5 YEAR WARRANTY

pico Technology

PicoScope® 3000 Series

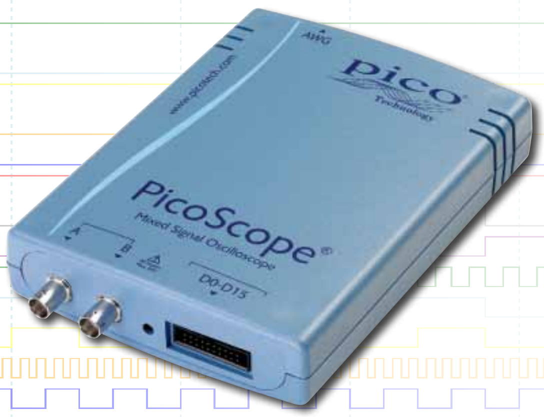
USB OSCILLOSCOPES AND MIXED-SIGNAL OSCILLOSCOPES

Deep memory, high performance

2 ANALOG CHANNELS • SERIAL DECODING • MATH CHANNELS

2 CHANNELS

- HUGE 128 MS buffer size
- 200 MHz analog bandwidth
- 100 MHz digital channels
- 500 MS/s real-time sampling
- 10 GS/s repetitive sampling
- Advanced digital triggers
- 200 MHz spectrum analyzer
- Built-in function generator/AWG
- USB-connected and powered



+16 LOGIC CHANNELS

2 CHANNELS + 16 CHANNEL MSO

Supplied with a full SDK including example programs • Software compatible with Windows XP, Windows Vista, Windows 7 and Windows 8 • Free technical support

ANALOG , DIGITAL, OR BOTH? WE'VE GOT IT COVERED

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PicoScope: power, portability and versatility

Pico Technology continues to push the limits of USB-powered oscilloscopes. The PicoScope 3000 A/B Series offers the highest performance available from any USB-powered oscilloscope on the market today.

Pico USB-powered oscilloscopes are small, light and portable. They easily slip into a laptop bag making them ideal for the engineer on the move. There is no need for an external power supply, making them ideal for field use in many applications, such as design, research, test, education, service and repair.

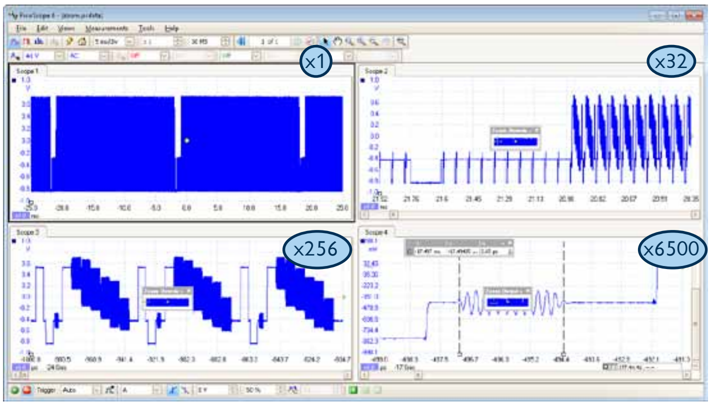
High bandwidth, high sampling rate

Most USB-powered oscilloscopes have real-time sampling rates of only 100 or 200 MS/s, but the PicoScope 3000 Series offers 500 MS/s. ETS mode boosts the maximum effective sampling rate further to 10 GS/s, allowing more detailed display of repetitive signals.

Huge buffer memory

The PicoScope 3000 Series offers memory depths up to 128 million samples, more than any other oscilloscope in this price range.

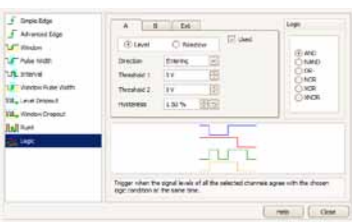
Other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The PicoScope 3206B can sample at 500 MS/s at timebases all the way down to 20 ms/div.



Managing all this data calls for some powerful tools, so PicoScope has a maximum zoom factor of 100 million combined with a choice of two zoom methods. There's a conventional set of zoom buttons, plus an overview window that shows you the whole waveform while you zoom and reposition the display by simply dragging with the mouse.

Each captured waveform is stored in the segmented buffer so you can rewind and review thousands of previous waveforms. No longer will you see a glitch on the screen only for it to vanish before you stop the scope. A mask can be applied to hide waveforms that are not of interest.

Advanced triggers



As well as the standard range of triggers found on all oscilloscopes, the PicoScope 3000 Series offers a class-leading set of advanced triggers including pulse width, windowed and dropout triggers to help you capture the data you need.

