SPECIFICATIONS

PXIe-4163

PXIe, 24-Channel, ±24 V, 50 mA Precision PXI Source Measure Unit

Contents

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.

NATIONAL
INSTRUMENTS™

Conditions

Specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature[1] of 23 °C ± 5 °C
- Chassis with slot cooling capacity ≥38 W[2]
  - 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 23
DC voltage range	±24 V

The following table and figure illustrate the voltage and the current source and sink ranges of the PXIe-4163.
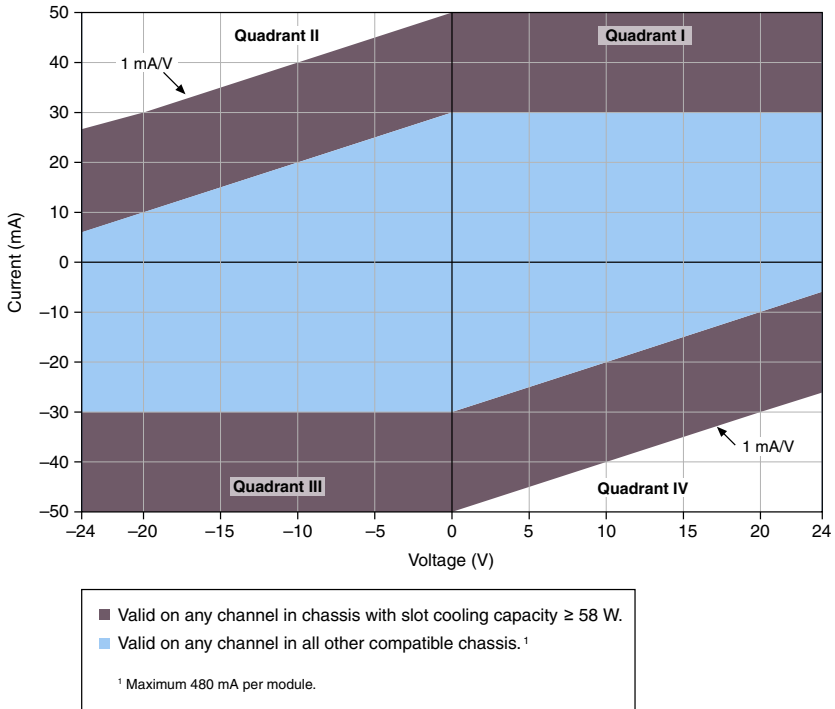
Table 1. PXIe-4163 DC Current Source and Sink Ranges, Warranted

Chassis Slot Cooling Capacity	
≥58 W	**38 W**
10 µA	
100 µA	
1 mA	
10 mA	
50 mA	30 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-4163 in a chassis with slot cooling capacity ≥58 W.

Figure 1. PXIe-4163 Quadrant Diagram, Any Channel

- ■ Valid on any channel in chassis with slot cooling capacity ≥ 58 W.
- ■ Valid on any channel in all other compatible chassis.[1]

  [1] Maximum 480 mA per module.

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[3] ± (% of Voltage + Offset)/°C, 0 °C to 55 °C
		$T_{cal} \pm 5$ °C	
24 V	200 µV	0.05% + 5 mV	0.0005% + 1 µV

---

[3] 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[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
30 mA or 50 mA[5]	500 nA	0.10% + 25 μA	0.004% + 50 nA

Available DC Output Power

Chassis Slot Cooling Capacity	Per Channel Maximum	Absolute Maximum
≥58 W	1.2 W	28.8 W
38 W	0.7 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] 50 mA range available only when installed in chassis with slot cooling capacity ≥58 W. 30 mA range available in all other chassis.

[6] Current limit set to ≥1 mA and ≥10% of the selected current limit range. PXIe-4163 configured for fast transient response.

[7] To settle to 0.1% of voltage step.

[8] PXIe-4163 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-4163 configured for normal transient response. Measured at the end of the 1 m SHDB62M-DB62M-LL cable.

