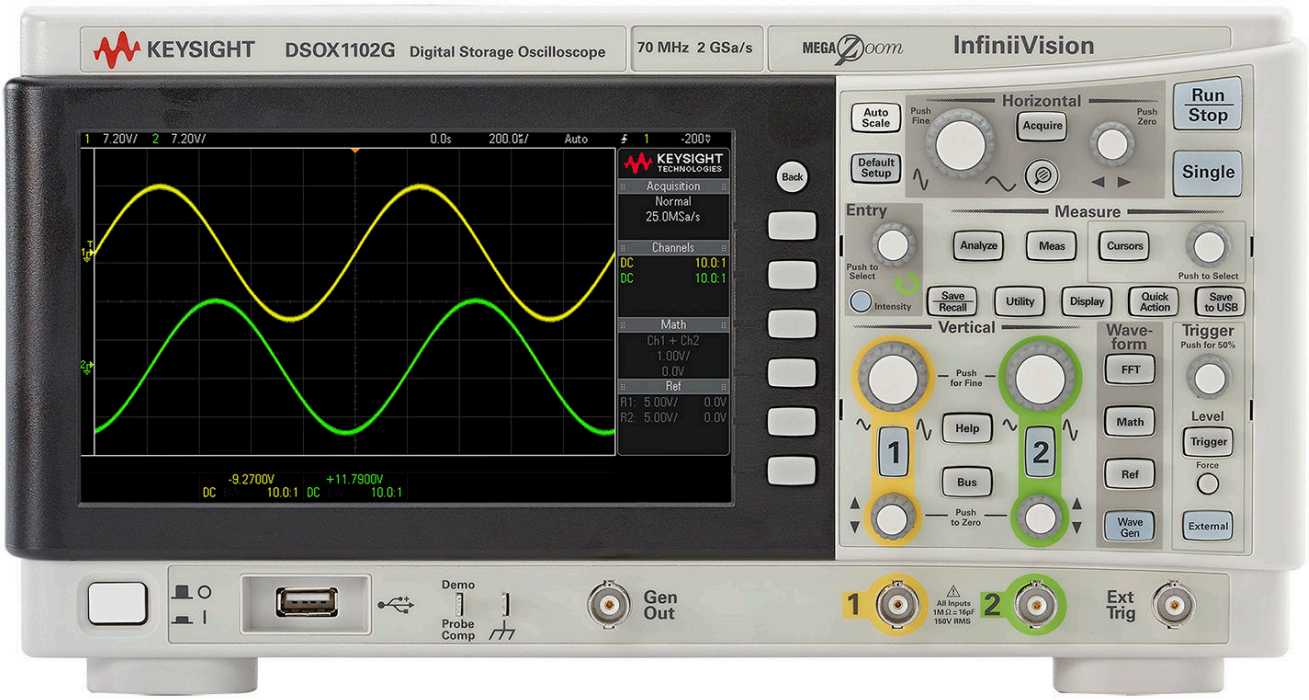
Keysight Technologies
InfiniiVision 1000 X-Series Oscilloscopes

Data Sheet



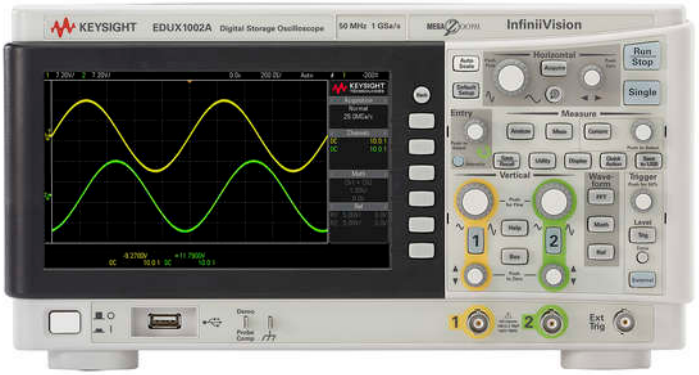
KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Scrap the Toys, Get a Real Oscilloscope

Keysight's InfiniiVision 1000 X-Series oscilloscopes are engineered to give you quality, industry-proven technology at unbelievably low prices. Now it's easy to get professional measurements and accessible expertise at your fingertips. Don't settle for less – and test to impress.

- 50 to 100 MHz
- See more signal detail with 50,000 wfms/sec update rate
- Have confidence in your measurements with Keysight-custom technology that leverages more than 60 years of oscilloscope expertise
- Test quickly and easily with a simple, intuitive user interface and built-in help and training signals
- Get professional-level functionality with industry-leading software analysis and 6-in-1 instrument integration



	EDUX1002A 50 MHz, 2 channel	**EDUX1002G 50 MHz, 2 channel with function generator**	**DSOX1102A 70/100 MHz, 2 channel**	**DSOX1102G 70/100 MHz, 2 channel with function generator**
Analog channels	2	2	2	2
Digital channels	1	1	1	1
Bandwidth	50 MHz	50 MHz	70 MHz (base)	70 MHz (base)
			100 MHz (with Option DSOX1B7T102)	100 MHz (with Option DSOX1B7T102)
Maximum sample rate	1 GSa/s	1 GSa/s	2 GSa/s	2 GSa/s
Maximum memory depth	100 kpts	100 kpts	1 Mpts	1 Mpts
Segmented memory	N/A	N/A	Standard	Standard
Mask/limit testing	N/A	N/A	Standard	Standard
WaveGen	N/A	20-MHz function generator (includes Bode plot test)	N/A	20-MHz function generator (includes Bode plot test)
Serial protocol analysis	Optional: – I²C, UART/RS-232 - (EDUX1EMBD)		Optional: – I²C, SPI, UART/RS-232 - (DSOX1EMBD) – CAN, LIN - (DSOX1AUTO)	
Waveform math	Add, subtract, multiply, divide, FFT (magnitude and phase), low pass filter			
Integrated digital voltmeter	Free with product registration			
Display	7-inch TFT LCD WVGA			
Waveform update rate	50,000 waveforms per second			
Connectivity	USB 2.0 (host and device)			

Get a quote

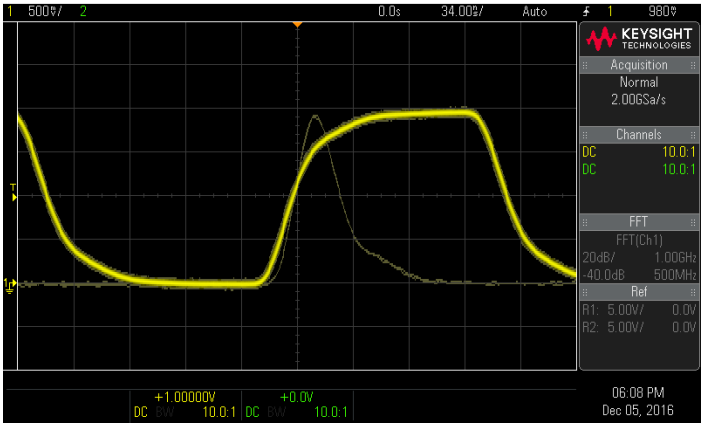
Scrap the Toys, Get a Real Oscilloscope (Continued)

Have confidence in your measurements with Keysight-custom technology that leverages more than 60 years of oscilloscope expertise.

Cheap oscilloscopes don't have to be low quality. Designing premier test solutions has been the goal and passion of Keysight Technologies ever since we made our first oscillator in 1939, and now we're bringing you a professional-quality oscilloscope for a fraction of the price.

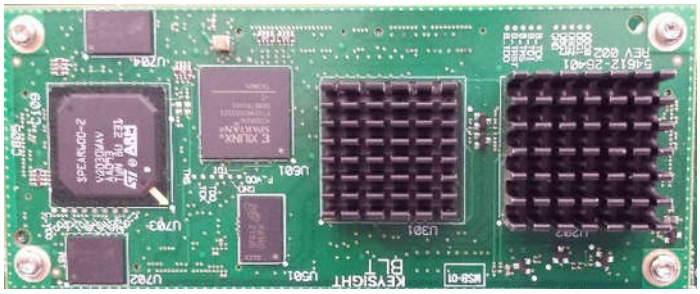
Superior measurements

With the unique, Keysight-designed *MegaZoom* IV custom ASIC technology, the InfiniiVision 1000 X-Series family delivers up to 50,000 waveforms per second. With this speed, you can clearly see the glitches and anomalies that you may miss on other oscilloscopes in this class.



