8-Channel Strain Gage Modules

NI 9235, NI 9236

8 channels, simultaneous quarter-bridge inputs
10 kS/s/channel sample rate
1000 Vrms transient isolation
24-bit resolution

Multiple module synchronization
Built-in excitation
Built-in shunt calibration

Overview

NI 9235 and 9236 quarter-bridge strain gage modules are designed for higher-channel-count, dynamic strain measurement systems based on NI CompactDAQ, CompactRIO, or other compatible C Series hardware. With eight simultaneous channels per module, you can make more measurements with a smaller, more channel-dense system. Simultaneous sampling is important for higher-speed acquisitions where it is necessary to compare results from different locations at a particular instant in time, such as impact tests. For a bridge-based module with a higher sampling speed or the ability to implement full- and half-bridge as well as quarter-bridge measurements, try the NI 9237 C Series simultaneous bridge module.

Requirements and Compatibility

<table>
<thead>
<tr>
<th>OS Information</th>
<th>Driver Information</th>
<th>Software Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-Time OS</td>
<td>NI-DAQmx</td>
<td>ANSI C/C++</td>
</tr>
<tr>
<td>Windows</td>
<td>NI-RIO</td>
<td>LabVIEW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LabVIEW SignalExpress</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LabWindows/CVI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurement Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual C#</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual Studio .NET</td>
</tr>
</tbody>
</table>

Comparison Tables

<table>
<thead>
<tr>
<th>Module</th>
<th>Signal Type</th>
<th>Channels</th>
<th>Sample Rate</th>
<th>Resolution (bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9201</td>
<td>Voltage</td>
<td>8</td>
<td>500 kS/s</td>
<td>12</td>
</tr>
</tbody>
</table>
Application and Technology
NI 9235 and 9236 C Series analog input modules are ideal for medium- to high-channel-count strain measurement applications such as structural or impact test. You can use these modules in the eight-slot NICompactDAQ USB chassis for a plug-and-play, portable setup that can measure up to 64 channels in a single chassis. All channels of all NI C Series modules synchronize in the backplane.

For structural health monitoring or other applications that require embedded logging or processing, you can use NI 9235/9236 modules in four- and eight-slot NICompactRIO chassis, which include an onboard processor and storage media. CompactRIO has an extended operational temperature range as well as rugged shock and vibration specifications and a Class 1, Division 2 hazardous location rating.

The small size and high performance of C Series hardware make it a good choice for compact test systems with multiple measurement types. You can add and synchronize new measurements by installing additional modules in the chassis. Common systems that use strain gages range from small engine test cells to mountain bike frame tests to in-vehicle chassis and suspension tests. The high bandwidth available in C Series hardware like NICompactDAQ and CompactRIO delivers high-speed measurements such as dynamic strain, acceleration, and sound. You can mix these measurements with lower-speed measurements such as temperature in the same system with the same program.

High Throughput with Multiple ADCs
The use of multiple analog-to-digital converters (ADCs) in a single module has two main benefits. First, the overall sample rate available to each channel is dramatically increased. This is important when conducting high-speed tests, such as impact or fracture tests, over multiple channels. The other main advantage is the elimination of phase offset between channels when sampling at higher speeds.

Elimination of Unwanted Signals with Built-In Antialias Filters
For dynamic measurements, it is important to filter out unwanted signals. Without some form of filtering, unwanted high-frequency signals can alias the signal you are measuring, causing incorrect readings. To prevent these phenomena, NI 9235/9236 modules have built-in antialiasing filters that adjust to your selected sample rate and ensure that the signal you are measuring has no interference from signals beyond the Nyquist frequency.

Mixed-Measurement Test System
NI 9235/9236 modules are just two in a collection of more than 50 C Series modules for measurements such as temperature, acceleration, voltage, current, sound, pressure, load, force, torque, and digital I/O. You can easily synchronize every C Series module you use in a chassis to acquire data from all channels at the same rate and at the same time.

