

Beyond Your Imagination

MPO-2000 Series

Multi-function Programmable Oscilloscope
200M/100MHz Bandwidth



GW Instek MPO-2000 Series Multi-function Programmable Oscilloscope New Product Announcement

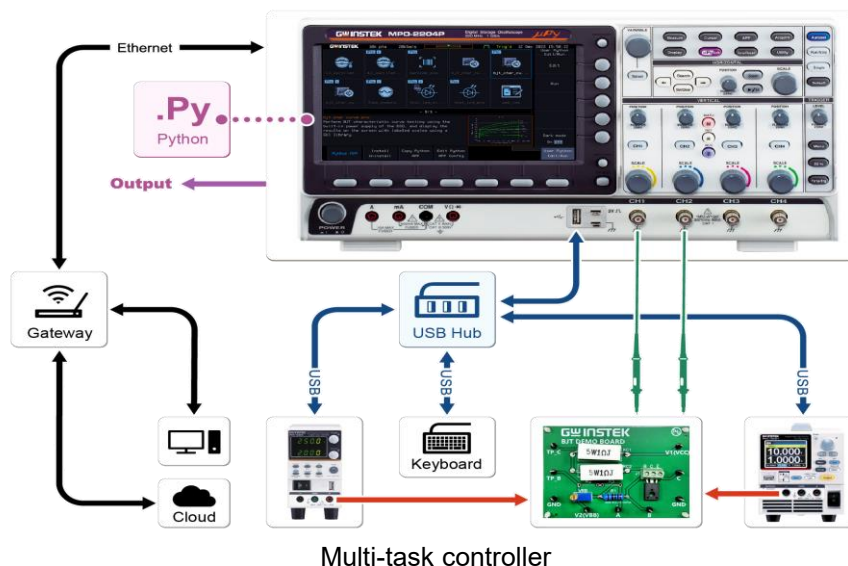
This document allows GW Instek's partners to quickly grasp product's main features, FAB and ordering information.

MPO-2000 series Multi-function Programmable Oscilloscope

GW Instek launches the MPO-2000 series, which is named after the abbreviation of **M**ulti-function **P**rogrammable **O**scilloscope. In addition to being an oscilloscope, it also includes a spectrum analyzer, an arbitrary waveform generator, a digital multimeter and a DC power supply. In addition to the five-in-one multi-functional architecture, we innovatively introduced the Python script function into the MPO-2000, so that users can conduct program control of a small automated test system by setting up a single unit test or multi-unit test without a PC, hence, the name MPO.

The MPO-2000 series provides Basic and Professional versions (model suffixes are represented by B and P). In terms of bandwidth, the Basic version is 100MHz and the Professional version is 200MHz and the main difference is that the Professional version provides larger program memory and more system resources to achieve the ability to process longer waveform data. The series provides USB CDC device control to meet the needs of multi-unit collaborative tests, and a Python GUI library is provided to allow users to modify the original built-in Python APP or write their own programs that present curve drawing and GUI operation menus to be packaged into Python programs developed by third parties. The Basic version features the provided demo programs that can be executed (including programs with USB device control and GUI) and Python programs provided by third parties. In addition, the Professional version provides more diverse bus decoding functions, including FlexRay, USB-PD and I²S. A large number of bus decoding functions are included in the standard configuration, and users do not have to pay to have the functions, making MPO-2000 more competitive.

MPO-2000P is the only product of its class that has a built-in Python GUI library. Users can build their own test systems at a lower cost. A variety of executable Python APPs are built-in. An all-in-one instrument with affordable pricing is ideal for test and measurement automation teaching courses; small-scale automated test of production lines, component tolerance testing for quality assurance, and diversified test applications. It is hoped that the launch of MPO-2000 can solve users' product test needs for repeatability and diversity, and can improve users' demand for simple and repetitive work efficiency and single-unit program control or the requirement of uploading test results to the cloud. It is also hoped that with the launch of MPO-2000, new markets can be explored in the fiercely competitive oscilloscope market and the overall competition of oscilloscopes can be improved.



