

## Analog Discovery Pro (ADP2230) Datasheet

Mixed Signal Oscilloscope (MSO) for Professional Engineers



### Highlighted Features

- USB-based Mixed Signal Oscilloscope
- BNC connectors and an aluminum case
- Two analog inputs – 50+ MHz bandwidth
- One analog output – 15 MHz bandwidth
- 16 digital input/output channels
- Sample rates up to 125 MS/s
- Two power supply outputs
- Deep memory buffers for long acquisitions
- Sync multiple devices for increased channel count
- Extensive software support with WaveForms, WaveForms SDK, LabVIEW, MATLAB

## Overview

The Analog Discovery Pro (ADP2230)<sup>™</sup> is a mixed signal oscilloscope (MSO) designed for professional engineers. It features analog inputs, analog output, and digital I/O, all operating at up to 125 MS/s. Users can both receive and generate digital signals to test and analyze data from various devices while simultaneously powering those systems with its robust power supply. The feature-packed design allows the ADP2230 to perform the functions of several test and measurement devices and can replace a stack of traditional instruments.

With the free WaveForms software, users can view and capture complex data, perform spectral and network analysis, and quickly retrieve large amounts of data. WaveForms leverages the ADP2230's deep buffer memory, allowing hundreds of millions of samples to be stored and streamed back to the host computer. WaveForms' friendly user interface has the feel of traditional benchtop oscilloscopes.

The ADP2230 is part of the Digilent Analog Discovery Pro family of Test and Measurement devices that empower engineers, researchers, educators, and scientists to design and test with unparalleled flexibility. These customizable solutions cater to both seasoned professionals and emerging engineers, accelerating development while maintaining a low barrier to entry.

# 1 Features

## Analog Inputs

- Two BNC input channels with 14-bit resolution with up to  $\pm 25$  V input range
- 50+ MHz bandwidth, up to 125 MS/s per channel
- On-device buffering of 64 MS per channel by default, up to 128 MS per channel

## Analog Output

- One BNC output channel with 14-bit resolution,  $\pm 5$  V output range
- 15 MHz bandwidth, up to 125 MS/s per channel

## Digital I/O

- 16 dynamically configurable 3.3 V CMOS digital input/output channels
- Up to 125 MS/s per channel
- On-device buffering up to 128 MS per channel

## Power Supplies

- Two programmable power supplies (0.5 V to 5 V, -0.5 V to -5 V)
- Up to 1 A or 3 W per channel
- Integrated hardware readback of system temperature, voltage rail outputs, and sourced current

## Additional Features

- Adjustable system clock frequency and external clocking
- USB 3.0 support for rapid data streaming
- Advanced triggering and cross triggering between instruments and devices, including Dual Mode support
- Internal hardware loopbacks allow for both the recapture of analog outputs and the output of filtered and unfiltered analog input signals
- Optional standard waveform generator control over the two programmable power supplies

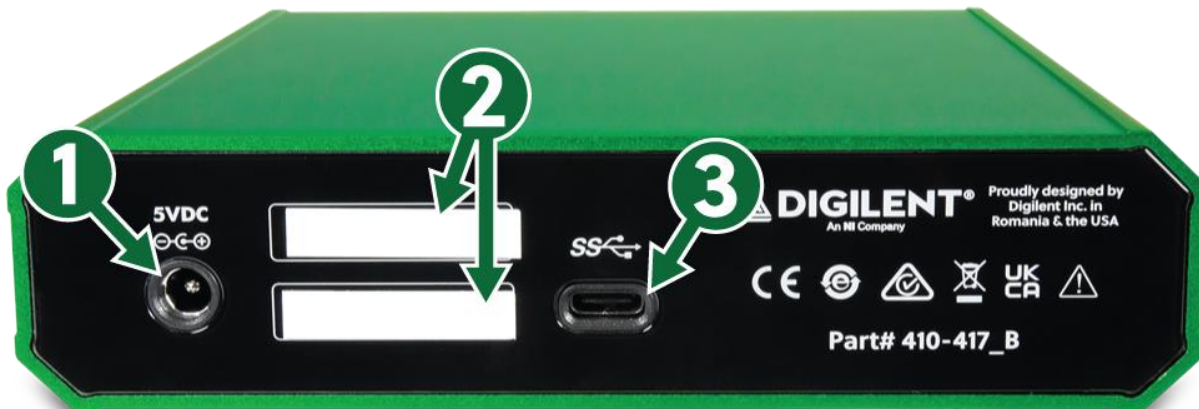
## Software Support

- WaveForms, Digilent's free software application for Windows, Mac, and Linux
- WaveForms SDK for custom applications and scripting through C/C++, Python, C#, Visual Basic
- LabVIEW and MATLAB support

## Callout Diagrams



1. Two BNC connectors for analog input channels
2. One BNC connector for analog output channel
3. MTE cable connector for 16 digital input/output channels, power supplies, triggers, and ground connections
4. Power indicator LED



1. Barrel jack for supplementary power supply (optional depending on USB power available)
2. Stickers for device serial number and registration number
3. USB-C connector for host computer connectivity

## 2 WaveForms Software

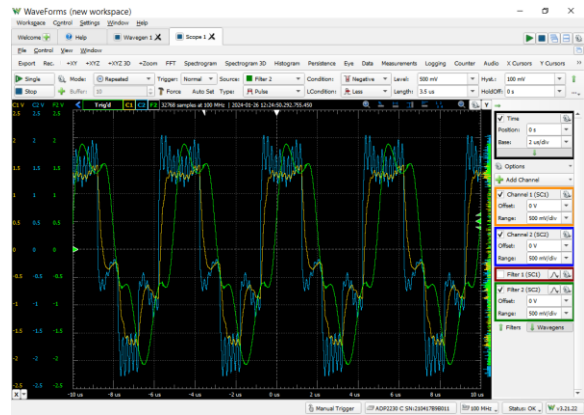
Digilent's WaveForms software offers a unified device experience across all our Test and Measurement devices, enabling use of all hardware features and instruments. It features a friendly user interface that has the feel of traditional benchtop devices. WaveForms makes it easy to acquire, visualize, store, analyze, produce, and reuse both analog and digital signals simultaneously.

