PXIe-4082 Specifications

2022-06-30

Contents

PXIe-4082 Specifications

These specifications apply to the PXIe-4082.

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. Refer to each section for additional conditions that apply.

- Self-calibration performed within the last 24 hours
- Calibration interval of 2 years
- 60 minutes warm-up time

DC Voltage Specifications

Accuracy

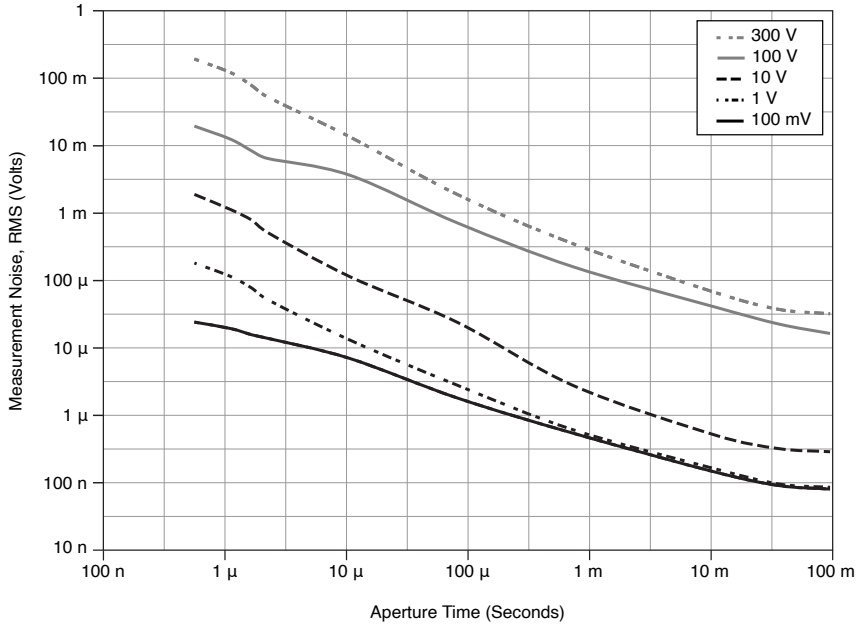
All DC voltage accuracy specifications apply to apertures of ≥100 ms, with Auto Zero and ADC calibration enabled. Assumes offset nulling. Otherwise, add 2 µV to the specifications.

Table 1. DC Voltage ± (ppm of reading + ppm of range)

Range	Input Resistance[1]	24 Hr [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 GΩ	10 + 10	40 + 20	45 + 20	4 + 5	0.3 + 0.3
1 V		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

Noise

Figure 1. DC Voltage Noise, Typical



Note 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.

General

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

Accuracy

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.

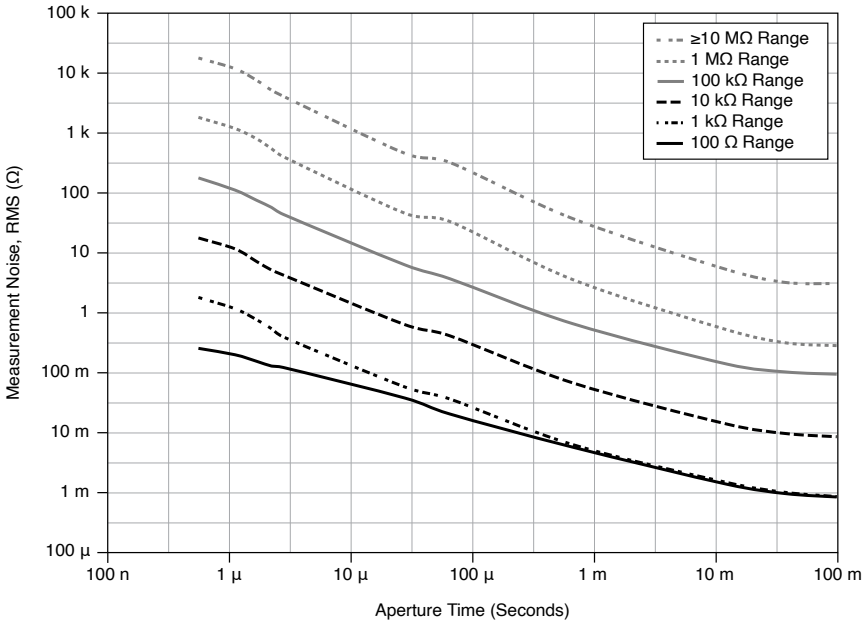
Table 2. Resistance (4-Wire and 2-Wire[3]) ± (ppm of reading + ppm of range)