Why do we choose to import Python into the oscilloscope? In the survey of top programming languages on GitHub in 2022, Python is second only to JavaScript in web-related applications, ranking second in the most popular programming language. The number of users of Python continues to grow, and the entry threshold is low. For beginners, its syntax is relatively simple and easy to learn. Python has become an increasingly common programming language, so we chose Python to be imported into the oscilloscopes to expand its program control applications.

The Python APP currently installed on MPO-2000 includes the following categories: BJT output characteristic curve; LC oscillator circuit frequency and temperature characteristic curve; fuse endurance test; LED forward bias characteristic curve and barcode scanner measurement application



Python APP for MPO-2000

On the MPO-2000, if users want to modify or call the script of the drawing library, they must purchase the Pro version to modify the program by themselves to meet the testing of different DUTs. In addition, other manufacturers can use the built-in AWG function of the oscilloscope to achieve similar effects, but the voltage and power of this kind of AWG are too small, and their practicality is low. One single MPO-2000 unit can meet the IV test requirements of parts suitable for voltages below 20V.

Panel introduction

	<ol style="list-style-type: none"> 1. Hardcopy Key 2. Autoset, Run/Stop, Single & Default Keys 3. Search and Zooming Controls 4. Trigger Controls 5. Math, Reference & Bus Keys 6. Python APP Key 7. Probe Calibration Output 8. USB Host Port 9. Option Key 10. Menu Off Key 11. USB Device Port 12. LAN Port 13. Go-NoGo Output 14. Calibration Output 15. Dual Channel Arbitrary Waveform Generator 16. Power Supply Output
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Major Specifications and Functions

Main features

- MPO-2000P:200MHz;4CH/2CH
MPO-2000B:100MHz;4CH/2CH
- Allow to use Python scripts to control for automation purpose
- Dual Channel Spectrum analyzer with Spectrogram
- I²C/SPI/UART/CAN/LIN serial bus trigger and decoding function
- MPO-2000P:CAN FD, USB 2.0(full speed), FlexRay, USB PD, I²S digital decoding
- MPO-2000B: CAN FD, USB 2.0 (full speed) digital decoding.
- Data log function is able to track signal changes up to 1000 hours
- Network storage function
- Equips with a spectrum analyzer; a dual channel 25MHz AWG; DMM and power supply.
- Power Supply: Dual channel output, 1V to 20V continuously adjustable (0.1V step)

Interface

- USB Host port: front panel, for storage device,
- Supports USB HID protocol, which can be used to connect keyboard, mouse and barcode scanner under Python script control
- Supports USB Host CDC-ACM protocol, and can control other GW Instek instruments under Python script control, such as PSW, PFR, PPX, PEL, GDM series.
- USB Device port: rear panel, for remote control (USBTMC protocol).
- Ethernet port as standard.

Software and Driver

- PC software (OpenWave software)
- LabVIEW driver

Customers and Applications

Customers

- Educational institutions
- Industrial small- scale semi-automated test

Applications

- Educational courses
 - Industrial applications
- Small semi-automated test applications for production lines
Component endurance test by QA
Automated acquisition and automated test of experimental data for R&D engineers

Key Dates for Product Announcement

1. Order Queue Open (Mar /4th/2024)
2. Global Market Announcement (Mar /11/2024)

The first batch of products made in China has been put into warehouse on February 29, 2024, and products made in Taiwan are expected to be put into warehouse on April 10, 2024.