Digital triggering

Most digital oscilloscopes sold today still use an analog trigger architecture based on comparators. This can cause time and amplitude errors that cannot always be calibrated out. The use of comparators often limits the trigger sensitivity at high bandwidths.

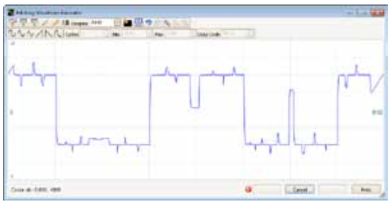
In 1991 we pioneered the use of fully digital triggering using the actual digitized data. This technique reduces trigger errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth. Trigger levels and hysteresis can be set with high precision and resolution.

Digital triggering also reduces re-arm delay and this, combined with the segmented memory, allows the triggering and capture of events that happen in rapid sequence. At the fastest timebase you can use rapid triggering to collect 10,000 waveforms in under 20 milliseconds. Our mask limit testing function can then scan through these waveforms to highlight any failed waveforms for viewing in the waveform buffer.

Custom probe settings

The custom probes feature allows you to correct for gain, attenuation, offsets and nonlinearities in special probes, or to convert to different units of measurement (such as current, power or temperature). You can save definitions to disk for later use.

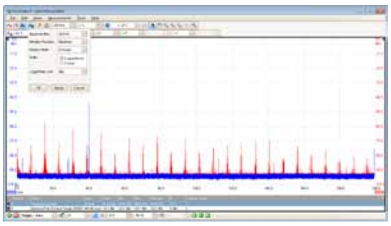
Arbitrary waveform and function generator



All units have a built-in function generator (sine, square, triangle, DC level). As well as basic controls to set level, offset and frequency, more advanced controls allow you to sweep over a range of frequencies. Combined with the spectrum peak hold option this makes a powerful tool for testing amplifier and filter responses.

The PicoScope 3000 Series B and MSO models include additional built-in waveforms as well as a full arbitrary waveform generator. Waveforms can be created or edited using the built-in AWG editor, imported from oscilloscope traces, or loaded from a spreadsheet.

Spectrum analyzer



With the click of a button, you can display a spectrum plot of the selected channels. The spectrum analyzer allows signals up to 200 MHz to be viewed in the frequency domain. A full range of settings gives you control over the number of spectrum bands, window types and display modes: instantaneous, average, or peak-hold.

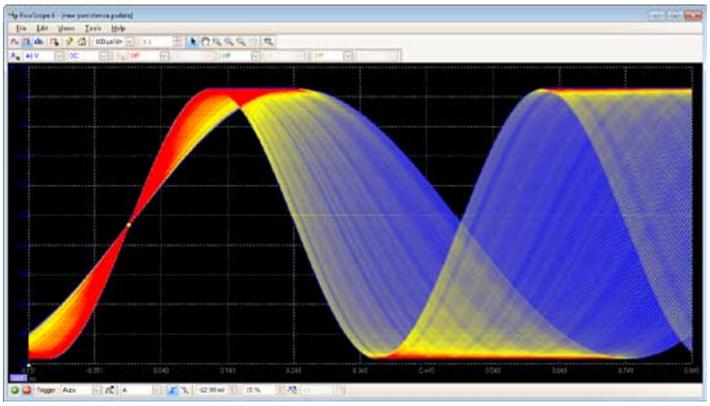
You can display multiple spectrum views with different channel selections and zoom factors, and see these alongside time-domain waveforms of the same data. A comprehensive set of automatic frequency-domain measurements, including THD, THD+N, SNR, SINAD and intermodulation distortion, can be added to the display.

Our commitment

To protect your investment, the API, the PicoScope software, and the firmware inside the unit can be updated. We have a long history of providing new features for free via our software downloads.

Users of our products reward us by becoming lifelong customers, frequently recommending us to their colleagues.

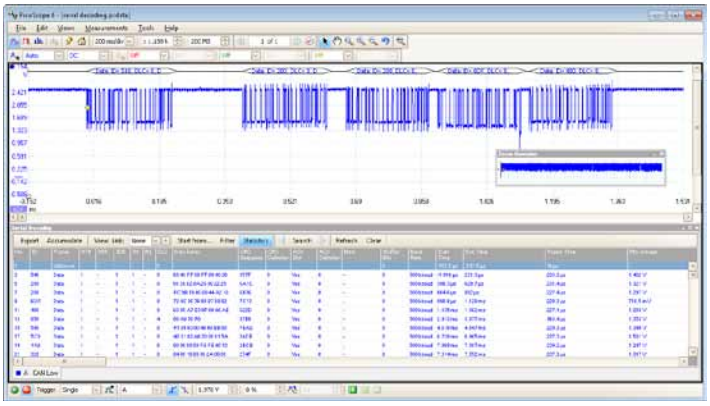
Persistence display modes



See old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose between analog persistence and digital color, or create a custom display mode.

