NI-9220 Specifications

2024-06-06

Contents

NI-9220 Specifications

Connector Types

The NI-9220 has more than one connector type: NI-9220 with spring terminal and NI-9220 with DSUB. Unless the connector type is specified, NI-9220 refers to all connector types.

The NI-9220 with spring terminal 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-9220 with spring terminal 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. All voltages are relative to the AI- signal on each channel unless otherwise noted.

Input Characteristics

Number of channels	16 analog input channels
ADC resolution	16 bits
Type of ADC	Successive approximation register (SAR)
Input voltage ranges	
Measurement Voltage (AI+ to AI-)	
Minimum[1]	±10.4 V
Typical	±10.5 V
Maximum	±10.6 V
Maximum voltage (Signal + Common Mode)	Each channel must remain within ±10.4 V of common
Overvoltage protection	±30 V
Conversion time	10 µs minimum

1. The minimum measurement voltage range is the largest voltage the NI-9220 is guaranteed to accurately measure.

Sample rate	100 kS/s maximum

Table 1. Accuracy

Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range[2] (Offset Error)
Calibrated	Maximum (-40 °C to 70 °C)	0.142%	±0.070%
	Typical (23 °C ±5 °C)	0.010%	±0.011%
Uncalibrated[3]	Maximum (-40 °C to 70 °C)	0.350%	±0.360%
	Typical (23 °C ±5 °C)	0.060%	±0.070%

Stability	
Gain drift	5 ppm/°C
Offset drift	29 µV/°C
CMRR (f_{in} = 60 Hz)	70 dB
-3 dB bandwidth	>100 kHz
Input impedance	>1 GΩ
Input noise	0.85 LSB_{rms}

2. Range equals ±10.5 V.
3. Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.

Crosstalk	-90 dB
Settling time (to 2 LSBs)	
10 V step	19 µs
20 V step	26 µs
No missing codes	15 bits
MTBF	1,522,250 at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method

NI-9220 with Spring Terminal (Black Connector)

Connect only voltages that are within the following limits.

Channel-to-COM	±30 V maximum
Isolation	
Channel-to-COM	None
Channel-to-earth ground	
Continuous	250 V RMS, Measurement Category II
Withstand	3,000 V RMS, verified by a 5 s dielectric withstand test

NI-9220 with Push-In Spring Terminal (Black/Orange Connector)

Connect only voltages that are within the following limits.

Channel-to-channel	None
Channel-to-earth ground	
Continuous	250 V RMS, Measurement Category II
Withstand up to 4,000 m	3,000 V RMS, verified by a 5 s dielectric withstand test

NI-9220 with DSUB Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-COM	±30 V maximum
Isolation	
Channel-to-COM	None
Channel-to-earth ground	
Continuous	60 V DC, Measurement Category I
Withstand up to 2,000 m	1,000 V RMS, verified by a 5 s dielectric withstand test

Measurement Category

Measurement Category I

Caution Do not connect the NI-9220 with DSUB to signals or use for measurements within Measurement Categories II, III, or IV.

Attention Ne pas connecter le NI-9220 with DSUB à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour effectuer des mesures dans ces catégories.

Warning Do not connect the NI-9220 with DSUB 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 NI-9220 with DSUB 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 NI-9220 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

Attention Ne pas connecter le NI-9220 with spring terminal 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	
NI-9220 with spring terminal (black connector)	2,000 m
NI-9220 with push-in spring terminal (black/orange connector)	4,000 m
NI-9220 with DSUB	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 (full-scale input, 100 kS/s)	
Active mode	1 W maximum
Sleep mode	4 mW maximum
Thermal dissipation (at 70 °C)	
Active mode	1.250 W maximum
Sleep mode	510 mW maximum

Physical Characteristics

Weight

NI-9220 with spring terminal (black connector)	143 g (5.0 oz)
NI-9220 with push-in spring terminal (black/orange connector)	148 g (5.2 oz)
NI-9220 with DSUB	147 g (5.2 oz)

NI-9220 with Spring Terminal (Black Connector)

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-9220 with Push-In Spring Terminal (Black/Orange Connector)

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	0.14 mm^2 to 1.5 mm^2
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.2 N · m (1.80 lb · in.)

Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9220 at ni.com/calibration.

Calibration interval	1 year