
NI-9244 Getting Started

2022-07-06



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Overview

This document explains how to connect to the NI-9244.



Note Before you begin, read the **NI-9244 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-9244. 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 Voltages

Connect only voltages that are within the following limits.

Maximum working voltage, channel-to-earth ground

Up to 2,000 m altitude

Continuous	400 Vrms, Measurement Category III
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Up to 5,000 m altitude

Continuous	400 Vrms, Measurement Category II or 300 Vrms, Measurement Category III
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Division 2 and Zone 2 hazardous locations applications

Channel-to-earth ground	300 Vrms, Measurement Category III
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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 NI 9969 connector backshell kit to ensure that the terminals are not accessible.

Safety Guidelines for Hazardous Locations

The NI-9244 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 Gc and Ex nA IIC T4 Gc hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI-9244 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-9244 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 12ATEX 1202658X and is IECEx UL 14.0089X certified. Each NI-9244 is marked Ⓢ II 3G 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-9244 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 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-9244 meets the following specifications.

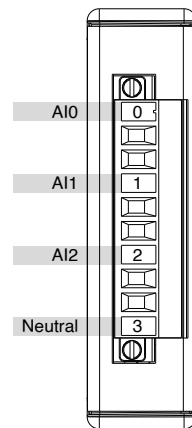
Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Operating humidity (IEC 60068-2-30)	10% RH to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude	5,000 m

Indoor use only.



Note Refer to the **NI-9244 Specifications** on ni.com/manuals for complete specifications.

NI 9244 Pinout



Signal	Description
AI	Analog input signal connection referenced to the Neutral signal
Neutral	Referenced, single-ended analog input connection

Table 1. Signal Descriptions

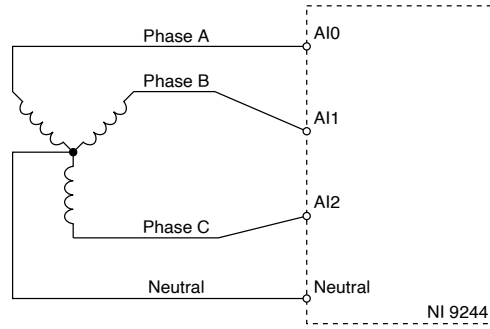
Connecting Phase Measurements

The NI-9244 accepts three-phase and single-phase measurement configuration.

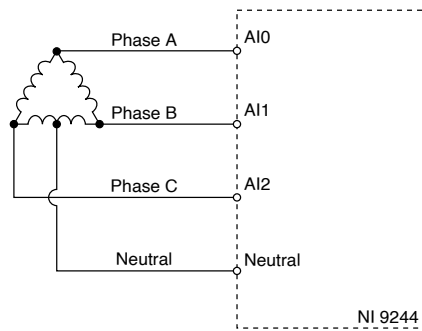
Three-Phase Measurement Configurations

NI recommends the following three-phase connection types.

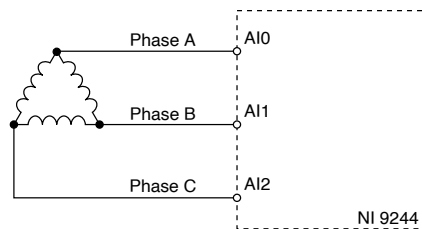
4-Wire WYE Measurement Configuration



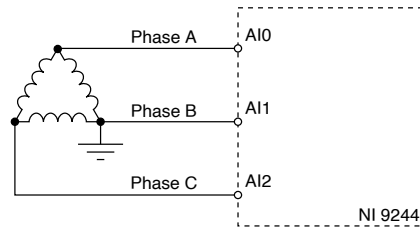
High-Leg Delta Measurement Configuration



3-Wire Delta Measurement Configuration



Corner Grounded 2-Wire Delta Measurement Configuration

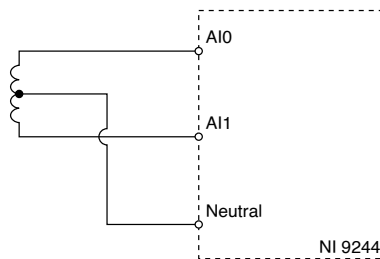


The 9244 cannot measure the entire tolerance range or high crest factor signals on 690 Vrms systems in this configuration.

