

Keysight Technologies

34401A Digital Multimeter

Data Sheet



Measurement capability

- 6½ digit resolution
- 10 measurement functions: DC/AC voltage, DC/AC current, 2- and 4-wire resistance, diode, continuity, frequency, period
- Basic accuracy: 0.0035% DC, 0.06% AC
- 1000 V max voltage input, 3 A max current input

System Capability

- 1000 readings/second
- 512 reading memory

www.keysight.com/find/dmm

Superior performance

The Keysight Technologies, Inc. 34401A multimeter gives you the performance you need for fast, accurate bench and system testing. The 34401A provides a combination of resolution, accuracy and speed that rivals DMMs costing many times more. 6½ digits of resolution, 0.0015% basic 24-hr dcV accuracy and 1,000 readings/s direct to GPIB assure you of results that are accurate, fast, and repeatable.

Use it on your benchtop

The 34401A was designed with your bench needs in mind. Functions commonly associated with bench operation, like continuity and diode test, are built in. A Null feature allows you to remove lead resistance and other fixed offsets in your measurements. Other capabilities like min/max/avg readouts and direct dB and dBm measurements make checkout with the 34401A faster and easier.

The 34401A gives you the ability to store up to 512 readings in internal memory. For troubleshooting, a reading hold feature lets you concentrate on placing your test leads without having to constantly glance at the display.

Use it for systems testing

For systems use, the 34401A gives you faster bus throughput than any other DMM in its class. The 34401A can send up to 1,000 readings/s directly across GPIB in user-friendly ASCII format.

You also get both GPIB and RS-232 interfaces as standard features. Voltmeter Complete and External Trigger signals are provided so you can synchronize to other instruments in your test system. In addition, a TTL output indicates Pass/Fail results when limit testing is used.

To ensure both forward and backward compatibility, the 34401A includes three command languages (SCPI, Keysight 3478A and Fluke8840A/42A), so you don't have to rewrite your existing test software. An optional rack mount kit is available.

Easy to use

Commonly accessed attributes, such as functions, ranges, and resolution are selected with a single button press.

Advanced features are available using menu functions that let you optimize the 34401A for your applications.

The included Keysight IntuiLink software allows you to put your captured data to work easily, using PC applications such as Microsoft Excel or Word to analyze, interpret, display, print, and document the data you get from the 34401A. You can specify the meter setup and take a single reading or log data to the Excel spreadsheet in specified time intervals. Programmers can use ActiveX components to control the DMM using SCPI commands. To find out more about IntuiLink, visit www.keysight.com/find/intuilink

3-year warranty

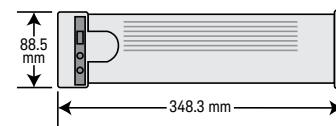
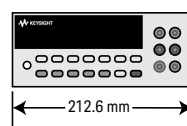
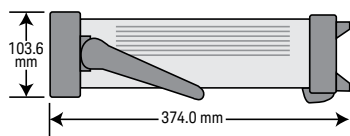
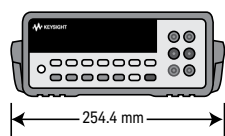
With your 34401A, you get full documentation, a high-quality test lead set, calibration certificate with test data, and a 3-year warranty, all for one low price.