The design of the PicoScope software ensures that maximum display area is available for waveform viewing. Even with a laptop you have a much bigger viewing area and higher resolution than a typical benchtop scope.

Serial decoding



The PicoScope 3000 Series, with its deep memory, is ideal for serial decoding as it can capture thousands of frames of uninterrupted data.

Protocols currently included are I^{2}C, SPI, RS232/UART, CAN bus, LIN and FlexRay. Expect this list to grow with free software updates.

PicoScope displays the decoded data in the format of your choice: in-view, in-window, or both at once. The in-view format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. You can zoom in on these frames to look for noise or distortion on the waveform.

In-window format shows a list of the decoded frames, including the data and all flags and identifiers. You can set up filtering conditions to display only the frames you are interested in, search for frames with specified properties, or define a start pattern that the program will wait for before listing the data.

You can also create a spreadsheet to fully decode the hex data into plain text.

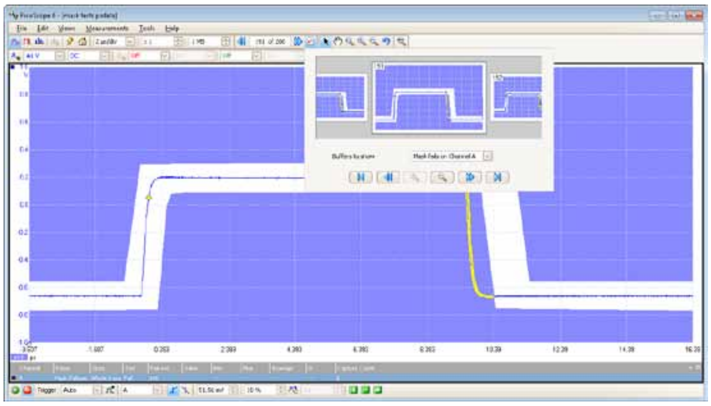
High-speed data acquisition/digitizer

The drivers and software development kit supplied allow you to write your own software or interface to popular third-party software packages such as LabView.

If the 128 MS record length isn't enough, the driver supports data streaming, a mode that captures gap-free continuous data through the USB port directly to the PC's RAM or hard disk at a rate of >10 MS/s (Maximum speed is PC-dependent).

Mask limit testing

This feature is specially designed for production and debugging environments. Capture a signal from a known working system, and PicoScope will draw a mask around it with your specified tolerance. Connect the system under test, and PicoScope will highlight any parts of the waveform that fall outside the mask area. The highlighted details persist on the display, allowing the scope to catch intermittent glitches while you work on something else. The measurements window counts the number of failures, and can display other measurements and statistics at the same time.



The numerical and graphical mask editors can be used separately or in combination, allowing you to enter accurate mask specifications and to modify existing masks. You can import and export masks as files.

High-end features as standard

Buying a scope from some companies is a bit like buying a car. By the time you have added all the optional extras you need, the price has gone up considerably. With the PicoScope 3000 Series, high-end features such as mask limit testing, serial decoding, advanced triggering, measurements, math, XY, digital filtering and segmented memory are all included in the price.