Trusted custom technology

Keysight's custom ASIC technology combines the capabilities of an oscilloscope and WaveGen built-in function generator in a compact form factor at an affordable price. 4th generation *MegaZoom* technology enables the fast waveform update rate with responsive memory acquisitions.



Memory performance beyond specifications

The 1000 X-Series' segmented memory optimizes your acquisition memory by selectively capturing and storing important segments of signals without capturing unimportant signal idle-/dead-time. Segmented memory acquisition is ideal for applications including packetized serial pulses, pulsed laser, radar bursts and high-energy physics experiments. Up to 50 segments can be captured on the 1000 X-Series models with a minimum re-arm time of less than 19 µs.

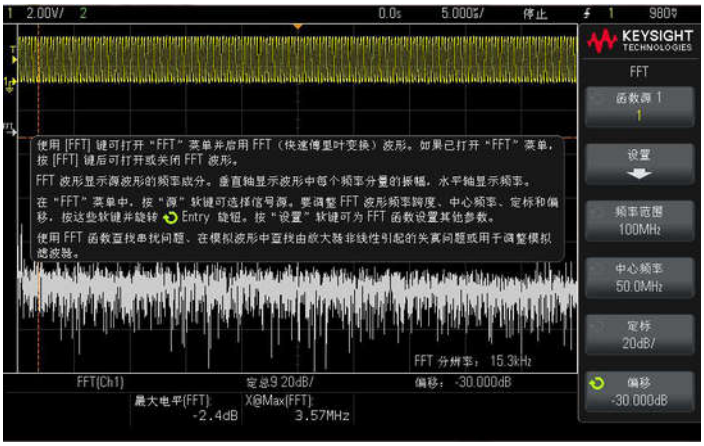
Scrap the Toys, Get a Real Oscilloscope (Continued)

Test quickly and easily with a simple, intuitive user interface and built-in help and training signals.

The 1000 X-Series was created with you in mind. Not only are these oscilloscopes cheap, but they also make setting up measurements and learning how to use the oscilloscope a breeze. The industry-standard front panel is easy to use, and built-in help and training signals quickly get you up to speed on oscilloscope operation. Educator resources (including free teaching labs) are included standard, and the EDU models are especially good for students and beginners.

Intuitive controls with built-in help

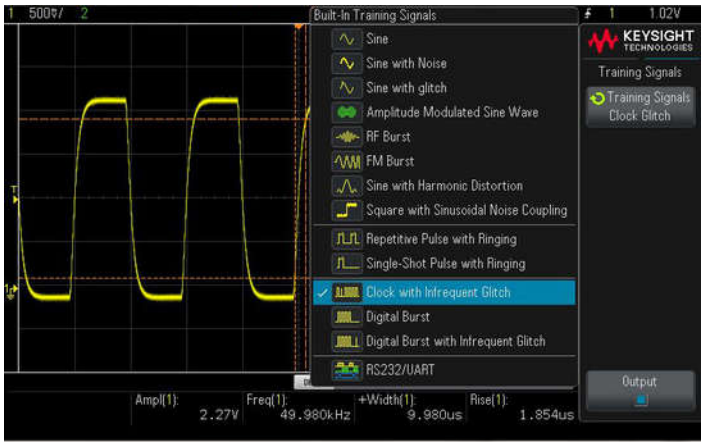
The front panel has pushable knobs for quick access to commonly used oscilloscope functions to help you spend less time learning how to use the oscilloscope and more time making measurements. Simply press down and hold any button to access the multi-language built-in help system. Also available are multi-language overlays for the front panel so you can customize the scope to your preferred language.



Example of FFT display with Chinese GUI and built-in help.

Get up to speed with training signals

All models come standard with built-in training signals, that enable users to quickly learn to capture and analyze simple (e.g. sine wave) or complex (e.g. radar pulse) signals with controlled real-time signal generation. Now you have the information you need to effectively use an oscilloscope to make measurements on complex signals – at no additional cost.



A large variety of training signals supply common test and analysis signals for users to gain expertise in oscilloscope usage and signal analysis.

Easily set up (or upgrade) a teaching lab

The educator's resource kit also comes standard on all 1000 X-Series oscilloscopes and includes dynamic teaching labs. The kit contains an array of built-in training signals, a comprehensive oscilloscope lab guide, a tutorial written specifically for undergraduate students, and an oscilloscope fundamentals PowerPoint slide set for professors and lab assistants.

Visit **www.keysight.com/find/scopes-edu** to access all labs, teaching presentations and more educational resources to maximize training.

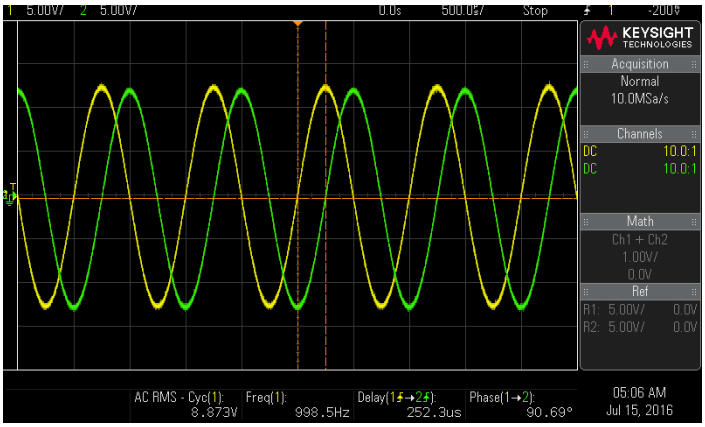
Scrap the Toys, Get a Real Oscilloscope (Continued)

Get professional-level oscilloscope functionality with industry-leading software analysis and 6-in-1 instrument integration.

The 1000 X-Series is a family of cheap oscilloscopes that don't compromise on quality. Each has measurement and software analysis capability that rivals oscilloscopes 3x the price. They are also a 6-in-1 instrument so you can get even more for your money and save on bench space.

Automatic measurements

Automatic measurements enable easy access to 24 typical oscilloscope measurements so you can quickly analyze signals and determine signal parameters. Up to four individual measurements can be displayed in real-time with continuous updates on the screen.



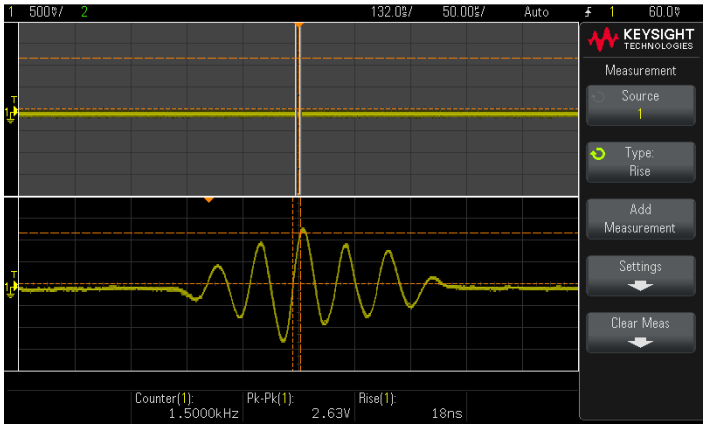
Up to four individual measurements can be displayed on the screen.



Snapshot of all 24 measurements being taken simultaneously.

Cursors

Cursors allow you to quickly make detailed measurements on the waveform. Whether you're measuring voltage, time or frequency, the set of X and Y cursors support precise user-defined measurement.



