Frequency Errors: (% of reading)

| Frequency | Gate Time (Resolution) | | | |
|--------------|------------------------|--------------|----------------|------------------|
| | 1 s (0.1ppm) | 0.1 s (1ppm) | 0.01 s (10ppm) | 0.001 s (100ppm) |
| 3 Hz-5Hz | 0 | 0.12 | 0.12 | 0.12 |
| 5 Hz-10Hz | 0 | 0.17 | 0.17 | 0.17 |
| 10 Hz-40Hz | 0 | 0.20 | 0.20 | 0.20 |
| 40 Hz-100Hz | 0 | 0.06 | 0.21 | 0.21 |
| 100 Hz-300Hz | 0 | 0.03 | 0.21 | 0.21 |
| 300 Hz-1 kHz | 0 | 0.01 | 0.07 | 0.07 |
| >1kHz | 0 | 0 | 0.02 | 0.02 |

[1] Specifications are for 90 minutes warm-up, using 1s gate time.

[2] For frequency ≤ 300 kHz, the specification is the 10% to 110% of range of the AC input voltage. For frequency > 300 kHz, the specification is the 20% to 110% of range of the AC input voltage. The maximum input is limited to 750V rms or 8 × 10⁷ Volts-Hz (whichever is less). 200 mV range is full range input or input that is larger than the full range. For 20mV to 200mV, multiply % of reading error ×10.

[3] Relative to calibration standards.

Measuring Characteristics

| | |
|--|--|
| Frequency and Period | |
| Measurement Method | Reciprocal-counting technique, AC-coupled input using the AC voltage function. |
| Input Impedance | 1 MΩ ± 2% in parallel with < 150 pF capacitance on any range |
| Input Protection | 750 V rms on all ranges |
| Measurement Considerations | |
| All frequency counters are susceptible to error when measuring low-voltage, low-frequency signals. Shielding inputs from external noise pickup is critical for minimizing measurement errors. | |
| Settling Time Considerations | |
| Errors will occur when attempting to measure the frequency or period of an input following a dc offset voltage change. Make sure the RC circuit of input terminal has been fully settled (about 1s) before accurate measurement. | |

Capacitance Characteristics

Accuracy Specifications: ± (% of reading + % of range)^{[1][2]}

| Function | Range ^[2] | Test Current | 1 Year | Temperature Coefficient |
|-------------|----------------------|--------------|-------------------------------------|--|
| Capacitance | 2.000nF | 200nA | $T_{CAL} \pm 5^{\circ}C$ 2 + 2.5 | 0°C to ($T_{CAL} \pm 5^{\circ}C$) ($T_{CAL} \pm 5^{\circ}C$) to 50°C |
| | 20.00nF | 2uA | 1 + 0.3 | 0.05+0.01 |
| | 200.0nF | 10uA | 1 + 0.3 | 0.01+0.01 |
| | 2.000uF | 100uA | 1 + 0.3 | 0.01+0.01 |
| | 20.00uF | 1mA | 1 + 0.3 | 0.01+0.01 |
| | 200.0uF | 1mA | 1 + 0.3 | 0.01+0.01 |
| | 2.000mF | 1mA | 1 + 0.3 | 0.01+0.01 |
| | 20.00mF | 1mA | 1 + 0.3 | 0.01+0.01 |
| | 100.0mF | 1mA | 3 + 0.2 | 0.05+0.02 |

[1] Specifications are for 90 minutes warm-up and using REL operation. Additional errors may be caused by non-film capacitors.

[2] Specifications are the 1% to 110% of range on 2nF range and 10% to 110% of range on all other ranges.

Measuring Characteristics

| | |
|--|---|
| Capacitance Measurement | |
| Measurement Method | Apply constant current into the capacitance, and measure the voltage changing rate. |
| Connection Type | 2-wire |
| Measurement Considerations | |
| Since small capacitance measurements are susceptible to the external noise, shielding inputs from external noise pickup is critical for minimizing measurement errors. | |

Temperature Characteristics

Accuracy Specifications^[1]

| Function | Probe Type | Type | Optimum Range | 1 Year | Temperature Coefficient |
|-------------|--|-----------------------------|--------------------|------------------------------------|---|
| Temperature | RTD ^[2] (R0 is within 49 Ω and 2.1 kΩ) | $\alpha = 0.00385$ | -200°C to 660°C | $T_{CAL} \pm 5^{\circ}C$ 0.16°C | 0°C to ($T_{CAL} \pm 5^{\circ}C$) ($T_{CAL} \pm 5^{\circ}C$) to 50°C |
| | | $\alpha = 0.00389$ | -200°C to 660°C | 0.17°C | 0.01°C |
| | | $\alpha = 0.00391$ | -200°C to 660°C | 0.14°C | 0.01°C |
| | | $\alpha = 0.00392$ | -200°C to 660°C | 0.15°C | 0.01°C |
| | | Thermal Resistance | 2.2 kΩ | -40°C to 150°C | 0.08°C |
| | | 3 kΩ | -40°C to 150°C | 0.08°C | 0.002°C |
| | | 5 kΩ | -40°C to 150°C | 0.08°C | 0.002°C |
| | | 10 kΩ | -40°C to 150°C | 0.08°C | 0.002°C |
| | | 30 kΩ | -40°C to 150°C | 0.08°C | 0.002°C |
| | | Thermocouple ^[3] | B | 0°C to 1820°C | 0.76°C |
| | | E | -270°C to 1000°C | 0.5°C | 0.02°C |
| | | J | -210°C to 1200°C | 0.5°C | 0.02°C |
| | | K | -270°C to 1372°C | 0.5°C | 0.03°C |
| | | N | -270°C to 1300°C | 0.5°C | 0.04°C |
| | | R | -270°C to 1768.1°C | 0.5°C | 0.09°C |
| | | S | -270°C to 1768.1°C | 0.6°C | 0.11°C |
| | | T | -270°C to 400°C | 0.5°C | 0.03°C |

[1] Specifications are for 90 minutes warm-up. Exclusive of sensor error.

