

NI 4065 Specifications

6½-Digit Digital Multimeter



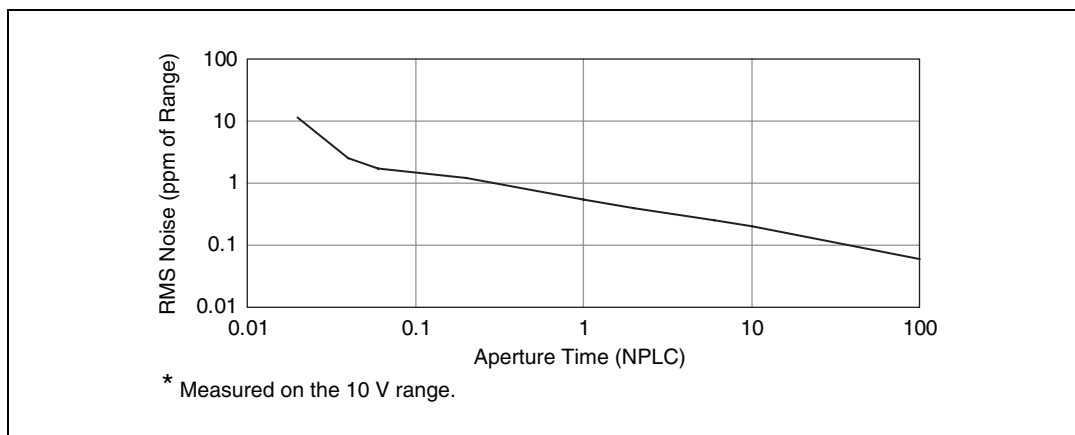
Note All specifications in this document are subject to change without notice. For the most current specifications, visit ni.com/manuals. All accuracy specifications apply to the 6½ digit resolution setting at 6 samples/second (S/s).

DC Specifications

| Resolution (Digits) | Reading Rate* (S/s) | Aperture Time (NPLC) | RMS Noise† (ppm of range) |
|---------------------|---------------------|----------------------|---------------------------|
| 6½ | 0.6 (0.5) | 100 | 0.06 |
| | 6 (5) | 10 | 0.2 |
| | 10 (8.33) | 6 | 0.25 |
| 5½ | 30 (25) | 2 | 0.4 |
| | 60 (50) | 1 | 0.55 |
| | 900 | 0.06 | 1.7 |
| | 1,500 | 0.04 | 2.5 |
| 4½ | 3,000 | 0.02 | 11.5 |

* Specified for 60 Hz (and 50 Hz) operation.
† Measured on the 10 V range.

Noise Performance*



DC System Speeds

Range or function change 10/s

Auto Range time, DC V 200 ms

Auto Range time, DC I 200 ms

Auto Range time, resistance 250 ms

Trigger latency <1 μ s

Maximum trigger rate >2.5 kHz

DC Accuracy Specifications

DC Voltage \pm (ppm* of reading + ppm of range)

| Range | Resolution | Input [†] Resistance | 24 Hr [‡] $T_{cal} \pm 1^\circ\text{C}$ | 90 Day $T_{cal} \pm 5^\circ\text{C}$ | 1 Year $T_{cal} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ 0 $^\circ\text{C}$ to 40 $^\circ\text{C}$ |
|----------|-------------|-----------------------------------|---|---|---|---|
| 100 mV** | 100 nV | >10 G Ω , 10 M Ω | 30 + 30 | 65 + 35 | 90 + 35 | 5 + 2 |
| 1 V | 1 μ V | >10 G Ω , 10 M Ω | 20 + 6 | 65 + 7 | 90 + 7 | 5 + 0.2 |
| 10 V | 10 μ V | >10 G Ω , 10 M Ω | 15 + 5 | 65 + 6 | 90 + 6 | 5 + 0.2 |
| 100 V | 100 μ V | 10 M Ω | 20 + 6 | 75 + 7 | 110 + 7 | 6 + 0.2 |
| 300 V | 1 mV | 10 M Ω | 20 + 20 | 75 + 20 | 110 + 20 | 6 + 0.5 |

* 1 ppm (part per million) = 0.0001%.

[†] Default input resistance is 10 M Ω .

[‡] Relative to external calibration source. DMM must remain powered on.

** With offset nulling.

T_{cal} = temperature at which last external calibration was performed. NI factory calibration is 23 $^\circ\text{C} \pm 1^\circ\text{C}$.

Tempco = temperature coefficient.