Accuracy Specifications \pm (% of reading + % of range)¹

| Function | Range ³ | Frequency, etc. | 24 hour ² 23 \pm 1 °C | 90 day 23 \pm 5 °C | 1 year 23 \pm 5 °C | Temperature coefficient 0 – 18 °C 28 – 55 °C |
|-------------------------------------|----------------------------|----------------------------|---------------------------------------|-------------------------|-------------------------|--|
| DC voltage | 100.0000 mV | | 0.0030 + 0.0030 | 0.0040 + 0.0035 | 0.0050 + 0.0035 | 0.0005 + 0.0005 |
| | 1.000000 V | | 0.0020 + 0.0006 | 0.0030 + 0.0007 | 0.0040 + 0.0007 | 0.0005 + 0.0001 |
| | 10.000000 V | | 0.0015 + 0.0004 | 0.0020 + 0.0005 | 0.0035 + 0.0005 | 0.0005 + 0.0001 |
| | 100.0000 V | | 0.0020 + 0.0006 | 0.0035 + 0.0006 | 0.0045 + 0.0006 | 0.0005 + 0.0001 |
| | 1000.000 V | | 0.0020 + 0.0006 | 0.0035 + 0.0010 | 0.0045 + 0.0010 | 0.0005 + 0.0001 |
| True rms AC voltage ⁴ | 100.0000 mV | 3 – 5 Hz | 1.00 + 0.03 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.004 |
| | | 5 – 10 Hz | 0.35 + 0.03 | 0.35 + 0.04 | 0.35 + 0.04 | 0.035 + 0.004 |
| | | 10 Hz – 20 kHz | 0.04 + 0.03 | 0.05 + 0.04 | 0.06 + 0.04 | 0.005 + 0.004 |
| | | 20 – 50 kHz | 0.10 + 0.05 | 0.11 + 0.05 | 0.12 + 0.05 | 0.011 + 0.005 |
| | | 50 – 100 kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | | 100 – 300 kHz ⁶ | 4.00 + 0.50 | 4.00 + 0.50 | 4.00 + 0.50 | 0.20 + 0.02 |
| | 1.000000 V to 750.000 V | 3 – 5 Hz | 1.00 + 0.02 | 1.00 + 0.03 | 1.00 + 0.03 | 0.100 + 0.003 |
| | | 5 – 10 Hz | 0.35 + 0.02 | 0.35 + 0.03 | 0.35 + 0.03 | 0.035 + 0.003 |
| | | 10 Hz – 20 kHz | 0.04 + 0.02 | 0.05 + 0.03 | 0.06 + 0.03 | 0.005 + 0.003 |
| | | 20 – 50 kHz | 0.10 + 0.04 | 0.11 + 0.05 | 0.12 + 0.04 | 0.011 + 0.005 |
| Resistance ⁷ | 100.0000 Ω | 1 mA current source | 0.0030 + 0.0030 | 0.008 + 0.004 | 0.010 + 0.004 | 0.0006 + 0.0005 |
| | 1.000000 k Ω | 1 mA | 0.0020 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0006 + 0.0001 |
| | 10.00000 k Ω | 100 μ A | 0.0020 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0006 + 0.0001 |
| | 100.0000 k Ω | 10 μ A | 0.0020 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0006 + 0.0001 |
| | 1.000000 M Ω | 5.0 μ A | 0.002 + 0.001 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0010 + 0.0002 |
| | 10.00000 M Ω | 500 nA | 0.015 + 0.001 | 0.020 + 0.001 | 0.040 + 0.001 | 0.0030 + 0.0004 |
| | 100.0000 M Ω | 500 nA II 10 M Ω | 0.300 + 0.010 | 0.800 + 0.001 | 0.800 + 0.001 | 0.1500 + 0.0002 |
| DC current | 10.00000 mA | < 0.1 V burden voltage | 0.005 + 0.010 | 0.030 + 0.020 | 0.050 + 0.020 | 0.0020 + 0.0020 |
| | 100.0000 mA | < 0.6 V | 0.010 + 0.010 | 0.030 + 0.005 | 0.050 + 0.005 | 0.0020 + 0.0005 |
| | 1.000000 A | < 1.0 V | 0.050 + 0.010 | 0.080 + 0.010 | 0.100 + 0.010 | 0.0050 + 0.0010 |
| | 3.00000 A | < 2.0 V | 0.100 + 0.010 | 0.120 + 0.020 | 0.120 + 0.020 | 0.005 + 0.0020 |
| True rms AC current ⁴ | 1.000000 A | 3 – 5 Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |
| | | 5 – 10 Hz | 0.30 + 0.04 | 0.30 + 0.04 | 0.30 + 0.04 | 0.035 + 0.006 |
| | | 10 Hz – 5 kHz | 0.10 + 0.04 | 0.10 + 0.04 | 0.10 + 0.04 | 0.015 + 0.006 |
| | 3.00000 A | 3 – 5 Hz | 1.10 + 0.06 | 1.10 + 0.06 | 1.10 + 0.06 | 0.100 + 0.006 |
| | | 5 – 10 Hz | 0.35 + 0.06 | 0.35 + 0.06 | 0.35 + 0.06 | 0.035 + 0.006 |
| | | 10 Hz – 5 kHz | 0.15 + 0.06 | 0.15 + 0.06 | 0.15 + 0.06 | 0.015 + 0.006 |
| Frequency or period ⁸ | 100 mV to 750 V | 3 – 5 Hz | 0.10 | 0.10 | 0.10 | 0.005 |
| | | 5 – 10 Hz | 0.05 | 0.05 | 0.05 | 0.005 |
| | | 10 – 40 Hz | 0.03 | 0.03 | 0.03 | 0.001 |
| | | 40 Hz – 300 kHz | 0.006 | 0.01 | 0.01 | 0.001 |
| Continuity | 1000.0 Ω | 1 mA test current | 0.002 + 0.030 | 0.008 + 0.030 | 0.010 + 0.030 | 0.001 + 0.002 |
| Diode test ⁹ | 1.0000 V | 1 mA test current | 0.002 + 0.010 | 0.008 + 0.020 | 0.010 + 0.020 | 0.001 + 0.002 |

