



# MDO-2000E Series

**VPO**  
Visual Persistence Oscilloscope

200/100MHz Mixed-domain Oscilloscope

## FEATURES

- 200/100MHz Bandwidth Selections: 2 or 4 Channels
- Real Time Sample Rate Per Channel: 1GSa/s (2 Channel Models);  
Maximum Real Time Sample Rate: 1 GSa/s (4 Channel Models)
- MDO-2000EG Equips with a Spectrum Analyzer and a Dual Channel 25MHz AWG
- MDO-2000EX Equips with a Spectrum Analyzer ; a Dual Channel 25MHz AWG;  
DMM and Power Supply
- Per Channel 10M Memory Depth and VPO Waveform Display Technology
- Waveform Update Rate up to 120,000 wfm/s
- 8 " WVGA TFT LCD
- Free Frequency Response Analyzer Software
- Maximum 1M FFT Provides Higher Frequency Domain Resolution Measurements
- High Pass, Low Pass and Band Pass Filter Functions
- 29,000 Segmented Memory Sections and Waveform Search Functions
- I<sup>2</sup>C/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- Data Log Function is Able to Track Signal Changes up to 1000 Hours
- Mask Test Function
- Network Storage Function
- True RMS Measurement in DMM Function

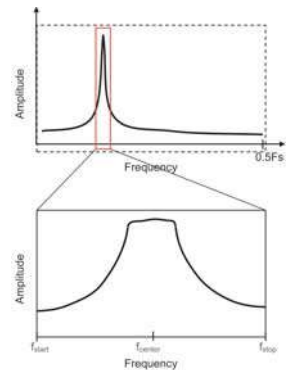
**GW INSTEK**  
Simply Reliable

# One Oscilloscope ,Two Domains

MDO-2000E series is multi-functional mixed domain oscilloscope. The series includes two feature combinations : MDO-2000EG and MDO-2000EX. MDO-2000EG models have a built-in spectrum analyzer and a dual channel 25MHz arbitrary waveform generator and MDO-2000EX models feature a built-in a spectrum analyzer, arbitrary waveform generator, a 5,000 count DMM, and a 5V/1A power supply. The first of its kind, MDO-2000EX is the only oscilloscope to equip with a DMM and a power supply in the T&M industry.

While entering the spectrum mode, MDO-2000E series will display a full screen of frequency domain. Users can input Center frequency, Span, Start frequency, and Stop frequency based upon test requirements so as to rapidly and intuitively observe required frequency range that allows users to experience the user interface of a real spectrum analyzer. While observing frequency domain display, engineers can observe waveform characteristics, which are not easily to be seen from time domain waveforms, for instance, the harmonic composition of a waveform and the frequency characteristics of a modulation signal. Compared with oscilloscope' FFT, MDO-2000E series allows engineers to effectively conduct signal measurements on frequency domain.

Conventional DSO's FFT always calculates the entire signal bandwidth up to half the sampling rate ( $F_s$ ). However, the insufficient calculation capability can't conduct FFT calculation with more points. Users can't have the signal's detailed frequency information due to the insufficient frequency resolution from the calculation result. Whereas MDO-2000E series analyzes signal spectrum of interest. Compared with oscilloscope' FFT, MDO-2000E series allows engineers to effectively conduct signal measurements on frequency domain. Right illustration shown the conventional DSO's FFT (above figure) VS. MDO-2000E's Spectrum analyzer (below figure).



MDO-2000E series frequency domain also includes Spectrum Trace Type settings (Normal, Max-hold, Min-hold, and Average)(Figure 1). Users can freely select various Spectrum Traces for simultaneous display. Detection method (Sample, +Peak, -Peak, and Average)(Figure 2) can be individually set for each Trace. Additionally, users, via Cursor, can manually mark the corresponding positions to reflect Frequency and Amplitude. The Search function can also be applied to log spectrum's Peak Table. Amplitude is displayed with dB and Marker can obtain measurement data. Users can use the Search function to search and mark the amplitude and frequency of spectrum signal. Search methods include Max. peak and threshold. Measurement results can be displayed and saved.(Figure 3)



