Contents [hide]

National

National Instruments NI-9218 Channel Analogue Input Module

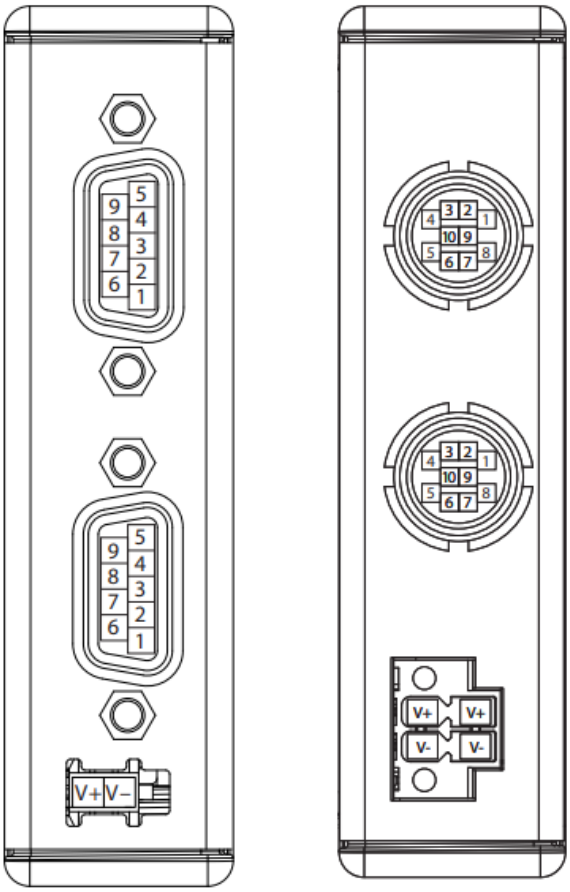
Specifications

- Product Name: NI-9218
- Connector Types: LEMO and DSUB
- Measurement Types: Built-in support for various types
- Sensor Excitation: Optional 12V excitation

Connector Types

The NI-9218 has more than one connector type: NI-9218 with LEMO and NI-9218 with DSUB. Unless the connector type is specified, NI-9218 refers to both connector types.

NI-9218 Pinout



Signals by Measurement Type

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

IEPE	—	AI+	AI-	—	—	—	—	—	—	—
TEDS	—	T+ 4	T-	—	—	—	—	—	—	T+ 5

Signal Descriptions

Signal	Description
AI+	Positive analogue input signal connection
AI-	Negative analogue 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

Measurement Types

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

- ±16 V
- ±65 mV
- Full-Bridge
- IEPE
- NI-9218 with LEMO only.

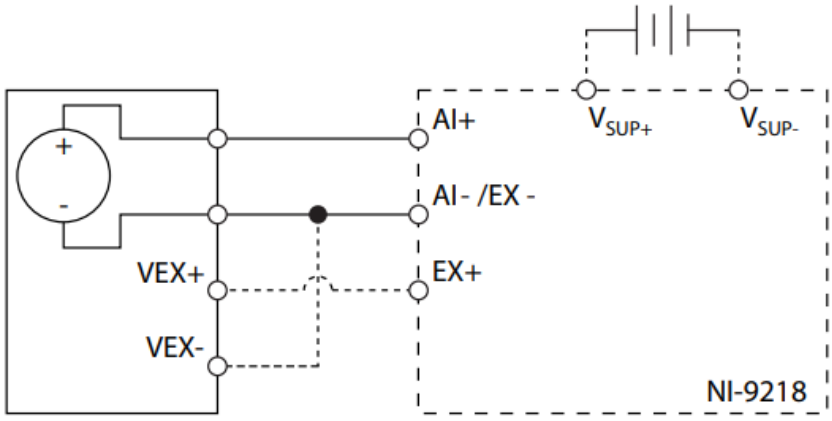
- Optional sensor excitation.
- Tie to pin 3.
- TEDS Class 1 data connection.
- TEDS Class 2 data connection.

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.

- ±20 mA, requires the NI-9983
- ±60 V, requires the NI-9987
- Half-Bridge requires the NI-9986
- Quarter-Bridge requires the NI-9984 (120 Ω) or NI-9985 (350 Ω)

±16 V Connections

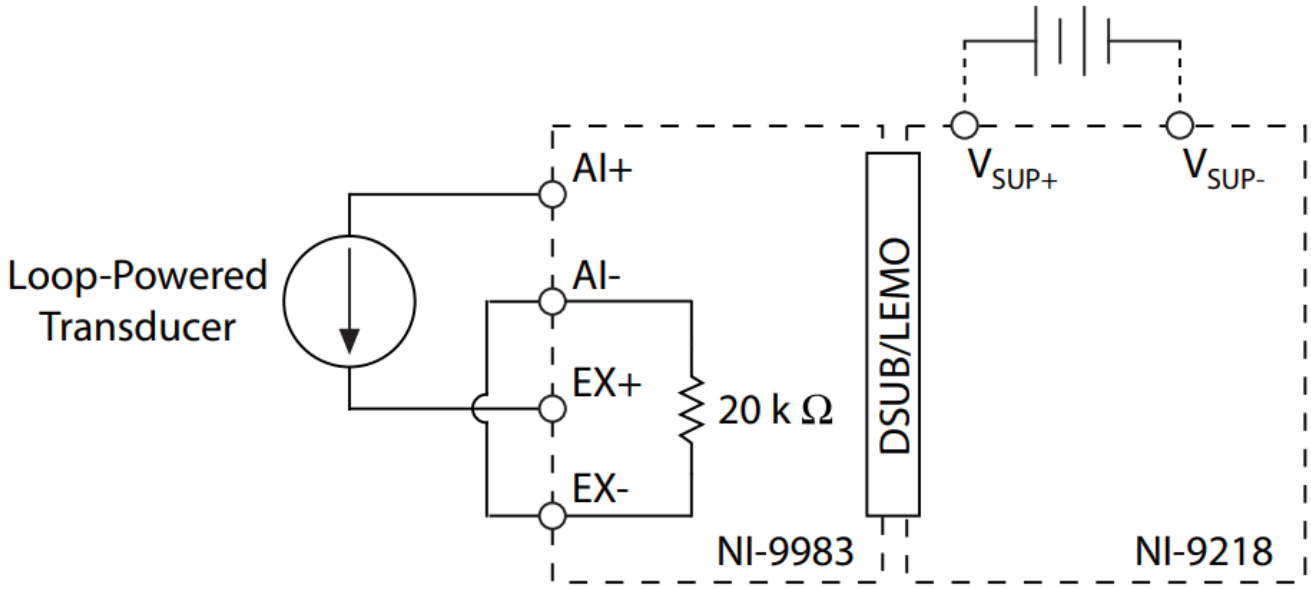


The NI-9218 provides optional 12 V sensor excitation. To use the 12 V excitation, connect a 9 VDC to 30 VDC power supply to Vsup, connect the excitation terminals on your sensor to EX+/EX-, and enable 12 V excitation in your software.

Related reference:

- NI-9982 ±16 V Connection Pinout

±65 mV Connections

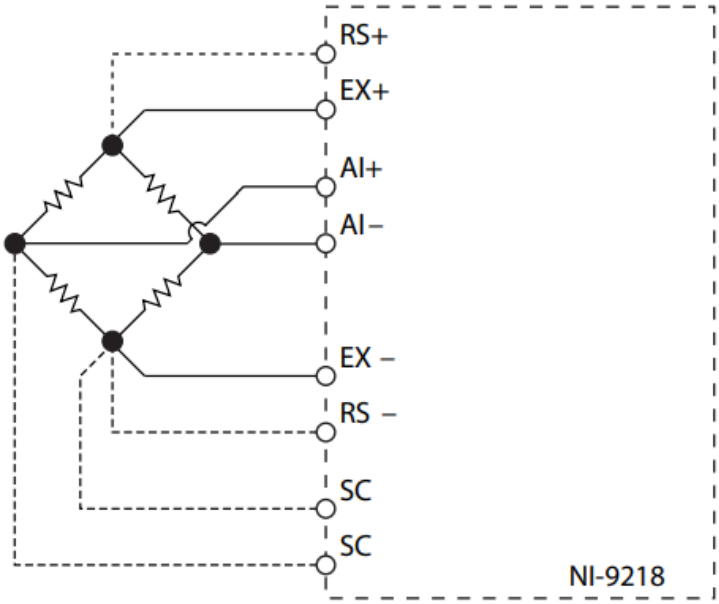


- You must connect AI to EX- on the NI-9218.
- The NI-9218 provides optional 12 V sensor excitation. To use the 12 V excitation, connect a 9 VDC to 30 VDC power supply to Vsup, connect the excitation terminals on your sensor to EX+/EX-, and enable 12 V excitation in your software.

