NI-9209 Specifications

2025-03-10

Contents

NI-9209 Specifications

Connector Types

The NI-9209 has more than one connector type: NI-9209 with spring terminal and NI-9209 with DSUB. Unless the connector type is specified, NI-9209 refers to all connector types.

The NI-9209 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-9209 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 COM unless otherwise noted.

NI-9209 Pinout

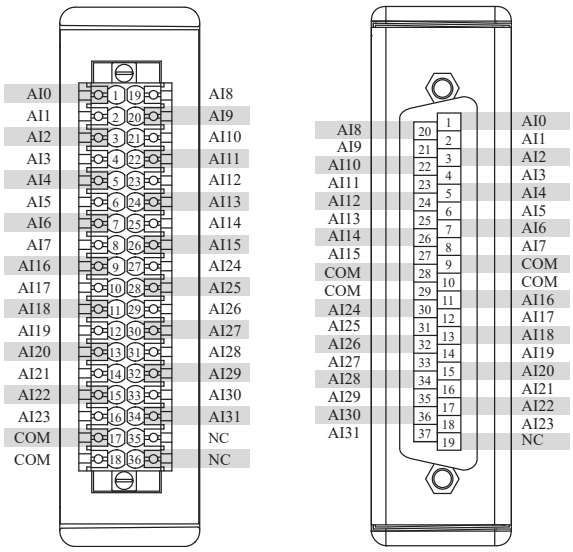

Table 1. Signal Descriptions

Signal	Description
AI	Analog input signal connection
COM	Common reference connection to isolated ground
NC	No connection

NI-9209 Signals

You can connect single-ended or differential signals to the NI-9209; use a differential measurement configuration to attain more accurate measurements and less noise. Specific signal pairs are valid for differential connections.

The following table shows the signal pairs that are valid for differential connection configurations with the NI-9209.

Table 2. NI-9209 Differential Pairs

Channel	AI+	AI-
0	AI0	AI8
1	AI1	AI9
2	AI2	AI10
3	AI3	AI11
4	AI4	AI12
5	AI5	AI13
6	AI6	AI14
7	AI7	AI15
16	AI16	AI24
17	AI17	AI25
18	AI18	AI26
19	AI19	AI27
20	AI20	AI28
21	AI21	AI29
22	AI22	AI30
23	AI23	AI31

Input Characteristics

Number of channels	16 differential/32 single-ended channels
ADC resolution	24 bits
Type of ADC	Delta-Sigma

Sampling mode	Scanned

Table 3. Accuracy

Calibrated Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range[1](Offset Error)
Maximum (-40 °C to 70 °C)	±0.46%	±0.011%
Typical (25 °C ±5 °C)	±0.06%	±0.003%

Input range	
Minimum	±10.2 V
Typical	±10.4 V
Maximum working voltage for analog inputs (signal voltage + common mode voltage)	Each channel must remain within ±10.2 V of common
Conversion time (per channel)	
High-Resolution Mode	52 ms
High-Speed Mode	2 ms
Overvoltage protection, channel-to-COM	±30 V maximum on one channel at a time
Input impedance	>1 GΩ
Input noise	

1. Range equals 10.4 V

High-Resolution Mode	20 µVrms
High-Speed Mode	86 µVrms
Alias rejection	
High-Resolution Mode	14 dB
High-Speed Mode	42 dB
Stability	
Gain drift	25 ppm/°C
Offset drift	2.4 µV/°C
CMRR (f_{in}= 0 Hz to 60 Hz)	68 dB
CMRR, channel-to-earth ground (50/60 Hz)[2]	
High-Resolution Mode	160 dB
High-Speed Mode	100 dB
NMRR (High-Resolution Mode only)	
50 Hz	66 dB
60 Hz	68 dB

2. NI-9209 with spring terminal only.

Power Requirements

Power consumption from chassis	
Active mode	333 mW maximum
Sleep mode	25 µW maximum
Thermal dissipation	
Active mode	354 mW maximum
Sleep mode	25 µW maximum

Physical Characteristics

Weight	
NI-9209 with spring terminal	159 g (5.6 oz)
NI-9209 with DSUB	144 g (5.1 oz)
Dimensions	Visit ni.com/dimensions and search by module number.

with Spring Terminal

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 (0.39 in.) of insulation stripped from the end
Temperature rating	90 °C minimum
Wires per spring terminal	One wire per screw terminal; two wires per screw 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 (1.8 lb · in.)

NI-9209 with Spring Terminal Safety Voltages

Connect only voltages that are within the following limits:

Isolation	
Channel-to-channel	None

Channel-to-earth ground	
Continuous	250 V RMS, Measurement Category II
Withstand up to 5,000 m	3,000 V RMS, verified by a 5 s dielectric withstand test

Measurement Category II

Caution Do not connect the NI-9209 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

Attention Ne pas connecter le NI-9209 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.

NI-9209 with DSUB Safety Voltages

Connect only voltages that are within the following limits:

Isolation	
Channel-to-channel	None
Channel-to-earth ground	
Continuous	60 V DC, Measurement Category I
Withstand	1,000 V RMS up to 3,000 m, verified by a 5 s dielectric withstand test; 860 V RMS up to 5,000 m

Measurement Category I

Caution Do not connect the NI-9209 with DSUB to signals or use for measurements within Measurement Categories II, III, or IV.

Attention Ne pas connecter le NI-9209 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-9209 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 NI-9209 with DSUB 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 NI-9209 with DSUB 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-9209 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 NI-9209 with DSUBne 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 NI-9209 with DSUB 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.

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	5,000 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.

Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9209 at ni.com/calibration.

Calibration interval	2 years