Figure 1



Figure 2

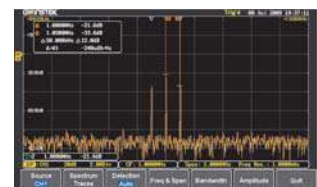


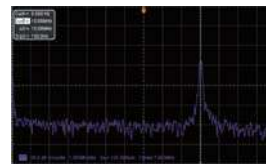
Figure 3

Compared with the general spectrum analyzer, the spectrum function of MDO-2000E series can test below~9kHz signals, which is applicable to the frequency domain analysis of audio frequency and vibration. MDO-2000E series can also test the frequency domain signal with DC component without damaging the instrument. With respect to frequency domain waveform display, MDO-2000E series, featuring the same capability of a real-time spectrum analyzer, is faster than the general spectrum analyzer. Why? It is because MDO-2000E series utilizes digital circuit and software to calculate FFT. The general spectrum analyzer can only process the signal of a narrow frequency bandwidth at a time by frequency sweeping. Each sweeping will take several ms to dozens of ms. Hundreds and thousands of frequency sweepings are gathered to form a spectrum. Therefore, the displayed spectrum is not obtained at the same time. MDO-2000E series obtains spectrum display at the same time by utilizing digital circuit and software to calculate FFT that is faster than the frequency sweeping method. The FFT settings of oscilloscopes are based upon horizontal scale (sample rate) setting, which is totally different from the frequency range setting of MDO-2000E series. Most instruments will have insufficient frequency resolution due to insufficient FFT points while conducting spectrum measurement by FFT. Compared with the FFT of oscilloscopes, MDO-2000E series satisfies users with signal measurement requirements under 9kHz; a better setting interface, measurement resolution and measurements speed.

Three screen displays on the right show the spectrum results of MDO-2000E's spectrum analyzer and the FFT of two different branded oscilloscopes after testing the same FSK signal. The parameters of FSK signal: 500mVpp sine wave, fmax: 10.2MHz, fmin: 10.0MHz, bit rate: 10.0kHz. The upper right screen display is the spectrum of MDO-2000E's spectrum analyzer. Users can directly input Center and Span Frequency by an intuitive and swift setting. Fmax and fmin can be clearly identified from the screen display.



The right screen display is an often seen spectrum from a general oscilloscope's FFT. The left boundary started from DC (low frequency signal) and the maximum frequency on the right is half of the sample rate (can be extended to the right or even out of the boundary). The Span setting for spectrum can only be switched by fixed 1-2-5 multiplying factors. Therefore, users can't set Span according to their requirements that is extremely inconvenient for the operation. In fact, switching multiplying factor is to conduct Zoom In/Out calculation on the original FFT spectrum and the sample rate remains the same during the calculation process. Users can easily encounter the upper and lower boundary limits that is totally different from the general spectrum analyzer in terms of operational experience. Most importantly, no matter how setting is changed the important  $f_{max}$  and  $f_{min}$  of spectrum can't be identified.



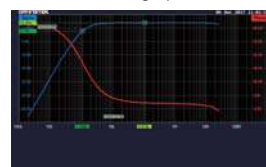
The right screen display is the FFT spectrum from a well-known oscilloscope manufacturer. It also provides Span setting (adjustable 1-2-5 multiplying factor) but the result is the same as the previous case, which only conducts Zoom In/Out calculation on FFT spectrum and FFT calculation points have not increased. This method is absolutely unhelpful on increasing frequency resolution. Therefore, its  $f_{max}$  and  $f_{min}$  can't be identified as well.

Users will see  $f_{max}$  and  $f_{min}$  appearing on the screen alternatively if the conventional swept tuned spectrum analyzer is used to conduct the measurement on the previous signal. The reason is that each frequency component is not obtained at the same time frame and it will take a longer time to process.



FRA of RC high-pass filter

MDO-2000E also provide the frequency response analysis function (Bode plot). The FRA software can be directly downloaded from GW Instek website. Via arbitrary waveform generator, oscilloscope, and FRA software, users can obtain DUT's FRA characteristic curve plot. FRA has a very wide application range, including product circuit and component performance verification and analysis such as Feedback of Circuit Design, Filter Design, Amplifier Design, Resonant Circuit Design, Cable Frequency Response, and Signal Transformer Performance. Via FRA, users can preliminarily verify product and analyze component's characteristics without the expensive instrument.