DC Current \pm (ppm of reading + ppm of range)

| Range | Resolution | Burden Voltage (typical) | 24 Hr $T_{cal} \pm 1^\circ\text{C}$ | 90 Day $T_{cal} \pm 5^\circ\text{C}$ | 1 Year $T_{cal} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ 0 $^\circ\text{C}$ to 40 $^\circ\text{C}$ |
|--------|------------|-----------------------------|--|---|---|---|
| 10 mA | 10 nA | <60 mV | 50 + 100 | 300 + 200 | 500 + 200 | 30 + 20 |
| 100 mA | 100 nA | <0.6 V | 100 + 40 | 300 + 50 | 500 + 50 | 30 + 5 |
| 1 A | 1 μ A | <0.35 V | 500 + 60 | 800 + 100 | 1,000 + 100 | 40 + 10 |
| 3 A | 3 μ A | <1 V | 1,000* + 200 | 1,200* + 200 | 1,200* + 200 | 40 + 20 |

* Add 600 ppm/A of reading for currents above 2 A.

T_{cal} = temperature at which last external calibration was performed. NI factory calibration is 23 $^\circ\text{C} \pm 1^\circ\text{C}$.

Tempco = temperature coefficient.

Resistance* (4-Wire and 2-Wire) ± (ppm of reading + ppm of range)

| Range | Resolution | Nominal Test Current | 24 Hr [†] T _{cal} ±1 °C | 90 Day T _{cal} ±5 °C | 1 Year T _{cal} ±5 °C | Tempco/°C (0 °C to 40 °C) |
|---------------------|------------|----------------------|--|----------------------------------|----------------------------------|------------------------------|
| 100 Ω | 100 μΩ | 1 mA | 30 + 30 | 95 + 40 | 110 + 40 | 8 + 3 |
| 1 kΩ | 1 mΩ | 1 mA | 20 + 6 | 95 + 10 | 110 + 10 | 8 + 1 |
| 10 kΩ | 10 mΩ | 100 μA | 20 + 6 | 95 + 10 | 110 + 10 | 8 + 1 |
| 100 kΩ | 100 mΩ | 10 μA | 20 + 6 | 95 + 10 | 110 + 10 | 8 + 1 |
| 1 MΩ | 1 Ω | 5 μA | 20 + 10 | 110 + 12 | 125 + 12 | 10 + 1 |
| 10 MΩ [‡] | 10 Ω | 500 nA | 150 + 10 | 400 + 12 | 500 + 12 | 30 + 2 |
| 100 MΩ [‡] | 100 Ω | 500 nA/10 MΩ | 2,000 + 20 | 6,000 + 40 | 8,000 + 40 | 400 + 4 |

* Specifications are for 4-wire measurements. For 2-wire measurements perform offset nulling or add 200 mΩ to specification.

[†] Relative to external calibration source. DMM must remain powered on.

[‡] 2-wire resistance measurement only.

For relative humidity >80%, add 100 ppm/MΩ.

T_{cal} = temperature at which last external calibration was performed. NI factory calibration is 23 °C ± 1 °C.

Tempco = temperature coefficient.

Diode Test*

| Range | Resolution | Nominal Test Current | Accuracy |
|-------|------------|---------------------------|--|
| 10 V | 10 μV | 100 μA, 1 mA [†] | Add 50 ppm of range and 50 ppm of reading to 10 V DC voltage specifications. |

* Can be used to test p-n junctions, LEDs, or zener diodes up to 10 V.

[†] Up to 3.5 V measurement for 1 mA test current.

DC Functions General Specifications

Effective Common-Mode Rejection Ratio (CMRR)

(1 kΩ resistance in LO lead) >150 dB (DC, 50 Hz and
60 Hz ± 1%) second-order DC
noise rejection, 10 PLC aperture

Maximum 4-wire lead resistance Use the lesser of 10% of range
or 1 kΩ

Overrange 105% of range except
300 V and 3 A range

DC voltage input bias current <40 pA at 23 °C (typical)

AC Specifications

| Desired Bandwidth | Recommended Reading Rate | Resolution (Digits) |
|-------------------|--------------------------|---------------------|
| 10 Hz to 100 kHz | 1 S/s | 6½ |
| 100 Hz to 100 kHz | 10 S/s | 5½ |
| 500 Hz to 100 kHz | 100 S/s | 4½ |

AC System Speeds

Range or function change 10/s

Trigger latency <1 µs

Maximum trigger rate >2.5 kHz

AC Accuracy Specifications



Note All AC accuracy specifications apply to signal amplitudes greater than 2% of range.

AC Volts (% of reading + % of range)

| Range (Peak Voltage) | Frequency | 24 Hr $T_{cal} \pm 1 \text{ } ^\circ\text{C}$ | 90 Day $T_{cal} \pm 5 \text{ } ^\circ\text{C}$ | 1 Year $T_{cal} \pm 5 \text{ } ^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ (0 $^\circ\text{C}$ to 40 $^\circ\text{C}$) |
|--|---------------------|--|---|---|--|
| 200 mV (± 320 mV), 2 V (± 3.2 V), 20 V (± 32 V), 300 V (± 425 V) | 10 Hz to 40 Hz | 1.5 + 0.04 | 2 + 0.05 | 2 + 0.05 | 0.01 + 0.003 |
| | > 40 Hz to 20 kHz | 0.2 + 0.04 | 0.2 + 0.05 | 0.2 + 0.05 | 0.005 + 0.003 |
| | > 20 kHz to 50 kHz | 0.3 + 0.04 | 0.3 + 0.05 | 0.3 + 0.05 | 0.01 + 0.003 |
| | > 50 kHz to 100 kHz | 1.5 + 0.08 | 1.5 + 0.08 | 1.5 + 0.08 | 0.02 + 0.005 |
| T_{cal} = temperature at which last external calibration was performed. NI factory calibration is 23 $^\circ\text{C} \pm 1 \text{ } ^\circ\text{C}$. Tempco = temperature coefficient. | | | | | |