Related reference

- NI-9982 ±65 mV Connection Pinout

Full-Bridge Connections



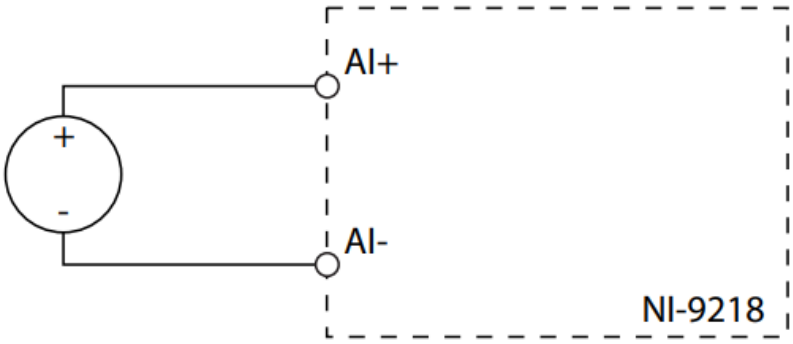
- The NI-9218 provides 2 V excitation to loads ≥120 Ω or 3.3 V excitation to loads ≥350 Ω.
- The NI-9218 provides optional connections for remote sensing (RS) and shunt

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

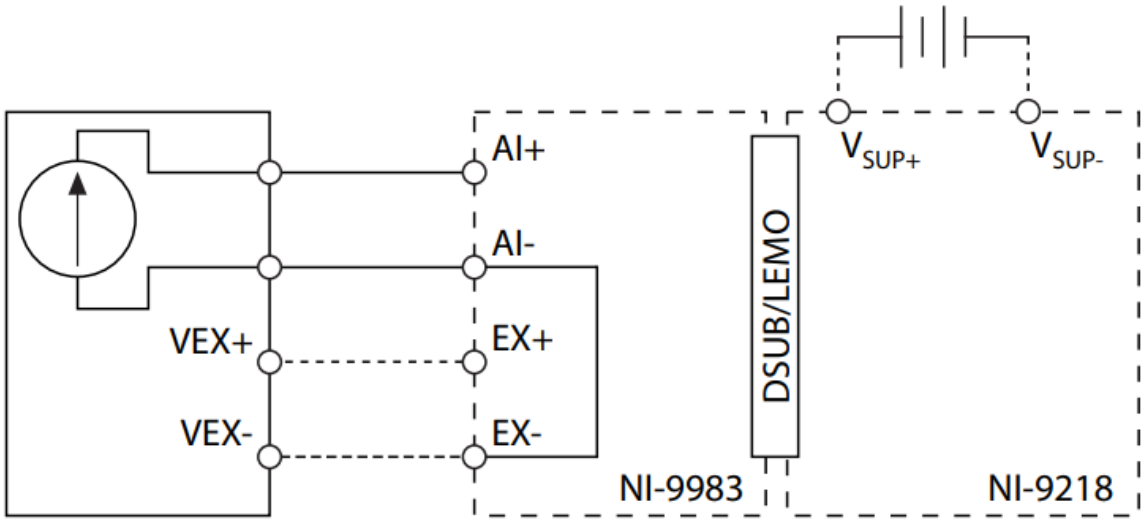


- The NI-9218 provides an excitation current for each channel that powers IEPE sensors.
- AI+ provides DC excitation, and AI- provides the excitation return path.

Related reference:

- NI-9982 IEPE Connection Pinout

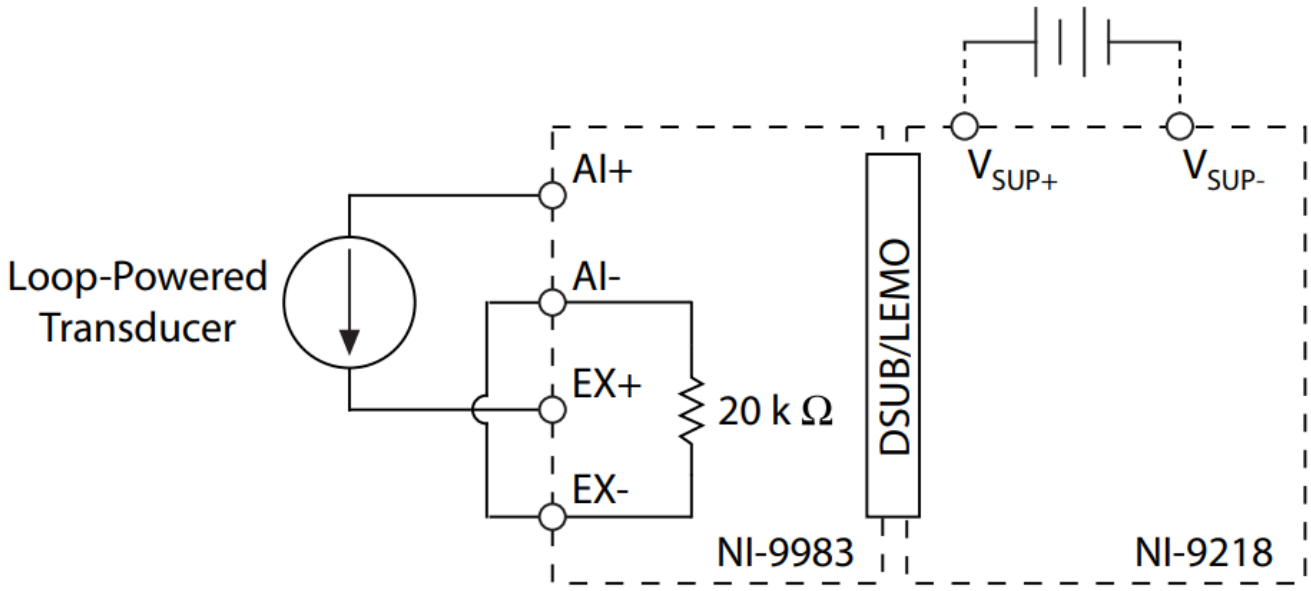
±20 mA Connections



- Connecting ±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.

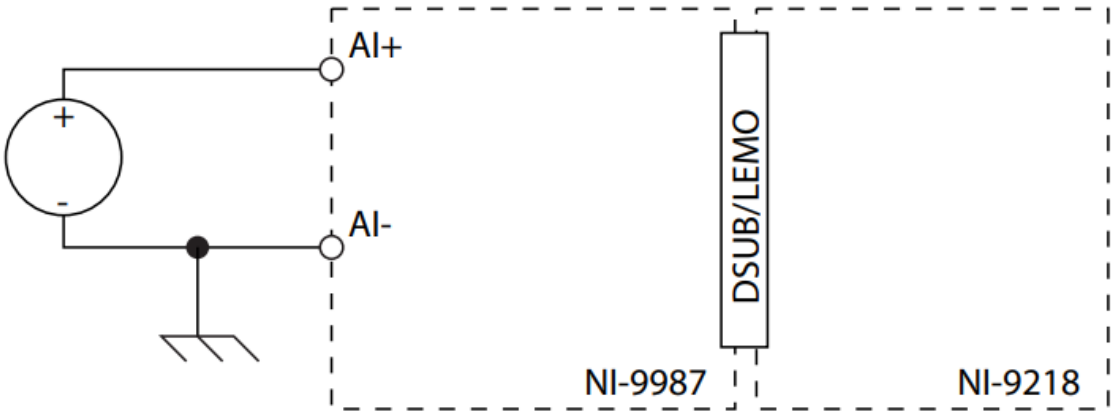
Connecting a loop-powered 2-wire or 3-wire transducer requires adding a 20 kΩ resistor between AI- and Ex-.