[2] Specification is for 4WR sensor measurement or 2WR measurement using REL operation.

[3] Relative to cold junction temperature, accuracy is based on ITS-90. Built-in cold junction temperature refers to the temperature inside the banana jack and its accuracy is ± 2.5°C.

Measuring Characteristics

| | |
|---|--|
| Measurement Considerations | |
| The built-in cold junction temperature tracks the temperature inside the banana jack. The change of the temperature in banana jack might cause additional error. When using the built-in cold junction compensation, connect the sensor terminal of the thermocouple to the banana jack and warm it up for more than 3 minutes to minimize the error. | |

Measurement Rate

| Function | Setting | Integration Time | Readings/s 50Hz (60Hz) |
|-------------------------------------|-----------------------------|-------------------|------------------------|
| DC Voltage | 0.006 NPLC Integration Time | 100 (100) μ s | 10000 (10000) |
| DC Current | 0.02 NPLC | 400 (333) μ s | 2500 (3000) |
| 2 - wire Resistance | 0.06 NPLC | 1.2 (1) ms | 833 (1000) |
| 4 - wire Resistance | 0.2 NPLC | 4 (3.33) ms | 250 (300) |
| | 1 NPLC | 20 (16.7) ms | 50 (60) |
| | 2 NPLC | 40 (33.3) ms | 25 (30) |
| | 10 NPLC | 200 (167) ms | 5 (6) |
| | 100 NPLC | 2 (1.67) s | 0.5 (0.6) |
| AC Voltage | 3 Hz AC Filter | | 0.2 |
| AC Current ^[2] | 20 Hz | | 1.5 |
| | 200 Hz | | 10 |
| | 200 Hz | | 50 ^[3] |
| Frequency and Period ^[4] | 1 s Gate Time | | 1 |
| | 0.1 s | | 10 |
| | 0.01 s | | 80 |
| | 0.001 s | | 500 |
| Capacitance ^[5] | | | 25 |

[1] Auto trigger, zero trigger delay, auto zero off, auto range off, math function off and external interface off.

[2] Use the default trigger delay setting.

[3] The maximum rate available when trigger delay is set to 0.

[4] 20 V range, fast filter, 1kHz input.

[5] Measure 20 nF capacitance on 200 nF range. The measurement period changes with the capacitance under test. The maximum measurement period on 100mF is 4 s (typical value).

Other Measurement Characteristics

| Triggering and Storage | |
|---------------------------------|---|
| Trigger | Pre-trigger or Pos-trigger, Internal Trigger or External Trigger, Rising Edge Trigger or Falling Edge Trigger |
| Time Base Resolution | 33.333 μ s, 0.01% Accuracy |
| Trigger Delay | 0 to 3600 s available (about 33 μ s step size) |
| Sample Timer | 0 to 3600 s available (about 33 μ s step size) |
| Internal Trigger Level Accuracy | \pm 1% of range |
| Reading Hold Sensitivity | 0.01%, 0.1%, 1% or 10% of reading |
| Single Trigger Samples | 1 to 50000 |
| External Trigger Input | Level: 5 V TTL compatible Impedance: > 30 k Ω in parallel with 500 pF Delay: < 50 μ s Jitter: < 50 μ s (ACV, ACI, FREQ and PREIOD < 2ms) Polarity: selectable rising edge or falling edge Maximum Rate: 300/s Minimum Pulse Width: 2 μ s |
| VMC Output | Level: 5 V TTL compatible Output Impedance: 100 Ω , typical Output Polarity: Falling Edge Pulse Width: about 2 μ s |
| History Record and Storage | |
| RAM | 512 k reading history data record |
| Non-volatile Memory | 10 sets history data storage (5000 readings/group) 5 sets sensor data storage (5000 readings/group) 10 sets instrument setup storage 5 sets Anysensor setup storage Support USB flash device backup data and setting. |

General Specifications

| | |
|----------------------|--|
| Display | 256 × 64 LCD, dual display, graphical menu, selectable Chinese or English, online help. |
| Power Supply | AC 100 V - 120 V, 45 Hz - 440 Hz AC 200 V - 240 V, 45 Hz - 66 Hz Detect the power-line frequency automatically at power-on, 400Hz defaults to 50Hz |
| Power Consumption | 25 VA Max |
| Working Environment | Full accuracy for 0 °C to 50 °C Full accuracy to 40 °C, 80% R.H., Non-coagulation |
| Storage Temperature | - 40 °C to 70 °C |
| Operation Altitude | Up to 2000 m |
| Safety | IEC 61010-1; EN 61010-1; UL 61010-1; CAN/CSA-C22.2 No. 61010-1 Measurement CAT I 1000 V/CAT II 300 V Pollution Degree 2 |
| EMC | EN 61326-1 |
| Weight | About 3.2 kg (without package) |
| Dimension | (height × width × length): 107.0mm × 231.6mm × 290.5mm |
| Remote Interface | GPIB, 10/100 Mbit LAN, USB 2.0 Full Speed Device & Host (support USB flash device), RS-232C |
| Programming Language | SCPI |
| LXI Compatibility | LXI Class C, Version 1.2 |
| Warm-up Time | 90 minutes |