# NI-9201 Specifications

2023-05-29

# Contents

# NI-9201 Specifications

## Connector Types

The NI-9201 has more than one connector type: NI-9201 with screw terminal, NI-9201 with spring terminal, and NI-9201 with DSUB. Unless the connector type is specified, NI-9201 refers to all connector types.

## 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.

### Related information:

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

# Input Characteristics

| | |
|---|---|
| Number of channels | 8 |
| ADC resolution | 12 bits |
| Type of ADC | Successive approximation register (SAR) |

**Table 1.** Sample Rate (Aggregate)

| Mode | Maximum Sample Rate (R Series Expansion Chassis) | Maximum Sample Rate (All Other Chassis) |
|---|---|---|
| Single Channel | 475 kS/s | 800 kS/s |
| Scanning | 475 kS/s | 500 kS/s |

| | |
|---|---|
| Input range | ±10 V |
| **Measurement voltage, channel-to-COM (V)** | |
| Minimum | ±10.3 |
| Typical | ±10.53 |
| Maximum | ±10.8 |
| Overvoltage protection, channel-to-COM | ±100 V |

**Table 2.** NI-9201 Accuracy (Excludes Noise)

| Measurement Conditions | | Percent of Reading (Gain Error) | Percent of Range (Offset Error) |
|---|---|---|---|
| Calibrated | Typical (25 °C, ±5 °C) | ±0.04% | ±0.07% |
| | Maximum (-40 °C to 70 °C) | ±0.25% | ±0.25% |
| Uncalibrated | Typical (25 °C, ±5 °C) | ±0.26% | ±0.46% |

| Measurement Conditions | | Percent of Reading (Gain Error) | Percent of Range (Offset Error) |
|---|---|---|---|
| | Maximum (-40 °C to 70 °C) | ±0.67% | ±1.25% |

| | |
|---|---|
| **Stability** | |
| Gain drift | ±34 ppm/°C |
| Offset drift | ±100 µV/°C |
| Input bandwidth (-3 dB) | 690 kHz minimum |
| **Input impedance** | |
| Resistance | 1 MΩ |
| Capacitance | 5 pF |
| **Input noise, code-centered** | |
| RMS | 0.7 LSB RMS |
| Peak-to-peak | 5 LSB |
| No missing codes | 12 bits |
| DNL | -0.9 to 1.5 LSB |
| INL | ±1.5 LSB |
| Crosstalk, at 10 kHz | -75 dB |
| Settling time, to 1 LSB | 2 µs |
| MTBF | 1,092,512 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method |

# Power Requirements

| **Power consumption from chassis** | |
|---|---|
| Active mode | 1 W maximum |
| Sleep mode | 1 mW maximum |
| **Thermal dissipation (at 70 °C)** | |
| Active mode | 1 W maximum |
| Sleep mode | 32 mW maximum |

# Physical Characteristics

| **Weight** | |
|---|---|
| NI-9201 with screw terminal | 165 g (5.8 oz) |
| NI-9201 with spring terminal | 152 g (5.4 oz) |
| NI-9201 with DSUB | 142 g (5.0 oz) |
| Dimensions | Visit ni.com/dimensions and search by module number. |

# NI-9201 with Screw Terminal Wiring

| | |
|---|---|
| Gauge | 0.2 mm to 2.5 mm (26 AWG to 14 AWG) copper conductor wire |
| Wire strip length | 13 mm (0.51 in.) of insulation stripped from the end |

| | |
|---|---|
| Temperature rating | 90 °C minimum |
| Torque for screw terminals | 0.5 N · m to 0.6 N · m(4.4 lb · in. to 5.3 lb · in.) |
| Wires per screw terminal | One wire per screw terminal; two wires per screw terminal using a 2-wire ferrule |
| Ferrules | 0.25 mm to 2.5 mm |
| **Connector securement** | |
| Securement type | Screw flanges provided |
| Torque for screw flanges | 0.2 N · m (1.8 lb · in.) |

## NI-9201 with Spring Terminal Wiring

| | |
|---|---|
| Gauge | 0.2 mm to 2.5 mm (30 AWG to 12 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 spring terminal; two wires per spring terminal using a 2-wire ferrule |
| Ferrules | 0.25 mm to 2.5 mm |
| **Connector securement** | |
| Securement type | Screw flanges provided |
| Torque for screw flanges | 0.2 N · m (1.8 lb · in.) |

# 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;<br>18 shocks at 6 orientations |

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

# NI-9201 with Screw Terminal and NI-9201 with Spring Terminal Safety Voltages

Connect only voltages that are within the following limits.

| | |
|---|---|
| Channel-to-COM | ±60 V DC maximum |
| Channel-to-channel | None |
| **Channel-to-earth ground** | |
| Continuous | 250 V RMS, Measurement Category II |
| Withstand | 2,300 V RMS, verified by a 5 s dielectric withstand test |

# NI-9201 with DSUB Safety Voltages

Connect only voltages that are within the following limits.

| | |
|---|---|
| Channel-to-COM | ±60 V DC maximum |
| Channel-to-channel | None |
| **Channel-to-earth** | |
| Continuous | 60 V DC, Measurement Category I |
| Withstand | 1,000 V RMS, verified by a 5 s dielectric withstand test |

# Measurement Category

## Measurement Category I

**Caution** Do not connect the NI-9201 with DSUB to signals or use for measurements within Measurement Categories II, III, or IV.

**Attention** Ne pas connecter le NI-9201 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-9201 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-9201 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-9201 with screw terminal or NI-9201 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

**Attention** Ne pas connecter le NI-9201 with screw terminal ou NI-9201 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.

# Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9201 at ni.com/calibration.

| | |
|---|---|
| Calibration interval | 1 year |