Related reference:

- NI-9983 Pinout

±60 V Connections

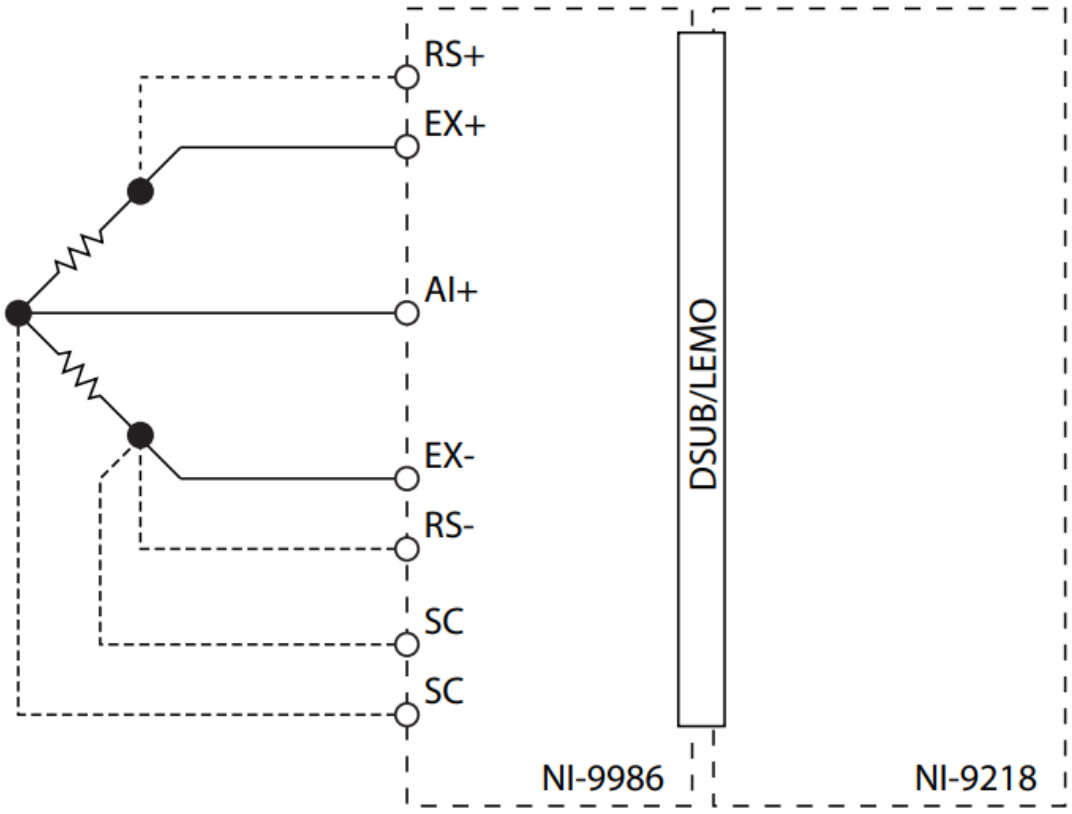


Connecting ±60 V signals requires the NI-9987.

Related reference:

- NI-9987 Pinout

Half-Bridge Connections

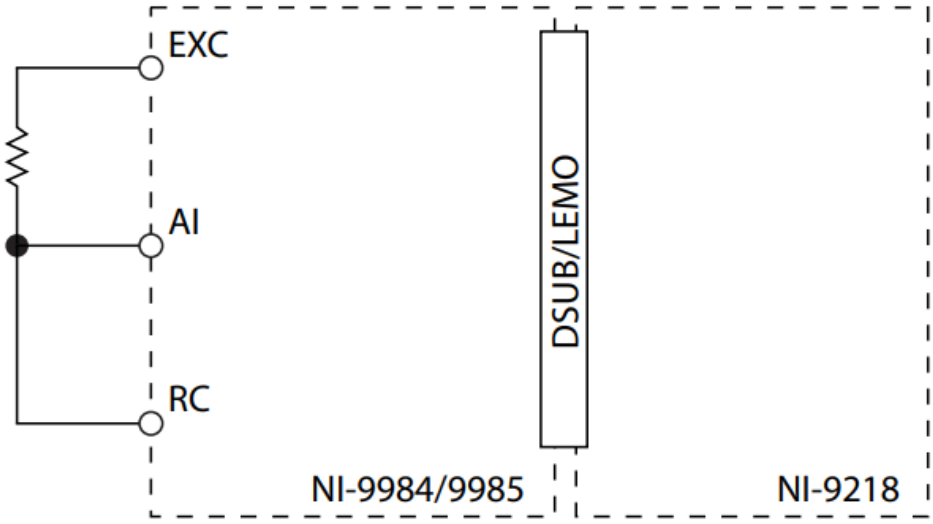


- Connecting half bridges requires the NI-9986.
- The NI-9218 provides 2 V excitation to half bridges of ≥240 Ω total or 3.3 V excitation to half bridges of ≥700 Ω total.
- The NI-9218 provides optional connections for remote sensing (RS) and shunt calibration (SC). Remote sensing corrects for errors 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



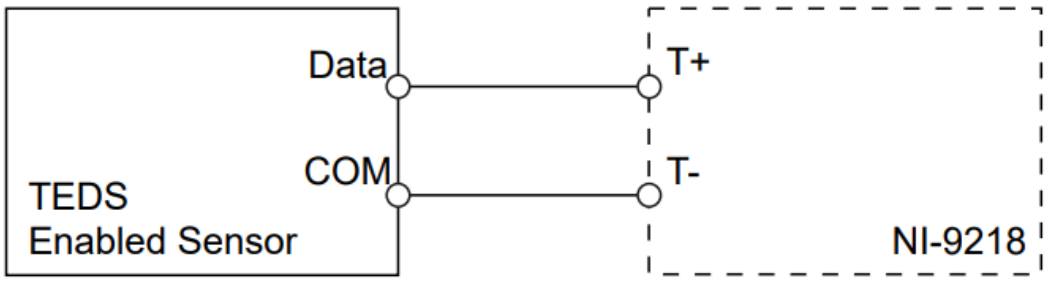
- Connecting 120 Ω quarter bridges requires the NI-9984.
- Connecting 350 Ω quarter bridges requires the NI-9985.

Tip NI-recommends 2 V excitation when using a NI-9984 with 120 Ω quarter bridges and 3.3 V excitation when using the NI-9985 with 350 Ω quarter bridges.

Related reference:

- NI-9984/9985 Pinout

TEDS Connections



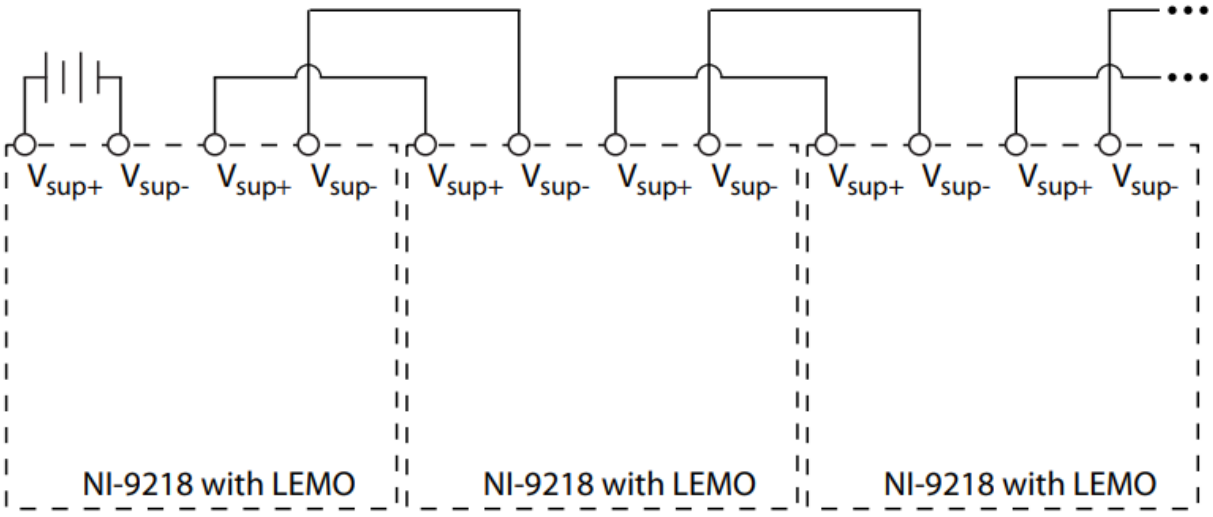
For more information about TEDS, visit ni.com/info and enter the Info Code rdteds.