Range	Test Current[4]	Max Test Voltage	24 Hr[5] $T_{selfcal}$ ± 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	15 + 10	50 + 15	80 + 15	5 + 1	0.8 + 1
1 kΩ	1 mA	1 V	12 + 2	50 + 3	80 + 3	5 + 0.1	0.8 + 0.1
10 kΩ	100 µA	1 V	12 + 2	50 + 3	80 + 3	5 + 0.1	0.8 + 0.1
100 kΩ [6]	10 µA	1 V	15 + 2	90 + 6	95 + 6	5 + 0.5	2 + 0.5

Range	Test Current[4]	Max Test Voltage	24 Hr[5] $T_{selfcal}$ ± 1 °C	90 Day $T_{selfcal}$ ± 5 °C	2 Year $T_{selfcal}$ ± 5 °C	Tempco/°C	
						Without Self-Cal	With Self-Cal
1 MΩ	10 µA	10 V	20 + 2	90 + 10	95 + 10	5 + 1	2 + 1
10 MΩ	1 µA	10 V	100 + 2	800 + 10	800 + 10	20 + 3	20 + 3
100 MΩ [7]	1 µA || 10 MΩ	10 V	500 + 10	3000 + 10	3000 + 10	300 + 10	300 + 10

Noise

Figure 2. PXIe-4082 Resistance Noise, Typical



Note 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.

General

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

DC Current Specifications

Accuracy

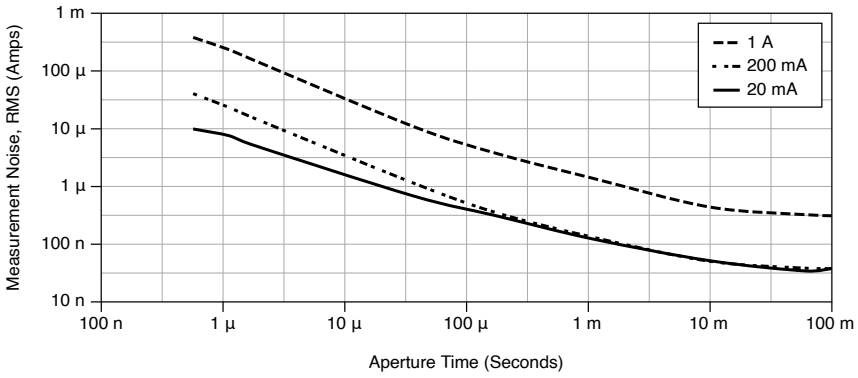
All DC current accuracy specifications apply for apertures ≥100 ms, with Auto Zero and ADC calibration enabled.

Table 3. DC Current ± (ppm of reading + ppm of range)

Range	Burden Voltage, Typical	24 hour[8] $T_{selfcal}$ ± 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

Noise

Figure 3. PXIe-4082 DC Current Noise, Typical



Note 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.

General

Overrange	105% of range except 1 A range.

AC Voltage Specifications

Accuracy

Note Measurement aperture greater than $4/\mathbf{f}_L$ where $\mathbf{f}_L$ is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

Table 4. 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[9]	>40 Hz to 20 kHz	>20 kHz to 50 kHz	>50 kHz to 100 kHz	>100 kHz to 300 kHz
50 mV [10]	±105 mV	0.1 + 0.04	0.05 + 0.04	0.09 + 0.04	0.5 + 0.08	3 + 0.1
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

General

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

Accuracy

Note Measurement aperture greater than $4/\mathbf{f}_L$, where $\mathbf{f}_L$ is the lowest frequency component of the signal being measured. Signal amplitudes greater than 1% of range.

Table 5. 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[11]	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

General

Overrange	105% of range except 300 V

Capacitance Specifications

Accuracy Specifications

Table 6. Capacitance ± (% of reading + % of range), 2 Years, T_{extcal} ± 10 °C

Range (rms)	Accuracy[12]	Tempco/°C	Effective Test Current,[] Nominal	Effective Frequency,[] Nominal	Default Model	Maximum Reading Rate[14]
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

Range (rms)	Accuracy[12]	Tempco/°C	Effective Test Current,[] Nominal	Effective Frequency,[] Nominal	Default Model	Maximum Reading Rate[14]
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
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

General Specifications

DC bias[15]	0.46 V from HI to LO, nominal, user-selectable (OFF by default)

Inductance Specifications

Accuracy Specifications

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

Range (rms)	Accuracy[16]	Tempco/°C	Effective Test Current,[] Nominal	Effective Frequency,[] Nominal	Default Model	Maximum Reading Rate[18]
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 []	0.5 + 0.1	0.005 + 0.001	3.3 µA	3 kHz	Series	15 S/s
100 mH []	0.5 + 0.1	0.005 + 0.001	33 µA	273 kHz	Series	3 S/s
1 H []	0.5 + 0.1	0.007 + 0.001	3.3 µA	273 kHz	Series	3 S/s
5 H []	0.5 + 0.1	0.007 + 0.001	330 nA	273 kHz	Series	3 S/s

Diode Test Specifications

Range	10 V
Test current[20]	1 µA, 10 µA, 100 µA, 1 mA[21]
Accuracy	Add 20 ppm of reading to 10 VDC voltage specifications.

