# PXIe-4112 Specifications

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# Contents

# PXIe-4112 Specifications

## 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.

## Conditions

Specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature[1] of 23 °C ± 5 °C
- Calibration interval of 2 years
- 30 minutes warm-up time
- niDCPower Power Line Frequency property or NIDCPOWER_ATTR_POWER_LINE_FREQUENCY attribute set to 1 power line cycle (PLC)
- niDCPower Samples to Average property or NIDCPOWER_ATTR_SAMPLES_TO_AVERAGE attribute set to 300 for optimal 50 Hz and 60 Hz rejection
- If the PXI Express chassis has multiple fan speed settings, fans set to the highest setting

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

# PXIe-4112 Pinout

## Output Connector

Figure 5. PXIe-4112 Output Connector Pinout

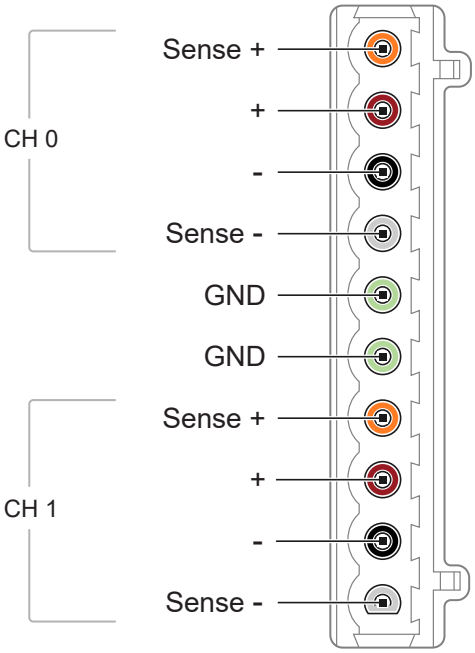



Table 2. Signal Descriptions

| Signal | Description |
|---|---|
| CH <0..1> + | HI force terminal connected to channel power stage (generates and/or dissipates power). Positive polarity is defined as voltage measured on HI > LO. |
| CH <0..1> - | LO force terminal connected to channel power stage (generates and/or dissipates power). Positive polarity is defined as voltage measured on HI > LO. |
| CH <0..1> Sense + | Voltage remote sense input terminals. Used to compensate for ***I*R*** voltage drops in cable leads, connectors, and switches. |
| CH <0..1> Sense - | |
| GND | Tied to chassis ground through module front panel. Use for connections to cable shields or grounding the LO force terminal. |

## Auxiliary Power Input Connector

Figure 6. PXIe-4112 Auxiliary Power Input Connector

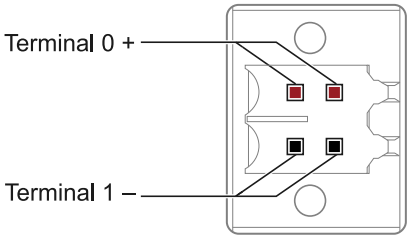



Table 3. Signal Descriptions

| Signal | Description |
|---|---|
| Terminal 0 + | Positive Auxiliary Power Input |
| Terminal 1 - | Negative Auxiliary Power Input |

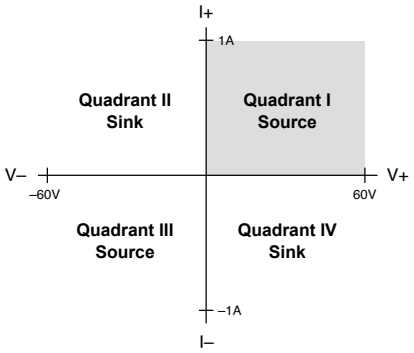
# Device Capabilities

The PXIe-4112 is a single-quadrant power supply with two output channels that are capable of identical output. Channels are isolated from each other and from chassis ground.

| | |
|---|---|
| **DC voltage** | |
| Voltage range | 60 V |
| Minimum programmable voltage level/limit | 0.1 V |
| **DC current** | |
| Current range | 1 A |
| Minimum programmable current level/limit | 0.01 A |
| Output power | 60 W/channel |

The following figure illustrates the voltage and the current source capabilities of the PXIe-4112.

