

# Test Equipment Solutions Datasheet

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# SPECIFICATIONS

# PXIe-4081

PXIe, 7½-Digit, ±1,000 V, Onboard 1.8 MS/s Isolated Digitizer, PXI Digital Multimeter

These specifications apply to the PXIe-4081.

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## Definitions

*Warranted* specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.



*Characteristics* describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- *Typical* specifications describe the performance met by a majority of models.
- *Nominal* specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are *Warranted* unless otherwise noted.

T<sub>extcal</sub> is the device temperature at last external calibration.

T<sub>selfcal</sub> is the device temperature at last self-calibration.

# Conditions

Specifications are valid under the following conditions unless otherwise noted. Refer to each section for additional conditions that apply.

- Self-calibration performed within the last 24 hours
- Calibration interval of 2 years
- 60 minutes warm-up time

# DC Voltage Specifications

## Accuracy

All DC voltage accuracy specifications apply to apertures of  $\geq 100$  ms, with Auto Zero and ADC calibration enabled. Assumes offset nulling. Otherwise, add 2  $\mu$ V to the specifications.

**Table 1.** DC Voltage  $\pm$  (ppm of reading + ppm of range)

| Range  | Input Resistance <sup>1</sup>             | 24 Hr <sup>2</sup><br>T <sub>selfcal</sub><br>$\pm 1$ °C | 90 Day<br>T <sub>selfcal</sub><br>$\pm 5$ °C | 2 Year<br>T <sub>selfcal</sub><br>$\pm 5$ °C | Tempco/°C <sup>3</sup> |               |
|--------|-------------------------------------------|----------------------------------------------------------|----------------------------------------------|----------------------------------------------|------------------------|---------------|
|        |                                           |                                                          |                                              |                                              | Without Self-Cal       | With Self-Cal |
| 100 mV | 10 M $\Omega$ $\pm$ 2%,<br>>10 G $\Omega$ | 6 + 5                                                    | 27 + 7                                       | 28 + 8                                       | 3 + 2                  | 0.3 + 1       |
| 1 V    |                                           | 4.5 + 0.8                                                | 15 + 2.5                                     | 18 + 2.5                                     | 2 + 0.2                | 0.3 + 0.1     |
| 10 V   |                                           | 2 + 0.5                                                  | 10.5 + 0.5                                   | 12 + 0.5                                     | 0.3 + 0.02             | 0.3 + 0.01    |

<sup>1</sup> In parallel with 90 pF, typical.

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

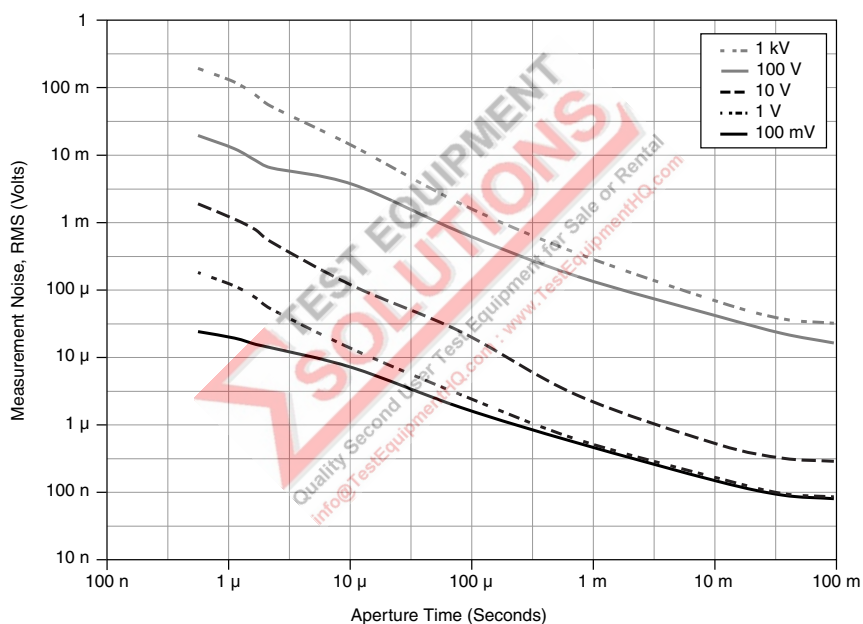
<sup>3</sup> Accuracy specifications allow for the indicated temperature variation. If the device temperature falls outside of that bounds, apply the Tempco 'Without Self-Cal'. Tempco 'With Self-Cal' describes the stability of the calibration mechanism, and is included for reference.

