

# MSO/DS7000 Series Digital Oscilloscope

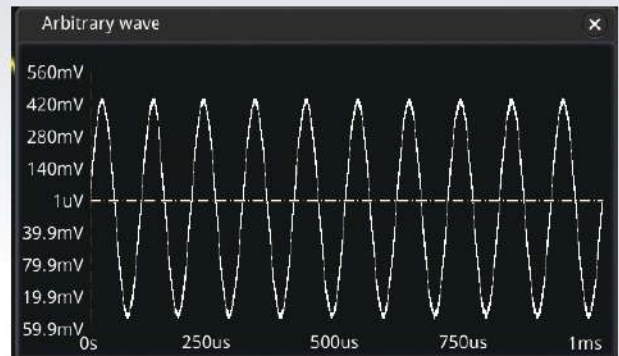
- Analog bandwidth: 500 MHz, 350 MHz, 200 MHz, and 100 MHz; bandwidth upgrade option supported
- 4 analog channels, 1 EXT channel, and 16 digital channels (Option)
- Up to 10 GSa/s real-time sample rate
- Up to 500 Mpts memory depth (Option)
- High waveform capture rate (over 600,000 waveforms per second)
- Up to 450,000 frames of hardware real-time and ceaseless waveforms recording and playback functions
- Integrates 7 independent instruments into 1, including digital oscilloscope, 16-channel logic analyzer, spectrum analyzer, arbitrary waveform generator, digital voltmeter, 6-digit frequency counter and totalizer, and protocol analyzer
- A variety of serial protocol triggers and decodes
- Auto measurement of 41 waveform parameters; full-memory hardware measurement function
- A variety of math operations, built-in enhanced FFT analysis, and peak search function
- Waveform histogram analysis (standard)
- Independent search, navigation keys, and event table
- Built-in advanced power analysis software (option)
- User-defined one-key quick operation
- 10.1-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

MSO7000/DS7000 series is a multifunctional and high-performance digital oscilloscope designed on the basis of the UltraVision II technology developed by **RIGOL**. Integrating 7 independent instruments into one, the MSO7000/DS7000 series is equipped with super high sample bandwidth ratio, extremely high memory depth, clear display, excellent waveform capture rate, and powerful data analysis functions. Many of its specifications have reached the top level in the industry. With sound solutions for mainframes, optional accessories, and application software, it has aroused great attention from customers in the areas such as industrial control, power supply, and automotive electronics.



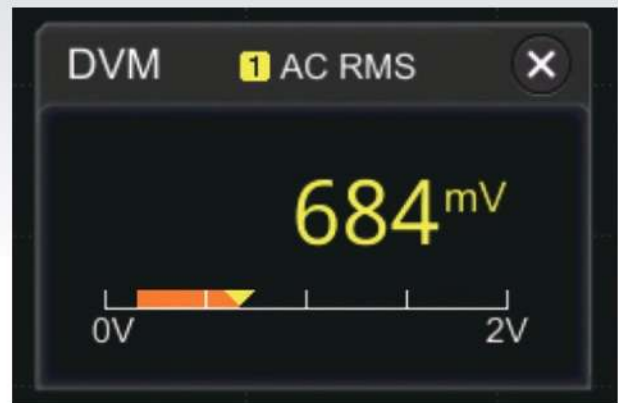
#### 4. Arbitrary Waveform Generator (Option)

- Standard configuration of 2 waveforms output channels for the hardware of MSO model, 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

- Optional 3 to 6-digit 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/UART, I2C, SPI, CAN, LIN, I2S, FlexRay, and MIL-STD-1553 serial bus
- Support the protocol trigger and decoding for the analog channel and the digital channel
- RS232/UART, I2C, and SPI protocols support the waveform search function
- Capable of working with the waveform recording, pass/fail test, and zone trigger



# 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 MSO7000/DS7000 Series Technical Specifications

Model	MSO7014	DS7014	MSO7024	DS7024	MSO7034	DS7034	MSO7054	DS7054
Analog Bandwidth	100 MHz		200 MHz		350 MHz		500 MHz	
Rising time (typical)	≤3.5 ns		≤1.75 ns		≤1 ns		≤700 ps	
No. of Input/Output Channels	4 input analog channels							
	1 input EXT channel							
	16 input digital channels (only for the MSO model)							
	dual-channel arbitrary waveform generator output (only for the MSO model, option)							
Sampling Mode	real-time sampling							
Max. Sample Rate of Analog Channel	10 GSa/s (single-channel), 5 GSa/s (half-channel <sup>1</sup> ), 2.5 GSa/s (all channels)							
Max. Memory Depth	analog channel: 500 Mpts (single-channel), 250 Mpts (half-channel <sup>1</sup> ), 125 Mpts (all channels) digital channel: 62.5 Mpts (all channels)							
Max. Waveform Capture Rate <sup>2</sup>	≥600,000 wfms/s							
Hardware real-time waveform recording and playing	≥450,000 wfms (single-channel)							
Peak Detection	under all the time base settings, capture 400 ps glitches							
LCD Size and Type	10.1-inch capacitive multi-touch screen/gesture enabled operation							
Display Resolution	1024 × 600							