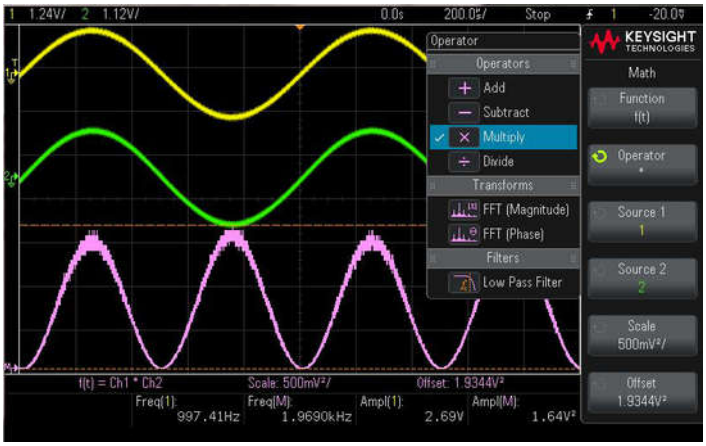
Zoom in to see signal detail, and use the cursors to easily make exact measurement.

Scrap the Toys, Get a Real Oscilloscope (Continued)

Get professional-level oscilloscope functionality with industry-leading software analysis and 6-in-1 instrument integration.

Math

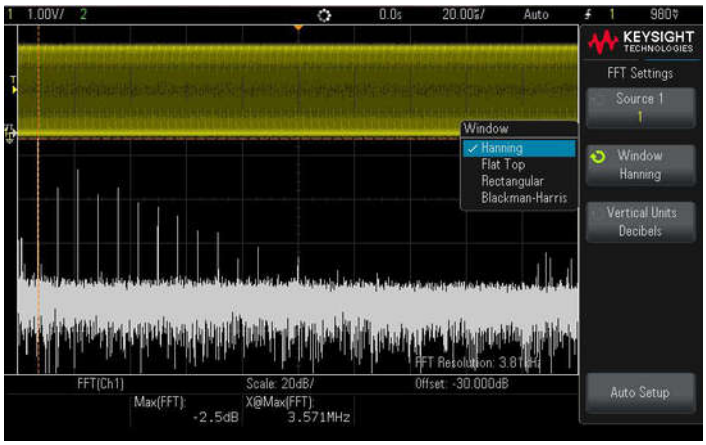
Math functions let you perform an arithmetic operation (like add, subtract or multiply) on analog input channels or perform a transform function on the result of an arithmetic operation.



Easily calculate the resulting waveform when adding two waveforms by using waveform math.

FFT (Fast Fourier Transform)

FFT is used to compute the Fast Fourier Transform using analog input channels or an arithmetic operation g(t). FFT takes the digitized time record of the specified source and transforms it to the frequency domain. When the FFT function is selected, the FFT spectrum is plotted on the oscilloscope display as magnitude in dBV versus frequency. The readout for the horizontal axis changes from time to frequency (Hertz), and the vertical readout changes from volts to dB. Use the FFT function to find crosstalk problems; distortion problems in analog waveforms caused by amplifier non-linearity; and to adjust analog filters.

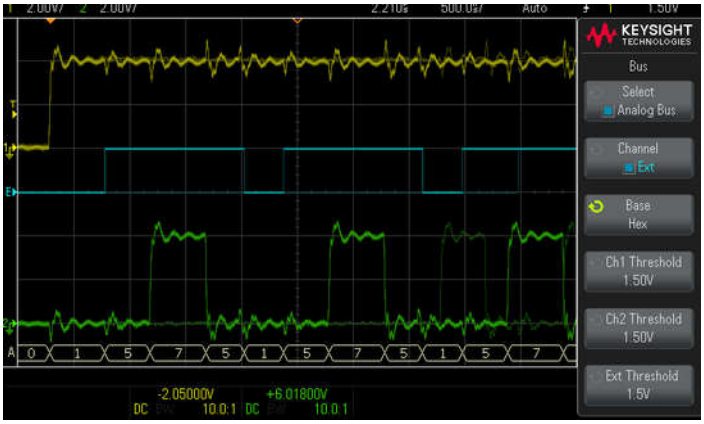


Multiple FFT window functions are supported to provide required signal analysis.

Scrap the Toys, Get a Real Oscilloscope (Continued)

Analog buses

The 1000 X-Series lets you combine multiple signals to create a logical bus. This is helpful when testing circuit designs because they often require combining related signals with each other. The combined information can be from both the analog channels and the external trigger, and they can be displayed as hex or binary value.

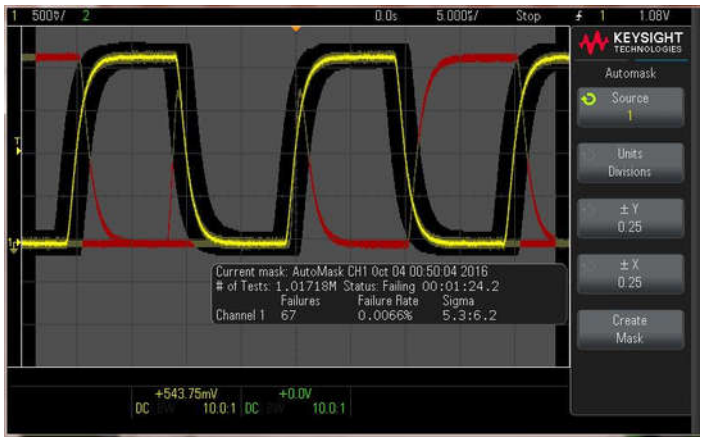


Channel 1, 2 and external trigger can be combined to form a bus with hex or binary values displayed as the bus along the bottom of the display.

Mask test [1]

The 1000 X-Series' hardware-based mask testing can quickly validate a signal's quality and detect errors with up to 50,000 tests per second. Whether performing pass/fail tests to specified standards in manufacturing or testing for infrequent signal anomalies in R&D debug, the mask test option can be an invaluable tool.

1. DSOX1102A or DSOX1102G models only.



Mask testing can quickly validate signal quality and detect errors.

Scrap the Toys, Get a Real Oscilloscope (Continued)

Get professional-level oscilloscope functionality with industry-leading software analysis and 6-in-1 instrument integration.

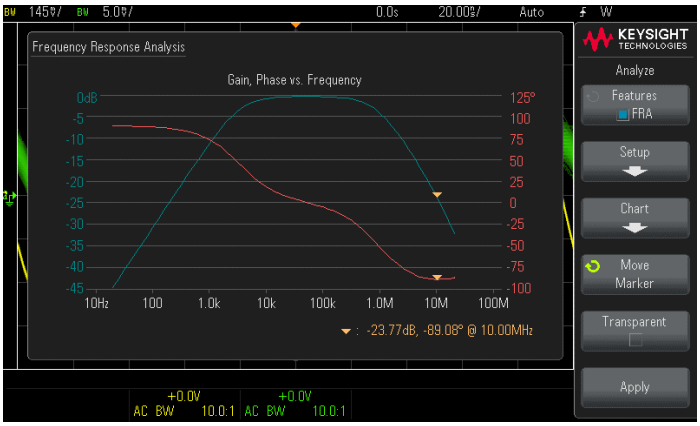
In addition to being an oscilloscope, the 1000 X-Series also gives you the following functionality so you can save money and valuable bench space:

1. Frequency response analyzer – Bode plot (EDUX1002G and DSOX1102G models only)
2. WaveGen function generator (EDUX1002G and DSOX1102G models only)
3. Serial protocol analyzer – triggering and decode (optional)
4. Digital voltmeter
5. Frequency counter

1. Frequency response analyzer [2]

Frequency response analysis is a critical measurement to characterize the stability of feedback networks and switch-mode power supplies. Bode plots are fundamental concepts that every electrical engineering student must know. The 1000 X-Series' frequency response analyzer capability is the perfect tool to help students understand the gain and phase performance of passive LRC circuits or active op-amps. This capability is achieved with a gain and phase measurement versus frequency (Bode plot). Vector network analyzers (VNAs) and low-cost frequency response analyzers are typically used for these measurements, but now an easy-to-use gain and phase analysis is possible by utilizing the 1000 X-Series' built-in WaveGen. EDUX1002G and DSOX1102G models only.

