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# NI-9218 Getting Started

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2022-07-06



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## Overview

This document explains how to connect to the NI-9218. In this document, the NI-9218 with LEMO and the NI-9218 with DSUB are referred to inclusively as the NI-9218.



**Note** Before you begin, read the **NI-9218 Safety, Environmental, and Regulatory Information** document on [ni.com/manuals](https://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-9218. 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.

## NI-9218 with LEMO Safety Voltages

Connect only voltages that are within the following limits:

|   |       |
|---|-------|
| Maximum voltage, from any pin to any pin on a single connector <sup>[1]</sup> | ±30 V |
|---|-------|

**Isolation****Channel-to-channel, channel-to-Vsup, channel-to-earth, Vsup-to-earth (up to 5,000 m)<sup>[2]</sup>**

|            |   |
|------------|---|
| Continuous | 60 VDC, Measurement Category I                          |
| Withstand  | 1,000 Vrms, verified by a 5 s dielectric withstand test |



**Caution** Any excitation output voltage to earth ground must remain below 60 VDC for each channel. To determine excitation output voltage to earth ground for a channel, add the maximum excitation voltage to the maximum potential on pin 3. The maximum excitation voltages are 2 V +3% and 3.3 V +3% for the bridge excitations, 12 V +5% for the +12 V excitation, and 22 V for the IEPE excitation.

<sup>1</sup> The maximum voltage between pin 2 and pin 3 on a single connector is -20 V to +30 V.

<sup>2</sup> Must use crimp contact LEMO plug (784162-01) to maintain these ratings. Ratings are invalidated if solder version is used.

## NI-9218 with DSUB Safety Voltages

Connect only voltages that are within the following limits:

|   |   |
|---|---|
| Maximum voltage, from any pin to any pin on a single connector <sup>[1]</sup> | ±30 V   |
| <b>Isolation</b>  |   |
| <b>Channel-to-channel, channel-to-Vsup inputs (up to 5,000 m)</b>             |   |
| Continuous  | 60 VDC, Measurement Category I                          |
| Withstand   | 1,000 Vrms, verified by a 5 s dielectric withstand test |
| <b>Channel-to-earth ground (up to 3,000 m)</b>                                |   |
| Continuous  | 60 VDC, Measurement Category I                          |
| Withstand   | 1,000 Vrms, verified by a 5 s dielectric withstand test |

**Channel-to-earth ground (up to 5,000 m)**

|            |                                |
|------------|--------------------------------|
| Continuous | 60 VDC, Measurement Category I |
|------------|--------------------------------|

|           |          |
|-----------|----------|
| Withstand | 860 Vrms |
|-----------|----------|

**Vsup inputs-to-earth ground (up to 5,000 m)**

|            |                                |
|------------|--------------------------------|
| Continuous | 60 VDC, Measurement Category I |
|------------|--------------------------------|

|           |   |
|-----------|---|
| Withstand | 1,000 Vrms, verified by a 5 s dielectric withstand test |
|-----------|---|



**Caution** Any excitation output voltage to earth ground must remain below 60 VDC for each channel. To determine excitation output voltage to earth ground for a channel, add the maximum excitation voltage to the maximum potential on pin 3. The maximum excitation voltages are 2 V +3% and 3.3 V +3% for the bridge excitations, 12 V +5% for the +12 V excitation, and 22 V for the IEPE excitation.

<sup>1</sup> The maximum voltage between pin 2 and pin 3 on a single connector is -20 V to +30 V.

## Safety Guidelines for Hazardous Locations

The NI-9218 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-9218 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 9218 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 12ATEX 1202658X and is IECEx UL 14.0089X certified. Each NI 9218 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 9218 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](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 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 9218 meets the following specifications.

|  |                 |
|--|-----------------|
| Operating temperature (IEC 60068-2-1, IEC 60068-2-2) | -40 °C to 70 °C |
|--|-----------------|



