

EDU34450A 5½-Digit Dual-Display Digital Multimeter



EDU34450A Provides Industry-Grade Measurement Capabilities

The Keysight EDU34450A is a modern digital multimeter (DMM) designed for bench applications. It measures a broad range of input signals. It features 5½ digits of resolution and up to 110 readings/s measuring rate for speed-critical tests. It includes generous internal memory, allowing prolonged data logging of up to 5,000 data points.

With the EDU34450A, you get the benefits of Keysight measurement performance in a low-cost, compact package.

Combination of hard and soft keys for more intuitive front-panel operation

For easy access to the most frequently used measurement functions, the EDU34450A retains all the function keys found on a traditional DMM. The function key lights up when pressed to provide a clear indication of the parameter you are measuring. The intuitive soft keys allow more advanced configuration when the need arises. Combining these hard and soft keys allows you to quickly set up and begin your measuring tasks without a steep learning curve.

Standard connectivity to the PC

The DMM has built-in gigabit LAN and USB. The remote connectivity allows you to connect to the PathWave BenchVue DMM software for more advanced data logging and export logged data. You can also use the software to retrieve the data saved in the non-volatile memory. Software drivers are available if you prefer to write your own program, with SCPI commands to control the DMM and automate your test.

Signature 7-inch dual-measurement color display

The EDU34450A comes with a 7-inch, dual-measurement color display. With this innovation, you can view your measurement setup, instrument status, reading, and statistics all at once, without flipping through several screens.

It features a secondary display where you can view primary and secondary components of your input signal at the same time to help you better understand your device under test.

With the large display, you can set up data logging and view the logged data easily.

USB flash drive adds convenience

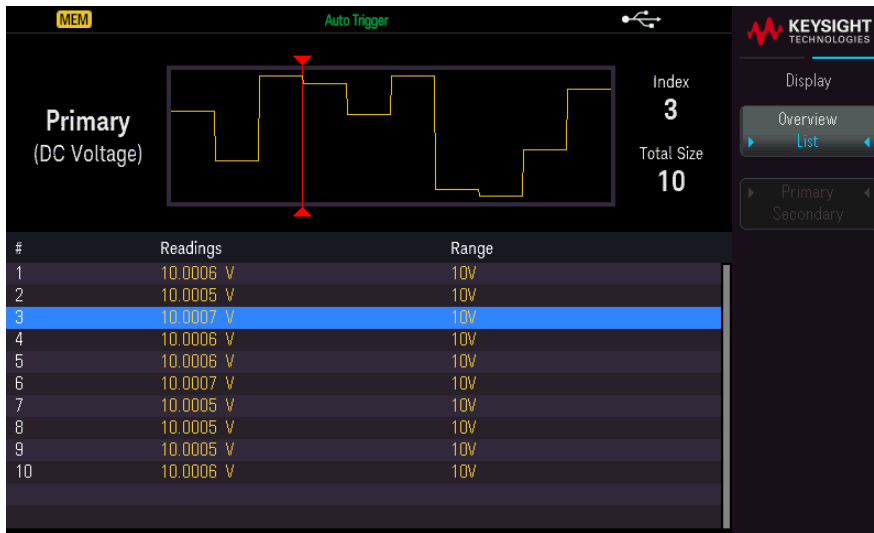
The EDU34450A also features a built-in USB memory port, so you can use a USB flash drive to store your DMM setup. This feature will help you install the same setup in all the DMMs in your lab.

Robust design

We know you can't afford instrument downtime caused by hardware failures and unscheduled maintenance. That's why our engineers designed reliability into the EDU34450A: a rugged enclosure; state-of-the-art, surface-mount construction throughout; reduced part counts; and rigorous and thorough testing of all aspects of the product.

Key features

- Measures 11 input signals:
 - DC voltage, DC current, true RMS AC voltage, AC Current, two- and four-wire resistance, frequency, continuity, diode test, temperature, and capacitance
- Signature 7-inch dual-measurement color display
- Fast reading rate of up to 110 readings/s for speed-critical measurements
- 5,000 points logging memory for recording more data and perform analysis
- Standard USB and LAN for flexible PC connectivity
- USB flash drive support to copy / load configuration for repeated test setup
- Includes PathWave BenchVue DMM software for remote control and data logging



Simplify Data Gathering and Analysis with PathWave BenchVue DMM Software

PathWave BenchVue software for the PC makes it simple to connect, control, capture, and view Keysight DMMs with no additional programming.

