NI 9219 Specifications

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

Input Characteristics

Number of channels	4 analog input channels
ADC resolution	24 bits
Type of ADC	Delta-sigma (with analog prefiltering)
Sampling mode	Simultaneous
Type of TEDS supported	IEEE 1451.4 TEDS Class II (Interface)

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Mode input ranges

Mode	Nominal Range(s)	Actual Range(s)
Voltage	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV
Current	±25 mA	±25 mA
4-Wire and 2-Wire Resistance	10 KΩ, 1 KΩ	10.5 KΩ, 1.05 KΩ
Thermocouple	±125 mV	±125 mV
4-Wire and 3-Wire RTD	Pt 1000, Pt 100	5.05 KΩ, 505 Ω
Quarter-Bridge	350 Ω, 120 Ω	390 Ω, 150 Ω
Half-Bridge	±500 mV/V	±500 mV/V
Full-Bridge	±62.5 mV/V, ±7.8 mV/V	±62.5 mV/V, ±7.8125 mV/V
Digital In	—	0–60 V
Open Contact	—	1.05 KΩ

Conversion time, no channels in TC mode

- High speed ..... 10 ms for all channels
- Best 60 Hz rejection ..... 110 ms for all channels
- Best 50 Hz rejection ..... 130 ms for all channels
- High resolution ..... 500 ms for all channels

Conversion time, one or more channels in TC mode

- High speed ..... 20 ms for all channels
- Best 60 Hz rejection ..... 120 ms for all channels
- Best 50 Hz rejection ..... 140 ms for all channels
- High resolution ..... 510 ms for all channels

Overvoltage protection

- Terminals 1 and 2 ..... ±30 V
- Terminals 3 through 6, across any combination ..... ±60 V

Input impedance

- Voltage and Digital In modes (±60 V, ±15 V, ±4 V) ..... 1 MΩ
- Current mode ..... < 40 Ω
- All other modes ..... >1 GΩ

Accuracy

Mode, Range	Gain Error (% of Reading)	Offset Error (ppm of Range)
	Typ (25 °C, ±5 °C), Max (–40 to 70 °C)	
Voltage, ±60 V	±0.3, ±0.4	±20, ±50[1]
Voltage, ±15 V	±0.3, ±0.4	±60, ±180
Voltage, ±4 V	±0.3, ±0.4	±240, ±720
Voltage, ±1 V	±0.1, ±0.18	±15, ±45[1]
Voltage/Thermocouple, ±125 mV	±0.1, ±0.18	±120, ±360
Current, ±25 mA	±0.1, ±0.6	±30, ±100
4-Wire and 2-Wire[2] Resistance, 10 KΩ	±0.1, ±0.5	±120, ±320
4-Wire and 2-Wire[2] Resistance, 1 KΩ	±0.1, ±0.5	±1200, ±3200
4-Wire and 3-Wire RTD, Pt 1000	±0.1, ±0.5	±240, ±640
4-Wire and 3-Wire RTD, Pt 100	±0.1, ±0.5	±2400, ±6400
Quarter-Bridge, 350 Ω	±0.1, ±0.5	±2400, ±6400
Quarter-Bridge, 120 Ω	±0.1, ±0.5	±2400, ±6400

Mode, Range	Gain Error (% of Reading)	Offset Error (ppm of Range)
	Typ (25 °C, ±5 °C), Max (–40 to 70 °C)	
Half-Bridge, ±500 mV/V	±0.03, ±0.07	±300, ±450
Full-Bridge, ±62.5 mV/V	±0.03, ±0.08	±300, ±1000
Full-Bridge, ±7.8 mV/V	±0.03, ±0.08	±2200, ±8000

[1] Offset Error is ±80 typ/±150 max ppm for Voltage mode with ±60 V range and ±70 typ/±140 max ppm for Voltage mode with ±1 V range when using the Best 60 Hz rejection conversion time.

[2] 2-Wire Resistance mode accuracy depends on the lead wire resistance. This table assumes 0 Ω of lead wire resistance.

Cold-junction compensation
sensor accuracy .....±1 °C typ

Stability

Mode, Range	Gain Drift (ppm of Reading/°C)	Offset Drift (ppm of Range/°C)
Voltage, ±60 V	±20	±0.2
Voltage, ±15 V	±20	±0.8
Voltage, ±4 V	±20	±3.2
Voltage, ±1 V	±10	±0.2
Voltage/Thermocouple, ±125 mV	±10	±1.6
Current, ±25 mA	±15	±0.4
4-Wire and 2-Wire Resistance, 10 KΩ	±15	±3
4-Wire and 2-Wire Resistance, 1 KΩ	±15	±30
4-Wire and 3-Wire RTD, Pt 1000	±15	±6
4-Wire and 3-Wire RTD, Pt 100	±15	±60
Quarter-Bridge, 350 Ω	±15	±120
Quarter-Bridge, 120 Ω	±15	±240
Half-Bridge, ±500 mV/V	±3	±20

