

## SPECIFICATIONS

# PXI-4110

## 3-Channel, 20 V, 1 A PXI Programmable Power Supply

These specifications apply to the PXI-4110 with APS-4100 Auxiliary Power Supply and the PXI-4110 without auxiliary power supply.

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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 expected performance met by a majority of the models.
- *Nominal* specifications describe parameters and attributes that may be useful in operation.

Specifications are *Warranted* unless otherwise noted.

# Conditions

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Specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature<sup>1</sup> of  $23\text{ °C} \pm 10\text{ °C}$
- Calibration interval of 1 year
- 15 minutes warm-up time
- **niDCPower Samples to Average** property or `NIDCPOWER_ATTR_SAMPLES_TO_AVERAGE` attribute set to 300 for optimal 50 Hz and 60 Hz rejection

# Cleaning Statement

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**Caution** Clean the hardware with a soft, nonmetallic brush. Make sure that the hardware is completely dry and free from contaminants before returning it to service.

# Device Capabilities

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The following table and figure illustrate the voltage and current source ranges of the PXI-4110.

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

Channel	DC voltage	Isolation <sup>2</sup>	DC current (power)			
			Auxiliary power		Internal power	
			20 mA range	1 A range	20 mA range	1 A range
0	0 V to +6 V	N/A	N/A	1 A (6 W)	N/A	1 A (6 W)
1	0 V to +20 V	60 VDC, CAT I	20 mA	1 A (20 W)	20 mA	100 mA (2 W) <sup>3</sup>
2	0 V to -20 V	60 VDC, CAT I	20 mA	1 A (20 W)	20 mA	100 mA (2 W) <sup>3</sup>

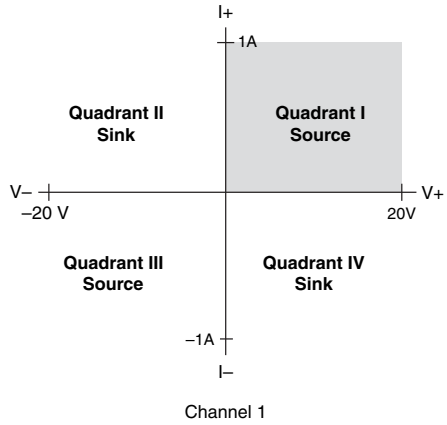
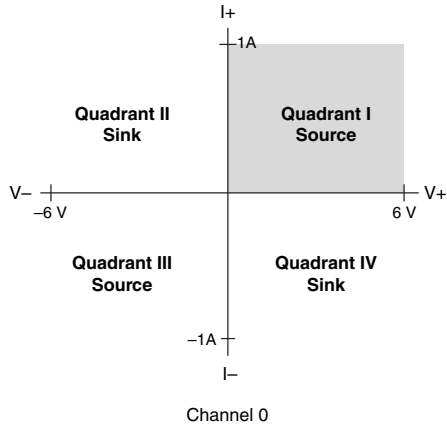


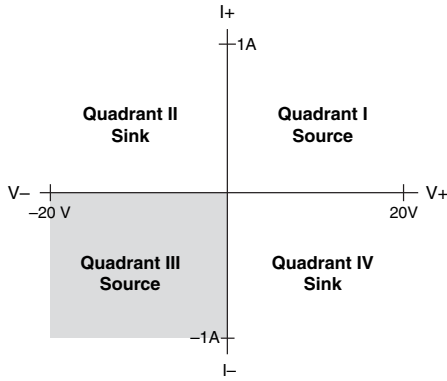
**Note** The PXI-4110 is a single-quadrant power supply with three output channels. In this document, channel 0 refers to the 0 V to +6 V output, channel 1 refers to the 0 V to +20 V output, and channel 2 refers to the 0 V to -20 V output.

<sup>2</sup> Channels 1 and 2 are isolated from the ground but not from each other.

<sup>3</sup> When internally powered, the combined outputs of channels 1 and 2 must not exceed 3 W total.

**Figure 1. Quadrant Diagrams**





Channel 2

## Voltage Programming Accuracy/Resolution

**Table 1.** Voltage Programming Accuracy/Resolution

Channel	Range	Resolution	Accuracy ± (% of voltage + offset)	
			1 year 23 °C ± 10 °C	Tempco/ <sup>o</sup> C <sup>4</sup> 0 °C to 55 °C
0	+6 V	0.12 mV	0.05% + 4 mV	0.005% + 0.3 mV
1	+20 V	0.40 mV	0.05% + 10 mV	0.005% + 1 mV
2	-20 V	0.40 mV	0.05% + 10 mV	0.005% + 1 mV

<sup>4</sup> Tempco refers to the temperature coefficient.