## Vertical System Analog Channel

Vertical System Analog Channel		
Input Coupling	DC or AC	
Input Impedance	1 MΩ ± 1%, 50 Ω ± 1%	
Input Capacitance	17 pF ± 3 pF	
Probe Attenuation Coefficient	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	
Probe Recognition	auto-recognized RIGOL probe	
Maximum Input Voltage	1 MΩ	CAT I 300 Vrms, 400 Vpk, Transient Overvoltage 1600 Vpk
	50 Ω	5 Vrms
Vertical Resolution	8 bits	
Vertical Sensitivity Range <sup>3</sup>	1 MΩ	1 mV/div ~ 10 V/div
	50 Ω	1 mV/div ~ 1 V/div
Offset Range	1 MΩ	± 1 V ( 1 mV/div ~ 50 mV/div )
		± 30 V ( 51 mV/div ~ 260 mV/div )
	50 Ω	± 100 V ( 265 mV/div ~ 10 V/div )
		± 1 V ( 1 mV/div ~ 100 mV/div )
		± 4 V ( 102 mV/div ~ 1 V/div )
Dynamic Range	± 5 div (8 bits)	
Bandwidth Limit (Typical)	20 MHz, 250 MHz; selectable for each channel	
DC Gain Accuracy <sup>3</sup>	± 2% 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	40dB, 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	± 20.0 V, in 10 mV step
Threshold Accuracy	± {100 mV + 3% of the threshold setting}
Threshold Selection	TTL(1.4 V), CMOS5.0(2.5 V), CMOS3.3(1.65 V), CMOS2.5(1.25 V), CMOS1.8(0.9 V), ECL(-1.3 V), PECL(3.7 V), LVDS(1.2 V), and 0.0V 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 kΩ
Probe Load	≈ 8 pF
Vertical Resolution	1 bit

## Horizontal System--Analog Channel

Vertical System--Analog Channel		100 MHz	200 MHz	350 MHz	500 MHz
Range of Time Base		5 ns/div ~ 1 ks/div	2 ns/div ~ 1 ks/div	1 ns/div ~ 1 ks/div	500 ps/div ~ 1 ks/div
		support fine adjustment			
Time Base Resolution		10 ps			
Time Base Accuracy		± 2 ppm ± 2 ppm/year			
Time Base	before triggering	≥ 1/2 screen width			
Delay Range	after triggering	1 s to 100 div			
Time Interval (ΔT) Measurement		± {1 sample interval} ± {2 ppm × readout} ± 50 ps			
Inter-channel Offset Correction Range		± 100 ns			
	YT	Default			
	XY	X = Channel 1, Y = Channel 2			
Horizontal Mode	SCAN	Time base ≥ 200 ms/div, available to enter or exit the SCAN mode by rotating the Horizontal SCALE knob			
	ROLL	Time base ≥ 200 ms/div, available to enter or exit the SCAN mode by rotating the Horizontal SCALE knob			

## Horizontal System--Digital Channel

Horizontal System--Digital Channel	
Min. Detectable Pulse Width	3.2 ns
Maximum Input Frequency	500 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	1 ns (typical), 2 ns (maximum)

## Acquisition System

Acquisition System	
Max. Sample Rate of Analog Channel	10 GSa/s (single-channel), 5 GSa/s (half-channel <sup>  </sup> ), 2.5 GSa/s (all channels)
Max. Memory Depth of Analog Channel	Standard 100 Mpts (single-channel), 50 Mpts (half-channel <sup>  </sup> ), 25 Mpts (all channels)
	2RL (Option) 250 Mpts (single-channel), 125 Mpts (half-channel <sup>  </sup> ), 50 Mpts (all channels)
	5RL (Option) 500 Mpts (single-channel), 250 Mpts (half-channel <sup>  </sup> ), 125 Mpts (all channels)
Max. Sample Rate of Digital Channel	1.25 GSa/s (all channels)
Max. Memory Depth of Digital Channel	62.5 Mpts (all channels)
Acquisition Mode	Normal Default
	Peak Detection capture 400 ps glitches
	Average Mode 2, 4, 8, 16...65536 are available for you to choose, averaging point by point

## Trigger System

Trigger System		
Trigger Source	Analog channel (1 ~ 4), Digital channel (D0 ~ D15), EXT TRIG, and 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 ~ 75 kHz (internal only)
	Low Frequency Rejection	Low frequency rejection, cut-off frequency ~ 75 kHz (internal only)
Noise Rejection	increase delay for the trigger circuit (internal only), On/Off	
Holdoff Range	8 ns to 10 s	
Trigger Bandwidth	Internal: analog bandwidth of the oscilloscope	
	External: 200 MHz	
Trigger Sensitivity (Internal)	1 div or 5 mVpp, whichever is larger, <10mV/div	
	0.5 div, $\geq 10\text{mV/div}$ enable the noise rejection, with trigger sensitivity reducing half	
Trigger Sensitivity (External)	200 mVpp, DC ~ 100 MHz	
	500 mVpp, 100 MHz ~ 200 MHz	
Trigger Level Range	Internal:	$\pm 5$ div from the center of the screen
	External	$\pm 8$ V
	AC Line	fixed 50%