Service Policy

1. **3 years warranty.** The MPO-2000 Series Multi-function Programmable Oscilloscope carries a standard warranty for 3 years.
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 MPO-2000 will be posted on the distributor zone of GW Instek's website at <http://www.gwinstek.com>

Ordering Information

MPO-2204P 200MHz, 4-channel, Digital Storage Oscilloscope, Spectrum analyzer, dual channel 25MHz AWG, 5,000 counts DMM and power supply

MPO-2202P 200MHz, 2-channel, Digital Storage Oscilloscope, Spectrum analyzer, dual channel 25MHz AWG, 5,000 counts DMM and power supply

MPO-2104B 100MHz, 4-channel, Digital Storage Oscilloscope, Spectrum analyzer, dual channel 25MHz AWG, 5,000counts DMM and power supply

MPO-2102B 100MHz, 2-channel, Digital Storage Oscilloscope, Spectrum analyzer, dual channel 25MHz AWG, 5,000 counts DMM and power supply

*P version: Supports 100,000 points of waveform processing; CAN FD, USB 2.0(full speed), FlexRay, USB PD, I²S digital decoding; USB CDC ACM Class; USB HID Class; Python GUI library; Python scripts packaging into apps.

*B version: Supports 1,000 points of waveform processing; Supports CAN FD, USB 2.0 (full speed) digital decoding.

EAN code:

Model name	Part No.	EAN-13 code
MPO-2204P (CE)	01MP224P00GS	4711458120757
MPO-2202P (CE)	01MP222P00GS	4711458120740
MPO-2104B (CE)	01MP214B00GS	4711458120733
MPO-2102B (CE)	01MP212B00GS	4711458120726

Standard Accessories

Power Cord, Certificate of Calibration,
Passive probe (one probe per channel)
GTL-110 BNC-BNC cable*2
GTL-105A Alligator Clip test lead
GTL-207 Banana plug test lead

Option

MP2-PRO: Basic version upgrade to Professional version
Part No:11MP-2PRO0C01

Free Download

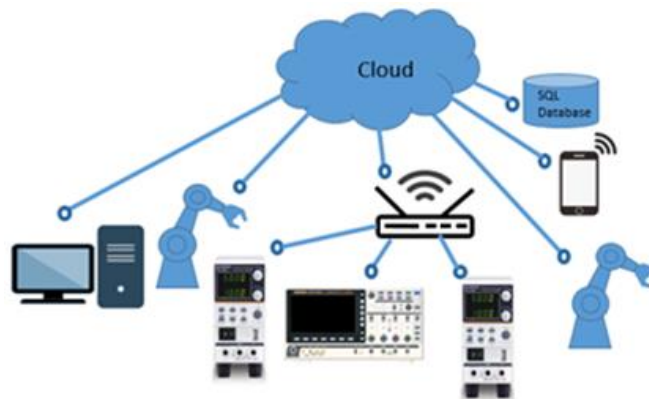
OpenWave software; LabVIEW driver

MPO-2000 is the only five-in-one instrument in the same class and provides seven innovative functions to extend diverse applications. The seven innovative functions include Python script execution, component tester I-V curve, MQTT protocol, series bus decoding, spectrogram, Python GUI library* and USB CDC-ACM USB*. (*: Professional version only).

The seven innovative features are described below:

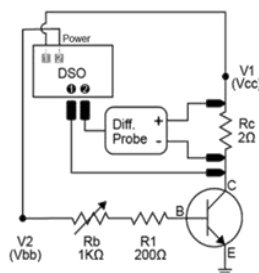
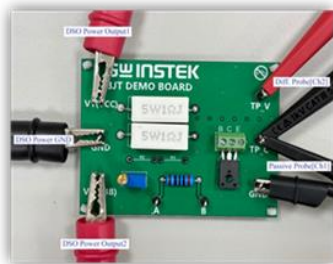
1. Python script execution

Maximum number of installable python APPs: 100 sets (including pre-installed Python APPs).Running Python source code (.py file) from internal disk or USB flash disk.



