

Economical and Multi-Functional MSO



GW Instek MSO-2000 Series
Mixed Signal Oscilloscope
New Product Announcement

This document allows GW Instek's partners to quickly grasp product's main features, FAB and ordering information.

Economical and Multi-Functional MSO

MSO-2000, a mixed-signal oscilloscope, is developed from the high-performance software and hardware platforms of GDS-2000E, which boasts the superb functions including the highest waveform update rate of 120,000 wfm/s in the same class and 10M memory depth per channel to allow users to completely retrieve and analyze waveforms. The series includes MSO-2000E and MSO-2000EA. MSO-2000E has a built-in 16-channel logic analyzer and MSO-2000EA has a built-in 16-channel logic analyzer and a dual channel 25MHz arbitrary waveform generator.

For MSO-2000E, its 16-channel logic analyzer has the memory depth of 10Mpts per channel, which can retrieve more and longer digital signals as well as clearly display digital signals to obtain sufficient information for analysis. The standard bus trigger and decoding functions include I2C, SPI, UART (RS232/422/485) and CAN/LIN bus for automotive communications. Serial bus waveforms can be triggered and decoded in real time. Via the waveform search function, the desired signals can be identified for analysis and debugging. The feature of converting digital signals into analog signals allows MSO-2000 to observe analog waveforms and abnormal digital signals simultaneously to clearly differentiate the cause of abnormal signals. The digital channel of MSO-2000E features high signal sensitivity, long record length and high sample rate. The minimum input swing of logic analyzer represents the minimum operating voltage of ± 250 mV, which demonstrates that digital channels are highly sensitive with respect to input. MSO-2000E offers complete analysis and debugging capabilities with the economical pricing.

In addition to a 16-channel logic analyzer, MSO-2000EA has a built-in dual channel 25MHz arbitrary waveform generator with the modulation capability and also features 14 bits vertical resolution; sample rate of 200MSa/s; 5 standard output waveforms (Sine, Square, Pulse, Ramp, DC, Noise) and 7 user-defined waveforms (Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac); AM/FM/FSK modulation and sweep function. The friendly user interface is the ideal choice for applications such as circuit simulation tests.

Other than the new functionalities, the hardware characteristics of MSO-2000E and MSO-2000EA are identical to those of GDS-2000E. MSO-2000E and MSO-2000EA are equipped with 8-inch display and feature bandwidth selections of 200MHz, 100MH, and 70MHz. Models with two analog channels provide 1GSa/s real-time sampling rate per channel; models with four analog channels provide 1GSa/s maximum real-time sampling rate. The waveform update rate of 120,000 wfm/s and the minimum 1mV/div vertical range allow MSO-2000E and MSO-2000EA to measure complex feeble signals and clearly display measurement results.

With respect to the memory depth, MSO-2000E and MSO-2000EA provide 10M long memory for users to completely retrieve and analyze waveforms. Users, based upon the application requirements, can select 1k, 10k, 100k, 1M or 10M memory depth. In general, short memory depth collocating with the high sampling rate allows users to observe fast-changing waveforms and, on the other hand, long memory depth aims for observing small waveform variation. Waveform search and segmented memory functions expand the flexible applications of 10M long memory. The segmented memory can be divided the maximum into 29,000 sections for users to bypass any unimportant waveforms to swiftly search all required waveforms. With the function, more meaningful waveforms can be saved and target waveforms can be displayed rapidly. With the waveform search function, users can rapidly search desired waveforms according to the required trigger conditions.

MSO-2000 also provides 1M FFT display that allows users to correctly and efficiently acquire measurement results of the frequency domain. MSO-2000, enhancing by the high waveform update rate of 120,000wfm'sec, Window Zoom and Peak Search, becomes the optimal choice of the economical and multi-function mixed signal oscilloscope.

MSO-2000E provides a 16-channel logic analyzer



16-channel logic analyzer has the memory depth of 10Mpts per channel, which can clearly display digital signals. The standard bus trigger and decoding functions include I2C, SPI, UART (RS232/422/485) and CAN/LIN bus for automotive communications. The minimum input swing of logic analyzer represents the minimum operating voltage of ± 250 mV, which demonstrates that MSO-2000E has a very high sensitivity with respect to input.

