

NI 449x Specifications

Français Deutsch 日本語 한국어 简体中文 ni.com/manuals

This document lists specifications for the NI 4495, NI 4496, and NI 4498 Dynamic Signal Acquisition (DSA) analog input devices. These specifications are typical at 25 °C unless otherwise stated. The operating range for the NI 449x is 0 to 55 °C. All specifications are subject to change without notice. Visit ni.com/manuals for the most current specifications and product documentation.

Input Characteristics

Number of channels	16, simultaneously sampled
Input configuration	Pseudodifferential (50 Ω between negative input and chassis ground)
Input coupling	
DC	NI 4495
AC	NI 4496/4498
A/D converter (ADC) resolution	24 bits
ADC type	Delta-sigma
Sample rates (f_s), samples-per-second (S/s)	100 S/s to 204.8 kS/s in 181.9 μS/s increments, maximum
FIFO buffer size	4,095 samples
Data transfers	Direct memory access (DMA)

Maximum Working Voltage

Input	Voltage (V_{pk})*
Positive terminal	±10
Negative terminal	±1
* Voltages with respect to chassis ground	

Overvoltage Protection

Input	Voltage (V_{pk})*
Positive terminal	±30
Negative terminal	±5
* Voltages with respect to chassis ground	

Signal Range

Gain (dB)*	Full-Scale Range (V_{pk}) ^{†,‡}
30	±0.316
20	±1.00
10	±3.16
0	±10.0
* NI 4495/4496 gain is 0 and 20 dB only. [†] Each input channel gain is independently software selectable. [‡] Voltages on the positive terminal with respect to the negative terminal.	

Transfer Characteristics

Offset (residual DC) ¹	±2 mV max
Gain amplitude accuracy	
1 kHz input tone ¹	0.1 dB max
¹ Temperature within 5 °C from last self-calibration.	

Amplifier Characteristics

Impedance

Terminal	Input Impedance
Between positive input and negative input	10 M Ω 35 pF, DC-coupled (4495) 10 M Ω 35 pF, AC-coupled (4496/4498)
Between negative input and chassis ground	50 Ω

Common-Mode Rejection Ratio (CMRR)

Input frequency < 20 kHz¹40 dB

¹ Using the Infiniband 4x to 8 BNC cable assembly.

Dynamic Characteristics

Bandwidth and Alias Rejection

Specification	Low-Frequency Alias Rejection Enabled	Low-Frequency Alias Rejection Disabled (Default)
Alias-free bandwidth (BW) (passband)	DC to 0.4 f_s	DC to 0.4535 f_s
Alias rejection, minimum	104 dBc	120 dBc
-3 dB BW	0.484 f_s	0.491 f_s

AC Coupling (NI 4496/4498)

-3 dB cutoff frequency0.5 Hz

-0.1 dB cutoff frequency3.3 Hz

ADC Filter Delay

Sample Rate (f_s)	Filter Delay (Samples)	
	Low-Frequency Alias Rejection Enabled	Low-Frequency Alias Rejection Disabled (Default)
100 S/s $\leq f_s \leq$ 200 S/s	32.12	N/A
200 S/s < $f_s \leq$ 400 S/s	32.24	
400 S/s < $f_s \leq$ 800 S/s	32.48	
800 S/s < $f_s <$ 1.0 kS/s	32.97	
1.0 kS/s $\leq f_s \leq$ 1.6 kS/s	32.97	63
1.6 kS/s < $f_s \leq$ 3.2 kS/s	33.94	
3.2 kS/s < $f_s \leq$ 6.4 kS/s	35.88	
6.4 kS/s < $f_s \leq$ 12.8 kS/s	39.75	
12.8 kS/s < $f_s \leq$ 25.6 kS/s	47.5	
25.6 kS/s < $f_s \leq$ 204.8 kS/s	63	

Flatness

Frequency Band	20 Hz to 20 kHz	20 Hz to 45 kHz	20 Hz to 92.2 kHz
Flatness* (dB)	± 0.003	± 0.01	± 0.05

* Relative to 1 kHz

Spectral Noise Density

NI 4495/4496 input voltage

noise density 14 nV/ $\sqrt{\text{Hz}}$ at 20 dB gain, 1 kHz

NI 4498 input voltage

noise density 7 nV/ $\sqrt{\text{Hz}}$ at 30 dB gain, 1 kHz

Spurious Free Dynamic Range (SFDR)

NI 4495/4496 SFDR (dBc)^{1, 2, 3} 102

NI 4498 SFDR (dBc)^{1, 2, 3} 104

¹ $f_s = 204.8$ kS/s

² 1 kHz input tone, input amplitude is -1 dBFS.

³ Measurement includes all harmonics.

Dynamic Range (NI 4495/4496)

Gain (dB)	Dynamic Range (dBFS)*		
	51.2 kS/s	102.4 kS/s	204.8 kS/s
20	110	107	103
0	114	111	106

* 1 kHz input tone, unweighted. Input amplitude is -60 dBFS.

