# NI PXI-4461 Specifications

This document lists specifications for the NI PXI-4461 Dynamic Signal Acquisition (DSA) device. These specifications are typical at 25 °C unless otherwise stated. The operating range is 0 °C to 55 °C. All specifications are subject to change without notice. Visit `ni.com/manuals` for the most current specifications and product documentation.

## Analog Input

This section lists the NI PXI-4461 analog input specifications.

### Input Characteristics

Number of input channels ..... 2, simultaneously sampled

Input configuration ..... Differential or pseudodifferential (50 Ω between negative input and chassis ground), per input channel selectable

Input coupling ..... AC or DC, each channel independently software selectable

ADC Resolution ..... 24 bits

ADC type ..... Delta-sigma

Sample rates ($f_s$) ..... 1 kS/s to 204.8 kS/s in 181.9 µS/s increments

Oversampling, for sample rate

- 1.0 kS/s ≤ $f_s$ < 51.2 kS/s ..... 128 $f_s$
- 51.2 kS/s ≤ $f_s$ < 102.4 kS/s ..... 64 $f_s$
- 102.4 kS/s ≤ $f_s$ ≤ 204.8 kS/s ..... 32 $f_s$

FIFO buffer size ..... 1,023 samples

Data transfers ..... Direct memory access (DMA)

NATIONAL INSTRUMENTS

## Input Common Mode Range

| Gain (dB) | Input | Differential[1] | Pseudodifferential[1] |
|---|---|---|---|
| ≥0 | + | ±12 $V_{pk}$ | ±12 $V_{pk}$ |
| | – | ±12 $V_{pk}$ | ±10 $V_{pk}$ |
| <0 | + | ±42.4 $V_{pk}$ | ±42.4 $V_{pk}$ |
| | – | ±42.4 $V_{pk}$ | ±10 $V_{pk}$ |

[1] Voltages with respect to ground

## Input Overvoltage Protection

Differential configuration .....±42.4 $V_{pk}$

Pseudodifferential configuration, positive.....±42.4 $V_{pk}$

Pseudodifferential configuration, negative (shield) .....±10.0 $V_{pk}$

## Input Signal Range

| Gain (dB) | Full Scale Range ($V_{pk}$)[1] |
|---|---|
| 30 | ±0.316 |
| 20 | ±1.00 |
| 10 | ±3.16 |
| 0 | ±10.0 |
| –10 | ±31.6 |
| –20 | ±42.4 |

[1] Each input channel gain is independently software selectable.

# Transfer Characteristics

## AI Offset (Residual DC)

| Gain (dB) | Maximum Offset[1], 24 Hr, $T_{cal}$[2] ±5 °C (±mV) | Maximum Offset[1], 0 °C to 55 °C (±mV) |
|---|---|---|
| 30 | 0.1 | 1 |
| 20 | 0.2 | 2 |
| 10 | 0.5 | 3 |
| 0 | 0.7 | 7 |
| –10 | 5 | 30 |
| –20 | 7 | 70 |

[1] Source impedance ≤ 50 Ω
[2] $T_{cal}$ = ambient temperature at which last calibration was performed

## AI Gain Amplitude Accuracy

1 kHz input tone

$T_{cal}$ ±5 °C ..... ±0.03 dB max
0 °C to 55 °C..... ±0.2 dB max

# Amplifier Characteristics

## Typical Input Impedance

| Input Impedance | Differential Configuration | Pseudodifferential Configuration |
|---|---|---|
| Between positive input and chassis ground | 1 MΩ ‖ 217 pF | 1 MΩ ‖ 217 pF |
| Between negative input and chassis ground | 1 MΩ ‖ 229 pF | 50 Ω |

## Common Mode Rejection Ratio (CMRR)

| Gain (dB) | Typical CMRR (dBc)[1, 2] |
|---|---|
| 30 | 105 |
| 20 | 101 |
| 10 | 90 |
| 0 | 80 |
| –20, –10 | 60 |

[1] 1 kHz input tone
[2] Differential configuration, DC coupling

## Dynamic Characteristics[1]

Alias free
bandwidth (BW) (passband).....DC to 0.4535 $f_s$

Alias rejection.....120 dBc min

0.5465 $f_s$ < frequency input < 127.4535 $f_s$,
where 1.0 kS/s ≤ $f_s$ ≤ 51.2 kS/s

0.5465 $f_s$ < frequency input < 63.4535 $f_s$,
where 51.2 kS/s < $f_s$ ≤ 102.4 kS/s

0.5465 $f_s$ < frequency input < 31.4535 $f_s$,
where 102.4 kS/s < $f_s$ ≤ 204.8 kS/s

–3 dB BW .....0.491 $f_s$

ADC filter delay .....63/$f_s$ seconds

AC coupling BW

–3 dB cutoff frequency.....3.4 Hz typical

–0.1 dB cutoff frequency.....22.6 Hz typical

[1] Test system equipped with a liquid crystal display (LCD) monitor for AI noise and distortion measurements to avoid possible magnetic interference caused by cathode ray tube (CRT)-based monitors.

