

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.

The following characteristic specifications 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
- 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)
- Fans set to the highest setting if the PXI Express chassis has multiple fan speed settings

Device Capabilities

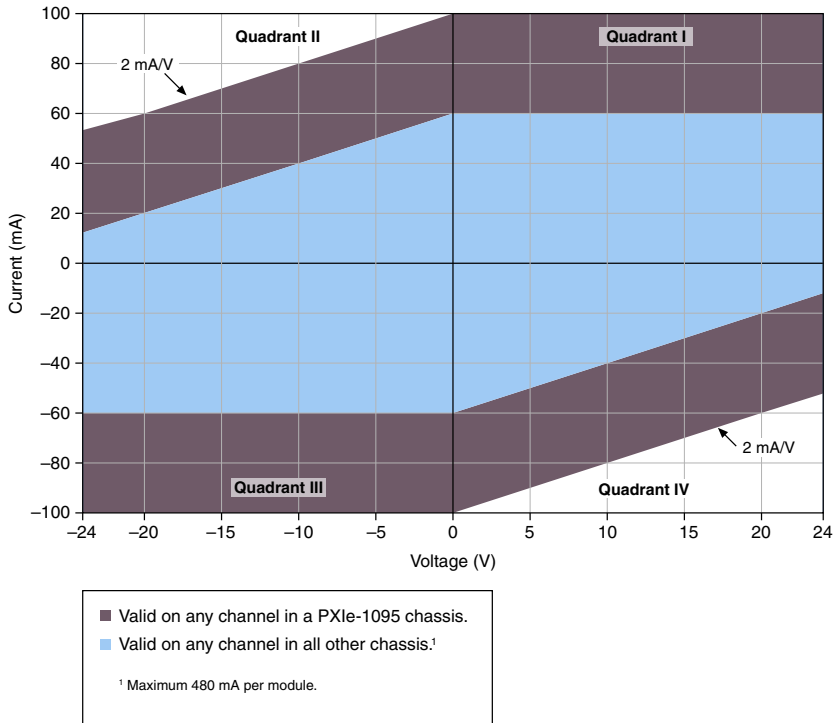
The following table and figure illustrate the voltage and the current source and sink ranges of the PXIe-4162.

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

| Channels | DC Voltage Ranges | DC Current Source and Sink Ranges | |
|--------------|-------------------|--|---|
| | | With a PXIe-1095 Chassis | With All Other Chassis |
| 0 through 11 | ±24 V | 10 µA 100 µA 1 mA 10 mA 100 mA | 10 µA 100 µA 1 mA 10 mA 60 mA |

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

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 °C ± 5 °C) ± (% of Voltage + Offset) | Tempco ² ± (% of Voltage + Offset)/°C, 0 °C to 55 °C |
|-------|---|---|--|
| | | T _{cal} ± 5 °C | |
| 24 V | 200 μV | 0.05% + 5 mV | 0.0005% + 1 μV |

² Temperature coefficient applies beyond 23 °C ± 5 °C within 5 °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 ³ ± (% 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 | 1 µA | 0.10% + 50 µA | 0.004% + 100 nA |
| 100 mA ⁴ | 1 µA | 0.10% + 50 µA | 0.004% + 100 nA |

DC Power

With a PXIe-1095 chassis

| | |
|-------------|--------|
| Per channel | 2.4 W |
| Total | 28.8 W |

With all other chassis

| | |
|-------------|--------|
| Per channel | 1.4 W |
| Total | 11.5 W |

Additional Specifications

| | |
|---------------------------------|-------------------------------|
| Settling time ⁵ | <500 µs, typical ⁶ |
| Transient response ⁷ | <100 µs, typical ⁸ |

³ Temperature coefficient applies beyond 23 °C ± 5 °C within 5 °C of T_{cal}.

⁴ Only available when used with a PXIe-1095 chassis.

⁵ Current limit set to ≥1 mA and ≥10% of the selected current limit range. PXIe-4162 configured for fast transient response.

⁶ To settle to 0.1% of voltage step.

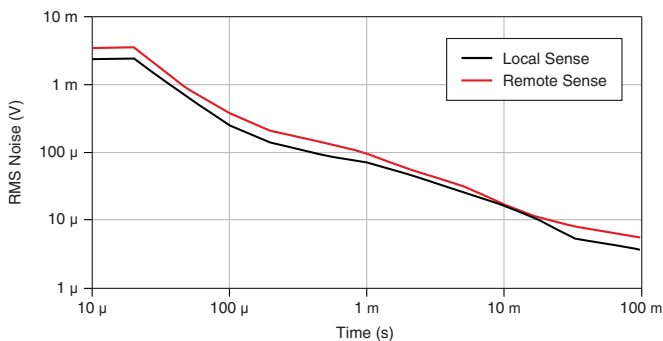
⁷ PXIe-4162 configured for fast transient response.