For even more customization potential, the WaveForms Software Development Kit (SDK) can be used to create custom applications and scripts to control the T&M device in Python, C, and additional languages.

WaveForms is Windows, Mac, and Linux compatible.

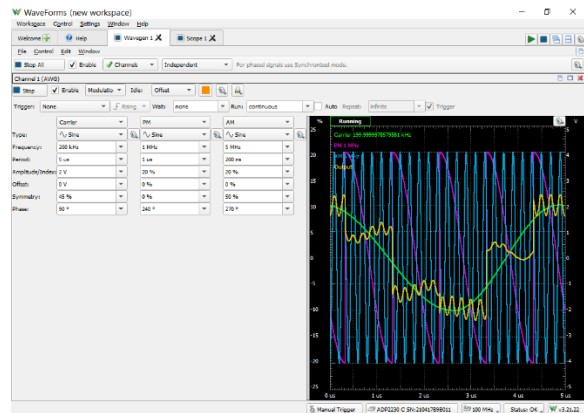
### 2.1 Oscilloscope

The Oscilloscope instrument captures analog input data via the analog input scope channels. When this instrument is used, the ADP2230's analog input channels act as a two-channel, 14-bit, 125 MS/s oscilloscope. Multiple sample and triggering modes are supported.



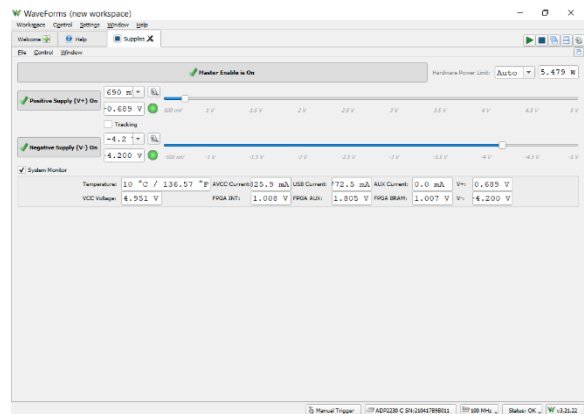
### 2.2 Waveform Generator

The Waveform Generator instrument can output analog voltage waveforms. The instrument supports everything from simple waveforms like Sine and Triangle waves, up to more complicated functions like AM and FM modulation. Custom sets of samples can be defined by the user in applications like Excel and imported to WaveForms.



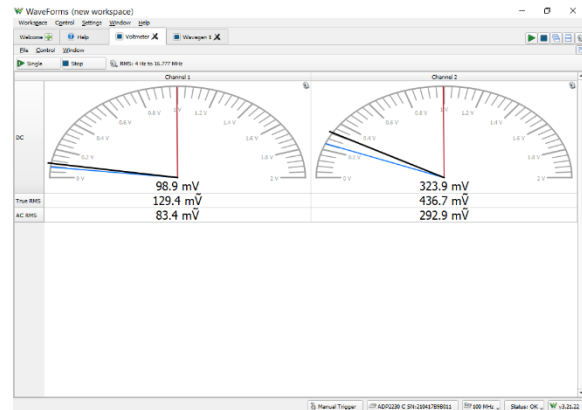
### 2.3 Power Supplies

The ADP2230 has two variable power supply rails that can be used to power circuits under test at up to 3 W per channel. These rails can be set to voltage levels between 0.5 V to 5 V and -0.5 V to -5 V.



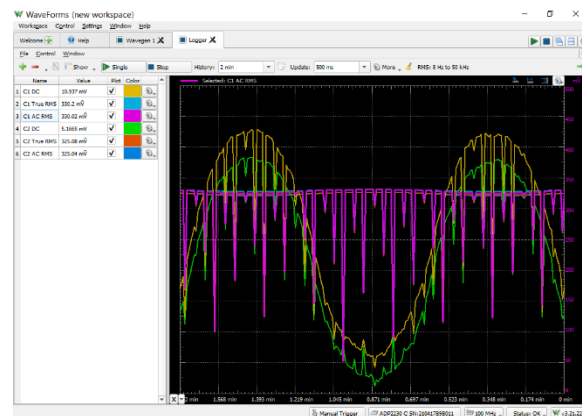
## 2.4 Voltmeter

The ADP2230's analog input pins can be used with WaveForms' Voltmeter instrument to act as a simple voltmeter. DC voltages, AC RMS voltages, and True RMS voltages can be viewed for each of the two Scope channels.



## 2.5 Data Logger

The Data Logger instrument can capture large buffers of analog input data on the Scope pins. The Data Logger can capture buffers of data at update rates of up to 10 samples per second. The maximum duration of a log is dependent on the update rate, but at the extreme, can run for over a thousand hours.