**Table 1.** DC Voltage  $\pm$  (ppm of reading + ppm of range) (Continued)

| Range               | Input Resistance <sup>1</sup> | 24 Hr <sup>2</sup><br>$T_{\text{selfcal}}$<br>$\pm 1\text{ }^{\circ}\text{C}$ | 90 Day<br>$T_{\text{selfcal}}$<br>$\pm 5\text{ }^{\circ}\text{C}$ | 2 Year<br>$T_{\text{selfcal}}$<br>$\pm 5\text{ }^{\circ}\text{C}$ | Tempco/ $^{\circ}\text{C}^3$ |               |
|---------------------|-------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------|---------------|
|                     |                               |                                                                               |                                                                   |                                                                   | Without Self-Cal             | With Self-Cal |
| 100 V               | 10 M $\Omega \pm 2\%$         | 6 + 2                                                                         | 24 + 2.5                                                          | 26 + 2.5                                                          | 4 + 0.2                      | 0.3 + 0.1     |
| 1000 V <sup>4</sup> |                               | 4 + 0.5                                                                       | 24 + 0.5                                                          | 25 + 0.5                                                          | 3 + 0.02                     | 0.3 + 0.01    |

## Noise

**Figure 1.** DC Voltage Noise, Typical



**Note** With input shorted, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to the accuracy specification.

<sup>1</sup> In parallel with 90 pF, typical.

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

<sup>3</sup> Accuracy specifications allow for the indicated temperature variation. If the device temperature falls outside of that bounds, apply the Tempco 'Without Self-Cal'. Tempco 'With Self-Cal' describes the stability of the calibration mechanism, and is included for reference.

<sup>4</sup> To account for self-heating effects, add 14  $\mu\text{V}$  to the specification for each volt beyond  $\pm 300\text{ V}$ .

## General

|                                                                           |                                                                                                                 |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| ADC Linearity                                                             | 0.5 ppm of reading + 0.5 ppm of range                                                                           |
| Effective Common-Mode Rejection Ratio (CMRR) (1 kΩ resistance in LO lead) | >140 dB (DC), 100 ms aperture;<br>>170 dB (>46 Hz) with high-order DC noise rejection, 100 ms aperture, typical |
| Overrange                                                                 | 105% of range except 1000 V                                                                                     |
| DC voltage input bias current                                             | <30 pA at 23 °C, typical                                                                                        |

## Resistance Specifications

### Accuracy

All resistance accuracy specifications apply to apertures of  $\geq 100$  ms, with Offset Compensated Ohms (for ranges  $\leq 10$  kΩ) or Auto Zero (for ranges  $\geq 100$  kΩ) and ADC calibration enabled.

**Table 2.** Resistance (4-Wire and 2-Wire<sup>5</sup>)  $\pm$  (ppm of reading + ppm of range)

| Range                | Test Current <sup>6</sup> | Max Test Voltage | 24 Hr <sup>7</sup><br>Tselfcal $\pm$ 1 °C | 90 Day<br>Textcal $\pm$ 10 °C,<br>Tselfcal $\pm$ 5 °C | 2 Year<br>Textcal $\pm$ 10 °C,<br>Tselfcal $\pm$ 5 °C | Tempco/°C <sup>8</sup> |               | 2 Year <sup>9</sup><br>Tselfcal $\pm$ 5 °C |
|----------------------|---------------------------|------------------|-------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|------------------------|---------------|--------------------------------------------|
|                      |                           |                  |                                           |                                                       |                                                       | Without Self-Cal       | With Self-Cal |                                            |
| 100 Ω                | 1 mA                      | 100 mV           | 9 + 5                                     | 40 + 12                                               | 55 + 12                                               | 5 + 0.12               | 0.8 + 0.12    | 60 + 12                                    |
| 1 kΩ                 | 1 mA                      | 1 V              | 7 + 0.5                                   | 30 + 1.5                                              | 45 + 1.5                                              | 5 + 0.05               | 0.8 + 0.05    | 50 + 1.5                                   |
| 10 kΩ                | 100 μA                    | 1 V              | 7 + 0.5                                   | 30 + 1.5                                              | 45 + 1.5                                              | 5 + 0.05               | 0.8 + 0.05    | 50 + 1.5                                   |
| 100 kΩ <sup>10</sup> | 10 μA                     | 1 V              | 7 + 1                                     | 36 + 2.5                                              | 45 + 2.5                                              | 5 + 0.2                | 2 + 0.2       | 95 + 2.5                                   |
| 1 MΩ                 | 10 μA                     | 10 V             | 6 + 1                                     | 60 + 1                                                | 60 + 1                                                | 5 + 0.05               | 2 + 0.05      | 95 + 1                                     |
| 10 MΩ                | 1 μA                      | 10 V             | 60 + 2                                    | 130 + 10                                              | 130 + 10                                              | 20 + 1                 | 20 + 1        | 800 + 10                                   |

<sup>5</sup> Perform offset nulling or add 200 mΩ to reading.

<sup>6</sup> -10% to 0% tolerance, typical.

<sup>7</sup> Relative to external calibration source.

<sup>8</sup> Accuracy specifications allow for the indicated temperature variation. If the device temperature falls outside of that bounds, apply the Tempco 'Without Self-Cal'. Tempco 'With Self-Cal' describes the stability of the calibration mechanism, and is included for reference.

<sup>9</sup> Over full operating temperature range.

<sup>10</sup> Perform offset nulling or add 2 ppm of range to the specifications.

