



Oscilloscopes

From debugging to standards compliance testing

BUYING GUIDE

Keysight Oscilloscopes

One family. Four performance grades. 8 classes.



ESSENTIAL

XR1, XR2, XR3-class

- 70 MHz to 1 GHz
Maximum bandwidth
- 2 to 4 Analog channels and up
to 16 digital channels



ADVANCED

XR4, XR5-class

- 200 MHz to 1.5 GHz
Maximum bandwidth
- 2 to 4 Analog channels and up
to 16 digital channels



EXPERT

XR6-class

- 500 MHz to 6 GHz
Maximum bandwidth
- 4 to 8 Analog channels and
16 digital channels



PRO

XR8, XR9-class

- 10 GHz to 110 GHz
Maximum bandwidth
- 2 to 4 Analog channels

Introduction

Selecting the right oscilloscope depends on the level of precision, signal integrity, and throughput your application demands. Keysight offers four performance grades of oscilloscopes — Essential, Advanced, Expert, and Pro. This buying guide compares these grades and their specifications. Whether you are characterizing simple signals, ensuring compliance with the latest standards, or exploring new industry standards, each oscilloscope tier offers a unique combination of bandwidth, channels, sample rate, memory depth, resolution, and display size. Use this guide to determine which oscilloscope grade aligns with your application requirements.

Essential

Essential oscilloscopes come in three classes. The XR1-class includes InfiniiVision 1000- and 2000-series, XR2 includes 3000-series, and XR3 includes HD3. High-functionality meets affordability in these 6-in-1 instruments, which offer a wide range of measurement capabilities in a compact package.



Expert

The XR6-class Expert oscilloscopes include the Infiniium EXR and MXR. For labs that demand precision measurements against the latest industry standards, these oscilloscopes reach frequencies up to 6 GHz across 8 analog channels.



Advanced

Advanced oscilloscopes come in two classes. The XR4-class includes 4000-series and XR5 includes 6000-series. For lab measurements that need more sophisticated features, higher sample rates, or a larger touch screen, these oscilloscopes deliver 7-in-1 instrument functionality.



Pro

Pro oscilloscopes come in two classes. The XR8-class includes the Infiniium UXR, and the XR9-class includes the Infiniium UXR. For labs that need to push the edges of performance and explore new industry standards, these oscilloscopes deliver exceptional precision, sensitivity, and expansion to frequencies up to 110 GHz.

Step 1. Check the General Specifications

All Keysight benchtop oscilloscopes enable a wide range of measurements, whether you are at the design, debugging, or fine-tuning stages of your product development. Our entire line of oscilloscopes deliver measurements with excellent signal integrity and high effective number of bits (ENOB) capturing the true performance of your device under test.

Couple this with protocol decoding, analysis, and compliance software, and your lab will be able to troubleshoot and debug designs, perform

enhanced circuit analysis, decode protocols, and ensure compliance with next-generation standards. The first part of your oscilloscope selection process will be based on bandwidth, analog and digital channels, sample rate, and memory depth.

The table below summarizes the key specifications by product grade — Essential, Advanced, Expert, and Pro — to help you select the oscilloscope that is right for your application.

Benchtop oscilloscope comparison of specifications

Specifications	Essential	Advanced	Expert	Pro
Class	XR1, XR2, XR3	XR4, XR5	XR6	XR8, XR9
Maximum bandwidth	70 MHz to 1 GHz	200 MHz to 1.5 GHz	500 MHz to 6 GHz	10 GHz to 110 GHz
Analog channels	2 to 4	2 to 4	4 to 8	2 to 4
Digital channels	0 to 16	0 to 16	16	0
Max sample rate	2 to 5 GSa/s	5 to 20 GSa/s	16 GSa/s	128 to 256 GSa/s
Max memory depth	1 Mpt to 100 Mpts	4 Mpts	1.6 Gpts	2 Gpts to 8 Gpts
ADC resolution	8 bits to 14 bits	8 bits	10 bits	10 bits to 12 bits
Display size	7-inch to 10.1-inch	12.1-inch	15.6-inch	15.4-inch to 15.6 inch
	EXPLORE ESSENTIAL	EXPLORE ADVANCED	EXPLORE EXPERT	EXPLORE PRO

Essential

Core Features

- 6 instruments in 1
- serial bus analysis
- automated measurements
- compact and portable

Key Capabilities

High-performance capabilities in an entry-level instrument provides Bode plotting, mask testing, mixed signal analysis, and triggering at frequencies up to 1 GHz.