2. EDUX1002G and DSOX1102G models only.

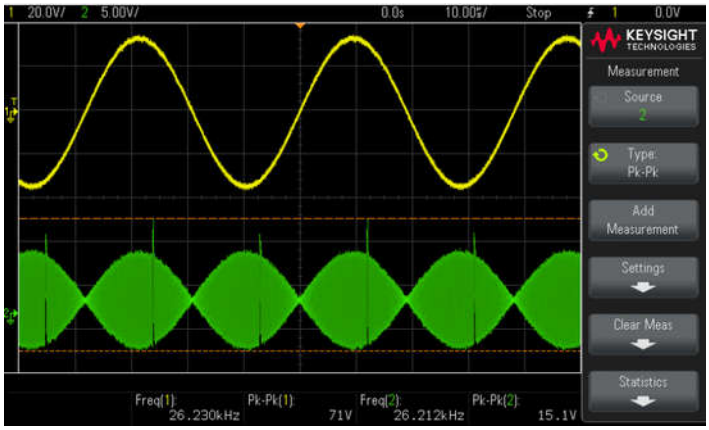


Measure and plot the frequency and gain of any circuit from 20 Hz to 20 MHz.

2. Powerful WaveGen (built-in 20 MHz function generator with modulation capability) [3]

The 1000 X-Series offers an integrated 20 MHz function generator with signal modulation capability. It's ideal for educational or design labs where bench space and budget are at a premium. The integrated function generator provides stimulus output of sine, square, ramp, pulse, DC and noise waveforms to your device under test. Add modulation to the signal with customizable AM, FM and FSK settings. No need to buy a separate function generator when you can get one integrated in your new oscilloscope. WaveGen is available on EDUX1002G and DSOX1102G models only.

3. EDUX1002G and DSOX1102G models only.



The WaveGen function enables the definition of multiple waveforms including amplitude modulated signals.

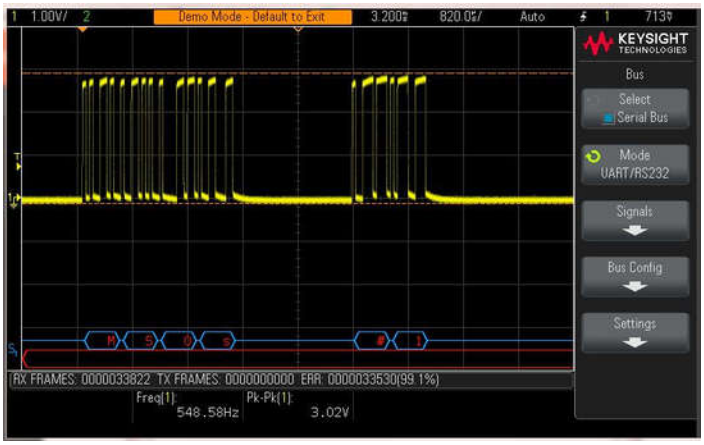
Scrap the Toys, Get a Real Oscilloscope (Continued)

3. Hardware-based serial protocol decode and triggering

Protocols supported

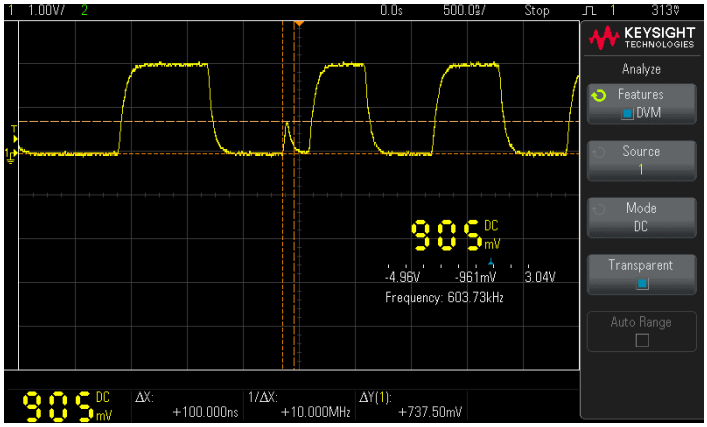
- I^2C, UART/RS232 for EDU models (EDUX1EMBD)
- I^2C, SPI, UART/RS232 for DSO models (DSOX1EMBD)
- CAN, LIN (automotive) for DSO models (DSOX1AUTO)

When you add optional software, the 1000 X-Series is a powerful protocol analyzer that can do powerful decode and hardware-based triggering that enables specialized serial communication analysis. Other vendors' oscilloscopes use software post-processing techniques that slow down the waveform and decode update rate, but the 1000 X-Series has faster decoding by using hardware-based technology that enhances scope usability and the probability of capturing infrequent serial communication errors.



4 and 5. Digital voltmeter and frequency counter

The 1000 X-Series has an integrated 3-digit voltmeter (DVM) and 5-digit frequency counter inside each oscilloscope. The voltmeter operates through probes connected to the oscilloscope channels, but its measurement is de-coupled from the oscilloscope triggering system so both the DVM and triggered oscilloscope measurements can be made with the same connection. You can quickly measure AC RMS, DC, DC RMS and frequency without configuring the oscilloscope capture. The voltmeter results are always displayed, keeping these quick characterization measurements at your fingertips. Turn on the DVM capability for no addition cost by registering your oscilloscope at **www.keysight.com/find/1000X-Series-DVM**.

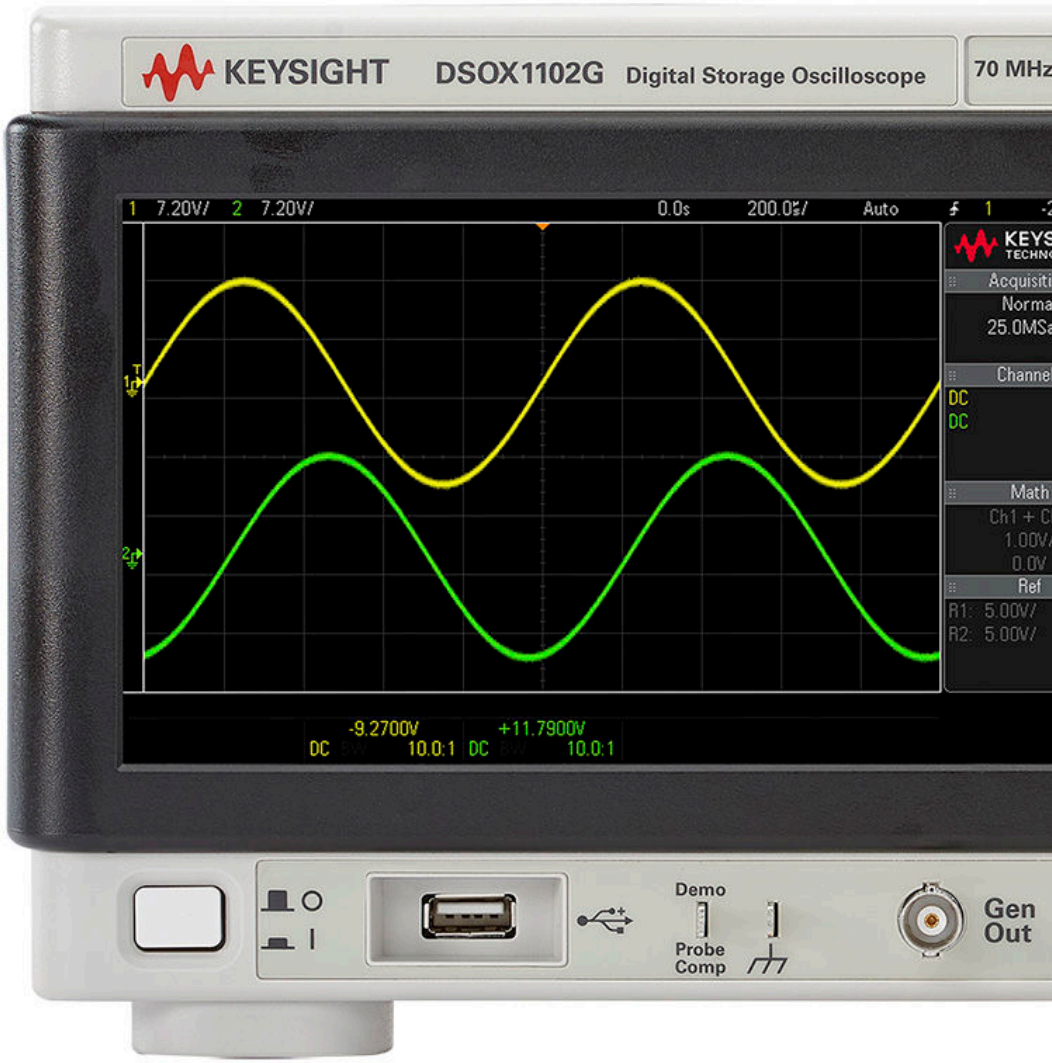


The DVM makes accurate RMS measurements when the signal frequency is between 20 Hz and 100 kHz.