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



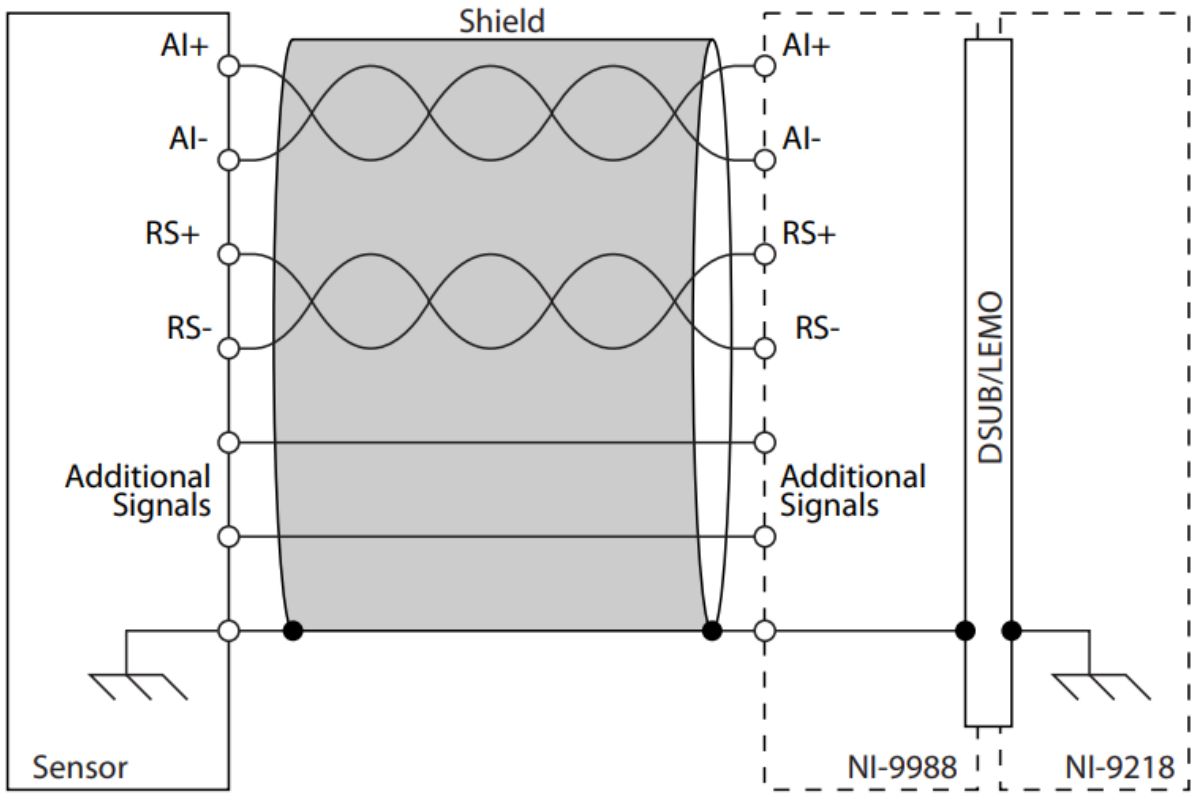
The NI-9218 with LEMO provides four pins on the Vsup connector for daisy chaining.

NI-9218 Connection Guidelines

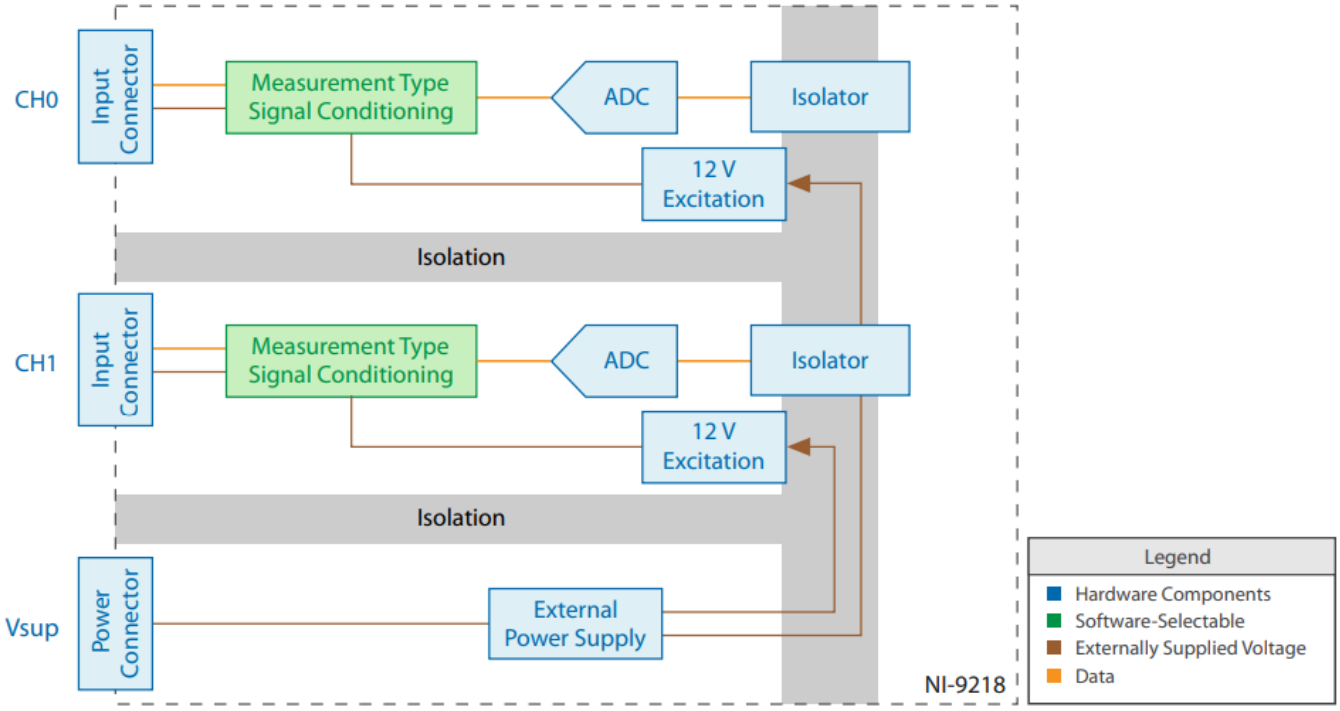
Make sure that the devices you connect to the NI-9218 are compatible with the module specifications.

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 the earth ground.
- Use twisted-pair wiring for the AI+/AI- and RS+/RS- signals to achieve specified EMC performance.



