NI-9219 Specifications

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Contents

NI-9219 Specifications

Connector Types

The NI-9219 is available in two types: push-in spring terminal and spring terminal. The push-in type spring terminal connector is black and orange. The spring terminal connector is black. NI-9219 refers to both types unless the two types are specified. Differences between the two types of spring terminal connectors are noted by the connector color.

Related information:

- Software Support for CompactRIO, CompactDAQ, Single-Board RIO, R Series, and EtherCAT

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 **Typical** unless otherwise noted.

Conditions

Specifications are valid for the range -40 °C to 70 °C unless otherwise noted.

NI-9219 Safety Voltages (Black Connector)

Connect only voltages that are within the following limits.

Channel-to-channel	
Continuous	250 V AC, Measurement Category II
Withstand	1,390 V AC, verified by a 5 s dielectric withstand test
Channel-to-earth ground	
Continuous	250 V AC, Measurement Category II
Withstand	2,300 V AC, verified by a 5 s dielectric withstand test
Zone 2 hazardous locations applications in Europe	
Channel-to-channel and channel-to-earth ground	60 V DC, Measurement Category I

NI-9219 Safety Voltages (Black/Orange Connector)

Connect only voltages that are within the following limits.

Isolation	
Channel-to-channel	
Continuous	250 V AC, Measurement Category II
Withstand	1,500 V AC, verified by a 5 s dielectric withstand test
Channel-to-earth ground	
Continuous	250 V AC, Measurement Category II

Withstand	3,000 V AC, verified by a 5 s dielectric withstand test
Zone 2 hazardous locations applications	
Channel-to-channel and channel-to-earth ground	60 V DC, Measurement Category I

Measurement Category

Measurement Category I

Caution When using the NI-9219 above 2,000 m or in explosive atmospheres, do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV.

Attention Lorsque vous utilisez le NI-9219 à une altitude supérieure à 2 000 m ou dans des atmosphères explosibles, ne le connectez pas à des signaux et ne l'utilisez pas pour effectuer des mesures dans les catégories de mesure II, III ou IV.

Warning When using the NI-9219 above 2,000 m or in explosive atmospheres, do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV, or for measurements on MAINs circuits or on circuits derived from Overvoltage Category II, III, or IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation. The product can only withstand transients up to the transient overvoltage rating without breakdown or damage to the insulation. An analysis of the working voltages, loop impedances,

temporary overvoltages, and transient overvoltages in the system must be conducted prior to making measurements.

Mise en garde Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour des mesures dans ces catégories, ou des mesures sur secteur ou sur des circuits dérivés de surtensions de catégorie II, III ou IV pouvant présenter des surtensions transitoires supérieures à ce que le produit peut supporter. Le produit ne doit pas être raccordé à des circuits ayant une tension maximale supérieure à la tension de fonctionnement continu, par rapport à la terre ou à d'autres voies, sous peine d'endommager et de compromettre l'isolation. Le produit peut tomber en panne et son isolation risque d'être endommagée si les tensions transitoires dépassent la surtension transitoire nominale. Une analyse des tensions de fonctionnement, des impédances de boucle, des surtensions temporaires et des surtensions transitoires dans le système doit être effectuée avant de procéder à des mesures.

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

Note Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Measurement Category II

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

Attention Ne pas connecter le produit à des signaux dans les catégories de mesure III ou IV et ne pas l'utiliser pour effectuer des mesures dans ces catégories.

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

Environmental Characteristics

Temperature	
Operating	-40 °C to 70 °C
Storage	-40 °C to 85 °C
Humidity	
Operating	10% RH to 90% RH, noncondensing
Storage	5% RH to 95% RH, noncondensing
Ingress protection	IP40
Pollution Degree	2
Maximum altitude	2,000 m

Shock and Vibration	
Operating vibration	
Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

To meet these shock and vibration specifications, you must panel mount the system.

Power Requirements

Power consumption from chassis	
Active mode	750 mW maximum
Sleep mode	25 µW maximum
Thermal dissipation (at 70 °C)	
Active mode	625 mW maximum
Sleep mode	25 µW maximum

Physical Characteristics

Weight	
NI-9219 (black connector)	156 g (5.5 oz.)
NI-9219 (black/orange connector)	160 g (5.6 oz.)

Dimensions	Visit ni.com/dimensions and search by module number.

