PXIe-4082 Specifications

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These specifications apply to the PXIe-4082, a PXIe, 6½-Digit, ±300 V, Onboard 1.8 MS/s Isolated Digitizer, L and C Measurement Support, PXI Digital Multimeter.

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.

T_{extcal} is the device temperature at last external calibration.

$T_{selfcal}$ is the device temperature at last self-calibration.

Conditions

Specifications are valid under the following conditions unless otherwise noted. Refer to each section for additional conditions that apply.

- Self-calibration performed within the last 24 hours
- Calibration interval of 2 years
- Warm-up time of 60 minutes
- Resolution set to 6.5 digits or higher for specifications requiring an aperture greater than or equal to 100 ms

PXIe-4082 Pinout

Figure 1. PXIe-4082 Connector Pinout

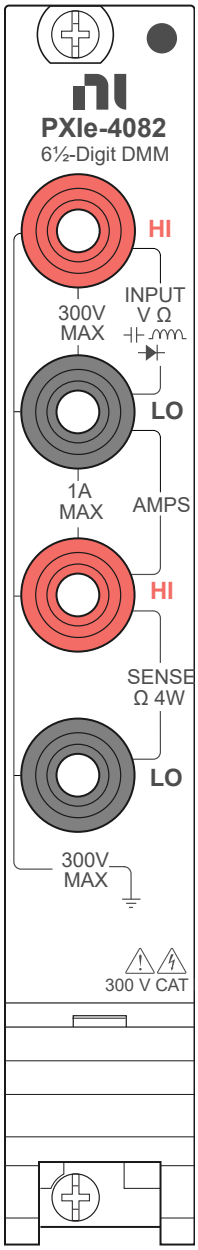


Table 1. Signal Descriptions

Signal Name	Description
Input HI	High-input impedance terminal with a positive polarity defined as Input HI > Input LO. Use this terminal in conjunction with Input LO to measure voltage, 2-wire resistance, and sourcing a test current in 4-wire resistance mode.

Signal Name	Description
Input LO	Low-input impedance terminal that must be connected for all measurement types. Use this terminal in conjunction with Input HI to measure voltage, 2-wire resistance, and sourcing a test current in 4-wire resistance mode. Use this terminal in conjunction with Sense HI to measure current.
Sense HI	Positive input terminal when measuring current. Positive current is defined as current flowing into the Sense HI terminal and out of the Input LO terminal. Sense HI is also a high-input impedance terminal when measuring 4-wire resistance. In this mode, connect the terminal to Input HI as close to the DUT as possible to avoid measuring parasitic resistance in the cabling and fixturing.
Sense LO	High-input impedance terminal when measuring 4-wire resistance. In this mode, connect the terminal to Input LO as close to the DUT as possible to avoid measuring parasitic resistance in the cabling and fixturing.

DC Voltage Specifications

DC Voltage Accuracy Specifications

All DC voltage accuracy specifications apply to apertures of ≥100 ms, with Auto Zero and ADC calibration enabled. Assumes offset nulling. Otherwise, add 2 µV to the specifications.

Table 2. DC Voltage ± (ppm of reading + ppm of range)

Range	Input resistance[1]	24 hour[2] $T_{selfcal}$ ±1 °C	90 day $T_{selfcal}$ ±5 °C	2 year $T_{selfcal}$ ±5 °C	Tempco/°C	
					Without Self-Cal	With Self-Cal
100 mV	10 MΩ ± 2%,	10 + 10	40 + 20	45 + 20	4 + 5	0.3 + 0.3