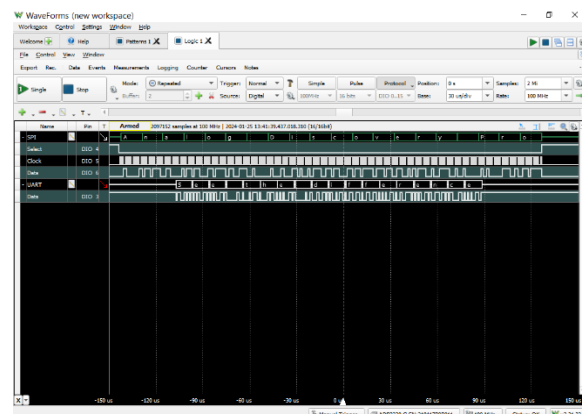


## 2.6 Logic Analyzer

With the Logic Analyzer, the 16 digital input/output channels are configured to capture high/low logic states. These channels are capable of interfacing with 3.3 V logic signals and are tolerant to voltages of up to 5V.

Individual input/output channels can be grouped as buses and protocols. Protocol groups can be used to view the decoded contents of packets of many common communications protocols, including SPI, I2C, UART, CAN, and I2S.

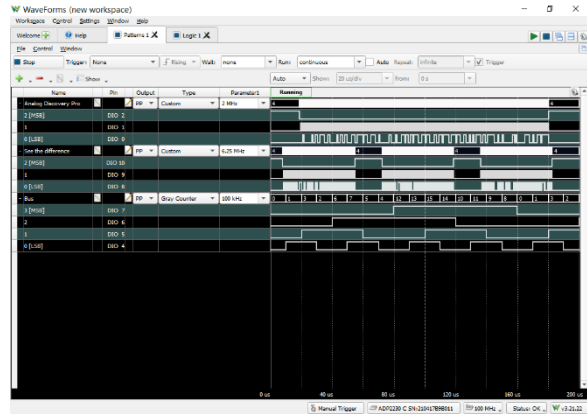
Signal states, decoded bus values, and decoded protocols can be used to trigger a Logic Analyzer capture. Protocol triggers include protocol-specific events, like start-of-transmission, end-of-transmission, or packet contents matching a user-specified value.



## 2.7 Pattern Generator

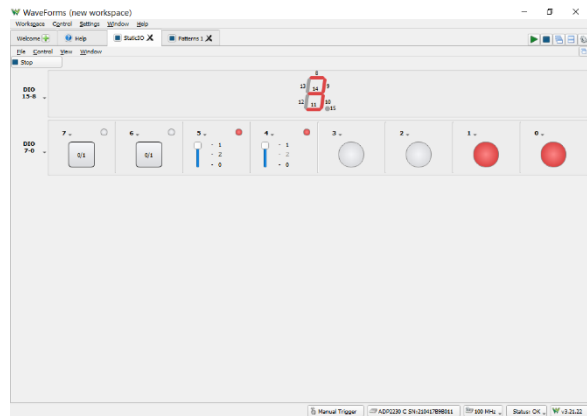
The Pattern Generator can generate logic signal sequences on the digital input/output pins. The pins can be configured to be push/pull, open drain, open source, or three-state logic. Sample rates can go as high as 125 MS/s.

Various patterns can be generated, including clocks, random signals, multiple counter types, and fully custom digital data. ROM logic can map digital input pins to digital outputs, using user-defined truth tables.



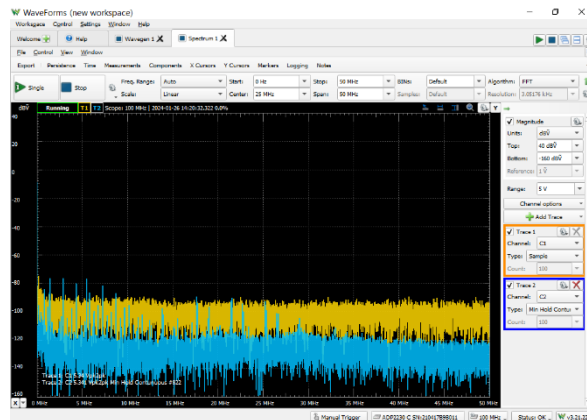
## 2.8 Static I/O

The Static I/O instrument can emulate a variety of user input/output devices on the digital input/output pins. Virtual LEDs, buttons, switches, sliders, and displays can be assigned to specific digital I/O pins and interacted with within the WaveForms user interface.



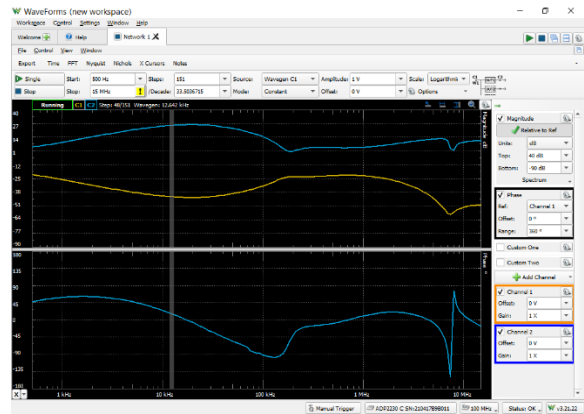
## 2.9 Spectrum Analyzer

The Spectrum Analyzer instrument is used to view the power of frequency-domain components of analog signals captured on the analog input channels. Cursors and automatic measurements include noise floor, SFDR, SNR, THD and more.