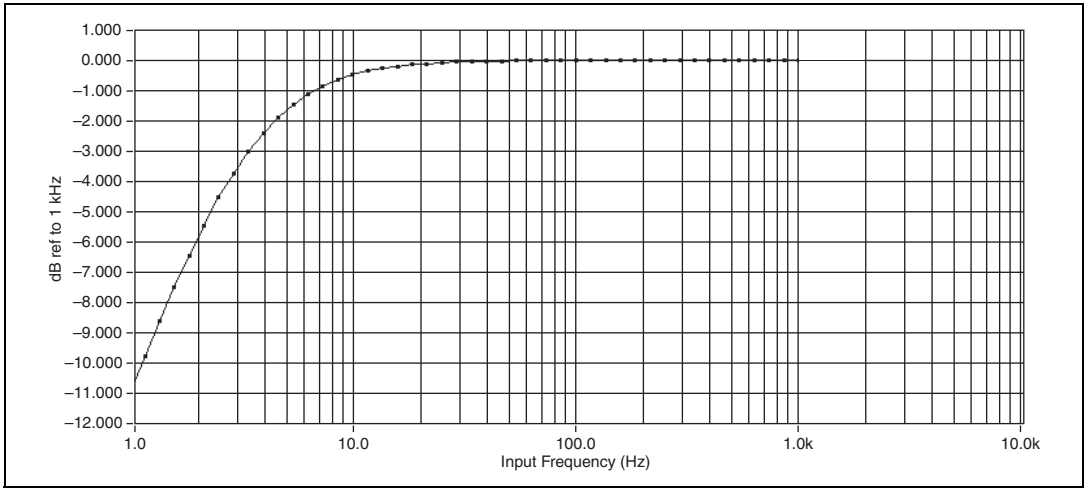


**Figure 1.** Magnitude Response of AC Coupling Circuit (1 Hz to 1 kHz)

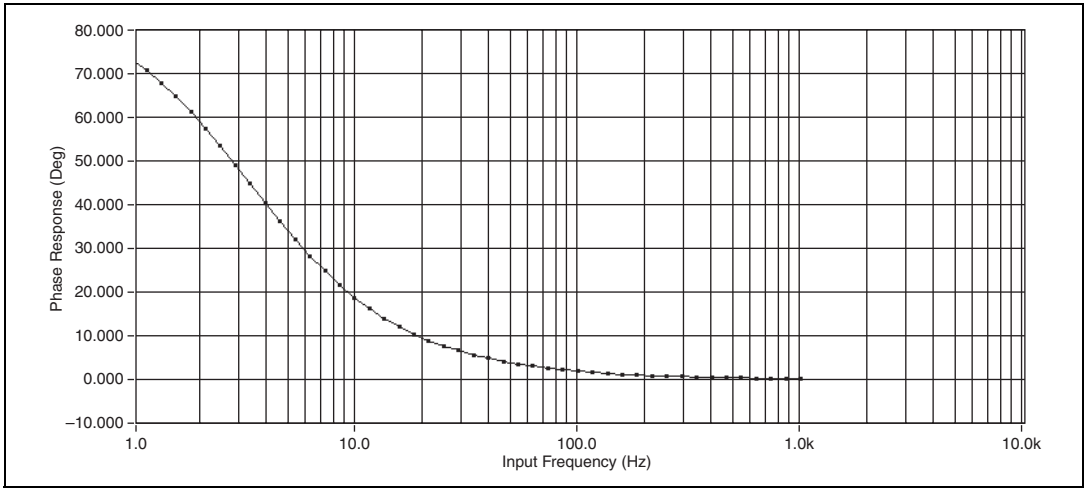


**Figure 2.** Phase Response of AC Coupling Circuit (1 Hz to 1 kHz)

## AI Flatness

| Gain (dB) | Flatness[1, 2] (dB), Max | | |
|---|---|---|---|
| | 20 Hz to 20 kHz | 20 Hz to 45 kHz | 20 Hz to 92.2 kHz |
| 0, 10, 20, 30 | ±0.008 | ±0.03 | ±0.1 |
| –20, –10 | ±0.1 | ±0.33 | ±0.55 |

[1] Relative to 1 kHz
[2] DC coupling

## AI Spectral Noise Density

AI spectral noise density.....8 nV/$\sqrt{\text{Hz}}$ typical at 30 dB gain, 1 kHz

