

# SPECIFICATIONS FOR THE NI PCMCIA-4050

This document lists the specifications of the NI PCMCIA-4050. These specifications are guaranteed between 15 and 35 °C unless otherwise specified.

## DC Voltage

Accuracy (% of reading  $\pm$   $\mu$ V)

| Range  | 24 Hour<br>(25 °C $\pm$ 1 °C) | 90 Day<br>(25 °C $\pm$ 10 °C) | 1 Year<br>(25 °C $\pm$ 10 °C) | Tempco<br>(% of Reading/ $^{\circ}$ C $\pm$ $\mu$ V/ $^{\circ}$ C) |
|--------|-------------------------------|-------------------------------|-------------------------------|--|
| 250 V  | 0.0032% $\pm$ 4.9 mV          | 0.021% $\pm$ 49 mV            | 0.024% $\pm$ 49 mV            | 0.0017% $\pm$ 4800 $\mu$ V   |
| 25 V   | 0.0032% $\pm$ 4.9 mV          | 0.021% $\pm$ 49 mV            | 0.024% $\pm$ 49 mV            | 0.0017% $\pm$ 4800 $\mu$ V   |
| 2 V    | 0.0029% $\pm$ 37 $\mu$ V      | 0.014% $\pm$ 260 $\mu$ V      | 0.017% $\pm$ 260 $\mu$ V      | 0.0009% $\pm$ 25 $\mu$ V   |
| 200 mV | 0.0029% $\pm$ 27 $\mu$ V      | 0.014% $\pm$ 250 $\mu$ V      | 0.017% $\pm$ 250 $\mu$ V      | 0.0009% $\pm$ 25 $\mu$ V   |
| 20 mV  | 0.0029% $\pm$ 27 $\mu$ V      | 0.014% $\pm$ 250 $\mu$ V      | 0.017% $\pm$ 250 $\mu$ V      | 0.0009% $\pm$ 25 $\mu$ V   |

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

## Noise Rejection

NMRR (10 Hz reading rate, 50/60 Hz  
powerline frequency  $\pm$ 1%)..... 80 dB

DC ECMRR ..... 140 dB (with a 1 k $\Omega$  imbalance  
in LO lead)

AC ECMR (RDC to 60 Hz) ..... 150 dB (with a 1 k $\Omega$  imbalance  
in LO lead)

## Input Characteristics

Input bias current ..... 1 nA max

Input resistance ..... >1 G $\Omega$  (2 V, 200 mV,  
20 mV ranges);  
1 M $\Omega$  (250 V, 25 V)

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# DC Current

DC current measurements require the use of the CSM current shunt modules.

Accuracy (% of reading  $\pm \mu\text{A}$ )

| Range   | 24 Hour<br>(25 °C $\pm$ 1 °C) | 90 Day<br>(25 °C $\pm$ 10 °C) | 1 Year<br>(25 °C $\pm$ 10 °C) | Tempco<br>(% of Reading/ $^{\circ}\text{C} \pm \mu\text{A}/^{\circ}\text{C}$ ) |
|---------|-------------------------------|-------------------------------|-------------------------------|--|
| 200 mA* | 0.1% $\pm$ 27 $\mu\text{A}$   | 0.14% $\pm$ 250 $\mu\text{A}$ | 0.15% $\pm$ 250 $\mu\text{A}$ | 0.0035% $\pm$ 25 $\mu\text{A}$   |
| 20 mA*  | 0.1% $\pm$ 27 $\mu\text{A}$   | 0.14% $\pm$ 250 $\mu\text{A}$ | 0.15% $\pm$ 250 $\mu\text{A}$ | 0.0035% $\pm$ 25 $\mu\text{A}$   |
| 10 A**  | 0.02% $\pm$ 4 mA              | 0.035% $\pm$ 26 mA            | 0.035% $\pm$ 26 mA            | 0.007% $\pm$ 2.5 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 200 mA shunt, CSM-200mA.

