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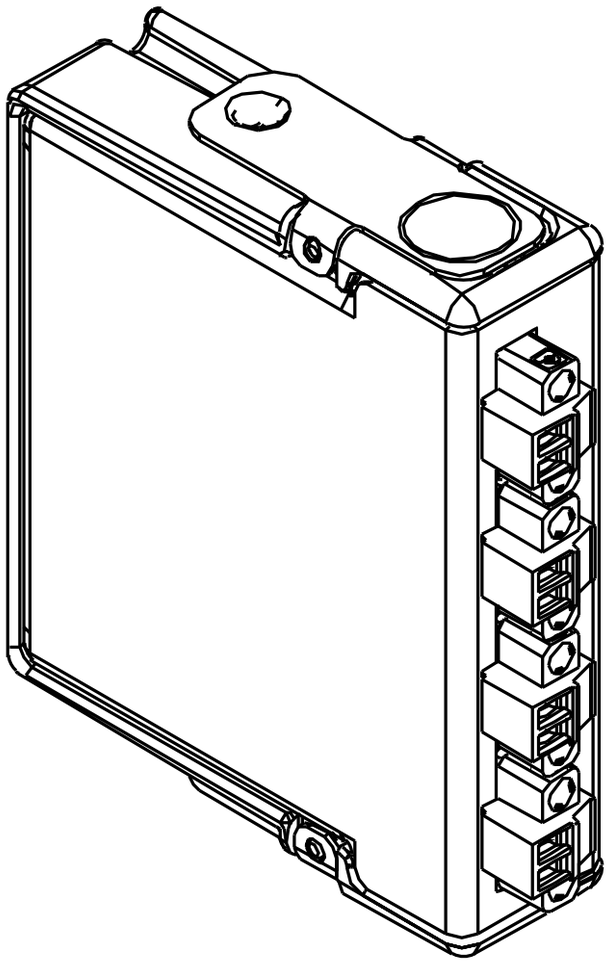
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Find the *National Instruments NI 9238* at our website: ***Click HERE***

GETTING STARTED GUIDE

NI 9238

4 AI, ±500 mV, 24 Bit, 50 kS/s/ch Simultaneous



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This document explains how to connect to the NI 9238.



Note Before you begin, complete the software and hardware installation procedures in your chassis documentation.



Note The guidelines in this document are specific to the NI 9238. The other components in the system might not meet the same safety ratings. Refer to the documentation for each component in the system to determine the safety and EMC ratings for the entire system.

Safety Guidelines

Operate the NI 9238 only as described in this document.



Caution Do not operate the NI 9238 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.

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Hazardous Voltage This icon denotes a warning advising you to take precautions to avoid electrical shock with the NI 9238.

Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-channel isolation		
	Up to 2,000 m altitude	
		Continuous: 250 Vrms, Measurement Category II
		Withstand: 1,500 Vrms, verified by a 5 s dielectric test
	2,001 m to 5,000 m altitude	
		Continuous: 60 VDC, Measurement Category I
		Withstand: 1,000 VDC

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Channel-to-earth ground isolation		
	Up to 2,000 m altitude	
		Continuous	250 Vrms, Measurement Category II
		Withstand	3,000 Vrms, verified by a 5 s dielectric test
	2,001 m to 5,000 m altitude	
		Continuous	60 VDC, Measurement Category I
		Withstand	1,000 VDC
Division 2 and Zone 2 hazardous locations applications (Channel-to-channel and channel-to-earth ground)		60 VDC, Measurement Category I

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

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circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.



Caution If using in Division 2 or Zone 2 hazardous locations applications, do not connect the NI 9238 to signals or use for measurements within Measurement Categories II, III, or IV.

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.



Caution Do not connect the NI 9238 to signals or use for measurements within Measurement Categories III or IV.



Note Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

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Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the device, take the following precautions. A hazardous voltage is a voltage greater than 42.4 Vpk voltage or 60 VDC to earth ground.



Caution Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.



Caution Do not mix hazardous voltage circuits and human-accessible circuits on the same module.



Caution Ensure that devices and circuits connected to the module are properly insulated from human contact.



Caution When module terminals are hazardous voltage LIVE (>42.4 Vpk/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9971 connector backshell kit to ensure that the terminals are not accessible.

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Safety Guidelines for Hazardous Locations

The NI 9238 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nA IIC T4 and Ex nA IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9238 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.