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 µV/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[12]	
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	±25 V

The following figures illustrate noise as a function of measurement aperture for the PXIe-4163.
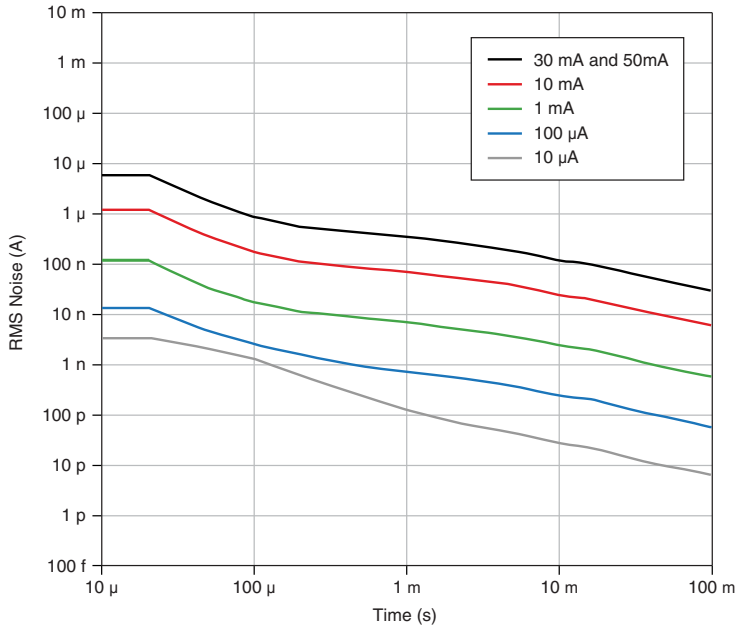
Figure 2. Voltage RMS Noise Versus Aperture Time,[13] Typical

---
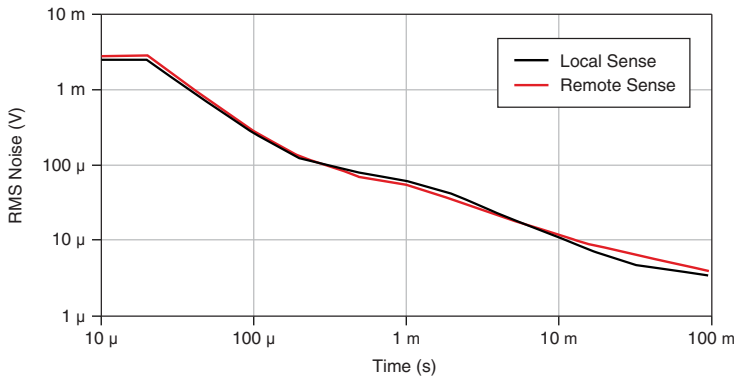
[11] At connector pins when using local sense.
[12] Where $V_{Output\ HI}$ is the voltage at the Output HI pin in the same channel as a Sense HI pin.
[13] All channels averaged. Channels 9 and 22 have degraded performance.

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

---

[14] All channels averaged. Channels 7, 9, and 11 have degraded performance.

Supplemental Specifications

Measurement and Update Timing

Available sample rates[15]	$(600 \text{ kS/s})/N$

where

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

    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*.

Destinations[19] (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
Destinations (PXI trigger lines 0 to 7)[18]	
Polarity	Active high (not configurable)
Pulse width	230 ns

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

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 ≥58 W[20]	0 °C to 55 °C
		All other compatible chassis	0 °C to 40 °C
	Storage	-40 °C to 71 °C
Humidity		
	Operating	10% to 90%, noncondensing
	Storage	5% to 95%, noncondensing
Pollution Degree		2
Maximum altitude		2,000 m (800 mbar) (at 25 °C ambient temperature)

Shock and Vibration

Random vibration		
	Operating	5 Hz to 500 Hz, 0.3 g RMS
	Non-operating	5 Hz to 500 Hz, 2.4 g RMS
Operating shock		30 g, half-sine, 11 ms pulse

---

[20] Not all chassis with slot cooling capacity ≥58 W can achieve this ambient temperature range. Refer to PXI chassis specifications to determine the ambient temperature ranges your chassis can achieve.