⁸ To recover within ±20 mV after a load current change from 10% to 90% of range.

| | |
|---|--|
| Wideband source noise ⁹ | 15 mV _{RMS} , typical <100 mV _{pk-pk} , typical |
| 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 ¹⁰ | 50 μ V/mA, typical |
| Current | (30 pA + 20 ppm of range)/volt, typical |
| Functional isolation voltage, any pin to earth ground | 60 VDC |
| Absolute maximum voltage to Output LO | |
| From Sense HI, Sense LO, or Guard ¹¹ | |
| When V _{Output HI} > 0 V | -0.5 V to (V _{Output HI} + 0.5 V) |
| When V _{Output HI} \leq 0 V | (V _{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 Time¹², Typical



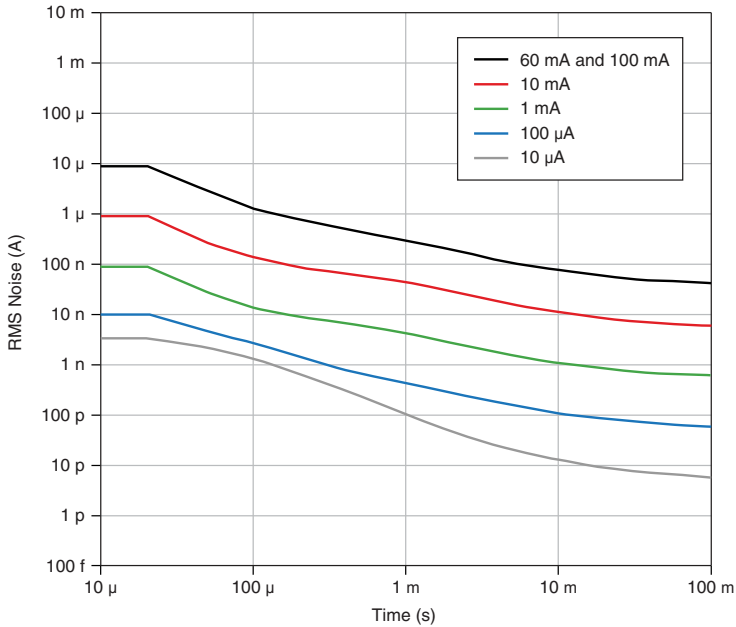
⁹ 20 Hz to 20 MHz bandwidth. PXIe-4162 configured for normal transient response. Measured at the end of the 1 m SHDB62M-DB62M-LL cable.

¹⁰ At connector pins when using local sense.

¹¹ Where V_{Output HI} is the voltage at the Output HI pin in the same channel as a Sense HI, Sense LO, or Guard pin.

¹² All channels averaged. Channel 11 has degraded performance.

Figure 3. Current RMS Noise Versus Aperture Time¹³, Typical



Supplemental Specifications

Measurement and Update Timing

Available sample rates¹⁴ (600 kS/s)/ N

where $N = 6, 7, 8, \dots, 2^{20}$ and S is samples.

Sample rate accuracy ±50 ppm

Maximum measure rate to host¹⁵ 100,000 S/s per channel, continuous

¹³ All channels averaged. In the 100 mA range, channel 4 has degraded performance.

¹⁴ 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.

¹⁵ Load dependent settling time is not included. Normal DC noise rejection is used.

Maximum source update rate¹⁶

| | |
|-----------------------------|------------------------------|
| Single channel | 100,000 updates/s |
| All channels simultaneously | 40,000 updates/s per channel |

Input trigger to

| | |
|----------------------|-------------|
| Source event delay | 8.5 μ s |
| Source event jitter | 1.7 μ s |
| Measure event jitter | 1.7 μ s |

Triggers

Input triggers

| | |
|-------|--|
| Types | Start Source Sequence Advance Measure |
|-------|--|

Sources (PXI trigger lines 0 to 7)¹⁷

| | |
|---------------------|--------------------------------|
| Polarity | Active high (not configurable) |
| Minimum pulse width | 100 ns |

Destinations¹⁸ (PXI trigger lines 0 to 7)¹⁷

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

Output triggers (events)

| | |
|-------|--|
| Types | Source Complete Sequence Iteration Complete Sequence Engine Done Measure Complete |
|-------|--|

Destinations (PXI trigger lines 0 to 7)¹⁷

| | |
|-------------|--------------------------------|
| Polarity | Active high (not configurable) |
| Pulse width | 230 ns |

¹⁶ As the source delay is adjusted or if advanced sequencing is used, maximum source update rates may vary.

¹⁷ Pulse widths and logic levels are compliant with *PXI Express Hardware Specification Revision 1.0 ECN 1*.

¹⁸ 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.

Calibration Interval

| | |
|----------------------------------|--------|
| Recommended calibration interval | 1 year |
|----------------------------------|--------|

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 |

Environment

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

Indoor use only.

Operating Environment

| | |
|---------------------------|--|
| Ambient temperature range | |
| With a PXIe-1095 chassis | 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.) |
| With all other chassis | 0 °C to 45 °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 _{rms} (Tested in accordance with IEC 60068-2-64.) |
| Nonoperating | 5 Hz to 500 Hz, 2.4 g _{rms} (Tested in accordance with IEC 60068-2-64. Test profile exceeds the requirements of MIL-PRF-28800F, Class 3.) |

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