

# RIGOL



## MSO5000 Series Digital Oscilloscope

- Analog bandwidth: 350 MHz, 200 MHz, 100 MHz, and 70 MHz; bandwidth upgrade option supported
- 2 or 4 analog channels (upgradable), standard 16 digital channels(LA probe required)
- Up to 8 GSa/s real-time sample rate
- Up to 200 Mpts memory depth (option)
- High waveform capture rate (over 500,000 wfms)
- Auto measurement of 41 waveform parameters; full-memory hardware measurement function
- A variety of serial protocol triggers and decodes
- Up to 450,000 frames of hardware real-time and ceaseless waveforms recording and playback functions
- Independent search, navigation keys, and event table
- Built-in advanced power analysis software (option)
- Bode plot for loop test analysis
- Integrates 7 independent instruments into 1, including a digital oscilloscope, a logic analyzer, a spectrum analyzer, an arbitrary waveform generator, a digital voltmeter, a frequency counter and totalizer, and a protocol analyzer
- 9-inch capacitive multi-touch screen, 256-level intensity grading display, with color persistence
- Multiple interfaces available: USB HOST&DEVICE, LAN(LXI), HDMI, TRIG OUT, and USB-GPIB
- Web Control remote command
- Unique online version upgrade
- Novel and delicate industrial design, easy to operate

MSO5000 series digital oscilloscope is a high-performance oscilloscope model designed based on RIGOL UltraVision II technology. With a 9-inch capacitive multi-touch screen, the MSO5000 series integrates 7 independent instruments into one, delivering super sample bandwidth ratio, extremely high memory depth, and other excellent specifications. It is compact and portable in design, and all of the MSO series products support multiple channels, bandwidths, and the upgrade of the analysis software. As it integrates many functions of multiple instruments, different user groups can have more choices in selecting their desired product based on their needs, helping them save their budget to a large extent while enjoying the superior test support and user experience.

# Design Features

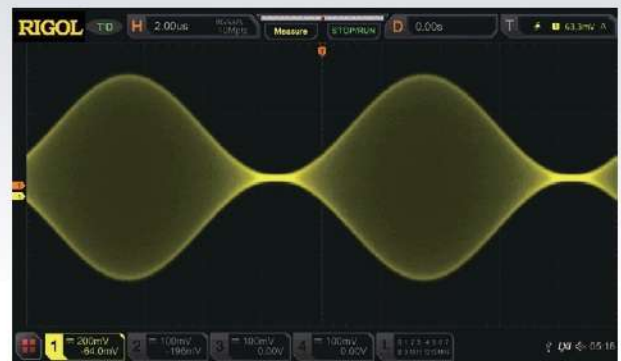
## ►7-into-1 Integrated Digital Oscilloscope



In today's integrated design field, a highly integrated comprehensive digital oscilloscope has become a useful tool for design engineers. The MSO5000 series digital oscilloscope launched by RIGOL this time integrates 7 independent instruments into 1, including one digital oscilloscope, one 16-channel logic analyzer, one spectrum analyzer, one arbitrary waveform generator, one digital voltmeter, one high-precision frequency counter and totalizer, and one protocol analyzer. The MSO5000 series offers you a flexible and economical solution to address your actual needs.

### 1. Digital Oscilloscope

- Four bandwidth models: 350 MHz, 200 MHz, 100 MHz, and 70 MHz; with the bandwidth upgradeable
- Up to 8 GSa/s real-time sample rate
- 2 or 4 analog channels (upgradeable), 16 digital channels (standard)
- Up to 200 Mpts memory depth (option)
- Maximum waveform capture rate of 500,000 wfms/s
- 350 MHz passive voltage probe for each channel (standard)



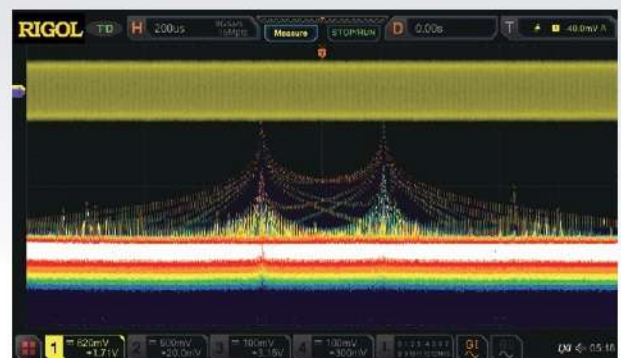
### 2. Logic Analyzer

- Standard 16 digital channels, just buy a PLA2216 active logic probe
- 25 Mpts memory depth for the waveforms of all the digital channels
- Up to 1 GSa/s sample rate
- Hardware real-time waveform recording and playback functions supported
- Mixed (analog channel and digital channel) trigger and decode supported
- Convenient digital channel grouping and group operation



