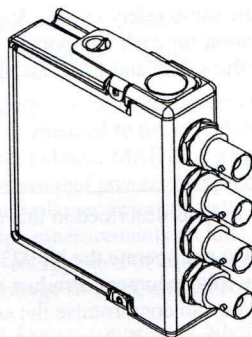


## GETTING STARTED GUIDE

# NI 9234

4 AI,  $\pm 5$  V, 24 Bit, 51.2 kS/s/ch Simultaneous,  
AC/DC Coupling, IEPE AC Coupling



This document explains how to connect to the NI 9234.



**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 9234. 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

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Operate the NI 9234 only as described in this document.



**Caution** Do not operate the NI 9234 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.

## Safety Voltages

Connect only voltages that are within the following limits:

Channel-to-earth ground	±30 V maximum, Measurement Category I
Isolation	
Channel-to-channel	None
Channel-to-earth ground	None

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.



**Caution** Do not connect the NI 9234 to signals or use for measurements within Measurement Categories II, III, or IV.

### Safety Guidelines for Hazardous Locations

The NI 9234 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 9234 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.



**Caution** For Division 2 and Zone 2 applications, connected signals must be within the following limits.

Capacitance

0.2  $\mu$ F maximum

### Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9234 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 07 ATEX 0626664X and is IECEX UL 14.0089X certified. Each NI 9234 is marked  $\text{Ex II 3G}$  and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of  $-40\text{ }^{\circ}\text{C} \leq T_a \leq 70\text{ }^{\circ}\text{C}$ . If you are using the NI 9234 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.



**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 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.

### 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](http://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.

## Preparing the Environment

Ensure that the environment in which you are using the NI 9234 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	5,000 m

Indoor use only.



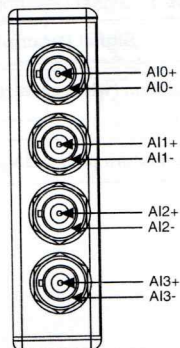
**Note** Refer to the device datasheet on [ni.com/manuals](http://ni.com/manuals) for complete specifications.



## Connecting the NI 9234

The NI 9234 provides connections to four simultaneously sampled analog input channels.

**Figure 1.** NI 9234 Pinout





**Tip** To minimize ground noise, prevent the metal shells of the BNC connectors from coming in contact with each other, the modules, or the chassis.

## Signal Descriptions

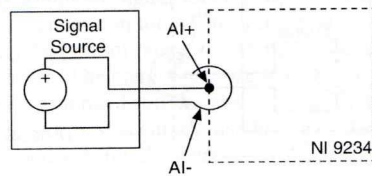
**Table 1.** Signal Descriptions

Signal	Signal Description
AI+	Provides DC excitation (when enabled) and positive input signal connection
AI-	Provides excitation return path and signal ground reference

## Connecting Floating Differential Signals

You can connect floating differential signals to the NI 9234.

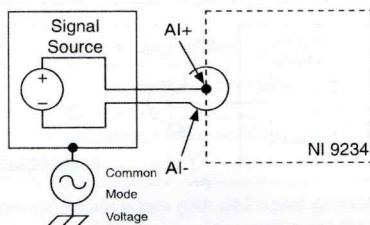
**Figure 2.** Connecting Floating Differential Signals to the NI 9234



### Connecting Grounded Differential Signals

You can connect grounded differential signals to the NI 9234.

**Figure 3.** Connecting Grounded Differential Signals to the NI 9234



Make sure the voltage on the AI- shell is in the common-mode range to ensure proper operation of the NI 9234. The AI- shell is protected against accidental contact with overvoltages within the overvoltage protection range.

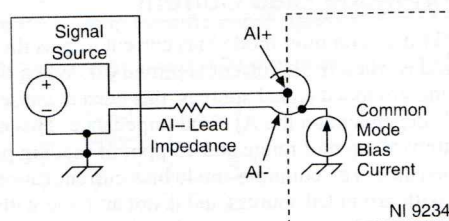
#### Related Information

*Overvoltage Protection on page 15*

## Common-Mode Bias Current

The NI 9234 uses common-mode bias current to bias the current-limiting diodes when IEPE current is turned off. When the NI 9234 is using grounded signal sources, this current causes an error that is dependent on the AI- lead impedance. This error is approximately 50 ppm of range and 15 ppm of reading per ohm of AI- impedance. The common-mode bias current causes an error only with grounded sources and is not an issue with floating signal sources. For best accuracy, use low-impedance leads when connecting grounded signal sources.

**Figure 4. Measurement Error Introduced by Common-Mode Bias Current**



## IEPE Excitation Current

The NI 9234 can also provide an IEPE excitation current for each channel to measure ground-referenced or floating IEPE sensors. Typical IEPE sensors have a case that is electrically isolated from the IEPE electronics, so connecting the sensor to the NI 9234 results in a floating connection even though the case of the sensor is grounded.

You can enable excitation current on a per-channel basis. Refer to your software help for more information about excitation current.

## Overvoltage Protection

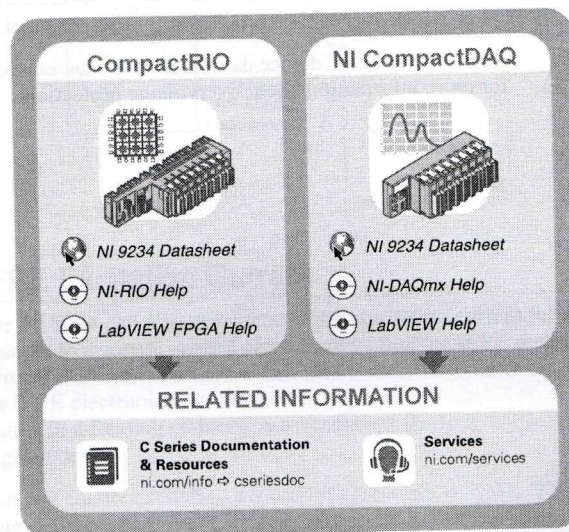
The NI 9234 provides overvoltage protection for each channel.



**Note** Refer to the device datasheet on [ni.com/manuals](http://ni.com/manuals) for more information about overvoltage protection.



## Where to Go Next



Located at [ni.com/manuals](http://ni.com/manuals) Installs with the software

## Worldwide Support and Services

The NI website is your complete resource for technical support. At [ni.com/support](http://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.

Visit [ni.com/services](http://ni.com/services) for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit [ni.com/register](http://ni.com/register) to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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