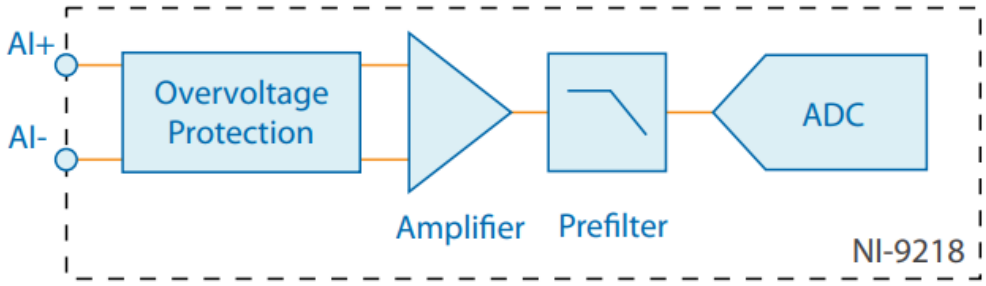
NI-9218 Block Diagram



- Two 24-bit analogue-to-digital converters (ADCs) simultaneously sample both AI channels.
- The NI-9218 provides channel-to-channel isolation.
- The NI-9218 reconfigures the signal conditioning for each measurement type.
- The NI-9218 provides excitation for IEPE and bridge completion measurement types.
- The NI-9218 can provide optional 12 V sensor excitation for ±16 V, ±65 mV, and ±20

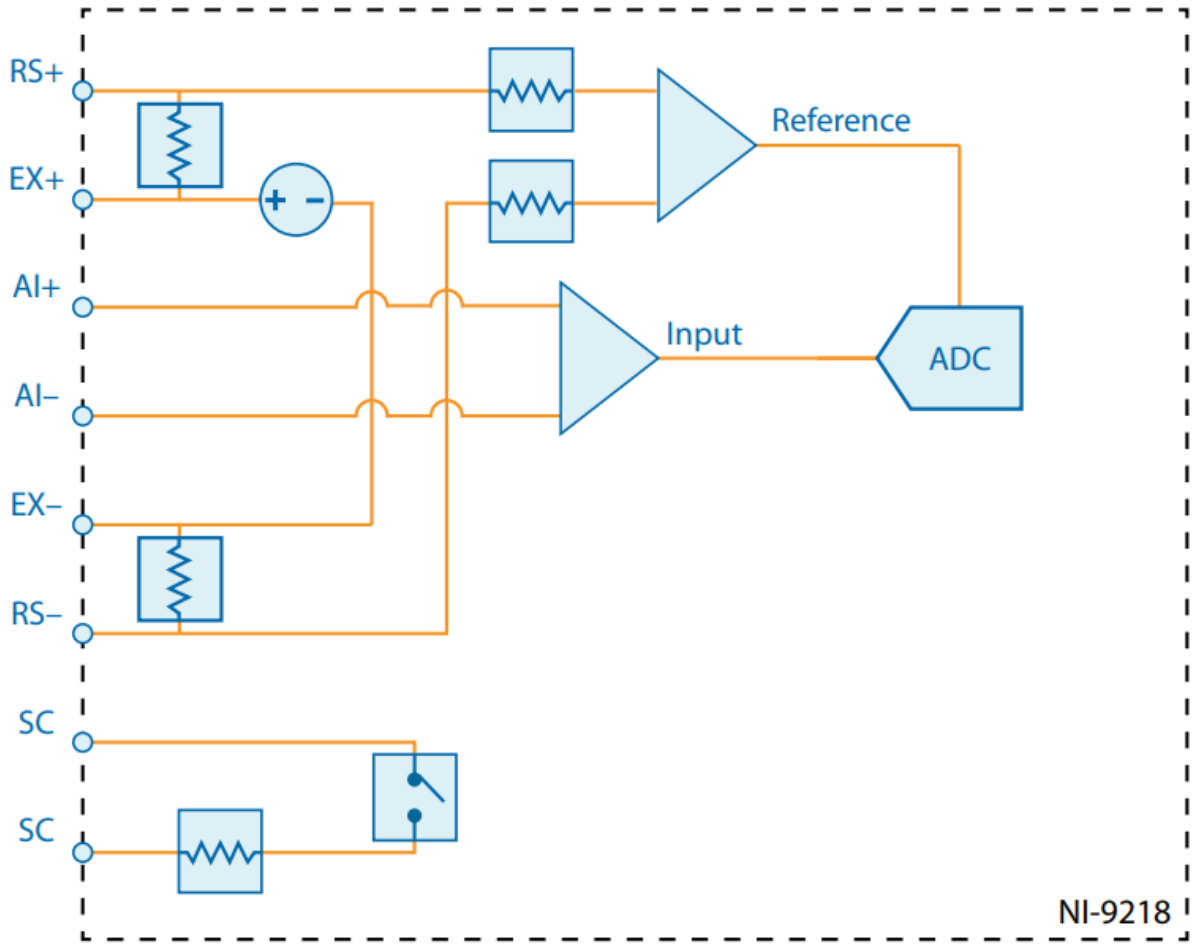
mA measurement types.

±16 V and ±65 mV Signal Conditioning



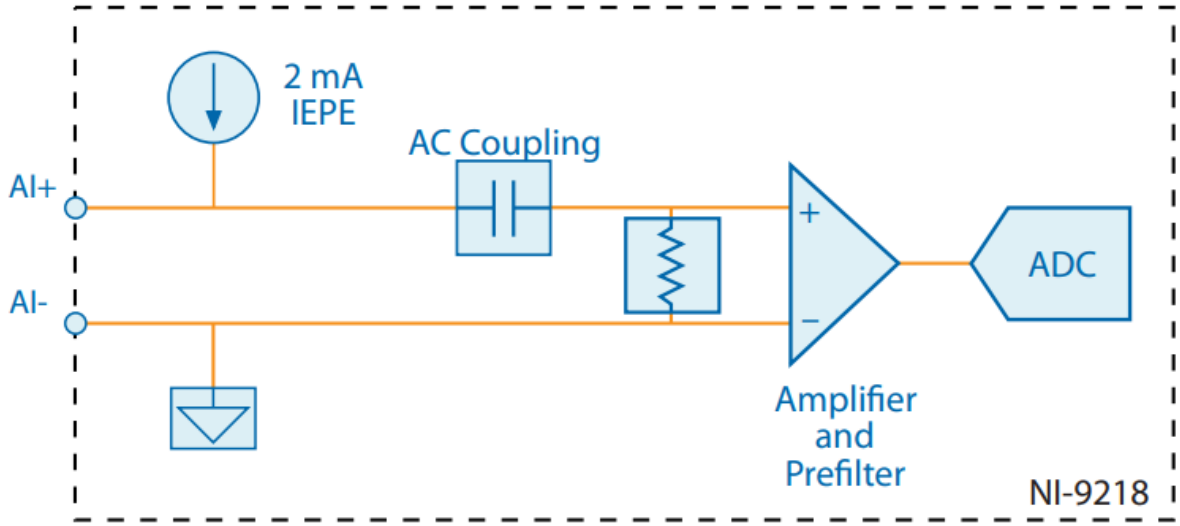
Input signals on each channel are buffered, conditioned, and then sampled by an ADC.

Full-Bridge Signal Conditioning



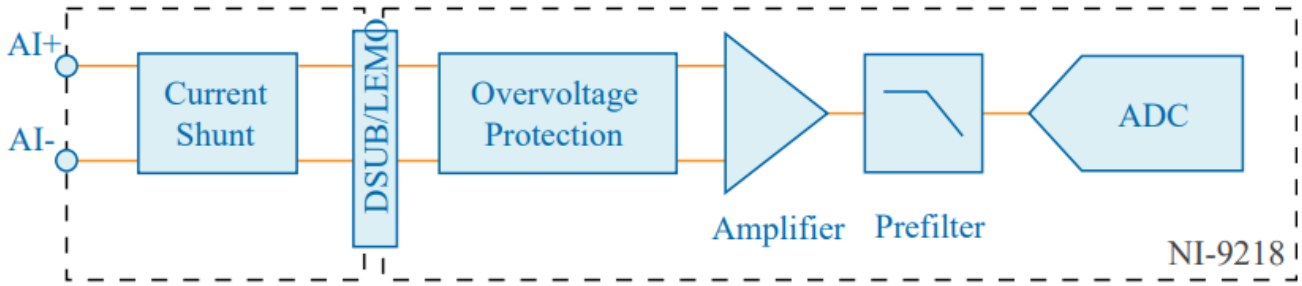
- The analogue input connections sense and then amplify the incoming analogue signal.
- The excitation connections provide differential bridge-excitation voltage.
- Remote sensing continuously and automatically corrects for lead-wire induced excitation voltage loss when using the RS connections.
- Shunt calibration can be used to correct for lead-wire-induced desensitisation of the bridge.