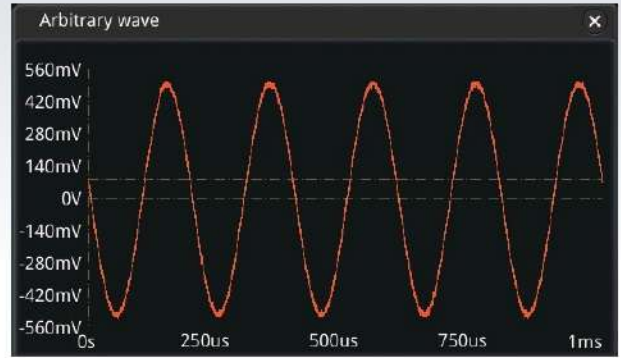
### 3. Spectrum Analyzer

- Standard configuration of enhanced FFT, real-time operation for max. 1 Mpts waveform data
- Max. frequency range: oscilloscope analog bandwidth
- Up to 4 groups of operations can be displayed at the same time
- Independent FFT color persistence view supported
- Up to 15 peaks available for the peak search function; event table available to be exported



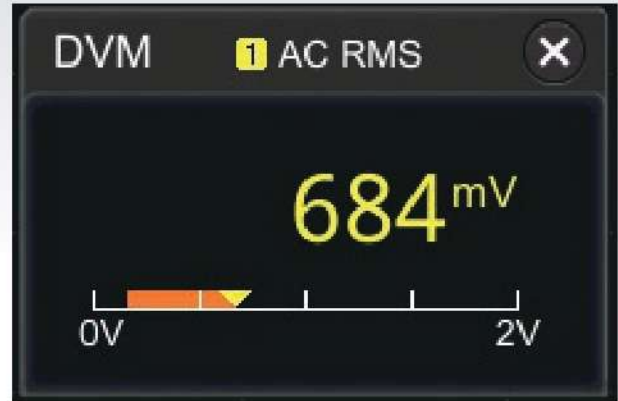
#### 4. Arbitrary Waveform Generator (Option)

- Standard configuration of 2 waveforms output channels for the hardware, and only AWG option is required to be ordered
- 13 pre-defined waveforms
- Up to 25 MHz frequency
- Up to 200 MSa/s sample rate
- Advanced modulation, sweep, and burst signal output supported



#### 5. Digital Voltmeter

- 3-digit DC/AC, RMS/AC+DC RMS voltage measurement
- Sound an alarm for reaching or exceeding the limits
- Display the latest measurement results in the form of a diagram, and display the extrema over the last 3 seconds



#### 6. High-precision Frequency Counter and Totalizer

- 3 to 6-digit (selectable) high-precision frequency counter
- Support the statistics on the maximum and minimum values of the frequency
- 48-bit totalizer (standard)



#### 7. Protocol Analyzer (Option)

- Support RS232/JART, I2C, SPI, CAN, LIN, I2S, FlexRay, and MIL-STD-1553 serial bus



# Specifications

All the specifications are guaranteed except the parameters marked with "Typical" and the oscilloscope needs to operate for more than 30 minutes under the specified operation temperature.

## Overview of the MSO5000 Series Technical Specifications

Model	MSO5072	MSO5074	MSO5102	MSO5104	MSO5204	MSO5354
Analog Bandwidth	70 MHz	70 MHz	100 MHz	100 MHz	200 MHz	350 MHz
Rising Time (typical)	≤5 ns	≤5 ns	≤3.5 ns	≤3.5 ns	≤1.75 ns	≤1 ns
	2	4	2	4	4	4
No. of Input/Output Channels	16 input digital channels (PLA2216 probe option is required to be ordered) Dual-channel arbitrary waveform generator output (required to install the MSO5000-AWG option to activate the software function)					
Sampling Mode	Real-time sampling					
Max. Sample Rate of Analog Channel	MSO5354/MSO5204/MSO5104/MSO5074: 8 GSa/s (single-channel), 4 GSa/s (half-channel <sup>II</sup> ), 2 GSa/s (all channels) MSO5102/MSO5072: 8 GSa/s (single-channel), 2 GSa/s (all channels)					
Max. Memory Depth	2RL(option) Analog channel: 200 Mpts (single-channel), 100 Mpts (half-channel <sup>III</sup> ), 50 Mpts (all channels) Digital channel: 25 Mpts (all channels)					
Max. Waveform Capture Rate <sup>21</sup>	≥500,000 wfms/s					
Hardware Real-time Waveform Recording and Playing	≥450,000 wfms (single-channel)					
Peak Detection	Under all the time base settings, capture 500 ps glitches					
LCD Size and Type	9-inch capacitive multi-touch screen/gesture enabled operation					
Display Resolution	1024 × 600					