# Current Programming Accuracy/Resolution

**Table 2. Current Programming Accuracy/Resolution<sup>5</sup>**

Channel	Range <sup>6</sup>	Resolution	Accuracy ± (% of current + offset)	
			1 year 23 °C ± 10 °C	Tempco/°C <sup>7</sup> 0 °C to 55 °C
0	1 A	0.02 mA	0.15% + 4 mA	0.02% + 0.2 mA
1 and 2	20 mA	0.40 µA	0.15% + 60 µA	0.01% + 3 µA
	1 A	0.02 mA	0.15% + 4 mA	0.02% + 0.2 mA

## Related Information

[Accuracy Specification Derating versus Output Current](#) on page 8

# Voltage Measurement Accuracy/Resolution

**Table 3. Voltage Measurement Accuracy/Resolution<sup>8</sup>**

Channel	Range	Resolution	Accuracy ± (% of voltage + offset)	
			1 year 23 °C ± 10 °C	Tempco/°C <sup>7</sup> 0 °C to 55 °C
0	+6 V	0.06 mV	0.05% + 4 mV	0.005% + 0.2 mV
1	+20 V	0.20 mV	0.05% + 5 mV	0.005% + 0.5 mV
2	-20 V	0.20 mV	0.05% + 5 mV	0.005% + 0.5 mV

<sup>5</sup> Calibrated at half of voltage range on channel. Applies to current limits greater than 2% of range. Applies to output current up to 500 mA. For output current greater than 500 mA, accuracy is derated.

<sup>6</sup> Minimum programmable current limit is 2% of range. Minimum programmable current level is 1% of the range.

<sup>7</sup> Tempco refers to the temperature coefficient.

<sup>8</sup> Using the **niDCPower Samples to Average** property or the `NIDCPOWER_ATTR_SAMPLES_TO_AVERAGE` attribute set to 300.

# Current Measurement Accuracy/Resolution

**Table 4. Current Measurement Accuracy/Resolution<sup>9</sup>**

Channel	Range	Resolution	Accuracy ± (% of current + offset) <sup>10</sup>	
			1 year 23 °C ± 10 °C	Tempco/°C <sup>11</sup> 0 °C to 55 °C
0	1 A	0.01 mA	0.15% + 4 mA	0.02% + 0.2 mA
1 and 2	20 mA	0.20 µA	0.15% + 35 µA	0.01% + 3 µA
	1 A	0.01 mA	0.15% + 4 mA	0.02% + 0.2 mA

## Related Information

[Accuracy Specification Derating versus Output Current](#) on page 8

# Voltage Output Speed, Typical

**Table 5. Voltage Output Speed,<sup>12</sup> Typical**

Channel	Auxiliary power				Internal power			
	Rise time <sup>13</sup>		Fall time <sup>14</sup>		Rise time <sup>13</sup>		Fall time <sup>14</sup>	
	Full load	No load	Full load	No load	Full load	No load	Full load	No load
0	<1 ms	<1 ms	<1 ms	<25 ms	same as auxiliary power			
1 and 2	<1 ms	<1 ms	<2 ms	<56 ms	<20 ms	<10 ms	<15 ms	<56 ms

<sup>9</sup> Using the **niDCPower Samples to Average** property or the `NIDCPOWER_ATTR_SAMPLES_TO_AVERAGE` attribute set to 300.

<sup>10</sup> For output current greater than 500 mA, accuracy is derated.

<sup>11</sup> Tempco refers to the temperature coefficient.

<sup>12</sup> Current limit set to 1 A for auxiliary power or 100 mA for internal power, resistive load. For 20 mA range, all voltage output speeds are <80 ms.

<sup>13</sup> Rise time is from 10% to 90% of programmed voltage change at maximum current.

<sup>14</sup> Fall time is from 90% to 10% of programmed voltage change at maximum current.

# Line and Load Regulation

Line Regulation<sup>15</sup> (per volt of change in auxiliary power input)  $\pm$  (% of output + offset)

Voltage, channel 1 and 2	0.01 + 1 mV
Current, channel 1 and 2	0.01 + 0.02% of range

## Load Regulation

Voltage (% of voltage range, per amp of output load, measured at output channel terminals)

Channel 0	0.42%
Channel 1 and 2	0.1%

Current (% of current range, per volt of output change)

Channel 0	0.02%
Channel 1 and 2, 1 A range	0.007%
Channel 1 and 2, 20 mA range	0.003%

# Ripple and Noise, Typical

**Table 6.** Ripple and Noise, Typical

Channel	RMS normal-mode voltage (20 Hz to 20 MHz)	RMS normal-mode current (20 mA into 500 $\Omega$ load) <sup>16</sup>
0	<1.5 mV	<8 $\mu$ A
1 and 2	<1 mV	<8 $\mu$ A (<3 $\mu$ A for 20 mA range)

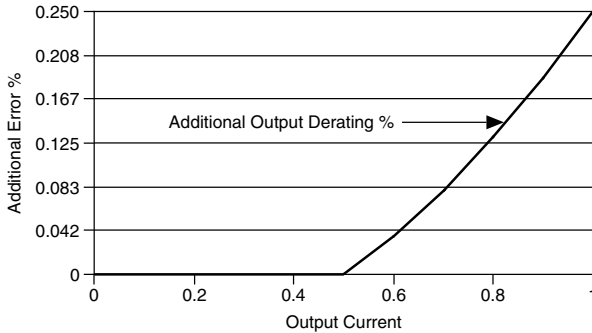
# Accuracy Specification Derating versus Output Current

The following figure illustrates accuracy specification derating as a function of output current for the PXI-4110.