Caution Do not disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.



Caution Do not remove modules unless power has been switched off or the area is known to be nonhazardous.



Caution Substitution of components may impair suitability for Class I, Division 2.



Caution For Division 2 and Zone 2 applications, install the system in an enclosure rated to at least IP54 as defined by IEC/EN 60079-15.

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Caution For Division 2 and Zone 2 applications, connected voltage sources must be within 60 VDC to earth ground.

Caution For Division 2 and Zone 2 applications, install a protection device between the input signal and the NI 9238 input terminal. The device must clamp all voltage sources to no more than 40% above their rated value or within 84 VDC to earth ground if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9238 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 12 ATEX 1202658X and is IECEx UL 14.0089X certified. Each NI 9238 is marked Ex II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of -40 °C ≤ Ta ≤ 70 °C. If you are using the NI 9238 in Gas Group IIC hazardous locations, you must use the device in an NI chassis that has been evaluated as Ex nC IIC T4, Ex IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.

Caution You must make sure that transient disturbances do not exceed 140% of the rated voltage.

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Caution The system shall only be used in an area of not more than Pollution Degree 2, as defined in IEC 60664-1.

Caution The system shall be mounted in an ATEX/IECEx-certified enclosure with a minimum ingress protection rating of at least IP54 as defined in IEC/EN 60079-15.

Caution The enclosure must have a door or cover accessible only by the use of a tool.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the

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product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.



Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

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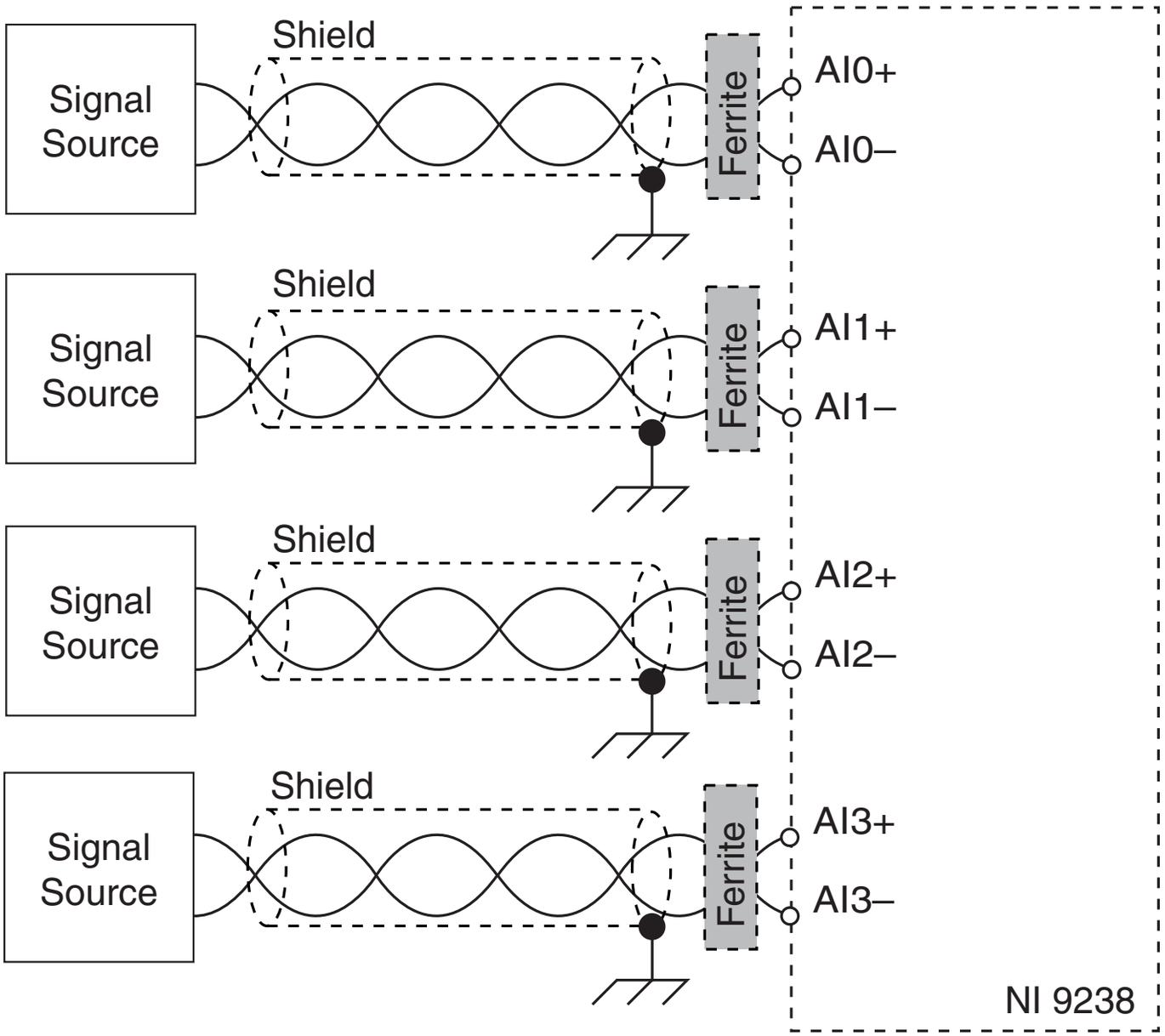
Cable Requirements for EMC Compliance