\*\* Requires 10 A shunt, CSM-10A.

## Input Characteristics

200 mA shunt

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

Shunt resistor.....1  $\Omega$

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

10 A shunt

Input protection .....Fuse F1 12.5 A/250 V fast fusing

Shunt resistor.....10 m $\Omega$

Burden voltage.....<300 mV at 10 A

# AC Voltage

Accuracy (% of reading  $\pm$  mV)

| Range  | 24 Hour<br>(25 °C $\pm$ 1 °C) | 90 Day<br>(25 °C $\pm$ 10 °C) | 1 Year<br>(25 °C $\pm$ 10 °C) | Tempco<br>(% of Reading/ $^{\circ}$ C $\pm$ mV/ $^{\circ}$ C) |
|--------|-------------------------------|-------------------------------|-------------------------------|---|
| 250 V  | 0.6% $\pm$ 500 mV             | 0.62% $\pm$ 680 mV            | 0.62% $\pm$ 680 mV            | 0.007% $\pm$ 20 mV  |
| 25 V   | 0.3% $\pm$ 30 mV              | 0.32% $\pm$ 210 mV            | 0.32% $\pm$ 210 mV            | 0.007% $\pm$ 20 mV  |
| 2 V    | 0.4% $\pm$ 3 mV               | 0.42% $\pm$ 21 mV             | 0.42% $\pm$ 21 mV             | 0.019% $\pm$ 2 mV   |
| 200 mV | 0.3% $\pm$ 0.22 mV            | 0.32% $\pm$ 1.20 mV           | 0.32% $\pm$ 1.20 mV           | 0.007% $\pm$ 0.110 mV   |
| 20 mV  | 0.4% $\pm$ 100 $\mu$ V        | 0.42% $\pm$ 170 $\mu$ V       | 0.42% $\pm$ 170 $\mu$ V       | 0.019% $\pm$ 12 $\mu$ V                                       |

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  $\geq$ 10% of input range. Accuracy may be affected by source impedance, cable capacitances dielectric absorption, or slew rate.

## Noise Rejection

AC CMRR (DC to 60 Hz)..... >80 dB (with a 1 k $\Omega$  imbalance in LO lead)

## Input Characteristics

Input resistance ..... 1 M $\Omega$  all ranges

Bandwidth ..... 20 Hz–25 kHz

## Additional AC Errors

Frequency-dependent errors

| Input Frequency | Additional Error (% of Reading) |
|-----------------|---------------------------------|
| 20 Hz–50 Hz     | 2.5%                            |
| 50 Hz–100 Hz    | 1%                              |
| 100 Hz–5 kHz    | 0%                              |
| 5 Hz–10 kHz     | 1%                              |
| 10 kHz–25 kHz   | 2.5%                            |

## AC Current

AC current measurements require the use of the CSM current shunt module.

Accuracy (% of reading  $\pm$  mA)

| Range   | 24 Hour<br>(25 °C $\pm$ 1 °C) | 90 Day<br>(25 °C $\pm$ 10 °C) | 1 Year<br>(25 °C $\pm$ 10 °C) | Tempco<br>(% of Reading/ $^{\circ}$ C $\pm$ mA/ $^{\circ}$ C) |
|---------|-------------------------------|-------------------------------|-------------------------------|---|
| 200 mA* | 0.45% $\pm$ 0.22 mA           | 0.47% $\pm$ 1.2 mA            | 0.47% $\pm$ 1.2 mA            | 0.007% $\pm$ 0.110 mA   |
| 20 mA*  | 0.35% $\pm$ 110 $\mu$ A       | 0.37% $\pm$ 170 $\mu$ A       | 0.37% $\pm$ 170 $\mu$ A       | 0.019% $\pm$ 0.120 mA   |
| 10 A**  | 0.3% $\pm$ 22 mA              | 0.32% $\pm$ 120 mA            | 0.32% $\pm$ 120 mA            | 0.026% $\pm$ 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 200 mA shunt, CSM-200mA.