MSO-2000EA provides a dual channel 25MHz arbitrary waveform generator



In addition to a 16-channel logic analyzer, MSO-2000EA features a built-in dual channel 25MHz arbitrary waveform generator with modulation capability and also provides 14 bits vertical resolution; sample rate of 200MSa/s ; 5 standard output waveforms (Sine, Square, Pulse, Ramp, DC, Noise) and 7 user-defined waveforms (Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac); AM/FM/FSK modulation and sweep function.

Major Specifications and Functions

Main features

- 200/100/70MHz bandwidth selections: 2 or 4 channels
- MSO-2000E equips with a 16-channel logic analyzer
- MSO-2000EA equips with a 16-channel logic analyzer and a dual channel 25MHz arbitrary waveform generator
- Real time sample rate for each channel is 1GSa/s (2-channel models); Maximum real time sample rate is 1 GSa/s (4- channel models)
- Maximum 10M memory depth and VPO waveform display technology
- Waveform update rate up to 120,000 wfms/s
- 8" WVGA TFT LCD screen display
- Maximum 1M FFT provides higher frequency domain resolution measurements
- High pass and low pass filter functions
- 29,000 segmented memory sections and waveform search function
- I2C/SPI/UART/CAN/LIN serial bus trigger and decoding functions
- Data log function can track signal changes up to 100 hours
- Network storage function

Interface

- USB device port, host port
- LAN port
- Go/No-go BNC
- Kensington Style lock

Software and Driver

- PC software (Openwave software)
- USB driver

Customers and Applications

Customers

- Educational institutions
- General industrial tests

Applications

- Educational courses
- Embedded circuit design
- Automotive electronics
- ICT product design

Product model selection

There are 12 models for the MSO-2000 series. The functionalities of each model are as follows:

4 Channel models	
	<p>MSO-2204E 200MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA</p>
	<p>MSO-2104E 100MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA</p>
	<p>MSO-2074E 70MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA</p>
	<p>MSO-2204EA 200MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG</p>
	<p>MSO-2104EA 100MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG</p>
	<p>MSO-2074EA 70MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG</p>
Dual Channel models	
	<p>MSO-2202E 200MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA</p>
	<p>MSO-2102E 100MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA</p>
	<p>MSO-2072E 70MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA</p>
	<p>MSO-2202EA 200MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG</p>
	<p>MSO-2102EA 100MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG</p>
	<p>MSO-2072EA 70MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG</p>

Position

GW Instek GDS-2000E is to meet the requirements of the high quality medium class oscilloscope.

MSO-2000E and MSO-2000EA are developed with the platform of GDS-2000E. Compared with GDS-2000A and DS2-16LA and AFG-225 options, MSO-2000E and MSO-2000EA provide longer memory depth. The arbitrary waveform generator of MSO-2000EA provides better vertical resolution of 14bits. The MSO-2000 series is indispensable for preliminary industrial applications and medium level educational experiments.

Key Dates for Product Announcement

1. Order Queue Open (Jan/16/2017)
2. Global Market Announcement (Feb/16/2017)

Service Policy

1. **2-year warranty.** The MSO-2000 Series Mixed Signal Oscilloscope carries a standard warranty for 1 year.
2. **Service Support.** The service instructions in the Service Manual will help distributors repairing damage units promptly. The parts-swapping service support is provided by Good Will Instrument to facilitate the repair jobs done at the distributor's site.
3. Marcom Material and Service Manual download through Website. Good Will Instrument continues to provide after sales support through its website. The most updated version of service manual and Marcom material of MSO-2000 Mixed Signal Oscilloscope will be posted on the distributor zone of GW Instek's website at <http://www.gwinstek.com>

Order information

MSO-2204EA 200MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG

MSO-2104EA 100MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG

MSO-2074EA 70MHz, 4-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG

MSO-2202EA 200MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA, dual channel 25MHz AFG

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MSO-2202E 200MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA

MSO-2102E 100MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA

MSO-2072E 70MHz, 2-channel, Digital Storage Oscilloscope, 16-channel LA

Standard Accessories

Power Cord, Certificate of Calibration,

CD-ROM (with Quick Start Guide, User Manual, Programming Manual)

Passive probe (one probe per channel)