Frequency and Period Specifications

Note Aperture time set to 150 ms.

Frequency 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[22]	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	
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 lowest possible resistance or voltage range for each temperature. Add probe accuracy and cold junction accuracy where applicable.

Sensor Type	Temperature Range	Accuracy
RTD[23]	-200 to 600 °C	0.1 °C
Thermistor[24]	-80 to 150 °C	0.08 °C
J Thermocouple	-210 to 1200 °C	0.2 °C
K Thermocouple	-200 to 1200 °C	0.3 °C
N Thermocouple	-200 to 1300 °C	0.4 °C
T Thermocouple	-200 to 400 °C	0.3 °C
E Thermocouple	-200 to 1000 °C	0.2 °C
R Thermocouple	-50 to 1760 °C	0.8 °C
S Thermocouple	-50 to 1760 °C	0.8 °C
B Thermocouple	400 to 1820 °C	0.8 °C

Isolated Digitizer Specifications

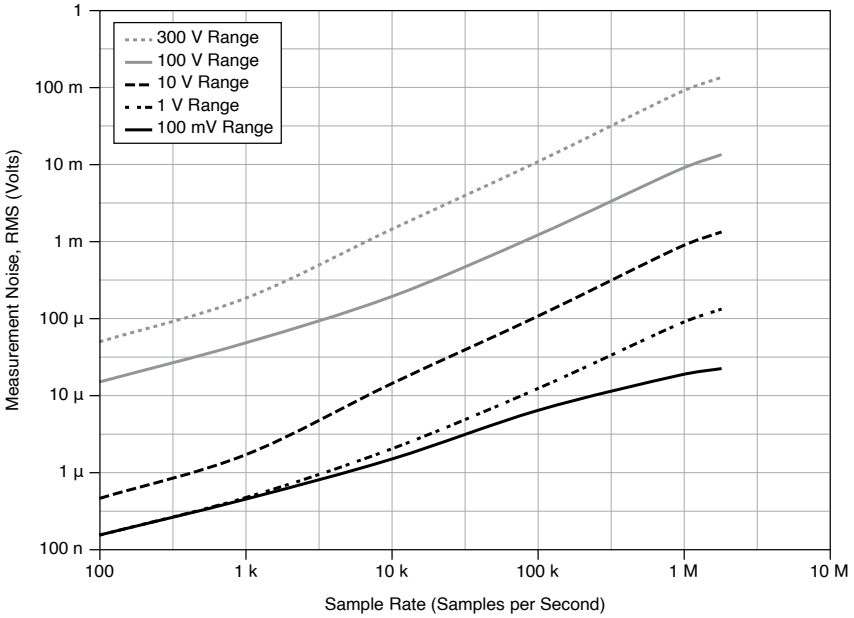
Available functions	Voltage and current
Voltage ranges	±100 mV to ±300 V (DC or AC coupled)
Current ranges	±20 mA to ±1 A
Sample rate range	10 S/s to 1.8 MS/s
Available sample rates	**r** = (1.8 MS/s) / **y**, where **y** = 1, 2, 3,...1.8 x 10^5
Timebase accuracy	Equal to the PXIe_CLK100 accuracy of the chassis
Digitizer record length	2 samples minimum, unlimited maximum

Table 8. Voltage Mode

Range	Input Resistance[25]	DC Accuracy, (ppm/reading + ppm/range) 2 year, $T_{selfcal}$ ± 5 °C	Analog Bandwidth, [26] Typical	
			±0.1 dB	-3 dB
100 mV	1 MΩ ± 2%, >10 GΩ	125 + 175	40 kHz	240 kHz

Range	Input Resistance[25]	DC Accuracy, (ppm/reading + ppm/range) 2 year, $T_{selfcal}$ ± 5 °C	Analog Bandwidth, [26] Typical	
			±0.1 dB	-3 dB
1 V	1 MΩ ± 2%	125 + 75	40 kHz	240 kHz
10 V		125 + 75	40 kHz	240 kHz
100 V		125 + 75	30 kHz	240 kHz
300 V		125 + 75	30 kHz	240 kHz