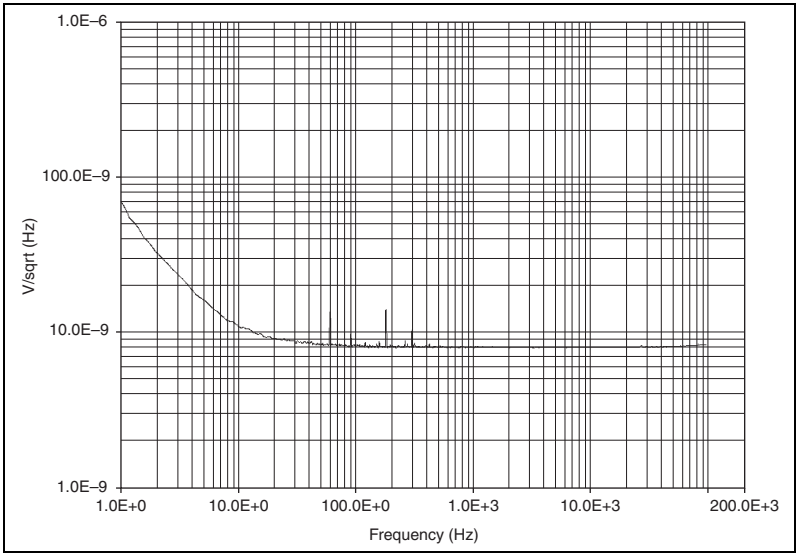


**Figure 3.** AI Spectral Noise Density (30 dB Gain)

## AI Idle Channel Noise

| Gain (dB) | Maximum Idle Channel Noise[1] | | | | | |
|---|---|---|---|---|---|---|
| | 1 kS/s ≤ $f_s$ ≤ 51.2 kS/s | | 51.2 kS/s < $f_s$ ≤ 102.4 kS/s | | 102.4 kS/s < $f_s$ ≤ 204.8 kS/s | |
| | $dBV_{rms}$ | $\mu V_{rms}$ | $dBV_{rms}$ | $\mu V_{rms}$ | $dBV_{rms}$ | $\mu V_{rms}$ |
| 30 | –118 | 1.3 | –115 | 1.8 | –111 | 2.8 |
| 20 | –115 | 1.8 | –112 | 2.5 | –108 | 4.0 |
| 10 | –108 | 4.0 | –105 | 5.6 | –100 | 10 |
| 0 | –99 | 11 | –96 | 16 | –91 | 28 |
| –10 | –80 | 100 | –78 | 126 | –75 | 178 |
| –20 | –77 | 141 | –74 | 200 | –70 | 316 |

[1] Source impedance ≤ 50 Ω

## AI Spurious Free Dynamic Range (SFDR)

| Gain Setting (dB) | SFDR (dBc), Typical[1, 2] |
|---|---|
| 30 | 106 |
| 0, 10, 20 | 108 |
| –20, –10 | 110 |

[1] $f_s$ = 204.8 kS/s
[2] 1 kHz input tone, input amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$