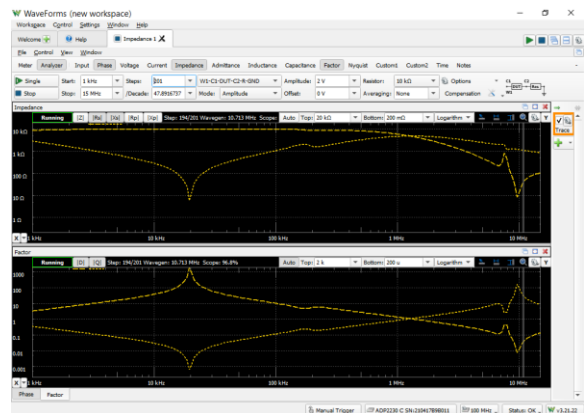
## 2.10 Network Analyzer

The Network Analyzer instrument can be used to view the amplitude and phase response of a circuit under test. Bode, Nichols, and Nyquist plots can also be viewed with this instrument. The Network Analyzer instrument uses the analog output and analog input channels of the ADP2230 to probe a test circuit, by generating a frequency sweep and measuring the circuit’s response. The Network Analyzer can be configured to use an external signal to provide input to the circuit under test, rather than using the analog output channels.



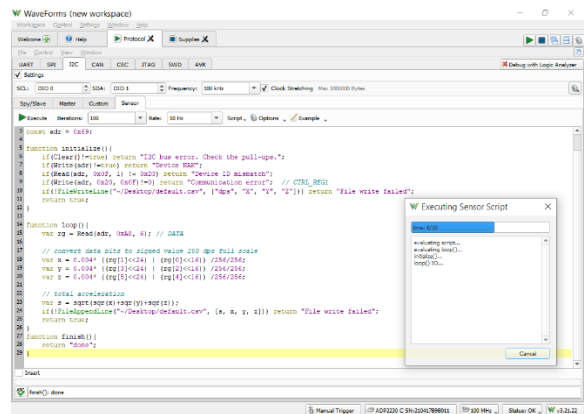
## 2.11 Impedance Analyzer

The Impedance Analyzer instrument is used to view a wide variety of frequency response characteristics of a circuit under test. Input, Phase, Voltage, Current, Impedance, Admittance, Inductance, Factor, and Nyquist plots are all available. In addition, Custom plots can be used to present the results of a wide variety of different mathematical operations on buffered data.



## 2.12 Protocol Analyzer

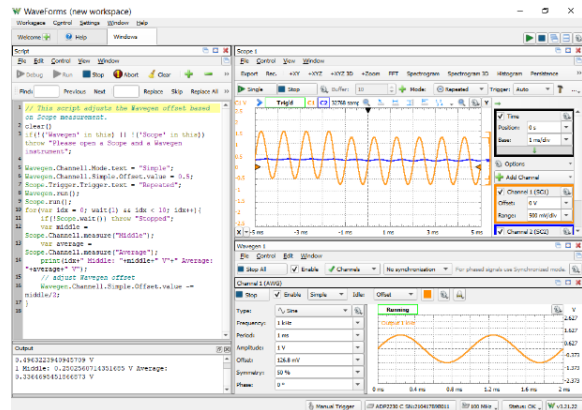
The Protocol Analyzer instrument generates and analyzes common communications protocols. UART, SPI, I2C, CAN, and various other kinds of transactions can be received, transmitted, and/or spied upon (depending on the protocol) by the ADP2230 using any of the digital input/output channels. Custom scripts can be written within the Protocol Analyzer instrument to generate sequences of SPI or I2C transactions.





## 2.13 WaveForms Script Editor

Each of WaveForms' instruments can be controlled through scripts within the WaveForms application itself. WaveForms' "Script" instrument allows the user to write and run JavaScript code that can control the rest of the application through an extensive API. This allows the user to configure and run many instruments at the same time, in an easily repeatable way.



## 3 Extended Software Support

Digilent has created packages for both MATLAB and LabVIEW to provide users with flexibility in the environment used for both data acquisition and subsequent analysis. Each offering provides a curated experience to let users that are more comfortable in different development environments still have access to all the power contained within the Analog Discovery Pro (ADP2230). Further customization and control of the ADP2230 can be done through Digilent's WaveForms SDK, letting users create their own applications in C/C++, Python, C#, and Visual Basic.

## 4 Analog Discovery Pro (ADP2230) Specifications

These specifications are typical unless otherwise stated and are valid following 30 minutes of warm-up at 25 °C unless otherwise noted. WaveForms was used to determine these specifications.

### 4.1 Mixed Signal Oscilloscope

#### Analog Input Channels

Supports the Oscilloscope, Voltmeter, Data Logger, Spectrum Analyzer, Network Analyzer, Impedance Analyzer, and Script Editor instruments.

#### Vertical System

<b>Number of Channels</b>	Two
<b>Input Type</b>	Single-ended
<b>Connector Type</b>	BNC
<b>Input Range</b>	±2.5 V with respect to ground (5 V peak-to-peak) ±25 V with respect to ground (50 V peak-to-peak)
<b>Resolution</b>	14 bits (16-bit with averaging), 14-bit noise <sup>1</sup>

<sup>1</sup> A separate small buffer to collect maximum and minimum samples when the sample rate is slower than the system frequency and is represented within WaveForms as noise.