IEPE Signal Conditioning



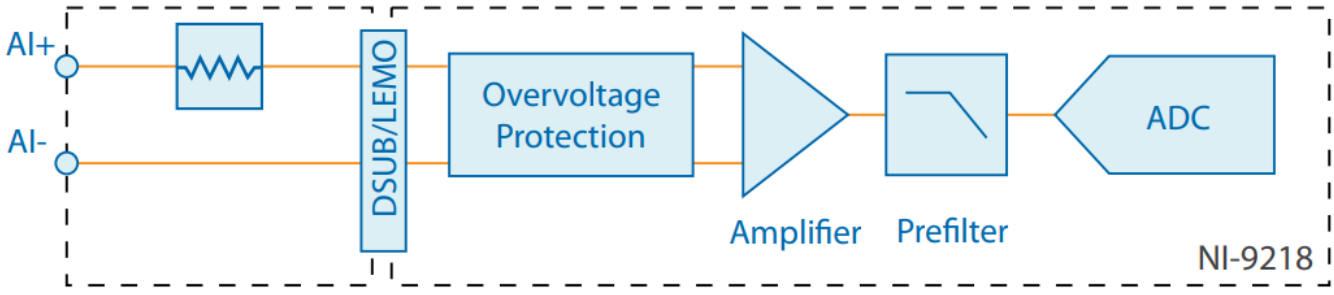
- The incoming analogue signal is referenced to an isolated ground.
- Each channel is configured for AC coupling with an IEPE current.
- Each channel provides a TEDS Class 1 interface.

±20 mA Signal Conditioning



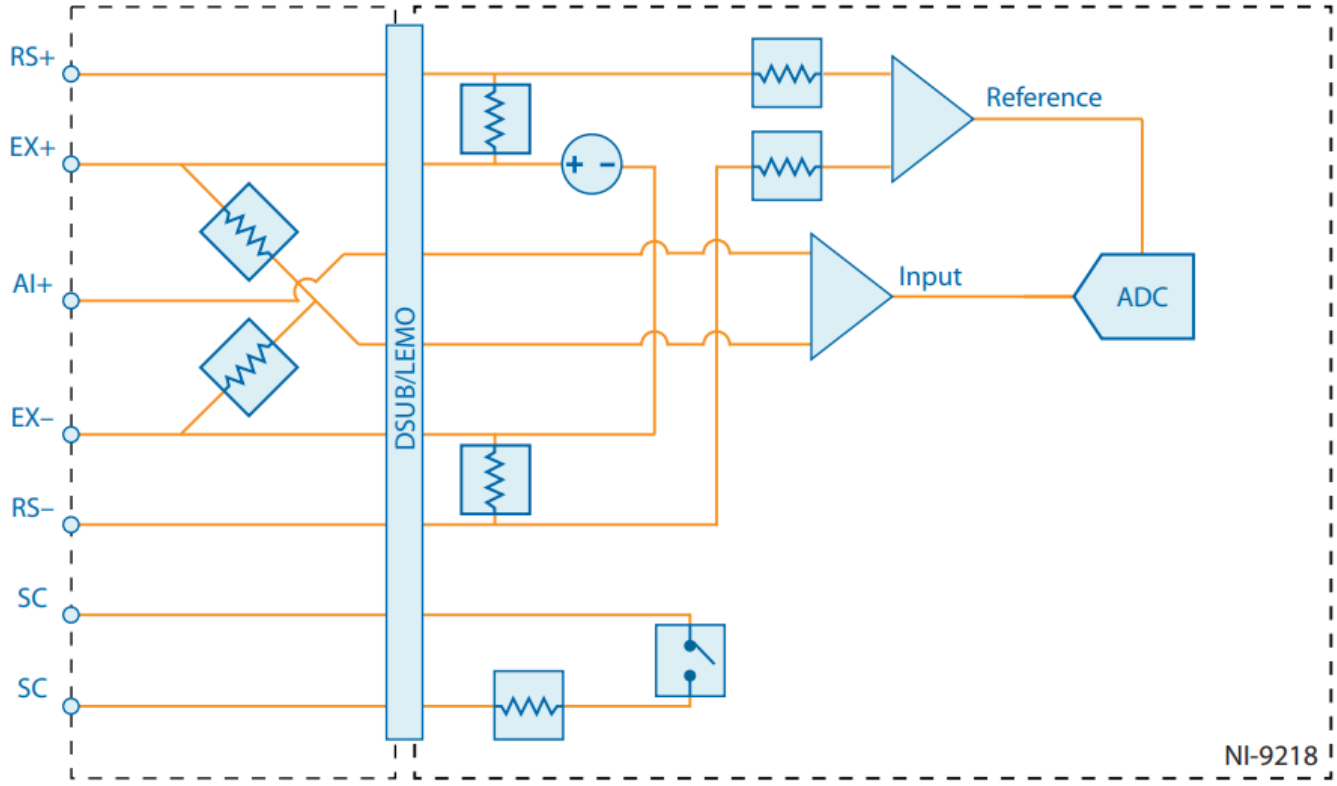
The NI-9983 provides a current shunt for the incoming analogue signal.

±60 V Signal Conditioning



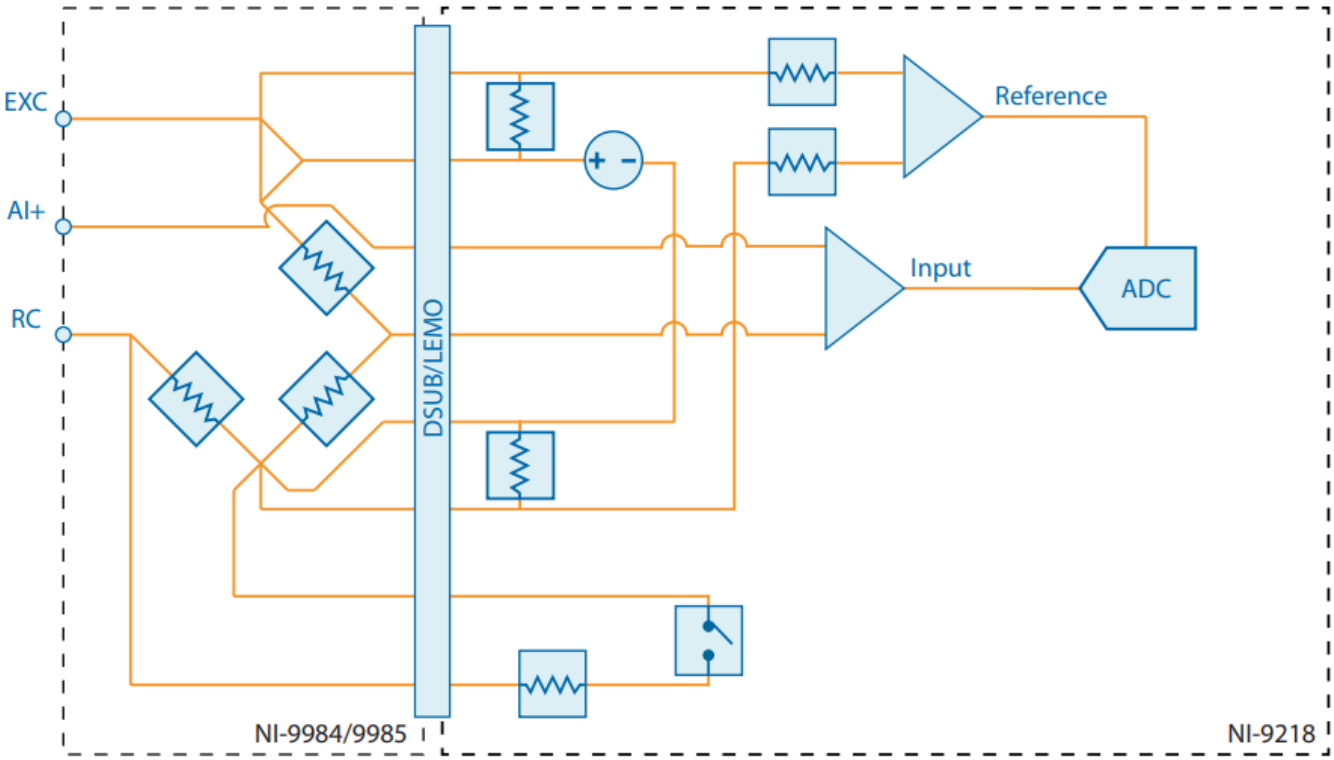
The NI-9987 provides an attenuator for the incoming analogue signal.

Half-Bridge Signal Conditioning



- The NI-9886 provides half-bridge completion resistors for the incoming analogue signal.
- You must connect AI+, EX+, and EX-.
- RS+ and RS- connections are optional.
- You do not need to connect the AI signal because it is connected internally.

