
NI-9234

Specifications

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Contents

NI-9234 Specifications 3

NI-9234 Specifications

Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Typical** unless otherwise noted.

Related information:

- [Software Support for CompactRIO, CompactDAQ, Single-Board RIO, R Series, and EtherCAT](#)

Conditions

Specifications are valid for the range -40 °C to 70 °C unless otherwise noted.

Input Characteristics

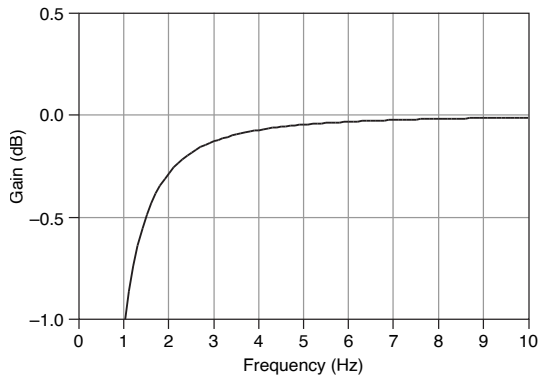
Number of channels	4 analog input channels
ADC resolution	24 bits

Type of ADC	Delta-Sigma (with analog prefiltering)
Sampling mode	Simultaneous
Type of TEDS supported	IEEE 1451.4 TEDS Class I
Internal master timebase (f_M)	
Frequency	13.1072 MHz
Accuracy	± 50 ppm maximum
Data rate range (f_s)	
Using internal master timebase	
Minimum	1.652 kS/s
Maximum	51.2 kS/s
Using external master timebase	
Minimum	0.391 kS/s
Maximum	52.734 kS/s
Data rates ¹ (f_s)	$(f_M \div 256)/n, n = 1, 2, \dots, 31$
Input coupling	AC/DC (software-selectable)

1. The data rate must remain within the appropriate data range.

AC cutoff frequency	
-3 dB	0.5 Hz
-0.1 dB	4.6 Hz maximum

Figure 1. AC Cutoff Frequency Response



Input range	±5 V	
AC voltage full-scale range		
Minimum	±5 Vpk	
Typical	±5.1 Vpk	
Maximum	±5.2 Vpk	
Common-mode voltage range (AI- to earth ground)	±2 V maximum	
IEPE excitation current (software-selectable on/off)		
Minimum	2.0 mA	

Typical	2.1 mA
Power-on glitch	90 μ A for 10 μ s
IEPE compliance voltage	19 V maximum

If you are using an IEPE sensor, use the following equation to make sure your configuration meets the IEPE compliance voltage range.

- $(V_{\text{common-mode}} + V_{\text{bias}} \pm V_{\text{full-scale}})$ must be 0 to 19

Where

- $V_{\text{common-mode}}$ is the common-mode voltage applied to the NI 9234
- V_{bias} is the bias voltage of the IEPE sensor
- $V_{\text{full-scale}}$ is the full-scale voltage of the IEPE sensor

Overvoltage protection (with respect to chassis ground)	
For a signal source connected to AI+ and AI-	± 30 V
For a low-impedance source connected to AI+ and AI-	-6 V to 30 V
Input delay	$(40 + 13/512)/f_s + 2.6 \mu\text{s}$

Table 1. Accuracy

Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range ² (Offset Error)
Calibrated	Maximum (-40 °C to 70 °C)	0.34%, ±0.03 dB	±0.14%, 7.1 mV
	Typical (25 °C±5 °C)	0.05%, ±0.005 dB	±0.006%, 0.3 mV
Uncalibrated ³	Maximum (-40 °C to 70 °C)	1.9%, ±0.16 dB	±0.27%, 13.9 mV
	Typical (25 °C±5 °C)	0.48%, ±0.04 dB	±0.04%, 2.3 mV

Gain drift	
Typical	0.14 mdB/°C (16 ppm/°C)
Maximum	0.45 mdB/°C (52 ppm/°C)
Offset drift	
Typical	19.2 µV/°C
Maximum	118 µV/°C
Channel-to-channel matching	
Phase (f_{in} in kHz)	$(f_{in} * 0.045^\circ + 0.04 \text{ maximum})$
Gain	

2. Range = 5.1 Vpk

3. Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.