GTL-16E, 16-channel logic analyzer probe

GTL-110 BNC-BNC cable*2 (for MSO-2000EA models only)

Free Download

Openwave software; USB driver

Detailed product information

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Detailed feature descriptions

MSO-2000E

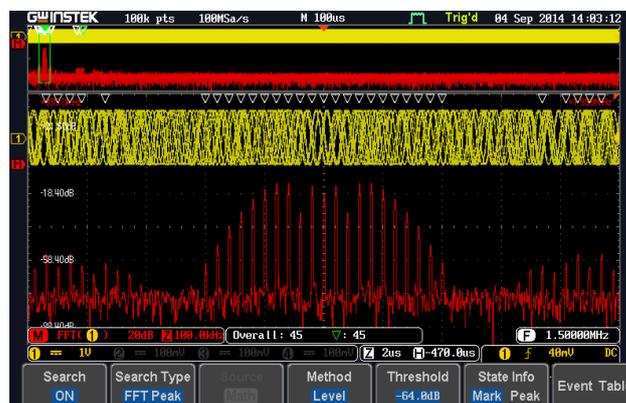
120,000wfm/s waveform update rate

The MSO-2000 series digital oscilloscopes allow users to easily observe rare transient waveforms and jitters with the waveform update rate up to 120,000 wfm/s. The advanced VPO (Visual Persistence Oscilloscope) signal processing technology combines the multi-layered gray display to enhance waveform display efficiency that allows users to easily and completely observe inrush signals and rare transient waveforms to increase waveform debugging efficiency. As shown on the above diagram, the MSO-2000 series can easily retrieve and differentiate rare transient signals. Oscilloscope with VPO technology displays signals with three-dimensional waveform data constructing by amplitude, time and signal strength to show each wave point. As many as 256 color gradients can clearly show waveform variation. Comparing with the conventional digital storage oscilloscope, the MSO-2000 series provides more useful information on the screen.



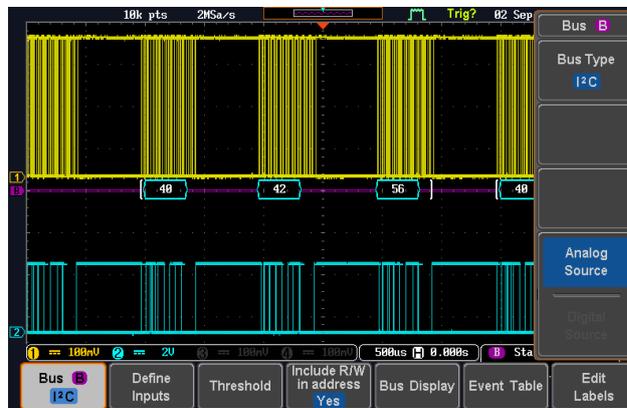
1M FFT frequency domain display

The FFT (Fast Fourier Transform) function of the MSO-2000 series provides the maximum 1M points display. The function supports four window displays, including Rectangular, Hamming, Hanning, and Black-Harris. Users select window display for frequency domain analysis according to their test requirements. After selecting the FFT function, dB marker will be shown on the screen for users to easily identify frequency domain signals. The MSO-2000 series not only provides the FFT function but also FFTrms, vertical adjustment, and local zoom-in functions. Via rapid waveform update rate and waveform search functions, users can precisely observe the test results of frequency domain. Below picture shows FFT display. We can clearly see that each spectrum component is shown in the frequency domain.



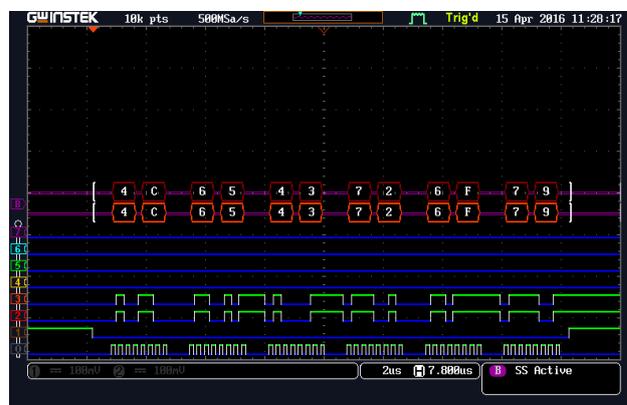
Both digital and analog channels support I2C/SPI/UART/CAN/LIN decoding and analysis

The serial bus technology has been widely applied in the present embedded application design. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The MSO-2000 series provides parallel and serial bus analysis function. It's 10M long memory depth to trigger, decode, and analyze, in a long period, frequently used I2C, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications.