- Specifications are for 1 hr warm-up and 6½ digits, slow ac filter.
- Relative to calibration standards.
- 20% over range on all ranges except 1000 Vdc and 750 Vac ranges.
- For sinewave input > 5% of range. For inputs from 1% to 5% of range and < 50 kHz, add 0.1% of range additional error.
- 750 V range limited to 100 kHz or 8 x 10⁷ Volt-Hz.
- Typically 30% of reading error at 1 MHz.
- Specifications are for 4-wire ohms function or 2-wire ohms using Math Null. Without Math Null, add 0.2 Ω additional error in 2-wire ohms function.
- Input > 100 mV. For 10 to 100 mV inputs multiply % of reading error x 10.
- Accuracy specifications are for the voltage measured at the input terminals only. 1 mA test current is typical. Variation in the current source will create some variation in the voltage drop across a diode junction.



Measurement Characteristics

DC voltage

| | |
|---------------------------------|--|
| Measurement method | Continuously integrating multi-slope III A-D converter |
| A-D linearity | 0.0002% of reading + 0.0001% of range |
| Input resistance | |
| 10 MΩ or 0.1V, 1 V, 10 V ranges | Selectable > 10,000 MΩ |
| 100 V, 1000 V ranges | 10 MΩ ±1% |
| Input bias current | < 30 pA at 25°C |
| Input protection | 1000 V all ranges |
| dcV:dcV ratio accuracy | V_{input} accuracy + $V_{relevance}$ accuracy |

True RMS AC voltage

| | |
|---|--|
| Measurement method | AC-coupled true rms-measures the ac component of the input with up to 400 Vdc of bias on any range |
| Crest factor | Maximum of 5:1 at full scale |
| Additional crest factor errors (non-sinewave) | Crest factor 1-2: 0.05% of reading Crest factor 2-3: 0.15% of reading Crest factor 3-4: 0.30% of reading Crest factor 4-5: 0.40% of reading |
| Input impedance | 1 MΩ ± 2% in parallel with 100 pF |
| Input protection | 750 Vrms all ranges |