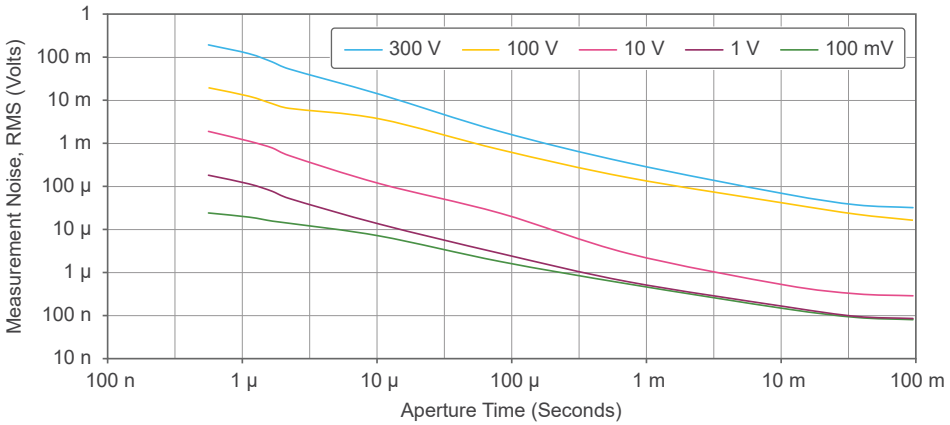
1. In parallel with 150 pF, typical
2. Relative to external calibration source.

Range	Input resistance	24 hour $T_{selfcal}$ ±1 °C	90 day $T_{selfcal}$ ±5 °C	2 year $T_{selfcal}$ ±5 °C	Tempco/°C	
					Without Self-Cal	With Self-Cal
1 V	>10 GΩ	6 + 2	20 + 6	25 + 6	2 + 1	0.3 + 0.3
10 V		4 + 2	20 + 6	25 + 6	1 + 1	0.3 + 0.3
100 V	10 MΩ ± 2%	6 + 2	30 + 6	35 + 6	4 + 1	0.3 + 0.3
300 V		6 + 6	30 + 20	35 + 20	4 + 1	0.3 + 0.3

DC Voltage Noise

Note The following graph represents DC voltage noise with input shorted, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to the accuracy specification.

Figure 2. DC Voltage Noise, Typical



DC Voltage General Specifications

ADC linearity	0.5 ppm of reading + 1 ppm of range
Effective common-mode rejection ratio (CMRR) (1 kΩ resistance in LO lead)	>140 dB (DC), 100 ms aperture; >170 dB (>46 Hz) with high-order DC noise rejection, 100 ms aperture, typical
Overrange	105% of range except 300 V
DC voltage input bias current	<30 pA at 23 °C, typical

Resistance Specifications

Resistance Accuracy Specifications

All resistance accuracy specifications apply to apertures of ≥100 ms, with Offset Compensated Ohms (for ranges ≤10 kΩ) or Auto Zero (for ranges ≥100 kΩ) and ADC calibration enabled.

Table 3. Resistance (4-Wire and 2-Wire) ± (ppm of reading + ppm of range)

Range	Test current[3]	Max test voltage[4]	Open circuit voltage[5]	24 hour[6] $T_{selfcal}$ ±1 °C	90 day $T_{selfcal}$ ±5 °C	2 year $T_{selfcal}$ ±5 °C	Tempco/°C	
							Without Self-Cal	With Self-Cal
100 Ω	1 mA	100 mV	11.3	15 + 10	50 + 15	80 + 15	5 + 1	0.8 + 1
1 kΩ	1 mA	1 V	11.3	12 + 2	50 + 3	80 + 3	5 + 0.1	0.8 + 0.1
10 kΩ	100 µA	1 V	11.7	12 + 2	50 + 3	80 + 3	5 + 0.1	0.8 + 0.1
100 kΩ [7]	10 µA	1 V	11.7	15 + 2	90 + 6	95 + 6	5 + 0.5	2 + 0.5
1 MΩ	10 µA	10 V	11.7	20 + 2	90 + 10	95 + 10	5 + 1	2 + 1
10 MΩ	1 µA	10 V	11.6	100 + 2	800 + 10	800 + 10	20 + 3	20 + 3
100 MΩ [8]	1 µA || 10 MΩ	10 V	9.7	500 + 10	3000 + 10	3000 + 10	300 + 10	300 + 10

Note For 2-wire resistance measurements, perform offset nulling or add 200 mΩ to reading.