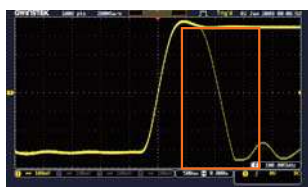


Cursor measurement for the determination at 3dB cut-off frequency of the high-pass filter.

The frequency range of FRA is from 20Hz to 25MHz; the number of test point can be selected from 10 to 90 points per decade. After completing the Bode plot, users can select measurement curve by Cursor so as to retrieve each point's amplitude and phase on the curve.

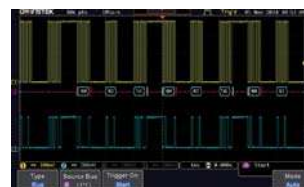
Other than the new functionalities, the hardware characteristics of MDO-2000EG and MDO-2000EX are identical to those of GDS-2000E Series. MDO-2000EG and MDO-2000EX are equipped with 8-inch display and feature bandwidth selections of 200MHz, 100MHz, and 70MHz. Models with two analog channels provide 1GSa/s 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 MDO-2000EG series MDO-2000EX to measure complex feeble signals and clearly display measurement results. With respect to the memory depth, MDO-2000E series 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. The segmented memory can be divided the maximum into 29,000 sections for users to bypass any unimportant waveforms so as 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. MDO-2000E series also provides 1M FFT display that allows users to correctly and efficiently acquire measurement results of the frequency domain. MDO-2000E series, 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 domain oscilloscope.

**A. 120,000wfm/s WAVEFORM UPDATE RATE AND VPO WAVEFORM DISPLAY TECHNOLOGY**



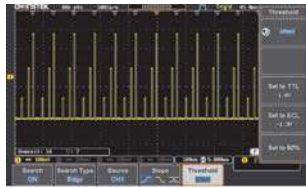
The MDO-2000E series oscilloscope allows users to easily and completely observe inrush signals and rare transient waveforms to increase waveform debugging efficiency by using features, including advanced VPO (Visual Persistence Oscilloscope) signal processing technology, waveform update rate as high as 120,000 wfm/s, and multi-layered afterglow display to enhance waveform display efficiency. Oscilloscope with VPO technology displays signals with three dimensional waveforms constructed by amplitude, time and signal strength to show each waveform point. 256 color gradients yield clear waveform changes. Comparing with the conventional digital storage oscilloscope, the MDO-2000E series provides more natural and more genuine signal display effect which is very close to the original analog signal.

**B. SUPPORT I<sup>2</sup>C, SPI, UART, CAN, LIN BUS TRIGGER AND DECODING FUNCTIONS**



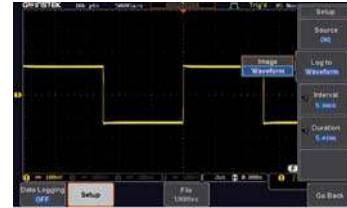
The serial bus technology has been widely applied in the present embedded application design. The IoT devices connecting sensors and the peripheral components are using serial bus such as UART, I<sup>2</sup>C, and SPI. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The MDO-2000E series provides serial bus analysis function with 10M long memory depth. Users can trigger, decode, and analyze frequently used I<sup>2</sup>C, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

### C. WAVEFORM SEARCH FUNCTION



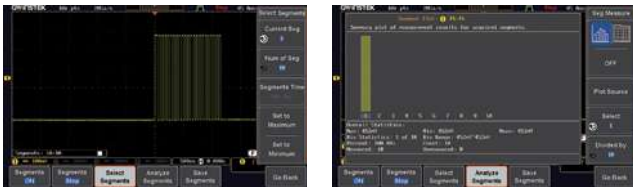
Users can rapidly search desired waveforms according to the trigger condition. After activating the search function, hollow inverted triangles will show the location met the trigger condition. The upper left hand corner Overall will show the total number of waveforms met the trigger condition. Users can set waveform search by the trigger condition such as Edge, pulse width, Runt, Rise/Fall, and Bus. When the trigger condition is met, hollow inverted triangles will appear. Users can save all marks to compare with the next input signal. The front panel of the MDO-2000E series controls waveform zoom-out and play/pause function to swiftly identify each desired event. The function allows users to conveniently complete waveform search and save marks for rapid comparison and analysis.