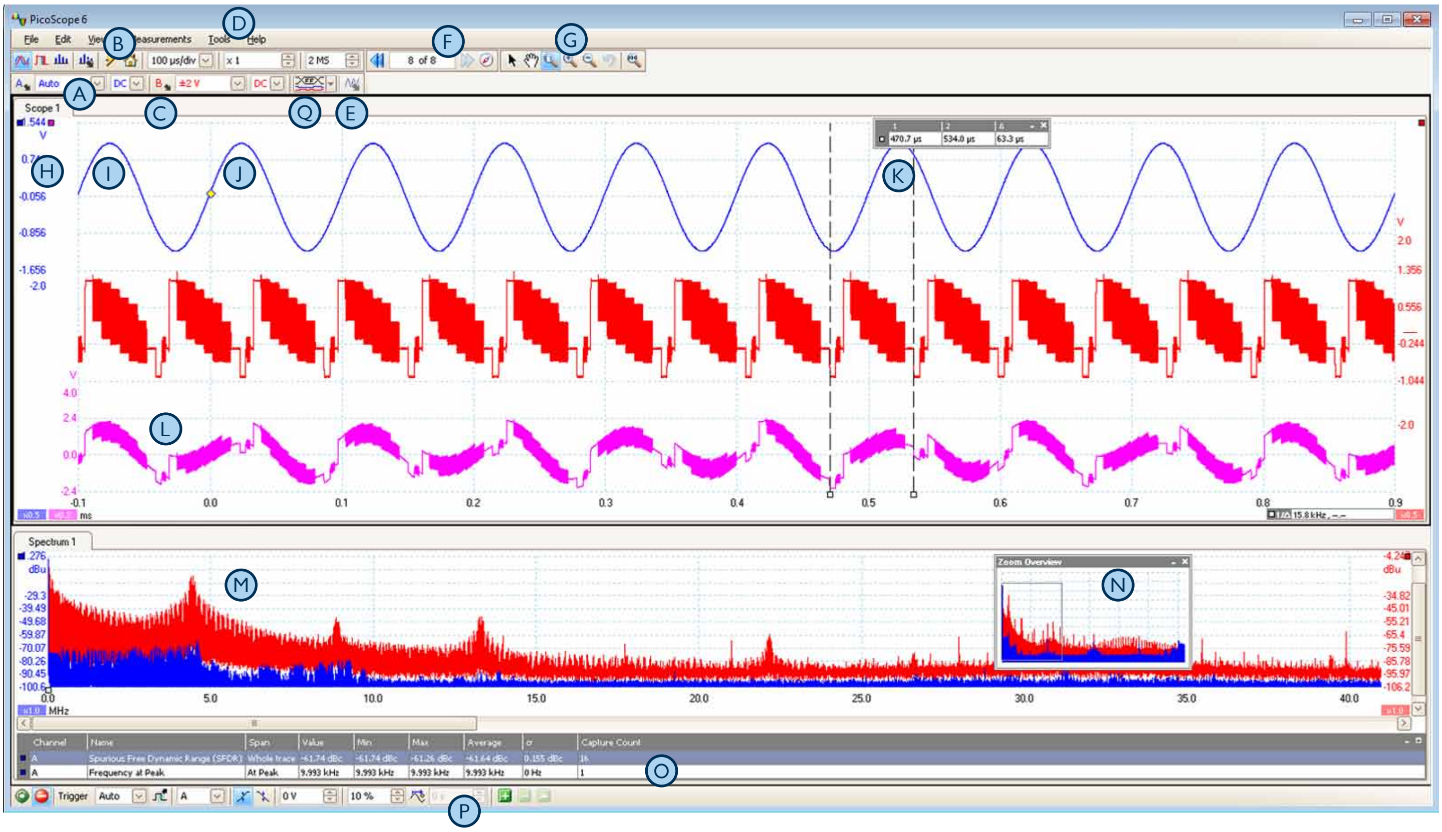
To protect your investment, both the PC software and firmware inside the unit can be updated. We have a long history of providing new features for free as software downloads. Other companies make vague promises about future enhancements but we deliver on our promises year after year. Users of our products reward us by becoming lifelong customers, frequently recommending us to their colleagues.

High signal integrity

Most oscilloscopes are built down to a price; ours are built up to a specification.

Careful front-end design and shielding reduces noise, crosstalk and harmonic distortion. Years of oscilloscope experience leads to improved pulse response and bandwidth flatness.

We are proud of the dynamic performance of our products and publish these specifications in detail. The result is simple: when you probe a circuit, you can trust in the waveform you see on the screen.

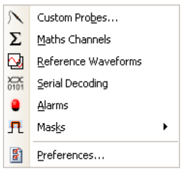


Ⓐ Commonly-used controls such as voltage range selection, timebase, memory depth and channel selection are placed on the toolbars for quick access, leaving the main display area clear for waveforms.

Ⓑ Auto setup button: Configures the timebase, voltage ranges and trigger for a stable display of your signals.

Ⓒ 

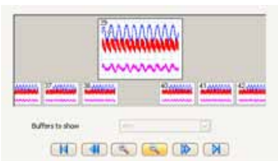
Channel Options give access to channel-specific settings such as custom probes, resolution enhancement, offset controls and filtering.

Ⓓ 

More advanced controls and functions are located in the Tools menu.

Ⓔ 

Function Generator: allows the scope to generate standard signals or arbitrary waveforms. Includes frequency sweep options.

Ⓕ 

Waveform Buffer Overview: PicoScope automatically records up to 10,000 of the most recent waveforms. You can quickly scan through to look for intermittent events. The buffer overview can be used with the mask test tools to display only failed waveforms.

