# Product Datasheet - Technical Specifications



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# Micsig

# High Resolution Oscilloscope

## MHO 3 Series

- ▸ Max. 500 MHz bandwidth, 4CH
- ▸ 12-Bit Vertical Resolution
- ▸ 3 GSa/s sampling, 360 Mpts memory depth
- ▸ 14" touch screen, 1920 x 1200 resolution
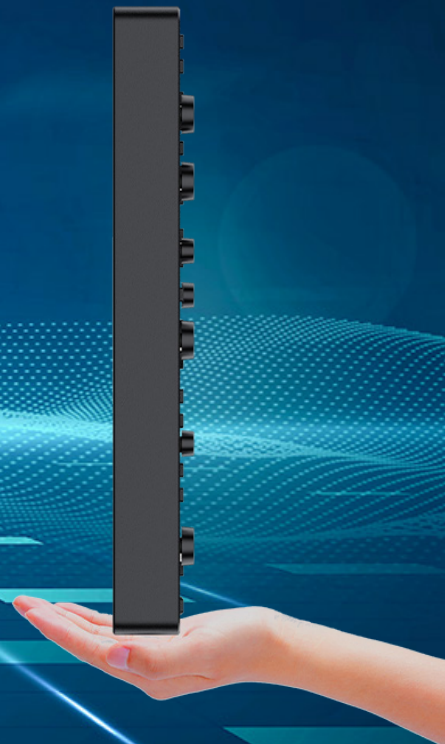
# Product Overview

Micsig's latest MHO 3 series oscilloscope features 4 analog channels, max. 500MHz bandwidth, 3GSa/s real-time sampling rate, and 360Mpts memory depth. With 3.58cm ultra-thin body and wall mount interface, significantly saved desktop space; 14-inch touchscreen with resolution of 1920 x 1200 provides ultimate clear waveform display. The MHO 3 series utilizes a 12-bit high-resolution ADC with a quantization level of up to 4096, enable engineers to observe waveform details more comprehensively and clearly.