### D. DATA LOG FUNCTION



Users, via the data log function, can observe waveform changes in long periods of time to ensure product reliability or measure sporadically appeared signals. The data log function, based on the requirements, can set record time and interval. Record time can be selected from 5 minutes to 1000 hours, and record interval is 5 seconds, the minimum. Waveform type for record data and CSV file format for each channel can also be selected. Data can be stored in USB drive, the MDO-2000E series or the remote computer via LAN.

### E. SEGMENTED MEMORY FUNCTION



Users Can Select "Analyze Segments" to Conveniently Obtain The Analysis Results.

To achieve the most ideal application for memory depth, the MDO-2000E series has the built-in segmented memory function. The segmented memory function allows users to select the desired important signals for observation. Hence, insignificant signals can be neglected and serial bus decoding; pulse or inrush signals can be identified when retrieving signals. The segmented memory function of the MDO-2000E series allows users to select the number of sections. The maximum sections can be selected are 29,000. After activating the function, users can select and observe waveform for each segment by turning the Variable knob. The ultimate application of memory depth, therefore, is completely realized.

### F. MASK FUNCTION



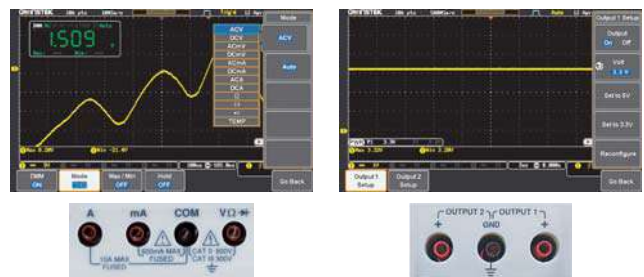
The MDO-2000E series provides the Mask function, which allows users to apply Auto Mask and user-defined Mask to determine whether the quality of the product meets the regulation. Via user-defined mask, users can set up to 8 areas and each area is up to 10 points to meet test requirements. Users can also 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.

### G. 25MHz DUAL CHANNEL ARBITRARY WAVEFORM GENERATOR



With respect to signal source, MDO-2000E 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; 13 output waveforms (Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac); and AM/FM/FSK modulation and sweep function. The friendly user interface is the ideal choice for education and applications such as circuit simulation tests. Arbitrary waveform generator provides users with 16k memory length. Users can upload basic waveforms, including Sine, Square, Pulse, Ramp, and Noise to edit arbitrary waveforms. Normal and Function Edit can edit waveforms. The edited waveforms can be saved as UAW file for data access.

### H. POWER SUPPLY AND DMM FUNCTIONS (MDO-2000EX only)



MDO-2000EX has expanded its capabilities by incorporating a 5,000 count DMM and a 5V/1A power supply. DMM provides tests for ACV, DCV, ACA, DCA resistance, diode and temperature. The highly accurate DMM can strengthen DSO's capabilities of voltage and current measurement accuracy. Power supply provides 5V/1A; 0.1V incremental adjustment which can supply power for the development board and IoT (Internet of Things) module of the often used 8051/Arduino/ESP8266/MSP430 in Microprocessors and Micro controllers experiment courses. For education and digital circuit tests, it can satisfy the voltage input requirements of 5V or 3.3V. Each increment is 0.1V and over load protection is available.

## PANEL INTRODUCTION



1. Hardcopy Key
2. Autoset, Run/Stop, Single & Default Keys
3. Search and Zooming Controls
4. Trigger Controls
5. Math, Reference & Bus Keys
6. Probe Calibration Output
7. USB Host Port
8. Option Key
9. Menu Off Key
10. DMM Test Input (MDO-2000EX only)
11. USB Device Port
12. LAN Port
13. Go-NoGo Output
14. Calibration Output
15. Dual Channel Arbitrary Waveform Generator
16. Power Supply Output (MDO-2000EX only)

## SELECTION GUIDE

Model	MDO-2104E(G/X)	MDO-2102E(G/X)	MDO-2204E(G/X)	MDO-2202E(G/X)
Bandwidth	100MHz	100MHz	200MHz	200MHz
Channels	4	2	4	2
Record Length	10M / ch	10M / ch	10M / ch	10M / ch
Real-time Sampling Rate	Max. 1 GSa/s	Per channel 1 GSa/s	Max. 1 GSa/s	Per channel 1 GSa/s
Built-in	MDO-2000EG : Spectrum Analyzer ; Dual Channel 25MHz Arbitrary Waveform Generator MDO-2000EX : Spectrum Analyzer ; Dual Channel 25MHz Arbitrary Waveform Generator ; Power Supply and DMM			