Ⓖ Zoom and pan tools: PicoScope enables a zoom factor of up 100 million, which is necessary when working with the deep memory of the 3000 Series scopes. Use the conventional zoom-in, zoom-out and pan tools, or try the zoom overview window for fast navigation.

Ⓗ Movable axes: The vertical axes can be dragged up and down. This feature is particularly useful when one waveform is obscuring another. There's also a command to rearrange all the axes automatically.

Ⓘ The PicoScope display can be as simple or as complex as you need. Begin with a single view of one channel, and then expand the display to include any number of live channels, math channels and reference waveforms.

PicoScope is carefully designed to make the best use of the display area. You can add new scope and spectrum views, all of which are fully adjustable in size.

Ⓙ Trigger marker: Shows the level and time of the trigger event. Drag with the mouse to adjust.

Ⓚ Rulers: Each axis has two rulers that can be dragged onto the screen to make quick measurements of amplitude, time and frequency.

Ⓛ Math channels: Combine input channels and saved reference waveforms using simple arithmetic, or use custom equations with trigonometric and other functions.

Ⓜ Spectrum views: One or more spectrum views can be added to show an FFT of the data in the scope view. Alternatively, PicoScope can be configured as a dedicated spectrum analyzer.

Ⓝ Zoom overview: When a scope or spectrum view is zoomed in, the overview window allows fast navigation. As well as providing an overview, this allows the zoom level and position to be changed using the mouse.

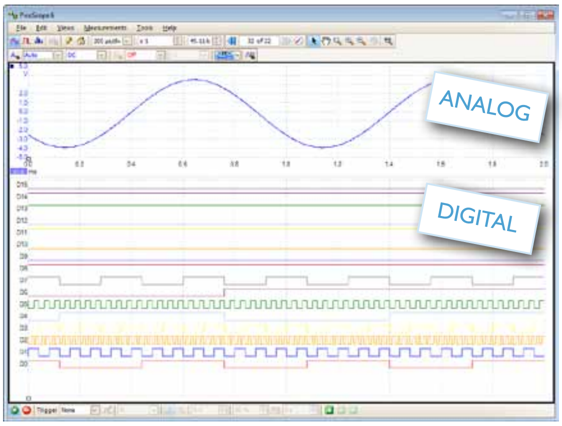
Ⓞ Automatic measurements. You can add as many measurements as you need on each view. Each measurement includes statistical parameters showing its variability.

Ⓟ Trigger toolbar: Commonly-used controls are on the toolbar with more advanced trigger options available from a pop-up window.

Ⓠ Digital channels (MSOs only): Drag-and-drop to add the channels you want to see. These channels can be arranged into any order, grouped, renamed, and even temporarily disabled if required.

Mixed-signal capability

The PicoScope 3000 Series MSOs from Pico Technology are 2+16 channel, 8-bit resolution oscilloscopes. This means that along with 2 analog channels, the PicoScope 3000 Series MSOs also have 16 digital inputs. The result? With the PicoScope 3000 Series MSOs you can view your digital and analog signals simultaneously.



Full-featured oscilloscope

The PicoScope 3000 Series MSOs, while featuring the 2+16 channel format, still remain full-featured oscilloscopes. An arbitrary waveform generator is built-in and includes a sweep function. The oscilloscopes also offer mask limit testing, math and reference channels, advanced triggers, serial decoding, automatic measurements and color persistence display.

Triggering

The PicoScope 3000 Series MSOs offer a comprehensive set of advanced triggers including pulse width, windowed and dropout triggers to help you capture the data you need. Digital triggering reduces timing errors and allows these oscilloscopes to trigger on the smallest signals, even at the full bandwidth. Trigger levels and hysteresis can be set with high resolution.