- Easily log data, screenshots, and system state. Rapidly prototype custom test sequences.
- Recall the past state of your bench to replicate results.
- Quickly export measurement data in the desired format.
- Quickly access manuals, drivers, FAQs, and videos.

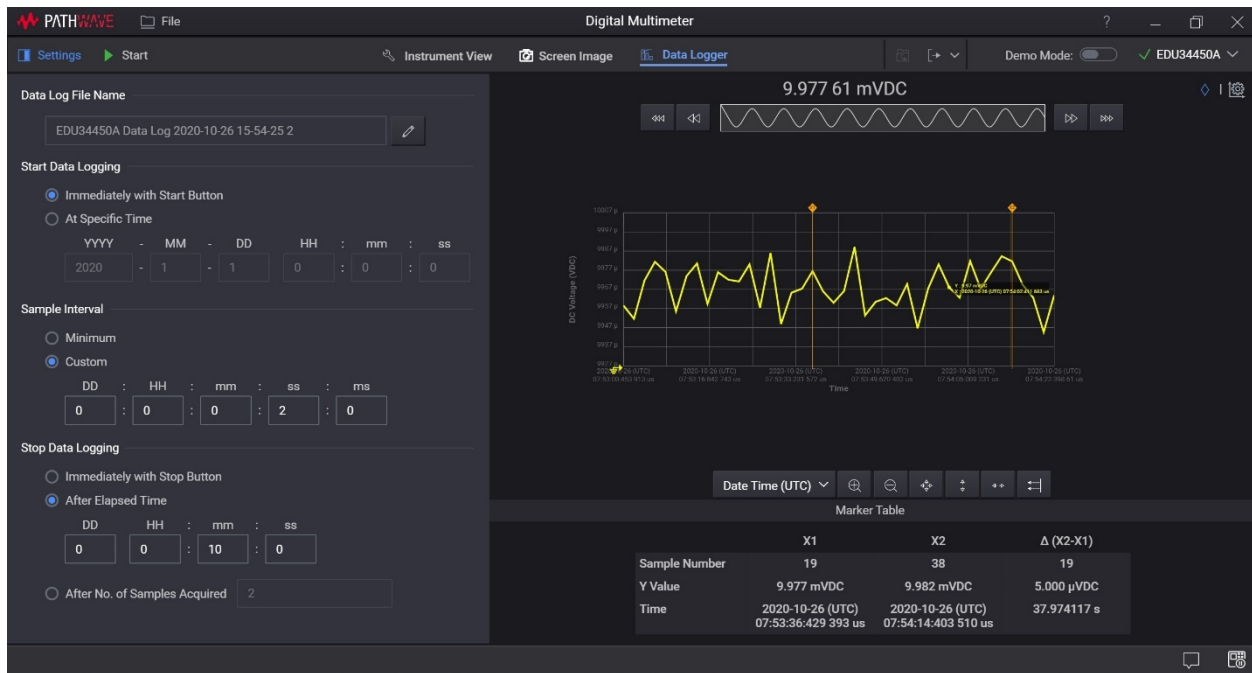
The DMM app in BenchVue allows you to control DMMs to visualize measurements and perform unrestricted data logging and statistical analysis. The software comes with your EDU34450A purchase.

Record measurements and export results in a few clicks

Quickly log and export data to Microsoft Excel for documentation or further analysis.

Remotely control your DMM via LAN

You can change your instrument settings and perform measurements remotely with built-in LAN connectivity.



Intuitive Front Panel



| Label | Description |
|-------|---------------------------|
| 1 | On/off switch |
| 2 | Display |
| 3 | USB host |
| 4 | Measurement function keys |
| 5 | Soft keys |
| 6 | Range change keys |
| 7 | Input terminals |
| 8 | Fuse |

Spec Interpretation Guide

The following pages list the technical specifications for the Keysight EDU34450A DMM. The following explanations and examples are helpful in understanding how to interpret these specifications:

- Measurement accuracy is specified as the percentage of reading plus the percentage of range, where reading is the actual measured value and range is the name of the scale (1 V, 10 V, and so on) — not the full-scale value (1.2 V, 12 V, and so on).
- Accuracies are listed as one-year specifications. This refers to the length of time since the instrument's last calibration.

