

# Low-Cost 6½-Digit Multimeters

## NI PXI-4065, NI PCI-4065, NI PCIe-4065, NI USB-4065 **NEW!**

- Basic 6½-digit digital multimeters (DMMs) for PXI, PCI, PCI Express, and USB
- 7 built-in measurement modes – AC/DC voltage, AC/DC current, 2- or 4-wire resistance, and diode test
- $\pm 300$  VDC/ $V_{rms}$  isolation
- 10 readings/s maximum at 6½ digits
- Ideally suited for OEMs, educational labs, and production test

*For increased accuracy, resolution, measurement speed, and functionality, consider NI 407x FlexDMM devices.*

<sup>1</sup>PXI-4065 only

### Operating Systems

- Windows Vista/XP/2000

### Recommended Software

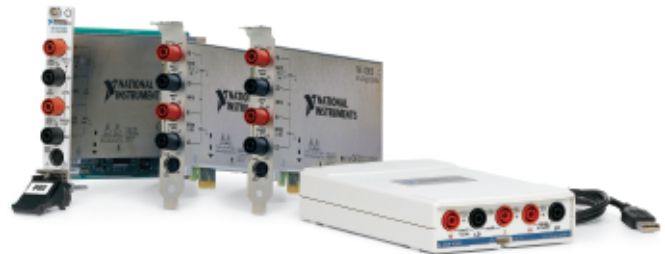
- LabVIEW
- LabVIEW Real-Time Module<sup>1</sup>
- LabWindows™/CVI
- Measurement Studio
- LabVIEW SignalExpress

### Other Compatible Software

- Microsoft Visual Basic
- C/C++

### Driver Software (included)

- NI-DMM
- NI-DMM Soft Front Panel
- DMM/Switch Express VI



## Overview

National Instruments 4065 devices are low-cost 6½-digit PXI, PCI, PCI Express, and USB DMMs for the measurement of voltage, current, and resistance, or for diode test. They are ideally suited for OEMs, educational laboratories, or other cost-conscious test and measurement facilities. With  $\pm 300$  VDC/ $V_{rms}$  of isolation, current measurements up to 3 A, and 2- or 4-wire resistance measurements, NI 4065 DMMs provide a complete multimeter solution for basic 6½-digit measurement needs.

For higher-performance requirements, consider using NI 407x PCI and PXI FlexDMM devices. They combine industry-leading accuracy and resolution at 6½ and 7½ digits with 1.8 MS/s digitizer capability for faster sampling rates in production test environments.

## Flexible Software Improves Usability

You can program NI 4065 DMMs through a standard application programming interface (API) in NI LabVIEW and LabWindows/CVI or Microsoft programming languages. For simple benchtop measurements, the NI-DMM Soft Front Panel provides the common display and interface found on traditional DMMs to make simple measurements quickly and easily. When combined with switches, the DMM/Switch Express VI can rapidly develop a high-channel-count data-logging system with a single function call in LabVIEW. In LabVIEW SignalExpress, the DMM/Switch Express VI sets up a live data logger without any programming.

## Efficient Mixture of Accuracy, Resolution, and Speed

NI 4065 DMMs offer 6½ digits of resolution at up to 10 readings/s and up to 3000 readings/s at lower resolutions. By trading off speed for resolution, you can maximize measurement quality and throughput. NI 4065 DMMs also offer comparable accuracy over a 24-hour cycle or one year of an external calibration to other GPIB, LAN, or USB-based

| Digits | Resolution (bits) | Reading Rate (S/s) |
|--------|-------------------|--------------------|
| 6½     | 22                | 10                 |
| 5½     | 18                | 1500               |
| 4½     | 15                | 3000               |

Table 1. NI 4065 Reading Rates versus Resolution

6½-digit DMMs on the market. With an NI 4065, there is no need to sacrifice basic measurement quality for a low selling price.

For higher resolution, accuracy, or speed, consider using one of the NI 407x 6½-digit FlexDMM devices. The PCI-4070 can accurately measure 100 readings/s at 6½ digits with 31 ppm of DC voltage accuracy over a two-year period. This represents a 3X improvement over the NI 4065 DMMs for accuracy and noise. The PXI-4071 is also available with measurements at 7½ digits up to 1000 V. For more information on the complete line of National Instruments DMMs, visit [ni.com/multimeters](http://ni.com/multimeters).