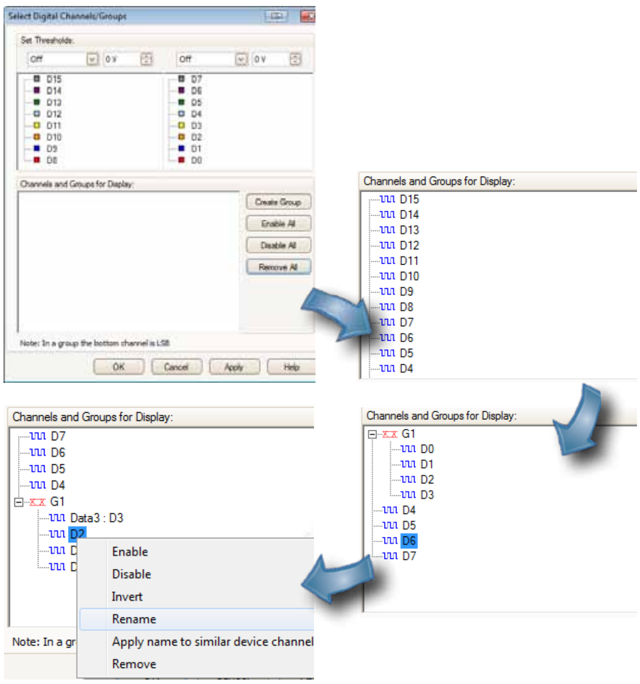
Digital triggering reduces re-arm delay and, combined with the segmented memory, allows the triggering and capture of events that happen in rapid sequence. For analog inputs the mask limit testing function can then scan through the buffer to highlight failed waveforms for viewing in the buffer navigator.

The 16 digital inputs can be displayed individually or in arbitrary groups labelled with binary, decimal or hexadecimal values. A separate logic threshold from -5 V to +5 V can be defined for each 8-bit input port. The digital trigger can be activated by any bit pattern combined with an optional transition on any input.

Advanced logic triggers can be set on either the analog or digital input channels, or both.

Selecting digital channels, or groups

Selecting the digital channels in the software couldn't be easier. Just click the digital channels button ( ), and then drag-and-drop to add the channels you want to see. These channels can be arranged into any order, grouped, renamed, and even temporarily disabled if required.



MODEL	ANALOG BANDWIDTH	DIGITAL MAX. FREQ.	SAMPLING	BUFFER SIZE	WAVEFORM	PROBES SUPPLIED
PicoScope 3204A	60 MHz	-	500 MS/s	4 MS	Function generator	2 x 60 MHz
PicoScope 3204B	60 MHz	-	500 MS/s	8 MS	Func. gen. + AWG	2 x 60 MHz
PicoScope 3204 MSO	60 MHz	100 MHz	500 MS/s	8 MS	Func. gen. + AWG	2 x 60 MHz
PicoScope 3205A	100 MHz	-	500 MS/s	16 MS	Function generator	2 x 150 MHz
PicoScope 3205B	100 MHz	-	500 MS/s	32 MS	Func. gen + AWG	2 x 150 MHz
PicoScope 3205 MSO	100 MHz	100 MHz	500 MS/s	32 MS	Func. gen. + AWG	2 x 150 MHz
PicoScope 3206A	200 MHz	-	500 MS/s	64 MS	Function generator	2 x 250 MHz
PicoScope 3206B	200 MHz	-	500 MS/s	128 MS	Func. gen. + AWG	2 x 250 MHz
PicoScope 3206 MSO	200 MHz	100 MHz	500 MS/s	128 MS	Func. gen. + AWG	2 x 250 MHz

VERTICAL (Analog)	PicoScope 3204A/B/MSO	PicoScope 3205A/B/MSO	PicoScope 3206A/B/MSO
Bandwidth (-3 dB)	60 MHz	100 MHz	200 MHz
Rise time (calculated)	5.8 ns	3.5 ns	1.75 ns
Input connectors	BNC		
Resolution	8 bits		
Input characteristics	2 channels, 1 MΩ ±1%, in parallel with 13 pF ±1 pF		
Input coupling	AC/DC		
Input sensitivity	10 mV/div to 4 V/div (10 vertical divisions)		
Input ranges	±50 mV to ±20 V in 9 ranges		
Analog offset range	±250 mV (50 mV, 100 mV, 200 mV ranges), ±2.5 V (500 mV, 1 V, 2 V ranges), ±20 V (5 V, 10 V, 20 V ranges)		
DC accuracy	±3% of full scale		
Overvoltage protection	±100 V (DC + AC Peak)		

VERTICAL (Digital)	PicoScope 3204 MSO	PicoScope 3205 MSO	PicoScope 3206 MSO
Number of channels	16		
Input connectors	2.54 mm pitch, 10 x 2 way connector		
Maximum input frequency	100 MHz		
Minimum detectable pulse width	5 ns		
Input impedance (with TA136 cable)	200 kΩ ±2 % ‖ 8 pF ±2 pF		
Digital threshold range	±5 V		
Input range	±20 V		
Overvoltage protection	±50 V		
Threshold grouping	Two independent threshold controls - Port 0: D7-D0 and Port 1: D15-D8		
Threshold selection	TTL, CMOS, ECL, PECL, User Defined		
Threshold accuracy	±100 mV		
Minimum input voltage swing	500 mV		
Channel-to-channel skew	< 5 ns		
Minimum input slew rate	10 V/μs		