<b>Absolute Resolution<sup>1</sup></b>	0.336 mV (scale $\leq 0.5$ V/div) 3.36 mV (scale $> 0.5$ V/div)
<b>Accuracy</b>	$\pm 10$ mV $\pm 0.5\%$ (scale $\leq 0.5$ V/div, $V_{inCM} = 0$ V) $\pm 100$ mV $\pm 0.5\%$ (scale $> 0.5$ V/div, $V_{inCM} = 0$ V)
<b>Bandwidth</b>	50+ MHz @ -3 dB <sup>2</sup>
<b>Input Impedance</b>	1 M $\Omega$    24 pF
<b>Input Coupling</b>	DC or AC
<b>Vertical Sensitivity (range)</b>	200 $\mu$ V/div to 5 V/div (10 divisions) <sup>3</sup>
<b>Acquisition Modes</b>	average, decimate, min/max, full scale, record <sup>4</sup>
<b>Additional Channels</b>	On-device FIR and IIR filters for both inputs <sup>5</sup> , on-device loopback for Wavegen and Supplies outputs
<b>Overvoltage Protection</b>	$\pm 50$ V <sub>DC</sub> or $\pm 30$ V <sub>RMS</sub>

### DC Offset Range

Range	Full Scale	Offset	Offset Accuracy
Low range ( $\leq 0.5$ V/div)	5 V peak-to-peak	$\pm 2.5$ V	$\pm 10$ mV $\pm 0.5\%$
High range ( $> 0.5$ V/div)	50 V peak-to-peak	$\pm 25$ V	$\pm 100$ mV $\pm 0.5\%$

### Horizontal System

<b>Maximum Sample Rate</b>	125 MS/s per channel
<b>Fine System Frequency Adjustment</b>	50 MHz to 125 MHz <sup>6</sup>
<b>Buffer Size</b>	Up to 128 MS <sup>7</sup> per channel in the default configuration. <sup>8,9</sup>
<b>Noise Buffer</b>	1,024 samples <sup>10</sup>

For longer acquisitions, Record mode allows streaming acquisition data into host computer RAM (up to 200 MS) or to a file on the host computer disk (theoretically unlimited) at potentially reduced rates. Achievable sample rates and recording lengths depend on various factors, including host computer specifications and USB activity.

**Note:** Memory sizes, including buffer sizes, specified in units like kS and MS, are rounded from equivalent binary power units, such as MiS. For example, a listed 64 MS is rounded from 64 MiS, which is 67,108,864 samples.

<sup>1</sup> Ideal values based on hardware design ranges of 5.5 V and 55 V. Actual values may vary slightly due to component variations and are accounted for during factory calibration. WaveForms only exposes nominal ranges of 5 V and 50 V.

<sup>2</sup> When using a probe with the appropriate frequency response.

<sup>3</sup> Divisions in this context are the ten horizontal strips in the Analog Input graph windows within WaveForms. Vertical sensitivity specifies the height of one strip in the plot.

<sup>4</sup> Up to 10 MHz for single channel acquisition.

<sup>5</sup> The FIR filter supports up to 16 coefficients. The IIR filter uses a 2x2x5 structure and can implement either 2nd/4th order low or high pass or 4th/8th order band pass/stop filters.

<sup>6</sup> Adjustable through the WaveForms Device Options. Shared with the Analog Output and Digital I/O.

<sup>7</sup> Up to 200 MS when a single channel is used.

<sup>8</sup> Buffer size is limited to 32,768 samples when supplied power is insufficient to run DDR memory.

<sup>9</sup> Different preset buffer sizes can be chosen based on device configuration within the WaveForms Device Manager. See the Device Configurations section of this document for more info.

<sup>10</sup> In DDR configurations. 2,048 samples in BRAM configuration. See the Device Configurations section of this document for more info.

## Digital Channels

Supports the Logic Analyzer, Pattern Generator, Static I/O, Protocol Analyzer, Oscilloscope, and Script Editor instruments.

### Vertical System

<b>Number of Channels</b>	16
<b>Connector</b>	100 mil 2×16 MTE Header
<b>Function Control</b>	Individually programmable as Digital I/O, Logic Analyzer, Pattern Generator, or Protocol
<b>Input Voltage</b>	0 V to 3.3 V (5 V tolerant)
<b>Input Type</b>	LVC MOS (3.3 V, 5 V tolerant)
<b>Input Logic Level</b>	Input Low Voltage, VIL, Min 0 V, Max 0.8 V Input High Voltage, VIH, Min 2.0 V, Max 5 V
<b>Output Type</b>	LVC MOS (3.3 V)
<b>Output Logic Level</b>	Output Low Voltage, VOL, Min 0 V, Max 0.5 V Output High Voltage, VOH, Min 2.4 V, Max 3.3 V
<b>Slew Rate</b>	Slow (default), Fast <sup>1</sup>
<b>Drive Strength</b>	4, 8 (default), 12, or 16 mA <sup>1</sup>
<b>Configurable Pull Resistors</b>	None (default), pull-up, pull-down, or keeper <sup>2</sup>
<b>Hardware Pull Resistors</b>	1 MΩ pull-down resistors
<b>Logic Analyzer Interpreters</b>	SPI, I2C, UART, CAN, I2S, 1-Wire, PS/2, HDMI CEC, Manchester codes, JTAG, GPIB, SWD, custom <sup>3</sup>
<b>Pattern Generator</b>	Constant, clock, pulse, random, number, Binary counter, Gray counter, Johnson counter, Decimal counter, walking 0/1, ROM Logic, custom <sup>3</sup>
<b>Custom Patterns File</b>	Import and export custom data as *.csv, *.txt or *.tdms file
<b>Channel-to-Channel Skew</b>	2 ns, typical
<b>Overvoltage Protection</b>	Short-circuit to ground, ±20 V