## Vertical System Analog Channel

Vertical System Analog Channel	
Input Coupling	DC, AC or GND
Input Impedance	1 MΩ ± 1%
Input Capacitance	17 pF ± 3 pF
Probe Attenuation Coefficient	0.0001X, 0.0002X, 0.0005X, 0.001X, 0.002X, 0.005X, 0.01X, 0.02X, 0.05X, 0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X, 20X, 50X, 100X, 200X, 500X, 1000X, 2000X, 5000X, 10000X, 20000X, and 50000X
Maximum Input Voltage	CAT I 300 Vrms, 400 Vpk, Transient Overvoltage 1600 Vpk
Vertical Resolution	8 bits
Vertical Sensitivity Range <sup>21</sup>	500 μV/div~10 V/div ± 1 V (500 μV/div~50 mV/div) ± 30 V (51 mV/div~260 mV/div) ± 100 V (265 mV/div~10 V/div)
Offset Range	
Dynamic Range	± 5 div (8 bits)
Bandwidth Limit (Typical)	20 MHz, 100 MHz, 200 MHz; selectable for each channel
DC Gain Accuracy <sup>21</sup>	± 3% of full scale
DC Offset Accuracy	<200 mV/div (± 0.1 div ± 2 mV ± 1.5% of offset value) >200 mV/div (± 0.1 div ± 2 mV ± 1.0% of offset value)
Channel-to-Channel Isolation	40 dB, from DC to maximum rated bandwidth of each model
ESD Tolerance	± 8 kV (on input BNCs)

## Vertical System Digital Channel

Vertical System Digital Channel	
Number of Channels	16 input channels (D0~D15) {D0~D7, D8~D15}
Threshold Range	± 15.0 V, in 10 mV step
Threshold Accuracy	± (100 mV + 3% of the threshold setting)
Threshold Selection	TTL(1.4 V), COMS5.0(2.5 V), COMS3.3(1.65 V), COMS2.5(1.25 V), COMS1.8(0.9 V), ECL(-1.3 V), PECL(3.7 V), LVDS(1.2 V), 0.0 V User (adjustable threshold for 8 channels in a group)
Max. Input Voltage	± 40 V peak CAT I; transient overvoltage 800 Vpk
Max. Input Dynamic Range	± 10 V + threshold
Minimum Voltage Swing	500 mVpp

Input Impedance	About 101 k $\Omega$
Probe Load	$\approx$ 8 pF
Vertical Resolution	1 bit

## Horizontal System--Analog Channel

Horizontal System--Analog Channel		70 MHz	100 MHz	200 MHz	350 MHz
Range of Time Base		5 ns/div~1 ks/div	5 ns/div~1 ks/div	2 ns/div~1 ks/div	1 ns/div~1 ks/div
		Support fine adjustment			
Time Base Resolution		10 ps			
Time Base Accuracy		$\pm$ 10 ppm $\pm$ 10 ppm/year			
Time Base Delay Range	before triggering	$\geq$ 1/2 screen width			
	after triggering	1 s or 100 div, whichever is greater			
Time Interval ( $\Delta$ T) Measurement		$\pm$ (1 sample interval) $\pm$ (2 ppm $\times$ readout) $\pm$ 50 ps			
Inter-channel Offset Correction Range		$\pm$ 100 ns			
Horizontal Mode	YT	Default			
	XY	X = Channel 1, Y = Channel 2			
	SCAN	Time base $\geq$ 200 ms/div, available to enter or exit the SCAN mode by rotating the Horizontal SCALE knob			
	ROLL	Time base $\geq$ 200 ms/div, available to enter or exit the ROLL mode by rotating the Horizontal SCALE knob (enable the auto ROLL mode at first)			

## Horizontal System--Digital Channel

Horizontal System--Digital Channel	
Min. Detectable Pulse Width	5 ns
Maximum Input Frequency	200 MHz (accurately copied as the sine wave of the maximum frequency of the logic square wave; input amplitude is the minimum swing; the shortest the ground cable is required for the logic probe)
Inter-channel Time Delay	2 ns (typical), 5 ns (maximum)