Expert

Core Features

- high channel density with up to 8 analog and 16 digital channels
- automated fault detection
- robust software suite for signal and power integrity, protocol decode, RF, and compliance testing

Key Capabilities

Enhanced signal integrity analysis features and extensive suite of standards compliance test software available for most mainstream high-speed digital signals at frequencies up to 6 GHz.

Step 2. Look at Key Features



Advanced

Core Features

- 7 instruments in 1
- real-time protocol analysis
- enhanced triggering and segmented memory
- large 12.1-inch touch screen

Key Capabilities

Debug designs with a broader range of protocol trigger and decode and jitter analysis software, and analyze faster with a large touch screen interface at frequencies up to 1.5 GHz.

Pro

Core Features

- ultra-wide bandwidth
- fast sample rate
- high signal integrity
- compliance test software for next-generation standards like PCIe®, DDR, and MIPI®

Key Capabilities

Ensure compliance with the latest high-speed standards and perform cutting-edge research and development for next-generation standards. Our highest ENOB, highest bandwidth and lowest jitter, so you can fully evaluate your true signal.

Step 3. Consider Your Use Cases

While specifications are important, considering the various ways your team will use an instrument will determine which grade is best for your lab's needs. Here are a few typical use cases for each grade.

Essential: General-purpose debugging and education

Keysight Essential oscilloscopes are anything but basic. Even the most affordable entry-level version integrates six instruments in one (an oscilloscope, waveform generator, protocol analyzer, digital voltmeter, frequency counter, and frequency response analyzer) and provides auto-measurement capabilities. You can configure options for a 14-bit ADC with four times the resolution and half the noise floor of other general-purpose oscilloscopes. All Keysight Essential oscilloscopes feature automated test software for mask testing, FFT, and protocol triggering and decoding, plus histograms and Bode plots.

Keysight Essential oscilloscopes are ideal for education labs and general-purpose debugging. They enable you to debug low-speed signals, analyze basic waveforms, and characterize components in general electronics.

Common use cases for Essential oscilloscopes include:

- > How to Debug Electronic Devices with High Accuracy
- > How to Characterize Automotive Serial Buses
- > How to Measure AC Signals Over DC Signals
- > How to Perform Power Integrity Analysis



Advanced: Sophisticated debugging and characterization

Keysight Advanced oscilloscopes offer the same key features and capabilities as our Essential grade, plus higher bandwidth, faster sample rates, segmented memory, and an enlarged touch screen display. With the addition of digital channels, Advanced oscilloscopes integrate seven instruments in one. They are well-positioned for debugging more sophisticated designs that require jitter analysis, eye diagrams, and zone triggering.

Designed for embedded systems and mixed-signal designs, they feature enhanced triggering and protocol decoding for analyzing mixed-signal environments in a variety of applications, such as automotive, aerospace and defense, and power electronics.

Common use cases for Advanced oscilloscopes include:

- > How to Test Switch Mode Power Supplies
- > How to Measure Power Supply Control Loop Response (Bode Plot)
- > How to Characterize the Automotive CAN Bus
- > How to Debug Mixed-Signal Designs

Consider Your Use Cases (cont.)

Expert: High-speed data and signal integrity analysis

Keysight Expert oscilloscopes deliver up to eight analog channels compared with four in our Essential and Advanced oscilloscopes. Available configurations provide eight instruments in one with the addition of a real-time spectrum analyzer. They are well-suited for testing complex applications like 5G multiple-input / multiple-output, radar, and satellite communications.

Aimed at high-speed digital and RF analysis, these oscilloscopes support signal integrity engineers working with mainstream standards or high-speed serial buses.