## Trigger Type

Trigger Type	
Zone Trigger	Triggers 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, EXT, 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. The channel only supports analog channels 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, and 576P. The channel only supports analog channels Source channel: CH1 ~ CH4
Pattern	Identify 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. The channel only supports analog channels 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)	DS7000–COMP option Trigger on the Start, Error, Check Error, or Data frame of the RS232/UART bus (up to 20Mb/s) Source channel: CH1 ~ CH4, D0 ~ D15
I2C (Option)	DS7000–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)	DS7000–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)	DS7000–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, 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)	DS7000–FLEX option Trigger on the specified position (TSS End, FSS_BSS End, FES End and DTS End), frame (Invalid, Syn, Start and 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)	DS7000–AUTO option Triggers 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)	DS7000–AUDIO option Triggers 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
MIL–STD–1553 (Option)	DS7000–AERO option Triggers on the sync (Data Sync, Cmd Sync, and All Sync) field, Data word, command word, status word, and Error (Sync Error and Check Error) of the MIL–STD–1553 bus Source channel: CH1 ~ CH4

## Search and 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	Allows to display cursors during auto measurement	
XY Mode	Measures 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 (only for MSO model)
	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, Period 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	Frequency counter, DVM, power analysis, histogram
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	
Color Grade	Supporting Math and FFT	
Enhanced FFT	Record Length	Max. 1 Mpts
	Window Type	Rectangular (default), Blackman-Harris, Hanning, Hamming, Flatop, and Triangle
	Peak Search	a maximum of 15 peaks, confirmed by the settable threshold and offset threshold set by users

## Waveform Analysis

Waveform Analysis		
Waveform Recording		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.
	Source	All enabled analog channels and digital channels
Pass/Fail Test	Analysis	Support playing frame by frame or continuous playing; capable of calculating, measuring, and decoding the played waveforms
	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 measurement
	Measure	sum, peak, max, min, pKpk, mean, median, mode, bin width, and sigma
Color Grade	Mode	Support all modes, except the Zoom, XY, and ROLL modes
		Provide a dimensional view for color grade waveforms
	Source	Any analog channel
	Color Theme	Temperature and intensity
	Mode	Support all modes

## Parallel Decoding

Parallel 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	DS7000-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	DS7000-EMBD option Decode the address (with or without the RAW bit) of the I2C bus, data, and ACK Source channel: CH1 ~ CH4, D0 ~ D15
SPI	DS7000-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	DS7000-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	DS7000-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	DS7000-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	DS7000-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
MIL-STD-1553	DS7000-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

## Auto

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

## Arbitrary Waveform Generator

Arbitrary Waveform Generator (technical specifications are typical values) (option, only for the MSO model)		
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, and 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	5 ns
	Jitter	500 ps
Ramp	Frequency Range	100 mHz to 100 kHz
	Linearity	1%
	Symmetry	0% 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 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% (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
Sweep	AM, FM, FSK	
	AM	Modulating Waveforms: Sine, Square, Triangle, and Noise. 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
	Linear, Log, and Step	
	Sweep Time	1 ms to 500 s
Sweep	Start Frequency and End Frequency	any frequencies within the waveform range
	N Cycle, Infinite	
	Cycle Count	1 to 1000000
Burst	Burst Period	1 μs to 500 s
	Burst Delay	0 s to 100 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, digital channel, and EXT
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

## 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	10.1-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		4 (3 on the front panel and 1 on the rear 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 Output		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
	Trig Out	Output a pulse signal when the oscilloscope is triggered
	Pass/Fail	Output a pulse signal when a pass/fail event occurs. Support 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 Supply

Power Supply	
Power Voltage	100 V-240 V, 45 Hz-440 Hz
Power	Max. 200 W (connect to various interfaces, USB, and active probes)
Fuse	3.15 A, T degree, 250 V

## Environment

Environmental Stress		
Temperature Range	Operating	0°C ~ +50°C
	Non-operating	-30°C ~ +70°C
Humidity Range	Operating	below +30°C: ≤95% 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: ≤95% RH (without condensation)
Altitude	Operating	below 3,000
	Non-operating	below 15,000

Note11: Half-channel mode: CH1 and CH2 are considered as a group; CH3 and CH4 are considered as another group. Each group share the sample rate 5 GSa/s, and either one of the channels in each group is enabled.

Note12: Maximum value, single-channel, 10 ns horizontal time base, input amplitude 4 div, sine wave signal with 10 MHz frequency. Others are default settings.

Note13: 1 mV/div and 2 mV/div are a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 32 mV for 1 mV/div and 2 mV/div sensitivity setting.

Note14: Supporting legs and handle folded, knob height included, front protective cover excluded.

Note15: MSO7000 model, standard configuration.