

NI 9229/9239 Specifications

The following specifications are typical for the range -40 to $70\text{ }^{\circ}\text{C}$ unless otherwise noted. All voltages are relative to the AI- signal on each channel 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
Data rate range (f_s)	
Minimum	1.613 kS/s
Maximum	50 kS/s
Data rates (f_s)	$\frac{50\text{ kS/s}}{n}$, $n = 1, 2, \dots 31$.



Master timebase (internal)

Frequency 12.8 MHz

Accuracy..... ± 100 ppm max

Operating voltage ranges

	Measurement Voltage, AI+ to AI-		
	Nominal (V)	Typical (V)	Minimum (V)
NI 9229	± 60	± 62.64	± 61.5
NI 9239	± 10	± 10.52	± 10.3

Overvoltage protection ± 100 V

Input coupling..... DC

Input impedance (AI+ to AI-) 1 M Ω

Accuracy, NI 9229

Error	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated max (−40 to 70 °C)	±0.13%	±0.05%
Calibrated typ (25 °C, ±5 °C)	±0.03%	±0.008%
Uncalibrated max (−40 to 70 °C)	±1.2%	±0.55%
Uncalibrated typ (25 °C, ±5 °C)	±0.3%	±0.11%
* Range equals 62.64 V		

Accuracy, NI 9239

Error	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated max (−40 to 70 °C)	±0.13%	±0.05%
Calibrated typ (25 °C, ±5 °C)	±0.03%	±0.008%
Uncalibrated max (−40 to 70 °C)	±1.4%	±0.67%
Uncalibrated typ (25 °C, ±5 °C)	±0.3%	±0.11%
* Range equals 10.52 V		

Input noise

NI 9229..... 320 μV_{rms}

NI 9239..... 70 μV_{rms}

Stability

Gain drift ±5 ppm/°C

Offset drift

NI 9229 ±150 $\mu\text{V}/^{\circ}\text{C}$

NI 9239 ±24 $\mu\text{V}/^{\circ}\text{C}$

Post calibration gain match

(ch-to-ch, 20 kHz)..... 0.22 dB max

Crosstalk (1 kHz)..... -130 dB

Phase mismatch (ch-to-ch)

NI 9229..... $0.045^{\circ}/\text{kHz}$ max

NI 9239..... $0.075^{\circ}/\text{kHz}$ max

Phase mismatch (module-to-module, max)

NI 9229..... $0.045^{\circ}/\text{kHz} + 360^{\circ} \cdot f_{in}/M_{clk}$ ¹

NI 9239..... $0.075^{\circ}/\text{kHz} + 360^{\circ} \cdot f_{in}/M_{clk}$ ¹

Phase nonlinearity ($f_s = 50$ kS/s)..... 0.11° max

Input delay

NI 9229..... $38.4/f_s + 2.6 \mu\text{s}$

NI 9239..... $38.4/f_s + 3 \mu\text{s}$

Passband

Frequency $0.453 \cdot f_s$

Flatness ($f_s = 50$ kS/s)..... ± 100 mdB max

¹ M_{clk} is the master timebase.

Stopband

Frequency $0.547 \cdot f_s$

Rejection..... 100 dB

Alias-free bandwidth $0.453 \cdot f_s$

–3 dB prefilter bandwidth

($f_s = 50$ kS/s)..... 24.56 kHz

CMRR ($f_{in} = 60$ Hz)

NI 9229..... 116 dB

NI 9239..... 126 dB

SFDR (1 kHz, –60 dBFS)..... –128 dBFS

Total Harmonic Distortion (THD)

1 kHz, –1 dBFS –99 dB

1 kHz, –20 dBFS –105 dB

MTBF 662,484 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. Visit ni.com/certification and search for the module number or product line for more information about MTBF and other product certifications.

Power Requirements

Power consumption from chassis

Active mode 148 mA max

Sleep mode 5 μ A max

Thermal dissipation

Active mode 760 mW max

Sleep mode 16 mW max

Physical Characteristics

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

Screw-terminal wiring 16 to 28 AWG copper
conductor wire with 7 mm
(0.28 in.) of insulation
stripped from the end

Torque for screw terminals	0.22 to 0.25 N · m (1.95 to 2.21 lb · in.)
Ferrules	0.25 mm ² to 0.5 mm ²
Weight.....	147 g (5.2 oz)

Safety

Safety Voltages

Isolation

Channel-to-earth ground

Continuous	250 V _{rms} , Measurement Category II
Withstand	2300 V _{rms} , verified by a 5 s dielectric withstand test

Channel-to-channel

Continuous	250 V _{rms} , Measurement Category II
Withstand	1390 V _{rms} , 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 9229/9239 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 for the 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,
ATEX 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 and either affix ferrules to the ends of the terminal wires or use the NI 9971 backshell kit to protect the connections.

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 marking, 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 for the 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 9229/9239 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,
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Finland 385 (0) 9 725 72511, France 33 (0) 1 48 14 24 24,
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