### Horizontal System

<b>Maximum Sampling Rate</b>	125 MS/s per channel
<b>Fine System Frequency Adjustment</b>	50 MHz to 125 MHz <sup>4</sup>
<b>Logic Analyzer Buffer Memory</b>	Up to 128 MS per channel <sup>5, 6</sup>
<b>Pattern Generator Buffer Memory</b>	Up to 32,768 samples per channel <sup>6</sup>

For longer acquisitions, Record mode allows streaming acquisition data into host computer RAM or to a file on the host computer disk at potentially reduced rates. Achievable sample rates and recording lengths depend on various factors, including host computer specifications and USB activity.

<sup>1</sup> Configurable within WaveForms. Selected setting shared with all DIOs and Trigger IOs.

<sup>2</sup> Internal to the FPGA and configurable within WaveForms. Selected setting shared with all DIOs and Trigger IOs.

<sup>3</sup> More options may be available in the latest version of the WaveForms software.

<sup>4</sup> Adjustable through the WaveForms Device Options. Shared with Analog Inputs, Analog Output.

<sup>5</sup> Buffer size is limited to 16,384 samples when supplied power is insufficient to run DDR memory.

<sup>6</sup> Different preset buffer sizes can be chosen based on device configuration within the WaveForms Device Manager. See the Device Configurations section of this document for more info.

**Note:** Memory sizes, including buffer sizes, specified in units like kS and MS, are rounded from equivalent binary power units, such as MiS. For example, a listed 64 MS is rounded from 64 MiS, which is 67,108,864 samples.

## 4.2 Arbitrary Waveform Generator (Wavegen)

Supports the Waveform Generator, Network Analyzer, Impedance Analyzer, and Script Editor instruments.

### Vertical System

<b>Number of Channels</b>	1
<b>Output Type</b>	Single-ended
<b>Connector Type</b>	BNC
<b>Standard Functions</b>	Sine, square, triangle, sawtooth, ramp up, ramp down, DC voltage, noise, trapezium, others
<b>Advanced Waveforms</b>	Sweep, modulation and summing (phase, AM, FM), math, play mode, custom Raw, averaged, or filtered Scope input data
<b>Output Voltage Range</b>	±5 V
<b>Resolution</b>	14 bits <sup>1</sup>
<b>Absolute Resolution</b>	166 µV ( Vout  ≤ 1.25 V) 665 µV ( Vout  > 1.25 V)
<b>Accuracy</b>	±10 mV ± 0.5% ( Vout  ≤ 1.25 V) ±25 mV ± 0.5% ( Vout  > 1.25 V)
<b>Output Impedance</b>	50 Ω
<b>Bandwidth</b>	15 MHz @ -3 dB <sup>2</sup>
<b>Sweep Modes</b>	Frequency and Amplitude. Up and down with selectable start/stop frequencies and settable time increments
<b>Custom Waveform Files Supported</b>	Import files *.csv, *.txt, *.mp3, *.wav, *.wmv & *.avi, export as image, or as raw data in *.csv, *.txt or *.tdms formats
<b>DC Current Drive</b>	30 mA maximum <sup>3</sup>
<b>Slew Rate</b>	400 V/µs (10 V step)
<b>Overvoltage Protection</b>	Short-circuit to ground, ±15 V

### DC Offset Range

Range	Full Scale	Offset	Offset Accuracy
Low range	2.5 V peak-to-peak	±1.25 V	±10 mV ± 0.5%
High range	10 V peak-to-peak	±5 V	±25 mV ± 0.5%

<sup>1</sup> Each channel also has a pair of 16-bit buffers used to store up to 32,768 samples of FM/PM and AM/SUM modulation parameters in DDR configurations. 2,048 samples in BRAM configuration.

<sup>2</sup> When using a probe with the appropriate frequency response.

<sup>3</sup> Maximum value for distortion-free generation. Up to 40 mA can be supplied before hardware cutoff.

## Horizontal System

<b>Maximum Sample Rate</b>	125 MS/s per channel
<b>Fine System Frequency Adjustment</b>	50 MHz to 125 MHz <sup>1</sup>
<b>Buffer Size</b>	Up to 32,768 samples per channel <sup>2, 3</sup>

## 4.3 Pattern Generator

Shares digital input/output channels with Mixed Signal Oscilloscope: See the Digital Channels specifications for characteristics.

## 4.4 Trigger System

### Trigger Features

<b>Trigger Sources</b>	Oscilloscope analog channels, Arbitrary waveform generator start, Digital I/O lines, External triggers (TRIG1/TRIG2), Manual
<b>Trigger Modes</b>	None, Auto, Manual (Forced Trigger), Single
<b>Analog Trigger</b>	Edge, pulse, transition, condition, level, hysteresis, hold-off
<b>Digital Trigger</b>	Edge, level, pattern, glitch
<b>Analog/Oscilloscope Trigger Resolution</b>	8 to 20 ns, depending on system frequency, 10 ns by default <sup>4</sup>
<b>Digital/Logic Analyzer Trigger Resolution</b>	8 to 20 ns, depending on system frequency, 10 ns by default <sup>4</sup>

### External Triggers (T1/T2) Characteristics

Trigger 1 and Trigger 2 are connected to two pins in the 2×16 MTE connector.