\*\* Requires 10 A shunt, CSM-10A.

## Input Characteristics

200 mA shunt

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

Shunt resistor.....1  $\Omega$

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

10 A shunt

Input protection .....Fuse F1 12.5 A/250 V fast fusing

Shunt resistor.....10 m $\Omega$

Burden voltage.....<300 mV at 10 A

## Resistance

Accuracy (% of reading  $\pm$   $\Omega$ )

| Range                                    | 24 Hour<br>(25 °C $\pm$ 1 °C) | 90 Day<br>(25 °C $\pm$ 10 °C) | 1 Year<br>(25 °C $\pm$ 10 °C) | Tempco<br>(% of Reading/ $^{\circ}$ C $\pm$ $\Omega$ / $^{\circ}$ C) |
|--|-------------------------------|-------------------------------|-------------------------------|--|
| Extended resistance<br>(> 2 M $\Omega$ ) | 0.1% $\pm$ 6 k $\Omega$       | 0.1% $\pm$ 60 k $\Omega$      | 0.1% $\pm$ 60 k $\Omega$      | 0.0072% $\pm$ 6 k $\Omega$   |
| 2 M $\Omega$                             | 0.012% $\pm$ 55 $\Omega$      | 0.077% $\pm$ 370 $\Omega$     | 0.080% $\pm$ 20 $\Omega$      | 0.0072% $\pm$ 35 $\Omega$  |
| 200 k $\Omega$                           | 0.012% $\pm$ 37 $\Omega$      | 0.077% $\pm$ 350 $\Omega$     | 0.080% $\pm$ 2 $\Omega$       | 0.0072% $\pm$ 35 $\Omega$  |
| 20 k $\Omega$                            | 0.006% $\pm$ 0.5 $\Omega$     | 0.024% $\pm$ 4 $\Omega$       | 0.027% $\pm$ 4 $\Omega$       | 0.0020% $\pm$ 0.40 $\Omega$  |

| Range | 24 Hour<br>(25 °C ± 1 °C) | 90 Day<br>(25 °C ± 10 °C) | 1 Year<br>(25 °C ± 10 °C) | Tempco<br>(% of Reading/°C ± Ω/°C) |
|-------|---------------------------|---------------------------|---------------------------|------------------------------------|
| 2 kΩ  | 0.006% ± 0.4 Ω            | 0.024% ± 4 Ω              | 0.027% ± 4 Ω              | 0.0020% ± 0.40 Ω                   |
| 200 Ω | 0.006% ± 0.4 Ω            | 0.024% ± 4 Ω              | 0.027% ± 4 Ω              | 0.0020% ± 0.40 Ω                   |

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

Measurement mode ..... 2-wire resistance

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

## Diode Testing

Accuracy (% of reading ± μV)

| Range | 24 Hour<br>(25 °C ± 1 °C) | 90 Day<br>(25 °C ± 10 °C) | 1 Year<br>(25 °C ± 10 °C) | Tempco<br>(% of Reading/°C ± μV/°C) |
|-------|---------------------------|---------------------------|---------------------------|-------------------------------------|
| 2 V   | 0.006% ± 60 μV            | 0.024% ± 400 μV           | 0.027% ± 400 μV           | 0.002% ± 40 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..... PCMCIA, slave

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

Working voltage..... 250 V maximum between either input terminal and earth ground

Power requirement ..... +5 VDC, 45 mA in operational mode

## Safety

Designed in accordance with IEC 1010-1 and UL 3111 for electrical measuring and testing equipment. Double insulated. Indoor use only. UL 3111 listed

Installation Category.....II

Pollution Degree .....2

## Physical

Dimensions .....Type II PC Card

## Environment

Operating temperature .....0 to 55 °C

Storage temperature .....-20 to 70 °C

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