

SPECIFICATIONS

PXIe-4162

PXIe, 12-Channel, ± 24 V, 100 mA Precision PXI Source Measure Unit

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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 *Nominal* unless otherwise noted.

Conditions

Specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature¹ of 23 °C ± 5 °C
- Chassis with slot cooling capacity ≥38 W²
 - 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	±24 V

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

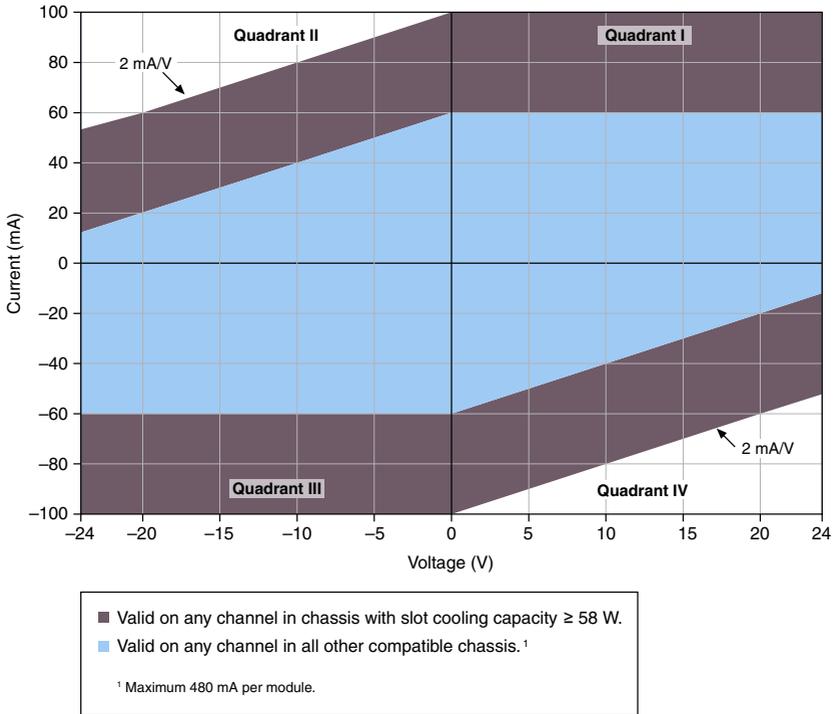
Table 1. PXIe-4162 DC Current Source and Sink Ranges, Warranted

Chassis Slot Cooling Capacity	
≥58 W	38 W
10 μA	
100 μA	
1 mA	
10 mA	
100 mA	60 mA

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

² For increased capability, NI recommends installing the PXIe-4162 in a chassis with slot cooling capacity ≥58 W.

Figure 1. PXIe-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 ³ \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 μV	0.05% + 5 mV	0.0005% + 1 μV

³ Temperature coefficient applies beyond $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ within $5\text{ }^{\circ}\text{C}$ of T_{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 ⁴ ± (% of Current + Offset)/°C, 0 °C to 55 °C
		T _{cal} ± 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 ⁵	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 ⁶	<500 µs, typical ⁷
Transient response ⁸	<100 µs, typical ⁹
Wideband source noise ¹⁰	15 mV RMS, typical <100 mV _{pk-pk} , typical

⁴ Temperature coefficient applies beyond 23 °C ± 5 °C within 5 °C of T_{cal}.

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

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

⁷ To settle to 0.1% of voltage step.

⁸ PXIe-4162 configured for fast transient response.

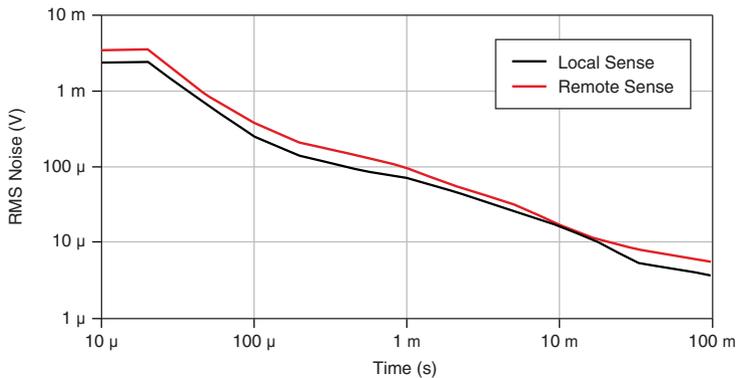
⁹ To recover within ±20 mV after a load current change from 10% to 90% of range.

¹⁰ 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 μ 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 ¹¹	50 μ 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 ¹²	
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	± 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,¹³ Typical

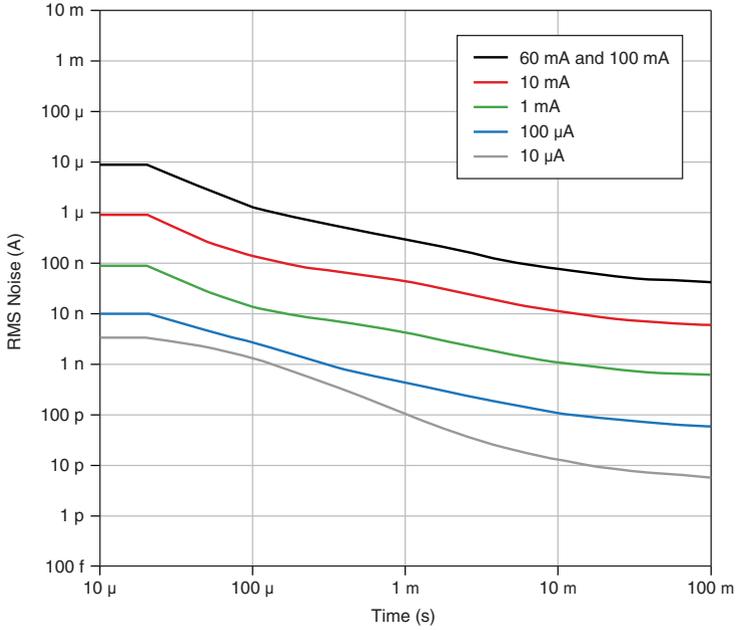


¹¹ At connector pins when using local sense.

¹² 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.

¹³ All channels averaged. Channel 11 has degraded performance.

Figure 3. Current RMS Noise Versus Aperture Time,¹⁴ Typical



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

Supplemental Specifications

Measurement and Update Timing

Available sample rates ¹⁵	(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 ¹⁶	100,000 S/s per channel, continuous
Maximum source update rate ¹⁷	
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) ¹⁸	
Polarity	Active high (not configurable)
Minimum pulse width	100 ns

¹⁵ 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.

¹⁶ Load dependent settling time is not included. Normal DC noise rejection is used.

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

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

Destinations¹⁹ (PXI trigger lines 0 to 7)¹⁸

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)¹⁸

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

¹⁹ 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

Temperature and Humidity

Temperature

Operating

Chassis with slot cooling capacity $\geq 58 \text{ W}^{20}$	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

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

Random vibration

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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²⁰ Not all chassis with slot cooling capacity $\geq 58 \text{ W}$ 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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