Typical	0.01 dB
Maximum	0.04 dB
Passband	
Frequency	$0.45 * f_s$
Flatness ($f_s = 51.2$ kS/s)	40 mdB (pk-to-pk maximum)
Phase nonlinearity ($f_s = 51.2$ kS/s)	$\pm 0.45^\circ$ maximum
Stopband	
Frequency	$0.55 * f_s$
Rejection	100 dB
Alias-free bandwidth	$0.45 * f_s$
Oversample rate	$64 * f_s$
Crosstalk (1 kHz)	-110 dB
CMRR ($f_{in} \leq 1$ kHz)	
Minimum	40 dB

Typical	47 dB
SFDR ($f_{in} = 1$ kHz, -60 dBFS)	120 dB

Table 2. Idle Channel Noise and Noise Density

Idle Channel	51.2 kS/s	25.6 kS/s	2.048 kS/s
Noise	97 dBFS	99 dBFS	103 dBFS
	50 μ Vrms	40 μ Vrms	25 μ Vrms
Noise density	310 nV/ \sqrt Hz	350 nV/ \sqrt Hz	780 nV/ \sqrt Hz

Input impedance	
Differential	305 k Ω
AI- (shield) to chassis ground	50 Ω

Table 3. Total Harmonic Distortion (THD)

Input Amplitude	1 kHz	8 kHz
-1 dBFS	-95 dB	-87 dB
-20 dBFS	-95 dB	-80 dB

Intermodulation distortion (-1 dBFS)	
DIN 250 Hz/8 kHz 4:1 amplitude ratio	-80 dB
CCIF 11 kHz/12 kHz 1:1 amplitude ratio	-93 dB

MTBF	390,362 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method
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Power Requirements

Power consumption from chassis	
Active mode	900 mW maximum
Sleep mode	25 μ W maximum
Thermal dissipation (at 70 °C)	
Active mode	930 mW maximum
Sleep mode	25 μ W maximum

Physical Characteristics

Dimensions	Visit ni.com/dimensions and search by module number.
Weight	173 g (6.1 oz)

Safety Voltages

Connect only voltages that are within the following limits:

Channel-to-earth ground	\pm 30 V maximum, Measurement Category I
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Isolation	
Channel-to-channel	None
Channel-to-earth ground	None

Measurement Category I



Warning Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV, or for measurements on MAINS circuits or on circuits derived from Overvoltage Category II, III, or IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation. The product can only withstand transients up to the transient overvoltage rating without breakdown or damage to the insulation. An analysis of the working voltages, loop impedances, temporary overvoltages, and transient overvoltages in the system must be conducted prior to making measurements.



Mise en garde Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour des mesures dans ces catégories, ou des mesures sur secteur ou sur des circuits dérivés de surtensions de catégorie II, III ou IV pouvant présenter des surtensions transitoires supérieures à ce que le produit peut supporter. Le produit ne doit pas être raccordé à des circuits ayant une tension maximale supérieure à la tension de fonctionnement continu, par rapport à la terre ou à d'autres voies, sous peine d'endommager et de compromettre l'isolation. Le produit peut tomber en panne et son isolation risque d'être endommagée si les tensions transitoires dépassent la surtension transitoire nominale. Une analyse des tensions de fonctionnement, des impédances de boucle, des surtensions temporaires et des surtensions transitoires dans le système doit être effectuée avant de procéder à des mesures.

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as **MAINS** voltage. MAINS is a hazardous live electrical supply system that powers equipment. 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.



Note Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Environmental Characteristics

Temperature	
Operating	-40 °C to 70 °C
Storage	-40 °C to 85 °C
Humidity	
Operating	10% RH to 90% RH, noncondensing
Storage	5% RH to 95% RH, noncondensing
Ingress protection	IP40
Pollution Degree	2
Maximum altitude	5,000 m

Shock and Vibration	
Operating vibration	
Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

To meet these shock and vibration specifications, you must panel mount the system.

Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9234 at ni.com/calibration.

Calibration interval	1 year
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