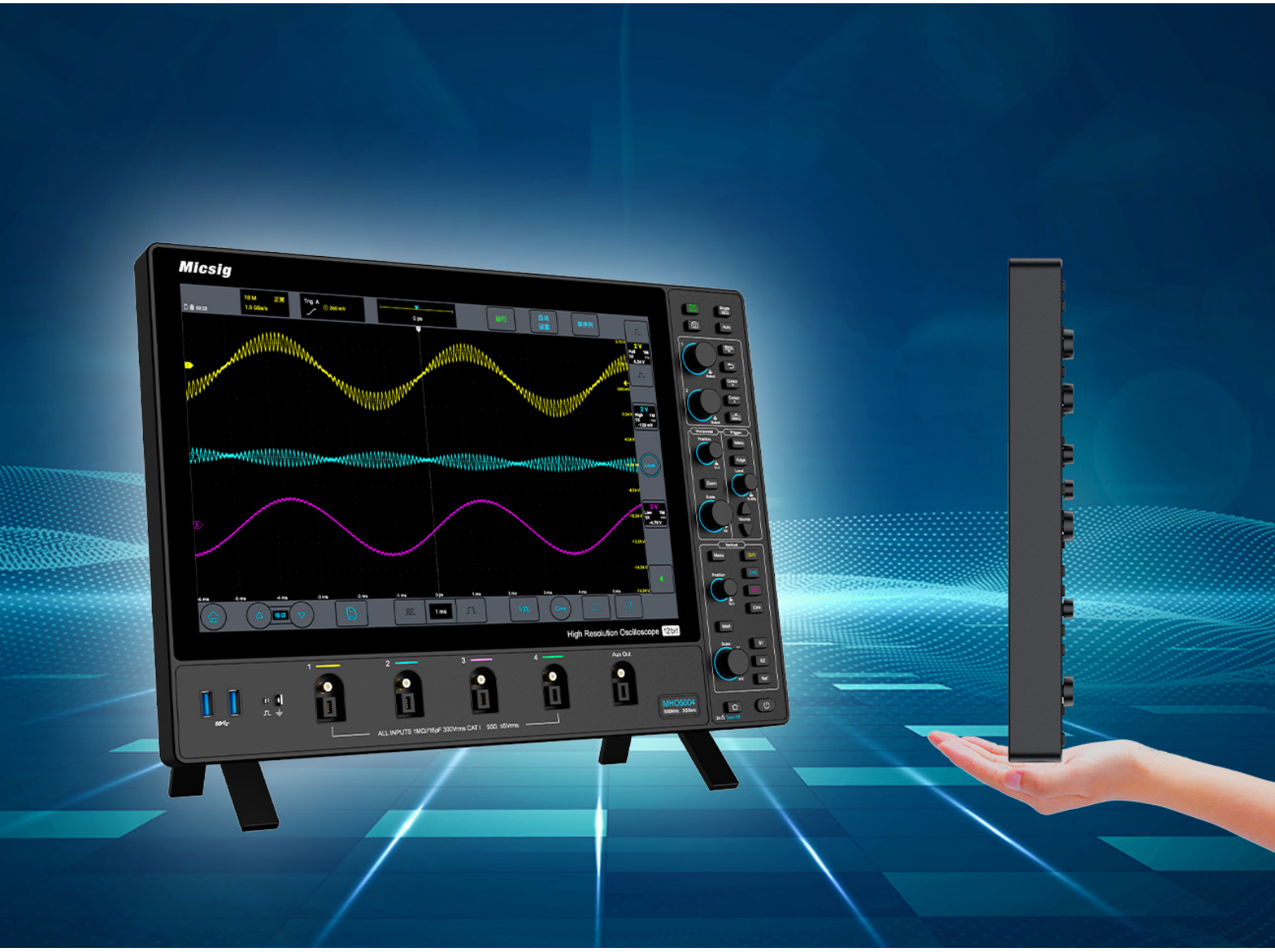
High Resolution Oscilloscope

MHO / MDO series

- 500 MHz bandwidth, 4 CH
- 12 Bit & 8 Bit vertical resolution
- 3 GSa/s sampling, 360 Mpts memory depth
- 14" touch screen, 1920 x 1200 resolution