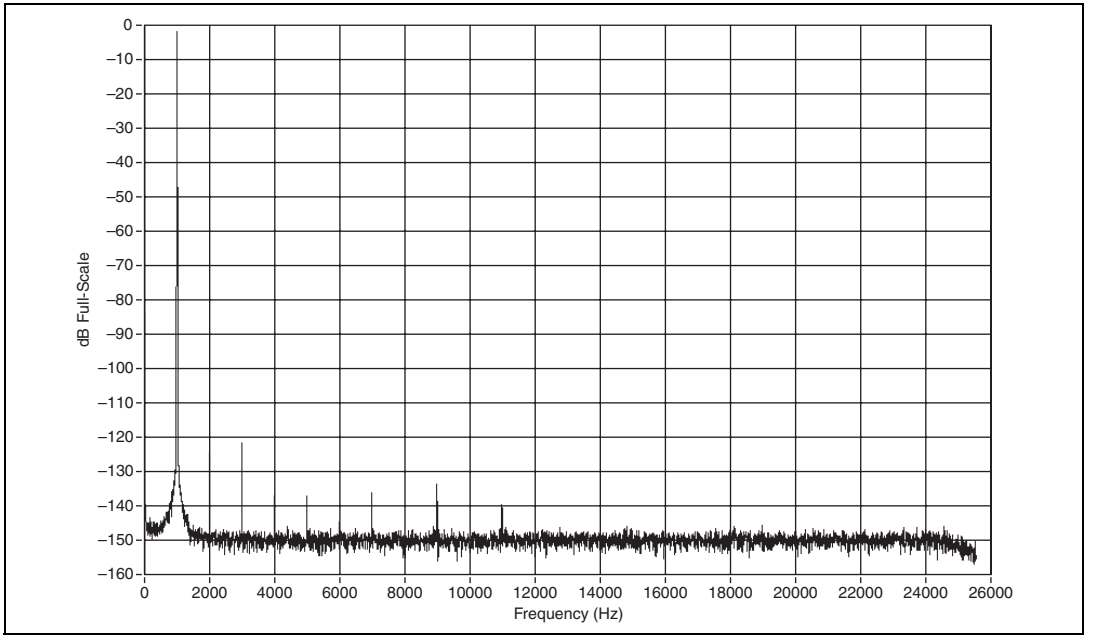


**Figure 4.** SFDR 51.2 kS/s (–1 dBFS, 0 dB Gain)

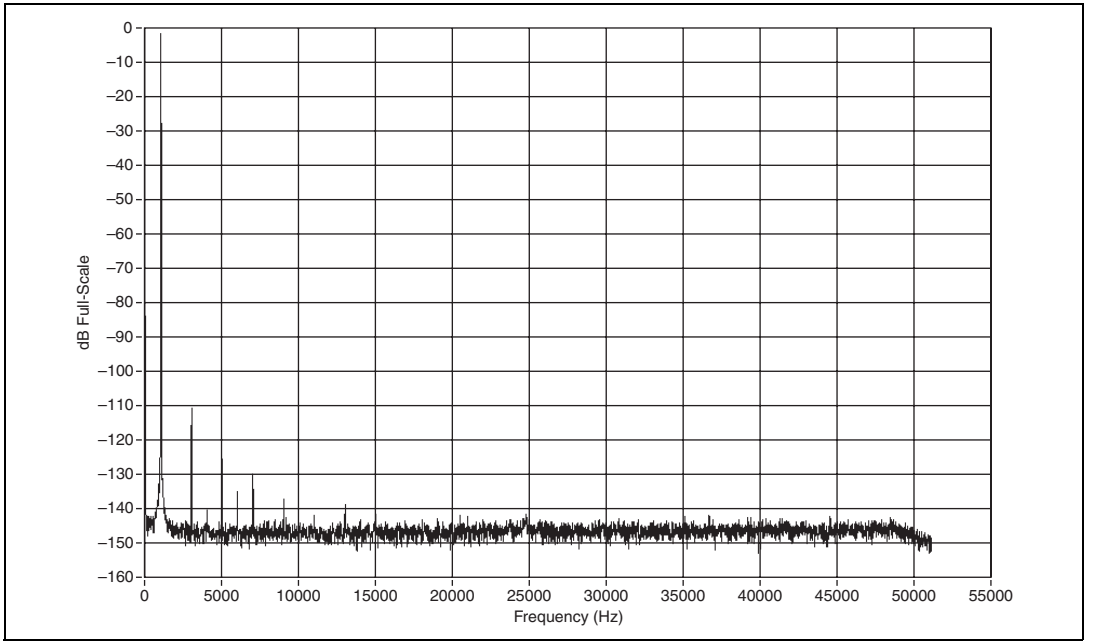


**Figure 5.** SFDR 102.4 kS/s (–1 dBFS, 0 dB Gain)

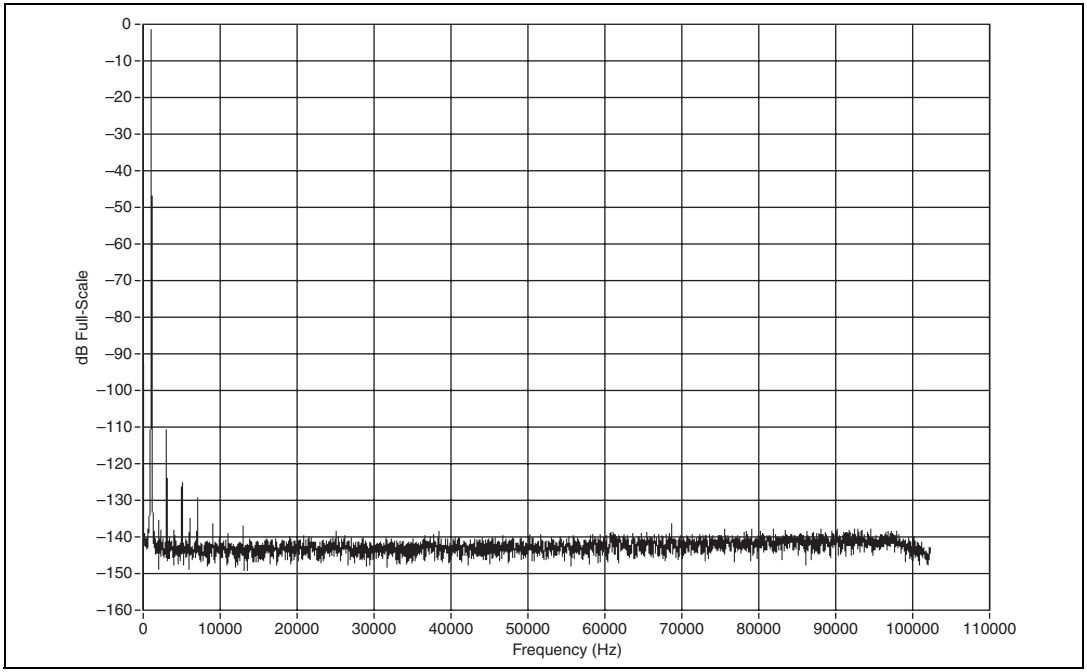


**Figure 6.** SFDR 204.8 kS/s (–1 dBFS, 0 dB Gain)

## AI Dynamic range

| Gain Setting (dB) | Minimum Dynamic Range (dBFS)[1] | | |
|---|---|---|---|
| | **1 kS/s ≤ $f_s$ ≤ 51.2 kS/s** | **51.2 kS/s < $f_s$ ≤ 102.4 kS/s** | **102.4 kS/s < $f_s$ ≤ 204.8 kS/s** |
| 30 | 105 | 102 | 97 |
| 20 | 112 | 109 | 105 |
| 10 | 115 | 112 | 107 |
| 0 | 116 | 113 | 107 |
| –10 | 107 | 105 | 102 |
| –20 | 114 | 111 | 107 |