**Table 2.** Resistance (4-Wire and 2-Wire<sup>5</sup>) ± (ppm of reading + ppm of range) (Continued)

| Range             | Test Current <sup>6</sup> | Max Test Voltage | 24 Hr <sup>7</sup><br>T <sub>selfcal</sub> ± 1 °C | 90 Day<br>T <sub>extcal</sub> ± 10 °C,<br>T <sub>selfcal</sub> ± 5 °C | 2 Year<br>T <sub>extcal</sub> ± 10 °C,<br>T <sub>selfcal</sub> ± 5 °C | Tempco/°C <sup>8</sup> |               | 2 Year <sup>9</sup><br>T <sub>selfcal</sub> ± 5 °C |
|-------------------|---------------------------|------------------|---------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------|---------------|----------------------------------------------------|
|                   |                           |                  |                                                   |                                                                       |                                                                       | Without Self-Cal       | With Self-Cal |                                                    |
| 100 MΩ            | 1 μA    10 MΩ             | 10 V             | 500 + 6                                           | 2600 + 10                                                             | 3000 + 10                                                             | 300 + 6                | 300 + 6       | —                                                  |
| 5 GΩ<br>(typical) | 1 μA    10 MΩ             | 10 V             | 1% + 0.2%                                         | 5% + 0.2%                                                             | 5% + 0.2%                                                             | 0.5% + 0.2%            | 0.5% + 0.2%   | —                                                  |



<sup>5</sup> Perform offset nulling or add 200 mΩ to reading.

<sup>6</sup> -10% to 0% tolerance, typical.

<sup>7</sup> Relative to external calibration source.

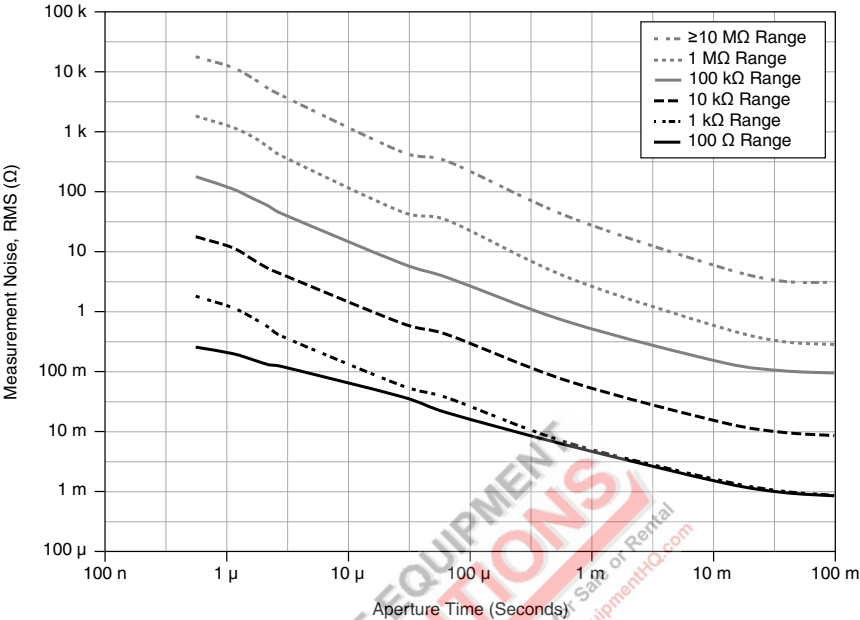
<sup>8</sup> Accuracy specifications allow for the indicated temperature variation. If the device temperature falls outside of that bounds, apply the Tempco 'Without Self-Cal'. Tempco 'With Self-Cal' describes the stability of the calibration mechanism, and is included for reference.

<sup>9</sup> Over full operating temperature range.

<sup>11</sup> 2-wire resistance measurement only.

Noise

Figure 2. PXIe-4081 Resistance Noise, Typical



**Note** With input shorted, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to the accuracy specification.

General

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

# DC Current Specifications

Accuracy

All DC current accuracy specifications apply for apertures  $\geq 100$  ms, with Auto Zero and ADC calibration enabled.