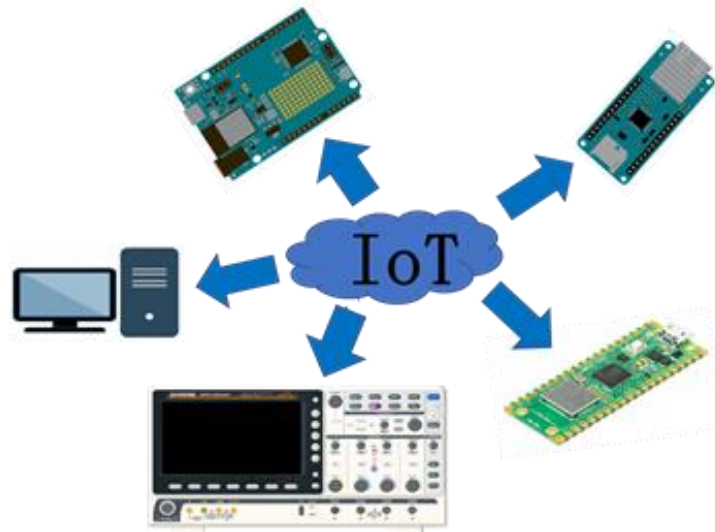
2. Component tester I-V curve

Providing I-V characteristic curve (Curve Tracer) with readout scale. The transistor characteristic curve is our first application after completing the Python software platform. We use MPO-2000 to implement the Curve Tracer function application. XY mode is used to have waveform accumulation (as shown in the figures below). Users can use the two built-in 20V DC power outputs of MPO-2000. The Professional version can use an external DC power supply through USB CDC-ACM.



3. Support MQTT protocol

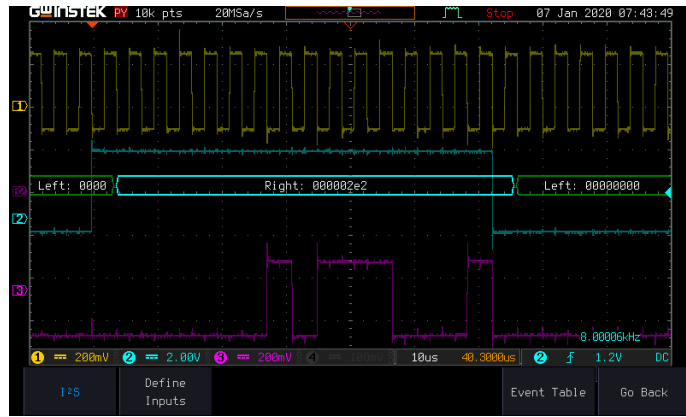
MPO-2000 also supports MQTT (Message Queuing Telemetry Transport) protocol. For publishers, measurement data can be transmitted to the cloud and for subscribers, remote control of an oscilloscope can be realized.



4. Serial bus decoding

MPO-2000 provides CAN FD/USB 2.0 (FS) decoding in the Basic version and CAN FD/ USB 2.0 (FS)/ FlexRay/USB PD / I²S decoding is provided in the Professional version. No additional options are required for decoding and analysis of new automotive, USB and audio protocols.

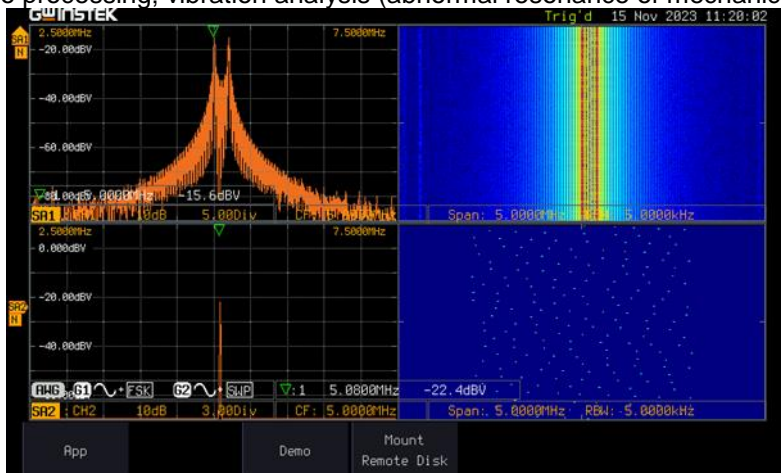
Decoding category	Application
CAN-FD	Automobile/electric vehicle control system signal transmission
USB 2.0 (Full Speed)	PC peripheral device/CPU embedded system development
FlexRay (Professional version)	Automobile/electric vehicle control system signal transmission
I ² S (Professional version)	Digital audio signal transmission
USB-PD (Professional version)	USB Power Delivery for portable battery quick charging