Trigger 1 can be used to export or import a reference clock for the purposes of device synchronization.

See the Digital Channels specifications for the electrical characteristics of the External Triggers.

## 4.5 Device Configurations

The Analog Discovery Pro (ADP2230) has several different configurations which can be applied, primarily affecting the analog input, analog output, and digital I/O buffer sizes available to the user. Available selections depend on the amount of power available to the device through either USB or the Auxiliary power supply connector.

<sup>1</sup> Adjustable through the WaveForms Device Options. Shared with Analog Inputs and Digital I/O.

<sup>2</sup> Different preset buffer sizes can be chosen based on device configuration within the WaveForms Device Manager. See the Device Configurations section of this document for more info.

<sup>3</sup> Each channel also has a pair of 16-bit buffers used to store up to 32,768 samples of FM/PM and AM/SUM modulation parameters in DDR configurations. 2,048 samples in BRAM configuration.

<sup>4</sup> WaveForms uses interpolation for much more accurate value positioning.

The 3.7 W power requirement for DDR Memory configurations can be satisfied by either a suitable Auxiliary power supply or by a standard USB 3.0 port.

Configuration	Power Requirement	Scope Buffer Size	Wavegen Buffer Size	Logic Buffer Size	Patterns Buffer Size
1 (Auto, Default)	WaveForms automatically selects configuration #2 or #3, depending on available power				
2 (Block RAM Memory Only)	>2.7 W	32 kS per channel, 2 kS noise buffer for each channel	16 kS	16 kS per channel	16 kS per channel
3 (DDR Memory)	>3.7 W	64 MS per channel, 1 kS noise buffer for each channel	32 kS	128 MS per channel	32 kS per channel
4 (DDR Memory, Oscilloscope prioritized)	>3.7 W	128 MS per channel, 1 kS noise buffer for each channel	32 kS	The Logic and Protocol Analyzers are not supported in this configuration	32 kS per channel

**Note:** Memory sizes, including buffer sizes, specified in units like kS and MS, are rounded from equivalent binary power units, such as MiS. For example, a listed 64 MS is rounded from 64 MiS, which is 67,108,864 samples.

## 4.6 Additional Features

### Spectrum Analyzer

<b>Frequency Range</b>	0 Hz to half of system clock frequency (50 MHz default)
<b>Display Modes</b>	Magnitude, average, peak hold, min hold, count
<b>Y Axis</b>	Logarithmic (dBV, dBu, dBm) or linear (volts)
<b>X Axis</b>	Linear or Logarithmic
<b>Power Spectrum Algorithms</b>	FFT, CZT
<b>Windowing Functions</b>	Rectangular, Triangular, Hamming, Hann, Cosine, Blackman-Harris, Flat Top, Kaiser

### Network Analyzer

<b>Frequency Range</b>	20 $\mu$ Hz up to one-quarter of the system clock frequency (25 MHz by default) <sup>1</sup> , up to 10,001 steps
<b>Display Modes</b>	Magnitude, Phase
<b>Y Axis</b>	Linear or Logarithmic
<b>X Axis</b>	Linear or Logarithmic
<b>Plots</b>	Bode, Time, FFT, Nichols, Nyquist

<sup>1</sup> Results may be limited by the analog input and output bandwidth of the hardware.

## Protocol Analyzer

Shares digital input/output channels with Mixed Signal Oscilloscope: See the Digital Channels specifications.

<b>Protocols<sup>1</sup></b>	UART, SPI, I2C, CAN, CEC, JTAG, SWD, AVR
------------------------------	--

## Impedance Analyzer

<b>Frequency Range</b>	20 $\mu$ Hz to one-quarter of the system clock frequency (25 MHz default) <sup>1</sup> , up to 10,001 steps
<b>Display Modes</b>	Magnitude, Phase
<b>Y Axis</b>	Linear or Logarithmic
<b>X Axis</b>	Linear or Logarithmic
<b>Plots</b>	Bode, Time, FFT, Nichols, Nyquist, Custom

## Math Channels

<b>Operations</b>	Addition "+", Subtraction "-", Multiplication "*", Division "/", Remainder "%"
<b>Brackets</b>	Parenthesis "()", Square "[]"
<b>Constants</b>	Exp, Ln, Log, Pi
<b>Functions</b>	Logarithm, power, minimum, maximum, square root, sine, cos, tan, arccos, arctan, arctan2, absolute value, round, floor, ceiling
<b>Operands</b>	All analog and digital input channels, reference waveforms, time, constants, Pi
<b>Custom Channels</b>	Butterworth, Chebyshev, Lock-In Amplifier

## Programmable Power Supply

<b>Number of Channels</b>	2
<b>Voltage Range</b>	0.5 V to 5 V, -0.5 V to -5 V <sup>2</sup>
<b>Current Output</b>	Up to 1 A or to 3 W per channel <sup>3</sup> , whichever limit is reached first
<b>Voltage Readback Resolution</b>	8 mV
<b>Connector Type</b>	2 pins per channel included in the 2x16 MTE connector

## 4.7 Connectivity

### USB Interfaces

<b>Device Connector</b>	USB Type-C® 3.2 Gen 1, 5 Gbps <sup>4,5</sup>
<b>Host Connector</b>	USB Type-C® or USB Standard-A <sup>6</sup>

<sup>1</sup> This functionality is implemented by WaveForms software on the host system.