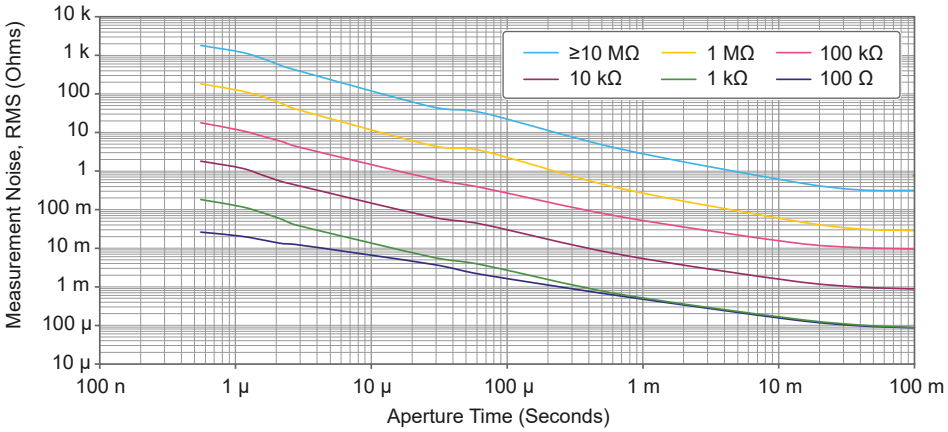
Resistance Noise

Note The following graph representes resistance noise with input shorted,

3. -13% to 0% tolerance, typical.
4. Highest nominal voltage present with highest range resistance applied.
5. Nominal voltage present at output with no resistance load.
6. Relative to external calibration source.
7. Perform offset nulling or add 2 ppm of range to the specifications.
8. 2-wire resistance measurement only. Use tempco outside T_{extcal} +/- 10 °C. Typical accuracy is 5% between 105 MΩ and 1.05 GΩ.

> Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to the accuracy specification.

Figure 3. PXIe-4082 Resistance Noise, Typical



Resistance General Specifications

Maximum 4-wire lead resistance	Use the lesser of 10% of range or 1 kΩ

DC Current Specifications

DC Current Accuracy Specifications

All DC current accuracy specifications apply for apertures ≥100 ms, with Auto Zero and ADC calibration enabled.

Table 4. DC Current ± (ppm of reading + ppm of range)

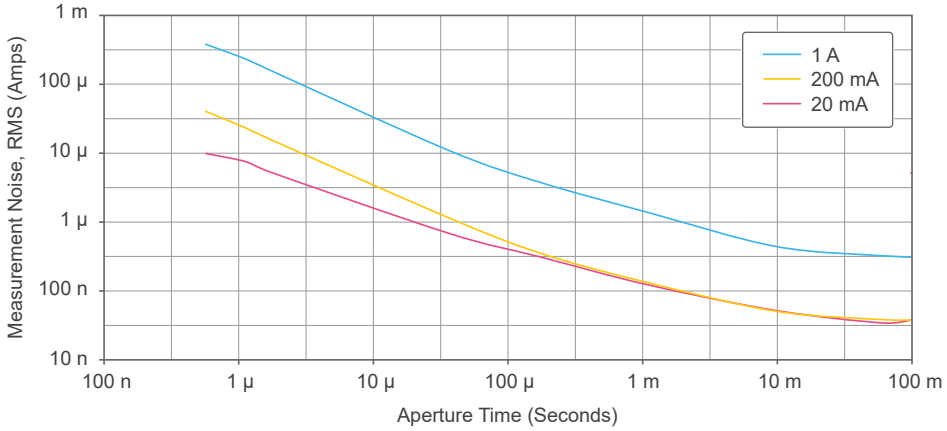
Range	Burden voltage, typical	24 hour[9] $T_{selfcal}$ ±1 °C	2 year $T_{selfcal}$ ±5 °C	Tempco/°C
20 mA	<20 mV	20 + 15	450 + 200	8 + 10
200 mA	<200 mV	20 + 15	550 + 20	8 + 1
1 A	<800 mV	20 + 15	700 + 50	8 + 2

9. Relative to external calibration source.

DC Current Noise

Note The following graph represents DC current noise with input open, Normal DC Noise Rejection, and Auto Zero ON. For apertures less than 100 ms, add five times the typical rms noise to accuracy specification.

