
NI-9219 Getting Started

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Overview

This document explains how to connect to the NI-9219.



Note Before you begin, read the **NI-9219 Safety, Environmental, and Regulatory Information** document on ni.com/manuals and complete the software and hardware installation procedures in your chassis documentation.



Note The guidelines in this document are specific to the NI-9219. 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



Caution Observe all instructions and cautions in the user documentation. Using the product in a manner not specified can damage the product and compromise the built-in safety protection.



Attention Suivez toutes les instructions et respectez toutes les mises en garde de la documentation d'utilisation. L'utilisation du produit de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée.

Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the product, take the following precautions. A hazardous voltage is a voltage greater than:

- 30 V RMS, 42.4 V peak, or 60 V DC in DRY LOCATIONS
- 16 V RMS, 22.6 V peak, or 35 V DC in WET LOCATIONS



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



Attention S'assurer que le câblage à tension dangereuse est effectué par du personnel qualifié respectant les normes électriques locales.



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



Attention Ne pas combiner des circuits avec des tensions dangereuses et des circuits accessibles aux personnes sur le même produit.



Caution When product terminals are hazardous voltage LIVE, you must ensure that devices and circuits connected to the product are properly insulated from human contact.



Attention Lorsqu'une haute tension dangereuse est appliquée aux bornes du produit, vous devez vous assurer que les appareils et les circuits auxquels il est connecté sont correctement isolés de tout contact humain.



Caution You must use the connector backshell kit to ensure that the terminals are not accessible.

NI-9219 Safety Voltages (Black Connector)

Connect only voltages that are within the following limits.

Channel-to-channel

Continuous	250 V AC, Measurement Category II
Withstand	1,390 V AC, verified by a 5 s dielectric withstand test

Channel-to-earth ground

Continuous	250 V AC, Measurement Category II
Withstand	2,300 V AC, verified by a 5 s dielectric withstand test

Zone 2 hazardous locations applications in Europe

Channel-to-channel and channel-to-earth ground	60 V DC, Measurement Category I
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Safety Guidelines for Hazardous Locations

The NI-9219 is suitable for use in hazardous locations; , and hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI-9219 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, or Zone 2.



Caution The system must be installed in an enclosure certified for the intended hazardous (classified) location, having a tool secured cover/door, where a minimum protection of at least IP54 is provided.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI-9219 has been evaluated as equipment under DEMKO ATEX and is IECEx certified. Each NI-9219 is marked and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of $-40\text{ °C} \leq T_a \leq 70\text{ °C}$. If you are using the NI-9219 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 Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value of 85 V at the supply terminals to the equipment.



Caution The system shall only be used in an area of not more than Pollution Degree 2, as defined in IEC/EN 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 approved for marine (shipboard) applications. To verify marine approval certification for a product, visit 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 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-9219 meets the following specifications.

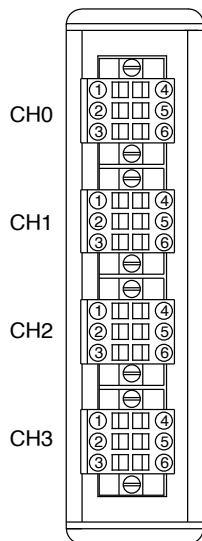
Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m

Indoor use only.



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

NI 9219 Pinout



Mode	Pin					
	1	2	3	4	5	6
Voltage	T+	T-	—	HI	LO	—
Current	T+	T-	HI	—	LO	—
4-Wire Resistance	T+	T-	EX+	HI	EX-	LO
2-Wire Resistance	T+	T-	HI	—	LO	—
Thermocouple	T+	T-	—	HI	LO	—
4-Wire RTD	T+	T-	EX+	HI	EX-	LO
3-Wire RTD	T+	T-	EX+	—	EX-	LO
Quarter-Bridge	T+	T-	HI	—	LO	—
Half-Bridge	T+	T-	EX+	HI	EX-	—
Full-Bridge	T+	T-	EX+	HI	EX-	LO
DI	T+	T-	—	HI	LO	—
Open Contact	T+	T-	HI	—	LO	—

Table 1. Signals by Mode

Signal	Description
EX+	Positive sensor excitation connection

Signal	Description
EX-	Negative sensor excitation connection
HI	Positive input signal connection
LO	Negative input signal connection
T+	TEDS data connection
T-	TEDS COM connection

Table 2. Signal Descriptions

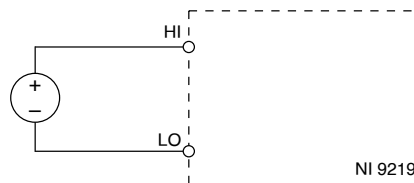
Measurement Types

The NI-9219 provides modes for the following measurement types.

- Voltage
- Current
- 4-Wire Resistance
- 2-Wire Resistance
- Thermocouple
- 4-Wire RTD
- 3-Wire RTD
- Quarter-Bridge
- Half-Bridge
- Full-Bridge
- Digital In^[1]
- Open Contact^[1]

¹ Only supported in CompactRIO systems.