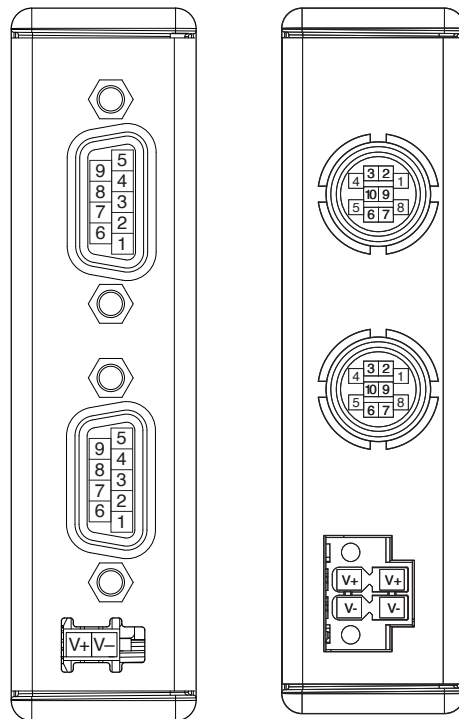
|                                     |                                 |
|-------------------------------------|---------------------------------|
| Operating humidity (IEC 60068-2-30) | 10% RH to 90% RH, noncondensing |
| Pollution Degree                    | 2                               |
| Maximum altitude                    | 5,000 m                         |

Indoor use only.



**Note** Refer to the **NI-9218 Specifications** on [ni.com/manuals](http://ni.com/manuals) for complete specifications.

## NI 9218 Pinout



| Mode        | Pin                |   |                    |     |     |     |                    |    |    |                   |
|-------------|--------------------|---|--------------------|-----|-----|-----|--------------------|----|----|-------------------|
|             | 1                  | 2 | 3                  | 4   | 5   | 6   | 7                  | 8  | 9  | 10 <sup>[1]</sup> |
| ±16 V       | EX+                | — | AI-, EX-           | —   | —   | AI+ | —                  | —  | —  | —                 |
| ±65 mV      | EX+ <sup>[2]</sup> | — | EX- <sup>[2]</sup> | —   | —   | AI+ | AI- <sup>[3]</sup> | —  | —  | —                 |
| Full-Bridge | EX+ <sup>[2]</sup> | — | EX- <sup>[2]</sup> | RS+ | RS- | AI+ | AI-                | SC | SC | —                 |

| Mode | Pin |                   |     |   |   |   |   |   |   |                   |
|------|-----|-------------------|-----|---|---|---|---|---|---|-------------------|
|      | 1   | 2                 | 3   | 4 | 5 | 6 | 7 | 8 | 9 | 10 <sup>[1]</sup> |
| IEPE | —   | AI+               | AI- | — | — | — | — | — | — | —                 |
| TEDS | —   | T+ <sup>[4]</sup> | T-  | — | — | — | — | — | — | T+ <sup>[5]</sup> |

Table 1. Signals by Measurement Type

| Signal | Description                             |
|--------|---|
| AI+    | Positive analog input signal connection |
| AI-    | Negative analog input signal connection |
| EX+    | Positive sensor excitation connection   |
| EX-    | Negative sensor excitation connection   |
| RS+    | Positive remote sensing connection      |
| RS-    | Negative remote sensing connection      |
| SC     | Shunt calibration connection            |
| T+     | TEDS data connection                    |
| T-     | TEDS return connection                  |

Table 2. Signal Descriptions

<sup>1</sup> NI-9218 with LEMO only.

<sup>2</sup> Optional sensor excitation.

<sup>3</sup> Tie to pin 3.

<sup>4</sup> TEDS Class 1 data connection.

<sup>5</sup> TEDS Class 2 data connection.

## Measurement Types

The NI-9218 provides built-in support for the following measurement types.

- ±16 V
- ±65 mV
- Full-Bridge
- IEPE

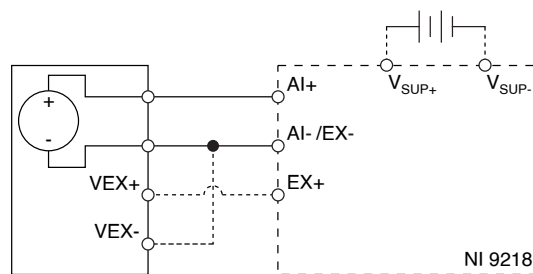


Tip NI recommends using the NI-9982 screw-terminal adapter when using built-in measurement types on the NI-9218.