## SPECIFICATIONS

		MDO-2102E(G/X)	MDO-2104E(G/X)	MDO-2202E(G/X)	MDO-2204E(G/X)
VERTICAL SENSITIVITY	Channels	2Ch+EXT	4Ch	2Ch+EXT	4Ch
	Bandwidth Calculated Rise Time Bandwidth Limit	DC~100MHz(-3dB) 3.5ns 20MHz		DC~200MHz(-3dB) 1.75ns 20M/100MHz	
	Vertical Resolution Input Coupling Input Impedance DC Gain Accuracy Polarity Maximum Input Voltage Offset Position Range Waveform Signal Process	8 bits : 1mV – 10V/div AC, DC, GND 1MΩ // 16pF approx. ±(3% when 2mV/div or greater is selected ; ±(5%) when 1mV/div is selected Normal & Invert 300Vrms , CAT 1 1mV/div – 20mV/div : ±0.5V ; 50mV/div – 200mV/div : ±5V ; 500mV/div – 2V/div : ±25V ; 5V/div~10V/div : ±250V + , - , × , ÷ , FFT , 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			
TRIGGER	Source Trigger Mode Trigger Type Trigger Holdoff Range Coupling Sensitivity	Ch1 ,CH2, CH3, CH4, Line, EXT* ; *dual channel models only Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, Time out, Event-Delay(1~65,535 events),Time-Delay(Duration;4ns~10s), Bus 4ns – 10s AC, DC, LF rej. , Hf rej. , Noise rej. 1div			
EXT TRIGGER	Range Sensitivity Input Impedance	±15V DC – 100MHz Approx. 100mV; 100MHz – 200MHz Approx. 150mV 1MΩ±3%, ~16pF			
HORIZONTAL	Time Base Range Pre-trigger Post-trigger Time Base Accuracy Real Time Sample Rate Record Length Acquisition Mode Peak Detection Average	1ns/div – 100s/div (1-2.5 increments); ROLL : 100ms/div – 100s/div 10 div maximum 2,000,000 div maximum ±50 ppm over any ≥ 1 ms time interval Max. : 1GSa/s (4ch model); Per channel 1GSa/s (2ch model) 10Mpts/CH Normal, Average, Peak Detect, Single 2ns (typical) Selectable from 2 to 256			