Shenzhen Micsig Technology Co., Ltd.
www.micsig.com

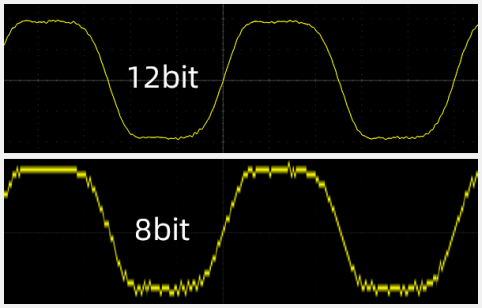
Product Overview

Micsig's latest MHO and MDO series oscilloscope both featuring 4 analog channels, 500MHz bandwidth, 3GSa/s real-time sampling rate, and 360Mpts memory depth. With the ultra-thin body at 3.58cm and VESA mount interface, significantly saved desktop space; The 14-inch touchscreen with resolution of 1920 x 1200 provides ultimate clear waveform display. The particular MHO series oscilloscope utilizes a 12-bit high-resolution ADC with a quantization level of up to 4096, which is 16 times that of traditional 8-bit ADC, helping users to observe waveform details more comprehensively and clearly.

Product Features

- 12 Bit / 8 Bit vertical resolution
- 500MHz bandwidth
- Simultaneous saving of multi-channel
- Bandwidth filtering to 30Hz
- Noise floor < 80μVrms
- Segmented storage function
- Advance math and FFT function
- 230,000 wfms/s waveform capture rate
- 14" anti-glare touch screen, 1920 x 1200 resolution
- Ultra-friendly UI, get to use in 5 minutes
- Special Mic-OPI™ probe interface, auto-match attenuation
- Mobile APP, PC remote control, SCPI commands
- 32G internal storage, free to save big data
- Standard decodes: RS-232/422/485/UART, CAN, CAN FD, LIN, SPI, I²C, ARINC-429, MIL-STD-1553B

12-bit vertical resolution

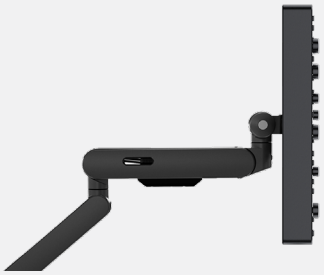


▸ MHO series has 12 bit high-resolution ADC with a quantization level of up to 4096, it's 16 times that of traditional 8-bit ADC, present unmatched waveform details.

Remote control

▸ MHO and MDO series support PC and smartphone remote control, also have HDMI port for demonstration purpose. Support SCPI programming commands control, helping engineers achieve automated measurements more flexibly and efficiently.

Wall mouting

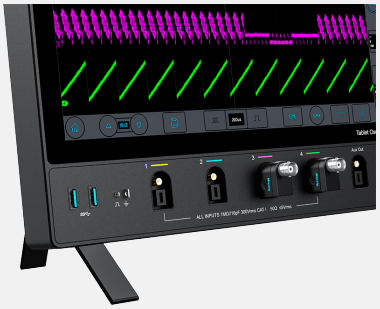


▸ 130 mm x 300 mm wall mount interface, convenient wall / arm mounting, flexible and space-saving on the desktop.

Complete connectivity

▸ USB 3.0 Host, USB Type-C, LAN, Grounding, HDMI, Trigger out, etc.