Low-Cost 6½-Digit Multimeters

Integration with Switching

NI PXI-4065

You can easily combine the NI PXI-4065 DMM with NI PXI switches in the low-cost NI PXI-1033 integrated chassis and controller to create high-channel-count, 6½-digit data-logging systems with up to 588 channels. You can configure these systems, controllable from any PCI Express or ExpressCard slot on a PC or laptop computer, with more than 100 available PXI switch topologies. For further system expansion, you can add more than 3,000 channels with each additional 18-slot PXI chassis.

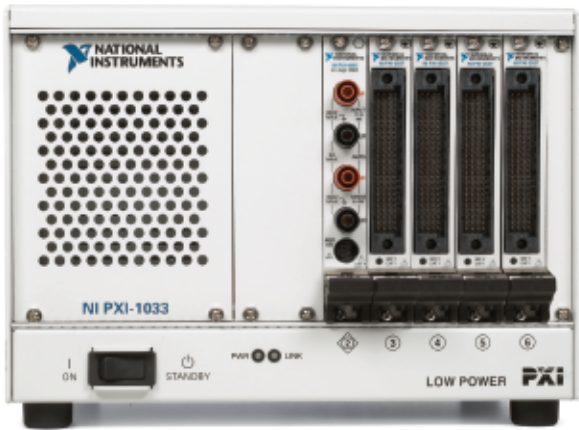


Figure 1. Expand channel count with PXI switching.

NI USB-4065, PCI-4065 and PCIe-4065

You can integrate NI 4065 DMMs with stand-alone switching using the 4- or 12-slot USB Switch Mainframes from National Instruments. You can configure these switch systems, controllable from any available USB port on a PC or laptop computer, with more than 50 available SCXI switch topologies. For existing SCXI switch systems, the NI 4065 DMMs can also provide control via the AUX connector on the front of the DMM. Switching offers a simple method of channel expansion for data-logging systems based on an NI 4065.



Figure 2. Expand channel count with USB-controlled switching.



Figure 3. Use the USB-4065 with USB-controlled switching for a complete DMM/switch solution.

Ordering Information

|                   |           |
|-------------------|-----------|
| NI PXI-4065.....  | 780011-01 |
| NI PCI-4065.....  | 779770-01 |
| NI PCIe-4065..... | 779771-01 |
| NI USB-4065.....  | 780152-01 |

*Includes the standard P-1 probe set and NI-DMM software.*

Accessories for PXI

|                                                                                                  |           |
|--------------------------------------------------------------------------------------------------|-----------|
| NI PXI-1033 (chassis and integrated MXI Express controller, 1 PXI Express port, 3 m cable) ..... | 779756-01 |
| NI PXI-2527 (300 V, 64-channel multiplexer) .....                                                | 778572-27 |

Accessories for USB, PCI, and PCI Express

|                                                   |           |
|---------------------------------------------------|-----------|
| NI USB Switch Mainframe (4-slot) .....            | 778570-01 |
| NI SCXI-1127 (300 V, 64-channel multiplexer)..... | 776572-27 |

General Accessories

|                                                |           |
|------------------------------------------------|-----------|
| P-1 Probe Set (standard).....                  | 761000-01 |
| P-2 Probe Set (additional connectors) .....    | 184698-01 |
| P-3 Probe Set (banana plug to bare wire) ..... | 185692-01 |
| CSM-10 A (10 A current shunt) .....            | 777488-02 |

BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to [ni.com/multimeters](http://ni.com/multimeters).

## Low-Cost 6½-Digit Multimeters

### Specifications

#### DC Specifications

| Resolution (Digits) | Reading Rate <sup>1</sup> (S/s) | Aperture Time (NPLC) | RMS Noise <sup>2</sup> (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                                  |