Figure 4. PXIe-4082 DC Current Noise, Typical



DC Current General Specifications

Overrange	105% of range except 1 A range

AC Voltage Specifications

AC Voltage Accuracy Specifications

Note Measurement aperture greater than $4/f_L$ where f_L is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

Table 5. AC Voltage Accuracy ± (% of reading + % of range), 2 Years, T_{extcal} ± 10 °C, $T_{selfcal}$ ± 5 °C

Range (RMS)	Peak voltage	1 Hz to 40 Hz[10]	>40 Hz to 20 kHz	>20 kHz to 50 kHz	>50 kHz to 100 kHz	>100 kHz to 300 kHz
50 mV [11]	±105 mV	0.1 + 0.04	0.05 + 0.04	0.09 + 0.04	0.5 + 0.08	3 + 0.1

10. Applies to DC coupled only.
11. Applies to signals >2 mV

Range (RMS)	Peak voltage	1 Hz to 40 Hz	>40 Hz to 20 kHz	>20 kHz to 50 kHz	>50 kHz to 100 kHz	>100 kHz to 300 kHz
500 mV	±1.05 V	0.1 + 0.01	0.05 + 0.02	0.09 + 0.02	0.5 + 0.02	3 + 0.05
5 V	±10.5 V					
50 V	±105 V					
300 V	±450 V					
Tempco/°C		0.001 + 0.001	0.001 + 0.001	0.001 + 0.001	0.001 + 0.001	0.01 + 0.01

AC Voltage General Specifications

Input impedance	1 MΩ ± 2% in parallel with 150 pF, typical
Input coupling	AC or DC coupled
Overrange	105% of range except 300 V
Maximum Volt-Hertz product	Verified to 2.2×10^7 V-Hz
Maximum DC voltage component	250 V
Common mode rejection ratio (CMRR), 1 kΩ resistance in LO lead	>70 dB (DC to 60 Hz), typical

AC Current Specifications

AC Current Accuracy Specifications

Note Measurement aperture greater than $4/f_L$, where f_L is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

Table 6. AC Current Specifications ± (% of reading + % of range), 2 Years, Full operating temperature range

Range (RMS)	Peak current	Burden voltage (RMS), typical	1 Hz to 20 kHz[12]	Tempco/°C
10 mA	±20 mA	<10 mV	0.04 + 0.02	0.001 + 0.0001
100 mA	±200 mA	<100 mV	0.04 + 0.02	0.001 + 0.0001
1 A	±2 A	<800 mV	0.1 + 0.02	0.001 + 0.0001

AC Current General Specifications

Overrange	105% of range except 1 A

Capacitance Specifications

Capacitance Accuracy Specifications

Table 7. Capacitance ± (% of reading + % of range), 2 Years, T_{extcal} ± 10 °C

Range (RMS)	Accuracy[13]	Tempco/°C	Effective test current[14], nominal	Effective frequency[15], nominal	Default model	Maximum reading rate[16]
300 pF	0.5 + 0.6	0.01 + 0.025	160 nA	3 kHz	Parallel	15 S/s
1 nF	0.4 + 0.2	0.01 + 0.003	330 nA	3 kHz	Parallel	15 S/s
10 nF	0.3 + 0.1	0.01 + 0.001	330 nA	3 kHz	Parallel	15 S/s
100 nF	0.3 + 0.1	0.01 + 0.001	3.3 µA	3 kHz	Parallel	15 S/s
1 µF	0.3 + 0.1	0.01 + 0.001	100 µA	1 kHz	Series	15 S/s
10 µF	0.3 + 0.1	0.01 + 0.001	1 mA	1 kHz	Series	15 S/s
100 µF	0.3 + 0.1	0.01 + 0.001	1 mA	91 Hz	Series	3 S/s