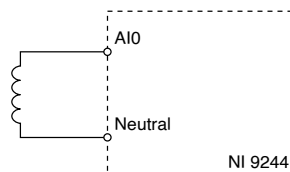
Connecting Single-Phase Measurement Configurations

NI recommends the following single-phase connection types.

3-Wire Measurement (Split Phase) Configuration



2-Wire Measurement



Connection Guidelines

- You must use 2-wire ferrules to create a secure connection when connecting more than one wire to a single terminal on the NI-9244.

- Make sure that devices you connect to the NI-9244 are compatible with the module specifications.

To ensure that measurements to chassis ground are correct, NI recommends connecting the chassis to earth ground using the chassis grounding screw. Refer to your chassis manual for information about connecting the chassis to earth ground.

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-9244:

- Use ferrules to terminate wires to the detachable connector.
- Use the NI 9969 connector backshell kit.

Wiring the NI 9969



Caution For safe operation with hazardous voltages, you must use the NI 9969 Connector Backshell with the 4-terminal connector on the NI-9244.

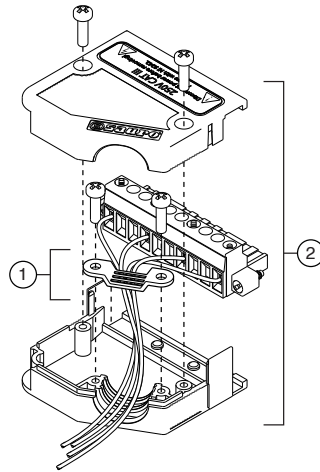
Complete the appropriate procedure for each wire gauge.

Installing the NI 9969 Using 12 AWG to 14 AWG Wire

What to Use

- NI 9969 backshell
- 12 AWG to 14 AWG wire
- Smallest strain-relief piece
- Screwdriver

What to Do



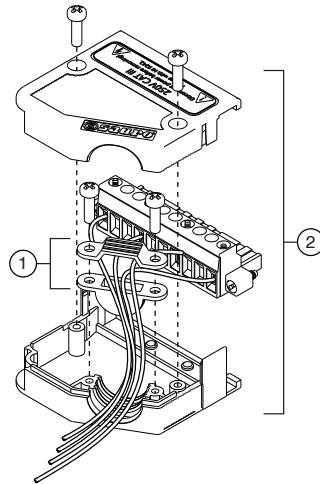
1. Route wires under the smallest strain-relief piece.
2. Secure the smallest strain-relief piece and the backshell in place using captive screws.

Installing the NI 9969 Using 16 AWG Wire

What to Use

- NI 9969 backshell
- 16 AWG wire
- Small and large strain-relief pieces
- Screwdriver

What to Do



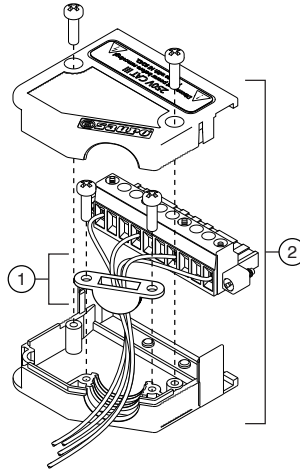
1. Route wires between the two strain-relief pieces, with the small strain-relief piece on top of the wires and the large strain-relief piece underneath the wires.
2. Secure the strain-relief pieces and the backshell in place using captive screws.

Installing the NI 9969 Using 18 AWG to 24 AWG Wire

What to Use

- NI 9969 backshell
- 18 AWG to 24 AWG wire
- Largest strain-relief piece
- Screwdriver

What to Do



1. Route wires under the largest strain-relief piece.
2. Secure the largest strain-relief piece and the backshell in place using captive screws.

Converting L-N Measurements to L-Earth

To convert L-N measurements to L-Earth values, add the neutral channel reading to each AI channel reading.

Refer to the following equation for an example of converting L-N measurements to L-Earth.

$$\text{Line to Earth} = \text{AI}_x + \text{Neutral}$$

where

- AI_x is the analog input channel reading
- Neutral is the Neutral channel reading

Converting L-N Measurements to L-L

To convert L-N measurements to L-L values, calculate the voltage difference between the AI channels using your application software.

Refer to the following equation for an example of converting L-N measurements to L-L.

$$\text{Phase A to Phase B Voltage} = \text{AI}_0 - \text{AI}_1$$

where

- AI0 is the reading from Phase A
- AI1 is the reading from Phase B

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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