Mic-OPI™ probe interface

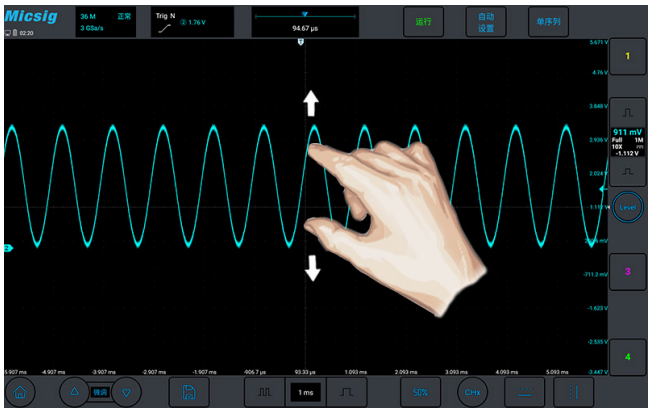


▸ The patented Mic-OPI™ probe interface on MHO and MDO oscilloscope can proceed automatic probe compensation. They also come standard with BNC adapter so to connect all BNC probes.

Key Specifications

Model	MHO5004	MDO5004
Bandwith	500MHz	500MHz
Analog channels	4	4
Sampling rate	3GSa/s	3GSa/s
Memory depth	360Mpts	360Mpts
Waveform capture rate	230,000wfms/s	230,000wfms/s
Noise	< 80μVrms	< 90μVrms
Vertical resolution	12 bit	8 bit
Trigger types	Edge, Pulse Width, Logic, N Edge, Runt Pulse (Runt), Slope, Time Out, Video, Serial bus	
Bus decoding	RS-232/422/485/UART, CAN, CAN FD, LIN, SPI, I²C, ARINC-429, MIL-STD-1553B	
Interfaces	USB 3.0 Host, USB type-C, LAN, HDMI, Trigger out	
Display	14" TFT LCD touch screen, 1920*1200 resolution	
Dimension / Net weight	400*280*35.8mm / 4.3kg	

Product Features

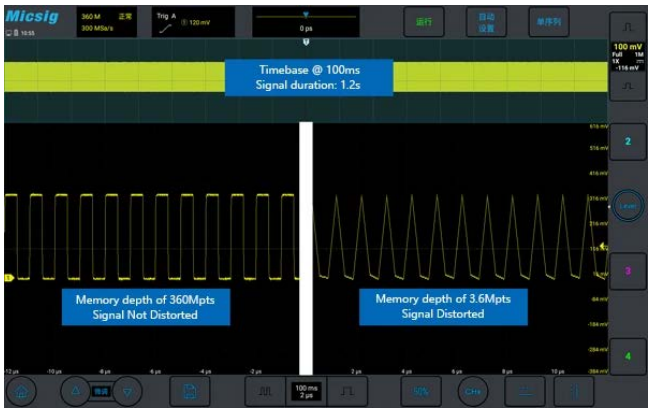


Smooth touch control

Both MHO and MDO series have 14" full-touch integrated display, all operations can be completed by touch, more intuitive and efficient than ever before..

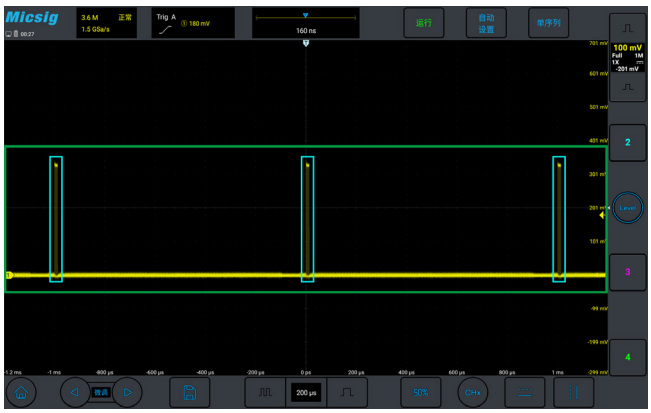
Most friendly UI

With accumulation of 10 years of UI design experience, the MHO/MDO series simplifies all user interfaces, newer engineers can quickly learn to use in 5 minutes.