Common use cases for Expert oscilloscopes include:

- How to Verify Automotive Ethernet Transmitter Compliance
- How to Test USB 2.0 Interface Compliance
- How to Test USB Type-C Power Delivery
- How to Automate Conformance Debug and Verification

Explore more **oscilloscope use cases** to help you innovate faster and with greater confidence.

Pro: Next-generation compliance testing and research

Keysight Pro oscilloscopes are our highest-performance models, ideal for next-generation research and development, high-speed compliance testing, photonic device testing, and more. Conquer your most difficult measurement challenges with our highest bandwidth and low noise-floor oscilloscopes. They are well-suited for researchers developing next-generation standards like Ethernet, PCIe, DDR, and 5G New Radio.

Common use cases for Pro oscilloscopes include:

- How to Test PCIe® 6.0 Transmitter Compliance
- How to Test USB4 Version 2.0 Transmitter Compliance
- How to Test 5G Communication Systems
- How to Test 400G / 800G Electrical Transmitter Conformance



Step 4. Final Key Considerations

As you look across basic features, enhanced features, and your lab's typical use cases, it is good to revisit how use cases might drive each of your instrument's features.

Factors to consider when choosing an oscilloscope:

Bandwidth

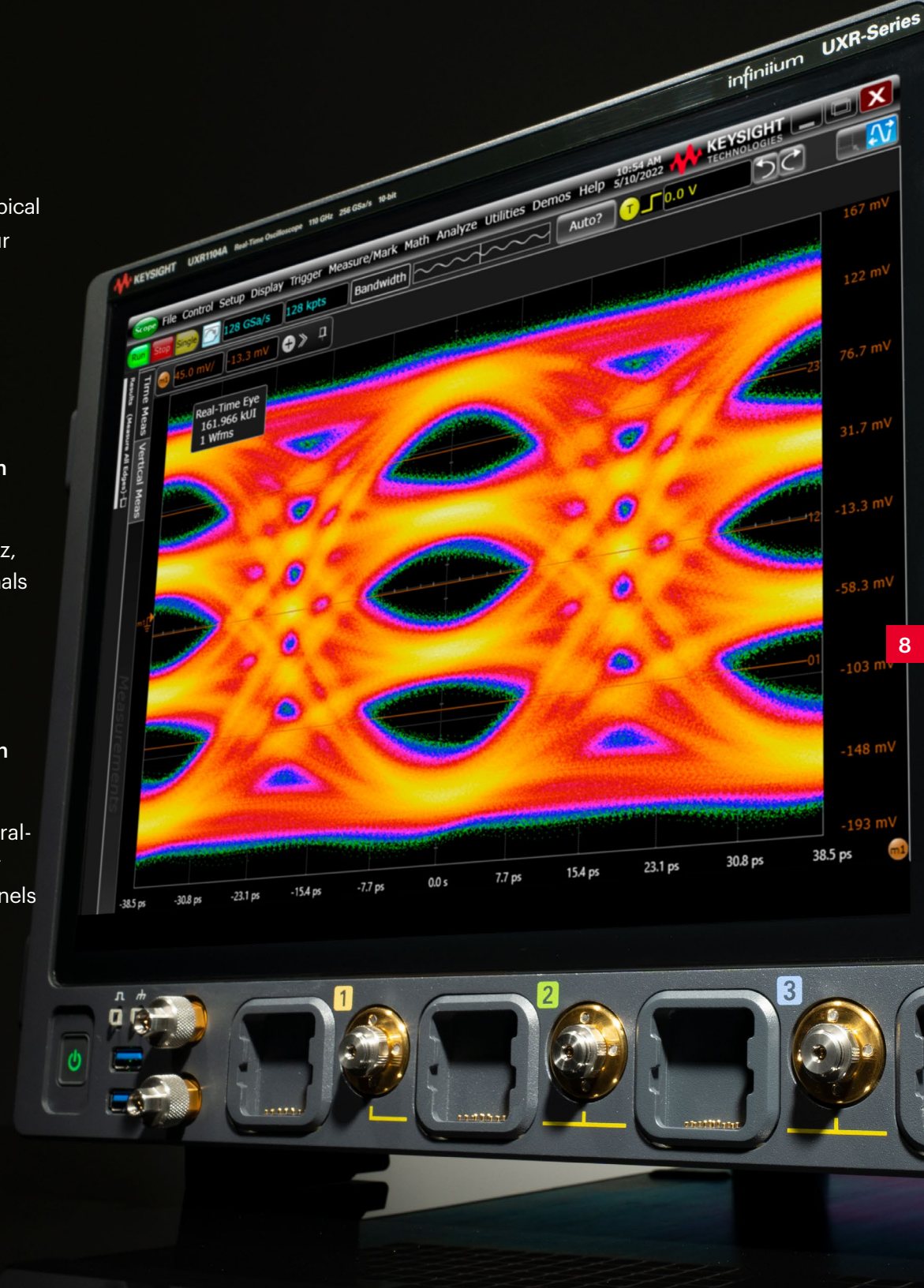
Bandwidth determines the highest frequency an oscilloscope can accurately measure.