Figure 4. PXIe-4082 Voltage Waveform Noise, Typical

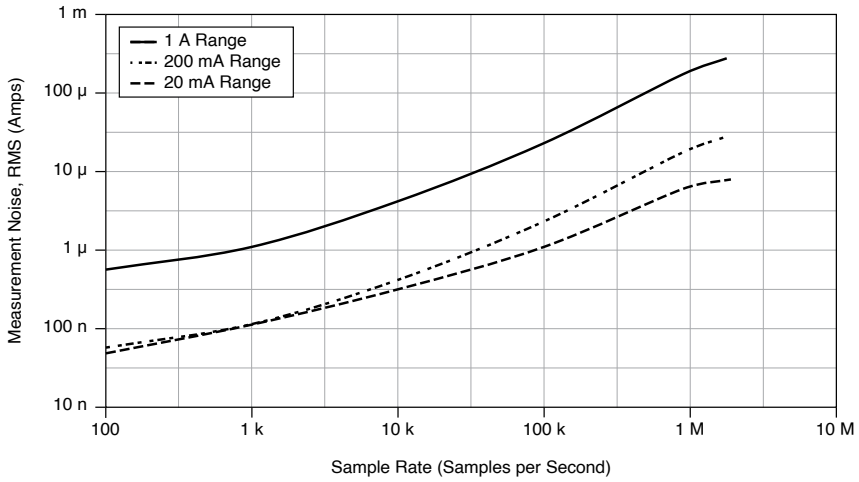


Note With input shorted.

Table 9. 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 5. PXIe-4082 Current Waveform Noise, Typical



Note With input open.

General Specifications

External calibration interval	2 years
Warm-up	60 minutes to rated accuracy
Measurement Category	II

Caution Do not use this device for connection to signals or for measurements within Measurement Categories III or IV.

Input protection (between terminals or terminal to ground)	300 VDC or AC_{rms}
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 AC_{rms}

Maximum voltage to earth ground	
HI	300 VDC or AC_{rms}
LO	300 VDC or AC_{rms}
HI SENSE	300 VDC or AC_{rms}
LO SENSE	300 VDC or AC_{rms}

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

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

Timing

Mode	Trigger Latency		Maximum Reading Rate[27]
	AC Voltage	All Functions Except AC Voltage[28]	
Voltage, current, and resistance	15 µs	<0 µs	20 kS/s
Voltage and current digitizer			1.8 MS/s
Capacitance and inductance	30 ms, nominal		Refer to capacitance 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 40 °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}

Compliance and Certifications

Caution Electromagnetic interference can adversely affect the measurement accuracy of this product. The input terminals of this device are not protected for electromagnetic interference. As a result, this device may experience reduced measurement accuracy or other temporary performance degradation when connected cables are routed in an environment with radiated or conducted radio frequency electromagnetic interference. To limit radiated emissions and to ensure that this device functions within specifications in its operational electromagnetic environment, take precautions when designing, selecting, and installing measurement probes and cables.

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)
- 2011/65/EU; Restriction of Hazardous Substances (RoHS)
- 2014/53/EU; Radio Equipment Directive (RED)
- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

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.)

[1] In parallel with 150 pF, typical

[2] Relative to external calibration source.

[3] Perform offset nulling or add 200 mΩ to reading.

[4] -10% to 0% tolerance, typical.

[5] Relative to external calibration source.

[6] Perform offset nulling or add 2 ppm of range to the specifications.

[7] 2-wire resistance measurement only. Use tempco outside T_{extcal} +/- 10 °C. Typical accuracy is 5% between 105 MΩ and 1.05 GΩ.

[8] Relative to external calibration source.

[9] Applies to DC coupled only.

[10] Applies to signals >2 mV

[11] Specification is typical for the 5 kHz to 20 kHz frequency range.

[12] 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.

[13] Correlated to single-tone test method.

[14] Number of LC measurements to average = 1

[15] Applies to capacitance modes only.

[16] 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.

[17] Correlated to single-tone test method.

[18] Number of LC Measurements to Average = 1.

[19] Specifications apply to >1% of range.

[20] -10% to 0% tolerance, typical.

[21] Up to 4.5 V measurement for 1 mA test current.

[22] 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.

[23] Based on Pt3851 RTD in a 4-wire configuration.

[24] Based on 44004, 44006, and 44007 interchangeable thermistors.

[25] Input impedance in parallel with 150 pF, typical. When AC coupled, only 1 MΩ available.

[26] Typical AC coupled frequency is 6 Hz(±0.1 dB) and 0.8 Hz(-3 dB).

[27] 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.

[28] Trigger latency for all functions except AC Voltage assumes Auto Zero, Offset Compensated Ohms, and ADC Calibration are OFF.