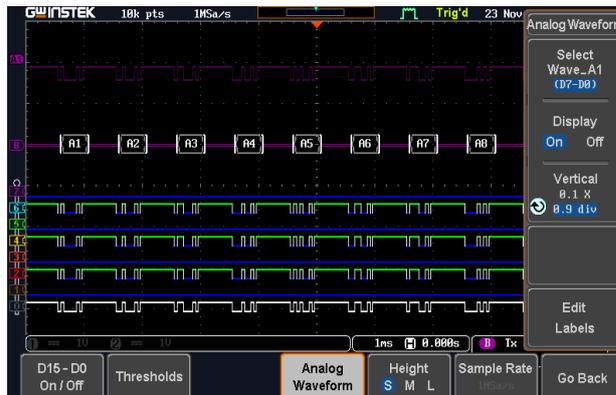
Users can select either digital or analog channels to conduct trigger and decoding.

Users can select either digital or analog channels to conduct trigger and decoding. The digital channels can be used to conduct parallel bus analysis. Without the extra software cost, school courses and embedded system design can easily conduct excellent serial bus decoding and analysis by using the MSO-2000 series oscilloscopes. Additionally, while using digital channels,



Digital signals can be restored to analog signals.

Analog Waveform can be selected to observe and analyze analog and digital signals related to time. This function can be used to verify and analyze analog and digital conversion.

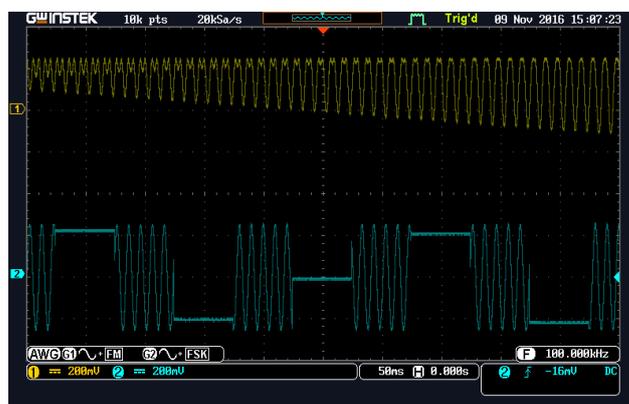
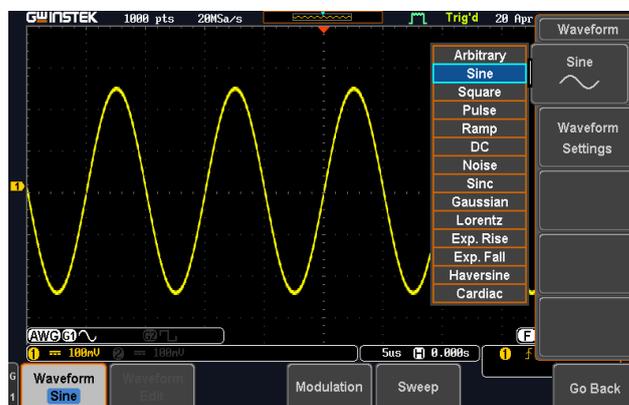


MSO-2000EA

Dual channel 25MHz arbitrary waveform (outputs on the rear panel)