## Acquisition System

Acquisition System		
Max. Sample Rate of Analog Channel	M505354/M505204/M505104/M505074: 8 GSa/s (single-channel), 4 GSa/s (half-channel) <sup>II</sup> , 2 GSa/s (all channels) M505102/M505072: 8 GSa/s (single-channel), 2 GSa/s (all channels)	
Max. Memory Depth of Analog Channel	Standard: 100 Mpts (single-channel), 50 Mpts (half-channel) <sup>III</sup> , 25 Mpts (all channels) 2RL(option): 200 Mpts (single-channel), 100 Mpts (half-channel) <sup>III</sup> , 50 Mpts (all channels)	
Max. Sample Rate of Digital Channel	1 GSa/s (all channels)	
Max. Memory Depth of Digital Channel	25 Mpts (all channels)	
Acquisition Mode	Normal	Default
	Peak Detection	Capture 500 ps glitches
	Average Mode	2, 4, 8, 16...65536 are available for you to choose, averaging point by point
	High Resolution	12 bits (max.)

## Trigger System

Trigger System		
Trigger Source	Analog channel (1~4), digital channel (D0~D15), AC Line	
Trigger Mode	Auto, Normal, Single	
Trigger Coupling	DC	DC coupling trigger
	AC	AC coupling trigger
	High Frequency Rejection	High frequency rejection, cut-off frequency~55 kHz (internal only)
	Low Frequency Rejection	Low frequency rejection, cut-off frequency~55 kHz (internal only)
Noise Rejection	Increase delay for the trigger circuit (internal only), On/Off	
Holdoff Range	8 ns to 10 s	
Trigger Bandwidth	Analog bandwidth	
Trigger Sensitivity	1 div or 5 mVpp, whichever is larger, <10mV/div	
	0.5 div, $\geq$ 10mV/div Enable the noise rejection, with trigger sensitivity reducing half	

Trigger Level	Internal:	$\pm 5$ div from the center of the screen
Range	AC Line	Fixed 50%

## Trigger Type

Trigger Type	
Zone Trigger	Trigger in the rectangle area drawn manually, supporting trigger zone A and trigger zone B. The trigger conditions can be "Intersect" or "Not intersect" Source channel: CH1~CH4; only one analog channel is triggered each time
Trigger Type	Standard: Edge trigger, Pulse trigger, Slope trigger, Video trigger, Pattern trigger, Duration trigger, Timeout trigger, Runt trigger, Window trigger, Delay trigger, Setup/Hold trigger, and Nth Edge trigger Option: RS232, UART, I2C, SPI, CAN, FlexRay, LIN, I2S, and MIL-STD-1553
Edge	Trigger on the threshold of the specified edge of the input signal. The edge types can be Rising, Falling, or Either. Source channel: CH1~CH4, D0~D15, or AC Line
Pulse	Trigger on the positive or negative pulse with a specified width. The pulse width is greater or smaller than a certain value or within a certain time range. Source channel: CH1~CH4, D0~D15
Slope	Trigger on the positive or negative slope of the specified time (800 ps~10 s). The slew time is greater or smaller than a certain value or within a certain time range. Source channel: CH1~CH4
Video	Trigger on all lines, specified line, add field, or even field that conforms to the video standards. The supported video standards include NTSC, PAL/SECAM, 480P, 576P, 720P, 1080P, and 1080i. Source channel: CH1~CH4
Pattern	Identifies a trigger condition by searching for a specified pattern. The pattern is a combination of multiple selected channel sources. The logic pattern of each channel is H, L, X, Rising, or Falling. Source channel: CH1~CH4, D0~D15
Duration	Trigger when the specified pattern meets the specified duration condition. The pattern is a combination of multiple selected channel sources. The logic pattern of each channel is H, L, X. The duration is greater or smaller than a certain value, or within a certain time range, or outside a certain time range. Source channel: CH1~CH4, D0~D15
Timeout	Trigger when duration of a certain event exceeds the specified time (16 ns~10 s). The event can be specified as Rising, Falling, or Either. Source channel: CH1~CH4, D0~D15
Runt	Trigger when the pulses pass through one threshold but fail to pass through another threshold. The channel only supports analog channels Source channel: CH1~CH4
Window	Trigger in a specified window state when the rising edge of the signal crosses the upper threshold or the falling edge crosses the lower threshold. The window state can be Enter, Exit, or Time. Source channel: CH1~CH4
Delay	Trigger when the time difference between the specified edges of Source A and Source B meets the preset time. The duration is greater or smaller than a certain value, or within a certain time range, or outside a certain time range. Source channel: CH1~CH4, D0~D15
Setup/Hold	When the setup time or hold time between the input clock signal and the data signal is smaller than the specified time (8 ns~1 s). Source channel: CH1~CH4, D0~D15
Nth Edge	Trigger on the Nth edge that appears after the specified idle time. The edge can be specified as Rising or Falling. Source channel: CH1~CH4, D0~D15
RS232/UART (Option)	MSO5000-COMP option Trigger on the Start, Error, Check Error, or Data frame of the RS232/UART bus (up to 20 Mb/s). Source channel: CH1~CH4, D0~D15
I2C (Option)	MSO5000-EMBD option Trigger on the Start, Stop, Restart, MissedACK, Address (7 bits, 8 bits, or 10 bits), Data, or Address Data of the I2C bus. Source channel: CH1~CH4, D0~D15
SPI (Option)	MSO5000-EMBD option Trigger on the specified pattern of the specified data width (4~32) of SPI bus. CS and Timeout are supported. Source channel: CH1~CH4, D0~D15
CAN (Option)	MSO5000-AUTO option Trigger on the start of a frame, end of a frame, Remote ID, Overload, Frame ID, Frame Data, Data&ID, Frame Error, Answer Error, Check Error, Format Error, Bit Fill, and Random of the CAN signal (up to 5Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF. Source channel: CH1~CH4, D0~D15
FlexRay (Option)	MSO5000-FLEX option Trigger on the specified position (TSS End, FSS_BSS End, FES End, DTS End), frame (null, Syn, Start, All), symbol (CAS/MTS and WUS), error (Head CRC Err, Tail CRC Err, Decode Err, and Random Err) of the FlexRay signal (up to 10 Mb/s). Source channel: CH1~CH4, D0~D15
LIN (Option)	MSO5000-AUTO option Trigger on the Sync, ID, Data (length settable), Data&ID, Wakeup, Sleep, and Error of the LIN bus signal (up to 20 Mb/s). Source channel: CH1~CH4, D0~D15