12. Specification is typical for the 5 kHz to 20 kHz frequency range.
13. After lead compensation with <3 meters of coaxial or shielded twisted-pair cabling. Specifications apply to >5% of range and <110% of range, except 300 pF range which measures down to 0.05 pF.
14. Correlated to single-tone test method.
15. Correlated to single-tone test method.
16. Number of LC measurements to average = 1

Range (RMS)	Accuracy	Tempco/°C	Effective test current, nominal	Effective frequency, nominal	Default model	Maximum reading rate
1000 µF	0.4 + 0.1	0.01 + 0.001	1 mA	91 Hz	Series	3 S/s
10000 µF	0.3 + 0.1	0.01 + 0.001	1 mA	91 Hz	Series	3 S/s

Capacitance General Specifications

DC bias[17]	0.46 V from HI to LO, nominal, user-selectable (OFF by default)

Inductance Accuracy Specifications

Table 8. Inductance ± (% of reading + % of range), 2 Years, T_{extcal} ± 10 °C

Range (RMS)	Accuracy[18]	Tempco/°C	Effective test current[19], nominal	Effective frequency[20], nominal	Default model	Maximum reading rate[21]
10 µH	0.5 + 1	0.01 + 0.01	330 µA	30 kHz	Series	20 S/s
100 µH	0.5 + 0.1	0.01 + 0.01	330 µA	30 kHz	Series	20 S/s
1 mH	0.5 + 0.1	0.01 + 0.0001	330 µA	3 kHz	Series	15 S/s
10 mH [22]	0.5 + 0.1	0.005 + 0.001	3.3 µA	3 kHz	Series	15 S/s
100 mH[23]	0.5 + 0.1	0.005 + 0.001	33 µA	273 kHz	Series	3 S/s
1 H [24]	0.5 + 0.1	0.007 + 0.001	3.3 µA	273 kHz	Series	3 S/s

17. Applies to capacitance modes only.
18. After lead compensation with <3 meters of coaxial or shielded twisted-pair cabling. Specifications apply to >5% of range and <110% of range, except 300 pF range which measures down to 0.05 pF.
19. Correlated to single-tone test method.
20. Correlated to single-tone test method.
21. Number of LC Measurements to Average = 1.
22. Specifications apply to >1% of range.
23. Specifications apply to >1% of range.

Range (RMS)	Accuracy	Tempco/°C	Effective test current, nominal	Effective frequency, nominal	Default model	Maximum reading rate
5 H [25]	0.5 + 0.1	0.007 + 0.001	330 nA	273 kHz	Series	3 S/s

Diode Test Specifications

Range	10 V
Test current[26]	1 µA, 10 µA, 100 µA, 1 mA[27]
Accuracy	Add 20 ppm of reading to 10 VDC voltage specifications.

Frequency and Period Specifications

Note Aperture time set to 150 ms.

Frequency measurement range	15 Hz to 500 kHz
Period measurement range	2 µs to 66.67 ms

AC input voltage range	Corresponding isolated digitizer range	Minimum peak-to-peak signal amplitude[28]	Maximum peak-to-peak signal amplitude	Accuracy
50 mV	100 mV	5 mV	200 mV	Refer to the PXIe_CLK100 accuracy of the chassis.
500 mV	1 V	50 mV	2 V	
5 V	10 V	500 mV	20 V	
50 V	100 V	5 V	200 V	

24. Specifications apply to >1% of range.
25. Specifications apply to >1% of range.
26. -13% to 0% tolerance, typical.
27. Up to 4.5 V measurement for 1 mA test current.
28. Square wave input. Minimum required peak-to-peak signal level is valid only for frequencies up to the -3 dB bandwidth. For higher frequencies, the signal amplitude must be increased. Refer to the Digitizer Voltage Mode for bandwidths.

AC input voltage range	Corresponding isolated digitizer range	Minimum peak-to-peak signal amplitude	Maximum peak-to-peak signal amplitude	Accuracy
300 V	300 V	50 V	450 V	

Temperature Specifications

All temperature accuracy specifications apply to apertures ≥100 ms, Auto Zero, and ADC calibration enabled. Use the lowest possible resistance or voltage range for each temperature. Add probe accuracy and cold junction accuracy where applicable.

