

## KEITHLEY

# DMM7510

The Keithley DMM7510 is a premium 7½-digit graphical sampling digital multimeter that integrates a high-accuracy instrument with a high-speed 18-bit digitizer and a 5-inch capacitive touchscreen display. Designed for precision laboratory measurements and rapid transient waveform analysis, it represents the state of the art in high-performance test instrumentation.

## SPECIFICATIONS

### General

|                                  |                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------|
| Interfaces                       | GPIB, LAN (LXI Core), USB Device (Type B), USB Host (Type A), Digital I/O (TSP-Link) |
| Display                          | 5-inch color TFT touchscreen with WVGA (800 × 480) resolution                        |
| Real-Time Clock                  | Yes, with battery backup                                                             |
| Front/Rear Input Selector Switch | Manual front-panel toggle                                                            |

### Physical

|                       |                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------|
| Power Supply          | 100 V to 240 V AC ±10%, 50 Hz/60 Hz/400 Hz (auto-sensing), 55 VA maximum                                     |
| Operating Temperature | 0 °C to 50 °C °C                                                                                             |
| Dimensions (W×H×D)    | 224 mm × 106 mm × 410 mm (with bumpers and handle) / 213 mm × 88 mm × 360 mm (without bumpers and handle) mm |
| Weight                | 4.08 kg (without bumpers) / 4.36 kg (with bumpers) kg                                                        |

### DC Voltage Specifications

|                                             |                                                                |
|---------------------------------------------|----------------------------------------------------------------|
| DCV Measurement Ranges                      | 100 mV, 1 V, 10 V, 100 V, 1000 V                               |
| DCV Best Resolution                         | 10 nV                                                          |
| DCV Input Impedance (100mV to 10V)          | >10 GΩ or 10 MΩ selectable                                     |
| DCV Input Impedance (100V to 1000V)         | 10 MΩ ±1%                                                      |
| DCV Accuracy (90-Day, 10 V range)           | ±(11 ppm of reading + 1.5 ppm of range)                        |
| DCV Accuracy (1-Year, 10 V range)           | ±(14 ppm of reading + 1.5 ppm of range)                        |
| DCV Temp Coefficient (0°C–18°C & 28°C–50°C) | ±(0.15 ppm of reading + 0.08 ppm of range) per °C (10 V range) |
| Common Mode Rejection Ratio (CMRR)          | 140 dB (DC, 50 Hz/60 Hz, 1 kΩ unbalance in LO lead)            |
| Normal Mode Rejection Ratio (NMRR)          | 60 dB (at 50 Hz/60 Hz, with line sync enabled)                 |

## AC Voltage Specifications

|                                         |                                                            |
|-----------------------------------------|------------------------------------------------------------|
| ACV Measurement Ranges                  | 100 mV, 1 V, 10 V, 100 V, 700 V                            |
| ACV Best Resolution                     | 100 nV                                                     |
| ACV Frequency Range                     | 3 Hz to 300 kHz                                            |
| ACV Accuracy (1-Year, 10 Hz - 20 kHz)   | $\pm(0.06\%$ of reading + 0.01% of range)                  |
| ACV Accuracy (1-Year, 20 kHz - 100 kHz) | $\pm(0.12\%$ of reading + 0.05% of range) on 10 V range    |
| ACV Input Impedance                     | 1 M $\Omega$ $\pm 1\%$ in parallel with <100 pF            |
| ACV Maximum Crest Factor                | 5 at full scale                                            |
| AC Common Mode Rejection Ratio          | 70 dB (for 50 Hz/60 Hz, 1 k $\Omega$ unbalance in LO lead) |

## DC Current Specifications

|                                    |                                                              |
|------------------------------------|--------------------------------------------------------------|
| DCI Measurement Ranges             | 10 $\mu$ A, 100 $\mu$ A, 1 mA, 10 mA, 100 mA, 1 A, 3 A, 10 A |
| DCI Best Resolution                | 1 pA                                                         |
| DCI Accuracy (90-Day, 10 mA range) | $\pm(100$ ppm of reading + 20 ppm of range)                  |
| DCI Accuracy (1-Year, 10 mA range) | $\pm(150$ ppm of reading + 25 ppm of range)                  |
| DCI Max Burden Voltage (1 A)       | <300 mV                                                      |
| DCI Max Burden Voltage (3 A)       | <1.5 V                                                       |
| DCI Max Burden Voltage (10 A)      | <0.5 V                                                       |

