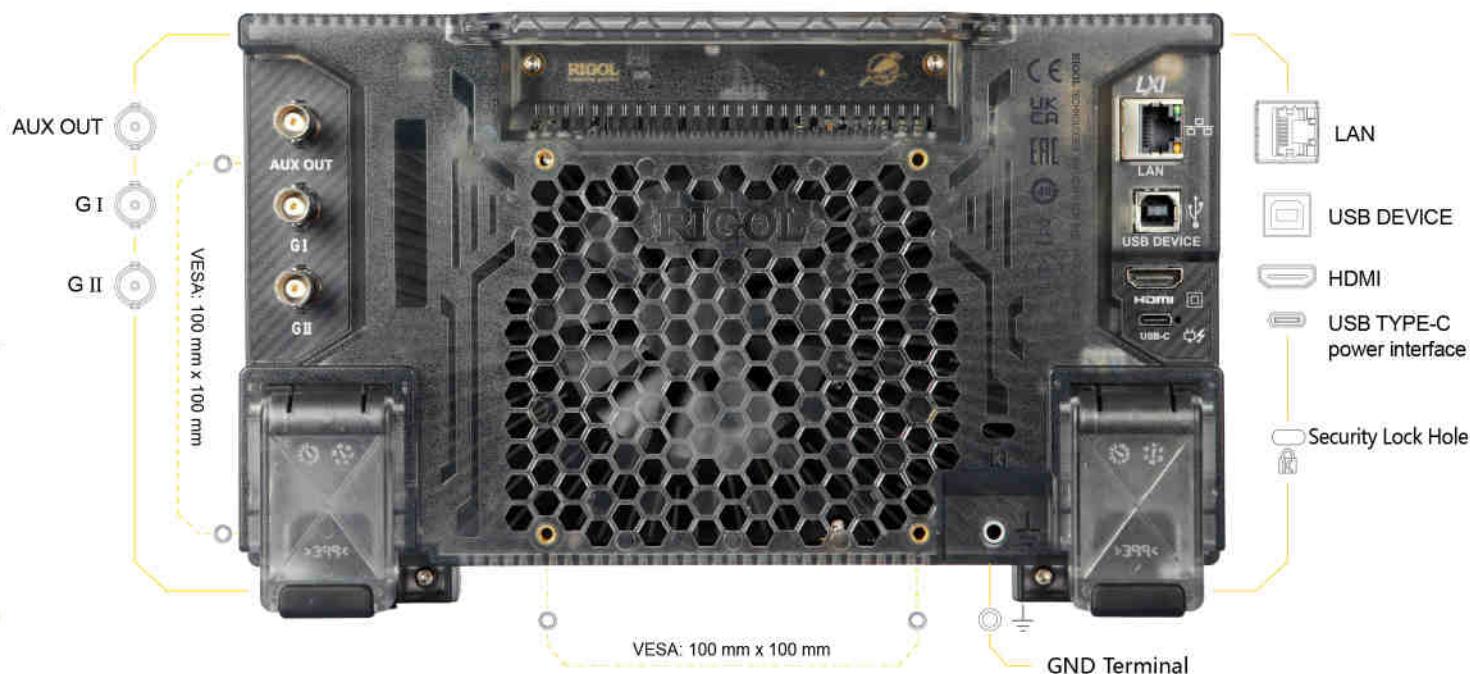


MHO900 Series

Digital Oscilloscope

Exquisite Appearance, Abundant Functions

7-inch capacitive touch screen



265.35 mm (W) x 161.75 mm (H) x 77.38 mm (D)