C Series Compatibility
The C Series hardware family features more than 50 measurement modules and several chassis and carriers for deployment. With this variety of modules, you can mix and match measurements such as temperature, acceleration, flow, pressure, strain, acoustic, voltage, current, digital, and more to create a custom system. Install the modules in one of several carriers to create a single module USB, Ethernet, or Wi-Fi system, or combine them in a chassis such as NI CompactDAQ and CompactRIO to create a mixed-measurement system with synchronized measurements. You can install up to eight modules in a simple, complete NICompactDAQ USB data acquisition system to synchronize all of the analog output, analog input, and digital I/O from the modules. For a system without a PC, CompactRIO holds up to eight modules and features a built-in processor, RAM, and storage for an embedded data logger or control unit. For higher-speed control, CompactRIO chassis incorporate a field-programmable gate array (FPGA) that you can program with NI LabVIEW software to achieve silicon-speed processing on I/O data from C Series modules.
Advanced Features

When used with CompactRIO, C Series analog input modules connect directly to reconfigurable I/O (RIO) FPGA hardware to create high-performance embedded systems. The reconfigurable FPGA hardware within CompactRIO provides a variety of options for custom timing, triggering, synchronization, filtering, signal processing, and high-speed decision making for all C Series analog modules. For instance, with CompactRIO, you can implement custom triggering for any analog sensor type on a per-channel basis using the flexibility and performance of the FPGA and the numerous arithmetic and comparison function blocks built into the LabVIEW FPGA Module.

Key Features

- High-accuracy, high-performance analog measurements for any CompactRIO embedded system, R Series expansion chassis, or NI CompactDAQ chassis
- Screw terminals, BNC, D-Sub, spring terminals, strain relief, high voltage, cable, solder cup backshell, and other connectivity options
- Available channel-to-earth ground double-isolation barrier for safety, noise immunity, and high common-mode voltage range
- CompactRIO Extreme Industrial Certifications and Ratings
- Built-in signal conditioning for direct connection to sensors and industrial devices

Visit [ni.com/compactrio](http://ni.com/compactrio) or [ni.com/compactdaq](http://ni.com/compactdaq) for up-to-date information on module availability, example programs, application notes, and other developer tools.

Connectivity Accessories

NI 9235/9236 modules are shipped with everything you need to take them out of the box and begin connecting signal wires. For added strain relief, you can purchase connector backshells as an accessory kit. Accessory kits are also available for spares or replacements of spring terminal connectors for the modules.

Ordering Information

For a complete list of accessories, visit the product page on ni.com.

<table>
<thead>
<tr>
<th>Products</th>
<th>Part Number</th>
<th>Recommended Accessories</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9235</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NI 9236</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each NI 9236 requires: 1 Connectivity Accessory</td>
<td></td>
<td>Connectivity Accessory: Spring Terminals - NI 9965 Backshell for 24-pos spring term connector block (qty 1)</td>
<td>780216-01</td>
</tr>
</tbody>
</table>

Software Recommendations

**LabVIEW Professional Development System for Windows**
- Advanced software tools for large project development
- Automatic code generation using DAQ Assistant and Instrument I/O Assistant
- Tight integration with a wide range of hardware
- Advanced measurement analysis and digital signal processing
- Open connectivity with DLLs, ActiveX, and .NET objects
- Capability to build DLLs, executables, and MSI installers

**NI LabVIEW SignalExpress for Windows**
- Quickly configure projects without programming
- Control over 400 PC-based and stand-alone instruments
- Log data from more than 250 data acquisition devices
- Perform basic signal processing, analysis, and file I/O
- Scale your application with automatic LabVIEW code generation
- Create custom reports or easily export data to LabVIEW, DIAdem or Microsoft Excel

**NI LabWindows™/CVI for Windows**
- Real-time advanced 2D graphs and charts
- Complete hardware compatibility with IVI, VISA, DAQ, GPIB, and serial
- Analysis tools for array manipulation, signal processing statistics, and curve fitting
- Simplified cross-platform communication with network variables
- Measurement Studio .NET tools (included in LabWindows/CVI Full only)
- The mark LabWindows is used under a license from Microsoft Corporation.