Dynamic Range (NI 4498)

Gain (dB)	Dynamic Range (dBFS)*		
	51.2 kS/s	102.4 kS/s	204.8 kS/s
30	106	103	100
20	112	109	105
0, 10	114	111	106

* 1 kHz input tone, unweighted. Input amplitude is -60 dBFS.

THD+N (NI 4495/4496)

Gain (dB)	THD+N (dBc)*	
	51.2 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 92.2 kHz‡
20	-94	-78
0	-98	-83

* Input amplitude is -1 dBFS.
 † 23.2 kHz measurement bandwidth
 ‡ 92.8 kHz measurement bandwidth

THD+N (NI 4498)

Gain (dB)	THD+N (dBc)*	
	51.2 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 92.2 kHz‡
30	-94	-79
0, 10, 20	-98	-86

* Input amplitude is -1 dBFS.
 † 23.2 kHz measurement bandwidth
 ‡ 92.8 kHz measurement bandwidth

Intermodulation Distortion (IMD)

Gain (dB)*	IMD (dBc)†
30	-98
0, 10, 20	-104

* NI 4495/4496 gain is 0 and 20 dB only.
 † CCIF 14 kHz + 15 kHz, each tone amplitude is -6 dBFS.

Crosstalk

Gain (dB)*	Crosstalk for Adjacent/ Nonadjacent Channels (dBc)†, ‡, **	
	1 kHz	92.2 kHz
30	-110/-110	-92/-96
0, 10, 20	-120/-120	-92/-110

* NI 4495/4496 gain is 0 and 20 dB only.
 † Source impedance ≤ 1 kΩ.
 ‡ Input amplitude is -1 dBFS.
 ** Using the Infiniband 4x to 8 BNC cable assembly.

Interchannel Gain Mismatch

Gain mismatch.....0.02 dB at 1 kHz

Interchannel Phase Mismatch

Phase mismatch.....0.01 deg at 1 kHz



Note All gain and phase mismatch specifications are for the same device and are not applicable between different NI 449x devices.

Phase Linearity

20 Hz to 20 kHz±0.01 deg

20 Hz to 92.2 kHz±0.3 deg

Onboard Calibration Reference

DC level.....5.000 V ±2.5 mV

Temperature coefficient±5 ppm/°C max

Long-term stability±15 ppm/√1,000 hr

IEPE Excitation NI 4496/4498)

Current.....0 or 4 mA, $\pm 10\%$
 each channel
 independently software
 selectable

Compliance.....24 V



Note Use the following equation to make sure that your configuration meets the IEPE compliance voltage range.

$$V_{\text{common-mode}} + V_{\text{bias}} \pm V_{\text{full-scale}} \text{ must be 1 to 24 V,}$$

where

$V_{\text{common-mode}}$ is the common-mode voltage seen by the input channel,

V_{bias} is the DC bias voltage of the sensor, and

$V_{\text{full-scale}}$ is the AC full-scale voltage of the sensor.

IEPE open Software readable¹

IEPE short Software readable¹

Channel input impedance
 with IEPE enabled > 250 k Ω at 1 kHz

Current noise 20 pA/ $\sqrt{\text{Hz}}$

¹ NI-DAQmx 8.6 or later.

Transducer Electronic Data Sheet (TEDS) Support

The NI 4496/4498 inputs support Transducer Electronic Data Sheet (TEDS) according to the IEEE 1451 Standard.

For more information about TEDS, go to ni.com/info and enter the info code `rdteds`.