Install cables for the NI 9238 in accordance with the following requirements:

- Connect the cable shield to the chassis ground (grounding screw of the chassis).
- Install an EMI Noise-Suppression Ferrite (part number 782802-01) on the input cable for each channel connected to the NI 9238.
- Position the ferrite as close to the module as possible. Placing the ferrite elsewhere decreases its effectiveness.

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Figure 1. NI 9238 Cable Connections for EMC Compliance



Related Information

NI 9238 Connection Guidelines on page 17

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Special Conditions for Marine Applications

Some products are Lloyd's Register (LR) Type Approved for marine (shipboard) applications. To verify Lloyd's Register certification for a product, visit *ni.com/certification* and search for the LR certificate, or look for the Lloyd's Register mark on the product.



Caution In order to meet the EMC requirements for marine applications, install the product in a shielded enclosure with shielded and/or filtered power and input/output ports. In addition, take precautions when designing, selecting, and installing measurement probes and cables to ensure that the desired EMC performance is attained.

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Preparing the Environment

Ensure that the environment in which you are using the NI 9238 meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude[1]	5,000 m

Indoor use only.

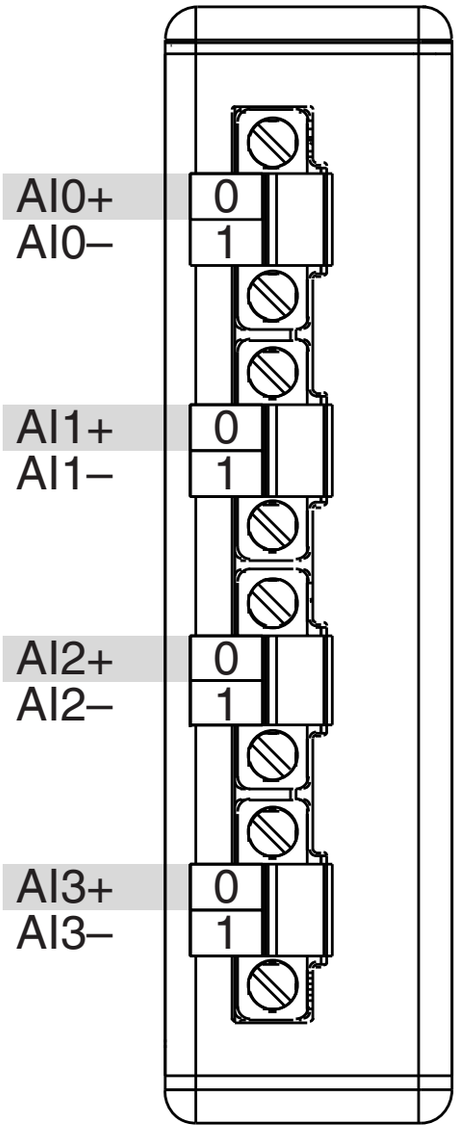


Note Refer to the device datasheet on *ni.com/manuals* for complete specifications.

[1] Refer to the *Safety Voltages* section for more information about altitude.