Example 1: Basic DC voltage accuracy

Calculate the accuracy of the following measurement: 9 V DC input, 10 V DC range, one-year accuracy specifications, standard operating temperature (18 – 28 °C).

From the following page, the one-year accuracy is 0.025% of reading + 0.005% of range.

It translates to this: $(0.025/100 \times 9 \text{ V}) + (0.005/100 \times 10 \text{ V}) = 2.75 \text{ mV}$

Total accuracy is **2.75 mV/9 V = 0.0306%**.

Example 2: Extreme operating temperature

When the EDU34450A operates outside of its 18 – 28 °C temperature range, you need to consider additional temperature drift errors. Assume the same conditions in Example 1 but at a 35 °C operating temperature.

The basic accuracy is again 0.025% of reading + 0.005% of range = 2.75 mV.

Now, multiply the 10 V temperature coefficient from the DC voltage specifications table by the number of degrees outside of operating range for additional error:

$(0.0020\% \text{ reading} + 0.0008\% \text{ range}) / ^\circ\text{C} \times (35 - 28 \text{ } ^\circ\text{C})$

$= (0.0020\% \text{ reading} + 0.0008\% \text{ range}) / ^\circ\text{C} \times 7 \text{ } ^\circ\text{C}$

$= 0.014\% \text{ reading} + 0.0056\% \text{ range} = 1.82 \text{ mV}$

Total error is **2.75 mV + 1.82 mV = 4.57 mV or 0.0508%**.

Example 3: AC voltage accuracy

The AC voltage function measures the true RMS value of the input waveform, regardless of waveshape. Listed accuracies assume a sine-wave input. To adjust accuracies for non-sinusoids, use the listed crest factor adder.

For this example, assume a $\pm 1 \text{ V}$ square wave input with a 50% duty cycle and a 1 kHz frequency.

Accuracy for 1 V, 1 kHz sinusoid is **0.2% reading + 0.1% range = 3 mV or 0.3%**.

EDU34450A Accuracy Specifications

Specifications are for 90-minute warm-up time, slow mode, NULL function enabled, and calibration temperature within 18 – 28 °C (unless stated otherwise).

DC specifications

Accuracy ± (% of reading + % of range):

| Function | Range ¹ | Test current or burden voltage | Input impedance | 1 year 23 °C ± 5 °C | Temperature coefficient / °C 0 °C – 18 °C 28 °C – 55 °C |
|-------------------------|--------------------|--------------------------------|------------------|------------------------|---|
| DC voltage | 100.000 mV | - | 10 MΩ or > 10 GΩ | 0.018 + 0.008 | 0.0020 + 0.0008 |
| | 1.00000 V | - | 10 MΩ or > 10 GΩ | 0.015 + 0.005 | 0.0015 + 0.0008 |
| | 10.0000 V | - | 10 MΩ | 0.025 + 0.005 | 0.0020 + 0.0008 |
| | 100.000 V | - | 10 MΩ | 0.025 + 0.005 | 0.0020 + 0.0008 |
| | 1000.00 V | - | 10 MΩ | 0.027 + 0.005 | 0.0020 + 0.0008 |
| Resistance ² | 100.000 Ω | 1 mA | - | 0.065 + 0.010 | 0.0080 + 0.0008 |
| | 1.00000 kΩ | 500 μA | - | 0.065 + 0.008 | 0.0080 + 0.0005 |
| | 10.0000 kΩ | 100 μA | - | 0.065 + 0.005 | 0.0080 + 0.0005 |
| | 100.000 kΩ | 10 μA | - | 0.065 + 0.005 | 0.0080 + 0.0005 |
| | 1.00000 MΩ | 1 μA | - | 0.065 + 0.005 | 0.0080 + 0.0005 |
| | 10.0000 MΩ | 100 nA | - | 0.300 + 0.005 | 0.0250 + 0.0005 |
| | 100.000 MΩ | 100 nA / 10 MΩ | - | 2.000 + 0.005 | 0.3000 + 0.0005 |
| DC current ³ | 10.0000 mA | < 0.02 V | - | 0.10 + 0.015 | 0.008 + 0.0015 |
| | 100.000 mA | < 0.2 V | - | 0.10 + 0.007 | 0.008 + 0.0010 |
| | 1.000 00 A | < 0.3 V | - | 0.30 + 0.015 | 0.019 + 0.0015 |
| | 3.000 0 A | < 0.9 V | - | 0.30 + 0.007 | 0.019 + 0.0010 |
| Continuity ⁴ | 1000 Ω | 0.5 mA | - | 0.1 + 0.1 | 0.009 + 0.005 |
| Diode test ⁵ | 1.0000 V | 0.5 mA | - | 0.05 + 0.10 | 0.005 + 0.005 |

1. 20% over range on all ranges except 1,000 VDC and 3 A range.