 Application

Power Supply Test

- Loop Response Analysis
- Ripple and Noise Test
- Transient Response Test



Embedded System Debugging

- Serial Protocol Analysis
- Digital Signal Analysis



Auto Electronics Test

- Automobile Bus Debugging
- Sensor Test



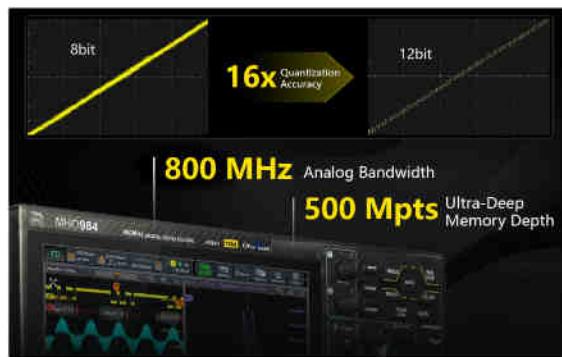
Basic Experiment

- Analog Circuit Experiment
- High-Frequency Circuit Experiment
- Power and Electronics Experiment



High Performance Rebuilds the Entry-Level Standard

- 800 MHz BW & 4 GSa/s sample rate enable you to address the high-speed signal acquisition challenge.
- 12-bit high-precision ADC, 4096 vertical digitalizing levels, not missing any weak signals.
- Max. 500 Mpts memory depth enables you to record high-speed and complex events, giving you full insight into the full details of high-speed signals.
- Various protocol decodings



N-in-one Integrated Efficient Test Tool

- Standard 16 digital channels allows you to capture and analyze the digital signals together with the analog signals.
- Optional 2-channel, 100 MHz AFG option can output up to 100 MHz pure sine wave, with Bode plot supported for signal analysis.



Product Features

Product Features

- 12-bit resolution
- Max. 800 MHz analog bandwidth, 4 analog channels
- 16 digital channels, 200 MHz PLA2216 logic analyzer probe (opt.)
- Real-time sample rate: up to 4 GSa/s
- Max. memory depth of 500 Mpts (option)
- Vertical sensitivity 200 μ V/div to 10 V/div
- Max. waveform capture rate: 1,000,000 wfms/s^[1]
- Digital phosphor display with real-time 256-level intensity grading
- Optional 2-channel, 50 MHz/100 MHz Function/Arbitrary Waveform Generator (Bode plot supported)
- Supports histogram, digital signal analysis, etc.
- Supports waveform search and navigation function, capable of debugging the signal anomalies faster
- 7" (1024x600) HD touch screen
- Flex knob brings user-friendly experience
- Standard USB2.0 Device & Host, LAN (100M), and HDMI interfaces
- Novel and delicate industrial design, easy to operate
- Supports online upgrade of software version

MHO900 series is RIGOL's new launched economical oscilloscope. Compact in size, it features 1,000,000 wfms/s^[1] capture rate, max. memory depth of 500 Mpts (option), 12-bit high resolution and low noise.

The product supports 16 digital channels. One instrument can make an analysis on both the analog and digital signals to meet the embedded design and test scenarios. With an affordable price equivalent to purchasing an entry-level instrument, you can access the auto serial and parallel bus analysis, bode plot analysis, and other functions to meet the test demands in the R&D, education, and scientific research fields.

NOTE:

[1]: Single-channel mode, recording mode, 20 ns/div, 1 kpts memory depth (or Auto memory depth).

RIGOL Probes and Accessories Supported

Model	Type	Description
Passive Probe		
	Passive High-impedance Probe PVP2150	<ul style="list-style-type: none">• Attenuation Ratio: 10:1/1:1• 1X BW: DC to 35 MHz• 10X BW: DC to 150 MHz• Compatibility: All models of RIGOL's digital oscilloscopes
	Passive High-impedance Probe PVP2350	<ul style="list-style-type: none">• Attenuation Ratio: 10:1/1:1• 1X BW: DC to 35 MHz• 10X BW: DC to 350 MHz• Compatibility: All models of RIGOL's digital oscilloscopes
	Passive High-impedance Probe PVP3150	<ul style="list-style-type: none">• Attenuation Ratio: 10:1/1:1• 1X BW: DC to 20 MHz• 10X BW: DC to 150 MHz• Compatibility: All models of RIGOL's digital oscilloscopes
	Passive Probe RP3500A	<ul style="list-style-type: none">• Attenuation Ratio: 10:1• BW: DC to 500 MHz• Compatibility: MSO/DS7000, MSO8000/A, DHO4000/1000, MHO/DHO5000, MHO2000, DS70000/80000, MHO98, and MHO900 series
High-voltage Single-ended Probe		
	High-voltage Probe RP1010H	<ul style="list-style-type: none">• Attenuation Ratio: 1000:1• BW: DC to 40 MHz• DC: 0 to 10 kV DC• AC: pulse ≤ 20 kVp-p• AC: sine ≤ 7 kV_{rms}• Compatibility: All models of RIGOL's digital oscilloscopes