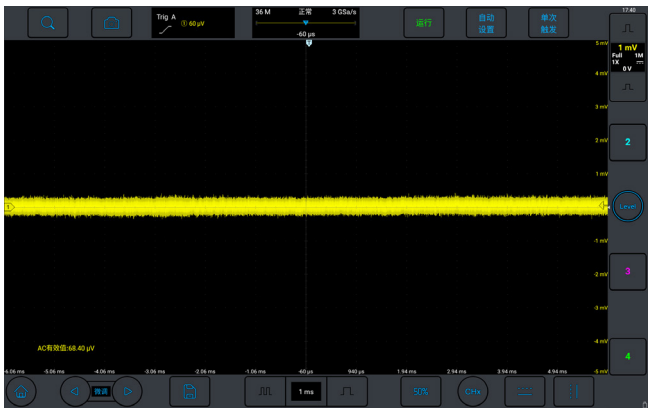
Large memory depth

Insufficient memory depth often leads to distortion when long time base signals are expanded. With memory depth of up to 360Mpts, there is no reduction in performance even with two channels opened at the same time. The signals will still maintain excellent fidelity even at long time base.



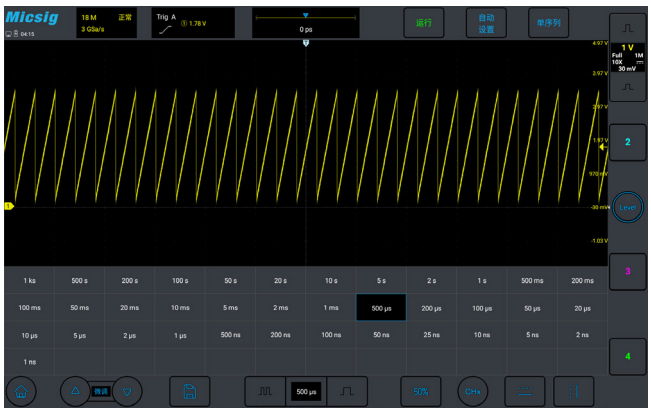
Segmented storage acquisition

Traditional Single acquisitions can only capture signals continuously,wasted storage depth when testing intermittent signals like laser pulses or serial buses, also difficult to trace back captured events. While the segmented storage acquisition can capture the target signal and allows to play back captured ones, effectively captures target signals multiple times over a long period of time.



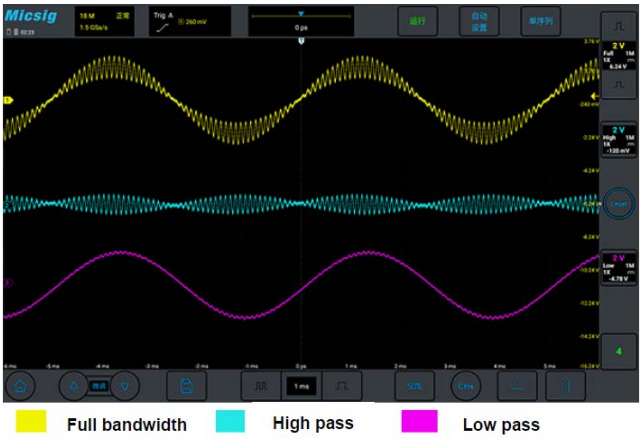
Low noise

Even at its full bandwidth of 500M, the noise floor of the MHO still less than 80μVrms, allow engineers accurately capture weak but important signals during daily circuit debugging and signal analysis.



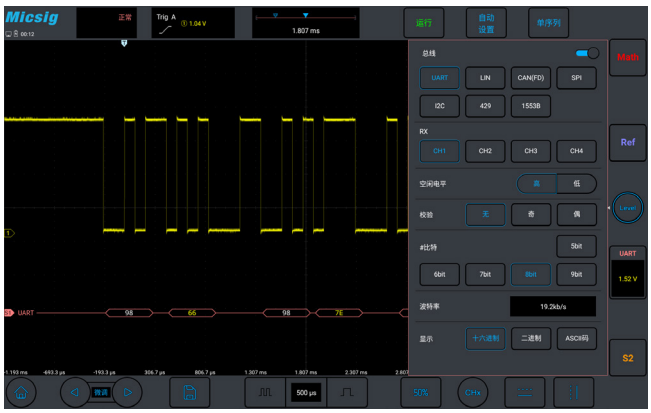
Fastest time base adjustment

Traditional oscilloscopes need to step in a sequential manner when adjusting the time base. In addition to traditional sequential steps, the MDO/MHO series also has a time base matrix, allows user to reach any time base in one click.



