
NI-9202

Specifications

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NI-9202 Specifications

The following specifications are typical for the range -40 °C to 70 °C unless otherwise noted.

Caution Do not operate the NI-9202 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to NI for repair.

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.

Input Characteristics

Number of channels	16 analog input channels
ADC resolution	24 bits
Type of ADC	Delta-Sigma with analog prefiltering

Sampling mode	Simultaneous
Internal master timebase (f_M)	
Frequency	12.8 MHz
Accuracy	± 50 ppm maximum
Data rate range (f_s)	
Using internal master timebase	
Minimum	10 S/s
Maximum	10 kS/s
Using external master timebase	
Minimum	3.81 S/s
Maximum	10.273 kS/s
Data rate ^[1]	$f_s = \frac{f_M}{a \times b \times c \times d}$
Overvoltage protection ^[2]	± 30 V
Input resistance (AIx to COM)	>10 G Ω
Input voltage range (Differential)	
Minimum	10.50 V
Typical	10.58 V

Scaling coefficients

10 kS/s, 5 kS/s	2,017,990 pV/LSB
60 S/s ^[3]	1,356,632 pV/LSB
2 kS/s, 1 kS/s, 500 S/s, 250 S/s, 125 S/s, 50 S/s ^[3]	1,614,392 pV/LSB
400 S/s, 200 S/s, 100 S/s, 10 S/s ^[3]	1,291,513 pV/LSB
60 S/s ^[4]	2,273,791 pV/LSB
All other data rates	1,261,244 pV/LSB

Maximum input voltage (AIx to COM)	±10.5 V
Input delay ^[5]	$\frac{(A+B)}{f_S} + C$
Settling time ^[5]	$\frac{2(A+B)}{f_S} + C$

Variable	Value
A	0.8 for $f_S = 10$ to 60, 100, 125, 200, 250, 400, 500, 1000, 2000
	1.4 for $f_S = 97.7$ to 2083.3, 2500, 3125, 5000, 10000 ^[6]
	1.8 for $f_S = 2272.7$ to 4166.7, 6250, 8333.3 ^[7]
	2.6 for $f_S = 4545.5, 5555.6, 7142.9$
B	0 for filter notch at f_S
	0.5 for filter notch at $f_S/2$
	1.5 for filter notch at $f_S/4$
	3.5 for filter notch at $f_S/8$

Variable	Value
	7.5 for filter notch at $f_s/16$
C	8.5 μ s

Table 2. Input Delay

Measurement Conditions	Percent of Reading ^[8] (Gain Error)	Percent of Range ^[9] (Offset Error)
Maximum (-40 °C to 70 °C)	$\pm 0.25\%$	$\pm 0.17\%$
Typical (23 °C, ± 5 °C)	$\pm 0.06\%$	$\pm 0.04\%$

Table 3. DC Accuracy

Non-linearity	5 ppm
Stability of Accuracy	
Gain drift ^[8]	5.3 ppm/°C
Offset drift	34.5 μ V/°C
Passband, -3 dB	Refer to the -3 dB graphs in the Passband section
Phase linearity ($f_{in} \leq 4.9$ kHz)	0.07° maximum
Channel-to-channel mismatch ($f_{in} \leq 4.9$ kHz)	
Gain	0.2 dB maximum
Phase	0.24°/kHz maximum
Module-to-module mismatch ($f_{in} \leq 4.9$ kHz)	
Phase	$0.24^\circ/\text{kHz} + 360^\circ f_{in}/f_M$
Attenuation @ 2 x oversample rate (23 °C)^[10]	

$f_s = 10000.0$ S/s

95 dB @ 581.818 kHz

$f_s = 4545.5$ S/s

85 dB @ 3.2 MHz

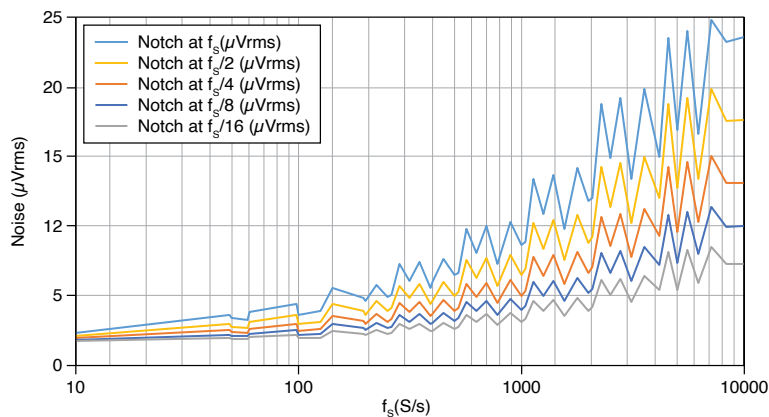
f_s (S/s)	ADC Decimation Rate	Filter Notch at f_s (μ Vrms)	Filter Notch at $f_s/2$ (μ Vrms)	Filter Notch at $f_s/4$ (μ Vrms)	Filter Notch at $f_s/8$ (μ Vrms)	Filter Notch at $f_s/16$ (μ Vrms)
10000.0	32	23.5	17.6	13.0	9.9	7.2
5000.0	64	16.8	12.7	9.5	7.3	5.4
6250.0	128	16.6	13.3	10.2	7.9	5.8
1562.5	256	9.7	7.5	5.8	4.6	3.5
781.3	512	7.2	5.6	4.4	3.6	2.8
390.6	1,024	5.5	4.3	3.5	2.9	2.4

Table 4. Idle Channel Noise

Note The noise specifications assume the NI-9202 is using the internal master timebase frequency of 12.8 MHz.