<sup>15</sup> Line regulation applies to the auxiliary power input only.

<sup>16</sup> Current noise bandwidth is limited to 10 kHz for 1 A range and 400 Hz for 20 mA range.

**Figure 2.** Accuracy Specification Derating versus Output Current



## Transient Response

Transient response

Recovers to <0.1% of voltage range within 50  $\mu$ s after a change in load current from 50% to 100% of current range, typical.

## Measurement Timing Characteristics

Sample rate

Default	300 S/s, nominal
Maximum	3,000 S/s, nominal

## Absolute Maximum Limit

Maximum Voltage<sup>17</sup>

Channel-to-COM	14 VDC over rated output, CAT I
Cascading multiple channels, channel-to-chassis ground	60 VDC max

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels,

<sup>17</sup> The maximum voltage that can be applied or output between any port or  $V_{SUP}$  terminal and a COM terminal without creating a safety hazard.

special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.



**Caution** Applying levels beyond the ratings specified in this section can result in permanent damage to the device.



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



**Caution** 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.

## Protection

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### Output channel protection

Overvoltage	Tolerates 14 VDC over rated output
Overcurrent or reverse voltage	Fused
Overtemperature	Automatic shutdown

### Auxiliary power input protection

Overvoltage	>15.5 VDC shut-off; >20 VDC crowbar (fused), typical
Overcurrent or reverse voltage	Fused

## Isolation

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Isolation voltage, channels 1- and 2-to-earth ground

60 VDC, CAT I, verified by dielectric withstand test, 5 s, continuous



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



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



**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.

# Calibration Interval

Recommended calibration interval	1 year
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# Power Requirement Characteristics

PXI power requirement	10 W at 5 V, 1 W at 3.3 V, 6 W at 12 V, 3 W at -12 V, typical
Auxiliary power source (optional, channels 1 and 2 only) input requirements	11 VDC to 15.5 VDC, 5 A max, typical

## Related Information

*For information about cascading multiple NI PXI-4110 devices, refer to the [NI DC Power Supplies and SMUs Help](#).*

# Physical Characteristics

Dimensions	3U, one-slot, PXI/cPCI module; 2.0 cm × 13.0 cm × 21.6 cm (0.8 in. × 5.1 in. × 8.5 in.), nominal
Weight	323 g, typical
User-replaceable fuses	
Output channels (internally socketed) <sup>18</sup>	3, Littelfuse 045301.5 (F 1.5 A 125 V), characteristic
Auxiliary power input (front panel mount)	1, 5 x 20 mm glass fuse, Littelfuse 21806.3 (T 6.3 A L 250 V), characteristic



**Note** Fuses located on bottom of device underneath door. Use Phillips #1 screwdriver for removal.



**Fuse** When this fuse symbol is marked on a device, take proper precautions.

## I/O connectors

Output channels	MINI-COMBICON, 3.81 mm (6 position), nominal
Auxiliary power input	MINI-COMBICON, 3.5 mm (2 position), nominal

<sup>18</sup> A spare output channel fuse is located near the rear PXI connector of the PXI-4110.



**Note** I/O connectors can accept wire gauges from 16 AWG to 28 AWG. NI recommends 18 AWG or lower.

## Environment

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

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Indoor use only.

## Operating Environment

Ambient temperature range	0 °C to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)

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## Storage Environment

Ambient temperature range	-40 °C to 71 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	5% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56.)

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## Shock and Vibration

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Operational shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)
Random vibration	
Operating	5 Hz to 500 Hz, 0.31 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64.)
Nonoperating	5 Hz to 500 Hz, 2.46 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64. Test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

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# Compliance and Certifications

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**Caution** You can impair the protection provided by the PXI-4110 if you use it in a manner not described in this document.



**Hazardous Voltage** This icon denotes a warning advising you to take precautions to avoid electrical shock.

## Safety

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 UL and other safety certifications, refer to the product label or the [Online Product Certification](#) 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 [Online Product Certification](#) 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)

## Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit [ni.com/certification](https://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## 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 *Minimize Our Environmental Impact* web page at [ni.com/environment](https://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](https://ni.com/environment/weee).

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