Select Essential for signals up to 1 GHz, Advanced for up to 1.5 GHz, Expert for up to 6 GHz, and Pro for next-generation designs with signals reaching up to 110 GHz.

Channels

More channels enable synchronized analysis of multiple signals in complex systems.

Choose Essential or Advanced for 2 or 4 analog channels for general-purpose applications, Expert for up to 8 analog channels, ideal for multiphase testing, and Pro for 2 or 4 ultra-high-speed analog channels designed for next-generation technologies.



Final Key Considerations (cont.)

Sample rate

Higher sample rates capture fast transients and preserve waveform details.

Use Essential for general-purpose applications up to 5 GSa/s, Advanced for detailed signal analysis at lower bandwidths with up to 20 GSa/s, Expert for detailed signal analysis at higher bandwidths with up to 16 GSa/s, and Pro for capturing ultra-fast transients in the most sophisticated applications and next-generation technologies with up to 256 GSa/s.

Memory depth

Greater memory depth enables long-duration captures at high resolution.

Choose Essential or Advanced for short tests, Expert for extended monitoring, and Pro for high-resolution, long-duration logging and analysis.



Common mistakes to avoid when selecting an oscilloscope

- Choosing insufficient bandwidth, leading to signal attenuation and inaccurate results.
- Ignoring software capabilities, which may be critical for debugging complex systems.
- Not considering future scalability, leading to premature obsolescence.
- Neglecting memory depth, which limits capturing long signal sequences.
- Overlooking probe selection, resulting in inaccurate or noisy measurements.

Modular Oscilloscopes

When you need oscilloscope functionality but don't need the display and interface flexibility, **Keysight modular** oscilloscopes provide you with the power of a benchtop oscilloscope in a compact, flexible form factor, helping you save valuable rack space. Get the same performance level as our Essential and Advanced oscilloscopes in a high-density PXIe module.



Choose from three modular oscilloscope models, offering bandwidths from 200 MHz to 1 GHz, to get the one that is right for your application.