Note The noise is dominated by the ADC Decimation Rate.

Figure 12. Idle Channel Noise vs Data Rate and Filter Settings.



Crosstalk (CH to CH)

NI-9202 with spring terminal $f_{in} \leq 100 \text{ Hz}$ 100 dB $f_{in} \leq 1 \text{ kHz}$ 80 dB $f_{in} \leq 3 \text{ kHz}$ 70 dB**NI-9202 with DSUB** $f_{in} \leq 100 \text{ Hz}$ 105 dB $f_{in} \leq 1 \text{ kHz}$ 85 dB $f_{in} \leq 3 \text{ kHz}$ 75 dB**Common mode rejection ratio (CMRR) to COM** $f_{in} \leq 60 \text{ Hz}$ 72 dB typical, 67 dB minimum**Common mode rejection ratio (CMRR) to Earth Ground** $f_{in} \leq 60 \text{ Hz}$ 125 dB minimum**Normal mode rejection ratio (NMRR) using internal or external master timebase of 12.8 MHz**60 S/s, $f_{in} = 60 \text{ Hz} \pm 1 \text{ Hz}$ 35 dB minimum50 S/s, $f_{in} = 50 \text{ Hz} \pm 1 \text{ Hz}$ 33 dB minimum10 S/s, $f_{in} = 50 \text{ Hz}/60 \text{ Hz} \pm 1 \text{ Hz}$ 34 dB minimum**Normal mode rejection ratio (NMRR) using external master timebase of 13.1072 MHz**

60 S/s, $f_{in} = 60 \text{ Hz} \pm 1 \text{ Hz}$	34 dB minimum
50 S/s, $f_{in} = 50 \text{ Hz} \pm 1 \text{ Hz}$	33 dB minimum
10 S/s, $f_{in} = 50 \text{ Hz}/60 \text{ Hz} \pm 1 \text{ Hz}$	33 dB minimum

Power Requirements

Power consumption from chassis

Active mode	0.95 W maximum
Sleep mode	53 μ W maximum

Thermal dissipation

Active mode	1.30 W maximum
Sleep mode	0.64 W maximum

Physical Characteristics

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

Connector securement

Securement type	Screw flanges provided
Torque for screw flanges	0.2 N · m (1.80 lb · in.)

Safety Voltages

Connect only voltages that are within the following limits:

Maximum voltage^[11]

Channel-to-COM	±30 V DC maximum, up to 6 channels at a time
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NI-9202 with Spring Terminal Isolation Voltages

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

NI-9202 with DSUB Isolation Voltages

Channel-to-channel	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
up to 5,000 m	500 V RMS

Hazardous Locations

U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4 Gc
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Ex nA IIC T4 Gc
Europe (ATEX) and International (IECEX)	Ex nA IIC T4 Gc

Safety and Hazardous Locations Standards

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1
- EN 60079-0:2012, EN 60079-15:2010
- IEC 60079-0: Ed 6, IEC 60079-15; Ed 4
- UL 60079-0; Ed 6, UL 60079-15; Ed 4
- CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-15

Note For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Industrial immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations and certifications, and additional information, refer to the [Online Product Certification](#) section.

CE Compliance

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

Shock and Vibration

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

Operating vibration	
Random (IEC 60068-2-64)	5 g _{rms} , 10 Hz to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz to 500 Hz
Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP40
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing

Storage humidity (IEC 60068-2-78)	5% RH to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	5,000 m


Indoor use only.

Environmental Management


NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the **Engineering a Healthy Planet** web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

EU and UK Customers

-  **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国 RoHS）

-  **中国 RoHS**— NI 符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于 NI 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9202 at ni.com/calibration.

Calibration interval	2 years
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1 The data rate must remain within the appropriate data rate range and

$\frac{f_M}{b}$
needs to stay within 1 MHz and 6.575 MHz.

2 Up to 6 channels simultaneously

3 When using the internal master timebase or an external master timebase of 12.8 MHz

4 When using an external master timebase of 13.1072 MHz

5 Refer to [Input Delay](#) for the values of A, B, and C.

6 Excludes sample rates in the 0.8 category

7 Excludes sample rates in 1.4 category

8 Includes the expected difference in measurement between using single-ended and differential sources due to finite CMRR

9 Range equals 10.58 V

10 The oversample rate is the timebase divided by Timebase Clock Divider and ADC Clock Divider in [Table 1](#). At odd multiples of the oversample rate, the NI-9202 will have significantly higher rejection.

11 The maximum voltage that can be applied or output between AI and COM without creating a safety hazard.