I2S (Option)	MSO5000–AUDIO option Trigger on 2's complement data of audio left channel, right channel, or either channel (=, ≠, >, <, <>, ><). The available alignment modes include I2S, LJ, and RJ. Source channel: CH1~CH4, D0~D15 (only available for the MSO5XX4 model or the model installed with the MSO5000–4CH option)
MIL–STD–1553 (Option)	MSO5000–AERO option Trigger on Sync (Data Sync, Cmd/Status Sync, and All Sync), Data, RTA, RTA+11Bit, and Error (Sync Error and Check Error) of the MIL–STD–1553 bus. Source channel: CH1~CH4

## Search&Navigation

Search, Navigation, and Table	
Type	Edge, Pulse, Runt, Slope, RS232, I2C, and SPI
Source	Any analog channel
Copy	Copy the search settings to the trigger settings, and copy from the trigger settings
Result Display	Event table or navigation. Go to the specific event through the event table index
Navigation	Memory playing: view the memory waveforms with the navigation keys by scrolling through stored waveform data, supporting viewing at three speeds.
	ZOOM playing: view the details of waveforms with the navigation keys by panning the ZOOM window automatically, supporting viewing at three speeds.
	Recording playback: play back the recorded waveforms with the navigation keys.
	Event navigation: use the navigation keys to scroll through the event search results.