Scrap the Toys, Get a Real Oscilloscope (Continued)

Measurement clarity with crisp 7” WVGA display that presents key measurement information in an easy-to-understand and simple-to-use format.

Display performance with fast 50,000 waveforms/sec update rate helps you quickly see random and infrequent signal glitches and errors.



Compact size
314 mm (12.4 in) x 165 mm (6.5 in) x 130 mm (5.1 in)

Training signals are included standard in all models so you can quickly learn how to troubleshoot many common signal problems.

The built-in function generator enables you to generate the signals you need to quickly stimulate your design. Signals are easily synchronized for measuring stimulus/response testing, including frequency response analysis (Bode gain and phase).

Fast and easy operation with the common oscilloscope controls right at your fingertips. All buttons provide instant access to language-localized help by simply holding down the button you want explained.

Need to perform waveform measurements? Press the measure key to access 24 built-in automatic measurements.



Custom measurements are easy with "Cursors." Measure any value or the difference using four powerful cursors.

Press "Analyze" to access
- Frequency response analysis (Bode plot)
- Mask test
- DVM
- And more

Waveform tools include quick access to waveform math, like FFT (magnitude and phase), add, subtract, multiply and divide. Reference waveforms allow quick comparison of stored waveforms.

Included probes are switchable 1:1/10:1 probes supporting most probing requirements up to 75 MHz.

Built-in WaveGen supports sine, square, ramp, pulse, DC, and noise with amplitude and frequency modulation.

External trigger can be used as a 3rd channel and displayed on-screen to create a bus-type display.

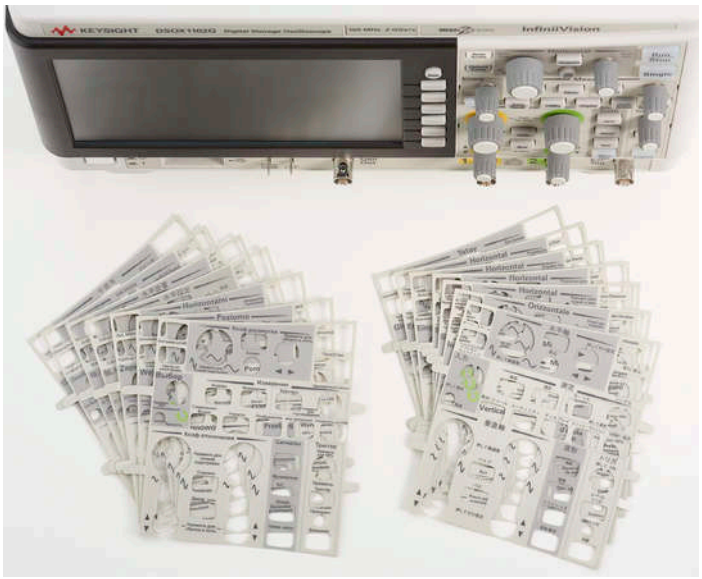
Other Productivity Tools

Reference waveforms

Store up to two waveforms in the oscilloscope's non-volatile reference waveform memory locations. Compare these reference waveforms with live waveforms and perform post analysis and measurements on stored data. You can also store waveform data on a removable USB memory device that can be recalled back into one of the two available reference memories for full waveform measurement and analysis. Save and/or transfer waveforms as XY data pairs in a comma-separated values format (.csv) for PC analysis. Save screen images to a PC for documentation purposes in a variety of formats including: 8-bit bitmaps (.bmp), 24-bit bitmaps (.bmp), and PNG 24-bit images (.png).

Localized GUI and help

Operate the oscilloscope in the language most familiar to you. The graphical user interface (GUI), built-in help system, front panel overlays and user's manual are available in English, Simplified Chinese, Traditional Chinese, Japanese, Korean, French, German, Italian, Portuguese, Russian and Spanish. The GUI and front panel overlay are also available in Polish, Thai and Czech, and the built-in help is also available in Polish and Thai. During operation, access the built-in help system by simply pressing and holding any button.



Keypad overlays as well as on-screen information are available in multiple languages.

Probe solutions

Get the most out of your 1000 X-Series oscilloscope by using the right probes and accessories for your application. Keysight offers a complete family of innovative probes and accessories for the InfiniiVision 1000 X-Series. For the most up-to-date and complete information about Keysight's probes and accessories, visit **www.keysight.com/find/scope_probes**.

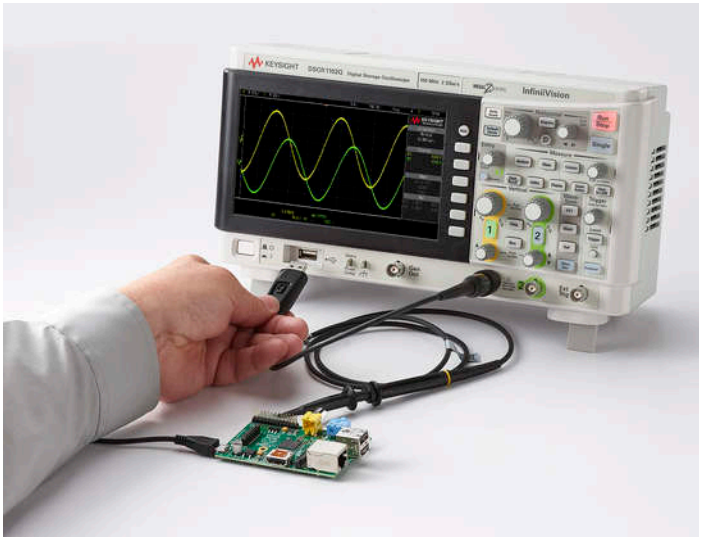


Includes standard 1:1 or 10:1 switchable probes.

Other Productivity Tools (Continued)

USB save

Documentation is fast and easy with screenshots and binary data for creating PC-based reports. Oscilloscope setups, reference waveforms and mask files can be saved to internal oscilloscope memory or to a USB storage device and recalled later. You can also recall default or factory default setups. Oscilloscope screen images can be saved to a USB storage device in BMP or PNG formats. Acquired waveform data can be saved to a USB storage device in comma-separated value (.csv), ASCII XY or binary (.bin) formats.



Convenient USB storage of data, screenshots, and scope setup files make documentation a breeze.

Connectivity compatibility

Built-in USB host and USB device ports make PC connectivity easy. BV0000A BenchVue lets you visualize the 1000 X-Series and multiple measurements simultaneously. Save time with the ability to export measurement data to Excel, Word and MATLAB in three clicks. Monitor and control your 1000 X-Series with a mobile device from anywhere. Learn more at **www.keysight.com/find/BenchVue**.

Secure erase

The secure erase feature comes standard on all 1000 X-Series models. At the press of a button, internal nonvolatile memory is clear of all setup, reference waveforms and user preferences, ensuring the highest level of security in compliance with National Industrial Security Program Operation Manual (NISPOM) Chapter 8 requirements.

Offline oscilloscope analysis software

Keysight's N8900A Infiniium Offline PC-based oscilloscope analysis software lets you do additional signal viewing, analysis and documentation tasks while you're away from your oscilloscope. You can capture waveforms on your scope, save to a file and recall the waveforms into the Infiniium Offline software on your PC.