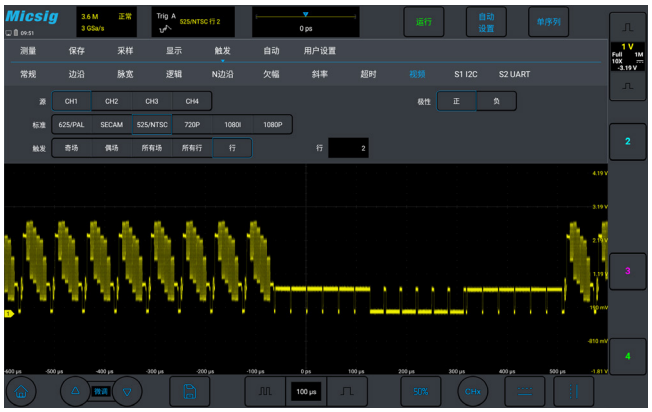
Hardware digital filtering

Digital filtering can selectively allow or block signal components within specific frequency ranges. The MHO/MDO bandwidth can be adjusted from full bandwidth to 30Hz, effectively rules out interference and noise.



Serial bus decoding and analysis

The MHO & MDO series standard with 8 serial bus decodes: RS-232/422/485/ UART, CAN, LIN, CAN FD, SPI, I2C, ARINC429, 1553B. With the TXT decoding text mode, the data can be transferred to CSV format.

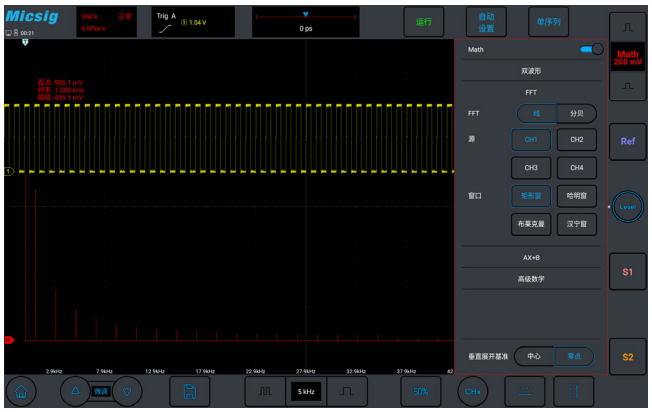


Complete trigger options

The MHO & MDO series provide multiple triggers, including edge, pulse width, logic, Nth edge, Runt, slope, bus decoding, etc. Whether you need to capture specific edge transitions, or observe duration and frequency of the target signal, it meets your requirement at ease.

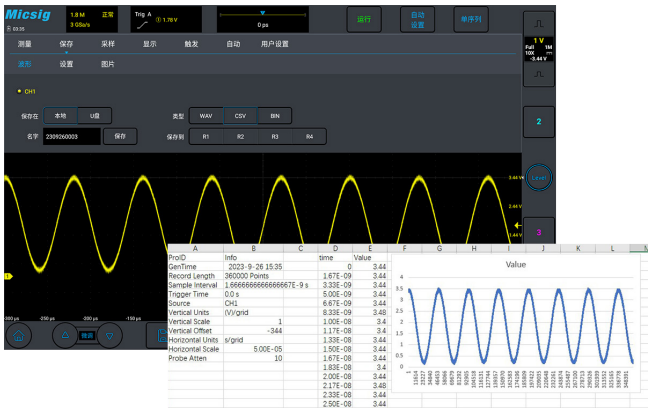
Statistics Measurement

Simultaneously calculate the average, maximum, minimum, and root mean square of 10 measurement items, with a max count of up to 10,000, every waveform data is accurately recorded, provide more accurate and comprehensive readings.