HORIZONTAL	PicoScope 3204A/B/MSO	PicoScope 3205A/B/MSO	PicoScope 3206A/B/MSO
Max. sampling rate Ch A or B Ch A or B + 1 Digital port (MSO only) 1 or 2 Digital ports (MSO only) All other combinations (All models)	 500 MS/s 500 MS/s 500 MS/s 250 MS/s	 500 MS/s 500 MS/s 500 MS/s 250 MS/s	 500 MS/s 500 MS/s 500 MS/s 250 MS/s
Sampling rate (repetitive sampling)	2.5 GS/s	5 GS/s	10 GS/s
Sampling rate (cont. USB streaming)	1 MS/s in PicoScope software. >10 MS/s using supplied SDK (PC-dependent)		
Timebase ranges (all models)	2 ns/div to 1000 s/div	1 ns/div to 1000 s/div	500 ps/div to 1000 s/div
Buffer memory* (A models)	4 MS	16 MS	64 MS
Buffer memory* (B/MSO models)	8 MS	32 MS	128 MS
Waveform buffer (no. of segments)	1 to 10,000		
Timebase accuracy	±50 ppm		
Sample jitter	< 5 ps RMS		

* Shared between active channels

DYNAMIC PERFORMANCE (typical) analog channels	
Crosstalk	Better than 400:1 up to full bandwidth (equal voltage ranges)
Harmonic distortion	< –50 dB at 100 kHz full scale input
SFDR	52 dB typical
ADC ENOB	7.6 bits
Noise	180 μV RMS (on most sensitive range)
Pulse response	< 5% overshoot
Bandwidth flatness	(+0.3 dB, –3 dB) at scope input, from DC to full bandwidth

ALL MODELS		
TRIGGER (Main features)	Trigger modes	None, Auto, Repeat, Single, Rapid (segmented memory)
	Max. pre-trigger capture	100% of capture size
	Max. post-trigger delay	4 billion samples
	Trigger re-arm time	< 2 μs on fastest timebase
	Max. trigger rate	Up to 10,000 waveforms in a 20 ms burst
TRIGGER (Analog inputs)	Source	Ch A, Ch B
	Trigger types	Rising, falling
	Advanced triggers	Edge, Window, Pulse width, Window pulse width, Dropout, Window dropout, Interval, Runt pulse, Logic
	Trigger sensitivity	Digital triggering provides 1 LSB accuracy up to full bandwidth of scope. ETS mode: Typical 10 mV p-p, at full bandwidth
TRIGGER (Digital inputs)	Source	D15 to D0
	Trigger types	Combined Level and Edge
	Advanced triggers	Data pattern (adjustable grouping)
TRIGGER (Logic)	Source	Ch A, Ch B, and D15 to D0
	Trigger types	AND, NAND, OR, NOR, XOR, XNOR of analog and digital inputs

EXTERNAL TRIGGER INPUT (A/B models only)			
Trigger types	Edge, pulse width, dropout, interval, logic, delayed		
Input characteristics	Front panel BNC, 1 MΩ ±1% in parallel with 13 pF ±1 pF		
Bandwidth	60 MHz	100 MHz	200 MHz
Voltage range	±5 V, DC coupled		
Overvoltage protection	±100 V (DC + AC peak)		