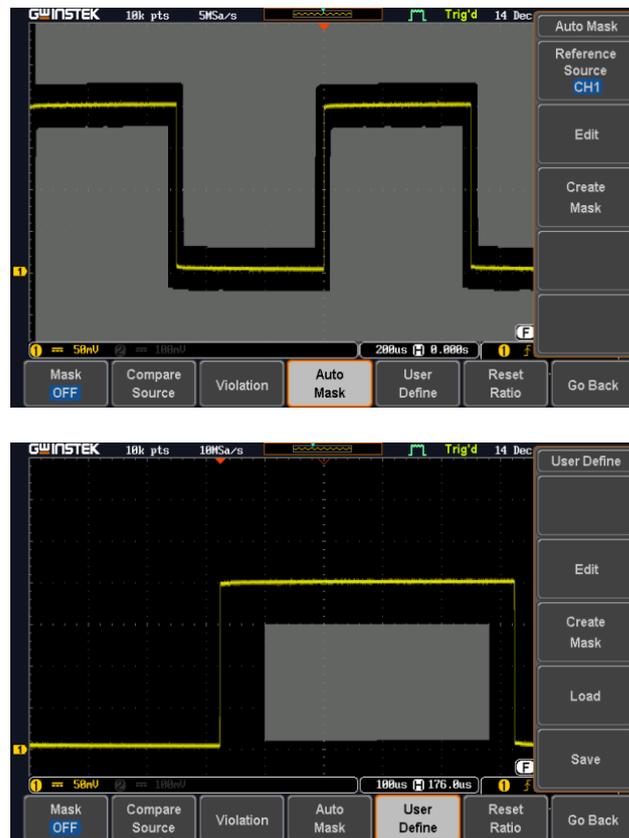
MSO-2000EA is equipped with a dual channel 25MHz arbitrary waveform generator. Users can select waveform output via selection menu. There are 5 standard output waveforms (Sine, Square, Pulse, Ramp, DC, Noise); 7 user-defined waveforms (Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac); AM/FM/FSK modulation and sweep function. The friendly user interface is the optimal choice for applications such as circuit simulation tests and school experiments.



DSO Function

Mask function

The MSO-2000 series provides the Mask function, which allows users to apply Auto Mask and user-defined Mask to determine whether the quality of the product meets the regulation. Via user-defined mask, users can set up to 8 areas and each area is up to 10 points to meet test requirements. Users can also refer to the examples from user manual to edit Mask by the PC to satisfy all test needs. By setting Save On, users can log and monitor signals, which violate test conditions.



The functions of GDS-2000E

MSO-2000 provides the functions of GDS-2000E such as segmented memory, waveform search, 38 measurement items, measurement statistics, data log, digital filter, DVM, etc. For detailed functional information please refer to GDS-2000E Marcom information.

Comparison

1. DSO Comparison

	GW Instek MSO-2000E(A)	Tektronix MSO/DPO2000B Series	Keysight MSOX/DSO2000X	Rigol MSO/DS2000A	Siglent SDS2000X
Bandwidth	70/100/200 MHz	70/100/ 200MHz	70/ 100/ 200MHz	70/100/200/300 MHz	70/100/200/300 MHz
Channels	2 / 4	2/ 4	2/ 4	2	2 / 4
Record Length	10M/ch	1M	100k, option to 1M	14M shared (56M option)	Record length up to 140 Mpts/CH
waveform capture rate(WFM/sec)	120,000	5,000	50,000	50,000	500,000
Real Time Sample rate	1 GSa/s	1GS/s	2GSa/s	2GSa/s (analog channel) 1GSa/s (Digital channel)	2GSa/s
Display	8" WVGA 800*480	7" WQVGA 480*234	8.5" WVGA 800*480	8inch WVGA (800x480)	8inch TFT LCD
Horizontal range	1ns~100s/div	DPO2012/ 2014: 4ns~100s/div DPO2024: 2ns~100s/div	70MHz: 5ns~50s /div 100MHz: 5ns~50s/div 200MHz: 2ns~50s/div	MSO/DS2302A/2302A-S: 1.000 ns/div to 1.000 ks/div MSO/DS2202A/2202A-S: 2.000 ns/div to 1.000 ks/div MSO/DS2102A/2102A-S/2072A/2072A-S: 5.000 ns/div to 1.000 ks/div	1ns/div ~ 50s/div
Vertical range	1mV~10V/div	2mV~5V/div	2mV~5V/div	500 μ V/div to 10 V/div	1mV/div - 10V/div
Bus decode	I2C, SPI, UART, CAN, LIN,	opt. I2C, SPI (DPO2SMBD), opt. CAN, LIN (DPO2AUTO) opt. UART (DPO2COMP)	Opt.CAN, LIN(DSOX2AUTO)	Parallel (standard), RS232 (optional), I2C (optional), SPI (optional), CAN (optional)	IIC, SPI, UART, RS232, CAN and LIN (decode optional)
Waveform Search	Standard	Standard	Nil	NA	NA
Segmented Memory	Standard	Nil	Option	NA	Standard
Logic Analyzer	16 CH	16ch	Yes 8CH (opt. DSOX2MSO)	16CH	16 Digital Channels Software and 16 Channel Logic Probe is option
FG Output	2CH AWG 25MHz	Nil	Yes (opt. 20M DSO2WAVEGEN)	MSO2000A-S built in 2ch 25MHz function generator	1CH AWG 25MHz
Interface	LAN, USB, Go/No-go BNC	USB Host/Device port, auxiliary input Optional VGA output and LAN	USB Host*2, Device port *1 Optional GPIB, LAN and WVGA output	USB Host (support USB-GPIB), USB Device, LAN, Aux Output (Trig Out/Pass-fail)	USB Host, USB Device (USBTMC), LAN (VXI-11), Pass/Fail, Trigger Out, GPIB (optional)
PS	Advanced Trigger is standard	Yes (opt.)	NA	Advanced Trigger (Option)	NA