Advanced Math functions

Support various mathematical calculations: addition, subtraction, multiplication, division, integration, differentiation, etc.
Support custom function formula for advanced signal analysis. Also support FFT (Fast Fourier Transform) for real-time spectral analysis of collected waveform signals.



Diverse file saving

Users can waveforms and measurement results as binary (BIN) or CSV format files for data analysis using Matlab or Excel. Also support saved as WAV format, direct open & analysis inside the oscilloscope. Additionally, user can save waveforms as images or record videos.

Product specifications

Vertical system	
Bandwidth filter	20MHz, High/Low pass (30Hz ~ max bandwidth)
Coupling	DC, AC, GND
Input impedance and accuracy	1MΩ±1% || 50Ω±1%
Vertical resolution	MHO5004：12 bit； MDO5004：8 bit
Vertical divisons	10div
Vertical scale factor	1mV/div~10V/div（1MΩ）；1mV/div~1V/div（50Ω）
DC Gain accuracy	5mV/div ~10V/div：≤ ±2.0%; ≤ 2mV/div：≤ ±3.0%
Vertical offset range(1MΩ/50Ω)	±2.5V（@probe X1， < 500mV/div），±125V（@probe X1，≥ 500mV/div）
Noise floor	MHO5004：≤ 80μVrms（1mV/div，1MΩ）； MDO5004：≤ 90μVrms（1mV/div，1MΩ）
Max. input voltage	CAT I 300Vrms 400Vpk（1MΩ），5Vrms（50Ω）
Channel isolation	> 40dB（≤ 100MHz）， > 35dB（> 100MHz）
Vertical expansion datum	Screen center, channel zero point
Probe Attenuation Ratio	1mX~10kX, 1-2-5 sequence, , support customization

Horizontal system	
Horizontal scale	1ns/div~1ks/div
Roll mode range	200ms/div~1ks/div
Time base accuracy	20ppm
Horizontal divisions	12div
Time base delay time range	-12 div ~ 12ks, resolution: 1 pixel

Trigger System	
Trigger mode	Auto, Normal, Single
Trigger level range (analog)	±5div from screen center, analog channel
Hold off range	200ns~10s
Trigger coupling and frequency (analog)	DC, AC(110Hz), low frequency (58KHz), high frequency (58KHz), noise (18MHz)
Trigger Types	Edge, Pulse Width, Logic, N Edge, Runt Pulse (Runt), Slope, Time Out, Video, Serial
Bus decoding	RS-232/422/485/UART, CAN, CAN FD, LIN, SPI, I2C, ARINC429, 1553B

Sampling System	
Real-time sampling rate	3G Sa/s （Either one of CH1 & CH2 is open, and either one of CH3 & CH4 is open); 1.5G Sa/s （Both CH1 and 2CH, or both CH3 and CH4 are open）
Memory depth (Max.)	360Mpts/36M/3.6M/360K/36K/3.6K/ Auto（Either one of CH1 & CH2 is open, and either one of CH3 & CH4); 180Mpts/18M/1.8M/180K/18K/1.8K/ Auto（Both CH1 and 2CH, or both CH3 and CH4 are open）
Peak sampling interval	single channel 333ps， dual channel 666ps
Average	2,4,8,16,32,64,128,256
Envelope times	2,4,8,16,32,64,128,256, ∞

Measurements	
Auto measurements	Period, frequency, rise time, fall time, delay, positive duty cycle, negative duty cycle, positive pulse width, negative pulse width, burst pulse width, positive overshoot, negative overshoot, phase, peak-to-peak, Amplitude, High, Low, Maximum, Minimum, RMS, C RMS, Average, C Average, AC RMS, Positive Slope, Negative Slope *C represents the first period, indicating a certain value in the first period of the waveform
Hardware frequency counter and resolution	Support each analog channel, 6bit, 2Hz~max. bandwidth, pk-pk > 0.8div
Cursor	Horizontal, Vertical, Cross
Cursor resolution	1 pixel
Math	
Dual waveform	+, -, *, /, Analog channel
FFT	Points: max. 360K; Source: Analog channel; Window: Rectangular, Hamming, Blackman, Hanning
AX+B	A: ±1k, Min. Resolution 1p or 4it B: ±1k, Resolution 1p or 5bit X: Analog channel
Advance math	Advanced input, including +, -, *, /, <, >, ≤, ≥, ==, !=, &&, ||, （, ）, !(, sqrt, abs, deg, rad, exp, diff, ln, sin, cos, tan, intg, lg, asin, acos, atan