## SPECIFICATIONS

<b>X-Y MODE</b>	X-Axis Input Y-Axis Input Phase Shift	Channel 1 ; Channel 3* ( * : four channel models only ) Channel 2 ; Channel 4* ( * : four channel models only ) ±3° at 100kHz
<b>CURSORS AND MEASUREMENT</b>	<b>Cursors</b> <b>Automatic Measurement</b>	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%) 38 sets : Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESshoot, FPREShoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, %Flicker, Flicker Idx., FRR, FRF, FFR, FFF, LRR, LRF, LFF, Phase
<b>CONTROL PANEL FUNCTION</b>	<b>Auto Counter</b> <b>Autoset</b> <b>Save Setup</b> <b>Save Waveform</b>	6 digits, range from 2Hz minimum to the rated bandwidth Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset 20 sets 24 sets
<b>DISPLAY SYSTEM</b>	<b>TFT LCD Type</b> <b>Display Resolution</b> <b>Interpolation</b> <b>Waveform Display</b> <b>Waveform Update Rate</b> <b>Display mode</b> <b>Display Graticule</b>	8" TFT LCD WVGA color display 800 horizontal x 480 vertical pixels (WVGA) Sin(x)/x Dots, Vectors, Variable persistence(16ms-4s), Infinite persistence 120,000 waveforms per second, maximum YT; XY 8 x 10 divisions
<b>INTERFACE</b>	<b>USB Port</b> <b>Ethernet Port (LAN)</b> <b>Go/NoGo BNC</b> <b>Kensington Style Lock</b>	USB 2.0 High-speed host port x 1, USB 2.0 High-speed device port x 1 RJ-45 connector, 10/100Mbps with HP Auto-MDIX 5V Max/10mA TTL open collector output Rear-panel security slot connects to standard Kensington-style lock
<b>SPECTRUM ANALYZER SPECIFICATIONS</b>	<b>Frequency Range</b> <b>Span</b> <b>Resolution Bandwidth</b> <b>Reference Level</b> <b>Vertical Units</b> <b>Vertical Position</b> <b>Vertical Scale</b> <b>Display Average Noise Level</b> <b>Spurious Response</b> <b>Frequency Domain</b> <b>Trace Types</b> <b>Detection Methods</b> <b>FFT Windows</b>	DC-500MHz(Max.) (Max. bandwidth -500MHz uncalibrated) 1kHz - 500MHz(Max.) 1Hz - 500kHz(Max.) -50 dBm to +40dBm in steps of 5dBm dBV RMS; Linear RMS; dBm -12divs to +12divs 1dB/div to 20dB/div in a 1-2-5 Sequence 1V/div < -50dBm, Avg : 16 ; 100mV/div < -70dBm, Avg : 16 ; 10mV/div < -90dBm, Avg : 16 2nd harmonic distortion < 40dBc ; 3rd harmonic distortion < 45dBc Normal ; Max Hold ; Min Hold ; Average (2 - 256) Sample ; +Peak ; -Peak ; Average FFT Factor : Hanning 1.44 ; Rectangular 0.89 ; Hamming 1.30 ; Blackman 1.68
<b>AWG SPECIFICATIONS</b>	<b>Channels</b> <b>Sample Rate</b> <b>Vertical Resolution</b> <b>Max. Frequency</b> <b>Waveforms</b> <b>Output Range</b> <b>Output Resolution</b> <b>Output Accuracy</b> <b>Offset Range</b> <b>Offset Resolution</b> <b>Sine</b> <b>Square/Pulse</b> <b>Ramp</b>	2 200 Msa/s 14 bits 25 MHz Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaston, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac 20 mVpp to 5 Vpp, High Z; 10 mVpp to 2.5 Vpp, 50Ω 1mV 2% (1 kHz) ±2.5 V ac+dc, High Z; ±1.25 V ac+dc, 50Ω 1mV Frequency Range: 100mHz-25MHz ; Flatness(relative to 1kHz): ±0.5 dB<15MHz; ±1 dB 15MHz-25MHz; Harmonic Distortion: -40 dBc ; Stray(Non-harmonic): -40 dBc ; Total Harmonic Distortion: 1% ; S/N Ratio: 40 dB Frequency Range: 100mHz-15MHz ; Rise/Fall time: <15ns ; Overshoot: <3% ; Duty cycle Square: 50% & Pulse: 0.4%-99.6% ; Min. Pulse Width: 30 ns ; Jitter: 500 ps Frequency Range: 100mHz-1MHz ; Linearity: 1% ; Symmetry: 0-100%
<b>FREQUENCY RESPONSE ANALYSIS</b>	<b>Dynamic Range</b> <b>Input and Output Sources</b> <b>Frequency Range</b> <b>Number of Test Points</b> <b>Test Amplitude</b> <b>Test Results</b> <b>Manual Measurements</b> <b>Plot Scaling</b>	> 80 dB (typical) Channel 1 or 2 ( 3 or 4 for four channel model ) 20 Hz to 25 MHz 10 to 90 points per decade 20 mVpp to 5 Vpp into High-Z Fixed amplitude across entire sweep Logarithmic overlaid gain and phase plot Two pairs of tracking gain and phase markers Auto-scaled during test
<b>DMM SPECIFICATIONS (MDO-2000EX only)</b>	<b>Digit Level</b> <b>DC Voltage</b> <b>Accuracy</b> <b>Input Impedance</b> <b>DC Current</b> <b>Accuracy</b> <b>AC Voltage</b> <b>Accuracy</b> <b>AC Current</b> <b>Accuracy</b> <b>Resistance</b> <b>Accuracy</b>	5,000 counts ; CAT II 600Vrms, CAT III 300Vrms 50mV, 500mV, 5V, 50V, 500V, 1000V 6 ranges 50mV, 500mV, 5V, 50V, 500V, 1000V ±(0.1% reading + 5 digits) 10MΩ 50mA, 500mA, 10A 3 ranges 50mA-500mA (0.5% reading+0.05mA), 10A ±(0.5% reading + 50mA) 50mV, 500mV, 5V, 50V, 700V 5 ranges 50mV, 500mV, 5V, 50V, 700V ±(1.5% reading + 15 digits) at 50Hz-1kHz * Amplitude greater than 0.2% of the full scale reading. 50mA, 500mA, 10A 3 ranges 50mA, 500mA, ±(1.5% reading + 0.05mA) at 50Hz-1kHz ; 10A ±(3% reading + 50mA) at 50Hz-1kHz * Measure range: >10mA 500Ω, 5kΩ, 50kΩ, 500kΩ, 5MΩ, 5 ranges 500Ω, 5kΩ, 50kΩ, 500kΩ ±(0.3% reading + 3 digits); 5MΩ ±(0.5% reading + 5 digits)
<b>POWER SUPPLY SPECIFICATIONS (MDO-2000EX only)</b>	<b>Output Channel</b> <b>Output Voltage Range</b> <b>Output Current (Max.)</b> <b>Voltage Step</b> <b>Output Voltage Accuracy</b> <b>Ripple and Noise</b>	CH1 & CH2 1.0V-5.0V 1A 0.1V Continuously Adjustable ±3% 50mVrms
<b>POWER SOURCE MISCELLANEOUS</b>	<b>Line Voltage Range</b> <b>Multi-Language Menu</b> <b>On-Line Help</b> <b>Time Clock</b> <b>Operation Environment</b>	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection Available Available Time and date, provide the date/time for saved data Temperature: 0°C to 50°C. Relative Humidity: ≤ 80% at 40°C or below; ≤ 45%, 41°C ~ 50°C
<b>DIMENSIONS &amp; WEIGHT</b>	384(W) X 208(H) X 127.3(D)mm, Approx. 3 kg	