Resistance

| | |
|----------------------------------|---|
| Measurement method | Selectable 4-wire or 2-wire Ohms Current source referenced to LO input |
| Maximum lead resistance (4-wire) | 10% of range per lead for 100 Ω, 1 kΩ ranges 1 kΩ per lead on all other ranges |
| Input protection | 1000 V all ranges |

DC current

| | |
|------------------|---|
| Shunt resistance | 5 Ω for 10 mA, 100 mA 0.1 Ω for 1 A, 3 A |
| Input protection | Externally accessible 3 A 250 V fuse Internal 7 A 250 V fuse |

True RMS AC current

| | |
|--------------------|---|
| Measurement method | Directly coupled to the fuse and shunt. ac coupled true rms measurement (measures the ac component only). |
| Shunt resistance | 0.1 Ω for 1 A and 3 A ranges |
| Input protection | Externally accessible 3 A 250 V fuse Internal 7 A 250 V fuse |

Frequency and period

| | |
|--------------------|-------------------------------|
| Measurement method | Reciprocal counting technique |
| Voltage ranges | Same as ac voltage function |
| Gate time | 1 s, 100 ms, or 10 ms |

Continuity/diode

| | |
|----------------------|---------------------------------|
| Response time | 300 samples/s with audible tone |
| Continuity threshold | Selectable from 1 Ω to 1000 Ω |

Measurement noise rejection 60 (50) Hz ¹

| | |
|---------|--------|
| dc CMRR | 140 dB |
| ac CMRR | 70 dB |

Integration time and normal mode rejection ²

| | |
|-------------------------|--------------------|
| 100 plc/1.67 s (2 s) | 60 dB ³ |
| 0 plc/167 ms (200 ms) | 60 dB ³ |
| 1 plc/16.7 ms (20 ms) | 60 dB |
| < 1 plc/3 ms or 800 μs) | 0 dB |

Operating characteristics ⁴

| Function | Digits | Reading/s |
|--------------------------|--------|-------------------------------|
| dcV, dcl, and resistance | 6½ | 0.6 (0.5) |
| | 6½ | 6 (5) |
| | 5½ | 60 (50) |
| | 5½ | 300 |
| | 4½ | 1000 |
| acV, acl | 6½ | 0.15 slow (3 Hz) |
| | 6½ | 1 medium (20 Hz) |
| | 6½ | 10 fast (200 Hz) ⁵ |
| | 6½ | 50 |
| Frequency or period | 6½ | 1 |
| | 5½ | 9.8 |
| | 4½ | 80 |

1. For 1 kΩ unbalanced in LO lead, ± 500 V peak maximum.
2. For power line frequency ± 0.1%.
3. For power line frequency ± 1% use 40 dB or ± 3% use 30 dB.
4. Reading speeds for 60 Hz and (50 Hz) operation.
5. Maximum useful limit with default settling delays defeated.
6. Speeds are for 4½ digits, delay 0, auto-zero and display OFF.

Measurement Characteristics *continued*

| System speeds | |
|----------------------------|--------------|
| Configuration rates | 26/s to 50/s |
| Autorange rate (dc Volts) | > 30/s |
| ASCII readings to RS-232 | 55/s |
| ASCII readings to GPIB | 1000/s |
| Maximum internal trig rate | 1000/s |
| Max. ext trig. rate to mem | 1000/s |

| Triggering and memory | |
|--------------------------|-----------------------------------|
| Reading HOLD sensitivity | 10%, 1%, 0.1%, or 0.01% of range |
| Samples/trigger | 1 to 50,000 |
| Trigger delay | 0 to 3600 s: 10 μ s step size |
| External trigger delay | < 1 ms |
| External trigger jitter | < 500 μ s |
| Memory | 512 readings |

| Math functions | |
|--|--|
| NULL, min/max/average, dBm, dB, limit test (with TTL output) | |

| Standard programming languages | |
|--|--|
| SCPI (IEEE-488.2), Keysight 3478A, Fluke 8840A/42A | |