2. Specifications are for four-wire Ω or two-wire Ω using NULL function. If without NULL function, add 0.2 Ω additional error. For 1 MΩ, 10 MΩ and 100 MΩ ranges, accuracy may be degraded when humidity is > 60% RH.

3. For 10 mA and 100 mA ranges, allow internal current sense resistor to cool after measuring > 1 A for more than 15 mins.

4. Typical specification. Continuity threshold is fixed at less than 10 Ω. Available in fast mode only.

5. Typical specification. Specifications are for the voltage measured at the input terminals only. Available in fast mode only.

AC specifications

Accuracy \pm (% of reading + % of range):

| Function | Range ¹ | Frequency | 1 year 23 °C \pm 5 °C | Temperature coefficient / °C 0 °C – 18 °C 28 °C – 55 °C |
|----------------------------------|-------------------------------------|-------------------------------|----------------------------|---|
| True RMS AC voltage ² | 100.000 mV | 20 Hz – 45 Hz | 1.0 + 0.1 | 0.02 + 0.02 |
| | | 45 Hz – 10 kHz | 0.2 + 0.1 | 0.02 + 0.02 |
| | | 10 kHz – 30 kHz | 1.5 + 0.3 | 0.05 + 0.02 |
| | | 30 kHz – 100 kHz ³ | 6.0 + 0.3 | - |
| | 1.000 00V to 750.00 V | 20 Hz – 45 Hz | 1.0 + 0.1 ⁴ | 0.02 + 0.02 |
| | | 45 Hz – 10 kHz | 0.2 + 0.1 | 0.02 + 0.02 |
| | | 10 kHz – 30 kHz | 1.5 + 0.3 | 0.05 + 0.02 |
| | | 30 kHz – 100 kHz ³ | 3.0 + 0.3 ⁵ | 0.10 + 0.02 |
| True RMS AC current ² | 10.0000 mA to 3.000 0A ⁶ | 20 Hz – 45 Hz | 1.5 + 0.1 | 0.02 + 0.02 |
| | | 45 Hz – 1 kHz | 0.5 + 0.1 | 0.02 + 0.02 |
| | | 1 kHz – 10 kHz ⁷ | 2.0 + 0.2 | 0.02 + 0.02 |

- 20% over range on all ranges except ACV 750 V and ACI 3 A.
- Specifications are for sine-wave inputs more than 5% of the range, except the 750 V range. Input signal must be more than 50 Vrms for the 750 V range. Maximum crest factor of 3 at full scale. Input impedance is at least 1.1 M Ω in parallel with capacitance less than 100 pF, AC couple with up to 400 DCV.
- Typical specification for 100 mV range. Additional error to be added as frequency > 30 kHz and signal input < 10% of range.
30 kHz to 100 kHz: 0.003% of full scale per 4 kHz
- For input < 200 V rms.
- For input < 300 V rms. 4.5% of reading + 0.3 % of range (typical specification) for 750 V range.
- For 10 mA and 100 mA ranges, allow internal current sense resistor to cool if applied > 1 A for more than 15 mins.
- Frequencies > 5 kHz are typical for 1 A and 3 A ranges.

Frequency accuracy \pm (% of reading + 3 counts):

| Function | Range ¹ | Frequency | 1 year 23 °C \pm 5 °C | Temperature coefficient / °C 0 °C – 18 °C 28 °C – 55 °C |
|-----------|------------------------|------------------------------|----------------------------|---|
| Frequency | 100.000 mV to 750.00 V | 20 Hz – 300 kHz ² | 0.025 + 3 | 0.005 |
| | 10.0000 mA to 3.0000 A | 20 Hz – 10 kHz ³ | 0.025 + 3 | 0.005 |

- The frequency can be measured up to 1 MHz as 0.5 V signal to 100 mV/1 V ranges.
- 10% of range to full-scale input on all ranges, except where noted. 100 mV range specifications are for full-scale or greater inputs. For inputs from 10 mV to 100 mV in 100 mV range, multiply the total percentage of reading error by 10.
- 10% of range to full-scale input on all ranges, except where noted. 10 mA range specifications are for full-scale or greater inputs. For inputs from 1 mA to 10 mA in 10 mA range, multiply the total percentage of reading error by 10.