Keysight's InfiniiVision X-Series Family

Sometimes the job is making a design work better, and sometimes it's just making it work. Whatever challenges you face, InfiniiVision oscilloscopes can help. The reason: Whether you use a scope once a day, once a week or once a month, InfiniiVision is ready to inspire quicker insight. They are built around Keysight technology that puts automated measurements and accessible expertise at your fingertips. Get quality and confidence with InfiniiVision oscilloscopes.

	InfiniiVision oscilloscopes				
					
	1000 X-Series	**2000 X-Series**	**3000T X-Series**	**4000 X-Series**	**6000 X-Series**
Analog channels	2	2 or 4	2 or 4	2 or 4	2 or 4
Bandwidth	50, 70, 100 MHz	70, 100, 200 MHz	100, 200, 350, 500 MHz and 1 GHz	200, 350, 500 MHz and 1, 1.5 GHz	1, 2.5, 4, 6 GHz
Max sample rate	2 GSa/s	2 GSa/s	5 GSa/s	5 GSa/s	20 GSa/s
Max memory depth	1 Mpts	1 Mpts	4 Mpts	4 Mpts	4 Mpts
Waveform update rate	> 50,000 wfm/s	> 50,000 wfm/s	> 1,000,000 wfm/s	> 1,000,000 wfm/s	> 450,000 wfm/s
Display	7" WVGA	8.5" WVGA	8.5" WVGA capacitive touch	12.1" SVGA capacitive touch	12.1" SVGA capacitive touch
MSO (digital channels)	1 channel	8 channels	16 channels	16 channels	16 channels
Data sheet	5992-1965EN	5990-6618EN	5992-0140EN	5991-1103EN	5991-4087EN

Configuring Your InfiniiVision 1000 X-Series Oscilloscope

Step 1. Choose your oscilloscope

EDUX1002A	50 MHz, 2 channels
EDUX1002G	50 MHz, 2 channels with function generator
DSOX1102A	70/100 MHz, 2 channels
DSOX1102G	70/100 MHz, 2 channels with function generator

Step 2. Select bandwidth upgrades

DSOX1B7T102	Upgrade bandwidth from 70 to 100 MHz	Compatible with DSOX1102A or DSOX1102G

Step 3. Add desired decodes

EDUX1EMBD	Decodes and analysis for I^2C, UART(RS-232) protocols	Compatible with EDUX1002A and EDUX1002G
DSOX1EMBD	Decodes and analysis for I^2C, SPI, UART(RS-232) protocols	Compatible with DSOX1102A or DSOX1102G
DSOX1AUTO	Decodes and analysis for CAN, LIN protocols	Compatible with DSOX1102A or DSOX1102G

Step 4. Choose probes and accessories

N2142A	1:1, 10:1 switchable 75 MHz	Two probes included standard with EDUX1002A and EDUX1002G
N2140A	1:1, 10:1 switchable 200 MHz	Two probes included standard with DSOX1102A and DSOX1102G
N2738A	Soft carrying case for 1000 X-Series oscilloscopes	
N2133A	Rackmount kit for 1000 X-Series oscilloscopes	

Step 5. Select language options (hard copy of user's guide is not included unless ordered)

	Front panel overlay	**User's guide**
English	Standard	N2132A-ABA
Chinese (Simplified)	DSOX1000-AB2	N2132A-AB2
Chinese (Traditional)	DSOX1000-AB0	N2132A-AB0
Czech	DSOX1000-AKB	Not available
French	DSOX1000-ABF	N2132A-ABF
German	DSOX1000-ABD	N2132A-ABD
Italian	DSOX1000-ABZ	N2132A-ABZ
Japanese	DSOX1000-ABJ	N2132A-ABJ
Korean	DSOX1000-AB1	N2132A-AB1
Polish	DSOX1000-AKD	Not available
Portuguese	DSOX1000-AB9	N2132A-AB9
Russian	DSOX1000-AKT	N2132A-AKT
Spanish	DSOX1000-ABE	N2132A-ABE
Thai	DSOX1000-AB3	Not available
Turkish	DSOX1000-AB8	Not available

Included standard

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Warranty	Standard 3-year warranty (90 days for unserialized accessories such as passive probes)
	Warranty upgradable to 5 years
Secure erase	Supported on all models
Built-in help language support	English, Japanese, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese, Italian, Polish and Thai
Interface language support GUI menus	English, Japanese, Simplified Chinese, Traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese, Italian, Polish, Czech, Thai and Turkish
Power cord	Localized power cord

Performance Characteristics

Oscilloscopes overview

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G
Bandwidth (–3 dB) [1, 2]	50 MHz	70 MHz
		100 MHz with option DSOX1B7T102
Calculated rise time (10 to 90%)	≤ 7 ns	≤ 5 ns
		≤ 3.5 ns (100 MHz model)
Input channels	2	2
Maximum sample rate	1 GSa/s	2 GSa/s
Maximum memory depth	100 kpts	1 Mpts
Waveform update rate	≥ 50,000 waveforms/sec	≥ 50,000 waveforms/sec

Vertical system analog channels

		EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G
Input coupling		DC, AC (10 Hz cutoff frequency)	DC, AC (10 Hz cutoff frequency)
Input impedance/capacitance		1 MΩ ± 2%/16 pF ±3 pF	1 MΩ ± 2%/16 pF ±3 pF
Input sensitivity range [3]		500 µV/div to 10 V/div	500 µV/div to 10 V/div
Standard probes		N2142A 1/10 switchable 75 MHz (2 included)	N2140A 1/10 switchable 200 MHz (2 included)
Probe attenuation factor		0.1X to 1000X in 1-2-5 sequence; (–20 dB to +80 dB in 0.1 dB steps)	0.1X to 1000X in 1-2-5 sequence; (–20 dB to +80 dB in 0.1 dB steps)
Hardware bandwidth limits		Approximately 20 MHz (selectable)	Approximately 20 MHz (selectable)
Vertical resolution		8 bits	8 bits
Invert signal		Selectable	Selectable
Maximum input voltage		150 Vrms, 200 Vpk	150 Vrms, 200 Vpk
DC vertical accuracy		± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale]	± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale]
DC vertical gain accuracy [1]		+3% full scale (> 10 mV/div)	+3% full scale (> 10 mV/div)
		+4% full scale (< 10 mV/div)	+4% full scale (< 10 mV/div)
DC vertical offset accuracy		± 0.1 div ± 2 mV ± 1% of offset setting	± 0.1 div ± 2 mV ± 1% of offset setting
Skew		Channel to channel: 1 ns (without deskew)	Channel to channel: 1 ns (without deskew)
		Channel to external: 2 ns (without deskew)	Channel to external: 2 ns (without deskew)
Offset range		500 uV/div to 200 mV/div: +2 V	500 uV/div to 200 mV/div: +2 V
		> 200 mV/div to 10 V/div: +100 V	> 200 mV/div to 10 V/div: +100 V
Time base range		5 ns/div to 50 s/div	5 ns/div to 50 s/div
Time base accuracy [1]		50 ppm ± 5 ppm per year (aging)	50 ppm ± 5 ppm per year (aging)
Time base delay time range	Pre-trigger	Greater of 1 screen width or 200 µs	Greater of 1 screen width or 200 µs
	Post-trigger	1 to 500 s	1 to 500 s
Channel to channel deskew range		± 100 ns	± 100 ns
Δ Time accuracy (using cursors)		± (time base acc. x reading) ± (0.0016 x screen width) ± 200 ps (same channel)	± (time base acc. x reading) ± (0.0016 x screen width) ± 200 ps (same channel)
Modes		Main, zoom, roll, XY	Main, zoom, roll, XY
XY		X = channel 1, Y = channel 2, Z = external trigger, 1.4 V blanking	X = channel 1, Y = channel 2, Z = external trigger, 1.4 V blanking
		Bandwidth: Maximum bandwidth. Phase error at 1 MHz: < 0.5 degree	Bandwidth: Maximum bandwidth. Phase error at 1 MHz: < 0.5 degree

1. Denotes warranted specifications; All others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C user calibration temperature.
2. For 1 mV/div to 10 V/div settings. Bandwidth is 20 MHz at the 500 uV/div setting.
3. 500 uV/div is a magnification of 1 mV/div setting.