**Table 3. DC Current  $\pm$  (ppm of reading + ppm of range)**

| Range                          | Burden Voltage, Typical | 24 Hr <sup>12</sup><br>$T_{\text{selfcal}} \pm 1^\circ\text{C}$ | 90 Day<br>$T_{\text{extcal}} \pm 10^\circ\text{C}$ ,<br>$T_{\text{selfcal}} \pm 5^\circ\text{C}$ | 2 Year<br>$T_{\text{extcal}} \pm 10^\circ\text{C}$ ,<br>$T_{\text{selfcal}} \pm 5^\circ\text{C}$ | Tempco/ $^\circ\text{C}$ | 2 Year <sup>13</sup><br>$T_{\text{selfcal}} \pm 5^\circ\text{C}$ |
|--------------------------------|-------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------|
| 1 $\mu\text{A}$ <sup>14</sup>  | <55 mV                  | 30 + 20                                                         | 340 + 40                                                                                         | 350 + 40                                                                                         | 10 + 5                   | 575 + 140                                                        |
| 10 $\mu\text{A}$ <sup>14</sup> | <550 mV                 | 30 + 2                                                          | 140 + 15                                                                                         | 200 + 15                                                                                         | 10 + 1                   | 500 + 20                                                         |
| 100 $\mu\text{A}$              | <60 mV                  | 10 + 10                                                         | 105 + 20                                                                                         | 175 + 20                                                                                         | 5 + 0.2                  | 220 + 20                                                         |
| 1 mA                           | <60 mV                  | 13 + 10                                                         | 100 + 20                                                                                         | 170 + 20                                                                                         | 5 + 0.2                  | 220 + 20                                                         |
| 10 mA                          | <60 mV                  | 15 + 10                                                         | 100 + 20                                                                                         | 170 + 20                                                                                         | 5 + 0.2                  | 250 + 20                                                         |
| 100 mA                         | <100 mV                 | 18 + 10                                                         | 175 + 20                                                                                         | 180 + 20                                                                                         | 10 + 0.2                 | 250 + 20                                                         |
| 1 A <sup>15</sup>              | <250 mV                 | 25 + 10                                                         | 275 + 20                                                                                         | 350 + 20                                                                                         | 16 + 0.2                 | 800 + 20                                                         |
| 3 A <sup>15</sup>              | <700 mV                 | 25 + 5                                                          | 250 + 20                                                                                         | 350 + 20                                                                                         | 16 + 0.2                 | 800 + 20                                                         |

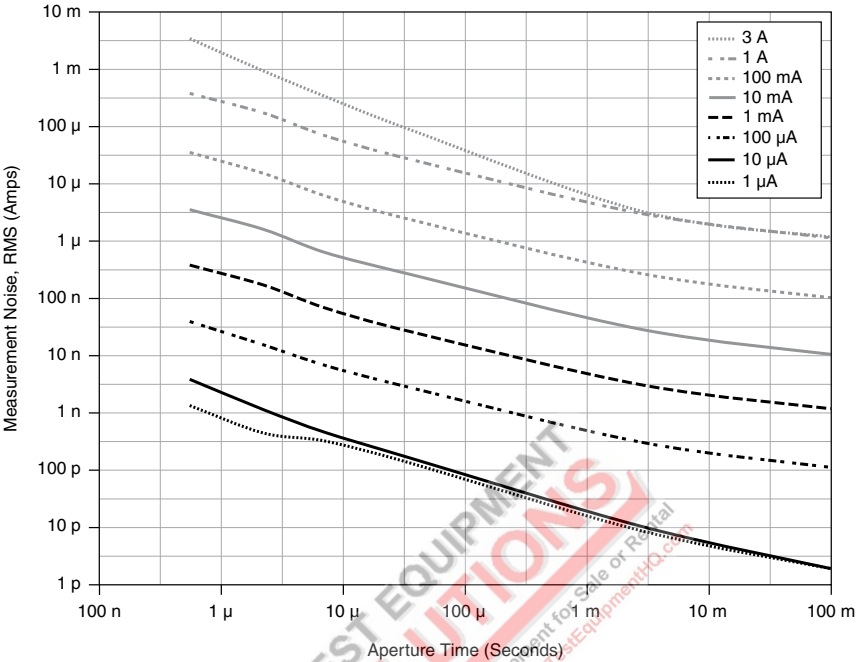
<sup>12</sup> Relative to external calibration source.

<sup>13</sup> Over full operating temperature range.

<sup>14</sup> 90 day and 2 year specifications are typical.

<sup>15</sup> To account for self-heating effects, for currents larger than 500 mA, add  $I^2 \times 75$  ppm of reading to the specification.

Figure 3. PXle-4081 DC Current Noise, Typical



**Note** With input open, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to accuracy specification.

General

Overrange

105% of range except 1 A range.

# AC Voltage Specifications

Accuracy



**Note** Measurement aperture greater than  $4/\epsilon_L$  where  $\epsilon_L$  is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

**Table 4. AC Voltage Accuracy  $\pm$  (% of reading + % of range), 2 Years,  $T_{\text{extcal}} \pm 10^\circ\text{C}$** 

| Range (rms)         | Peak Voltage        | 1 Hz to 40 Hz <sup>16</sup> | >40 Hz to 20 kHz | >20 kHz to 50 kHz | >50 kHz to 100 kHz | >100 kHz to 300 kHz |
|---------------------|---------------------|-----------------------------|------------------|-------------------|--------------------|---------------------|
| 50 mV <sup>17</sup> | $\pm 105\text{ mV}$ | $0.1 + 0.02$                | $0.05 + 0.02$    | $0.07 + 0.02$     | $0.3 + 0.02$       | $0.7 + 0.15$        |
| 500 mV              | $\pm 1.05\text{ V}$ | $0.1 + 0.005$               | $0.05 + 0.005$   | $0.06 + 0.01$     | $0.2 + 0.01$       | $0.7 + 0.15$        |
| 5 V                 | $\pm 10.5\text{ V}$ |                             |                  |                   |                    |                     |
| 50 V                | $\pm 105\text{ V}$  | $0.1 + 0.005$               | $0.12 + 0.05$    | $0.6 + 0.05$      | $3 + 0.15$         | $3 + 0.15$          |
| 700 V               | $\pm 1000\text{ V}$ |                             |                  |                   |                    |                     |