<sup>1</sup> Specified for 60 Hz and (50 Hz) operation

<sup>2</sup> Measured on the 10 V range

#### DC Voltage ± (ppm of reading + ppm of range)<sup>1</sup>

| Range               | Resolution | Input Resistance <sup>4</sup> | 24-Hour <sup>2</sup> , T <sub>cal</sub> ±1 °C | 90-Day, T <sub>cal</sub> ±5 °C | 1-Year, T <sub>cal</sub> ±5 °C | Tempco (0 to 55 °C) |
|---------------------|------------|-------------------------------|-----------------------------------------------|--------------------------------|--------------------------------|---------------------|
| 100 mV <sup>3</sup> | 100 nV     | >10 GΩ, 10 MΩ                 | 30 + 30                                       | 65 + 35                        | 90 + 35                        | 5 + 2               |
| 1 V                 | 1 µV       | >10 GΩ, 10 MΩ                 | 20 + 6                                        | 65 + 7                         | 90 + 7                         | 5 + 0.2             |
| 10 V                | 10 µV      | >10 GΩ, 10 MΩ                 | 15 + 5                                        | 65 + 6                         | 90 + 6                         | 5 + 0.2             |
| 100 V               | 100 µV     | 10 MΩ                         | 20 + 6                                        | 75 + 7                         | 110 + 7                        | 6 + 0.2             |
| 300 V               | 1 mV       | 10 MΩ                         | 20 + 20                                       | 75 + 20                        | 110 + 20                       | 6 + 0.5             |

<sup>1</sup>ppm (part per million) = 0.0001%

<sup>2</sup>Relative to external calibration source

<sup>3</sup>With offset nulling

<sup>4</sup>Default input resistance is 10 MΩ

T<sub>cal</sub> = temperature at which last external calibration was performed NI factory calibration is 23 °C ± 1 °C

Tempco = temperature coefficient

#### DC Current ± (ppm of reading + ppm of range)

| Range  | Resolution | Burden Voltage (typical) | 24-Hour <sup>2</sup> , T <sub>cal</sub> ±1 °C | 90-Day, T <sub>cal</sub> ±5 °C | 1-Year, T <sub>cal</sub> ±5 °C | Tempco (0 to 55 °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 µA       | <0.35 V                  | 500 + 60                                      | 800 + 100                      | 1000 + 100                     | 65 + 10             |
| 3 A    | 3 µA       | <1 V                     | 1000 <sup>1</sup> + 200                       | 1200 <sup>1</sup> + 200        | 1200 <sup>1</sup> + 200        | 65 + 20             |

<sup>1</sup>Add 650 ppm/A of reading for currents above 1.5 A

<sup>2</sup>Relative to external calibration source

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

| Range  | Resolution | Test Current    | 24-Hour <sup>1</sup> , T <sub>cal</sub> ±1 °C | 90-Day, T <sub>cal</sub> ±5 °C | 1-Year, T <sub>cal</sub> ±5 °C | Tempco (0 to 55 °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 | 2000 + 20                                     | 6000 + 40                      | 8000 + 40                      | 400 + 4             |

<sup>1</sup>Relative to external calibration source

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

#### Diode Test<sup>1</sup>

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

<sup>1</sup>Can be used to test p-n junctions, LEDs, or zener diodes up to 10 V=

## Low-Cost 6½-Digit Multimeters

### DC Functions General Specifications

Effective common-mode rejection ratio (CMRR)

(1 k $\Omega$  resistance in LO lead)..... >150 dB (DC, 50 and 60 Hz  $\pm$  1%) with second-order DC noise rejection, 10 PLC aperture

Maximum 4-wire lead resistance..... Use the lesser of 10% of range or 1 k $\Omega$

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

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

### AC Specifications

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

### AC Voltage $\pm$ (% of reading + % of range)

| Range (Peak Voltage)   | Frequency        | 24-Hour, $T_{cal} \pm 1^\circ\text{C}$ | 90-Day, $T_{cal} \pm 5^\circ\text{C}$ | 1-Year, $T_{cal} \pm 5^\circ\text{C}$ | Tempco (0 to 55 °C) |
|------------------------|------------------|----------------------------------------|---------------------------------------|---------------------------------------|---------------------|
| 200 mV ( $\pm 320$ mV) | 10 to 40 Hz      | 1.5 + 0.04                             | 2 + 0.05                              | 2 + 0.05                              | 0.01 + 0.003        |
| 2 V ( $\pm 3.2$ V)     | >40 Hz to 20 kHz | 0.2 + 0.04                             | 0.2 + 0.05                            | 0.2 + 0.05                            | 0.005 + 0.003       |
| 20 V ( $\pm 32$ V)     | >20 to 50 kHz    | 0.3 + 0.04                             | 0.3 + 0.05                            | 0.3 + 0.05                            | 0.01 + 0.003        |
| 300 V ( $\pm 425$ V)   | >50 to 100 kHz   | 1.5 + 0.08                             | 1.5 + 0.08                            | 1.5 + 0.08                            | 0.02 + 0.005        |