Performance Characteristics (Continued)

Acquisition system

		EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G
Maximum sample rate		1 GSa/s	2 GSa/s
Maximum analog channels record length		100 kpts	1 Mpts
Acquisition mode	Normal	Default mode	Default mode
	Peak detect	Capture glitches as narrow as 10 ns at all time base settings	Capture glitches as narrow as 10 ns at all time base settings
			Capture glitches as narrow as 5 ns at all time base settings with 100 MHz bandwidth upgrade - DSOX1B7T102
	Averaging	Selectable from 2, 4, 8, 16, 64, ... to 65,536	Selectable from 2, 4, 8, 16, 64, ... to 65,536
	High resolution	Real-time boxcar averaging reduces random noise and effectively increases vertical resolution to 12 bits of resolution when ≥ 20 µs/div at 2 GSa/s	Real-time boxcar averaging reduces random noise and effectively increases vertical resolution to 12 bits of resolution when ≥ 20 µs/div at 2 GSa/s
	Segmented	Not available	Segmented memory optimizes available memory for data streams that have long dead times between activity. Maximum segments = 50. Re-arm time = 1 µs (minimum time between trigger events)
Time mode	Normal	Default mode	Default mode
	Roll	Displays the waveform moving across the screen from right to left. Available at the time base 50 ms/div or slower	Displays the waveform moving across the screen from right to left. Available at the time base 50 ms/div or slower
	XY	Displays the volts-versus-volts display	Displays the volts-versus-volts display
		X = Channel 1, Y = Channel 2	X = Channel 1, Y = Channel 2
		Z = External trigger, 1.4 V blanking	Z = External trigger, 1.4 V blanking
		Phase error at 1 MHz: < 0.5 degree	Phase error at 1 MHz: < 0.5 degree
Autoscale		Finds and displays all active channels and external trigger. Sets edge trigger mode on external trigger first then highest numbered active channel. Sets vertical sensitivity. Sets time base to display ~ 1.8 periods. Requires minimum voltage of 10 mVpp (channel)	Finds and displays all active channels and external trigger. Sets edge trigger mode on external trigger first then highest numbered active channel. Sets vertical sensitivity. Sets time base to display ~ 1.8 periods. Requires minimum voltage of 10 mVpp (channel)

Performance Characteristics (Continued)

Trigger system

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Trigger sources	Analog channel (1, 2), line [5], external, WaveGen, WaveGen modulation FM/FSK
Trigger modes	**Normal** (triggered): Requires trigger event for oscilloscope to trigger
	Auto: Triggers automatically in absence of trigger event
	Single: Triggers only once on a trigger event
	Force: Front panel button that forces a trigger
Trigger coupling	DC: DC coupled trigger
	AC: AC coupled trigger, cutoff frequency: ~ 10 Hz
	HF reject: High frequency reject, cutoff frequency ~ 50 kHz
	LF reject: Low frequency reject, cutoff frequency ~ 50 kHz
	Noise reject: Selectable OFF or ON, decreases sensitivity 2x
Trigger holdoff range	60 ns to 10 s

Trigger sensitivity

	EDUX1002A/EDUX1002G		DSOX1102A/DSOX1102G	
Internal [6]	Greater of: 0.6 div or 2.5 mV (≤ 10 MHz) 0.9 div or 3.8 mV (10 to 70 MHz) 1.2 div or 5 mV (70 to 100 MHz)		Greater of: 0.6 div or 2.5 mV (≤ 10 MHz) 0.9 div or 3.8 mV (10 to 70 MHz) 1.2 div or 5 mV (70 to 100 MHz)	
External	≤ 10 MHz:	250 mVpp	≤ 10 MHz:	50 mVpp (1.6 V range)
				250 mVpp (8 V range)
	10 MHz to 50 MHz:	500 mVpp	10 MHz to 100 MHz:	100 mVpp (1.6 V range)
				500 mVpp (8 V range)

Trigger level range

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G
Internal	± 6 div from center screen	± 6 div from center screen
External [7]	± 8 V	± 1.6 V or ± 8 V selectable

5. Line trigger to ≤ 60 Hz.
6. Denotes warranted specifications; All others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C firmware calibration temperature.
7. Input voltage must remain within these limits for proper operation.

Performance Characteristics (Continued)

Trigger type selections

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G
Trigger types	Edge, pulse width, video, pattern/state	Edge, pulse width, video, rise/fall time, setup and hold, pattern/state
Edge	Trigger on a rising, falling, alternating or either edge of any source	
Pattern/state	Trigger when a specified pattern/state on any combination inputs is entered [8]	
Pulse width	Trigger on a pulse of a selected channel with a time duration that is 'less than a value,' 'greater than a value' or 'inside a time range'	Trigger on a pulse of a selected channel with a time duration that is 'less than a value,' 'greater than a value' or 'inside a time range'
	Range minimum: 10 ns, 10 s max	Range minimum: 10 ns, 10 s max
Setup and hold	Not available	Trigger and clock/data setup and/or hold time violation. Setup time can be set from –7 ns to 10 s. Hold time can be set from 0 s to 10 ns
Rise/fall time	Not available	Trigger on rise-time or fall-time edge speed violations (< or >) based on user-selectable threshold
		Select from (< or >) and time settings range between
		Minimum: 5 ns
		Maximum: 10 s
Video	Trigger on all lines or individual lines; odd/even or all fields from composite video; or broadcast standards (NTSC, PAL, SECAM and PAM-M)	
I^2C – EDUX1EMBD option – DSOX1EMBD option	Trigger at a start/stop condition or user-defined frame with address and/or data values. Also trigger on missing acknowledge, restart, EEPROM read and 10-bit write	
RS-232/422/485/UART – EDUX1EMBD option – DSOX1EMBD option	Trigger on Rx or Tx start bit, stop bit, data content or parity error	
SPI – DSOX1EMBD option	Not available	Trigger on SPI (Serial Peripheral Interface) data pattern during a specific framing period. Supports positive and negative chip select framing as well as clock idle framing and user-specified number of bits per frame. Supports MOSI and MISO data
CAN – DSOX1AUTO option	Not available	Trigger on CAN (controller area network) version 2.0A or 2.0B signals. Trigger on the start of frame (SOF), end of frame (EOF), data frame ID, data frame ID and data (non-FD), data frame ID and data (FD), remote frame ID, remote or data frame ID, error frame, acknowledge error, from error, stuff error, CRC error, spec error (ack or form or stuff or CRC), all errors, BRS bit (FD), CRC delimiter bit (FD), ESI bit active (FD), ESI bit passive (FD), overload frame, message, message and signal (non-FD), message and signal (FD, first 8 bytes only)
LIN – DSOX1AUTO option	Not available	Trigger on LIN (Local Interconnect Network) sync break, sync frame ID or frame ID and data, parity error, checksum error and frame

8. Pattern must have stabilized for a minimum of 5 ns to qualify as a valid trigger condition.

Performance Characteristics (Continued)

Waveform measurements

		EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Cursors		Single cursor accuracy: ± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale]
		Dual cursor accuracy: ± [DC vertical gain accuracy + 0.5% full scale]
		Units: Seconds(s), Hz (1/s), phase (degrees)
Automatic measurements		Measurements continuously updated with statistics. Cursors track last selected measurement. Select up to eight measurements from the list below:
	Snapshot	Measure all single waveform measurements (24)
	Voltage	Peak-to-peak, maximum, minimum, amplitude, top, base, overshoot, pre-shoot, average- N cycles, average-full screen, DC RMS-N cycles, DC RMS-full screen, AC RMS-N cycles, AC RMS-full screen (standard deviation)
	Time	Period, frequency, counter, + width, - width, +duty cycle, -duty cycle, bit rate, rise time, fall time, delay, phase, X at min Y, X at max Y
Automatic measurement logging		Available via BenchVue BV0000A

Waveform math

		EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Arithmetic		Add, subtract, multiply, divide, FFT (magnitude), FFT (phase), low-pass filter
FFT	Record size	Up to 64 kpts resolution
	Window types	Hanning, Flat top, Rectangular, Blackman-Harris

Performance Characteristics (Continued)

WaveGen – Built-in function waveform generator (specifications are typical)

Note: Only available on WaveGen models EDUX1002G and DSOX1102G. WaveGen cannot be added to the other models.