[1] 1 kHz input tone, –60 dBFS input amplitude

## AI Total Harmonic Distortion (THD), Balanced Source

| Gain (dB) | Typical THD (dBc)[1, 2] | |
|---|---|---|
| | 20 Hz to 20 kHz | 20 Hz to 92.2 kHz |
| 30 | –100 | –97 |
| 20 | –109 | –106 |
| 0, 10 | –107 | –104 |
| –10 | –108 | –107 |
| –20 | –107 | –106 |

[1] $f_s$ = 204.8 kS/s, 92.8 kHz BW, differential configuration
[2] Input amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$

## AI THD, Unbalanced Source

| Gain (dB) | Typical THD (dBc)[1, 2] | |
|---|---|---|
| | 20 Hz to 20 kHz | 20 Hz to 92.2 kHz |
| 30 | –100 | –93 |
| 20 | –106 | –94 |
| 10 | –105 | –92 |
| 0 | –97 | –87 |
| –10 | –90 | –88 |
| –20 | –91 | –89 |

[1] $f_s$ = 204.8 kS/s, 92.8 kHz BW
[2] Input amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$

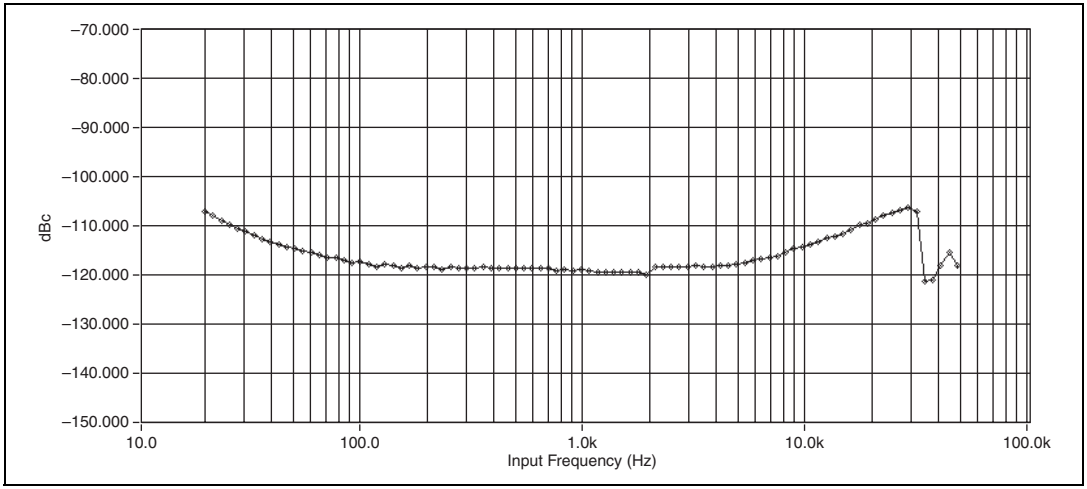


**Figure 7.** AI THD (Balanced Source with Differential Configuration, 204.8 kS/s, 0 dB Gain)

## AI Total Harmonic Distortion Plus Noise (THD+N), Balanced Source

| Gain (dB) | Typical THD+N (dBc)[1] | |
|---|---|---|
| | 51.2 kS/s<br>20 Hz to 20 kHz[2] | 204.8 kS/s<br>20 Hz to 92.2 kHz[3] |
| 30 | –103 | –94 |
| 20 | –107 | –95 |
| 10 | –108 | –96 |
| 0 | –107 | –96 |
| –10 | –96 | –91 |
| –20 | –94 | –88 |

[1] Input amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$, differential configuration
[2] 23.2 kHz measurement BW
[3] 92.8 kHz measurement BW

## AI THD+N, Unbalanced Source

| Gain (dB) | Typical THD + N (dBc)[1] | |
|---|---|---|
| | 51.2 kS/s<br>20 Hz to 20 kHz[2] | 204.8 kS/s<br>20 Hz to 92.2 kHz[3] |
| 30 | –103 | –91 |
| 20 | –107 | –93 |
| 10 | –108 | –91 |
| 0 | –104 | –87 |
| –10 | –94 | –86 |
| –20 | –93 | –86 |

[1] Input amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$
[2] 23.2 kHz measurement BW
[3] 92.8 kHz measurement BW

## AI Intermodulation Distortion (IMD)

| Gain (dB) | Typical IMD (dBc)[1] |
|---|---|
| 20, 30 | –109 |
| 10 | –107 |
| 0 | –104 |
| –20, –10 | –111 |