Tempco = temperature coefficient

### AC Current $\pm$ (% of reading + % of range)

| Range (Peak Current)   | Frequency       | 24-Hour, $T_{cal} \pm 1^\circ\text{C}$ | 90-Day, $T_{cal} \pm 5^\circ\text{C}$ | 1-Year, $T_{cal} \pm 5^\circ\text{C}$ | Tempco (0 to 55 °C) |
|------------------------|-----------------|----------------------------------------|---------------------------------------|---------------------------------------|---------------------|
| 10 mA ( $\pm 15$ mA)   | 10 to 40 Hz     | 1.6 + 0.05                             | 2.1 + 0.05                            | 2.1 + 0.05                            | 0.015 + 0.03        |
| 100 mA ( $\pm 150$ mA) | >40 Hz to 5 kHz | 0.3 + 0.05                             | 0.3 + 0.06                            | 0.3 + 0.06                            | 0.015 + 0.03        |
| 500 mA ( $\pm 750$ mA) |                 |                                        |                                       |                                       |                     |
| 3 A ( $\pm 4.2$ A)     |                 |                                        |                                       |                                       |                     |

Tempco = temperature coefficient

### High Crest Factor Additional Error<sup>1</sup>

| Crest Factor | Additional Error (% of reading) |
|--------------|---------------------------------|
| 1 to 3       | 0.05%                           |
| 3 to 4       | 0.1%                            |
| 4 to 5       | 1% <sup>2</sup>                 |

<sup>1</sup>Applicable for non-sine wave signals up to the rated peak voltage/current or bandwidth

<sup>2</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 x 10<sup>7</sup> 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

External calibration interval ..... 1 year recommended

Input protection

Resistance, diode ..... Up to 300 VDC

DC V, AC V ..... Up to 300 VDC, 300 V<sub>rms</sub>, 450 V<sub>p</sub>

DC I and AC I ..... F 3.15 A 250 V fast-acting fuse, user-replaceable

## Low-Cost 6½-Digit Multimeters

---

|                                   |                                                                                                                                                                                                                                     |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum common-mode voltage ..... | 300 VDC or $V_{rms}$                                                                                                                                                                                                                |
| Input terminals.....              | Gold-plated low-thermal emf solid copper                                                                                                                                                                                            |
| Dimensions .....                  | PXI: 3U, 1 slot, PXI/CompactPCI module; 21.6 by 2.0 by 13.0 cm (8.5 by 0.8 by 5.1 in.)<br>PCI/PCI Express: 1 slot, PCI or PCI Express board; 18.3 by 12 cm (7.2 by 4.72 in.)<br>USB: 17.8 by 10.4 by 3.3 cm (7.0 by 4.1 by 1.3 in.) |
| Operating temperature .....       | PXI: 0 to 55 °C; PCI/PCI Express: 0 to 40 °C; USB: 0 to 45°C                                                                                                                                                                        |
| Storage temperature.....          | -40 to 70 °C                                                                                                                                                                                                                        |
| Relative humidity .....           | Up to 95% at 40 °C                                                                                                                                                                                                                  |
| Measurement category.....         | CAT II                                                                                                                                                                                                                              |
| Pollution degree.....             | 2                                                                                                                                                                                                                                   |
| Approved at altitudes .....       | Up to 2000 m                                                                                                                                                                                                                        |

### Safety

An 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, CSA 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:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; 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).

# NI Services and Support



NI has the services and support to meet your needs around the globe and through the application life cycle — from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit [ni.com/services](http://ni.com/services).

## Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit [ni.com/training](http://ni.com/training).

## Professional Services

Our Professional Services Team is composed of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and

integrators. Services range from start-up assistance to turnkey system integration.

Visit [ni.com/alliance](http://ni.com/alliance).



## OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit [ni.com/oem](http://ni.com/oem).

## Local Sales and Technical Support

In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at [ni.com/support](http://ni.com/support).

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit [ni.com/ssp](http://ni.com/ssp).

## Hardware Services

### NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with [ni.com/pxiadvisor](http://ni.com/pxiadvisor).

### Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

### Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit [ni.com/services](http://ni.com/services).



[ni.com](http://ni.com) • 800 813 3693

National Instruments • [info@ni.com](mailto:info@ni.com)



351556A-01

2007-8778-101-D