I²S decoding

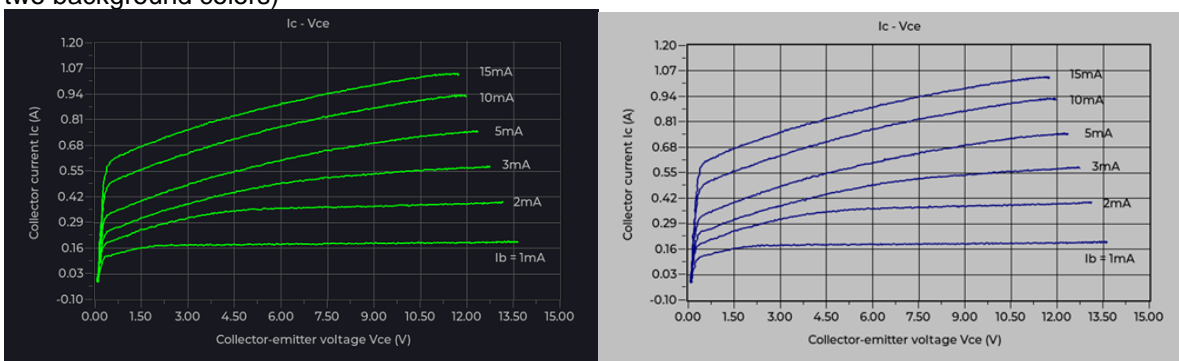
5. Dual Channel spectrum analyzer with spectrogram

Other than signal measurement on time domain, MPO-2000 also provides the frequency domain measurement and operation, which are similar to a spectrum analyzer. The dual channel spectrum analyzer and spectrogram are equipped. Users can measure and analyze dual channel frequency domain signals at the same time. The spectrogram function, which allows users to easily observe the signal's strength distribution and the relationship of the spectrum distribution over time. For promotion selling point, dual Spectrum Analyzer and Spectrogram can test the frequency response of low frequency ~ VHF wireless communication; audio processing; vibration analysis (abnormal resonance of mechanical equipment), etc.



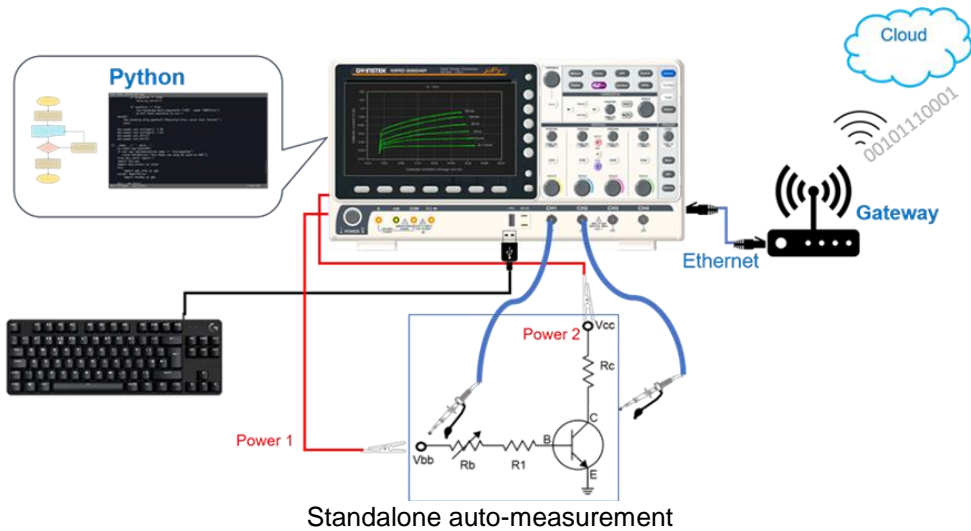
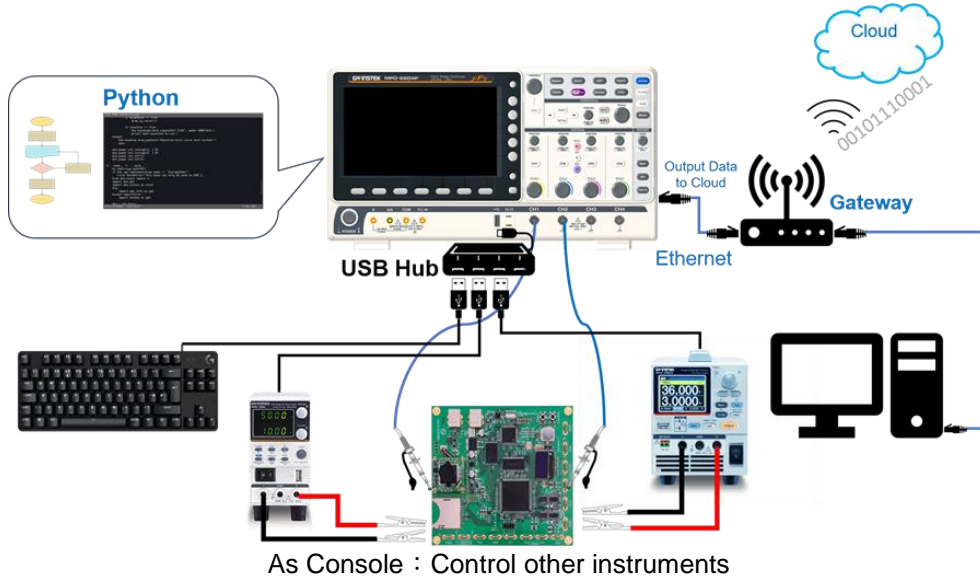
6. Support python GUI library

