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**PXIe-4162**

## SPECIFICATIONS

# PXIe-4162

PXIe, 12-Channel,  $\pm 24$  V, 100 mA Precision PXI Source Measure Unit

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## Definitions

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*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 *Nominal* unless otherwise noted.

# Conditions

Specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature<sup>1</sup> of 23 °C ± 5 °C
- Chassis with slot cooling capacity  $\geq 38$  W<sup>2</sup>
  - For chassis with slot cooling capacity = 38 W, fan speed set to HIGH
- Calibration interval of 1 year
- 30 minutes warm-up time
- Self-calibration performed within the last 24 hours
- **niDCPower Aperture Time** property or `NIDCPOWER_ATTR_APERTURE_TIME` attribute set to 2 power-line cycles (PLC)

# Instrument Capabilities

Channels	0 through 11
DC voltage range	$\pm 24$ V

The following table and figure illustrate the voltage and the current source and sink ranges of the PXIe-4162.

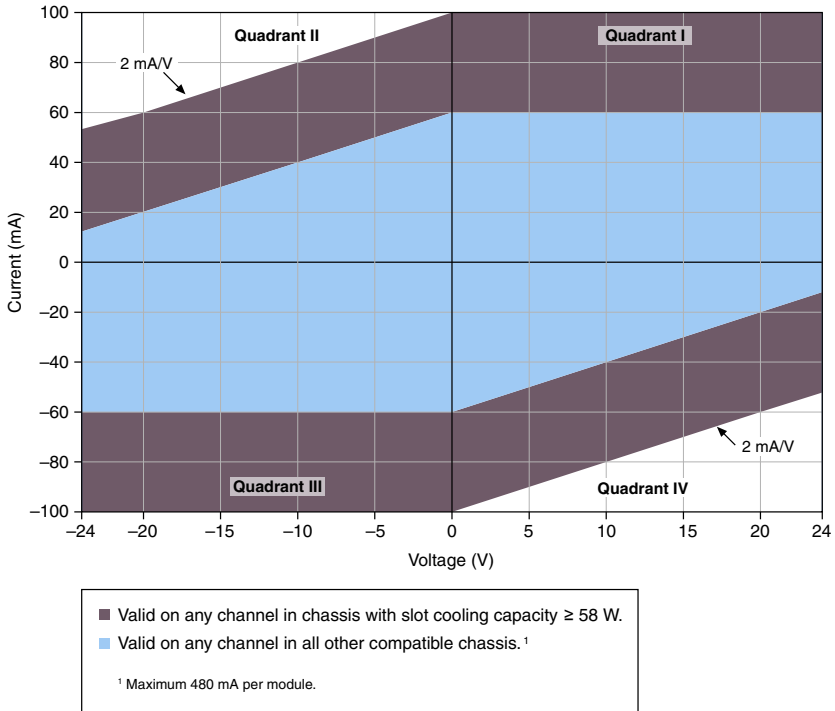
**Table 1.** PXIe-4162 DC Current Source and Sink Ranges, Warranted

Chassis Slot Cooling Capacity	
$\geq 58$ W	38 W
10 $\mu$ A	
100 $\mu$ A	
1 mA	
10 mA	
100 mA	60 mA

<sup>1</sup> The ambient temperature of a PXI system is defined as the temperature at the chassis fan inlet (air intake).

<sup>2</sup> For increased capability, NI recommends installing the PXIe-4162 in a chassis with slot cooling capacity  $\geq 58$  W.

**Figure 1. PXle-4162 Quadrant Diagram, Any Channel**



## SMU Specifications

### Voltage

**Table 2. Voltage Programming and Measurement Accuracy/Resolution, Warranted**

Range	Resolution and Noise (0.1 Hz to 10 Hz)	Accuracy ( $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ ) $\pm$ (% of Voltage + Offset)	Tempco <sup>3</sup> $\pm$ (% of Voltage + Offset)/ $^{\circ}\text{C}$ , $0\text{ }^{\circ}\text{C}$ to $55\text{ }^{\circ}\text{C}$
		$T_{\text{cal}} \pm 5\text{ }^{\circ}\text{C}$	
24 V	200 $\mu\text{V}$	0.05% + 5 mV	0.0005% + 1 $\mu\text{V}$

<sup>3</sup> Temperature coefficient applies beyond  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  within  $5\text{ }^{\circ}\text{C}$  of  $T_{\text{cal}}$ .