# Product Features
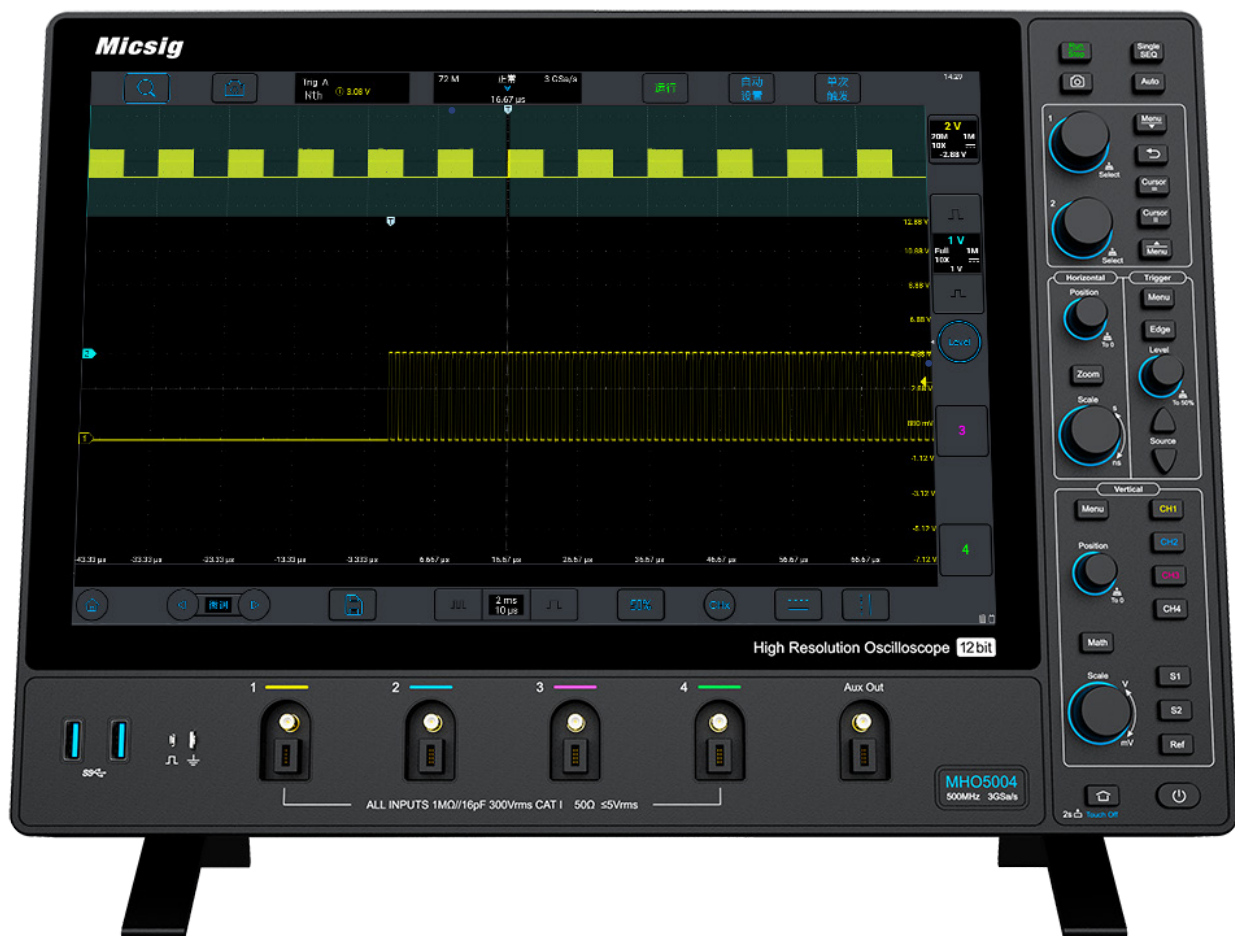


- ▸ 12-bit vertical resolution
- ▸ Max. 500MHz bandwidth
- ▸ Simultaneous data saving on multi-channel
- ▸ High / Low pass bandwidth filtering
- ▸ Noise floor < 80μVrms
- ▸ Segmented storage function
- ▸ Advanced math and FFT function

- ▸ 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 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
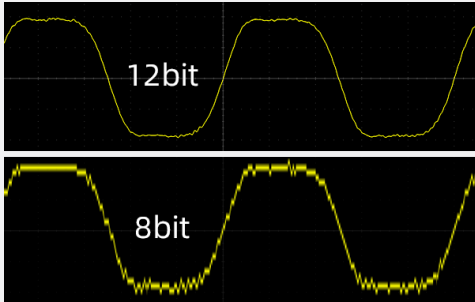


▶ MHO 3 series has 12 bit high-resolution ADC with a quantization level of up to 4096, it's 16 times that of traditional 8-bit ADC, present unmatched waveform details.

## Remote control



▶ MHO 3 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.

## Various Interfaces



▶ USB 3.0 Host, USB Type-C, LAN, Ground, HDMI, Trigger out and others

## Mic-OPI™ probe interface



▶ The Mic-OPI™ probe interface can proceed automatic probe compensation and calibration, also comes standard with BNC adapter to connect with all BNC probes.

# Key Specifications

| Model | MHO3-5004 | MHO3-3504 | MHO3-2504 |
|---|---|---|---|
| Bandwith | 500MHz | 350MHz | 250MHz |
| Rise time | ≤ 0.7ns | ≤ 1ns | ≤ 1.4ns |
| Analog channels | 4 | 4 | 4 |
| Sampling rate | 3GSa/s | 3GSa/s | 3GSa/s |
| Memory depth | 360Mpts | 360Mpts | 360Mpts |
| Waveform capture rate | 230,000 wfms/s | 230,000 wfms/s | 230,000 wfms/s |
| Vertical resolution | 12 bits | | |
| Noise | < 80µVrms | | |
| Bus decoding (std.) | 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
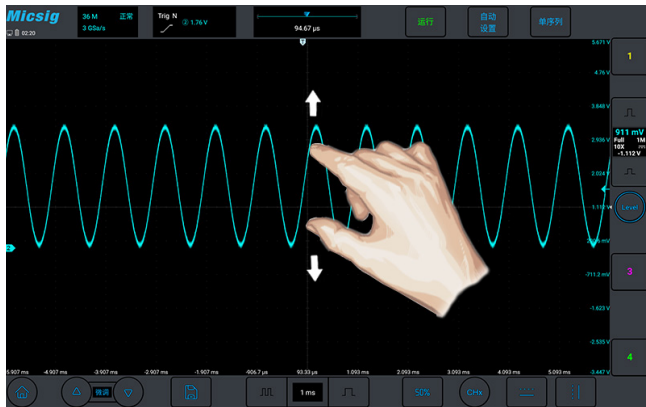


## Smooth touch control

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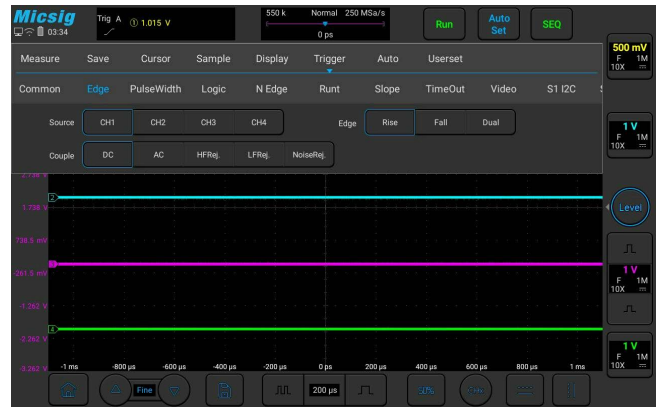


## Most friendly UI

With accumulation of 10 years of UI design experience, the MHO 3 series simplifies all user interfaces, engineers can quickly learn to use in 5 minutes.