Figure 7. PXIe-4112 Quadrant Diagram




# Programming and Measurement Accuracy/Resolution

Table 4. Programming and Measurement Accuracy/Resolution

| Specification | Resolution | Accuracy ± (% of output + offset), $T_{cal}$ ± 5 °C* | Temperature Coefficient/°C, outside $T_{cal}$ ± 5 °C |
|---|---|---|---|
| Voltage programming | 2 mV† | 0.12% + 55 mV | 0.008% + 0.3 mV |
| Voltage measurement | 17 mV‡ | 0.1% + 50 mV | 0.004% + 1.5 mV |
| Current programming | 34 µA† | 0.15% + 10 mA[2] | 0.015% + 0.05 mA |
| Current measurement | 274 µA‡ | 0.15% + 4 mA | 0.015% + 0.05 mA |

* $T_{cal}$ is the internal device temperature recorded by the PXIe-4112 at the completion of the last self-calibration.

† Based on 16-bit DAC after calibration.

‡ Based on 14-bit ADC with sign bit after calibration.

2. $T_{cal}$ is the internal device temperature recorded by the PXIe-4112 at the completion of the last external calibration.

## Load Regulation

| | |
|---|---|
| Voltage (per amp of output load) | 12 mV |
| Current (per volt of output change) | 32 µA |

**Note** Voltage load regulation is measured at the output channel terminals with the device configured for local sense.

## Voltage Output Speed

| | |
|---|---|
| **Rise time (measured from 10% to 90% of programmed voltage change from 0.1 V to 60 V with specified load)** | |
| Full resistive load (60 Ω) | <20 ms, typical |
| No load | <10 ms, typical |
| **Fall time (measured from 10% to 90% of programmed voltage change from 60 V to 0.1 V with specified load)** | |
| Full resistive load (60 Ω) | <20 ms, typical |
| No load | <40 ms, typical |

## Transient Response and Settling Time

| | |
|---|---|
| Transient response | <200 µs to recover within 200 mV of voltage level after a load current change from 50% to 100% of current range, typical |

| Settling time | |
|---|---|
| **Rise time (time to settle within 0.1% of final programmed voltage level from 0.1 V to 60 V with specified load)** | |
| Full resistive load (60 Ω) | 40 ms, typical |
| No load | 40 ms, typical |
| **Fall time (time to settle within 0.1% of final programmed voltage level from 60 V to 0.1 V with specified load)** | |
| Full resistive load (60 Ω) | 100 ms, typical |
| No load | 100 ms, typical |

## Ripple and Noise

| Voltage[3] | |
|---|---|
| Peak-to-peak | <24 mV, typical |
| RMS | <4 mV, typical |
| Current, RMS[4] | <2 mA, typical |

## Auxiliary Power Input Line Regulation

| Line regulation (per volt of change in the auxiliary power input) |
|---|

3. Noise is measured from 20 Hz to 20 MHz at output voltages of 0.5 V to 60 V.
4. Noise bandwidth is limited to 10 kHz and measured at 20 mA into a 500 Ω load.

| | |
|---|---|
| Voltage | 1 mV |
| Current | 0.2 mA |

## Remote Sense

| | |
|---|---|
| Maximum output lead drop | Up to 1 V drop per lead |
| Maximum sense lead resistance | Up to 1 Ω per lead |

## Protection

| | |
|---|---|
| **Output channel protection** | |
| Overcurrent or reverse voltage | Reverse clamp diode, protected by thermal overload circuit |
| Overtemperature | Automatic shutdown |
| **Auxiliary power input protection** | |
| Overvoltage, typical | >52.8 VDC shut-off |
| Overcurrent or reverse voltage | Fused |

## Absolute Maximum Limit

**Note** Applying levels beyond the ratings specified in this section can result

in permanent damage to the device.

**Note** Connect only voltages that are within these limits.

| | |
|---|---|
| Voltage from auxiliary power + to earth ground | 60 VDC |
| Voltage from auxiliary power - to earth ground | 1 VDC |

## Isolation

| **Isolation voltage, channels 0- and 1-to-earth ground**[5] | |
|---|---|
| Continuous | 150 VDC, CAT I |
| Withstand | 800 $V_{pk}$ |

**Caution** Do not connect to MAINs. Do not connect to signals or use for the measurements within CAT II, III, or IV.

**Note** 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, CAT III, or CAT IV.

**Hazardous Voltage** Take precautions to avoid electrical shock when operating this product at hazardous voltages.

**Note** Isolation voltage ratings apply to the voltage measured between any

5. Verified with a 5-second dielectric withstand test.

> channel pin and the chassis ground pins of the front panel. When operating channels in series or floating on top of external voltage references, ensure that no terminal exceeds this rating.