**NI Measurement Studio Professional Edition**
- Support for Microsoft Visual Studio .NET 2010/2008/2005
- Customizable Windows Forms and Web Forms controls for test and measurement user interface design
- Hardware integration support with data acquisition and instrument control libraries
- Automatic code generation with data acquisition, instrument control, and parameter assistants
- Cross-platform communication with network variables
- Analysis libraries for array operations, signal generation, windowing, filters, signal processing

Support and Services

**System Assurance Programs**
NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

**Calibration**
NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

**Technical Support**
Get answers to your technical questions using the following National Instruments resources.
- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

**Repair**
While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained
Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- Classroom training in cities worldwide - the most comprehensive hands-on training taught by engineers.
- On-site training at your facility - an excellent option to train multiple employees at the same time.
- Online instructor-led training - lower-cost, remote training if classroom or on-site courses are not possible.
- Course kits - lowest-cost, self-paced training that you can use as reference guides.
- Training memberships and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

Detailed Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted. The specifications are the same for the NI 9235 and the NI 9236 unless otherwise noted.

<table>
<thead>
<tr>
<th>Input Characteristics</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of channels</td>
<td>8 analog input channels</td>
</tr>
<tr>
<td>Quarter-bridge completion</td>
<td></td>
</tr>
<tr>
<td>NI 9235</td>
<td>120 Ω, 10 ppm/°C max</td>
</tr>
<tr>
<td>NI 9236</td>
<td>350 Ω, 10 ppm/°C max</td>
</tr>
<tr>
<td>ADC resolution</td>
<td>24 bits</td>
</tr>
<tr>
<td>Type of ADC</td>
<td>Delta-Sigma (with analog prefiltering)</td>
</tr>
<tr>
<td>Sampling mode</td>
<td>Simultaneous</td>
</tr>
<tr>
<td>Internal master timebase ( (f_M) )</td>
<td>12.8 MHz</td>
</tr>
<tr>
<td>Frequency</td>
<td>±100 ppm max</td>
</tr>
<tr>
<td>Data rate range ( (f_s) ) using internal master timebase</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>794 S/s</td>
</tr>
<tr>
<td>Maximum</td>
<td>10 kS/s</td>
</tr>
<tr>
<td>Data rate range ( (f_s) ) using external master timebase</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>195.3125 S/s</td>
</tr>
<tr>
<td>Maximum</td>
<td>10.547 kS/s</td>
</tr>
</tbody>
</table>
Data rates $f_s$ \(^1\)

\[ f_M = \frac{250}{n}, \quad n = (2; 4; 5; \ldots; 63) \]

Full-scale range

±29.4 mV (±62,500 με–55,500 με)

Scaling coefficient

3.5062 nV/V per LSB

Overvoltage protection between any two terminals

±30 V

### Accuracy, NI 9235

<table>
<thead>
<tr>
<th>Measurement Conditions</th>
<th>Percent of Reading (^2) (Gain Error)</th>
<th>Percent of Range (^3) (Offset Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 days after cal. (±5 °C)</td>
<td>1 year after cal. (±5 °C)</td>
</tr>
<tr>
<td>Calibrated typ (25 °C, ±5 °C)</td>
<td>0.02%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Calibrated max (–40 to 70 °C)</td>
<td>0.07%</td>
<td>0.17%</td>
</tr>
<tr>
<td>Uncalibrated typ (25 °C, ±5 °C)</td>
<td>0.15%</td>
<td>1.25%</td>
</tr>
<tr>
<td>Uncalibrated max (–40 to 70 °C)</td>
<td>0.53%</td>
<td>2.14%</td>
</tr>
</tbody>
</table>

Stability, NI 9235

- Gain drift: 6 ppm/°C
- Offset drift: 2.2 μV/V/°C

### Accuracy, NI 9236

<table>
<thead>
<tr>
<th>Measurement Conditions</th>
<th>Percent of Reading (^2) (Gain Error)</th>
<th>Percent of Range (^3) (Offset Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 days after cal. (±5 °C)</td>
<td>1 year after cal. (±5 °C)</td>
</tr>
<tr>
<td>Calibrated typ (25 °C, ±5 °C)</td>
<td>0.02%</td>
<td>0.08%</td>
</tr>
<tr>
<td>Calibrated max (–40 to 70 °C)</td>
<td>0.07%</td>
<td>0.16%</td>
</tr>
<tr>
<td>Uncalibrated typ (25 °C, ±5 °C)</td>
<td>0.15%</td>
<td>0.79%</td>
</tr>
<tr>
<td>Uncalibrated max (–40 to 70 °C)</td>
<td>0.53%</td>
<td>1.67%</td>
</tr>
</tbody>
</table>