**Table 5. AC Voltage Tempco/ $^\circ\text{C} \pm$  (% of reading + % of range)**

| Range (rms) | 1 Hz to 40 Hz    | >40 Hz to 20 kHz | >20 kHz to 50 kHz | >50 kHz to 100 kHz | >100 kHz to 300 kHz |
|-------------|------------------|------------------|-------------------|--------------------|---------------------|
| 50 mV       | $0.001 + 0.0002$ | $0.001 + 0.0002$ | $0.001 + 0.001$   | $0.002 + 0.001$    | $0.02 + 0.01$       |
| 500 mV      |                  |                  |                   |                    |                     |
| 5 V         |                  |                  |                   |                    |                     |
| 50 V        | $0.001 + 0.0002$ | $0.012 + 0.001$  | $0.045 + 0.001$   | $0.1 + 0.01$       | $0.1 + 0.01$        |
| 700 V       |                  |                  |                   |                    |                     |

## General

|                                                                           |                                                       |
|---------------------------------------------------------------------------|-------------------------------------------------------|
| Input impedance                                                           | 10 M $\Omega \pm 2\%$ in parallel with 90 pF, typical |
| Input coupling                                                            | AC or DC coupled                                      |
| Overrange                                                                 | 105% of range except 700 V                            |
| Maximum Volt-Hertz product                                                | Verified to $2.2 \times 10^7$ V-Hz                    |
| Maximum DC voltage component                                              | 400 V                                                 |
| Common mode rejection ratio (CMRR),<br>1 k $\Omega$ resistance in LO lead | >70 dB (DC to 60 Hz), typical                         |

<sup>16</sup> Applies to DC coupled only.

<sup>17</sup> Applies to signals >1 mVrms

# AC Current Specifications

## Accuracy



**Note** Measurement aperture greater than  $4/f_L$ , where  $f_L$  is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

**Table 6.** AC Current Specifications  $\pm$  (% of reading + % of range), 2 Years,  $T_{\text{extcal}} \pm 10^\circ\text{C}$

| Range (rms)                     | Peak Current                      | Burden Voltage (rms at 1 kHz), Typical | 1 Hz to 1 kHz | >1 kHz to 5 kHz | 5 kHz to 10 kHz <sup>18</sup> | 10 kHz to 20 kHz <sup>18</sup> | Tempco/ <sup>o</sup> C |
|---------------------------------|-----------------------------------|----------------------------------------|---------------|-----------------|-------------------------------|--------------------------------|------------------------|
| 100 $\mu\text{A}$ <sup>19</sup> | $\pm 200 \mu\text{A}$             | <60 mV                                 | 0.065 + 0.02  | —               | —                             | —                              | 0.002 + 0.0002         |
| 1 mA                            | $\pm 2 \text{ mA}$                | <60 mV                                 | 0.035 + 0.02  | 0.06 + 0.02     | 0.19 + 0.02                   | 0.44 + 0.02                    | 0.001 + 0.0001         |
| 10 mA                           | $\pm 20 \text{ mA}$               | <60 mV                                 | 0.035 + 0.02  | 0.045 + 0.02    | 0.1 + 0.02                    | 0.17 + 0.02                    | 0.002 + 0.0002         |
| 100 mA                          | $\pm 200 \text{ mA}$              | <100 mV                                | 0.04 + 0.02   | 0.07 + 0.02     | 0.1 + 0.02                    | 0.1 + 0.02                     | 0.001 + 0.0002         |
| 1 A                             | $\pm 2 \text{ A}$                 | <250 mV                                | 0.07 + 0.02   | 0.4 + 0.02      | 0.9 + 0.02                    | 1.6 + 0.02                     | 0.002 + 0.0001         |
| 3 A                             | $\pm 4.2 \text{ A}$ <sup>20</sup> | <700 mV                                | 0.08 + 0.02   | 0.41 + 0.02     | 0.9 + 0.02                    | 1.6 + 0.02                     | 0.002 + 0.0001         |

## General

### Overrange

105% of range except 3 A

<sup>18</sup> Specification typical above 5 kHz

<sup>19</sup> Applies to signals  $> 9 \mu\text{Arms}$

<sup>20</sup> Sine wave only.