Display	
Display	14" capacitive TFT touch screen, 1920*1200 resolution, 12*10 Divisions
Persistence	Auto, 10ms~10s, ∞
Time base mode	YT, XY, Roll, Zoom
Expand base	center, trigger position
Waveform Display	Dot, line, adjustable brightness
Waveform Update Rate	230,000 wfms/s

Storage	
Storage media	Local , USB drive
ROM storage	32GB
Storage format	WAV, CSV, BIN
Quantity of stored waveforms	No limit
Stored waveform rename	Chinese, English
REF waveforms display	4
Quick screenshot	Support
Quantity of user setting	10
User setting rename	Support
Flash memory	Industry standard
Screenshot, video recording	Support

System	
Self-calibration	Support
Languages	English, Chinese, German, French, Czech, Korean, Spanish, Italian, etc
Operating System	Android
Built-in app	App Store, Browser, Oscilloscope, Calendar, Clock, Gallery, Calculator, User Guide, Electronic Tools, File Manager
Warranty	Three-year for mainframe. Probes and accessories are not covered. * Please refer to the data sheet of each probe and accessory for the respective warranty terms. (contact us for extended warranty)

Interfaces	
USB3.0	4, read and edit
USB Type-C	1, read and edit
LAN	1
4-pin aviation power socket	1, power supply
Probe calibration signal	1kHz, 2Vpk-pk
HDMI	HDMI 1.4
PC	Support
Android/iOS remote control APP	Support
SCPI	Support

Power supply	
Adapter input	100~240V AC, 50/60Hz
Power consumption	< 120W
Adapter output	24V DC, 5A
Power cord	Local

Environment	
Temperature	
Operating	0℃ ~ 45℃
Non-operating	-40℃ ~ 60℃
Humidity	
Operating	5% ~ 85%, 25℃
Non-operating	5% ~ 90%, 25℃
Altitude	
Operating	< 3000m
Non-operating	< 12000m

Physical Characteristics	
Dimensions (W x H x D)	400*280*35.8mm
Net weight	4.3kg

Standard Accessories

Model	Standard Accessories
MHO5004 / MDO5004	Passive Probe *4
	MSP-BNC adapter *4
	Power adapter *1
	Power cord *1
	Calibration certificate*1
	Quick Guide *1
	User Instructions *1
	Packing list*1

Optional instruments

Optical-fiber Isolated Probe	
MOIP series	Bandwidth: 100MHz - 1GHz, Common Mode Voltage: 85kVpk, DC Gain Accuracy: 1%, CMRR: Up to 180dB

High Voltage Differential Probe	
MDP series	Bandwidth: 100MHz - 500MHz; Differential Voltage (DC+AC PK) Max.: 70V - 3000V; Accuracy: ±2%, BNC interface

Current Probes	
HF AC / DC Current Probe CP series	Bandwidth: DC - 100MHz, Range: 6A/30A, Accuracy: ±1%, BNC interface
LF AC/DC Current Probe CP2100 series	Bandwidth: DC~2.5MHz, Range: 10A/100A, BNC interface
Rogowski AC Current Probe RCP series	Bandwidth: 30MHz, Range: 200mApk-600Apk, Accuracy: 1%, BNC interface
AC Current Probe ACP1000	Bandwidth: 10Hz-100KHz, Range: 0.1Apk-1000Apk, BNC interface

Handbag & Suitcase	
Micsig handbag	Black nylon , suitable for all Micsig oscilloscopes
Micsig Suitcase	Anti-fall, anti-seismic, anti-pressure, dust-proof, moisture-proof

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