	EDUX1002G/DSOX1102G
WaveGen out	Front-panel BNC connector
Waveforms	Sine, square, ramp, pulse, DC, noise
Modulation	Modulation types: AM, FM, FSK
	Carrier waveforms: Sine, ramp
	Modulation source: Internal (no external modulation capability)
	AM: – Modulation: sine, square, ramp – Modulation frequency: 1 Hz to 20 kHz – Depth: 0 to 100%
	FM: – Modulation: Sine, square, ramp – Modulation frequency: 1 Hz to 20 kHz – Minimum carrier frequency: 10 Hz – Deviation: 1 Hz to carrier frequency or (2e12 / carrier frequency), whichever is smaller
	FSK: – Modulation: 50% duty cycle square wave – FSK rate: 1 Hz to 20 kHz – Hop frequency: 2 x FSK rate to 10 MHz
Sine	Frequency range: 0.1 Hz to 20 MHz
	Amplitude flatness: ± 0.5 dB (relative to 1 kHz)
	Harmonic distortion: –40 dBc
	Spurious (non harmonics): –40 dBc
	Total harmonic distortion: 1%
	SNR (50 Ω load, 500 MHz bandwidth): 40 dB (typical); 30 dB (min)
Square wave /pulse	Frequency range: 0.1 Hz to 10 MHz
	Duty cycle: 20 to 80%
	Duty cycle resolution: Larger of 1% or 1 ns (≥ 25 kHz) or 10 ns (< 25 kHz)
	Pulse width: 20 ns minimum
	Rise/fall time: 18 ns (10 to 90%)
	Pulse width resolution: 1 ns (≥ 25 kHz) or 10 ns (< 25 kHz) or 5 digits, whichever is larger
	Overshoot: < 2%
	Asymmetry (at 50% DC): ± 1% ± 5 ns
	Jitter (TIE RMS): 500 ps
Ramp/triangle wave	Frequency range: 0.1 Hz to 200 kHz
	Linearity: 1%
	Variable symmetry: 0 to 100%
	Symmetry resolution: 1%
Noise	Bandwidth: 20 MHz typical

Performance Characteristics (Continued)

WaveGen – Built-in function waveform generator (specifications are typical) (Continued)

Note: Only available on WaveGen models EDUX1002G and DSOX1102G. WaveGen cannot be added to the other models.

	EDUX1002G/DSOX1102G
Frequency	Sine wave and ramp accuracy: – 130 ppm (frequency < 10 kHz) – 50 ppm (frequency > 10 kHz)
	Square wave and pulse accuracy: – [50 + frequency/200] ppm (frequency < 25 kHz) – 50 ppm (frequency ≥ 25 kHz)
	Resolution: 0.1 Hz or 4 digits, whichever is larger
Amplitude	Square, Pulse, Ramp: – 2 mVpp to 20 Vpp into Hi-Z (offset ≤ ±0.4 V) – 1 mVpp to 10 Vpp into 50 Ω (offset ≤ ±0.4 V) – 50 mVpp to 20 Vpp into Hi-Z (offset > ±0.4 V) – 25 mVpp to 10 Vpp into 50 Ω (offset > ±0.4 V)
	Sine: – 2 mVpp to 12 Vpp into Hi-Z (offset ≤ ± 0.4 V) – 1 mVpp to 9 Vpp into 50 Ω (offset ≤ ± 0.4 V) – 50 mVpp to 12 Vpp into Hi-Z (offset > ± 0.4 V) – 25 mVpp to 9 Vpp into 50 Ω (offset > ± 0.4 V)
	Resolution: ≤ 1% of amplitude
	Accuracy: 2% (Frequency = 1 kHz)
DC offset	Square, pulse, ramp: – ± [10 V – ½ amplitude] into Hi-Z – ± [5 V – ½ amplitude] into 50 Ω
	Sine: – ± [8 V – ½ amplitude] into Hi-Z – ± [4.5 V – ½ amplitude] into 50 Ω
	Resolution: Larger of 250 uV or 3 digits
	Accuracy: ± 1.5% of offset setting ± 1.5% of amplitude ± 1 mV
Main output	Impedance: 50 Ω typical
	Isolation: Not available, main output BNC is grounded
	Protection: Overload automatically disables output
	Single-shot (arbitrary, sine, ramp, sine cardinal, exp rise/fall, cardiac, Gaussian pulse)

Performance Characteristics (Continued)

Digital voltmeter (specifications are typical)

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Functions	ACrms, DC, DCrms
Resolution	ACV/DCV: 3 digits
Measuring rate	100 times/second
Autoranging	Automatic adjustment of vertical amplification to maximize the dynamic range of measurements
Range meter	Graphical display of most recent measurement, plus extrema over the previous 3 seconds

Frequency response analysis (Bode plot)

	EDUX1002G/DSOX1102G
Dynamic range	> 80 dB (typical)
Input and output sources	Channel 1 or 2
Frequency range	20 Hz to 20 MHz
Number of test points	10 points per decade
Test amplitude	10 mVpp to 9 Vpp into 50-Ω
	Fixed amplitude across entire sweep
Test results	Logarithmic overlaid gain and phase plot
Manual measurements	Single pair of tracking gain and phase markers
Plot scaling	Auto-scaled during test and manual

Environmental

Connectivity

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Standard ports	One USB 2.0 hi-speed device port on rear panel. Supports USBTMC protocol
	One USB 2.0 hi-speed host port on front panel. Supports memory devices, printers and keyboards

General and environmental characteristics

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Power line consumption	50 W max
Power voltage range	100 to 120 V, 50/60/400 Hz; 100 to 240 V, 50/60 Hz
Temperature	Operating: 0 to +50 °C
	Non-operating: –40 to +70 °C
Humidity	Operating: Up to 95% RH at or below +40 °C (non condensing)
	Non-operating: Up to 90% RH up to +65 °C (non condensing)
Altitude	Operating: Up to 2,000 m, Non-operating 15,300 m
Electromagnetic compatibility	Meets EMC directive (2004/108/EC), meets or exceeds IEC 61326-1:2005/EN61326-1:2013 (basic)
	IEC 61000-4-2/EN 61000-4-2
	IEC 61000-4-3/EN 61000-4-3
	IEC 61000-4-4/EN 61000-4-4
	IEC 61000-4-5/EN 61000-4-5
	IEC 61000-4-6/EN 61000-4-6
	IEC 61000-4-8/EN 61000-4-8
	IEC 61000-4-11/EN 61000-4-11
	Canada: ICES/NMB-001:2006
	Australia/New Zealand: AS/NZS CISPER 11:2011
Safety	UL61010-1 3rd edition, CAN/CSA-C22.2 No. 61010-1-12
Dimensions (W x H x D)	314 mm (12.4 in) x 165 mm (6.5 in) x 130 mm (5.1 in)
Weight	Net: 3.12 kg (6.9 lbs), shipping: 4.1 kg (9.0 lbs)
Display	7.0” diagonal color TFT LCD WVGA [9]

9. Display can have a maximum of 5 total stuck bright or stuck dark sub pixels (0.000434%) without being regarded as a failure.

Nonvolatile storage

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Reference waveform display	Two internal waveforms or USB thumb drive
Waveform storage	Set up, .bmp, .png, .csv, ASCII XY, reference waveforms, .bin, mask, HDF5
Max USB flash drive size	Supports industry standard flash drives
Set ups without USB flash drive	10 internal setups
USB drive	Limited by size of USB drive

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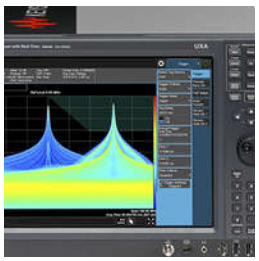
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