Frequency resolution:

| Function | Range | Frequency | Resolution |
|-----------|---|---------------------------|-------------|
| Frequency | 100.000 mV to 750.00 V ¹ 10.0000 mA to 3.0000 A | 012.000 Hz - 119.999 Hz | 0.001 Hz |
| | | 0.12000 Hz - 1.19999 kHz | 0.00001 kHz |
| | | 1.2000 Hz - 11.9999 kHz | 0.0001 kHz |
| | | 12.000 kHz - 119.999 kHz | 0.001 kHz |
| | | 0.12000 MHz - 1.19999 MHz | 0.00001 MHz |

- The frequency can be measured up to 1 MHz as 0.5 V signal to 100 mV/1 V ranges.

Temperature and capacitance specifications

Accuracy \pm (% of reading + % of range):

| Function | Range ¹ | Probe type or test current | 1 year 23 °C \pm 5 °C | Temperature coefficient / °C 0 °C – 18 °C 28 °C – 55 °C |
|--------------------------|-----------------------|-------------------------------|----------------------------|---|
| Temperature ² | -80.0 °C to 150 °C | 5 k Ω thermistor probe | Probe accuracy + 0.2 °C | 0.0020 °C |
| | -110.0 °F to 300.0 °F | 5 k Ω thermistor probe | Probe accuracy + 0.4 °F | 0.0036 °F |
| Capacitance | 1.000 nF | 100 nA | - | - |
| | 10.00 nF ² | 100 nA | 1 + 1.5 | 0.04 + 0.015 |
| | 100.0 nF | 1 μ A | 1 + 0.5 | 0.02 + 0.001 |
| | 1.000 μ F | 1 μ A | 1 + 0.5 | 0.02 + 0.001 |
| | 10.00 μ F | 10 μ A | 1 + 0.5 | 0.02 + 0.001 |
| | 100.0 μ F | 100 μ A | 1 + 0.5 | 0.02 + 0.001 |
| | 1.000 mF | 500 μ A | 1 + 0.5 | 0.02 + 0.001 |
| | 10.00 mF | 1 mA | 2 + 0.5 | 0.02 + 0.001 |

- 20% over range on all ranges. Specifications apply after NULL of open test leads connected to input terminals.
- Typical specification.



System characteristics

System specifications on single display (typical):

| Function | Resolution (digit) | Function change (sec) ¹ | Range change (sec) ² | Auto range (sec) ³ | Reading rate / sec ⁴ (USB) | Reading rate / sec ⁴ (LAN) |
|------------------------|--------------------|------------------------------------|---------------------------------|-------------------------------|---------------------------------------|---------------------------------------|
| ACV | Slow (5.5) | 2.6 | 2.5 | 4.6 | 1.9 | 1.9 |
| | Medium (4.5) | 1.2 | 1.2 | 1.5 | 19 | 19 |
| | Fast (4.5) | 1.1 | 1.1 | 1.2 | 90 | 43 |
| DCV | Slow (5.5) | 1.4 | 1.4 | 1.6 | 1.3 | 1.3 |
| | Medium (4.5) | 0.6 | 0.7 | 0.8 | 49 | 36 |
| | Fast (4.5) | 0.6 | 0.7 | 0.7 | 110 | 48 |
| 2-wire Ω | Slow (5.5) | 1.3 | 2.6 | 1.6 | 1.4 | 1.4 |
| | Medium (4.5) | 0.7 | 1.0 | 0.6 | 49 | 36 |
| | Fast (4.5) | 0.7 | 1.0 | 0.5 | 110 | 46 |
| 4-wire Ω | Slow (5.5) | 1.8 | 1.4 | 1.9 | 1 | 1 |
| | Medium (4.5) | 1.1 | 0.6 | 1.1 | 5.2 | 5.0 |
| | Fast (4.5) | 1.1 | 0.6 | 1 | 5.9 | 5.4 |
| Frequency ⁵ | Slow (5.5) | 2.1 | 2.1 | 2.6 | 0.9 | 0.9 |
| | Medium (4.5) | 1.2 | 1.2 | 1.7 | 9.0 | 9.0 |
| | Fast (4.5) | - | - | - | - | - |
| ACI | Slow (5.5) | 2.6 | 2.6 | 6.2 | 1.9 | 1.9 |
| | Medium (4.5) | 1.2 | 1.2 | 1.7 | 19 | 19 |
| | Fast (4.5) | 1.1 | 1.2 | 1.3 | 90 | 45 |
| DCI | Slow (5.5) | 1.3 | 1.3 | 1.9 | 1.7 | 1.7 |
| | Medium (4.5) | 0.6 | 0.7 | 0.9 | 49 | 42 |
| | Fast (4.5) | 0.6 | 0.7 | 0.7 | 110 | 48 |
| Diode test | 4.5 | 0.1 | - | - | 110 | 48 |
| Continuity | 4.5 | 0.6 | - | - | 110 | 47 |
| Temperature | 4.5 | 1.8 | - | - | 4.5 | 4.2 |
| Capacitance | 4.5 | - | - | - | - | - |