The NI-9218 provides additional support for the following measurement types when using a measurement-specific adapter.

- $\pm 20$  mA, requires the NI-9983
- $\pm 60$  V, requires the NI-9987
- Half-Bridge, requires the NI-9986
- Quarter-Bridge, requires the NI-9984 ( $120\ \Omega$ ) or NI-9985 ( $350\ \Omega$ )

## $\pm 16$ V Connections

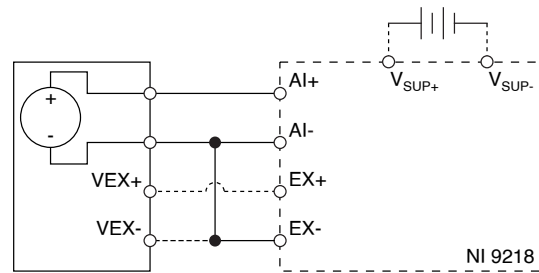


The NI 9218 provides optional 12 V sensor excitation. To use the 12 V excitation, connect a 9 VDC to 30 VDC power supply to  $V_{SUP}$ , connect the excitation terminals on your sensor to EX+/EX-, and enable 12 V excitation in your software.

### Related reference

- [NI 9982  \$\pm 16\$  V Connection Pinout](#)

## $\pm 65$ mV Connections

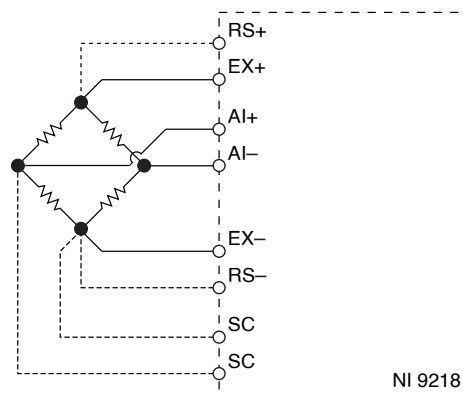


- You must connect AI- to EX- on the NI 9218.
- The NI 9218 provides optional 12 V sensor excitation. To use the 12 V excitation, connect a 9 VDC to 30 VDC power supply to V<sub>sup</sub>, connect the excitation terminals on your sensor to EX+/EX-, and enable 12 V excitation in your software.

#### Related reference

- [NI 9982 ±65 mV Connection Pinout](#)

#### Full-Bridge Connections

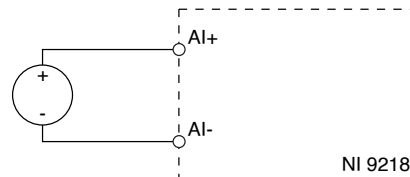


- The NI 9218 provides 2 V excitation to loads  $\geq 120 \Omega$  or 3.3 V excitation to loads  $\geq 350 \Omega$ .
- The NI 9218 provides optional connections for remote sensing (RS) and shunt calibration (SC). Remote sensing corrects for errors in excitation leads and shunt calibration corrects for errors caused by resistance within one leg of the bridge.

## Related reference

- [NI 9982 Full-Bridge Connection Pinout](#)

## IEPE Connections

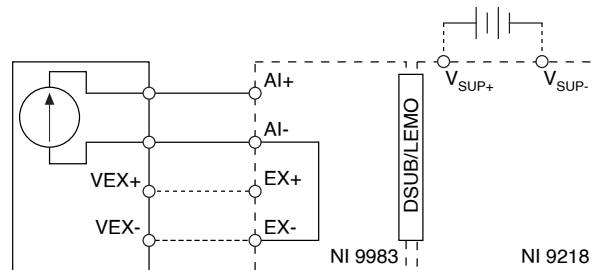


- The NI 9218 provides an excitation current for each channel that powers IEPE sensors.
- AI+ provides DC excitation and AI- provides the excitation return path.