Stability, NI 9236

- Gain drift: 6 ppm/°C
- Offset drift: 1.7 μV/V/°C

### Channel-to-channel matching (calibrated)

<table>
<thead>
<tr>
<th>Input Signal Frequency ($f_{in}$)</th>
<th>Gain</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Typical</td>
<td>Maximum</td>
</tr>
<tr>
<td>0 to 1 kHz</td>
<td>0.08%</td>
<td>0.11%</td>
</tr>
<tr>
<td>0 to 4 kHz</td>
<td>0.17%</td>
<td>0.32%</td>
</tr>
</tbody>
</table>

Phase nonlinearity

- $f_{in} = 0$ to 1 kHz: ±0.002°
- $f_{in} = 0$ to 4 kHz: ±0.1°

Input delay

38.2$/$$f_s$ + 11 μs

Passband

Frequency: 0.45 · $f_s$

Flatness ($f_s = 10$ kS/s): 33 mDB max

Stopband

Frequency
Rejection
Alias-free bandwidth
Oversample rate
Rejection at oversample rate \( f_s = 10 \text{ kS/s} \)

Input noise
\( f_s = 1 \text{ kS/s} \)

\begin{align*}
\text{NI 9235} & : 0.38 \mu \text{V/Vrms} \\
\text{NI 9236} & : 0.25 \mu \text{V/Vrms}
\end{align*}

\( f_s = 10 \text{ kS/s} \)

\begin{align*}
\text{NI 9235} & : 0.85 \mu \text{V/Vrms} \\
\text{NI 9236} & : 0.5 \mu \text{V/Vrms}
\end{align*}

SFDR (1 kHz, –60 dBFS)

\begin{align*}
\text{NI 9235} & : 110 \text{ dB} \\
\text{NI 9236} & : 115 \text{ dB}
\end{align*}

THD (1 kHz, –20 dBFS)

\begin{align*}
\text{NI 9235} & : –90 \text{ dB} \\
\text{NI 9236} & : –95 \text{ dB}
\end{align*}

Crosstalk \( f_s = 1 \text{ kHz} \)

\begin{align*}
\text{–100 dB}
\end{align*}

Common-mode voltage, all signals to earth ground

\begin{align*}
\pm 60 \text{ VDC}
\end{align*}

CMRR \( f_s = 0 \text{ to } 60 \text{ Hz} \)

\begin{align*}
\text{NI 9235} & : 120 \text{ dB} \\
\text{NI 9236} & : 110 \text{ dB}
\end{align*}

MTBF

566,796 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

### Shunt Calibration Characteristics

<table>
<thead>
<tr>
<th>Measurement Conditions</th>
<th>NI 9235 Percent of Reading (Gain Error)</th>
<th>NI 9236 Percent of Reading (Gain Error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical (25 °C, ±5 °C)</td>
<td>0.09%</td>
<td>0.07%</td>
</tr>
<tr>
<td>Maximum (–40 to 70 °C)</td>
<td>0.22%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Resistance

\begin{align*}
\text{NI 9235} & : 50 \text{ kΩ} \\
\text{NI 9236} & : 100 \text{ kΩ}
\end{align*}

Output value

\begin{align*}
\text{NI 9235} & : –599.28 \mu \text{V/V} \\
\text{NI 9236} & : –873.47 \mu \text{V/V}
\end{align*}

Temperature drift

15 ppm/°C

Method

Shunt across completion resistor

Excitation Characteristics
Excitation type

<table>
<thead>
<tr>
<th></th>
<th>Constant voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9235</td>
<td>2.0 V ± 1%</td>
</tr>
<tr>
<td>NI 9236</td>
<td>3.3 V ± 1%</td>
</tr>
</tbody>
</table>

Maximum output current

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9235</td>
<td>80 mA</td>
</tr>
<tr>
<td>NI 9236</td>
<td>46 mA</td>
</tr>
</tbody>
</table>