[1] CCIF 14 kHz + 15 kHz, each tone amplitude is the lesser of –6 dBFS or 5 $V_{pk}$

## Crosstalk (Input Channel Separation)

| Gain (dB) | Typical Crosstalk (dBc)[1, 2] | |
|---|---|---|
| | 1 kHz Signal | 92.2 kHz |
| 30 | –130 | –110 |
| 20 | –138 | –114 |
| 10 | –135 | –114 |
| 0 | –131 | –109 |
| –20, –10 | –98 | –65 |

[1] Source impedance ≤ 50 Ω
[2] Input amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$

## Crosstalk (Output to Input Channel Separation)

| Gain (dB) | Typical Crosstalk (dBc)[1, 2] | |
|---|---|---|
| | 1 kHz Signal | 92.2 kHz |
| 30 | –151 | –118 |
| 20 | –150 | –118 |
| 10 | –144 | –115 |
| 0 | –137 | –111 |
| –20, –10 | –87 | –51 |

[1] Source impedance ≤ 50 Ω
[2] Output amplitude is the lesser of –1 dBFS or 8.91 $V_{pk}$

## AI Interchannel Gain Mismatch

| Gain (dB) | Typical Mismatch (dB)[1] | |
|---|---|---|
| | 20 Hz to 20 kHz | 20 Hz to 92.2 kHz |
| 0, 10, 20, 30 | ±0.01 | ±0.01 |
| –20, –10 | ±0.10 | ±0.20 |

[1] Identical channel configurations

## AI Interchannel Phase Mismatch

| Gain (dB) | Typical Mismatch (deg)[1] | |
|---|---|---|
| | 20 Hz to 20 kHz | 20 kHz to 92.2 kHz |
| 30 | ±0.10 | ±0.20 |
| 0, 10, 20 | ±0.10 | ±0.10 |
| –20, –10 | ±0.10 | ±1.50 |

[1] Identical channel configurations

## AI Phase Linearity

| Gain (dB) | Typical Linearity (deg) | |
|---|---|---|
| | 20 Hz to 20 kHz | 20 Hz to 92.2 kHz |
| 30 | ±0.20 | ±0.60 |
| 0, 10, 20 | ±0.10 | ±0.60 |
| –10 | ±0.20 | ±2.90 |
| –20 | ±0.20 | ±3.10 |

## Onboard Calibration Reference

DC level ..... 5.000 V ±2.5 mV

Temperature Coefficient ..... ±5 ppm/°C max

Long-term stability ..... ±15 ppm/$\sqrt{1000\ \text{hr}}$

## Integrated Electronic Piezoelectric (IEPE)

Current ..... 0 to 20 mA ±5%, 20 µA resolution, each channel independently software selectable

Compliance ..... 24 V min

Channel input impedance with IEPE enabled ..... 1 MΩ ‖ 240 pF typical, pseudodifferential

Current noise ..... <300 pA/$\sqrt{\text{Hz}}$ typical

# Analog Output

This section lists the NI PXI-4461 analog output specifications.

## Output Characteristics

Number of output channels ..... 2, simultaneously sampled

Output configuration ..... Differential or pseudodifferential (50 Ω to chassis ground on shield), each channel independently software selectable

DAC Resolution ..... 24 bits

DAC type ..... Delta-sigma

Update rates ($f_s$) ..... 1 kS/s to 204.8 kS/s in 181.9 μS/s increments

Oversampling, for update rate

- 1.0 kS/s ≤ $f_s$ < 1.6 kS/s ..... 8192 $f_s$
- 1.6 kS/s ≤ $f_s$ < 3.2 kS/s ..... 4096 $f_s$
- 3.2 kS/s ≤ $f_s$ < 6.4 kS/s ..... 2048 $f_s$
- 6.4 kS/s ≤ $f_s$ < 12.8 kS/s ..... 1024 $f_s$
- 12.8 kS/s ≤ $f_s$ < 25.6 kS/s ..... 512 $f_s$
- 25.6 kS/s ≤ $f_s$ < 51.2 kS/s ..... 256 $f_s$
- 51.2 kS/s ≤ $f_s$ < 102.4 kS/s ..... 128 $f_s$
- 102.4 kS/s ≤ $f_s$ ≤ 204.8 kS/s ..... 64 $f_s$

FIFO buffer size ..... 1,023 samples

Data transfers ..... DMA

## Output Signal Range

| Attenuation (dB) | Full Scale Range ($V_{pk}$)[1] |
|---|---|
| 40 | ±0.1 |
| 20 | ±1.0 |
| 0 | ±10.0 |

[1] Each output channel is independently software selectable

# Transfer Characteristics

## AO Offset (Residual DC)

| Attenuation (dB) | Maximum Offset, 24 Hr, $T_{cal}$ ±5 °C (±mV) | Maximum Offset, 0 °C to 55 °C (±mV) |
|---|---|---|
| 20, 40 | 1 | 2 |
| 0 | 1 | 10 |

## Gain (Amplitude Accuracy)

Specifications valid at any attenuation setting with a 1 kHz output signal.