1. Time to change from two-wire resistance to this specified function and to take at least one reading using SCPI "FUNC" and "READ?" commands.

2. Time to change from one range to the next higher range and to take at least one reading using SCPI "RANGE" and "READ?" commands.

3. Time to automatically change one range and to take at least one reading using SCPI "CONF AUTO" and "READ?" commands.

4. Number of measurements using SCPI "READ?" command when the front-panel display is off using "DISP OFF" command.

5. Reading rate depends on signal frequency ≥ 20 Hz.

Supplemental measurement characteristics

| Measurement | Characteristic | |
|-----------------------------|---|--|
| DC voltage | Measurement method | |
| | Input resistance | > 10 G Ω (selectable 100 mV, 1 V ranges) 10 M Ω (typical) |
| | Input protection | 1,000 V on all ranges (HI terminal) |
| Resistance | Measurement method | Selectable 4-wire or 2-wire ohms. Current source referenced to LO input |
| | Open circuit voltage | Limited to < 2.8 V |
| | Input protection | 1,000 V on all ranges (HI terminal) |
| DC current | Shunt resistance | 1 Ω for 10 mA, 100 mA ranges 0.1 Ω for 1 A, 3 A ranges |
| | Input protection | Externally accessible at front panel 4 A, 600 V fuse for I terminal |
| Continuity / diode test | Measurement method | Uses 0.5 mA constant current source |
| | Response time | Continuity: 100 samples/second with audible tone Diode: 100 samples/second with audible tone |
| | Continuity threshold | 10 Ω fixed |
| | Input protection | 1000 V (HI terminal) |
| Temperature | Measurement method | 2-wire ohms measurement of 5 k Ω thermistor sensor (YSI 4407) with a 25 °C / 125 °C ratio of 29.26 Auto-ranging measurement, no manual range selection |
| | Input protection | 1000 V (HI terminal) |
| Measurement noise rejection | CMR (common mode rejection) For 1 k Ω unbalance LO lead | DC 140 dB AC 70 dB |
| | NMR (normal mode rejection) For 60 Hz (50 Hz) \pm 0.1% | Slow mode 5½ digits, medium mode: 4½ digits, 60 dB Fast mode: 4½ digits, 0 dB |
| AC voltage | Measurement method | AC coupled True-RMS – measures the AC component with up to 400 VDC bias on any range |
| | Crest factor | Maximum 3:1 at full scale |
| | Input impedance | > 1.1 M Ω in parallel with < 100 pF of all ranges |
| | Input protection | 750 V rms on all ranges (HI terminal) |
| AC current | Measurement method | DC coupled to the fuse and current shunt; AC coupled true-RMS measurement (measures the AC component only) |
| | Shunt resistance | 1 Ω for 10 mA, 100 mA ranges 0.1 Ω for 1 A, 3 A ranges |
| | Input protection | Externally accessible at front panel 4 A, 600 V fuse for I terminal |