**Power Requirements**

Power consumption from chassis

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9235</td>
<td>735 mW max</td>
</tr>
<tr>
<td>Sleep mode</td>
<td>25 μW max</td>
</tr>
<tr>
<td>NI 9236</td>
<td>675 mW max</td>
</tr>
<tr>
<td>Sleep mode</td>
<td>25 μW max</td>
</tr>
</tbody>
</table>

Thermal dissipation (at 70 °C)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 9235</td>
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<tr>
<td>NI 9236</td>
<td>675 mW max</td>
</tr>
<tr>
<td>Sleep mode</td>
<td>25 μW max</td>
</tr>
</tbody>
</table>

**Physical Characteristics**

Spring-terminal wiring

18 to 28 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end

Weight

153 g (5.4 oz)

**Safety**

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

**Safety Voltages**

Connect only voltages that are within the following limits.

Between any two terminals

±30 V max

Isolation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel-to-channel</td>
<td>None</td>
</tr>
<tr>
<td>Channel-to-earth ground</td>
<td></td>
</tr>
</tbody>
</table>

Continuous

60 VDC, Measurement Category I

Withstand

1,000 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. 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.

Caution Do not connect the NI 9235/9236 to signals or use for measurements within Measurement Categories II, III, or IV.

**Safety Standards**

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

IEC 61010-1, EN 61010-1

UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the Online Product Certification section.
### Hazardous Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. (UL)</td>
<td>Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4</td>
</tr>
<tr>
<td>Canada (C-UL)</td>
<td>Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nA IIC T4</td>
</tr>
<tr>
<td>Europe (DEMKO)</td>
<td>Ex nA IIC T4</td>
</tr>
</tbody>
</table>

### Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. Refer to the manual for the chassis you are using for more information about meeting these specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature (IEC 60068-2-1, IEC 60068-2-2)</td>
<td>–40 to 70 °C</td>
</tr>
<tr>
<td>Storage temperature (IEC 60068-2-1, IEC 60068-2-2)</td>
<td>–40 to 85 °C</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP 40</td>
</tr>
<tr>
<td>Operating humidity (IEC 60068-2-56)</td>
<td>10 to 90% RH, noncondensing</td>
</tr>
<tr>
<td>Storage humidity (IEC 60068-2-56)</td>
<td>5 to 95% RH, noncondensing</td>
</tr>
<tr>
<td>Maximum altitude</td>
<td>2,000 m</td>
</tr>
<tr>
<td>Pollution Degree (IEC 60664)</td>
<td>2</td>
</tr>
</tbody>
</table>

### Shock and Vibration

To meet these specifications, you must panel mount the system and use the NI 9965 backshell to protect the connections.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating vibration (Random, IEC 60068-2-64)</td>
<td>5 g&lt;sub&gt; rms&lt;/sub&gt;, 10 to 500 Hz</td>
</tr>
<tr>
<td>Sinusoidal (IEC 60068-2-6)</td>
<td>5 g, 10 to 500 Hz</td>
</tr>
<tr>
<td>Operating shock (IEC 60068-2-27)</td>
<td>30 g, 11 ms half sine, 50 g, 3 ms half sine, 18 shocks at 6 orientations</td>
</tr>
</tbody>
</table>

### Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

**Note** For EMC compliance, operate this device with shielded cables.

### CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

**Note** For the standards applied to assess the EMC of this product, refer to the Online Product Certification section.

### Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification, search by module number or product line, and click the appropriate link in the Certification column.

### Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

### Waste Electrical and Electronic Equipment (WEEE)

**EU Customers** At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.
Calibration

You can obtain the calibration certificate for this device at ni.com/calibration.

Calibration interval: 1 year

1. The data rate must remain within the appropriate data rate range. Refer to the Understanding NI 9235/9236 Data Rates section of the NI 9235/9236 Operating Instructions and Specifications for more information.

2. Exclusive of lead wire desensitization error.

3. Range equals 29.4 mV/V.

4. Calibrated errors represent offset stability following unstrained measurement. Errors include the effect of completion resistor tolerance and drift.

5. Rejection by analog prefilter of signal frequencies at oversample rate.

6. MAINS is defined as the (hazardous live) electrical supply system to which equipment is designed to be connected for the purpose of powering the equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.
Pinouts/Front Panel Connections

NI 9235/9236 Terminal Assignments

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