2. Logic Analyzer Comparison

Specification	GW Instek MSO-2000E(A)	Tektronix MSO/DPO2000B Series	Keysight MSOX/DSO2000X	Rigol MSO/DS2000A	Siglent SDS2000X
Sample Rate	1GSa/s	1GSa/s (When use any D0-D7) 500MSa/s (When use any D8~D15)	1 GSa/s	1GSa/s	500MSa/s
Record Length	Per Channel 10M pts (max)	Per channel 1M pts	500 kpts per channel (digital channels only)	14 Mpts (standard)/28 Mpts (optional)	14Mpts/CH
Input Channels	16 Digital (D15 - D0)	16 Digital (D15 - D0)	8 channels (D0 to D7)	16 Digital (D15 - D0)	16 Digital (D0~D7,D8~D15)
Trigger type	Edge, Pattern, Pulse Width, Serial bus (I2C, SPI, UART, CAN, LIN), Parallel Bus	Edge, pulse width, Logic (standard) I2C, SPI, UART, CAN, LIN (optional)	Edge, pulse width, Logic (standard) I2C, SPI, UART, CAN, LIN (optional)	I2C, SPI CAN trigger is option	(not support serial bus trigger in digital channel)
Threshold selections	TTL, CMOS(5V,3.3V,2.5V), ECL, PECL,0V, User Defined	TTL, CMOS, ECL, PECL, User-defined	TTL (+1.4 V), CMOS (+2.5 V), ECL (-1.3 V), User-definable (± 8.0 V in 10 mV stops	1 group with 8 channels adjustable threshold	TTL, CMOS, LVCMOS3.3, LVCMOS2.5, custom
User-defined Threshold Range	± 5 V	± 20 V	?	± 20.0 V, in 10 mV step	-3V~3V
Maximum Input Voltage	± 40 V	± 40 V	± 10 V about threshold	± 10 V + threshold	?
Minimum Voltage Swing	± 250 mV	500mVp-p	500 mVpp	500mVp-p	?
Vertical Resolution	1 bit	1 bit	?	1 bit	?

