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CSM-10A

SPECIFICATIONS

NI PXI/PCI-4060

This document lists the specifications of the NI PXI/PCI-4060. These specifications are guaranteed between 15 and 35 °C unless otherwise specified.

DC Voltage

Accuracy

(% of reading ± µV)

Range	24 Hour (25 °C ± 1 °C)	90 Day (25 °C ± 10 °C)	1 Year (25 °C ± 10 °C)	Tempco (% of reading/°C ± µV/°C)
250 V*	0.0032% ± 1.25 mV	0.021% ± 1.25 mV	0.024% ± 1.25 mV	0.0017% ± 480 µV
25 V	0.0032% ± 1 mV	0.021% ± 1 mV	0.024% ± 1 mV	0.0017% ± 480 µV
2 V	0.0029% ± 10 µV	0.014% ± 10 µV	0.017% ± 10 µV	0.0009% ± 5 µV
200 mV	0.0029% ± 6 µV	0.014% ± 6 µV	0.017% ± 6 µV	0.0009% ± 1 µV
20 mV	0.0029% ± 6 µV	0.014% ± 6 µV	0.017% ± 6 µV	0.0009% ± 1 µV

Accuracy numbers are for 5 1/2 digits with autozero on and include the effects of full-scale and zero-scale errors, temperature variation, linearity, and noise.

* The NI 4060 can overrange to 300 V.

Noise Rejection

NMRR
(10 Hz filter setting, 50/60 Hz
powerline frequency ±1%) ..... 80 dB

DC ECMRR
(with a 1 kΩ imbalance in HI lead) ..... 140 dB

AC ECMR (RDC to 50/60 Hz)
(with a 1 kΩ imbalance in HI lead) ..... 150 dB

Input Characteristics

Input bias current ..... 1 nA max

Input resistance ..... >1 GΩ (2 V, 200 mV, 20 mV ranges);
1 MΩ (250 V, 25 V)

NATIONAL INSTRUMENTS

DC Current

Accuracy

(% of reading ± µA)

Range	24 Hour (25 °C ± 1 °C)	90 Day (25 °C ± 10 °C)	1 Year (25 °C ± 10 °C)	Tempco (% of reading/°C ± µA/°C)
20 mA	0.015% ± 10 µA	0.039% ± 10 µA	0.042% ± 10 µA	0.0035% ± 1 µA
200 mA	0.015% ± 10 µA	0.039% ± 10 µA	0.042% ± 10 µA	0.0035% ± 1 µA
10 A*	0.11% ± 1 mA	0.035% ± 2 mA	0.0035% ± 2 mA	0.007% ± 0.1 mA

Accuracy numbers are for 5 1/2 digits with autozero on and include the effects of full-scale and zero-scale errors, temperature variation, linearity, and noise.

* Requires 10 A shunt, CSM-10A.

Input Characteristics

Maximum input.....200 mA/250 V

Input protection.....Fuse F1 500 mA/250 V fast fusing

Shunt resistor .....1 Ω

Burden voltage.....<400 mV at 200 mA DC

AC Voltage

Accuracy

(% of reading ± mV)

Range	24 Hour (25 °C ± 1 °C)	90 Day (25 °C ± 10 °C)	1 Year (25 °C ± 10 °C)	Tempco (% of reading/°C ± mV/°C)
250 V*	0.70% ± 500 mV	0.70% ± 680 mV	0.70% ± 680 mV	0.007% ± 20 mV
25 V	0.16% ± 30 mV	0.18% ± 210 mV	0.18% ± 210 mV	0.007% ± 20 mV
2 V	0.28% ± 3 mV	0.30% ± 21 mV	0.30% ± 21 mV	0.019% ± 2 mV
200 mV	0.16% ± 0.22 mV	0.18% ± 1.20 mV	0.18% ± 1.20 mV	0.007% ± 0.110 mV
20 mV	0.28% ± 100 µV	0.30% ± 170 µV	0.30% ± 170 µV	0.019% ± 12 µV

Accuracy numbers are for 5 1/2 digits and include the effects of full-scale and zero-scale errors, temperature variation, linearity, and noise, applies for sine waves ≥10% of input range. Accuracy may be affected by source impedance, cable capacitances dielectric absorption, or slew rate.

* The NI 4060 can overrange to 300 V.