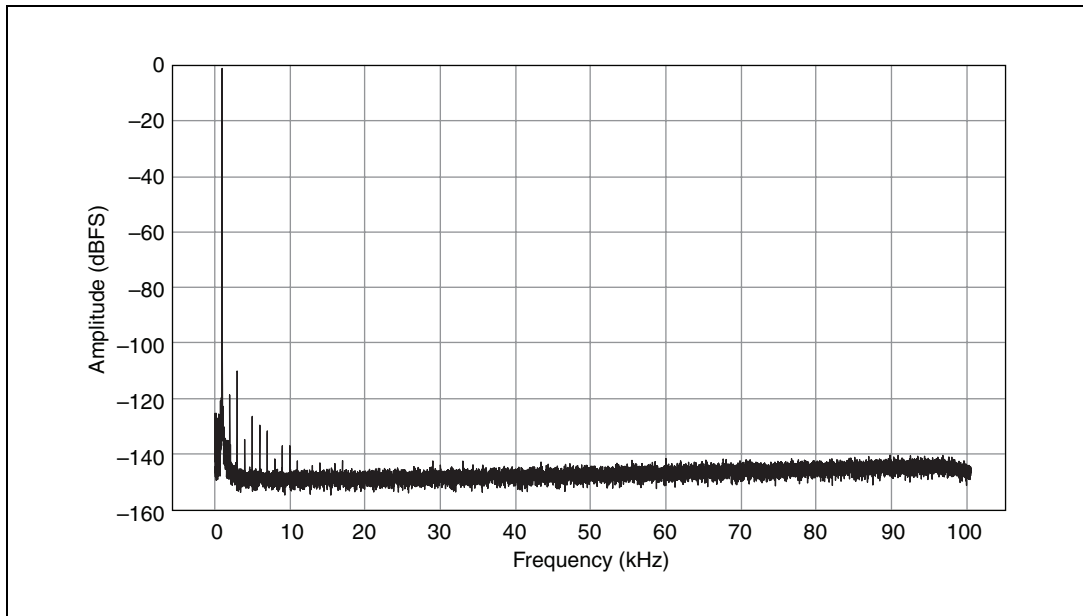


Figure 1. FFT of -1 dBFS, 1 kHz Tone Acquired at 204.8 kS/s and 0 dB Gain using the NI 4498. 65,536 Samples with 10 RMS Averages using the 7-Term Blackman-Harris Window. Source: Krohn-Hite, Model 4402B.

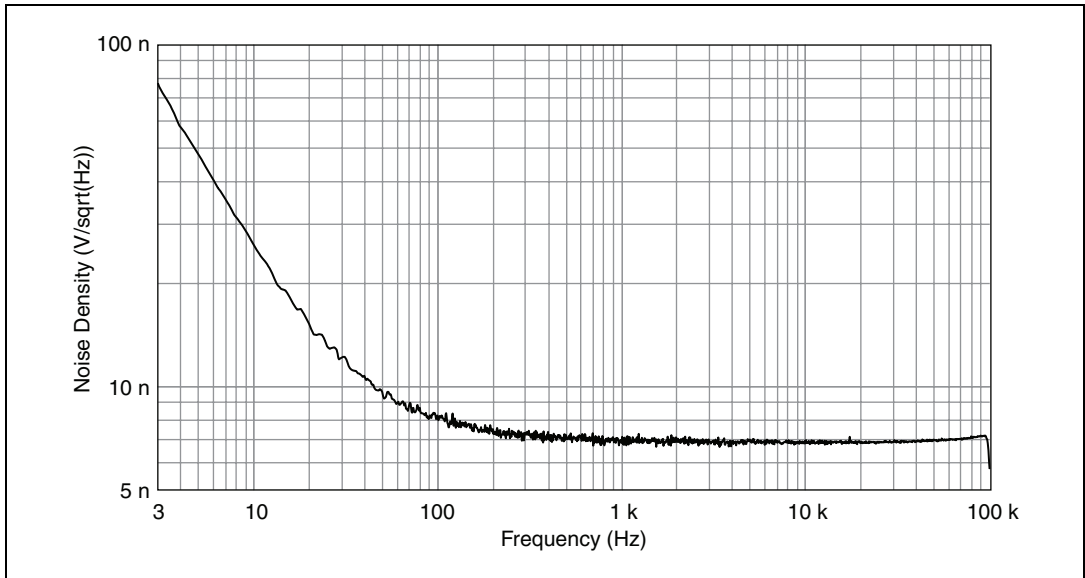


Figure 2. 30 dB Gain Spectral Noise Density of the NI 4498 with 50 Ω at Input

Internal Frequency Timebase Characteristics

Accuracy ±30 ppm max, over operating temperature range
 Aging 5 ppm max/year

Triggers

Analog trigger

Purpose Start or reference trigger
 Source Any AI
 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 (5 V TTL)
 Polarity Rising or falling edge
 Minimum pulse width 100 ns

General Specifications

Bus Interface

PXI 3.3 V or 5 V signal environment
 PXIe 3.3 V diff signal environment
 DMA channels 1

Synchronization

PXI CLK_10
 PXIe CLK_10

Power Requirements

Voltage	PXIe NI 4496	PXIe NI 4498
+3.3 V	2 A	2 A
+12 V	0.81	0.93

Voltage	PXI NI 4495	PXI NI 4496	PXI NI 4498
+5 V	0.8 A	1.4 A	1.7 A
+3.3 V	1.7 A	1.7 A	1.7 A
+12 V	0.4 A	0.4 A	0.4 A
-12 V	0.1 A	0.1 A	0.1 A

Physical

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

Analog I/O connectors..... Infiniband 4x

Digital trigger connector (PFI 0)SMB

Weight

PXI 326 g (11.5 oz)

PXIe 323 g (11.4 oz)

Measurement Category¹ I

¹ *Measurement Category* is also referred to as *Installation Category*.



Caution Do *not* use the NI 449x for connections to signals or for measurements within Categories II, III, or IV.

Environmental

Operating Environment

Ambient temperature range 0 to 55 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)
0 to 45 °C when installed in an NI PXI-1000B DC chassis.

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 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 to 500 Hz, 0.3 g_{rms}

Nonoperating 5 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.

Self-calibration interval Recommended whenever ambient temperature differs from T_{cal} by more than ±5 °C

External calibration interval 1 year

Warm-up time 15 minutes

Safety

This product meets 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.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



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



Note For EMC compliance, operate this product according to the documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

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

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 model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and 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 the 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.

电子信息产品污染控制管理办法（中国 RoHS）



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