FUNCTION GENERATOR	PicoScope 3204A/B/MSO	PicoScope 3205A/B/MSO	PicoScope 3206A/B/MSO
Standard output signals	*All models:* Sine, square, triangle, DC voltage *B/MSO models:* ramp, sinc, Gaussian, half-sine, white noise, PRBS		
Standard signal frequency	DC to 1 MHz		
Bandwidth	> 1 MHz		
Output frequency accuracy	±50 ppm		
Output frequency resolution	< 0.01 Hz		
Output voltage range	±2 V with ±1% DC accuracy		
Output voltage adjustment	Signal amplitude and offset adjustable in approx. 1 mV steps within overall ± 2 V range		
Amplitude flatness	< 0.5 dB to 1 MHz, typical		
SFDR	> 60 dB, 10 kHz full scale sine wave		
Connector type	BNC, 600 Ω output impedance		
Overvoltage protection	±10 V		
Sweep modes	Up, down, or alternating, with selectable start/stop frequencies and increments		
AWG (B/MSO models only)			
Update rate	20 MS/s		
Buffer size	8 kS	8 kS	16 kS
Resolution	12 bits (output step size approx. 1 mV)		
Standard signal frequency	DC to 1 MHz		
Bandwidth	> 1 MHz		
Rise time (10 - 90%)	< 100 ns		
SPECTRUM ANALYZER			
Frequency range	DC to 60 MHz	DC to 100 MHz	DC to 200 MHz
Display modes	Magnitude, average, peak hold		
Windowing functions	Rectangular, Gaussian, triangular, Blackman, Blackman-Harris, Hamming, Hann, flat-top		
Number of FFT points	Selectable from 128 to 1 million in powers of 2		
MATH CHANNELS			
Functions	Arbitrary equations using: −x, x+y, x−y, x*y, x/y, sqrt, x^y, exp, ln, log, abs, norm, sign, sin, cos, tan, arcsin, arccos, arctan, sinh, cosh, tanh		
Operands	A, B (input channels), T (time), reference waveforms, constants, pi		
AUTOMATIC MEASUREMENTS			
Oscilloscope	AC RMS, true RMS, DC average, cycle time, frequency, duty cycle, falling rate, fall time, rising rate, rise time, high pulse width, low pulse width, maximum, minimum, peak to peak		
Spectrum	Frequency at peak, amplitude at peak, average amplitude at peak, total power, THD %, THD dB, THD plus noise, SFDR, SINAD, SNR, IMD		
Statistics	Minimum, maximum, average and standard deviation		
SERIAL DECODING			
Protocols	CAN Bus, I²C, SPI, RS232/UART, FlexRay, LIN		
MASK LIMIT TESTING			
Statistics	Pass/fail, failure count, total count		
DISPLAY			
Interpolation	Linear or sin(x)/x		
Persistence modes	Digital color, analog intensity, custom, or none		
GENERAL			
PC connectivity	USB 2.0 hi-speed (USB 1.1 and USB 3.0 compatible)		
Power requirements	Powered from USB port (500 mA at 5 V)		
Dimensions	A/B models: 200 x 140 x 40 mm (including connectors) MSOs: 210 x 140 x 40 mm (including connectors)		
Weight	< 0.5 kg		
Temperature range	Operating: 0 °C to 50 °C (20 °C to 30 °C for stated accuracy)		
Humidity range	5 % to 80 % RH non-condensing		
Altitude	Up to 2000 m		
Environment	Dry locations only		
Safety approvals	Designed to EN 61010-1:2010		
EMC approvals	Tested to EN61326-1:2006 and FCC Part 15 Subpart B		
Environmental approvals	RoHS and WEEE compliant		
Software/PC requirements	PicoScope 6, SDK and example programs. Microsoft Windows XP, Windows Vista, Windows 7 or Windows 8 (Windows RT not supported)		
Accessories	USB cable, 2 probes in probe case. MSO only: digital cable and 2 packs of 10 test clips.		
Languages (full support):	English, French, German, Italian and Spanish		
Languages (UI only):	Chinese (Simplified and Traditional), Czech, Danish, Dutch, Finnish, Greek, Hungarian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Swedish and Turkish		

Connections

The 2-channel PicoScope 3000 Series oscilloscopes have:

- *2 x BNC analog input channels*
- *1 x BNC External Trigger input*
- *1 x BNC for the AWG/function generator*
- *1 x USB port*

The PicoScope 3000 Series MSOs have:

- *2 x BNC analog input channels*
- *16 x digital input channels*
- *1 x BNC AWG output*
- *1 x USB port*

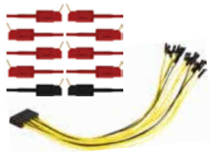
Kit contents and accessories

Your PicoScope 3000 Series oscilloscope kit contains your chosen PicoScope 3000 Series oscilloscope and the following items:

- 2 x probes in bag
- USB cable
- Quick Start Guide
- Software and Reference CD

In addition to the above, the MSO kits also include:

- TA136 digital cable
- 2 x TA139 pack of 10 test clips



Ordering Information

ORDER CODE	DESCRIPTION	GBP	USD*	EUR*
PP708	PicoScope 3204A with 2 x 60 MHz probes			
PP709	PicoScope 3204B with 2 x 60 MHz probes			
PP859	PicoScope 3204 MSO Kit			
PP710	PicoScope 3205A with 2 x 150 MHz probes			
PP711	PicoScope 3205B with 2 x 150 MHz probes			
PP860	PicoScope 3205 MSO Kit			
PP712	PicoScope 3206A with 2 x 250 MHz probes			
PP713	PicoScope 3206B with 2 x 250 MHz probes			
PP861	PicoScope 3206 MSO Kit			

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