# Power Requirement

| | |
|---|---|
| PXI power requirement | 0.5 A from 3.3 V rail, 0.25 A from 12 V rail |
| Auxiliary power source input requirements | 45.6 VDC to 50.4 VDC,3.5 A max |

# Measurement Timing Characteristics

| **Measurement rate** | |
|---|---|
| Default | 60/s (Line frequency set to 60 Hz, aperture set to 1 PLC, measure record mode), nominal |
| Maximum | 5,250/s, nominal |

# Triggers

## Input Triggers

| | |
|---|---|
| Types | Start<br>Source<br>Sequence Advance<br>Measure |
| **Sources (PXI trigger lines 0 to 7)**[6]6 | |

6. Pulse widths and logic levels are compliant with ***PXI Express Hardware Specification Revision***

| | |
|---|---|
| Polarity | Active high (not configurable) |
| Minimum pulse width | 100 ns |
| **Destinations[7] (PXI trigger lines 0 to 7)[6]** | |
| Polarity | Active high (not configurable) |
| Minimum pulse width | 200 ns |

## Output Triggers (Events)

| | |
|---|---|
| Types | Source Complete<br>Sequence Iteration Complete<br>Sequence Engine Done<br>Measure Complete |
| **Destinations (PXI trigger lines 0 to 7)[6]** | |
| Polarity | Active high (not configurable) |
| Pulse width | 230 ns |

***1.0 ECN 1***.

7. 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.

# Physical Characteristics

| | |
|---|---|
| Dimensions | 3U, one-slot, PXI Express/cPCI Express module; 2.0 cm × 13.0 cm × 21.6 cm (0.8 in. × 5.1 in. × 8.5 in.), nominal |
| Weight | 443 g, nominal |
| User-replaceable fuse, auxiliary power input (PCB-mount) | F 6.3 A H 250 V (5 × 20 mm ceramic fuse) |

**Note** NI recommends the Littelfuse 021606.3MXP fuse.

| **Front panel connectors** | |
|---|---|
| Output channels | Phoenix Contact, 5.08 mm (10 position) |
| Auxiliary power input | Weidmuller, 3.5 mm (2 × 2 position) |

**Note** I/O connectors can accept wire gauges from 12 AWG to 24 AWG. NI recommends 14 AWG or smaller.

**Note** The PXIe-4112 ships with four sense jumpers installed on the output connector. The sense jumpers connect the sense terminals to their respective output terminals.

# Calibration Interval

| | |
|---|---|
| Recommended calibration interval | 2 years |

# Environment

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

Indoor use only.

## Operating Environment

| | |
|---|---|
| **Ambient temperature range, operating** | 0 °C to 55 °C |
| **Relative humidity range, operating** | 10% to 90%, noncondensing |

## Storage Environment

| | |
|---|---|
| **Ambient temperature range, storage** | -40 °C to 71 °C |
| **Relative humidity range, storage** | 5% to 95%, noncondensing |

# Shock and Vibration

| | |
|---|---|
| **Operating shock** | 30 g peak, half-sine, 11 ms pulse |
| **Random vibration** | • Operating: 5 Hz to 500 Hz, 0.3 g RMS<br>• Nonoperating: 5 Hz to 500 Hz, 2.4 g RMS |

# Cleaning the Module

Clean devices and terminal blocks by brushing off light dust with a soft, nonmetallic brush. Remove other contaminants with a soft, lint-free, dampened cloth. Do not use detergent or chemical solvents. The unit must be completely dry and free from contaminants before returning to service.

# Compliance and Certifications

**Caution** You can impair the protection provided by the PXIe-4112 if you use it in a manner not described in this document.

**Caution** The auxiliary power input port is sensitive to electrostatic discharge (ESD). When subjected to ESD during normal operation, a fault might result that requires user intervention to recover to normal operation. To ensure proper operation, make all I/O connections before attempting to use the device. In addition, take care to prevent ESD to the auxiliary power input port during normal operation.

## 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 CE

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, 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 ***Engineering a Healthy Planet*** web page at 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.

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—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.

电子信息产品污染控制管理办法（中国RoHS）

- **中国RoHS**— NI符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于NI中国RoHS合规性信息，请登录 ni.com/environment/rohs_china。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)