Note : Three-year warranty, excluding probes & LCD display panel.

Specifications subject to change without notice. MDO2000EGD4BH-202406

## ORDERING INFORMATION

<b>MDO-2204E(G/X)</b>	200MHz,4Channel,Digital Storage Oscilloscope, Spectrum Analyzer,Dual Channel 25MHz AWG
<b>MDO-2202E(G/X)</b>	200MHz,2Channel,Digital Storage Oscilloscope, Spectrum Analyzer,Dual Channel 25MHz AWG
<b>MDO-2104E(G/X)</b>	100MHz,4Channel,Digital Storage Oscilloscope, Spectrum Analyzer,Dual Channel 25MHz AWG
<b>MDO-2102E(G/X)</b>	100MHz,2Channel,Digital Storage Oscilloscope, Spectrum Analyzer,Dual Channel 25MHz AWG

"(X)" built in 5,000 counts DMM and power supply

## ACCESSORIES

Power cord x 1, **GTL-110** BNC-BNC cable x 2, **GTL-105A** Alligator Clip test lead(only on MDO-2000EX), **GTL-207A** Banana plug test lead (only on MDO-2000EX)  
**GTP-100B-4** : 100MHz(10:1/1:1)Switchable passive probe for MDO-2102E(X)/2104E(X) (one per channel)  
**GTP-200B-4** : 200MHz(10:1/1:1)Switchable passive probe for MDO-2202E(X)/2204E(X) (one per channel)

## OPTIONAL ACCESSORIES

<b>GRA-426</b> Rack Adapter Panel	<b>GCP-500</b> 500kHz/150A Current probe
<b>GAK-003</b> 50Ω Impedance Adapter	<b>GCP-1030</b> 100MHz/30A Current probe
<b>GTL-246</b> USB Cable, USB 2.0, A-B Type, 1200mm	<b>GCP-1000</b> 1MHz/70A Current probe
<b>GTL-205A</b> Temperature probe adaptor with thermocouple (K type)	<b>GCP-206P</b> Power supply for current probe (2 input channel)
<b>GDP-025</b> 25MHz High voltage differential probe	<b>GCP-425P</b> Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030
<b>GDP-050</b> 50MHz High voltage differential probe	<b>GTP-033A</b> Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M)
<b>GDP-100</b> 100MHz High voltage differential probe	
<b>GSC-008</b> Soft Carrying Case	
<b>GCP-300</b> 300kHz/200A Current probe	
<b>GCP-530</b> 50MHz/30A Current probe	

## FREE DOWNLOAD

<b>PC Software</b>	OpenWave software	<b>Driver</b>	USB driver ; LabView driver
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