# Current

**Table 3.** Current Programming and Measurement Accuracy/Resolution, Warranted

Range	Resolution and Noise (0.1 Hz to 10 Hz)	Accuracy (23 °C ± 5 °C) ± (% of Current + Offset)	Tempco <sup>4</sup> ± (% of Current + Offset)/°C, 0 °C to 55 °C
		T <sub>cal</sub> ± 5 °C	
10 µA	100 pA	0.10% + 5 nA	0.004% + 10 pA
100 µA	1 nA	0.10% + 50 nA	0.004% + 100 pA
1 mA	10 nA	0.10% + 500 nA	0.004% + 1 nA
10 mA	100 nA	0.10% + 5 µA	0.004% + 10 nA
60 mA or 100 mA <sup>5</sup>	1 µA	0.10% + 50 µA	0.004% + 100 nA

## Available DC Output Power

Chassis Slot Cooling Capacity	Per Channel Maximum	Absolute Maximum
≥58 W	2.4 W	28.8 W
38 W	1.4 W	11.5 W

## Additional Specifications

Settling time <sup>6</sup>	<500 µs, typical <sup>7</sup>
Transient response <sup>8</sup>	<100 µs, typical <sup>9</sup>
Wideband source noise <sup>10</sup>	15 mV RMS, typical <100 mV <sub>pk-pk</sub> , typical

<sup>4</sup> Temperature coefficient applies beyond 23 °C ± 5 °C within 5 °C of T<sub>cal</sub>.

<sup>5</sup> 100 mA range available only when installed in chassis with slot cooling capacity ≥58 W. 60 mA range available in all other compatible chassis.

<sup>6</sup> Current limit set to ≥1 mA and ≥10% of the selected current limit range. PXIe-4162 configured for fast transient response.

<sup>7</sup> To settle to 0.1% of voltage step.

<sup>8</sup> PXIe-4162 configured for fast transient response.

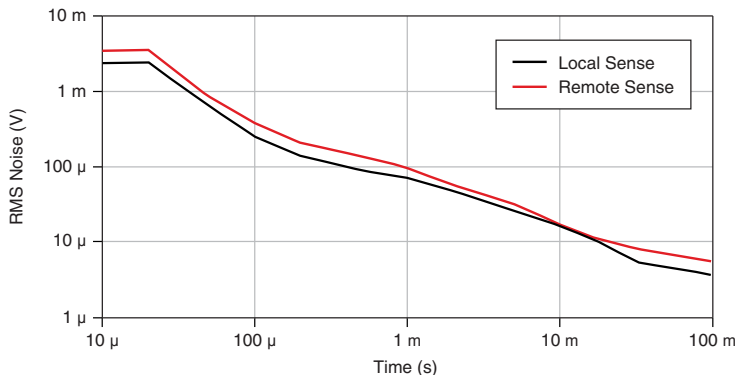
<sup>9</sup> To recover within ±20 mV after a load current change from 10% to 90% of range.

<sup>10</sup> 20 Hz to 20 MHz bandwidth. PXIe-4162 configured for normal transient response. Measured at the end of the 1 m SHDB62M-DB62M-LL cable.

Cable guard output current limit	100 $\mu$ A, typical
Remote sense	
Voltage	No additional error due to lead drop
Current	No additional error due to lead drop
Maximum lead drop	1 V drop/lead
Load regulation	
Voltage <sup>11</sup>	50 $\mu$ V/mA, typical
Current	(30 pA + 20 ppm of range)/volt, typical
Functional isolation voltage, any pin to earth ground	60 V DC
Absolute maximum voltage to Output LO	
From Sense HI, Sense LO, or Guard <sup>12</sup>	
When $V_{\text{Output HI}} > 0$ V	-0.5 V to ( $V_{\text{Output HI}} + 0.5$ V)
When $V_{\text{Output HI}} \leq 0$ V	( $V_{\text{Output HI}} - 0.5$ V) to 0.5 V
From all other pins	$\pm 25$ V

The following figures illustrate noise as a function of measurement aperture for the PXIe-4162.

**Figure 2. Voltage RMS Noise Versus Aperture Time,<sup>13</sup> Typical**

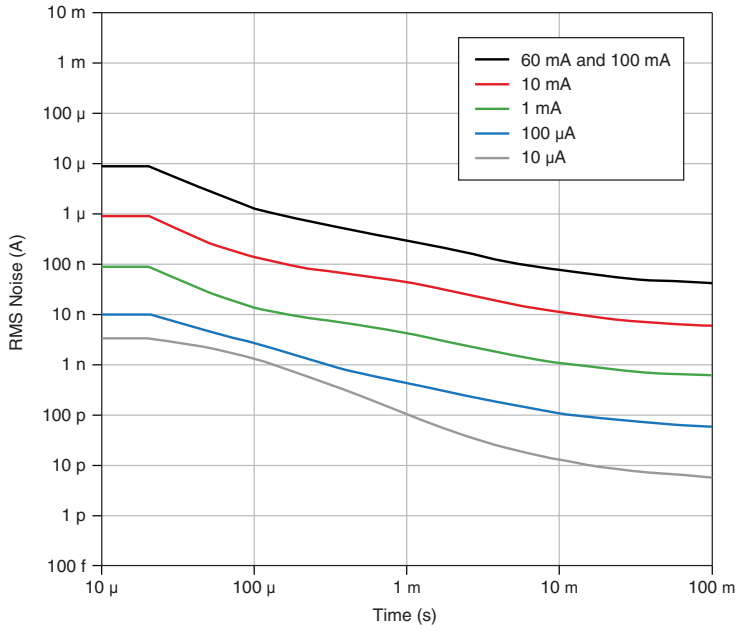


<sup>11</sup> At connector pins when using local sense.