The Basic version can execute Python APP (with scale) with GUI drawing mode, and the parameters can be modified to accommodate the testing of different parts to be tested. If users wish to modify the script that is from the drawing library, users must purchase the Pro version to modify the program by themselves. The Python GUI library can be used to draw scaled charts. (As shown in the figures below, users can set two background colors)



7. Support USB CDC-ACM to achieve multi-unit collaborative test.

The following two schematic diagrams are single-unit and multi-unit collaborative tests. No additional computer is required. Users only need to plug in a USB keyboard to program on a MPO-2000P model, and the measurement results can be presented in charts. It can also be saved as a CSV or image file, or uploaded to the cloud. The series is equipped with Python Script Execution (Edge Computing). It has the function of Python script execution to implement edge computing.



In addition to the novel built-in Python software functions, the MPO-2000 multi-function architecture is configured with an oscilloscope, a spectrum analyzer, an arbitrary waveform generator, a digital multimeter and a DC power supply to become a five-in-one multi-function instrument.

Specifications

MPO-2000 series Specifications				
	MPO-2102B	MPO-2104B	MPO-2202P	MPO-2204P
Channels	2ch+Ext	4ch	2ch+Ext	4ch
Bandwidth	DC~100MHz (-3dB)	DC~100MHz (-3dB)	DC~200MHz (-3dB)	DC~200MHz (-3dB)
Rise time(Calculated)	3.5ns	3.5ns	1.75ns	1.75ns
Bandwidth Limit	20MHz	20MHz	20M/100MHz	20M/100MHz
Python Script Execution (μ Py)	Basic version	Basic version	Professional version	Professional version
Vertical Sensitivity				
Resolution	8 bits			
	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	+, -, \times , \div , FFT, User Defined Expression.			
	FFT: Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS, and FFT Window to Rectangular, Hamming, Hanning, or Blackman.			
Trigger				
Source	CH1 ,CH2, CH3*, CH4*, Line, EXT**			
	* four channel models only			
	**dual channel models only			
Trigger Mode	Auto (supports Roll Mode for 100ms/div and slower), Normal, Single			
Trigger Type	Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, time out, Event-Delay(1~65535 events), Time-Delay(Duration,4ns~10s), Bus (UART,I ² C, SPI*, CAN, LIN)			
	*This bus decoder is only available on 4 channel models.			
Holdoff range	4ns~10s			
Coupling	AC, DC, LF rej., HF rej., Noise rej.			
Sensitivity	1 div			
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	±50 ppm over any ≥ 1ms time interval