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NI 9238 Pinout

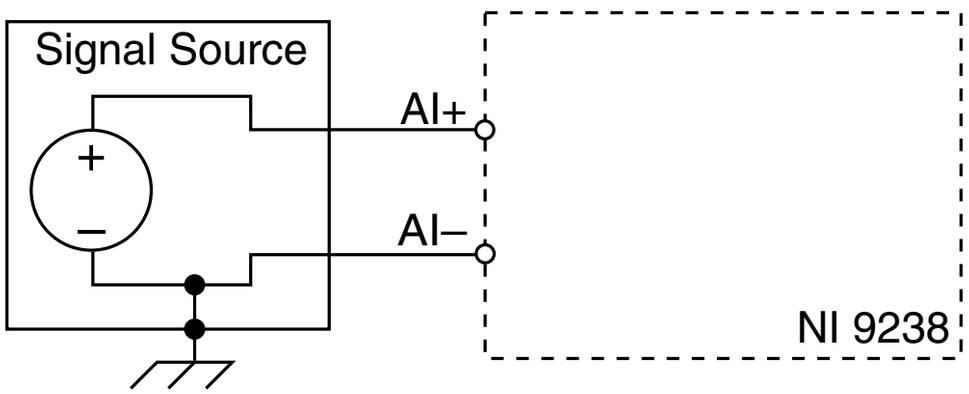


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Table 1. Signal Descriptions

Signal	Description
AI+	Positive analog input signal connection
AI-	Negative analog input signal connection

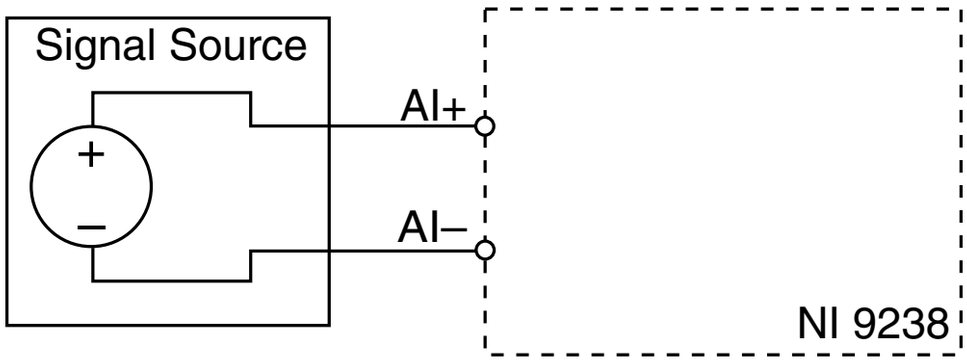
Grounded Connections



Make sure the voltage on the AI+ and AI- connections are in the channel-to-earth safety voltage range to ensure proper operation.

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Floating Connections



NI 9238 Connection Guidelines

- Make sure that devices you connect to the NI 9238 are compatible with the module specifications.
- You must use 2-wire ferrules to create a secure connection when connecting more than one wire to a single terminal on the NI 9238.

Related Information

Cable Requirements for EMC Compliance on page 11

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High-Vibration Application Connections

If your application is subject to high vibration, NI recommends that you follow these guidelines to protect connections to the NI 9238:

- Use ferrules to terminate wires to the detachable connector.
- Use the NI 9971 backshell kit.

Overvoltage Protection

The NI 9238 provides overvoltage protection for each channel.

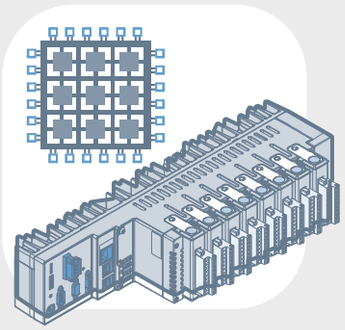


Note Refer to the device datasheet on *ni.com/manuals* for more information about overvoltage protection.

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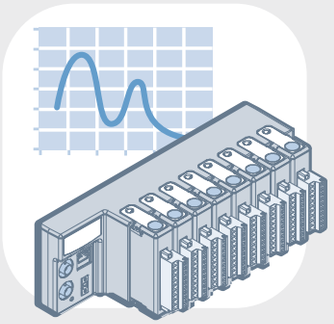
Where to Go Next

CompactRIO



- NI 9238 Datasheet
- NI-RIO Help
- LabVIEW FPGA Help

NI CompactDAQ



- NI 9238 Datasheet
- NI-DAQmx Help
- LabVIEW Help

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Worldwide Support and Services

The NI website 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.

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Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting *ni.com/certification*. If your product supports calibration, you can obtain the calibration certificate for your product at *ni.com/calibration*.

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