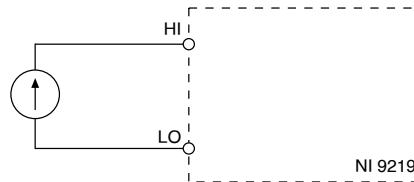
Voltage Connections



Related reference

- [Voltage Pinout](#)

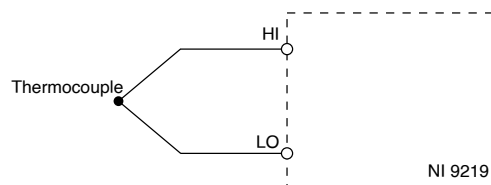
Current Connections



Related reference

- [Current Pinout](#)

Thermocouple Connections



Changes in the ambient air temperature near the front connector or a thermocouple wire conducting heat directly to terminal junctions can cause thermal gradients. Observe the following guidelines to minimize thermal gradients and improve the system accuracy.

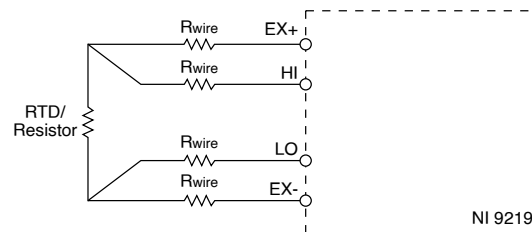
- Use small-gauge thermocouple wire. Smaller wire transfers less heat to or from the terminal junction.
- Avoid running thermocouple wires near hot or cold objects.
- Minimize adjacent heat sources and air flow across the terminals.
- Keep the ambient temperature as stable as possible.
- Make sure the NI-9219 terminals are facing forward or upward.
- Keep the NI-9219 in a stable and consistent orientation.

- Allow the thermal gradients to settle after a change in system power or in ambient temperature. A change in system power can happen when the system powers on, the system comes out of sleep mode, or you insert/remove modules.

Related reference

- [Thermocouple Pinout](#)

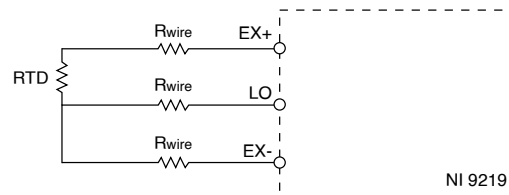
4-Wire Resistance and 4-Wire RTD Connections



Related reference

- [4-Wire Resistance and 4-Wire RTD Pinout](#)

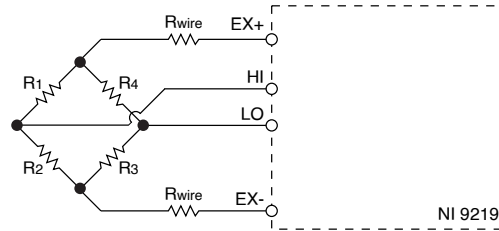
3-Wire RTD Connections



Related reference

- [3-Wire RTD Pinout](#)

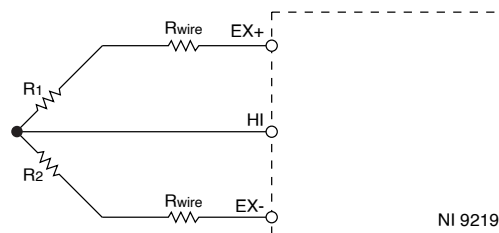
Full-Bridge Connections



Related reference

- [Full-Bridge Pinout](#)

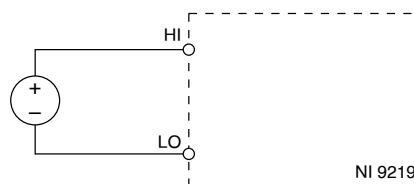
Half-Bridge Connections



Related reference

- [Half-Bridge Pinout](#)

Digital In Connections



The digital in measurement type is only supported in CompactRIO systems.

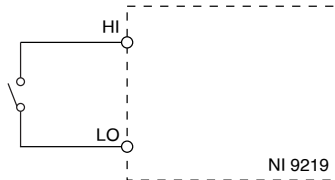


Tip Visit ni.com/info and enter the Info Code 9219cdaq for information about implementing the digital in measurement type in CompactDAQ systems.

Related reference

- [Digital In Pinout](#)

Open Contact Connections



The open contact measurement type is only supported in CompactRIO systems.

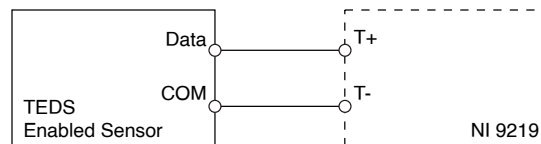


Tip Visit ni.com/info and enter the Info Code 9219cdaq for information about implementing the open contact measurement type in CompactDAQ systems.

Related reference

- [Open Contact Pinout](#)

TEDS Connections

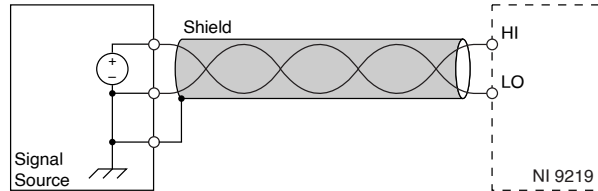


For more information about TEDS, visit ni.com/info and enter the Info Code rdteds.