| Accessories included | |
|--|--|
| Test lead kit with probe, alligator and grabber attachments | |
| Operating manual, service manual, test report and power cord | |

| General specifications | |
|------------------------|--|
| Power supply | 100 V/120 V/220 V/240 V \pm 10% |
| Power line frequency | 45 to 66 Hz and 360 to 440 Hz, automatically sensed at power-on |
| Power consumption | 25 VA peak (10 W average) |
| Operating environment | Full accuracy for 0 to 55 °C, full accuracy to 80% R.H. at 40 °C |
| Storage temperature | -40 to 70 °C |
| Weight | 3.6 kg (8.0 lbs) |
| Safety | Designed to CSA, UL-1244, IEC-348 |
| RFI and ESD | MIL-461C, FTZ 1046, FCC |
| Vibration and shock | MIL-T-28800E, Type III, Class 5 (sine only) |
| Warranty | 1 year |

Ordering Information

Keysight 34401A multimeter accessories included: Test lead kit with probe, alligator, and grabber attachments, calibration certificate, test report, and power cord. Also includes CD with: IntuiLink software, IVI and VXI PnP drivers, Quick start tutorial, user's guide, command quick reference, service guide, and data sheet.

Options

| | |
|------------|---------------------------------|
| 34401A-A6J | ANSI Z540 compliant calibration |
|------------|---------------------------------|

Accessories

| Probes/Leads/Clip Accessories | |
|-------------------------------|--|
| 11059A | Kelvin probe set |
| 11060A | Surface mount device (SMD) test probes |
| 11062A | Kelvin clip set |
| 34133A | Precision electronic test leads |
| 34134A | DC coupled current probe |
| 34136A | High voltage probe |
| 34138A | Test lead set |
| 34171B | Input terminal connector (sold in pairs) |
| 34172B | Input calibration short (sold in pairs) |
| 34330A | 30 A current shunt |
| E2308A | 5 k thermistor probe |
| Y1133A | Low-thermal external digital multimeter scanning kit |

Rackmount kits

| | |
|---------------------------|--|
| 34190A Rackmount kit | Designed for use with only one instrument, mounted on either the left or the right side of the rack. |
| 34191A 2U Dual flange kit | Secures the instrument to the front of the rack. This kit can be used with the 34194A dual lock link kit to mount two half-width, 2U height instruments side-by-side. |
| 34194A Dual lock link kit | Recommended for side-by-side combinations and includes links for instruments of different depths. This kit can be used with the 34191A 2U dual flange kit to mount two half-width, 2U height instruments side-by-side. |

Other accessories

| | |
|--------|--------------------------------------|
| 34131A | Hard transit case |
| 34161A | Accessory pouch |
| 34398A | RS-232 cable, 9 pin (f) to 9 pin (f) |
| E5810B | LAN/GPIB gateway |

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www.lxistandard.org

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Keysight is a founding member of the LXI consortium.



Three-Year Warranty

www.keysight.com/find/ThreeYearWarranty

Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.



www.keysight.com/go/quality

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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

Americas

| | |
|---------------|------------------|
| Canada | (877) 894 4414 |
| Brazil | 55 11 3351 7010 |
| Mexico | 001 800 254 2440 |
| United States | (800) 829 4444 |

Asia Pacific

| | |
|--------------------|----------------|
| Australia | 1 800 629 485 |
| China | 800 810 0189 |
| Hong Kong | 800 938 693 |
| India | 1 800 112 929 |
| Japan | 0120 (421) 345 |
| Korea | 080 769 0800 |
| Malaysia | 1 800 888 848 |
| Singapore | 1 800 375 8100 |
| Taiwan | 0800 047 866 |
| Other AP Countries | (65) 6375 8100 |

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| | |
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| Finland | 0800 523252 |
| France | 0805 980333 |
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| Ireland | 1800 832700 |
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| United Kingdom | 0800 0260637 |

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