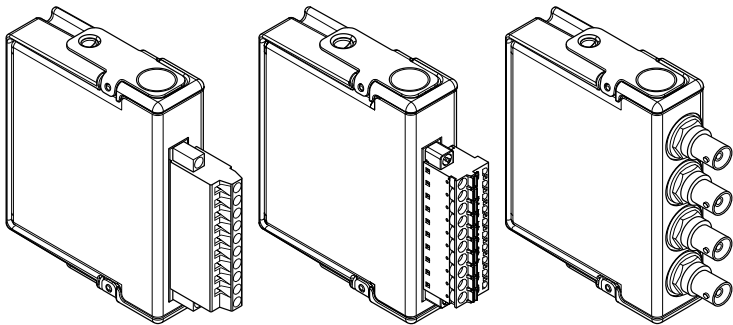


## GETTING STARTED GUIDE

# NI 9215

$\pm 10$  V, 100 kS/s/ch, 16-Bit, Simultaneous Input,  
4-Channel C Series Voltage Input Module



This document explains how to connect to the NI 9215. In this document, the NI 9215 with screw terminal, NI 9215 with spring terminal, and NI 9215 with BNC are referred to inclusively as the NI 9215.



**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 9215. 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 9215 only as described in this document.



**Caution** Do not operate the NI 9215 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.

## NI 9215 with Screw Terminal and NI 9215 with Spring Terminal Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-COM	$\pm 30$ V maximum
Isolation	
Channel-to-channel	None
Channel-to-earth ground	
Continuous	250 Vrms, Measurement Category II
Withstand	2,300 Vrms, 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.



**Caution** Do not connect the NI 9215 to signals or use for measurements within Measurement Categories III or IV.

## NI 9215 with BNC Safety Voltages

Connect only voltages that are within the following limits.

AI+-to-AI-	±30 V maximum
Isolation	
Channel-to-channel	None
Channel-to-earth ground	
Continuous	60 VDC, Measurement Category I
Withstand	1,500 Vrms, verified by a 5 s dielectric withstand test

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.



**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.



**Caution** Do not connect the NI 9215 to signals or use for measurements within Measurement Categories II, III, or IV.

## Safety Guidelines for Hazardous Voltages

You can connect hazardous voltages only to the NI 9215 with screw terminal and the NI 9215 with spring terminal. Do not connect hazardous voltages to the NI 9215 with BNC.

If hazardous voltages are connected to the device, take the following precautions. A hazardous voltage is a voltage greater than  $42.4 V_{pk}$  voltage or 60 V DC 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 ( $>42.4 V_{pk}/60 V DC$ ), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9927 connector backshell kit with the NI 9215 with screw terminal and the NI 9981 connector backshell kit with the NI 9215 with spring terminal to ensure that the terminals are not accessible.

## Safety Guidelines for Hazardous Locations

The NI 9215 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 9215 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

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

The NI 9215 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 03 ATEX 0324020X and is IECEx UL 14.0089X certified. Each NI 9215 is marked  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 9215 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.



## Safety Compliance 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, EN 60079-15
- 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 *Product Certifications and Declarations* 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)

## Electromagnetic Compatibility Guidelines

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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.



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



**Caution** Electrostatic Discharge (ESD) can damage the NI 9215. To prevent damage, use industry-standard ESD prevention measures during installation, maintenance, and operation.

## Special Conditions for Marine Applications

Some models are approved for marine (shipboard) applications. To verify marine approval certification for a model, visit [ni.com/product-certifications](https://ni.com/product-certifications), search by model number, and click the appropriate link.



**Notice** In order to meet the EMC requirements for marine applications, install the model 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.

## Physical Characteristics

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



**Tip** For two-dimensional drawings and three-dimensional models of the C Series module and connectors, visit [ni.com/dimensions](http://ni.com/dimensions) and search by module number.

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### Screw-terminal wiring

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Gauge	0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (26 AWG to 14 AWG) copper conductor wire
Wire strip length	13 mm (0.51 in.)

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Temperature rating	90 °C minimum
Torque for screw terminals	0.5 N · m to 0.6 N · m (4.4 lb · in. to 5.3 lb · in.)
Wires per screw terminal	One wire per screw terminal; two wires per screw terminal using a 2-wire ferrule
Ferrules	0.25 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (26 AWG to 14 AWG)
<b>Spring-terminal wiring</b>	
Gauge	0.2 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (26 AWG to 14 AWG) copper conductor wire
Wire strip length	10 mm (0.39 in.)
Temperature rating	90 °C minimum
Wires per spring terminal	One wire per spring terminal; two wires per spring terminal using a 2-wire ferrule
Ferrules	0.25 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (26 AWG to 14 AWG)

## Connector securement

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

## Weight

NI 9215 with screw terminal	150 g (5.3 oz)
NI 9215 with spring terminal	138 g (4.9 oz)
NI 9215 with BNC	173 g (6.1 oz)

## Preparing the Environment

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Ensure that the environment in which you are using the NI 9215 meets the following specifications.