## Related reference

- [NI 9982 IEPE Connection Pinout](#)

## $\pm 20$ mA Connections

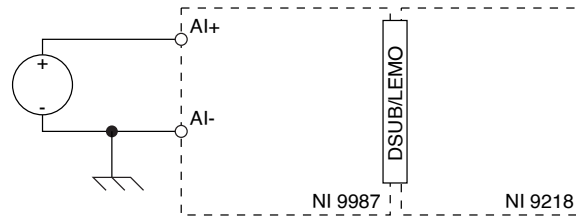


- Connecting  $\pm 20$  mA signals requires the NI 9983.
- The NI 9218 provides optional 12 V sensor excitation. To use the 12 V excitation, connect a 9 VDC to 30 VDC power supply to Vsup, connect the excitation terminals on your sensor to EX+/EX-, and enable 12 V excitation in your software.

## Related reference

- [NI 9983 Pinout](#)

## ±60 V Connections

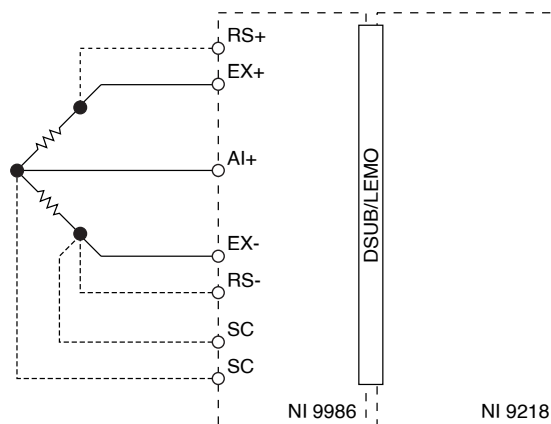


Connecting ±60 V signals requires the NI 9987.

Related reference

- [NI 9987 Pinout](#)

## Half-Bridge Connections

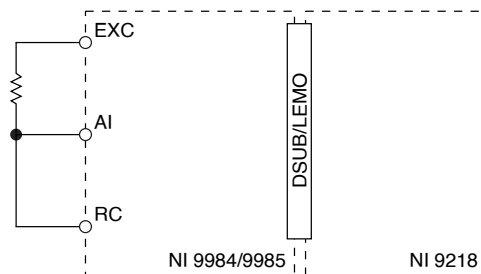


- Connecting half bridges requires the NI 9986.
- The NI 9218 provides 2 V excitation to half bridges of  $\geq 240 \Omega$  total or 3.3 V excitation to half bridges of  $\geq 700 \Omega$  total.
- The NI 9218 provides optional connections for remote sensing (RS) and shunt calibration (SC). Remote sensing corrects for errors in excitation leads and shunt calibration corrects for errors caused by resistance within one leg of the bridge.

## Related reference

- [NI 9986 Pinout](#)

## Quarter-Bridge Connections



- Connecting 120  $\Omega$  quarter bridges requires the NI 9984.
- Connecting 350  $\Omega$  quarter bridges requires the NI 9985.

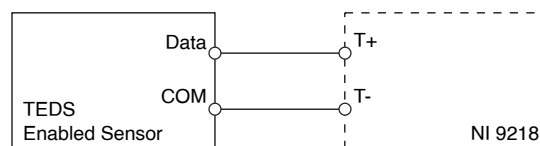


**Tip** NI recommends 2 V excitation when using a NI 9984 with 120  $\Omega$  quarter bridges and 3.3 V excitation when using the NI 9985 with 350  $\Omega$  quarter bridges.

## Related reference

- [NI 9984/9985 Pinout](#)

## TEDS Connections



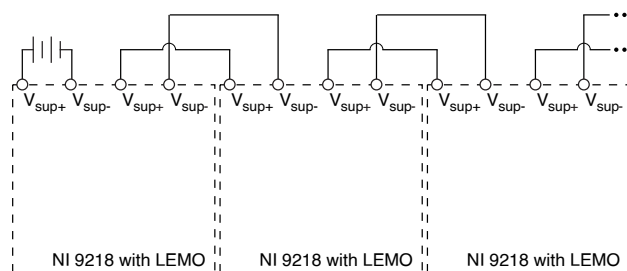
For more information about TEDS, visit [ni.com/info](https://ni.com/info) and enter the Info Code rdteds.