## Deep memory

Insufficient memory depth often leads to distortion when long time-base signals were 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 period of time.
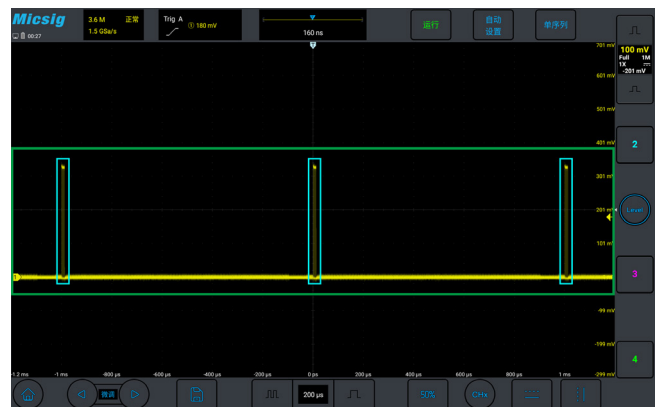


## Segmented storage acquisition

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.
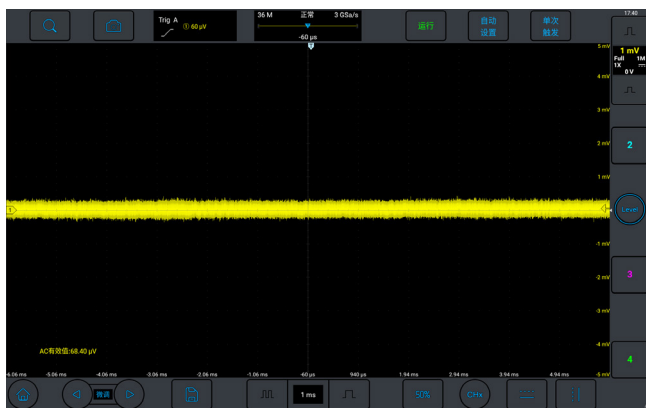


## Low noise

Even at its full bandwidth of 500M, the noise floor of the MHO 3 series still less than 80μVrms, allow engineers accurately capture weak but important signals during daily circuit debugging and signal analysis.
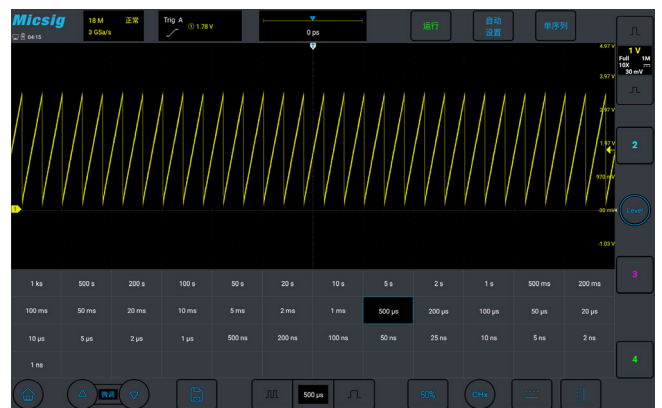


## Faster time base adjustment

Traditional oscilloscopes need to step in a sequential manner when adjusting the time base. In addition to traditional sequential steps, the MHO 3 series also has a time base matrix, allows user to select any time base in one click.
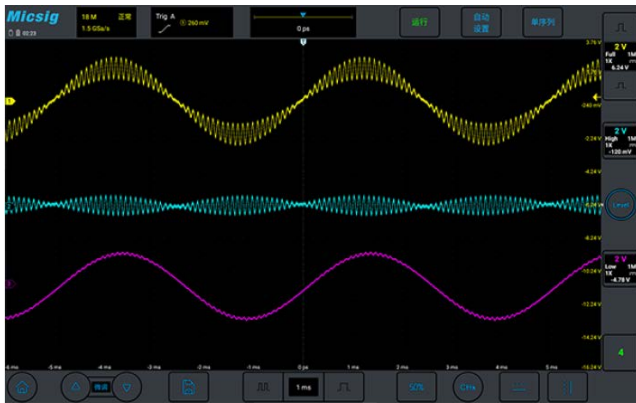
| Full bandwidth | High pass | Low pass |

## Hardware digital filtering

Digital filtering can selectively allow or block signal components within specific frequency ranges.