$T_{cal}$ ±5 °C.....±0.04 dB max

0 °C to 55 °C .....±0.1 dB max

# Voltage Output

Output coupling .....DC

Short circuit protection .....Indefinite protection between positive and negative

Minimum working load .....600 Ω

## Typical Output Impedance

| Output Impedance | Differential Configuration | Pseudodifferential Configuration |
|---|---|---|
| Between positive output and chassis ground | 2.4 kΩ | 70 Ω |
| Between negative output and chassis ground | 2.4 kΩ | 50 Ω |
| Between positive and negative outputs | 22 Ω | 22 Ω |

## Dynamic Characteristics[1]

Image rejection ..... 75 dB min < 768 kHz
66 dB min > 768 kHz

–3 dB BW ..... 0.487 $f_s$

## AO Flatness

All attenuation settings relative to 1 kHz

20 Hz to 20 kHz ..... ±0.008 dB max

20 Hz to 92.1 kHz ..... ±0.1 dB max

## AO Idle Channel Noise

| Attenuation (dB) | Maximum Idle Channel Noise | | | | | |
|---|---|---|---|---|---|---|
| | 102.5 kS/s (30 kHz BW) | | 204.8 kS/s (80 kHz BW) | | 204.8 kS/s (500 kHz BW) | |
| | $dBV_{rms}$ | $\mu V_{rms}$ | $dBV_{rms}$ | $\mu V_{rms}$ | $dBV_{rms}$ | $\mu V_{rms}$ |
| 40 | –106 | 5 | –101 | 9 | –87 | 45 |
| 20 | –106 | 5 | –101 | 9 | –86 | 50 |
| 0 | –96 | 16 | –93 | 22 | –73 | 224 |

## AO Spurious Free Dynamic Range (SFDR)

| Attenuation (dB) | Typical SFDR (dBc)[1, 2] |
|---|---|
| 40 | 87 |
| 20 | 94 |
| 0 | 98 |

[1] $f_s$ = 204.8 kS/s
[2] 1 kHz output frequency, –1 dBFS output amplitude

[1] Test system equipped with a liquid crystal display (LCD) monitor for AI noise and distortion measurements to avoid possible magnetic interference caused by cathode ray tube (CRT)-based monitors.

## AO Dynamic Range

| Attenuation (dB) | Minimum Dynamic Range (dBFS)[1] | | |
|---|---|---|---|
| | 102.5 kS/s (30 kHz BW) | 204.8 kS/s (80 kHz BW) | 204.8 kS/s (500 kHz BW) |
| 40 | 84 | 79 | 65 |
| 20 | 103 | 97 | 83 |
| 0 | 114 | 110 | 91 |

[1] 1 kHz output frequency

## AO Total Harmonic Distortion (THD)

| Attenuation (dB) | Typical THD (dBc)[1] | | |
|---|---|---|---|
| | 102.5 kS/s 20 Hz to 20 kHz[2] | 204.8 kS/s 20 Hz to 20 kHz[3] | 204.8 kS/s 20 Hz to 92.1 kHz[3] |
| 40 | –99 | –92 | –92 |
| 20 | –98 | –95 | –93 |
| 0 | –97 | –94 | –86 |

[1] –1 dBFS output amplitude
[2] 30 kHz measurement BW
[3] 92.8 kHz measurement BW