# Diode Test Specifications

|                            |                                                         |
|----------------------------|---------------------------------------------------------|
| Range                      | 10 V                                                    |
| Test current <sup>21</sup> | 1 $\mu$ A, 10 $\mu$ A, 100 $\mu$ A, 1 mA <sup>22</sup>  |
| Accuracy                   | Add 20 ppm of reading to 10 VDC voltage specifications. |

# Frequency and Period Specifications



**Note** Aperture time set to 150 ms.

|                             |                       |
|-----------------------------|-----------------------|
| Frequency measurement range | 15 Hz to 500 kHz      |
| Period measurement range    | 2 $\mu$ s to 66.67 ms |

| Frequency Input Voltage Range | Corresponding Digitizer Range <sup>23</sup> | Minimum Peak-to-Peak Signal Amplitude <sup>24</sup> | Maximum Peak-to-Peak Signal Amplitude | Accuracy                                          |
|-------------------------------|---------------------------------------------|-----------------------------------------------------|---------------------------------------|---------------------------------------------------|
| 50 mV                         | 100 mV                                      | 5 mV                                                | 200 mV                                | Refer to the PXIe_CLK100 accuracy of the chassis. |
| 500 mV                        | 1 V                                         | 50 mV                                               | 2 V                                   |                                                   |
| 5 V                           | 10 V                                        | 500 mV                                              | 20 V                                  |                                                   |
| 50 V                          | 100 V                                       | 5 V                                                 | 200 V                                 |                                                   |
| 700 V                         | 1000 V                                      | 50 V                                                | 1000 V                                |                                                   |

# Temperature Specifications

All temperature accuracy specifications apply to apertures  $\geq$ 100 ms, Auto Zero, and ADC calibration enabled. Use lowest possible resistance or voltage range for each temperature. Add probe accuracy and cold junction accuracy where applicable.

<sup>21</sup> -10% to 0% tolerance, typical.  
<sup>22</sup> Up to 4.5 V measurement for 1 mA test current.  
<sup>23</sup> AC Coupled.  
<sup>24</sup> Square wave input. Minimum required peak-to-peak signal level is valid only for frequencies up to the -3 dB bandwidth. For higher frequencies, the signal amplitude must be increased. Refer to the Digitizer Voltage Mode for bandwidths.

| Sensor Type              | Temperature Range | Accuracy |
|--------------------------|-------------------|----------|
| RTD <sup>25</sup>        | -200 to 600 °C    | 0.1 °C   |
| Thermistor <sup>26</sup> | -80 to 150 °C     | 0.08 °C  |
| J Thermocouple           | -210 to 1200 °C   | 0.2 °C   |
| K Thermocouple           | -200 to 1200 °C   | 0.3 °C   |
| N Thermocouple           | -200 to 1300 °C   | 0.4 °C   |
| T Thermocouple           | -200 to 400 °C    | 0.3 °C   |
| E Thermocouple           | -200 to 1000 °C   | 0.2 °C   |
| R Thermocouple           | -50 to 1760 °C    | 0.8 °C   |
| S Thermocouple           | -50 to 1760 °C    | 0.8 °C   |
| B Thermocouple           | 400 to 1820 °C    | 0.8 °C   |

## Isolated Digitizer Specifications

|                         |                                                                           |
|-------------------------|---------------------------------------------------------------------------|
| Available functions     | Voltage and current                                                       |
| Voltage ranges          | ±100 mV to ±1000 V (DC or AC coupled)                                     |
| Current ranges          | 100 µA to 3 A                                                             |
| Sample rate range       | 10 S/s to 1.8 MS/s                                                        |
| Available sample rates  | $r = (1.8 \text{ MS/s}) / y$ , where $y = 1, 2, 3, \dots 1.8 \times 10^5$ |
| Timebase accuracy       | Equal to the PXIe_CLK100 accuracy of the chassis                          |
| Digitizer record length | 2 samples minimum, unlimited maximum                                      |

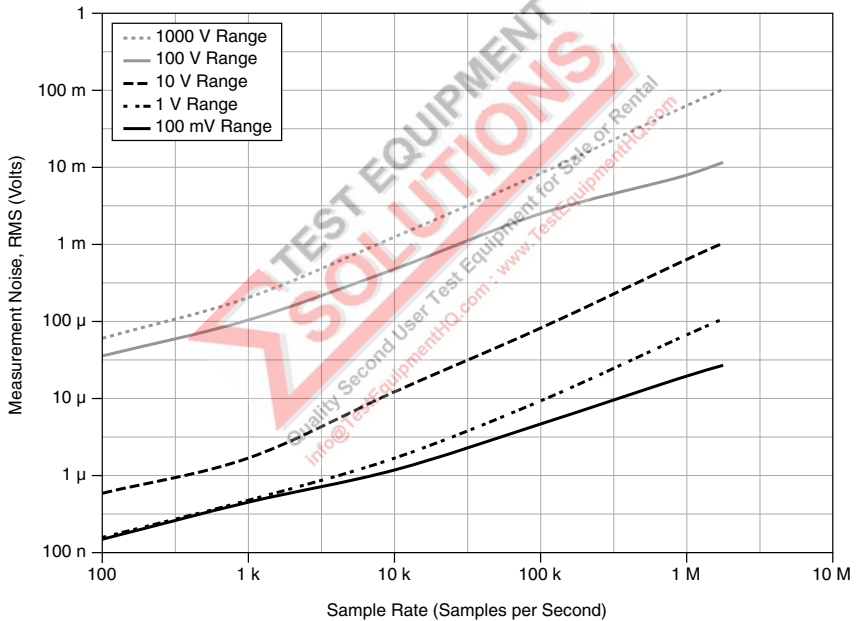
<sup>25</sup> Based on Pt3851 RTD in a 4-wire configuration.