NI-9219 with Spring Terminal (Black Connector)

The NI-9219 (black connector) requires a flathead screwdriver with a 2.3 mm × 1.0 mm (0.09 in. × 0.04 in.) blade for signal connection; insert the screwdriver into a spring clamp activation slot to open the corresponding connector terminal, press a wire into the open connector terminal, and then remove the screwdriver from the activation slot to clamp the wire into place.

Spring terminal wiring	
Gauge	0.08 mm^2 to 1.0 mm^2 (28 AWG to 18 AWG) copper conductor wire
Wire strip length	7 mm (0.28 in.) of insulation stripped from the end
Temperature rating	90 °C minimum
Wires per spring terminal	One wire per spring terminal
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.2 N · m (1.80 lb · in.)

NI-9219 with Push-in Style Spring Terminal (Black/Orange Connector)

The push-in spring style NI-9219 does not require a tool for signal connection; push the wire into the terminal when using solid wire or stranded wire with a ferrule, or by pressing the push button when using stranded wire without a ferrule.

Spring terminal wiring	
Gauge	0.14 mm^2 to 1.5 mm^2 (26 AWG to 16 AWG) copper conductor wire
Wire strip length	10 mm (0.394 in.) of insulation stripped from the end
Temperature rating	90 °C minimum
Wires per spring terminal	One wire per spring terminal; two wires per spring terminal using a 2-wire ferrule
Ferrules	
Single ferrule, uninsulated	0.14 mm^2 to 1.5 mm^2 (26 AWG to 16 AWG) 10 mm barrel length
Single ferrule, insulated	0.14 mm^2 to 1.0 mm^2 (26 AWG to 18 AWG) 12 mm barrel length
Two-wire ferrule, insulated	2x 0.34 mm^2 (2x 22 AWG) 12 mm barrel length
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.2 N · m (1.80 lb · in.)

Timing Modes

The NI-9219 supports high-resolution, best 50 Hz rejection, best 60 Hz rejection, and high-speed timing modes. High-resolution timing mode optimizes maximum overall noise rejection and provides rejection of 50 Hz and 60 Hz noise. Best 50 Hz rejection optimizes 50 Hz noise rejection. Best 60 Hz rejection optimizes 60 Hz noise rejection. High-speed timing mode optimizes sample rate.

Input Characteristics

Number of channels	4 analog input channels
ADC resolution	24 bits
Type of ADC	Delta-sigma (with analog prefiltering)
Sampling mode	Simultaneous
Type of TEDS supported	IEEE 1451.4 TEDS Class 2 (Interface)

Table 1. Input Ranges

Measurement Type	Nominal Range(s)	Actual Range(s)
Voltage	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV
Current	±25 mA	±25 mA
Thermocouple	±125 mV	±125 mV
4-Wire and 2-Wire Resistance	10 kΩ, 1 kΩ	10.5 kΩ, 1.05 kΩ
4-Wire and 3-Wire RTD	Pt 1000, Pt 100	5.05 kΩ, 505 Ω
Quarter-Bridge	350 Ω, 120 Ω	390 Ω, 150 Ω
Half-Bridge	±500 mV/V	±500 mV/V
Full-Bridge	±62.5 mV/V, ±7.8 mV/V	±62.5 mV/V, ±7.8125 mV/V
Digital In	—	0 V to 60 V
Open Contact	—	1.05 kΩ

Conversion time, all channels	
No channels configured as a thermocouple	
High speed	10 ms
Best 60 Hz rejection	110 ms
Best 50 Hz rejection	130 ms
High resolution	500 ms
One or more channels configured as a thermocouple	
High speed	20 ms
Best 60 Hz rejection	120 ms
Best 50 Hz rejection	140 ms
High resolution	510 ms
Overvoltage protection	
Terminals 1 and 2	±30 V
Terminals 3 through 6, across any combination	±60 V
Input impedance	
Voltage and Digital In (±60 V, ±15 V, ±4 V)	1 MΩ
Current	< 40 Ω
All other measurement types	>1 GΩ