## AC Current Specifications

|                                       |                                                           |
|---------------------------------------|-----------------------------------------------------------|
| ACI Measurement Ranges                | 105 mA, 10 mA, 100 mA, 1 A, 3 A                           |
| ACI Best Resolution                   | 1 nA                                                      |
| ACI Frequency Range                   | 3 Hz to 10 kHz                                            |
| ACI Accuracy (1-Year, 10 Hz - 10 kHz) | $\pm(0.10\%$ of reading + 0.04% of range) on 100 mA range |

## Resistance Specifications

|                                                   |                                                                                                                                           |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Resistance Measurement Ranges                     | 10 $\Omega$ , 100 $\Omega$ , 1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$ , 1 M $\Omega$ , 10 M $\Omega$ , 100 M $\Omega$ , 1 G $\Omega$ |
| Resistance Best Resolution                        | 1 $\mu\Omega$                                                                                                                             |
| Resistance Accuracy (1-Year, 10 k $\Omega$ range) | $\pm(24$ ppm of reading + 3 ppm of range)                                                                                                 |
| Maximum Test Current                              | 10 mA                                                                                                                                     |
| Offset Compensation                               | Selectable on 10 $\Omega$ to 100 k $\Omega$ ranges                                                                                        |
| Dry Circuit Mode Support                          | Yes (20 mV clamp, available on 100 $\Omega$ , 1 k $\Omega$ , and 10 k $\Omega$ ranges)                                                    |

## Digitizer Specifications

|                         |                                                                       |
|-------------------------|-----------------------------------------------------------------------|
| Digitizer Resolution    | 18-bit                                                                |
| Maximum Sampling Rate   | 1 MS/s                                                                |
| Analog Bandwidth (-3dB) | 1 MHz                                                                 |
| Aperture Range          | 1 $\mu$ s to 1 s                                                      |
| Digitizer Memory        | Up to 27.5 million readings (compact), 11 million readings (standard) |

## Temperature Measurements

|                              |                                                    |
|------------------------------|----------------------------------------------------|
| Supported RTD Types          | PT100, D100, F100, PT385, PT3916, and user-defined |
| Supported Thermocouple Types | J, K, T, E, R, S, B, N                             |
| Supported Thermistor Types   | 2.2 k $\Omega$ , 5 k $\Omega$ , and 10 k $\Omega$  |

## Triggering and Synchronization

|                               |                                                                                         |
|-------------------------------|-----------------------------------------------------------------------------------------|
| Trigger Sources               | Hardware, Software (Bus), Timer, Analog Threshold, External Trigger, TSP-Link           |
| External Trigger Input Level  | TTL compatible (nominal 0 V to 5 V, $V_{il} < 0.8$ V, $V_{ih} > 2.0$ V)                 |
| External Trigger Output Level | TTL compatible                                                                          |
| Digital I/O Ports             | 6 dual-purpose digital I/O lines (input or output, with programmable limit comparisons) |

## System and Interface Specifications

|                                      |                                                                                  |
|--------------------------------------|----------------------------------------------------------------------------------|
| LXI Compliance Version               | LXI version 1.4 Core 2011                                                        |
| Programming Languages / Command Sets | SCPI, TSP (Test Script Processor), Keithley 2001 emulation                       |
| Internal Reading Buffer Capacity     | Up to 27.5 million readings (compact), 11 million readings (standard)            |
| USB Host Port Functionality          | Saves screen captures, instrument settings, and reading data to USB flash drives |

## Math and Analytics Functions

|                             |                                                                             |
|-----------------------------|-----------------------------------------------------------------------------|
| Built-in Math Operations    | mX+b, Percent, Reciprocal (1/X), Ratio, Delta                               |
| Graphing and Trend Plotting | Waveform display, swipe-to-zoom, trend charts, histogram                    |
| Limit Testing Configuration | Dual limits with high/low pass/fail indication and digital I/O port mapping |

## Power and Environmental Specifications

|                            |                                                            |
|----------------------------|------------------------------------------------------------|
| Line Voltage Input Ranges  | 100 V / 120 V / 220 V / 240 V AC $\pm 10\%$ (auto-sensing) |
| Line Frequency Range       | 50 Hz, 60 Hz, and 400 Hz (auto-sensing)                    |
| Maximum Power Consumption  | 55 VA                                                      |
| Maximum Operating Altitude | 2000 meters                                                |
| Relative Humidity Limits   | Up to 80% R.H. @ 35°C, non-condensing                      |
| Warm-up Time               | 90 minutes                                                 |