## Waveform Measurement

Waveform Measurement		
Cursor	Number of Cursors	2 pairs of XY cursors
	Manual Mode	Voltage deviation between cursors ( $\Delta Y$ ) Time deviation between cursors ( $\Delta X$ ) Reciprocal of $\Delta X$ (Hz) ( $1/\Delta X$ )
	Track Mode	Fix Y–axis to track X–axis waveform point's voltage and time values Fix X–axis to track Y–axis waveform point's voltage and time values
	Auto Measurement	Allow to display cursors during auto measurement
	XY Mode	Measure the voltage parameters of the corresponding channel waveforms in XY time base mode. X = Channel 1, Y = Channel 2
Auto Measurement	Number of Measurements	41 auto measurements; and up to 10 measurements can be displayed at a time.
	Measurement Source	CH1~CH4, Math1~Math4, and D0~D15
	Measurement Mode	Normal and Precision (full–memory hardware measurement)
	Measurement Range	Main, Zoom, and Cursor
	All Measurement	Display 33 measurement items for the current measurement channel; the measurement results are updated continuously; you can switch the measurement channel.
	Vertical	Vmax, Vmin, Vpp, Vtop, Vbase, Vamp, Vupper, Vmid, Vlower, Vavg, VRMS, Per.VRMS, Overshoot, Preshoot, Area, Per Area, and Std.Dev.
	Horizontal	Period, Frequency, Rise Time, Fall Time, +Width, –Width, +Duty, –Duty, Positive Pulse Count, Negative Pulse Count, Rising Edge Count, Falling Edge Count, Tvmx, Tvmin, +Slew Rate, and –Slew Rate
	Others	Delay(A ↑ –B ↑), Delay(A ↑ –B ↓), Delay(A ↓ –B ↑), Delay(A ↓ –B ↓), Phase(A ↑ –B ↑), Phase(A ↑ –B ↓), Phase(A ↓ –B ↑), and Phase(A ↓ –B ↓)
	Analysis	Counter, DVM, Bode, and UPA
	Statistics	Current, Average, Max, Min, Standard Deviation, Count Statistical times settable

## Waveform Calculation

Waveform Calculation	
No. of Math Functions	4; 4 math functions available to be displayed at a time
Operation	A+B, A–B, A × B, A/B, FFT, A&&B, A  B, A^B, !A, Intg, Diff, Sqrt, Lg, Ln, Exp, Abs, AX+B, LowPass, HighPass, BandPass, and BandStop
Source	CH1~CH4, D0~D15 (only available for A&&B, A  B, !A, and A^B), Math1~Math4, and Ref1~Ref10
Color Grade	Support Math and FFT

	Record Length	Max. 1 Mpts
Enhanced FFT	Window Type	Rectangular, Blackman–Harris, Hanning (default), Hamming, Flattop, and Triangle.
	Peak Search	A maximum of 15 peaks, confirmed by the settable threshold and offset threshold set by users

## Waveform Analysis

Waveform Analysis		
		Store the signal under test in segments according to the trigger events, i.g. save all the sampled waveform data as a segment to the RAM for each trigger event. The maximum number of the sampled segments reaches 450,000.
Waveform Recording	Source	All enabled analog channels and digital channels
	Analysis	Support playing frame by frame or continuous playing; capable of calculating, measuring, and decoding the played waveforms
Pass/Fail Test		Compare the signal under test with the user–defined mask to provide the test results: the number of successful tests, failed tests, and the total number of tests. The pass/fail event can enable immediate stop, beeper, and the screenshot.
	Source	Any analog channel
Histogram		The waveform histogram provides a group of data, showing the number of times a waveform hits within the defined region range on the screen. The waveform histogram not only shows the distribution of hits, but also the ordinary measurement statistics.
	Source	Any analog channel or auto measurement item
	Type	Horizontal, Vertical, or Measure
	Measure	Sum, Peaks, Max, Min, Pk_Pk, Mean, Median, Mode, Bin width, Sigma, and XScale
		Support all modes, except the Zoom, XY, and ROLL modes
Color Grade		Provide a dimensional view for color grade waveforms
	Source	Any analog channel
	Color Theme	Temperature and intensity
	Mode	Support all modes

## Serial Decoding

Serial Decoding	
Number of Decodings	4, four protocol types can be supported at the same time
Decoding Type	Standard: Parallel
	Option: RS232, UART, I2C, SPI, LIN, CAN, FlexRay, I2S, and MIL–STD–1553
Parallel	Up to 20 bits of Parallel decoding, supporting the combination of any analog channel and digital channel. Support user–defined clock and auto clock settings. Source channel: CH1~CH4, D0~D15
RS232/UART	MSO5000–COMP option Decode the RS232/UART (up to 20 Mb/s) bus's TX/RX data (5–9 bits), parity (Odd, Even, or None), and stop bits (1–2 bits) Source channel: CH1~CH4, D0~D15
I2C	MSO5000–EMBD option Decode the address (with or without the R/W bit) of the I2C bus, data, and ACK. Source channel: CH1~CH4, D0~D15
SPI	MSO5000–EMBD option Decode the MISO/MOSI data (4–32 bits) of the SPI bus. The available mode includes "Timeout" and "CS". Source channel: CH1~CH4, D0~D15
LIN	MSO5000–AUTO option Decode the protocol version (1.X or 2.X) of the LIN bus (up to 20 Mb/s). The decoding displays sync, ID, data, and check sum. Source channel: CH1~CH4, D0~D15
CAN	MSO5000–AUTO option Decode the remote frame (ID, byte number, CRC), overload frame, and data frame (standard/extended ID, control domain, data domain, CRC, and ACK) of the CAN bus (up to 5 Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF. Source channel: CH1~CH4, D0~D15
FlexRay	MSO5000–FLEX option Decode the frame ID, PL (payload), Header CRC, Cycle Count, Data, Tail CRC, and DTS of the FlexRay bus (up to 10 Mb/s). The supported signal types include BP, BM, and RX/TX. Source channel: CH1~CH4, D0~D15
I2S	MSO5000–AUDIO option Decode I2S audio bus left channel data and right channel data, supporting 4–32 bits. The alignment modes include I2S, LJ, and RJ. Source channel: CH1~CH4, D0~D15 (only available for the MSO5XX4 model or the model installed with the MSO5000–4CH option)