## Serial bus decoding and analysis

The MHO 3 series standard with 8 serial bus decodes: RS-232/422/485/ UART, CAN, LIN, CAN FD, SPI, I2C, ARINC-429, 1553B. With the TXT decoding text mode, the data can be transferred to CSV format.



## Multiple Trigger Functions

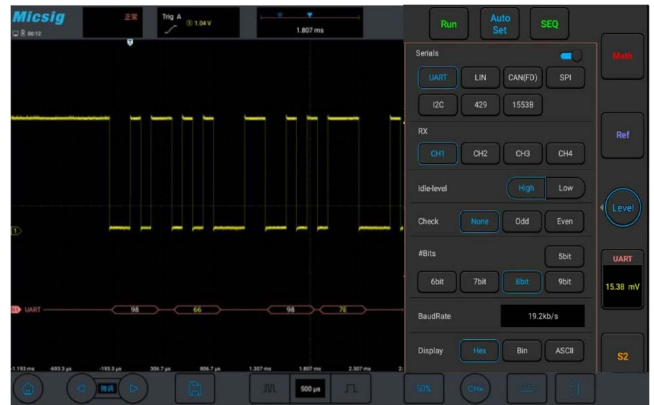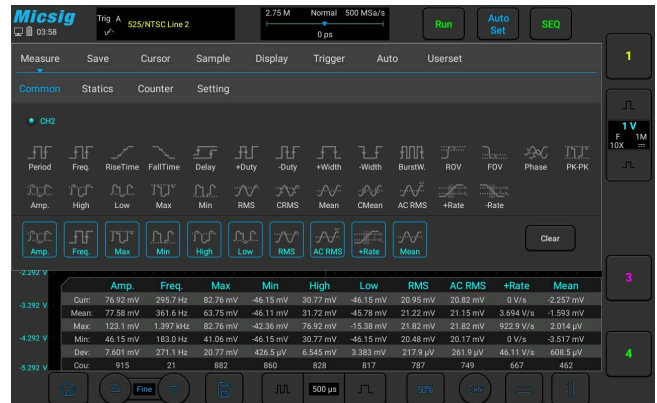The MHO 3 series provide multiple triggers, including edge, pulse width, logic, Nth edge, Runt, slope, bus decoding, etc. Whether you need to capture specific edge transitions, or observe duration and frequency of the target signal, it meets your requirement at ease.



## 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.
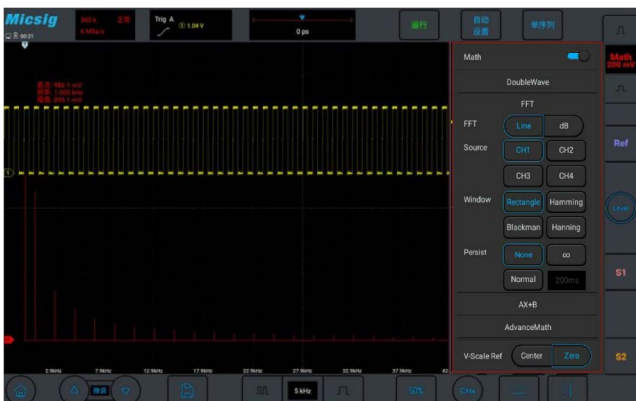


## Advanced Math functions

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 save 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 Pass / Low Pass |
| Coupling | DC，AC，GND |
| Input impedance and accuracy | 1MΩ±1% ‖ 50Ω±1% |
| Vertical resolution | 12 bits |
| 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%；<br>≤ 2mV/div：≤ ±3.0% |
| Vertical offset range(1MΩ/50Ω) | ±2.5V（@probe X1， < 500mV/div），±125V（@probe X1，≥ 500mV/div） |
| Noise floor | ≤ 80μVrms（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）;<br>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）;<br>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<br><br>*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;<br>Window: Rectangular, Hamming, Blackman, Hanning |
| AX+B | A: ±1k, Min. Resolution 1p or 4it<br>B: ±1k, Resolution 1p or 5bit<br>X: Analog channel |
| Advanced 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.<br>* 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 |
| 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 | Main unit: 400*280*35.8mm |
| Net Weight | 4.3kg |

## Standard Accessories

| Model | Standard Accessories |
|---|---|
| **MHO 3 Series** | 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 | |
|---|---|
| **SigOFIT series** | Bandwidth: up to 1GHz, Common mode voltage: 85kVpk, DC gain accuracy: 1%, CMRR: up to 180dB |

| High Voltage Differential Probe | |
|---|---|
| **MDP series** | Bandwidth: up to 500MHz; Differential voltage (DC+AC PK) Max.3000V; Accuracy: ±2% |

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

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

\* Micsig reserves all the rights of interpretation at any time, it is subject to update without prior notice.

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