3. Arbitrary waveform Generation Comparison

Specification	GW Instek MSO-2000E(A)	Rigol MSO-2000A-S	Siglent SDS-2000X AWG
Sample Rate	200 MSa/s	200 MSa/s	125 MSa/s
Vertical Resolution	14 bits	14 bits	14 bits
Max. Frequency	25 MHz	25 MHz	25 MHz
Standard Waveform	Sine, Square, Pulse, Ramp, DC, Noise	Sine, Square, Pulse, Ramp, Noise, DC	Sine, Square, Ramp, Pulse, DC, Noise, Cardiac, Gauss Pulse, Exp Rise, Exp Fall, Arb
Built-in Waveform	Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac	Sinc, Exponential Rise, Exponential Fall, ECG, Gauss, Lorentz, Haversine	
Output range	20 mVpp to 5 Vpp, HighZ	?	4mVpp ~ 6Vpp (into HiZ)
	10 mVpp to 2.5 Vpp, 50 Ω	?	2mVpp ~ 3Vpp (into 50Ω)
Output Resolution	1mV	?	?
Output Accuracy	2% (1 kHz)	?	?
Offset range	±2.5 V, HighZ	±2.5 V, HighZ	?
	±1.25 V, 50 Ω	±1.25 V, 50 Ω	?
Offset Resolution	1mV	?	?
Sine			
Frequency range	100 mHz to 25 MHz	100 mHz to 1 MHz	1μHz ~ 25MHz
Flatness	±0.5 dB (relative to 1 kHz)	±0.5 dB (relative to 1 kHz)	Offset Accuracy (100 kHz): ± (0.3dB* offset setting value +1mVpp)
Harmonic Distortion	-40 dBc	-40 dBc	?
Stray (Non-harmonic)	-40 dBc	-40 dBc	?
Total Harmonic Distortion	1%	1%	?
S/N Ratio	40 dB	40 dB	?
Square/Pulse			
	Square/Pulse: 100 mHz to 15 MHz	Square: 100 mHz to 15 MHz; Pulse: 100 mHz to 1 MHz	1μHz ~ 10MHz
Rise/Fall Time	< 15ns	<15 ns	< 24 ns (10% ~ 90%)
Overshoot	< 3 %	<5%	< 3% (typical, 1KHz, 1Vpp)
Duty Cycle	Square: 50%	Square: 50%	20% ~ 80%
	Pulse: 0.4% to 99.6%	Pulse: 10% to 90% (user adjustable)	
Min. Pulse Width	30ns	20 ns	> 50ns
Jitter	500 ps	500 ps	< 500ps + 10ppm
Ramp			
Frequency range	100 mHz to 1MHz	100 mHz to 100 kHz	1μHz ~ 300kHz
Linearity	1%	1%	< 0.1% of Pk-Pk (Typical, 1 kHz, 1 Vpp, 100% Symmetry)
Symmetry	0 to 100%	0 to 100%	0% ~ 100%

Specifications

Specifications						
	MSO-2072E(A)	MSO-2074E(A)	MSO-2102E(A)	MSO-2104E(A)	MSO-2202E(A)	MSO-2204E(A)
Channels	2ch+Ext	4ch	2ch+Ext	4ch	2ch+Ext	4ch
Bandwidth	DC~70MHz (-3dB)	DC~70MHz (-3dB)	DC~100MHz (-3dB)	DC~100MHz (-3dB)	DC~200MHz (-3dB)	DC~200MHz (-3dB)
Rise time	5ns	5ns	3.5ns	3.5ns	1.75ns	1.75ns
Bandwidth Limit	20MHz	20MHz	20MHz	20MHz	20M/100MHz	20M/100MHz
Vertical Sensitivity						
Resolution	8 bit :1mV~10V/div					
Input Coupling	AC, DC, GND					
Input Impedance	1M Ω // 16pF approx.					
DC Gain Accuracy	\pm (3%)when 2mV/div or greater is selected \pm (5%)when 1mV/div is selected;					
Polarity	Normal & Invert					
Maximum Input Voltage	300Vrms, CAT I					
Offset Position Range	1mV/div ~ 20mV/div : \pm 0.5V 50mV/div ~ 200mV/div : \pm 5V 500mV/div ~ 2V/div : \pm 25V 5V~10V/div : \pm 250V					
Waveform Signal Process	+, -, x, \div , FFT, FFTrms ,User Defined Expression.					
	FFT:1Mpts FFT:Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS, and FFT Window to Rectangular, Hamming, Hanning, or Blackman-Harris.					
Trigger						
Source	CH1 ,CH2, CH3, CH4, Line, EXT* *dual channel models only					
Trigger Mode	Auto (supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence					
Trigger Type	Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate,tme out, Event-Delay(1~65535 events), Time-Delay(Duration,4nS~10S), Bus					
Holdoff range	4ns~10s					
Coupling	AC,DC,LF rej. ,HF rej. ,Noise rej.					
Sensitivity	1div					
External Trigger						
Range	\pm 15V					
Sensitivity	DC ~ 100MHz Approx. 100mV 100MHz ~ 200MHz Approx. 150mV					
Input Impedance	1M Ω \pm 3%~16pF					
Horizontal						
Time base Range	1ns/div ~ 100s/div (1-2-5 increments) ROLL: 100ms/div ~ 100s/div					
Pre-trigger	10 div maximum					
Post-trigger	2,000,000 div maximum.					
Time base Accuracy	\pm 50 ppm over any \geq 1 ms time interval					
Real Time Sample Rate	Max.:1GSa/s (4ch model) Per channel 1GSa/s (2ch model)					
Record Length	Max:10Mpts					
Acquisition Mode	Normal, Average, Peak Detect, Single					
Peak Detection	2ns (typical)					
Average	selectable from 2 to 256					
X-Y Mode						
X-Axis Input	Channel 1; Channel 3* *four channel models only					
Y-Axis Input	Channel 2; Channel 4* *four channel models only					
Phase Shift	\pm 3 $^{\circ}$ at 100kHz					
Cursors and Measurement						
Cursors	Amplitude, Time, Gating available;Unit:Seconds(s),Hz(1/s) ,Phase(degree) ,Ration(%)					
Automatic Measurement	36 sets: Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPREShoot, FPRESshoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase ,Cursor measurements					
Control Panel Function						
Auto counter	6 digits, range from 2Hz minimum to the rated bandwidth					
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset					