MIL-STD-1553	MSO5000-AERO option Decode the MIL-STD-1553 bus signal's data word, command word, and status word (address+last 11 bits). Source channel: CH1-CH4
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## Auto

Auto	
AutoScale	Min voltage greater than 5 mVpp, duty cycle greater than 1%, frequency over 35 Hz

## Arbitrary Waveform Generator

Arbitrary Waveform Generator (technical specifications are typical values) (option)

Number of Channels	2	
Output Mode	Normal (2-channel output)	
Sample Rate	200 MSa/s	
Vertical Resolution	14 bits	
Max. Frequency	25 MHz	
Standard Waveform	Sine, Square, Ramp, Pulse, DC, Noise	
Built-in Waveform	Sinc, Exp.Rise, Exp.Fall, ECG, Gauss, Lorentz, Haversine	
Sine	Frequency Range	100 mHz to 25 MHz
	Flatness	± 0.5 dB (relative to 1 kHz)
	Harmonic Distortion	-40 dBc
	Spurious (non-harmonics)	-40 dBc
	Total Harmonic Distortion	1%
	S/N Ratio	40 dB
Square/Pulse	Frequency Range	Square: 100 mHz to 15 MHz Pulse: 100 mHz to 1 MHz
	Rise/Fall Time	<15 ns
	Overshoot	<5%
	Duty	Square: always be 50% Pulse: 10% to 90%, adjustable
	Duty Cycle Resolution	1% or 10 ns (whichever is greater)
	Min. Pulse Width	20 ns
	Pulse Width Resolution	10 ns or 5 bits (whichever is greater)
Jitter	5 ns	
Ramp	Frequency Range	100 mHz to 100 kHz
	Linearity	1%
	Symmetry	1% to 100%
Noise	Bandwidth	>25 MHz
Built-in Waveform	Frequency Range	100 mHz to 1 MHz
Arbitrary Waveform	Frequency Range	100 mHz to 10 MHz
	Waveform Length	2~16 kpts Support loading channel waveforms (screen range and cursor range) and stored waveforms
Frequency	Accuracy	100 ppm (<10 kHz), 50 ppm (>10 kHz)
	Resolution	100 mHz or 4 bits (whichever is greater)
Amplitude	Output Range	20 mVpp~5 Vpp (HighZ), 10 mVpp~2.5 Vpp (50 Ω)
	Resolution	100 uV or 3 bits (whichever is greater)
	Accuracy	± (2% of setting+1 mV) (Frequency=1 kHz)
DC Offset	Range	± 2.5 V (HighZ), ± 1.25 V (50 Ω)
	Resolution	100 uV or 3 bits (whichever is greater)
	Accuracy	± (2% of offset setting+5 mV+0.5% of amplitude)

	AM, FM, FSK	
Modulation		Modulating Waveforms: Sine, Square, Triangle, and Noise.
	AM	Modulation Frequency: 1 Hz to 50 kHz Modulation Depth: 0% to 120%
	FM	Modulating Waveforms: Sine, Square, Triangle, and Noise.
		Modulation Frequency: 1 Hz to 50 kHz Modulation Offset: 1 Hz to carrier frequency
	FSK	Modulating Waveforms: 50% duty cycle square
		Modulation Frequency: 1 Hz to 50 kHz Hopping Frequency: 100 mHz to max. carrier frequency
Sweep	Linear, Log, and Step	
	Sweep Time	1 ms to 500 s
	Start Frequency and End Frequency	Any frequencies within the waveform range
Burst	N Cycle, Infinite	
	Cycle Count	1 to 1000000
	Burst Period	1 $\mu$ s to 500 s
	Burst Delay	0 s to 500 s
	Trigger Source	Internal, Manual