<sup>26</sup> Based on 44004, 44006, and 44007 interchangeable thermistors.

**Table 7. Voltage Mode**

| Range  | Input Resistance <sup>27</sup> | DC Accuracy (ppm/<br>reading + ppm/range) 2<br>Year, T <sub>selfcal</sub> ± 5 °C | Analog Bandwidth, <sup>28</sup> Typical |         |
|--------|--------------------------------|----------------------------------------------------------------------------------|-----------------------------------------|---------|
|        |                                |                                                                                  | ±0.1 dB                                 | -3 dB   |
| 100 mV | 10 MΩ ± 2%, >10 GΩ             | 125 + 175                                                                        | 60 kHz                                  | 300 kHz |
| 1 V    |                                | 125 + 75                                                                         | 50 kHz                                  | 300 kHz |
| 10 V   |                                | 125 + 75                                                                         | 50 kHz                                  | 300 kHz |
| 100 V  | 10 MΩ ± 2%                     | 125 + 75                                                                         | 20 kHz                                  | 250 kHz |
| 1000 V |                                | 125 + 75                                                                         | 30 kHz                                  | 275 kHz |

**Figure 4. PXle-4081 Voltage Waveform Noise, Typical**



**Note** With input shorted.

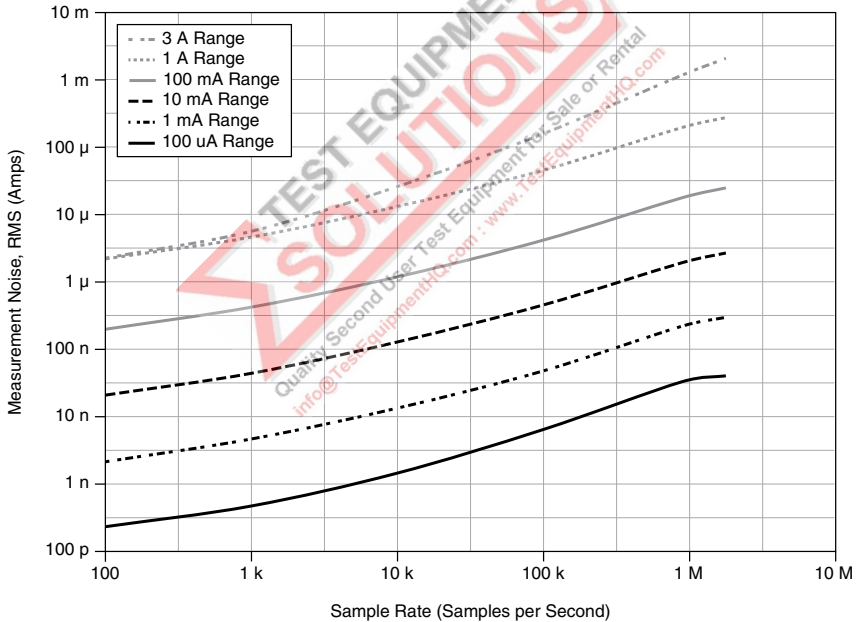
<sup>27</sup> In parallel with 90 pF. When AC coupled, only 10 MΩ available.

<sup>28</sup> Typical AC coupled frequency is 6 Hz (+/- 0.1 dB) and 0.8 Hz (-3 dB).

**Table 8. Current Mode**

| Range             | Burden Voltage, Typical | DC Accuracy (ppm/reading + ppm/range) 2 Year, $T_{\text{selfcal}} \pm 5^{\circ}\text{C}$ | Analog Bandwidth, Typical |                |
|-------------------|-------------------------|------------------------------------------------------------------------------------------|---------------------------|----------------|
|                   |                         |                                                                                          | $\pm 0.1\text{ dB}$       | $-3\text{ dB}$ |
| 100 $\mu\text{A}$ | <60 mV                  | 230 + 75                                                                                 | 50 kHz                    | 350 kHz        |
| 1 mA              | <60 mV                  | 230 + 75                                                                                 | 60 kHz                    | 400 kHz        |
| 10 mA             | <60 mV                  | 265 + 75                                                                                 | 70 kHz                    | 400 kHz        |
| 100 mA            | <100 mV                 | 265 + 75                                                                                 | 80 kHz                    | 400 kHz        |
| 1 A               | <250 mV                 | 800 + 75                                                                                 | 10 kHz                    | 450 kHz        |
| 3 A               | <700 mV                 | 800 + 75                                                                                 | 10 kHz                    | 450 kHz        |

**Figure 5. PXIe-4081 Current Waveform Noise, Typical**



**Note** With input open.

# General Specifications

|                               |                                                                                                                           |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| External calibration interval | 2 years                                                                                                                   |
| Warm-up                       | 60 minutes to rated accuracy                                                                                              |
| Measurement Category          | I <sup>29</sup> (up to 1000 VDC, 700 V <sub>rms</sub> , 1000 V <sub>pk</sub> )<br>II (up to 500 VDC or V <sub>rms</sub> ) |