Real Time Sample Rate	Max. 1GSa/s (4ch models) Per channel 1GSa/s (2ch models)
Record Length	Max. 10M pts
Acquisition Mode	Normal, Average, Peak Detect, Single
Peak Detection	2ns (typical)
Average	selectable from 2 to 512
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	±3° at 100kHz
Cursors and Measurement	
Cursors	Amplitude, Time, Gating available; Unit: Seconds(s), Hz(1/s), Phase(degree), Ratio(%)
Automatic Measurement	38 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, %Flicker, Flicker Idx, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase
Cursors measurement	Voltage difference between cursors (ΔV) Time difference between cursors (ΔT)
Auto counter	6 digits, range from 2Hz minimum to the rated bandwidth
Control Panel Function	
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with "Undo Autoset", "Fit Screen"/ "AC Priority" mode, and "Fine Scale" functions.
Save Setup	20 sets
Save Waveform	24 sets
Display	
TFT LCD Type	8" TFT LCD WVGA color display
Display Resolution	800 horizontal × 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
Spectrum Analyzer Specifications	
Frequency range	DC~500MHz Max., dual channel with spectrogram (based on Advanced FFT). Notice: Frequency which exceeds analog front end bandwidth is uncalibrated)
Span	1kHz~500MHz (Max.)
Resolution bandwidth	1Hz ~ 500kHz (Max.)
Reference level	-50 dBm to +40dBm in steps of 5dBm
Vertical units	dBV RMS; Linear RMS; dBm
Vertical position	-12divs to +12divs
Vertical scale	1dB/div to 20dB/div in a 1-2-5 Sequence

Display average noise level	1V/div < -50dBm, Avg : 16 100mV/div < -70dBm, Avg : 16 10mV/div < -90dBm, Avg : 16
Spurious response	2nd harmonic distortion< 40dBc 3rd harmonic distortion< 45dBc
Frequency domain trace types	Normal ; Max Hold ; Min Hold ; Average (2 ~ 512)
Detection methods	Sample ; +Peak ; -Peak ; Average
FFT Windows	FFT Factor :
	Hanning 1.44
	Rectangular 0.89
	Hamming 1.30
	Blackman 1.68
AWG Specifications	
Channels	2
Sample Rate	200 MSa/s
Vertical Resolution	14 bits
Max. Frequency	25 MHz
Waveforms	Arbitrary, Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac
Output Range	20mVpp to 5 Vpp, HighZ; 10mVpp to 2.5 Vpp, 50 Ω
Output Resolution	1mV
Output Accuracy	2% (1 kHz)
Offset Range	$\pm 2.5V$, High Z; $\pm 1.25V$, 50 Ω
Offset Resolution	1mV
Sine	
Frequency Range	100mHz to 25MHz
Flatness (relative to 1 kHz)	± 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
Square/Pulse	
Frequency Range	100 mHz to 15MHz
Rise/Fall time	<15ns
Overshoot	<3%
Duty cycle	Square:50%; Pulse:0.4%~99.6%
Min. Pulse Width	30ns
Jitter	500ps
Ramp	
Frequency Range	100mHz~1MHz
Linearity	1%
Symmetry	0 to 100%