Supplemental measurement characteristics (continued)

| Measurement | Characteristic | |
|-----------------------|---|--|
| Frequency | Measurement method | Reciprocal counting technique; AC coupled input using AC voltage function |
| | Signal level | 10% of range to full-scale input on ranges except where noted. Auto or manual range selection |
| | Gate time | 0.1 second or 1 second gate time |
| | Input protection | 750 V rms on all ranges (HI terminal) |
| Math functions | Null, dBm, dB, Min/Max/Avg, hold limit test | |
| Data log | Info, list | |
| Triggering and memory | Samples per trigger | 1 to 5,000 (typical) |
| | Trigger delay | 0 to 3,600 sec (100 μ s step size) |
| Non-volatile memory | 5,000 readings | |
| Sample timer | Range | Up to 3,600 sec in 100 μ s steps |
| Remote interface | USB, LAN standard | |
| Programming language | SCPI-1994.0, IEEE-488.2 | |

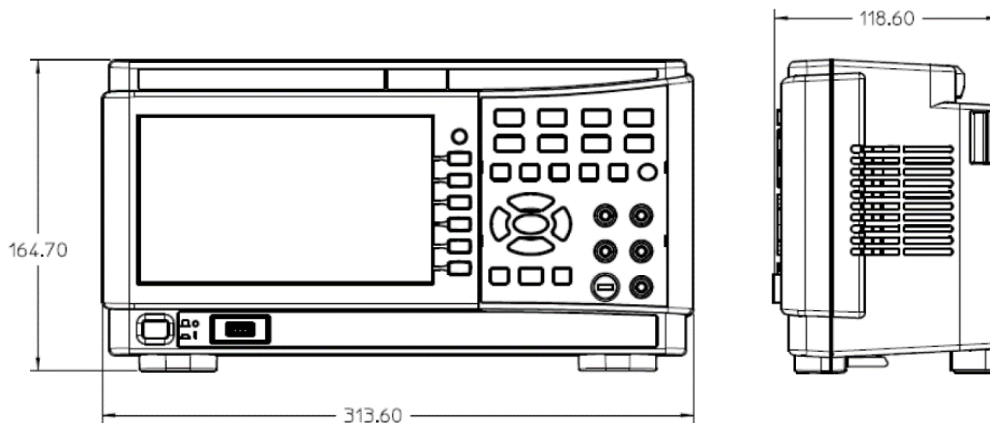
Rear Panel at a Glance



General characteristics

| Characteristics | |
|---------------------------|---|
| Power supply | 100 V / 120 V (127 V) / 220 V (230 V) / 240 V \pm 10% |
| | AC line frequency 45 Hz – 66 Hz, automatically sensed at power on |
| Power consumption | 13 VA maximum, < 6.6 W average |
| Operating environment | Full accuracy to 80% RH for 0 °C to 30 °C (non-condensing) |
| | Full accuracy to 40% RH for 30 °C to 55 °C (non-condensing) |
| | Altitude up to 3,000 meters |
| Operating temperature | Full accuracy for 0 °C to 55 °C |
| Storage temperature | - 40 °C to 70 °C |
| Safety and EMC compliance | Refer to Declaration of Conformity for the latest revisions of regulatory compliance at: www.keysight.com/go/conformity |
| Measurement category | CAT II, 300 V: CAT I 1000 Vdc 750 Vac rms, 2,500 Vpk transient over-voltages, pollution degree 2 |
| Shock and vibration | Tested to IEC/EN 60086-2 |
| Dimensions (HxWxD) | 165 mm x 314 mm x 119 mm (6.5 in x 12.6 in x 4.7 in) |
| Weight | 3.35 kg |
| Warm-up time | 90 minutes |

Dimensions (mm)



Ordering Information

Digital multimeter

EDU34450A 5½-digit DMM

Standard shipped items

Power cord, test leads

Keysight optional accessories

EDU190A Instrument stacking kit (to use with other education series instruments)

34138A Test lead set

E2308A Thermistor temperature probe

34330A 30 A current shunt

Other education series products

EDU33211A Waveform generator, 20 MHz, one channel

EDU33212A Waveform generator, 20 MHz, two channels

EDU36311A DC power supply, triple output

EDUX1052A InfiniiVision 1000 X-Series oscilloscope, 50 MHz, analog channels

EDUX1052G InfiniiVision 1000 X-Series oscilloscope, 50 MHz, analog channels, with a built-in waveform generator

To learn more, please visit:

www.keysight.com/find/EDU34450A

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