Quarter-Bridge Mode Conditioning



The NI-9984 and NI-9985 provide a quarter-bridge completion resistor and a half-bridge completion resistor.

Filtering

The NI-9218 uses a combination of analogue and digital filtering to provide an accurate representation of in-band signals while rejecting out-of-band signals. The filters discriminate between signals based on the frequency range, or bandwidth, of the signal. The three important bandwidths to consider are the passband, the stopband, and the alias-free bandwidth.

The NI-9218 represents signals within the passband, as quantified primarily by passband ripple and phase nonlinearity. All signals that appear in the alias-free bandwidth are either unaliased signals or signals that have been filtered by at least the amount of the stopband rejection.

Passband

The signals within the passband have frequency-dependent gain or attenuation. The small amount of variation in gain with respect to frequency is called the passband flatness. The digital filters of the NI-9218 adjust the frequency range of the passband to match the data rate. Therefore, the amount of gain or attenuation at a given frequency depends on the data rate.

Stopband

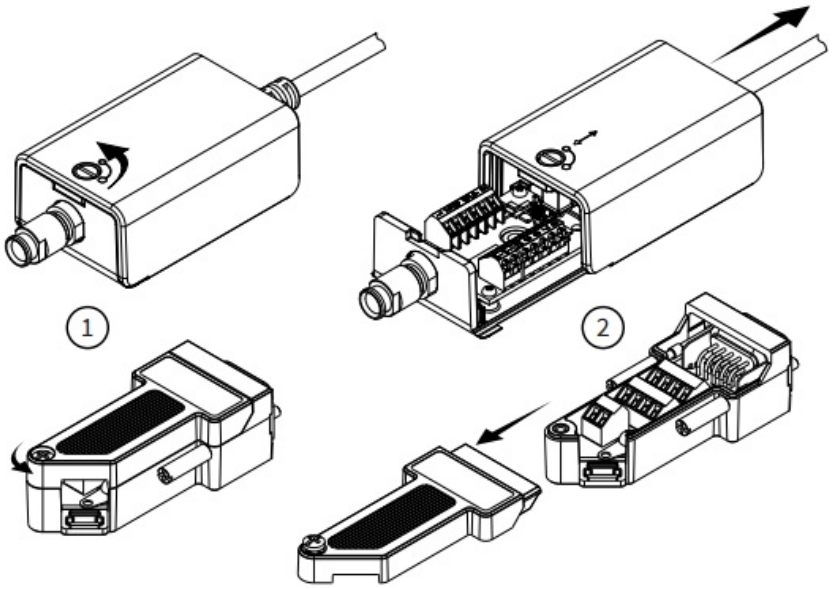
The filter significantly attenuates all signals above the stopband frequency. The primary goal of the filter is to prevent aliasing. Therefore, the stopband frequency scales precisely with the data rate. The stopband rejection is the minimum amount of attenuation applied by the filter to all signals with frequencies within the stopband.

Alias-Free Bandwidth

Any signal that appears in the alias-free bandwidth of the NI-9218 is not an aliased artefact of signals at a higher frequency. The alias-free bandwidth is defined by the ability of the filter to reject frequencies above the stopband frequency, and it is equal to the data rate minus the stopband frequency.

Opening a Measurement Adapter

What to Do



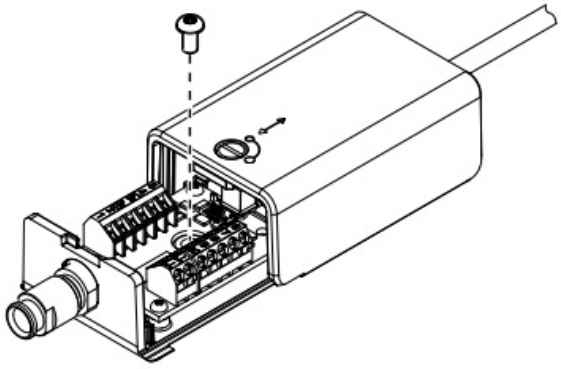
- Unlock the measurement adapter housing/cover.
- Slide the measurement adapter housing/cover to access the screw terminals.

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.

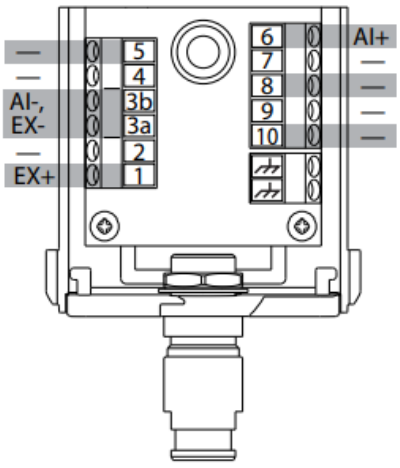
Measurement Adapter Grounding

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.

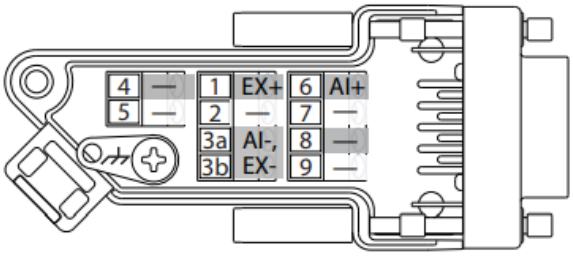
Measurement Adapter Pinouts

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

NI-9982 ±16 V Connection Pinout



NI-9982D/9982L



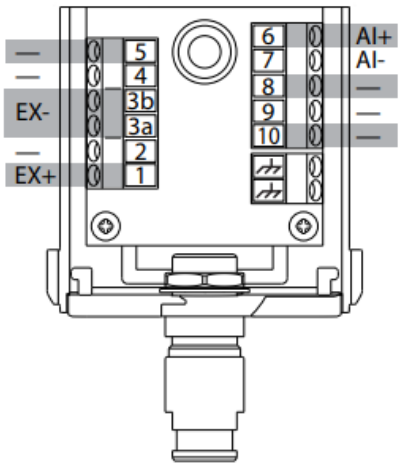
NI-9982F

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

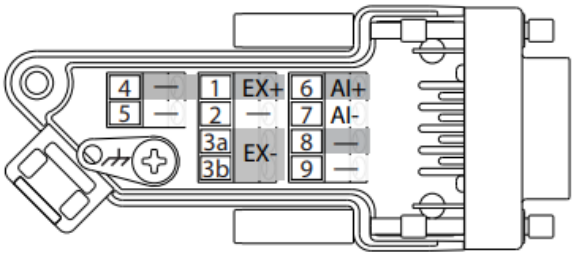
Related reference:

- ±16 V Connections

NI-9982 ±65 mV Connection Pinout



NI-v9982D/9982L



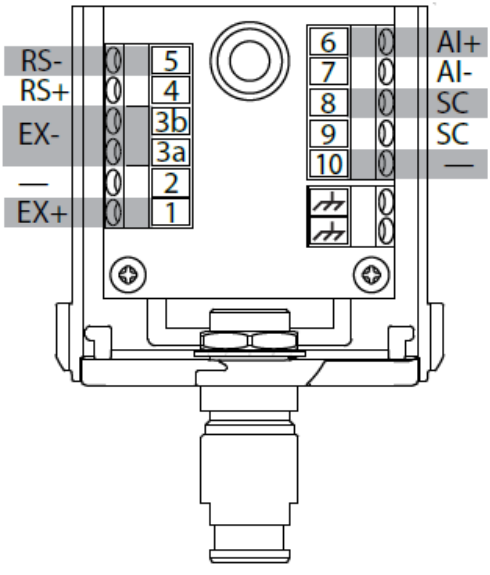
NI-9982F

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

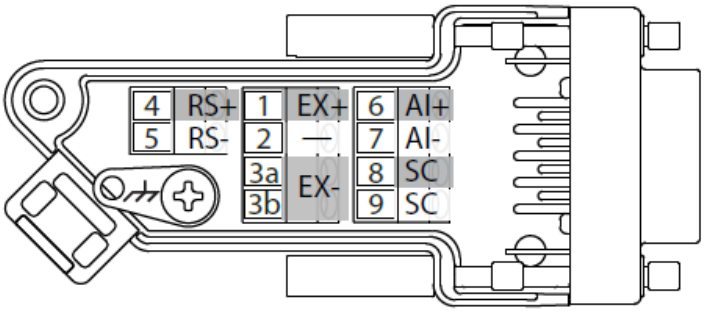
Related reference:

- ±65 mV Connections

NI-9982 Full-Bridge Connection Pinout



NI-9982D/9982L



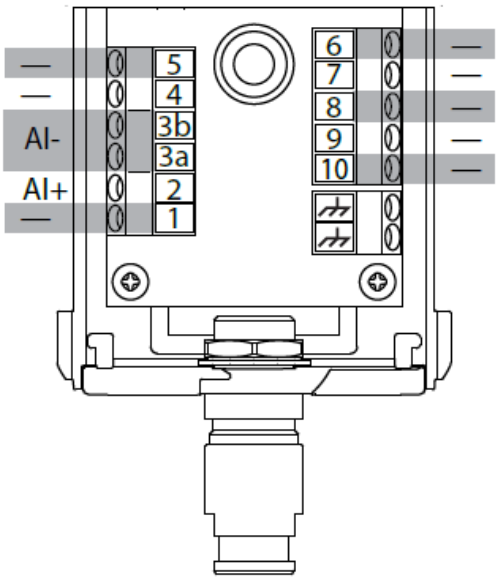
NI-9982F

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

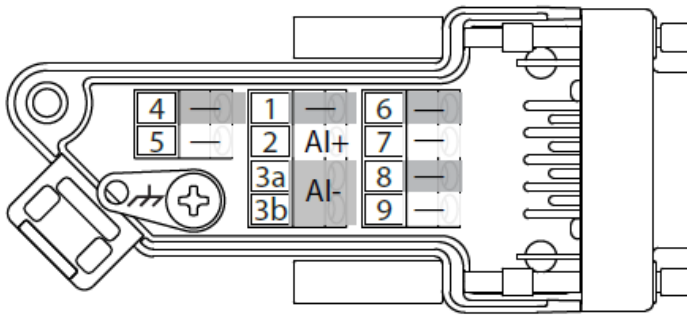
Related reference:

- Full-Bridge Connections

NI-9982 IEPE Connection Pinout



NI-9982D/9982L



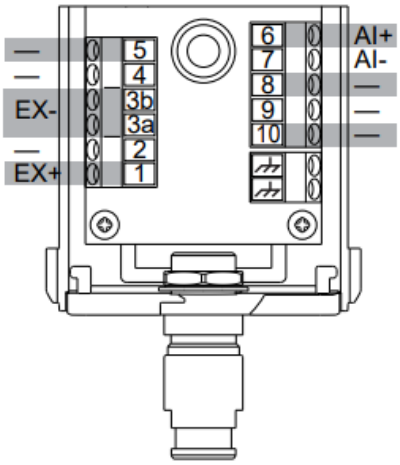
NI-9982F

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

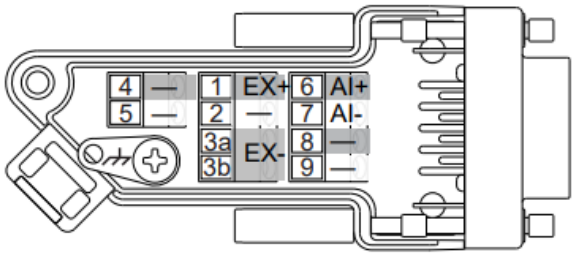
Related reference:

- IEPE Connections

  NI-9983 Pinout



NI-9983D/9983L



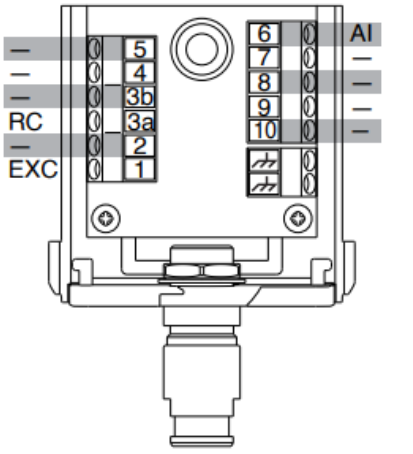
NI-9983F

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

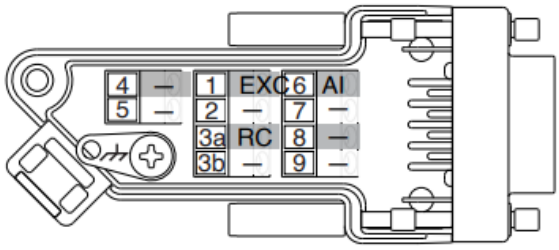
Related reference:

- ±20 mA Connections

NI-9984/9985 Pinout



NI-9984D/9984L/9985D/9985L

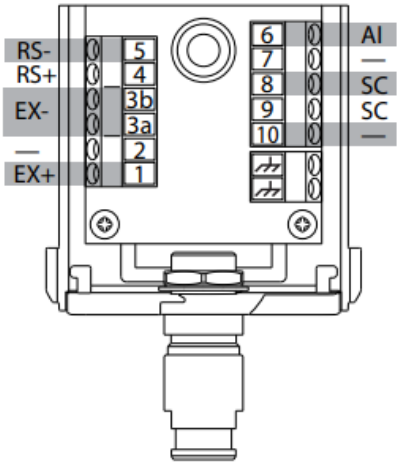


NI-9984F/9985F

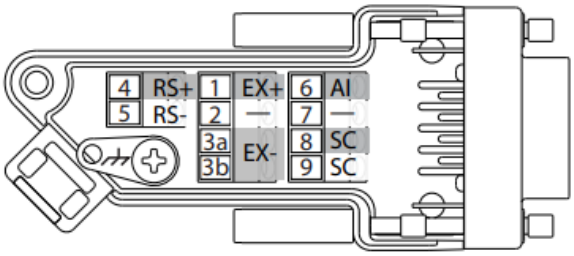
Related reference:

- Quarter-Bridge Connections

  NI-9986 Pinout



NI-9986D/9986L



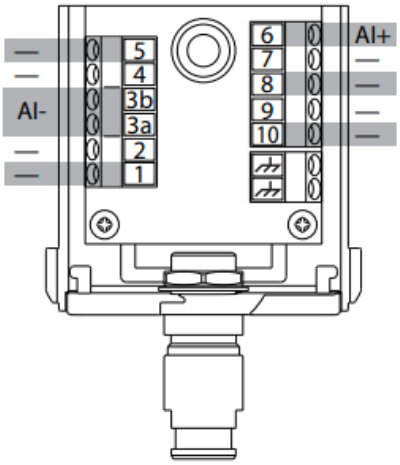
NI-9986F

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

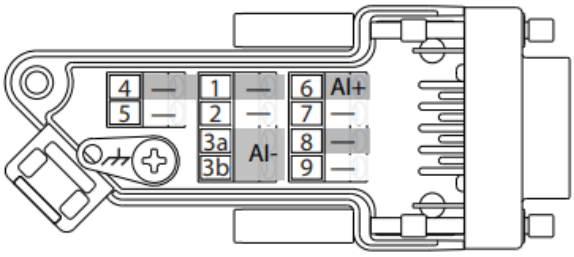
Related reference:

- Half-Bridge Connections

  NI-9987 Pinout



NI-9987D/9987L



NI-9987F

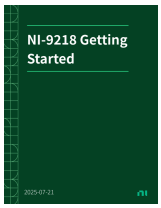
Pins 3a and 3b are tied together on the NI-9987.

Related reference:

- ±60 V Connections

FAQ

Documents / Resources

	National Instruments NI-9218 Channel Analog Input Module [pdf] Instruction Manual NI-9218 with LEMO, NI-9218 with DSUB, NI-9218 Channel Analog Input Module, NI-9218, Channel Analog Input Module, Analog Input Module, Input Module

References

- User Manual

NATIONAL INSTRUMENTS

Analog Input Module, Channel Analog Input Module, Input Module, NATIONAL INSTRUMENTS, NI-9218, NI-9218 Channel Analog Input Module, NI-9218 with DSUB, NI-9218 with LEMO

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