<sup>12</sup> Where  $V_{\text{Output HI}}$  is the voltage at the Output HI pin in the same channel as a Sense HI, Sense LO, or Guard pin.

<sup>13</sup> All channels averaged. Channel 11 has degraded performance.

**Figure 3. Current RMS Noise Versus Aperture Time,<sup>14</sup> Typical**



<sup>14</sup> All channels averaged. In the 100 mA range, channel 4 has degraded performance.

# Supplemental Specifications

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## Measurement and Update Timing

Available sample rates <sup>15</sup>	(600 kS/s)/N
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where

$$N = 6, 7, 8, \dots 2^{20}$$

S is samples

Sample rate accuracy	±50 ppm
Maximum measure rate to host <sup>16</sup>	100,000 S/s per channel, continuous
Maximum source update rate <sup>17</sup>	
Single channel	100,000 updates/s
All channels simultaneously	40,000 updates/s per channel
Input trigger to	
Source event delay	8.5 μs
Source event jitter	1.7 μs
Measure event jitter	1.7 μs

## Triggers

Input triggers	
Types	Start Source Sequence Advance Measure
Sources (PXI trigger lines 0 to 7) <sup>18</sup>	
Polarity	Active high (not configurable)
Minimum pulse width	100 ns

<sup>15</sup> When source-measuring, both the NI-DCPower **Source Delay** and **Aperture Time** properties affect the sampling rate. When taking a measure record, only the **Aperture Time** property affects the sampling rate.

<sup>16</sup> Load dependent settling time is not included. Normal DC noise rejection is used.

<sup>17</sup> As the source delay is adjusted or if advanced sequencing is used, maximum source update rates may vary.

<sup>18</sup> Pulse widths and logic levels are compliant with *PXI Express Hardware Specification Revision 1.0 ECN 1*.



Destinations<sup>19</sup> (PXI trigger lines 0 to 7)<sup>18</sup>

Polarity	Active high (not configurable)
Minimum pulse width	>200 ns

Output triggers (events)

Types	Source Complete Sequence Iteration Complete Sequence Engine Done Measure Complete
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Destinations (PXI trigger lines 0 to 7)<sup>18</sup>

Polarity	Active high (not configurable)
Pulse width	230 ns

## Calibration Interval

Recommended calibration interval	1 year
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## Physical

Dimensions	3U, one-slot, PXI Express/CompactPCI Express module 2.0 cm × 13.0 cm × 21.6 cm (0.8 in. × 5.1 in. × 8.5 in.)
Weight	394 g (13.9 oz)
Front panel connectors	Custom 62-position D-SUB, female

## Power Requirements

Chassis Slot Cooling Capacity	+3.3 V Current Draw, Typical		+12 V Current Draw, Typical	
	Idle	Full Output Load	Idle	Full Output Load
38 W	1 A	1 A	1.5 A	3 A
≥58 W		1 A		4.5 A

<sup>19</sup> Input triggers can come from any source (PXI trigger or software trigger) and be exported to any PXI trigger line. This allows for easier multi-board synchronization regardless of the trigger source.

# Environmental Characteristics

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## Temperature and Humidity

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### Temperature

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#### Operating

Chassis with slot cooling capacity $\geq 58$ W <sup>20</sup>	0 °C to 55 °C
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All other compatible chassis	0 °C to 40 °C
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Storage	-40 °C to 71 °C
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### Humidity

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Operating	10% to 90%, noncondensing
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Storage	5% to 95%, noncondensing
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### Pollution Degree

2

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### Maximum altitude

2,000 m (800 mbar) (at 25 °C ambient temperature)

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## Shock and Vibration

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### Random vibration

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Operating	5 Hz to 500 Hz, 0.3 g RMS
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Non-operating	5 Hz to 500 Hz, 2.4 g RMS
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### Operating shock

30 g, half-sine, 11 ms pulse

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<sup>20</sup> Not all chassis with slot cooling capacity  $\geq 58$  W can achieve this ambient temperature range. Refer to PXI chassis specifications to determine the ambient temperature ranges your chassis can achieve.

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