## Physical and Safety Specifications

|                                               |                                                      |
|-----------------------------------------------|------------------------------------------------------|
| Safety Compliance Certifications              | UL 61010-1, CAN/CSA-C22.2 No. 61010-1, EN 61010-1    |
| Electromagnetic Compatibility (EMC) Standards | Conforms to European Union EMC Directive, EN 61326-1 |
| Warranty Period                               | 3 years                                              |

## Capacitance

|                                |                                 |
|--------------------------------|---------------------------------|
| Capacitance Measurement Ranges | Not supported                   |
| Capacitance Best Resolution    | 0.1 pF                          |
| Capacitance Accuracy (1-Year)  | 0.5% of reading + 0.5% of range |

## Frequency & Period

|                             |                     |
|-----------------------------|---------------------|
| Frequency Measurement Range | 3 Hz to 1 MHz       |
| Period Measurement Range    | 333 ms to 1 $\mu$ s |
| Frequency Accuracy (1-Year) | 0.01% of reading    |

## Diode & Continuity

|                            |                               |
|----------------------------|-------------------------------|
| Diode Test Voltage Range   | 10 V                          |
| Diode Test Current Options | 10 $\mu$ A, 100 $\mu$ A, 1 mA |
| Continuity Threshold Range | 1 $\Omega$ to 1000 $\Omega$   |

## Temperature Measurement

|                                            |                                             |
|--------------------------------------------|---------------------------------------------|
| RTD Temperature Measurement Range          | -200 °C to +850 °C                          |
| Thermocouple Temperature Measurement Range | -200 °C to +1820 °C (sensor type dependent) |
| Thermistor Temperature Measurement Range   | -80 °C to +150 °C                           |

## Digitizer

|                          |                                                              |
|--------------------------|--------------------------------------------------------------|
| Digitizer Voltage Ranges | 100 mV, 1 V, 10 V, 100 V, 1000 V                             |
| Digitizer Current Ranges | 10 $\mu$ A, 100 $\mu$ A, 1 mA, 10 mA, 100 mA, 1 A, 3 A, 10 A |

## Input Protection & Safety

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| Maximum Common Mode Voltage       | 500 V peak (LO to chassis ground) |
| Voltage Input Overload Protection | 1000 V peak (continuous)          |
| Current Input Protection          | 11 A, 1000 V fast-acting fuse     |

## Resolution & Display

|                        |                         |
|------------------------|-------------------------|
| Digits of Resolution   | 3.5 to 7.5 digits       |
| Display Resolution     | 800 $\times$ 480 pixels |
| Touchscreen Technology | Capacitive multi-touch  |

## DC Voltage

|                        |                |
|------------------------|----------------|
| DCV Input Bias Current | < 30 pA @ 23°C |
|------------------------|----------------|

## Protection

|                                          |                                             |
|------------------------------------------|---------------------------------------------|
| Sense HI to Sense LO Overload Protection | 200 V peak                                  |
| Sense LO to Input LO Overload Protection | 150 V peak                                  |
| Front Current Input Fuse                 | 3 A, 1000 V (fast-acting, user-replaceable) |
| Rear Current Input Fuse                  | 11 A, 1000 V (fast-acting)                  |

Measurement Speed

|                                   |                                                         |
|-----------------------------------|---------------------------------------------------------|
| NPLC Range                        | 0.0005 to 12 PLC (@ 60 Hz) / 0.0005 to 15 PLC (@ 50 Hz) |
| Maximum Reading Rate (4.5 Digits) | 26,100 rdgs/s (at 0.0005 PLC to memory)                 |
| Maximum Reading Rate (7.5 Digits) | 60 rdgs/s (at 1 PLC @ 60 Hz to memory)                  |

Connectivity & Integration

|                  |     |
|------------------|-----|
| TSP-Link Support | Yes |
|------------------|-----|

Environmental

|                            |                               |
|----------------------------|-------------------------------|
| Chassis Vibration Standard | MIL-PRF-28800F Class 3 Random |
|----------------------------|-------------------------------|

TECHNOLOGY

Solid State Analog-to-Digital Conversion with Multi-slope and SAR Architectures

APPLICATIONS

Precision DC/AC metrology, high-speed transient analysis, components testing, and automated system integration

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