## TEDS Support

TEDS Class 1 sensors provide an interface for transferring information from sensors. The NI 9218 with LEMO, NI 9218 with DSUB, NI 9982L, NI 9982D, NI 9982F support TEDS Class 1 sensors.

TEDS Class 2 sensors provide an interface for transferring information from TEDS enabled sensors. The NI 9218 with LEMO, NI 9982L, NI 9983L, NI 9984L, NI 9985L, and NI 9986L support TEDS Class 2 sensors.

## Vsup Daisy Chain Topology



The NI 9218 with LEMO provides four pins on the Vsup connector for daisy chaining.

## NI 9218 Connection Guidelines

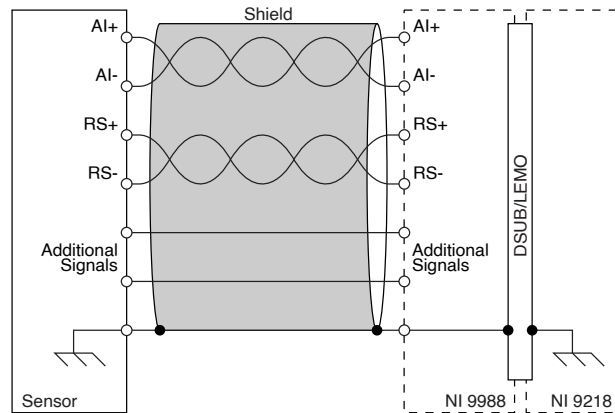
Make sure that devices you connect to the NI-9218 are compatible with the module specifications.

### Custom Cabling Guidelines

Observe the following guidelines when using the NI 9988 solder cup connector adapter or the LEMO crimp connector (784162-01) to create custom cables.

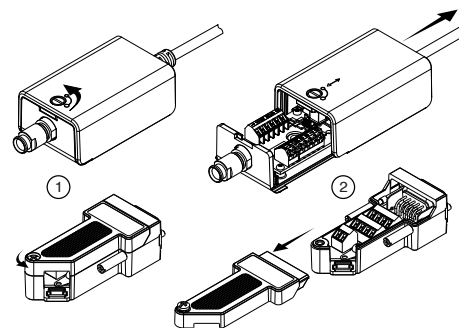
- Use a shielded cable for all signals.
- Connect the cable shield to earth ground.
- Use twisted-pair wiring for the AI+/AI- and RS+/RS- signals to achieve specified EMC performance.





## Opening a Measurement Adapter

### What to Do



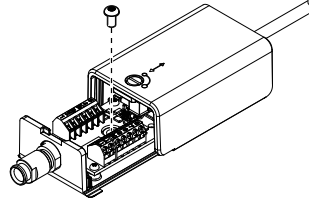
1. Unlock the measurement adapter housing/cover.
2. Slide the measurement adapter housing/cover to access the screw terminals.

## Mounting the NI 998xD/998xL

### What to Use

- NI 998xD or NI 998xL Measurement Adapter
- M4 or Number 8 Screw
- Screwdriver

## What to Do



Mount the measurement adapter to a flat surface using the mounting hole on the measurement adapter and the screw.

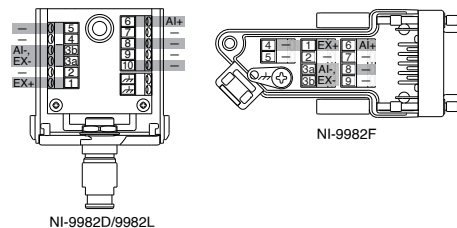
## Measurement Adapter Grounding

The ground terminals on a measurement adapter are connected to chassis ground when the measurement adapter is connected to the NI-9218 and the NI-9218 is installed in a chassis.

## Measurement Adapter Pinouts

The following sections include pinouts for the NI-9218 measurement adapters.