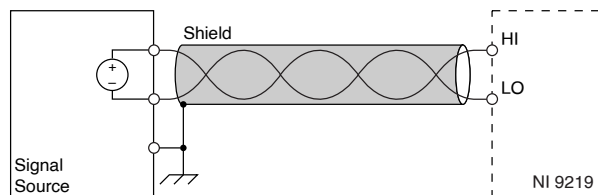
NI-9219 Connection Guidelines

- Make sure that devices you connect to the NI-9219 are compatible with the module specifications.
- Use shielded cables and twisted pair wiring for the best signal quality.

- NI recommends using the backshell for all connections to the NI-9219.
- You can connect ground-referenced signal sources to the NI-9219. The following figure illustrates a grounded connection for a voltage source.



- You can connect floating signal sources to the NI-9219. Ensure that the voltages on the HI and LO connections are within the channel-to-earth working voltage range. The following figure illustrates a floating connection for a voltage source.



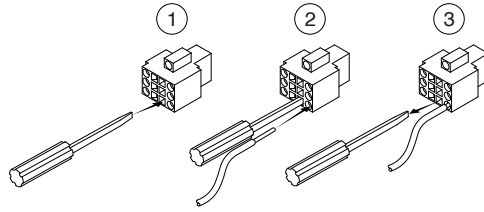
Connecting to a Spring-Terminal Connector

What to Use

- NI-9219 spring-terminal connector
- copper conductor wire with of insulation stripped from the end
- Flathead screwdriver with a 2.3 mm x 1.0 mm (0.09 in. x 0.04 in.) blade, included with the NI-9219

What to Do

Complete the following steps to connect wires to the spring-terminal connector.



1. Insert the screwdriver into a spring clamp activation slot to open the corresponding connector terminal.
2. Press a wire into the open connector terminal.
3. Remove the screwdriver from the activation slot to clamp the wire into place.

High-Vibration Application Connections

If your application is subject to high vibration, NI recommends that you use the backshell kit to protect connections to the NI-9219.

Excitation Protection

The NI-9219 protects the excitation circuit from overcurrent and overvoltage fault conditions. The NI-9219 automatically disables the circuit in the event of a fault condition. Whenever possible, channels automatically recover after the fault is removed.

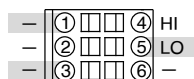


Note Refer to the device datasheet on ni.com/manuals for more information about excitation protection.

Measurement Type Pinout

The following sections include pinouts for the NI-9219 measurement types.

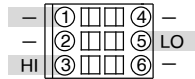
Voltage Pinout



Related reference

- [Voltage Connections](#)

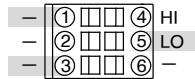
Current Pinout



Related reference

- [Current Connections](#)

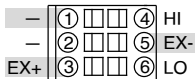
Thermocouple Pinout



Related reference

- [Thermocouple Connections](#)

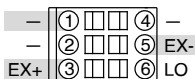
4-Wire Resistance and 4-Wire RTD Pinout



Related reference

- [4-Wire Resistance and 4-Wire RTD Connections](#)

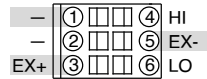
3-Wire RTD Pinout



Related reference

- [3-Wire RTD Connections](#)

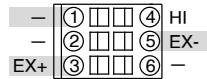
Full-Bridge Pinout



Related reference

- [Full-Bridge Connections](#)

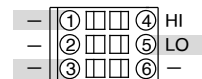
Half-Bridge Pinout



Related reference

- [Half-Bridge Connections](#)

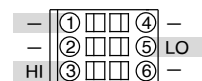
Digital In Pinout



Related reference

- [Digital In Connections](#)

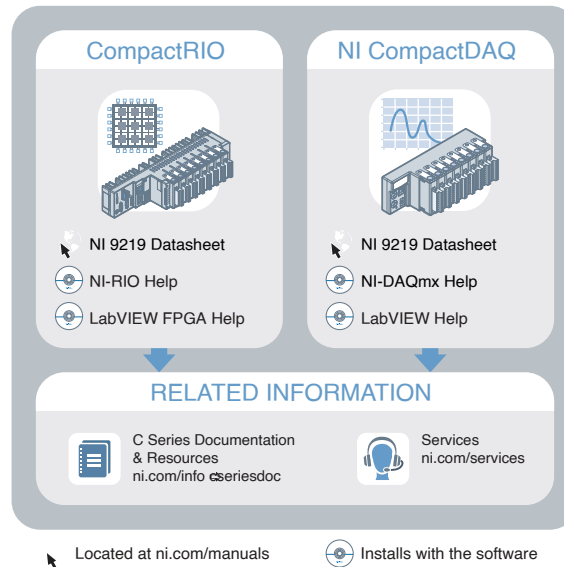
Open Contact Pinout



Related reference

- Open Contact Connections

Where to Go Next



NI Services

Visit ni.com/support to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit ni.com/services to learn about NI service offerings such as calibration options, repair, and replacement.

Visit 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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