**Caution** Do not connect the product to signals or use for measurements within Measurement Categories III or IV.



**Attention** Ne pas connecter le produit à des signaux dans les catégories de mesure III ou IV et ne pas l'utiliser pour effectuer des mesures dans ces catégories.

|                                                                                              |                                                                                 |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Input protection (between terminals or terminal to ground)                                   | 1000 VDC or V <sub>pk</sub>                                                     |
| Current mode fuse                                                                            | T 3.5 A 1000 V, time-lag<br>Minimum interrupt rating: 10 kA<br>Siba 5019906.3,5 |
|  <b>Fuse</b> | When this fuse symbol is marked on a device, take proper precautions.           |
| Maximum common-mode voltage                                                                  | 500 VDC or V <sub>rms</sub>                                                     |
| Maximum voltage-to-earth ground                                                              |                                                                                 |
| HI                                                                                           | 1000 VDC or V <sub>pk</sub>                                                     |
| LO                                                                                           | 500 VDC or V <sub>rms</sub>                                                     |
| HI SENSE                                                                                     | 500 VDC or V <sub>rms</sub>                                                     |
| LO SENSE                                                                                     | 500 VDC or V <sub>rms</sub>                                                     |



**Caution Possibility of Electric Shock** Take precautions to avoid electrical shock.



**Attention Possibilité d'électrocution** Prenez les précautions nécessaires pour éviter tout choc électrique.

<sup>29</sup> Measurement Categories CAT I and CAT O (Other) are equivalent. These test and measurement circuits are not intended for direct connection to the MAINs building installations of Measurement Categories CAT II, III, or CAT IV.

# Timing

| Mode                             | Trigger Latency |                                               | Maximum Reading Rate <sup>30</sup> |
|----------------------------------|-----------------|-----------------------------------------------|------------------------------------|
|                                  | AC Voltage      | All Functions Except AC Voltage <sup>31</sup> |                                    |
| Voltage, current, and resistance | 15 $\mu$ s      | <0 $\mu$ s                                    | 20 kS/s                            |
| Voltage and current digitizer    |                 |                                               | 1.8 MS/s                           |

# Power

|                   |                                 |
|-------------------|---------------------------------|
| Power consumption | <9 W from PXI Express backplane |
| +12 V load        | 0.55 A max                      |
| +3.3 V load       | 0.55 A max                      |

# Physical Characteristics

|            |                                                                                                        |
|------------|--------------------------------------------------------------------------------------------------------|
| Dimensions | 3U, one-slot, PXI/cPCI module;<br>2.0 cm x 13.0 cm x 21.6 cm<br>(0.8 in. x 5.1 in. x 8.5 in.), nominal |
| Weight     | 340 g (12 oz), nominal                                                                                 |



**Note** If you need to clean the device, wipe it with a dry towel.

# Environment

|                  |                                                   |
|------------------|---------------------------------------------------|
| Maximum altitude | 2,000 m (800 mbar) (at 25 °C ambient temperature) |
| Pollution Degree | 2                                                 |

Indoor use only.

<sup>30</sup> Maximum Reading Rate assumes minimum aperture time, Auto Zero is OFF, Offset Compensated Ohms is OFF, ADC Calibration is OFF, Number of Averages is 1, and Settle Time is 0 seconds. Varying these settings will vary the reading rate.

<sup>31</sup> Trigger latency for all functions except AC Voltage assumes Auto Zero, Offset Compensated Ohms, and ADC Calibration are OFF.

# Operating Environment

|                           |                                                                                                                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ambient temperature range | 0 °C to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.) |
| Relative humidity range   | 10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)                                                                                                            |

# Storage Environment

|                           |                                                                                                                   |
|---------------------------|-------------------------------------------------------------------------------------------------------------------|
| Ambient temperature range | -40 °C to 71 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.) |
| Relative humidity range   | 5% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56.)                                              |

# Shock and Vibration

|                  |                                                                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating shock  | 30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)                                 |
| Random vibration |                                                                                                                                                    |
| Operating        | 5 Hz to 500 Hz, 0.3 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64.)                                                                   |
| Nonoperating     | 5 Hz to 500 Hz, 2.4 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64. Test profile exceeds the requirements of MIL-PRF-28800F, Class 3.) |

# Compliance and Certifications



**Caution** Electromagnetic interference can adversely affect the measurement accuracy of this product. The input terminals of this device are not protected for electromagnetic interference. As a result, this device may experience reduced measurement accuracy or other temporary performance degradation when connected cables are routed in an environment with radiated or conducted radio frequency electromagnetic interference. To limit radiated emissions and to ensure that this device functions within specifications in its operational electromagnetic

environment, take precautions when designing, selecting, and installing measurement probes and cables.

## Safety Compliance Standards

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

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



**Note** For safety certifications, refer to the product label or the [Product Certifications and Declarations](#) 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
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**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, certifications, and additional information, refer to the [Product Certifications and Declarations](#) section.

## CE Compliance

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

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

## Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit [ni.com/product-certifications](http://ni.com/product-certifications), search by model number, and click the appropriate link.

## 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 *Commitment to the Environment* web page at [ni.com/environment](http://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 NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



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(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)



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