### NI 9982 $\pm 16$ V Connection Pinout

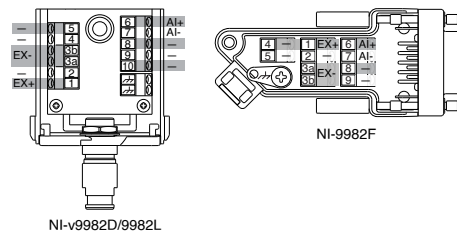


Pins 3a and 3b are tied together on the NI 9982.

### Related reference

- [±16 V Connections](#)

## NI 9982 $\pm 65$ mV Connection Pinout

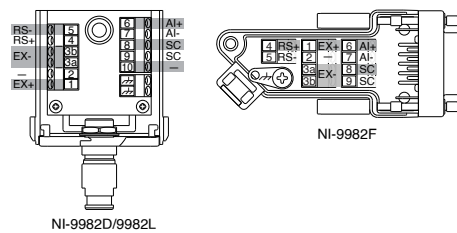


Pins 3a and 3b are tied together on the NI 9982.

Related reference

- [±65 mV Connections](#)

## NI 9982 Full-Bridge Connection Pinout

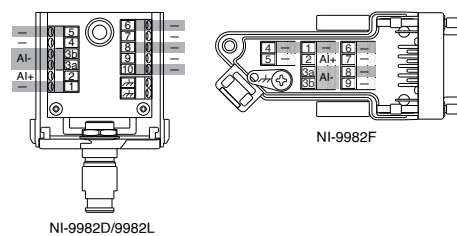


Pins 3a and 3b are tied together on the NI 9982.

Related reference

- [Full-Bridge Connections](#)

## NI 9982 IEPE Connection Pinout

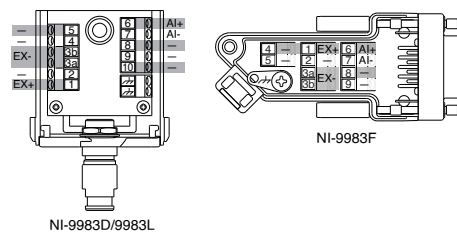


Pins 3a and 3b are tied together on the NI 9982.

Related reference

- [IEPE Connections](#)

NI 9983 Pinout

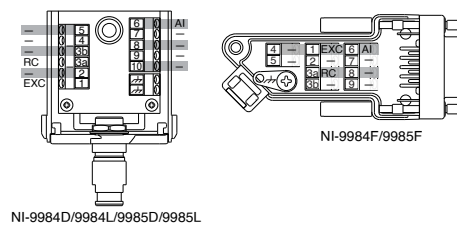


Pins 3a and 3b are tied together on the NI 9983.

Related reference

- [±20 mA Connections](#)

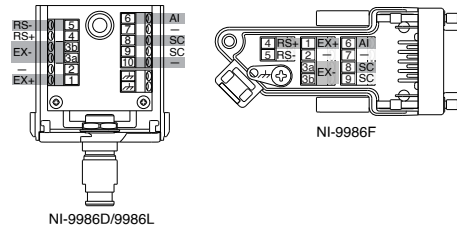
NI 9984/9985 Pinout



Related reference

- [Quarter-Bridge Connections](#)

NI 9986 Pinout

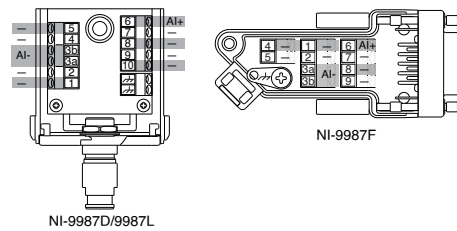


Pins 3a and 3b are tied together on the NI 9986.

Related reference

- [Half-Bridge Connections](#)

NI 9987 Pinout

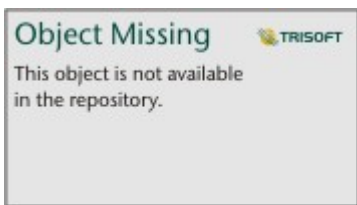


Pins 3a and 3b are tied together on the NI 9987.

Related reference

- [±60 V Connections](#)

Where to Go Next



## NI Services

Visit [ni.com/support](https://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](https://ni.com/services) to learn about NI service offerings such as calibration options, repair, and replacement.

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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