Bandwidth: 200 MHz to 1 GHz

Analog channels: 2

Maximum sample rate: 5 GSa/s

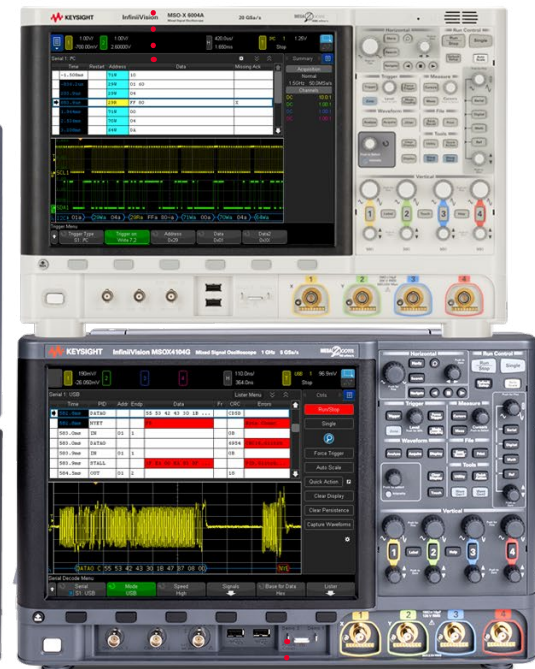
Maximum memory depth: 4 Mpts

EXPLORE

Oscilloscope Software Functionality

When looking for the right oscilloscope, often it is helpful to understand what kinds of measurements it can support and to what level. Keysight oscilloscopes support a wide range of engineering measurements. Below are some examples. To explore the full range of oscilloscope software, visit our [instrument measurement software](#) page.

Measurement software for Essential and Advanced oscilloscopes



Measurement software for Expert and Pro oscilloscopes

Explore the breadth of analysis, protocol decode, and compliance automation applications for Keysight Pro and Expert oscilloscopes.

EXPERT

Signal analysis

- Advanced signal integrity
- Jitter, vertical, and phase noise analysis

Power analysis

- Power supply test
- Power integrity analysis

Protocol / compliance

- Low-speed protocol trigger / decode
- USB protocol decode / trigger
- Automotive Ethernet transmitter compliance
- Automotive protocol decode / trigger
- And more...

PRO

Signal analysis

- Advanced signal integrity analysis
- Jitter, phase, and vertical noise analysis
- Pulse amplitude modulation analysis
- Vector signal analysis

Protocol / compliance

- OIF-CEI transmitter conformance
- IEEE 802.3 electrical transmitter conformance
- PCIe protocol / compliance
- USB protocol / compliance
- DDR transmitter compliance
- LPDDR compliance
- DisplayPort compliance test
- MIPI protocol / compliance
- HDMI transmitter compliance
- And more...



BUNDLE AND SAVE

Why Choose Keysight?

Keysight oscilloscopes offer high accuracy, signal integrity, and powerful software tools. Here's why engineers choose Keysight:

Accuracy and precision

- Optimized signal conditioning and noise reduction for accurate signal capture.
- High-resolution ADC technology and fast sampling for precise measurements.

High-speed performance

- Capture even the fastest signals without loss of detail with fast sample rates.
- Ultra-high bandwidth support enables measurement of high-speed digital signals.

Exceptional signal integrity

- Low noise and high ENOB reduce signal distortion and improve signal resolution.
- Preserve waveform detail for confident debug and analysis of complex signals.

Robust software

- Over 50 compliance test software packages speed testing of the latest standards.
- Broad suite of analysis and application software automates testing and analysis.

Feature

Specification*

Bandwidth range

Up to 110 GHz

Channels

Up to 8 analog and 16 digital channels

Max sample rate

Up to 256 GSa/s

Max memory depth

Up to 8 Gpts

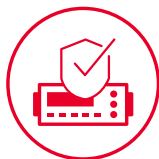
ADC resolution

Up to 14 bits

User interface

Up to 15.6-inch capacitive multi-touch display

* Some maximum specifications may not be available together.



Calibration

Ensure your test system performs to specification and meets local and global standards.



Repair

Restore equipment to original functionality and specifications with trained technicians.



KeysightCare

Innovate at speed with curated support plans and prioritized response and turnaround times.



Education

Make measurements quickly with eLearning and in-house, instructor-led training.



Keysight Support

Get 24x7 access to service requests, case management help, and technical articles.

Select the Oscilloscope That Is Right for You

Should you need more information on Keysight oscilloscope offerings, visit our extensive [library of resources](#) to help you select the right oscilloscope for your application.

Here are some of the resources that can guide you in determining the best oscilloscope for your needs:

- > [Evaluating Oscilloscope Bandwidths for Your Application](#)
- > [10 Tips for Making Your Best Power Integrity Measurements](#)
- > [7 Common Oscilloscope Probing Pitfalls to Avoid](#)



Once you are ready, visit **Keysight oscilloscopes** to select one of our popular configurations or build one to meet your specific application.



Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.

This information is subject to change without notice. © Keysight Technologies, 2026, Published in USA, February 28, 2026, 7125-1027.EN