<sup>2</sup> Optional tracking of the two supplies available within the Supplies Tool.

<sup>3</sup> While using AUX power supply or USB Type-C connection capable of delivering 3 A.

<sup>4</sup> USB Type-C® and USB-C® are registered trademarks of USB Implementers Forum.

<sup>5</sup> USB-C® to USB-C® cable included that is USB 3.2 compatible and capable of 5 Gbps transfer speeds.

<sup>6</sup> If used with a USB Standard-A port and no auxiliary power supply, the port must provide USB 3.2 compatible power.

## 4.8 Power Requirements

The Analog Discovery Pro (ADP2230) does not necessarily require an auxiliary power supply to function; however, one is provided in the kit in case host-supplied power is insufficient. An auxiliary power supply is recommended when utilizing a significant amount of power on the programmable power supplies, analog output channel, and digital channels.

<b>Auxiliary Power Supply Voltage</b>	5 V
<b>Auxiliary Power Supply Current</b>	4 A recommended (3 A minimum)
<b>Barrel Connector Size</b>	5.5 mm × 2.1 mm (positive inner pin)

## 4.9 Physical Characteristics

<b>Dimensions</b>	134.2 mm × 144.0 mm × 37.9 mm (L × W × H) (~5.28 in × ~5.67 in × ~1.49 in) <sup>1</sup>
<b>Weight</b>	464 g (~16.4 oz)

## 4.10 Environmental

<b>Ambient Operating Temperature</b>	0 °C to 40 °C (32 °F to 104 °F)
<b>Storage Temperature</b>	-20 °C to 60 °C (-4 °F to 140 °F)
<b>Operating Humidity</b>	10% to 90% RH non-condensing
<b>Storage Humidity</b>	5% to 95% RH non-condensing
<b>Pollution Degree</b>	2
<b>Maximum Altitude</b>	2000 m

## 4.11 Certifications

See the [Analog Discovery Pro \(ADP2230\) Declaration of Conformity](#) document.

<sup>1</sup> See the [Mechanical Dimensions](#) document for more information.



## 5 Ordering Information and Purchasing Options



Digilent Part Number: 410-417 – Analog Discovery Pro (ADP2230)

Material included in base purchase kit:

- One (1) Analog Discovery Pro (ADP2230)
- One (1) 2×16 MTE cable set
- One (1) set of P6100 probes (two probes total)
- One (1) 5 Volt, 4 Amp power supply with US and EU plug adapters
- One (1) USB Type C to Type C cable compatible with USB 3.2 and capable of 5 Gb/s transfer rates

## 6 Recommended Accessories

Digilent Part Number: 410-395 – [Discovery USB Programmable Power Supply \(DPS3340\)](#)

The DPS3340 is a three-channel variable DC programmable power supply that is well suited to professional applications and can be used in conjunction with the ADP2230 to provide additional power to circuits under test. It has 1 to 5 V, 1 to 15 V, and -1 V to -15 V channels that can deliver up to 3 A, 500 mA, and -500 mA, respectively.

Digilent Part Number: 240-136 – [BNC to Minigrabber Cable](#)

Digilent Part Number: 240-134 – [BNC to Alligator Clip Cable](#)

Use of one of these BNC cables is recommended for analog output. BNC Oscilloscope Probes should not be used with the AWG.

## 7 Additional Resources

Reference material for the Analog Discovery Pro (ADP2230) including a getting started guide, reference manual, specifications, and tutorials on each of the instruments within WaveForms can be found on the [ADP2230's Resource Center](#) on Digilent's Reference site.

## 8 The Analog Discovery Pro Family



Digilent's Analog Discovery Pro line is for users who are ready to go pro. With expanded feature sets not offered in Digilent's Test and Measurement Essentials line including deep memory, higher bandwidth, networking capability, and USB 3.0, an Analog Discovery Pro device has already stepped up to the challenging task ahead of you.

Devices in the Analog Discovery Pro family provide the utility of professional benchtop equipment with the flexibility of a portable instrument. The series includes mixed signal oscilloscope and programmable power supply instruments that give engineers the ability to tap into the efficiency of the WaveForms software while offering a wider selection of specifications in products created with the professional in mind. Other members of the Analog Discovery Pro family include:

### Analog Discovery Pro 3000-Series

- Mixed signal oscilloscope
- Two or four analog inputs, two analog outputs
- 0.5 GS/s sample rate (with oversampling), per channel
- 55+ MHz bandwidth
- 16 Digital I/O
- Ethernet connectivity
- Linux Mode

### Analog Discovery Pro 5000-Series

- Mixed signal oscilloscope
- Two analog inputs, one analog output
- 1 GS/s sample rate shared by both analog inputs
- 100 MHz bandwidth
- 8 Digital I/O
- Dedicated Digital Multimeter and DC Power Supplies

### Discovery USB-Programmable Power Supply (DPS3340)

- USB programmable power supply
- Three channels
- 1 V to 5 V, -1 V to -15 V, 1 V to 15 V

## 9 About Digiilent

Digiilent is committed to making engineering accessible, offering competitive pricing, portable products, and comprehensive documentation. Specializing in test and measurement devices, Xilinx-based FPGA development boards, a variety of expansion modules for customizing applications, and robust options for DAQ and datalogging, our design philosophy champions your creativity. By emphasizing speed, modularity, customizability, and world-class support, we provide the building blocks while you bring the brilliance.