Sensor type	Temperature range	Accuracy
RTD[29]	-200 °C to 600 °C	0.1 °C
Thermistor[30]	-80 °C to 150 °C	0.08 °C
J Thermocouple	-210 °C to 1200 °C	0.2 °C
K Thermocouple	-200 °C to 1200 °C	0.3 °C
N Thermocouple	-200 °C to 1300 °C	0.4 °C
T Thermocouple	-200 °C to 400 °C	0.3 °C
E Thermocouple	-200 °C to 1000 °C	0.2 °C
R Thermocouple	-50 °C to 1760 °C	0.8 °C
S Thermocouple	-50 °C to 1760 °C	0.8 °C
B Thermocouple	400 °C to 1820 °C	0.8 °C

Isolated Digitizer Specifications

Available functions	Voltage and current
Voltage ranges	±100 mV to ±300 V (DC or AC coupled)
Current ranges	±20 mA to ±1 A
Sample rate range	10 S/s to 1.8 MS/s

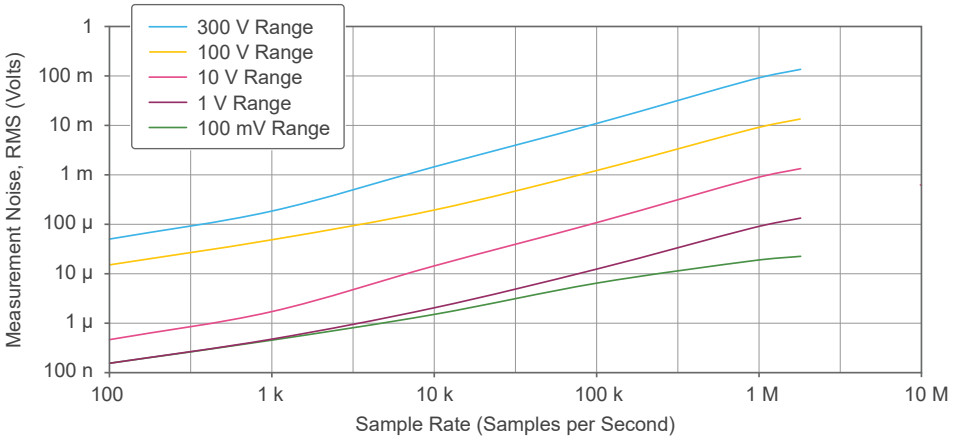
29. Based on Pt3851 RTD in a 4-wire configuration.
30. Based on 44004, 44006, and 44007 interchangeable thermistors.

Available sample rates	r = (1.8 MS/s) / y, where y = 1, 2, 3,...1.8 x 10^5
Timebase accuracy	Equal to the PXIe_CLK100 accuracy of the chassis
Digitizer record length	2 samples minimum, unlimited maximum

Table 9. Voltage Mode

Range	Input resistance[31]	DC accuracy, (ppm/reading + ppm/range) 2 year, $T_{selfcal}$ ±5 °C	Analog bandwidth[32], typical	
			±0.1 dB	-3 dB
100 mV	1 MΩ ± 2%, >10 GΩ	125 + 175	40 kHz	240 kHz
1 V		125 + 75	40 kHz	240 kHz
10 V		125 + 75	40 kHz	240 kHz
100 V	1 MΩ ± 2%	125 + 75	30 kHz	240 kHz
300 V		125 + 75	30 kHz	240 kHz