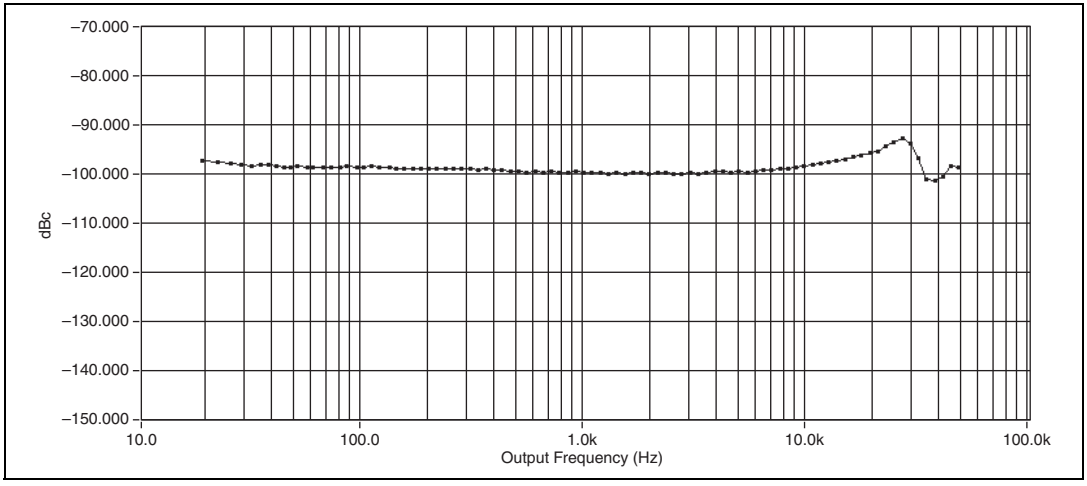


**Figure 8.** AO THD (204.8 kS/s, 0 dB Gain, 65,536 Samples)

## AO Total Harmonic Distortion Plus Noise (THD+N)

| Attenuation (dB) | Typical THD + N (dBc)[1] | | |
|---|---|---|---|
| | 102.5 kS/s 20 Hz to 20 kHz[2] | 204.8 kS/s 20 Hz to 80 kHz[3] | 204.8 kS/s 20 Hz to 92.1 kHz[4] |
| 40 | –83 | –77 | –63 |
| 20 | –98 | –92 | –79 |
| 0 | –99 | –89 | –68 |

[1] –1 dBFS output amplitude
[2] 30 kHz measurement BW
[3] 80 kHz measurement BW
[4] 500 kHz measurement BW

## AO Intermodulation Distortion (IMD)

| Attenuation (dB) | Typical IMD (dBc)[1] |
|---|---|
| 40 | –99 |
| 20 | –104 |
| 0 | –104 |

[1] CCIF 14 kHz + 15 kHz, each tone amplitude is –6 dBFS

## Crosstalk (Output Channel Separation)

No measurable crosstalk

## AO Interchannel Gain Mismatch

All attenuation settings

20 Hz to 92.1 kHz ..... ±0.01 dB

## AO Interchannel Phase Mismatch

All attenuation settings

20 Hz to 20 kHz ..... ±0.1° typical

20 Hz to 92.1 kHz ..... ±0.2° typical

### AO Phase Linearity

| Attenuation (dB) | Typical Linearity (deg) | |
|---|---|---|
| | 20 Hz to 20 kHz | 20 Hz to 92.1 kHz |
| 0 | ±0.1 | ±1.7 |
| 20 | ±0.1 | ±1.6 |
| 40 | ±0.1 | ±1.8 |

## Internal Frequency Timebase Characteristics

Accuracy .....±20 ppm, 0 °C to 70 °C

Aging .....8 ppm in first year
18 ppm after 10 years

## Triggers

Analog Trigger

- Purpose .....Start trigger
- Source .....AI0 or AI1
- Level .....Full scale, programmable
- Slope .....Positive (rising) or negative (falling), software selectable
- Resolution .....24 bits
- Hysteresis .....Programmable

Digital Trigger

- Purpose .....Start or reference trigger
- Source .....PFI0, PXI_Trig<0..6>
- Compatibility .....Transistor-transistor logic (TTL)
- Polarity .....Rising or falling edge
- Minimum pulse width.....10 ns

### Bus Interface

Type .....PXI master/slave

## Power Requirements

| Voltage | Typical | Max |
|---|---|---|
| +5 V | 990 mA | 1,600 mA |
| +3.3 V | 1,430 mA | 1,720 mA |
| +12 V | 170 mA | 300 mA |
| –12 V | 110 mA | 170 mA |

## Physical

Dimensions
(not including connectors) ..... 16 cm × 10 cm (6.3 in. × 3.9 in.)
3U CompactPCI slot

Analog I/O connectors ..... BNC female

Digital trigger connector ..... SMB male

## Environmental

### Operating Environment

Ambient temperature range..... 0 °C to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range ..... 10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Altitude..... 2,000 m (at 25 °C ambient temperature)

Pollution Degree (indoor use only)..... 2

### Storage Environment

Ambient temperature range..... –20 °C to 70 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range ..... 5% to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

## Shock and Vibration

Operational shock ..... 30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)

Random vibration

- Operating ..... 5 Hz to 500 Hz, 0.3 $g_{rms}$
- Nonoperating ..... 5 Hz to 500 Hz, 2.4 $g_{rms}$ (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

# Calibration

Self-calibration ..... On software command, the device computes gain and offset corrections relative to high-precision internal reference.

- Interval ..... Recommended whenever ambient temperature differs from $T_{cal}$ by more than ±5 °C

External calibration interval ..... 1 year

Warm-up time ..... 15 min

# General Specifications

Installation Category ..... I

## Safety

The NI PXI-4461 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 3111-1, UL 61010B-1
- CAN/CSA C22.2 No. 1010.1

**Note** For UL and other safety certifications, refer to the product label, or visit `ni.com/hardref.nsf`, search by model number or product line, and click the appropriate link in the Certification column.

## Electromagnetic Compatibility

Emissions ..... EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity ..... EN 61326:1997 + A2:2001, Table 1

CE, C-Tick, and FCC Part 15 (Class A) Compliant

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

## CE Compliance

The NI PXI-4461 meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety) ..... 73/23/EEC

Electromagnetic Compatibility
Directive (EMC) ..... 89/336/EEC

**Note** Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/hardref.nsf`, search by model number or product line, and click the appropriate link in the Certification column.

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