

# NI 4065 Specifications

## 6½-Digit Digital Multimeter



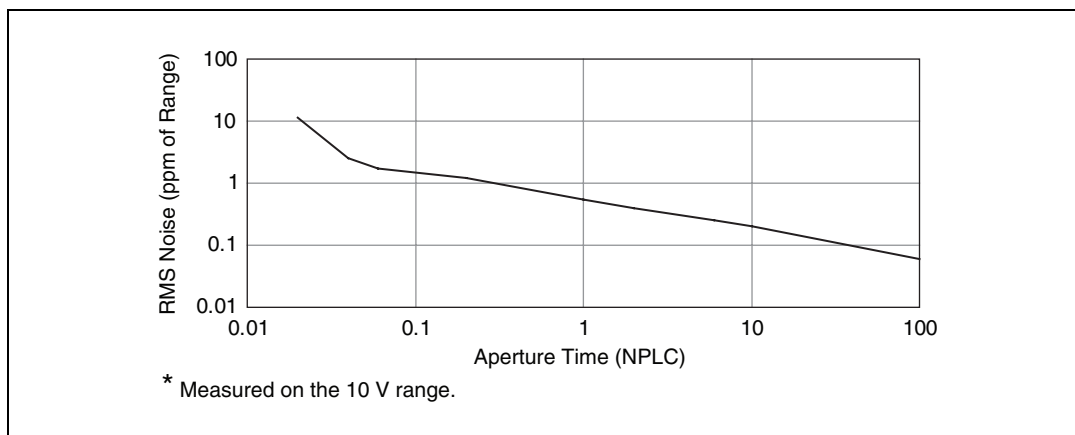
**Note** All specifications in this document are subject to change without notice. For the most current specifications, visit [ni.com/manuals](http://ni.com/manuals). All accuracy specifications apply to the 6½ digit resolution setting at 6 samples/second (S/s).

## 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  $\mu$ s

Maximum trigger rate ..... >2.5 kHz

## DC Accuracy Specifications

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

Range	Resolution	Input <sup>†</sup> Resistance	24 Hr <sup>‡</sup> $T_{cal} \pm 1\text{ }^{\circ}\text{C}$	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 $^{\circ}\text{C}$
100 mV**	100 nV	>10 G $\Omega$ , 10 M $\Omega$	30 + 30	60 + 35	90 + 35	5 + 2
1 V	1 $\mu$ V	>10 G $\Omega$ , 10 M $\Omega$	20 + 6	60 + 7	90 + 7	5 + 0.2
10 V	10 $\mu$ V	>10 G $\Omega$ , 10 M $\Omega$	15 + 4	60 + 5	90 + 5	5 + 0.2
100 V	100 $\mu$ V	10 M $\Omega$	20 + 6	70 + 6	110 + 6	6 + 0.2
300 V	1 mV	10 M $\Omega$	20 + 20	70 + 20	110 + 20	6 + 0.5

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

<sup>†</sup> Default input resistance is 10 M $\Omega$ .

<sup>‡</sup> Relative to external calibration source.

\*\* With offset nulling.

$T_{cal}$  = 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.

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

Range	Resolution	Burden Voltage (typical)	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	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 $\mu$ A	<0.35 V	500 + 60	800 + 100	1,000 + 100	40 + 10
3 A	3 $\mu$ 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  $^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ .

Tempco = temperature coefficient.

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

Range	Resolution	Nominal Test Current	24 Hr <sup>†</sup> T <sub>cal</sub> ± 1 °C	90 Day T <sub>cal</sub> ± 5 °C	1 Year T <sub>cal</sub> ± 5 °C	Tempco/°C (0 °C to 40 °C)
100 Ω	100 μΩ	1 mA	30 + 30	80 + 40	100 + 40	8 + 3
1 kΩ	1 mΩ	1 mA	20 + 6	80 + 10	100 + 10	8 + 1
10 kΩ	10 mΩ	100 μA	20 + 6	80 + 10	100 + 10	8 + 1
100 kΩ	100 mΩ	10 μA	20 + 6	80 + 10	100 + 10	8 + 1
1 MΩ	1 Ω	5 μA	20 + 10	100 + 10	120 + 10	10 + 1
10 MΩ <sup>‡</sup>	10 Ω	500 nA	150 + 10	400 + 10	500 + 10	30 + 2
100 MΩ <sup>‡</sup>	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.

<sup>†</sup> Relative to external calibration source.

<sup>‡</sup> 2-wire resistance measurement only.

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

T<sub>cal</sub> = 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 <sup>†</sup>	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.

<sup>†</sup> 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 ( $\pm 320$ mV), 2 V ( $\pm 3.2$ V), 20 V ( $\pm 32$ V), 300 V ( $\pm 425$ 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 ( $\pm 16$ mA), 100 mA ( $\pm 160$ mA), 500 mA ( $\pm 780$ mA), 3 A ( $\pm 4.25$ 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% <sup>†</sup>

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

## AC Functions General Specifications

Input impedance ..... 10 M $\Omega$  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 $\Omega$  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 <sub>rms</sub> , 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 <sub>rms</sub>
Measurement Category .....	II
Input terminals .....	Gold-plated low-thermal EMF solid copper
Triggers	
Measurement complete trigger pulse width.....	1 $\mu$ s, 3.3 V Logic output
Input trigger pulse width .....	1 $\mu$ 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
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# 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  $-0.5\text{ V}$  to  $5.5\text{ V}$  of your computer ground. The trigger signals are TTL-compatible.

Indoor use only.

## Operating Environment

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

Relative humidity range ..... Up to 95% at  $40\text{ °C}$

## Storage Environment

Ambient temperature range .....  $-40\text{ °C}$  to  $70\text{ °C}$  (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](http://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](http://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](http://ni.com/environment/weee.htm).

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