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# NI-9203

# Specifications

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# Contents

NI-9203 Specifications..... 3

# NI-9203 Specifications

## 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.

### Related information:

- [Software Support for CompactRIO, CompactDAQ, Single-Board RIO, R Series, and EtherCAT](#)

## Conditions

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

## Connector Types

The NI-9203 has more than one connector type: NI-9203 with screw terminal and NI-9203 with spring terminal. Unless the connector type is specified, NI-9203 refers to all connector types.

## Input Characteristics

|  |   |
|--|---|
| Number of channels                     | 8 analog input channels                     |
| ADC resolution                         | 16 bits                                     |
| Type of ADC                            | Successive approximation register (SAR)     |
| <b>Nominal input</b>                   |   |
| Unipolar                               | 0 mA to 20 mA                               |
| Bipolar                                | $\pm 20$ mA                                 |
| <b>Minimum overrange</b>               |   |
| Unipolar                               | 6.5%  |
| Bipolar                                | 5.5%  |
| Overvoltage protection, channel-to-COM | $\pm 30$ V maximum on one channel at a time |
| <b>Sample rate</b>                     |   |
| R Series Expansion chassis             | 192 kS/s maximum                            |
| All other chassis                      | 200 kS/s maximum                            |
| <b>Conversion time</b>                 |   |
| R Series Expansion chassis             | 5.2 $\mu$ s minimum                         |
| All other chassis                      | 5 $\mu$ s minimum                           |

**Table 1. Unipolar Accuracy**

|              | Measurement Conditions    | Percent of Reading (Gain Error) | Percent of Range <sup>[1]</sup> (Offset Error) |
|--------------|---------------------------|---------------------------------|--|
| Calibrated   | Maximum (-40 °C to 70 °C) | ±0.18%                          | ±0.06%   |
|              | Typical (25 °C, ±5 °C)    | ±0.04%                          | ±0.02%   |
| Uncalibrated | Maximum (-40 °C to 70 °C) | ±0.66%                          | ±0.54%   |
|              | Typical (25 °C, ±5 °C)    | ±0.49%                          | ±0.46%   |

**Table 2. Bipolar Accuracy**

|              | Measurement Conditions    | Percent of Reading (Gain Error) | Percent of Range <sup>[1]</sup> (Offset Error) |
|--------------|---------------------------|---------------------------------|--|
| Calibrated   | Maximum (-40 °C to 70 °C) | ±0.20%                          | ±0.09%   |
|              | Typical (25 °C, ±5 °C)    | ±0.05%                          | ±0.02%   |
| Uncalibrated | Maximum (-40 °C to 70 °C) | ±0.74%                          | ±0.66%   |
|              | Typical (25 °C, ±5 °C)    | ±0.54%                          | ±0.55%   |

**Scaling coefficients**

|          |                    |
|----------|--------------------|
| Unipolar | 330 nA/LSB typical |
| Bipolar  | 660 nA/LSB typical |

**Unipolar stability**

|              |            |
|--------------|------------|
| Offset drift | 63 nA/°C   |
| Gain drift   | ±14 ppm/°C |

**Bipolar stability**

|              |           |
|--------------|-----------|
| Offset drift | 286 nA/°C |
|--------------|-----------|

|                                    |  |
|------------------------------------|--|
| Gain drift                         | $\pm 17$ ppm/ $^{\circ}$ C   |
| Input bandwidth (-3 dB)            | 850 kHz  |
| <b>Input impedance</b>             |  |
| Resistance                         | 138 $\Omega$   |
| Capacitance                        | 20 pF  |
| <b>Input noise (code-centered)</b> |  |
| RMS                                | 1 LSB RMS  |
| Peak-to-peak                       | 7 LSB  |
| No missing codes                   | 16 bits  |
| INL                                | $\pm 3$ LSB maximum  |
| Crosstalk (at 1 kHz)               | -100 dB  |
| Settling time (to 2 LSB)           | 5 $\mu$ s  |
| MTBF                               | 1,522,814 hours at 25 $^{\circ}$ C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method |

## Safety Voltages

Connect only voltages that are within the following limits.

|                |                       |
|----------------|-----------------------|
| Channel-to-COM | $\pm 30$ V DC maximum |
|----------------|-----------------------|

## Isolation Voltages

|   |   |
|---|---|
| Channel-to-channel                                    | None  |
| <b>Channel-to-earth ground up to 2,000 m altitude</b> |   |
| Continuous  | 250 V RMS, Measurement Category II            |
| Withstand   | 2,300 V RMS, verified by a 5 s withstand test |
| <b>Channel-to-earth ground up to 5,000 m altitude</b> |   |
| Continuous  | 60 V DC, Measurement Category I               |
| Withstand   | 1,000 V RMS, verified by a 5 s withstand test |

## Measurement Category

### Measurement Category I



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



**Attention** Ne pas connecter le produit 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 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

| <b>Temperature</b>                            |                                 |
|---|---------------------------------|
| 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 (with power plug attached) | 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;<br>18 shocks at 6 orientations |

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

## Power Requirements

| <b>Power consumption from chassis</b> |                |
|---------------------------------------|----------------|
| Active mode                           | 399 mW maximum |
| Sleep mode                            | 5 mW maximum   |
| <b>Thermal dissipation (at 70 °C)</b> |                |
| Active mode                           | 1.22 W maximum |
| Sleep mode                            | 824 mW maximum |

## Physical Characteristics

| <b>Weight</b>                |                |
|------------------------------|----------------|
| NI-9203 with screw terminal  | 162 g (5.7 oz) |
| NI-9203 with spring terminal | 150 g (5.3 oz) |

|            |   |
|------------|---|
| Dimensions | Visit <a href="http://ni.com/dimensions">ni.com/dimensions</a> and search by product name |
|------------|---|

## NI-9203 with Screw Terminal

| <b>Screw terminal wiring</b> |   |
|------------------------------|---|
| Gauge                        | 0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (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<br><br>(4.4 lb · in. to 5.3 lb · in.)                        |
| Wires per terminal           | One wire per screw terminal; two wires per screw terminal using a 2-wire ferrule    |
| <b>Connector securement</b>  |   |
| Securement type              | Screw flanges provided  |
| Torque for screw flanges     | 0.2 N · m (1.80 lb · in.)   |

## NI-9203 with Spring Terminal

| <b>Spring terminal wiring</b> |   |
|-------------------------------|---|
| Gauge                         | 0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (24 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 terminal          | One wire per spring terminal; two wires per spring terminal using a 2-wire ferrule |
| Ferrules                    | 0.25 mm <sup>2</sup> to 2.5 mm <sup>2</sup>  |
| <b>Connector securement</b> |  |
| 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-9203 at [ni.com/calibration](https://ni.com/calibration).

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