## Digital Voltmeter

Digital Voltmeter (technical specifications are typical values)

Source	Any analog channel
Function	DC, AC+DC RMS, and AC RMS
Resolution	ACV/DCV: 3 bits
Limits Beeper	Sound an alarm when the voltage value is within or outside of the limit range.
Range Measurement	Display the latest measurement results in the form of a diagram, and display the extrema over the last 3 seconds

## High-precision Frequency Counter

High-precision Frequency Counter

Source	Any analog channel and digital channel	
Measure	Frequency, period, totalizer	
Counter	Resolution	Max. 6 bits, user-defined
	Max. Frequency	Max. bandwidth of the analog channel
Totalizer		48-bit totalizer
	Edge	Count the number of the rising edges
Time Reference	Internal Reference	

## Customization for Quick Key

Customization for Quick Key

Quick Screenshot	Quickly save the screen image to the specified path based on the current image storage menu settings.
Quick Waveform Save	Quickly save the screen or memory waveforms to the specified path based on the current waveform storage menu settings.
Quick Save Settings	Quickly save the setup file to the specified path based on the current setup storage menu settings.
Quick All Measurement	Display all the prompt message windows for all the measurement of the waveforms.
Quick Reset of Statistics	Quickly reset all the measurement statistics data and measurement counts.
	Quickly reset all the statistics information in PassFail function.
Quick Waveform Recording	Quickly start or stop the waveform recording.
Quick Email Sending	Quickly send the Email based on the set email address.
Quick Print	Quickly perform the print operation based on the current printer settings.
Quick Group Saving	Quickly perform the group saving function based on the currently selected item for saving.

## Command Set

Command Set	
Common Commands Support	IEEE488.2 Standard
Error Message Definition	Error messages
Support Status Report Mechanism	Status reporting
Support Syn Mechanism	Synchronization

## Display

Display	
LCD	9-inch capacitive multi-touch screen/gesture enabled operation
Resolution	1024 × 600 (Screen Region)
Graticule	(10 vertical divisions) × (8 horizontal divisions)
Persistence	Off, Infinite, variable persistence (100 ms to 10 s)
Brightness	256 intensity levels (LCD, HDMI)

## I/O

I/O	
USB 2.0 Hi-speed Host Port	1 on the front panel
USB 2.0 Hi-speed Device Port	1 on the rear panel, compatible with USB Test and Measurement Class (USBTMC)
LAN	1 on the rear panel, 10/100/1000-port, supporting LXI-C
GPIB	GPIB-USB adapter (option)
Web Remote Control	Support VNC Web interface (input the IP address of the oscilloscope into the Web browser to display the operation interface of the oscilloscope)
Aux Out	BNC output on the rear panel. Vo (H) ≥ 2.5 V open circuit, ≥ 1.0 V 50 Ω to GND Vo (L) ≤ 0.7 V to load ≤ 4 mA; ≤ 0.25 V 50 Ω to GND
	Trigger Output      Output a pulse signal when the oscilloscope is triggered.
	Pass/Fail              Output a pulse signal when a pass/fail event occurs. Supports user-defined pulse polarity and pulse time (100 ns~10 ms).
HDMI video output	1 on the rear panel, HDMI 1.4b, A plug, used to connect to an external monitor or projector
Probe Compensation Output	1 kHz, 3 Vpp square waveform

## Power

Power Supply	
Power Voltage	100 V~240 V, 45 Hz~440 Hz
Power	Max. 75 W (connect to various interfaces, USB)
Fuse	4 A, T degree, 250 V

## Bode

Bode	
Start Frequency	10 Hz to 25 MHz
Stop Frequency	100 Hz to 25 MHz
Points/Decade	10 to 300
Output Amplitude	HighZ: 20 mV to 5 V; 50 Ω: 10 mV to 2.5 V

## Environment

Environmental Stress		
Temperature Range	Operating	0°C~+50°C
	Non-operating	-30°C~+70°C
Humidity Range	Operating	Below +30°C: ≤90% RH (without condensation)
		+30°C to +40°C, ≤75% RH (without condensation)
	Non-operating	+40°C to +50°C, ≤45% RH (without condensation)
		Below 65°C: ≤90% RH (without condensation)
Altitude	Operating	Below 3,000
	Non-operating	Below 15,000