Figure 5. PXIe-4082 Voltage Waveform Noise with Input Shorted, Typical

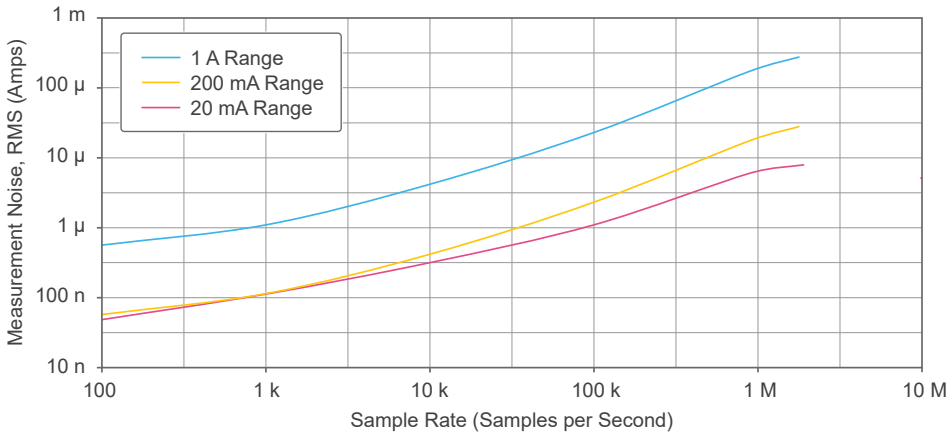


31. Input impedance in parallel with 150 pF, typical. When AC coupled, only 1 MΩ available.
32. Typical AC coupled frequency is 6 Hz(±0.1 dB) and 0.8 Hz(-3 dB).

Table 10. Current

Range	Burden voltage, typical	DC accuracy, (ppm/reading + ppm/range) 2 Year, $T_{selfcal}$ ±5 °C	Analog bandwidth, typical	
			±0.1 dB	-3 dB
20 mA	<20 mV	100 +100	60 kHz	300 kHz
200 mA	<200 mV	100 +100	60 kHz	300 kHz
1 A	<800 mV	100 +100	60 kHz	300 kHz

Figure 6. PXIe-4082 Current Waveform Noise with Input Open, Typical



General Specifications

External calibration interval	2 years
Warm-up	60 minutes to rated accuracy
Measurement Category	I (up to 300 V) II (up to 250 VAC_{rms}, 220 VDC)

Caution Do not connect the product to signals or use for measurements within Measurement Categories III or IV.

Input protection (between terminals or terminal	300 VDC or VAC_{rms}

to ground)	
Current mode fuse	T 1 A400 V, time-lag user-replaceable Minimum interrupt rating: 500 A Littelfuse 0477001.MXP
Maximum common-mode voltage	300 VDC or VAC_{rms}

Maximum Voltage to Earth Ground	
HI	300 VDC or VAC_{rms}
LO	300 VDC or VAC_{rms}
HI SENSE	300 VDC or VAC_{rms}
LO SENSE	300 VDC or VAC_{rms}

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

Caution Take precautions to avoid electrical shock.

Timing

Mode	Trigger latency		Maximum reading rate[33]
	AC voltage	All functions except AC voltage[34]	
Voltage, current, and resistance	15 µs	<0 µs	20 kS/s
Voltage and current digitizer			1.8 MS/s
Capacitance and	30 ms, nominal		Refer to capacitance

33. Maximum Reading Rate assumes minimum aperture time, Auto Zero is OFF, Offset Compensated Ohms is OFF, ADC Calibration is OFF, Number of Averages is 1, and Settle Time is 0 seconds. Varying these settings will vary the reading rate.
34. Trigger latency for all functions except AC Voltage assumes Auto Zero, Offset Compensated Ohms, and ADC Calibration are OFF.

Mode	Trigger latency		Maximum reading rate
	AC voltage	All functions except AC voltage	
inductance			and inductance specifications for maximum reading rates.

Power

Power consumption	<9 W from PXI Express backplane
+12 V load	0.55 A max
+3.3 V load	0.55 A max

Physical Characteristics

Dimensions	3U, one-slot, PXI/cPCI module 2.0 cm x 13.0 cm x 21.6 cm (0.8 in. x 5.1 in. x 8.5 in.), nominal
Weight	340 g (12 oz), nominal

Note If you need to clean the device, wipe it with a dry towel.

Environment

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

Indoor use only.

Operating Environment

Ambient temperature range	0 °C to 55 °C
Relative humidity range	10% to 90%, noncondensing

Storage Environment

Ambient temperature range	-40 °C to 71 °C
Relative humidity range	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
Nonoperating	5 Hz to 500 Hz, 2.4 g RMS