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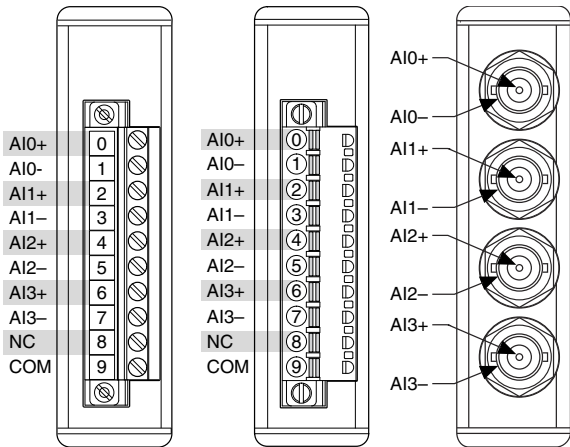
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Indoor use only.



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

# NI 9215 Pinout



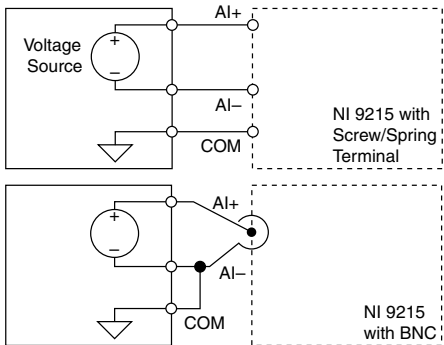


**Table 1.** Signal Descriptions

<b>Signal</b>	<b>Description</b>
AI+	Positive analog input signal connection
AI-	Negative analog input signal connection
COM	Common reference connection to isolated ground
NC	No connection

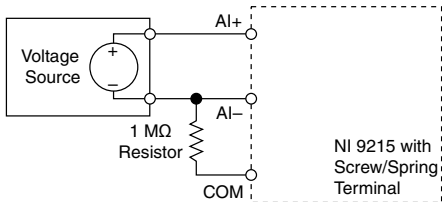
# Grounded Differential Connections

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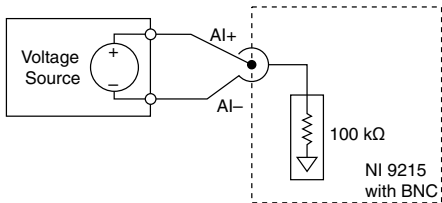


## Floating Differential Connections

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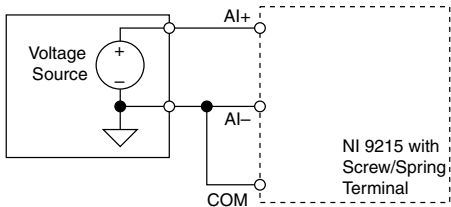
- Connect the negative lead to COM through a 1 MΩ resistor to keep the signal source within the common-mode voltage range.
- The NI 9215 with screw terminal and the NI 9215 with spring terminal does not read data accurately if the signal source is outside of the common-mode voltage range.



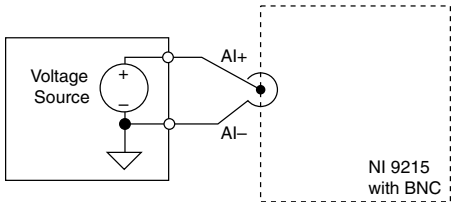
The NI 9215 with BNC has internal circuitry that maintains the common mode voltage range.

# Single-Ended Connections

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Connect the ground signal to COM to keep the signal source within the common-mode voltage range.



The NI 9215 with BNC has internal circuitry that maintains the common mode voltage range.

## Connection Guidelines

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- Make sure that devices you connect to the NI 9215 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 9215 with screw terminal or NI 9215 with spring terminal.

## 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 9215 with screw terminal or the NI 9215 with spring terminal:

- Use ferrules to terminate wires to the detachable connector.
- Use the NI 9927 backshell kit with the NI 9215 with screw terminal or the NI 9981 backshell kit with the NI 9215 with spring terminal.

## Overvoltage Protection

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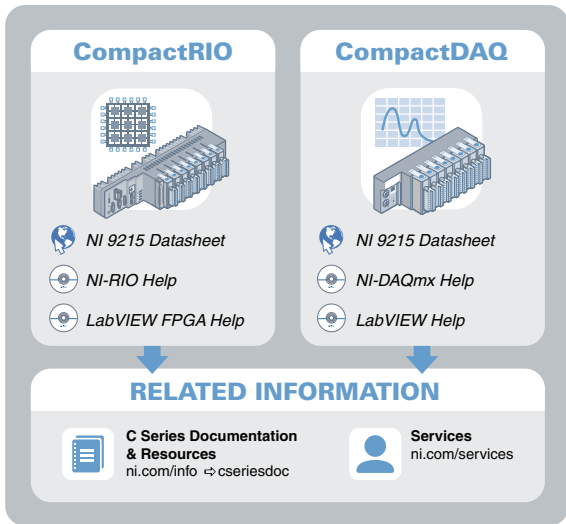
The NI 9215 provides overvoltage protection for each channel.



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

# Where to Go Next

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Located at [ni.com/manuals](http://ni.com/manuals)



Installs with the software



## Product Certifications and Declarations

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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](https://ni.com/product-certifications), search by model number, and click the appropriate link.

## Worldwide Support and Services

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The NI website is your complete resource for technical support. At [ni.com/support](https://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](https://ni.com/services) for information about the services NI offers.

Visit [ni.com/register](https://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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373779H-01      June 9, 2019