DMM Specifications	
Reading	5,000 counts
Voltage Input	CAT II 600Vrms, CAT III 300Vrms Below are the basic conditions required to operate the DMM within specifications: *Calibration: Yearly. *Operating Temperature Specification: 18~28°C (64.4~82.4°F). *Relative humidity: 80%. (Non-condensing) *Accuracy: \pm (% of Reading + % of Range). *AC measurement are based on a 50% duty cycle.
DC VOLTAGE	50mV, 500mV, 5V, 50V, 500V, 1000V 6 ranges
Accuracy	50mV, 500mV, 5V, 50V, 500V, 1000V \pm (0.1% + 0.1%)
Input Impedance	10M Ω
DC CURRENT	50mA, 500mA, 10A 3 ranges
Accuracy	50mA - 500mA \pm (0.5% + 0.1%) 10A \pm (0.5% + 0.5%)
AC VOLTAGE	50mV, 500mV, 5V, 50V, 700V 5 ranges
Accuracy	50mV, 500mV, 5V, 50V, 700V \pm (1.5% + 1.5%) at 50Hz-1kHz
AC CURRENT	50mA, 500mA, 10A 3 ranges
Accuracy*	50mA, 500mA, \pm (1.5% + 0.1%) at 50Hz-1kHz 10A \pm (3% + 0.5%) at 50Hz-1kHz * Measure range: >10mA
RESISTANCE	500 Ω , 5k Ω , 50k Ω , 500k Ω , 5M Ω , 5 ranges
Accuracy*	500 Ω , 5k Ω , 50k Ω , 500k Ω , 5M Ω : \pm (0.3% + 0.01%) *Measure range: 50 Ω to 5M Ω
Diode Test	Maximum forward voltage 1.5V, Open voltage 2.8V
Temperature (Thermocouple)*	Range: -50°C ~ + 1000°C Resolution: 0.1°C * Specifications do not include probe accuracy.
Continuity Beeper	15 Ω
Power supply Specifications	
Output Channel	CH1 & CH2
Output range	1V~5V/1A; 5V~10V/0.5A; 10V~20V/0.25A Peak current: 1A @250ms
Voltage Step	0.1V Continuously Adjustable
output Voltage Accuracy	\pm 3%
Ripple and Noise	50mVrms
Interface	
USB 2.0 Hi-speed Host Port	One on the front panel. Supporting USB2.0 Mass Storage Class (FAT32 or NTFS formatted). Professional version (MPO-2000P series) also supports USB CDC ACM Class and USB HID Class
USB 2.0 Hi-speed Device Port	One on the rear panel, USBTMC Class is supported.
Ethernet(LAN) Port	RJ-45 connector, 10/100Mbps with HP Auto-MDIX which also supporting TCP sockets communication, the TCP socket communication is using the default 5025 port number.
Web server	Supporting remote control and monitoring of the oscilloscope in web browser by using the LAN.
Go-NoGo BNC	5V Max/10mA TTL open collector output
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock.
Miscellaneous	
Multi-language menu	Available
Operation environment	Temperature: 0°C to 50°C. Relative Humidity \leq 80% at 40°C or below; \leq 45% at 41°C ~ 50°C.
Python Script Execution (μ Py)	Maximum number of installable python apps: 100 sets (including the pre-installed Python apps). Note. There is no restriction on script files (*.py). APPs installation capacity limit: 20M byte maximum

	<p>MQTT Protocol: "Message Queuing Telemetry Transport" is supported which including the "Publish" and "Subscribe" pattern.</p> <p>-<u>Basic version</u> (MPO-2000B series): *Supporting 1,000 points waveform data processing.</p> <p>-<u>Professional version</u> (MPO-2000P series): *Supporting USB CDC ACM Class, *USB HID Class, *Python GUI library, *100,000 points waveform data processing</p>
Component Tester	<p>Providing I-V characteristic curve (tracer) with readout scale. Please refer to the application note for the details.</p>
Time clock	Time and Date ,Provide the Date/Time for saved data
Internal flash disk	100M bytes Single-Level Cell flash memory
Installed APP	<p>Go/NoGo, DVM, DataLog, Digital Filter, Frequency Response Analyzer, Mask, CAN-FD*, USB2.0 (full speed)*, FlexRay*+, I²S*+, USB-PD*+, Mount Remote Disk, Demo</p> <p>*: Available for bus decoder function +: For Professional version (MPO-2000P series) Note: The I²S bus decoder is only available on 4 channel models.</p>
Dimensions	384mmX208mmX127.3mm
Weight	3kg

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

Sincerely yours,
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