AC Current (% of reading +% of range)

| Range (Peak Current) | Frequency | 24 Hr $T_{cal} \pm 1\text{ }^{\circ}\text{C}$ | 90 Day $T_{cal} \pm 5\text{ }^{\circ}\text{C}$ | 1 Year $T_{cal} \pm 5\text{ }^{\circ}\text{C}$ | Tempco/ $^{\circ}\text{C}$ (0 $^{\circ}\text{C}$ to 40 $^{\circ}\text{C}$) |
|--|------------------|--|---|---|--|
| 10 mA (± 16 mA), 100 mA (± 160 mA), 500 mA (± 780 mA), 3 A (± 4.25 A) | 10 Hz to 40 Hz | 1.6 + 0.05 | 2.1 + 0.05 | 2.1 + 0.05 | 0.015 + 0.03 |
| | > 40 Hz to 5 kHz | 0.3 + 0.05 | 0.3 + 0.06 | 0.3 + 0.06 | 0.015 + 0.03 |

T_{cal} = temperature at which last external calibration was performed. NI factory calibration is 23 $^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$.
Tempco = temperature coefficient.

High Crest Factor Additional Error*

| Crest Factor | Additional Error (% of reading) |
|--------------|---------------------------------|
| 1–3 | 0.05% |
| 3–4 | 0.1% |
| 4–5 | 1% [†] |

* Applicable for non-sinewave signals up to the rated peak voltage/current or bandwidth.
[†] For frequencies above 2 kHz.

AC Functions General Specifications

Input impedance 10 M Ω in parallel with 200 pF

Input coupling AC coupling

Maximum Volt-Hertz product $>3 \times 10^7$ V-Hz

Maximum DC voltage component 250 V

CMRR

(1 k Ω resistance in LO lead) >70 dB (DC to 60 Hz)

Overrange 105% of range except
300 V, 3 A range

General Specifications

| | |
|--|---|
| Calibration interval | 1 year recommended |
| Input protection | |
| Resistance, Diode | Up to 300 V DC |
| DC V, AC V | Up to 300 V DC, 300 V AC _{rms} , 450 V AC peak |
| DC I and AC I..... | F 3.15 A 250 V Fast-Acting user-replaceable fuse |
| Maximum common-mode voltage..... | 300 V DC or AC _{rms} |
| Measurement Category | II |
| Input terminals | Gold-plated low-thermal EMF solid copper |
| Triggers | |
| Measurement complete trigger pulse width..... | 1 μ s, 3.3 V Logic output |
| Input trigger pulse width | 1 μ s, with <2 m cable |
| Samples per trigger..... | 1 to 2 billion |
| Trigger delay | 0 to 149 s |
| Power consumption | <5 W from PCI/PCI Express motherboard |
| Warm-up..... | 30 minutes to rated accuracy |
| Dimensions | One slot, PCI/PCI Express module; 8.9 cm \times 16 cm (3.5 in. \times 6.33 in.) |
| Weight | 325 g (11.5 oz) |



Note Refer to the *Read Me First: Safety and Radio-Frequency Interference* document for definitions of Measurement Categories and other safety information.

| | |
|---------------------------|---------|
| Impulse overvoltage | 2,500 V |
|---------------------------|---------|

Environment

Maximum altitude 2,000 m (at 25 °C ambient temperature)

Pollution Degree 2



Note The AUX I/O connector is not isolated. It is not referenced to your measurement circuit. It is referenced to the ground of your computer. The digital signals on this connector should not operate beyond -0.5 V to 5.5 V of your computer ground. The trigger signals are TTL-compatible.

Indoor use only.

Operating Environment

Ambient temperature range 0 °C to 40 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range Up to 95% at 40 °C

Storage Environment

Ambient temperature range -40 °C to 70 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range 5% to 95% noncondensing (Tested in accordance with IEC-60068-2-56.)

Safety

The NI 4065 meets the requirements of the following standards of safety and electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CAN/CSA-C22.2 No. 61010-1



Note For UL and other safety certifications, refer to the product label, or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



Note For EMC compliance, operate this device according to product documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.

National Instruments, NI, ni.com, and LabVIEW are trademarks of National Instruments Corporation. Refer to the *Terms of Use* section on ni.com/legal for more information about National Instruments trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your CD, or ni.com/patents.