Noise Rejection

AC CMRR at 50/60 Hz
(with a 1 kΩ imbalance in HI lead) ..... >80 dB

Input Characteristics

Input resistance ..... 1 MΩ

Bandwidth..... 20 Hz-25 kHz

Additional AC Errors

Frequency-dependent errors

Input Frequency	Additional Error (% of Full-Scale)
20 Hz-50 Hz	2.5%
50 Hz-100 Hz	0%
100 Hz-20 kHz	1%
20 kHz-25 kHz	2.5%

AC Current

Accuracy

(% of reading ± mA)

Range	24 Hour (25 °C ± 1 °C)	90 Day (25 °C ± 10 °C)	1 Year (25 °C ± 10 °C)	Tempco (% of reading/°C ± mA/°C)
200 mA	0.18% ± 0.22 mA	0.20% ± 1.2 mA	0.20% ± 1.2 mA	0.009% ± 0.110 mA
20 mA	0.30% ± 100 µA	0.32% ± 170 µA	0.32% ± 170 µA	0.022% ± 12 µA
10 A*	0.3% ± 22 mA	0.32% ± 120 mA	0.32% ± 120 mA	0.026% ± 11 mA

Accuracy numbers are for 5 1/2 digits and include the effects of full-scale and zero-scale errors, temperature variation, linearity, and noise.

* Requires 10 A shunt, CSM-10A.

Input Characteristics

Maximum input ..... 200 mA/250 V

Input protection..... Fuse F1 500 mA/250 V fast fusing

Shunt resistor ..... 1 Ω

Burden voltage..... <400 mV at 200 mA AC

Resistance

Accuracy

(% of reading ± Ω)

Range	24 Hour (25 °C ± 1 °C)	90 Day (25 °C ± 10 °C)	1 Year (25 °C ± 10 °C)	Tempco (% of reading/°C ± Ω/°C)
Extended resistance (> 2 MΩ)	0.1% ± 6 kΩ	0.1% ± 60 kΩ	0.1% ± 60 kΩ	0.0072% ± 6 kΩ
2 MΩ*	0.012% ± 9 Ω	0.077% ± 27 Ω	0.080% ± 27 Ω	0.0072% ± 2 Ω
200 kΩ	0.012% ± 5 Ω	0.077% ± 22 Ω	0.080% ± 22 Ω	0.0072% ± 2 Ω
20 kΩ	0.006% ± 0.09 Ω	0.024% ± 0.3 Ω	0.027% ± 0.3 Ω	0.0020% ± 0.02 Ω
2 kΩ	0.006% ± 0.05 Ω	0.024% ± 0.2 Ω	0.027% ± 0.2 Ω	0.0020% ± 0.02 Ω
200 Ω	0.006% ± 0.05 Ω	0.024% ± 0.2 Ω	0.027% ± 0.2 Ω	0.0020% ± 0.02 Ω

Accuracy numbers are for the 4-wire resistance measurements 5 1/2 digits with autozero on and include the effects of full-scale and zero-scale errors, temperature variation, linearity, and noise.

* With autozero on or while scanning, and when large resistance with capacitive loads is measured, additional delay time is required.

Measurement modes

Resistance ..... 2-wire or 4-wire resistance

Extended resistance..... 2-wire resistance only

Maximum lead resistance ..... 10 Ω (200 Ω range);
1 kΩ (all other ranges)

Test current..... 100 µA for 200 Ω, 2 kΩ,
20 kΩ ranges;
1 ΩA for 2 MΩ, 200 kΩ ranges;
1 µA and 1 MΩ in parallel for extended resistance measurements

Additional error for 2-wire resistance..... 0.6 Ω

Diode Testing

Accuracy

(% of reading ± µV)

Range	24 Hour (25 °C ± 1 °C)	90 Day (25 °C ± 10 °C)	1 Year (25 °C ± 10 °C)	Tempco (% of reading/°C ± µV/°C)
2 V	0.006% ± 7 µV	0.024% ± 22 µV	0.027% ± 22 µV	0.0020% ± 2 µV
Accuracy numbers are for 5 1/2 digits and include the effects of full-scale and zero-scale errors, temperature variation, linearity, and noise.				

Test current ..... 100 µA

General Specifications

Settling time ..... Affected by source impedance and input signal changes

Warm-up time ..... 30 minutes for measurements accurate within specifications

Bus type

- PCI ..... Slave
- PXI ..... Slave
- CompactPCI ..... Slave

Altitude ..... Up to 2,000 m; at higher altitudes the installation category must be derated

Working voltage ..... 300 V maximum between either input terminal and earth ground

Power requirement ..... +5 VDC, 250 mA in operational mode

Physical

Dimensions

- PCI ..... 10.8 by 17.5 cm (4.25 by 6.9 in.)
- PXI ..... 10 by 16 cm (3.9 by 6.33 in.)

Environment

Operating temperature ..... 0 to 55 °C

Storage temperature ..... -20 to 70 °C

Relative humidity ..... 10 to 90% noncondensing

Compliance and Certifications

Safety

This product meets the requirements of the following standards of safety for 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 the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Caution When operating this product, use shielded cables and accessories.

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations and certifications, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

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