Save Setup	20set
Save Waveform	24set
Display	
TFT LCD Type	8" TFT LCD WVGA color display
Display Resolution	800 horizontal x 480 vertical pixels (WVGA)
Interpolation	Sin(x)/x
Waveform Display	Dots, vectors, variable persistence (16ms~4s), infinite persistence
Waveform Update Rate	120,000 waveforms per second, maximum
Display Graticule	8 x 10 divisions
Display mode	YT ;XY
Interface	
USB Port	USB 2.0 High-speed host port X1, USB High-speed 2.0 device port X1
Ethernet(LAN) Port	RJ-45 connector, 10/100Mbps with HP Auto-MDIX
Go-NoGo BNC	5V Max/10mA TTL open collector output
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock.
Logic analyser specifications	
Sample Rate	Per Channel 1GSa/s
Bandwidth	200MHz
Record Length	Per Channel 10M pts (max)
Input Channels	16 Digital (D15 - D0)
Trigger type	Edge, Pattern, Pulse Width, Serial bus (I2C, SPI, UART(RS232/422/485), CAN, LIN), Parallel Bus
Thresholds Quad	D0~D3, D4~D7, D8~D11, D12~D15 Thresholds
Threshold selections	TTL, CMOS(5V, 3.3V, 2.5V), ECL, PECL, 0V, User Defined
User-defined Threshold Range	±5V
Maximum Input Voltage	±40 V
Minimum Voltage Swing	±250 mV
Vertical Resolution	1 bit
AWG Specifications (MSO-2000EA only)	
Channels	2
Sample Rate	200 Msa/s
Vertical Resolution	14 bits
Max. Frequency	25 MHz
Standard Waveform	Sine, Square, Pulse, Ramp, DC, Noise
Built-in ARB Waveform	Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac
Output Range	20 mVpp to 5 Vpp, HighZ; 10 mVpp to 2.5 Vpp, 50 Ω
Output Resolution	1mV
Output Accuracy	2% (1 kHz)
Offset Range	±2.5 V, HighZ; ±1.25 V, 50 Ω
Offset Resolution	1mV
Sine	
Frequency Range	100mHz to 25MHz
Flatness	±0.5 dB(relative to 1kHz)
Harmonic Distortion	-40 dBc
Stray (Non-harmonic)	-40 dBc
Total Harmonic Distortion	1%
S/N Ratio	40 dB
Square/Pulse	
Frequency Range	100mHz to 15MHz
Rise/Fall time	<15ns
Overshoot	<3%
Duty cycle	Square:50%;Pulse:0.4%~99.6%
Min. Pulse Width	30 ns
Jitter	500 ps
Ramp	
Frequency Range	100mHz~1MHz
Linearity	1%
Symmetry	0 to 100%
Miscellaneous	
Multi-language menu operation	Available
environment	Temperature: 0°C to 50°C. Relative Humidity ≤ 80% at 40°C or below; ≤ 45% at 41°C ~ 50°C.
On-line help	Available
Time clock	Time and Date ,Provide the Date/Time for saved data
Dimensions	384mmX208mmX127.3mm
Weight	3kg

Please do not hesitate to contact us if you have any queries on the MSO-2000 series announcement.

Sincerely yours,

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