Table 2. Accuracy

Measurement Type	Range	Gain Error (Percent of Reading)	Offset Error (ppm of Range)
		Typical (25 °C±5 °C), Maximum (-40 °C to 70 °C)	
Voltage	±60 V	±0.3, ±0.4	±20, ±50
	±15 V	±0.3, ±0.4	±60, ±180
	±4 V	±0.3, ±0.4	±240, ±720
	±1 V	±0.1, ±0.18	±15, ±45
Voltage/Thermocouple	±125 mV	±0.1, ±0.18	±120, ±360
Current	±25 mA	±0.1, ±0.6	±30, ±100
4-Wire and 2-Wire[1] Resistance	10 kΩ	±0.1, ±0.5	±120, ±320
	1 kΩ	±0.1, ±0.5	±1200, ±3200
4-Wire and 3-Wire RTD	Pt 1000	±0.1, ±0.5	±240, ±640
	Pt 100	±0.1, ±0.5	±2400, ±6400
Quarter-Bridge	350 Ω	±0.1, ±0.5	±2400, ±6400
	120 Ω	±0.1, ±0.5	±2400, ±6400
Half-Bridge	±500 mV/V	±0.03, ±0.07	±300, ±450
Full-Bridge	±62.5 mV/V	±0.03, ±0.08	±300, ±1000
	±7.8 mV/V	±0.03, ±0.08	±2200, ±8000
Cold-junction compensation sensor accuracy		±1 °C typical	

Table 3. Stability

Measurement Type	Range	Gain Drift (ppm of Reading/°C)	Offset Drift (ppm of Range/°C)
Voltage	±60 V	±20	±0.2
	±15 V	±20	±0.8
	±4 V	±20	±3.2
	±1 V	±10	±0.2
Voltage/Thermocouple	±125 mV	±10	±1.6
Current	±25 mA	±15	±0.4
4-Wire and 2-Wire Resistance	10 kΩ	±15	±3

Measurement Type	Range	Gain Drift (ppm of Reading/°C)	Offset Drift (ppm of Range/°C)
	1 kΩ	±15	±30
4-Wire and 3-Wire RTD	Pt 1000	±15	±6
	Pt 100	±15	±60
Quarter-Bridge	350 Ω	±15	±120
	120 Ω	±15	±240
Half-Bridge	±500 mV/V	±3	±20
Full-Bridge	±62.5 mV/V	±3	±20
	±7.8 mV/V	±3	±20

Table 4. Input Noise in ppm of $Range_{rms}$

Measurement Type	Range	Timing Mode			
		High Speed	Best 60 Hz Rejection	Best 50 Hz Rejection	High Resolution
Voltage	±60 V	7.6	1.3	1.3	0.5
	±15 V	10.8	1.9	1.9	0.7
	±4 V	10.8	2.7	2.7	1.3
	±1 V	7.6	1.3	1.3	0.5
Voltage/ Thermocouple	±125 mV	10.8	1.9	1.9	1.0
Current	±25 mA	10.8	1.9	1.9	1.0
4-Wire and 2-Wire Resistance	10 kΩ	4.1	1.3	0.8	0.3
	1 kΩ	7.1	1.8	1.2	0.7
4-Wire and 3-Wire RTD	Pt 1000	7.6	1.7	1.1	0.4
	Pt 100	10.8	1.9	1.9	0.9
Quarter-Bridge	350 Ω	5.4	1.0	1.0	0.7
	120 Ω	5.4	1.0	1.0	0.7
Half-Bridge	±500 mV/V	3.8	0.5	0.5	0.2
Full-Bridge	±62.5 mV/V	5.4	1.0	1.0	0.8
	±7.8 mV/V	30	4.7	4.7	2.3

Input bias current	<1 nA
INL	±15 ppm
CMRR (f_{in} = 60 Hz)	>100 dB
NMRR	
Best 60 Hz rejection	90 dB at 60 Hz
Best 50 Hz rejection	80 dB at 50 Hz
High resolution	65 dB at 50 Hz and 60 Hz

Table 5. Half-Bridge, Full-Bridge, Quarter-Bridge, Resistance, and RTD Excitation Level

Measurement Type	Load Resistance (Ω)	Characteristic Excitation Level[2]
Half-Bridge	700	2.5 V
	240	2.0 V
Full-Bridge	350	2.7 V
	120	2.2 V
Resistance, RTD, and Quarter-Bridge	120	50 mV
	350	150 mV
	1,000	430 mV
	10,000	2200 mV

MTBF	384,716 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method

Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9219 at ni.com/calibration.

Calibration interval	1 year

[1] 2-wire resistance accuracy assumes 0 Ω of lead wire resistance. 2-wire resistance accuracy depends on the lead wire resistance.

[2] Excitation level is a characteristic and is not software-selectable.