Mode, Range	Gain Drift (ppm of Reading/°C)	Offset Drift (ppm of Range/°C)
Full-Bridge, ±62.5 mV/V	±3	±20
Full-Bridge, ±7.8 mV/V	±3	±20

Input noise in ppm of $Range_{rms}$

Mode, Range	Conversion Time			
	High speed	Best 60 Hz rejection	Best 50 Hz rejection	High resolution
Voltage, ±60 V	7.6	1.3	1.3	0.5
Voltage, ±15 V	10.8	1.9	1.9	0.7
Voltage, ±4 V	10.8	2.7	2.7	1.3
Voltage, ±1 V	7.6	1.3	1.3	0.5
Voltage/Thermocouple, ±125 mV	10.8	1.9	1.9	1.0
Current, ±25 mA	10.8	1.9	1.9	1.0

Mode, Range	Conversion Time			
	High speed	Best 60 Hz rejection	Best 50 Hz rejection	High resolution
4-Wire and 2-Wire Resistance, 10 KΩ	4.1	1.3	0.8	0.3
4-Wire and 2-Wire Resistance, 1 KΩ	7.1	1.8	1.2	0.7
4-Wire and 3-Wire RTD, Pt 1000	7.6	1.7	1.1	0.4
4-Wire and 3-Wire RTD, Pt 100	10.8	1.9	1.9	0.9
Quarter-Bridge, 350 Ω	5.4	1.0	1.0	0.7
Quarter-Bridge, 120 Ω	5.4	1.0	1.0	0.7
Half-Bridge, ±500 mV/V	3.8	0.5	0.5	0.2
Full-Bridge, ±62.5 mV/V	5.4	1.0	1.0	0.8
Full-Bridge, ±7.8 mV/V	30	4.7	4.7	2.3

Input bias current ..... <1 nA

INL ..... ±15 ppm[1]

CMRR (f_{in} = 60 Hz)..... >100 dB

NMRR

Best 60 Hz rejection ..... 90 dB[2] at 60 Hz

Best 50 Hz rejection ..... 80 dB at 50 Hz

High resolution ..... 65 dB at 50 Hz and 60 Hz

Excitation level for Half-Bridge and Full-Bridge modes

Mode	Load Resistance (Ω)	Excitation (V)
Half-Bridge	700	2.5
Half-Bridge	240	2.0
Full-Bridge	350	2.7
Full-Bridge	120	2.2

[1] INL is ±140 ppm for Voltage mode with ±60 V or ±1 V range when using the Best 60 Hz rejection conversion time.

[2] NMRR is 80 dB for Voltage mode with ±1 V range when using the Best 60 Hz rejection conversion time.

Excitation level for Resistance, RTD, and Quarter-Bridge modes

Load Resistance (Ω)	Excitation (mV)
120	50
350	150
1 K	430
10 K	2200

MTBF ..... 384,716 hours at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

Active mode ..... 750 mW max

Sleep mode ..... 25 µW max

Thermal dissipation (at 70 °C)

Active mode ..... 625 mW max

Sleep mode ..... 25 µW max

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

Spring-terminal wiring..... 18 to 28 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end

Weight..... 156 g (5.5 oz.)

Safety

Safety Voltages

Connect only voltages that are within these limits.

Isolation

Channel-to-channel

Continuous ..... 250 VAC, Measurement Category II

Withstand ..... 1390 VAC, verified by a 5 s dielectric withstand test

Channel-to-earth ground

Continuous	250 VAC, Measurement Category II
Withstand	2300 VAC, verified by a 5 s dielectric withstand test

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. Do *not* connect the NI 9219 to signals or use for measurements within Measurement Categories III or IV.

Safety Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search

by module number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

U.S. (UL) ..... Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4

Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. Refer to the installation instructions for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC60068-2-1, IEC 60068-2-2) ..... –40 to 70 °C

Storage temperature (IEC60068-2-1, IEC 60068-2-2) ..... –40 to 85 °C

Ingress protection..... IP 40

Operating humidity (IEC 60068-2-56)..... 10 to 90% RH, noncondensing

Storage humidity (IEC 60068-2-56)..... 5 to 95% RH, noncondensing

Maximum altitude..... 2,000 m

Pollution Degree (IEC 60664) 2

Shock and Vibration

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

Operating vibration

Random (IEC 60068-2-34)..... 5 g_{rms}, 10 to 500 Hz

Sinusoidal (IEC 60068-2-6) ..... 5 g, 10 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

Electromagnetic Compatibility

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

- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European directives, as amended for CE markings, as follows:

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9219 at ni.com/calibration.

Calibration interval ..... 1 year

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0, Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,

Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 385 (0) 9 725 72511, France 33 (0) 1 48 14 24 24,
Germany 49 89 7413130, India 91 80 41190000,
Israel 972 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,
Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,
Norway 47 (0) 66 90 76 60, Poland 48 22 3390150,
Portugal 351 210 311 210, Russia 7 495 783 6851,
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
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