

---

# NI-9209

# Specifications

---

2024-10-11



# Contents

NI-9209 Specifications ..... 3

# 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.

## Input Characteristics

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

**Table 1.** Accuracy

Calibrated Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range <sup>[1]</sup> (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)	Each channel must remain within

+ common mode voltage)	$\pm 10.2$ V of common
<b>Conversion time (per channel)</b>	
High-Resolution Mode	52 ms
High-Speed Mode	2 ms
Overvoltage protection, channel-to-COM	$\pm 30$ V maximum on one channel at a time
Input impedance	$>1$ G $\Omega$
<b>Input noise</b>	
High-Resolution Mode	20 $\mu$ Vrms
High-Speed Mode	86 $\mu$ Vrms
<b>Alias rejection</b>	
High-Resolution Mode	14 dB
High-Speed Mode	42 dB
<b>Stability</b>	
Gain drift	25 ppm/ $^{\circ}$ C
Offset drift	2.4 $\mu$ V/ $^{\circ}$ C

CMRR ( $f_{in}= 0 \text{ Hz to } 60 \text{ Hz}$ )	68 dB
<b>CMRR, channel-to-earth ground (50/60 Hz)<sup>[2]</sup></b>	
High-Resolution Mode	160 dB
High-Speed Mode	100 dB
<b>NMRR (High-Resolution Mode only)</b>	
50 Hz	66 dB
60 Hz	68 dB

## Power Requirements

<b>Power consumption from chassis</b>	
Active mode	333 mW maximum
Sleep mode	25 $\mu$ W maximum
<b>Thermal dissipation</b>	
Active mode	354 mW maximum
Sleep mode	25 $\mu$ W 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 <a href="https://ni.com/dimensions">ni.com/dimensions</a> and search by module number.

### with Spring Terminal

Spring-terminal wiring	
Gauge	0.14 mm <sup>2</sup> to 1.5 mm <sup>2</sup> (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 <sup>2</sup> to 1.5 mm <sup>2</sup>
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:

<b>Isolation</b>	
Channel-to-channel	None
<b>Channel-to-earth ground</b>	
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 DSUB 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 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	
<b>Humidity</b>		
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	
<b>Shock and Vibration</b>		
<b>Operating vibration</b>		
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](https://ni.com/calibration).

Calibration interval	2 years
----------------------	---------