Model	Type	Description
	High-voltage Probe RP1018H	<ul style="list-style-type: none"> Attenuation Ratio: 1000:1 BW: DC to 150 MHz DC+AC_{peak}: 18 kV CAT II AC_{rms}: 12 kV CAT II Compatibility: All models of RIGOL's digital oscilloscopes
	High-voltage Probe RP1300H	<ul style="list-style-type: none"> Attenuation Ratio: 100:1 BW: DC to 300 MHz CAT I 2000 V (DC+AC) CAT II 1500 V (DC+AC) Compatibility: All models of RIGOL's digital oscilloscopes
High-voltage Differential Probe		
	High-voltage Differential Probe PHA0150	<ul style="list-style-type: none"> BW: DC to 70 MHz Max. voltage \leq 1500 Vpp Compatibility: All models of RIGOL's digital oscilloscopes
	High-voltage Differential Probe PHA1150	<ul style="list-style-type: none"> BW: DC to 100 MHz Max. voltage \leq 1500 Vpp Compatibility: All models of RIGOL's digital oscilloscopes
	High-voltage Differential Probe PHA2150	<ul style="list-style-type: none"> 50X BW: DC to 160 MHz 500X BW: DC to 200 MHz Max. voltage \leq 1500 Vpp Compatibility: All models of RIGOL's digital oscilloscopes
	High-voltage Differential Probe RP1025D	<ul style="list-style-type: none"> BW: DC to 25 MHz Max. voltage \leq 1400 Vpp (DC + AC P-P) Compatibility: All models of RIGOL's digital oscilloscopes
	High-voltage Differential Probe RP1050D	<ul style="list-style-type: none"> BW: DC to 50 MHz Max. voltage \leq 7000 Vpp (DC + AC P-P) Compatibility: All models of RIGOL's digital oscilloscopes

Model	Type	Description
	High-voltage Differential Probe RP1100D	<ul style="list-style-type: none">• BW: DC to 100 MHz• Max. voltage \leq 7000 Vpp (DC + AC P-P)• Compatibility: All models of RIGOL's digital oscilloscopes
Current Probe		
	Current Probe RP1001C	<ul style="list-style-type: none">• BW: DC to 300 kHz• Maximum Input DC: ± 100 A AC P-P: 200 A AC RMS: 70 A• Compatibility: All models of RIGOL's digital oscilloscopes
	Current Probe RP1002C	<ul style="list-style-type: none">• BW: DC to 1 MHz• Maximum Input DC: ± 70 A AC P-P: 140 A AC RMS: 50 A• Compatibility: All models of RIGOL's digital oscilloscopes
	Current Probe RP1003C	<ul style="list-style-type: none">• BW: DC to 50 MHz• Maximum Input AC P-P: 50 A (non-continuous) AC RMS: 30 A• Compatibility: All models of RIGOL's digital oscilloscopes• Required to order RP1000P power supply.
	Current Probe RP1004C	<ul style="list-style-type: none">• BW: DC to 100 MHz• Maximum Input AC P-P: 50 A (non-continuous) AC RMS: 30 A• Compatibility: All models of RIGOL's digital oscilloscopes• Required to order RP1000P power supply.

Model	Type	Description
	Current Probe	<ul style="list-style-type: none">• BW: DC to 10 MHz• Maximum Input AC P-P: 300 A (non-continuous), 500 A (@pulse width \leq 30 us)• AC RMS: 150 A• Compatibility: All models of RIGOL's digital oscilloscopes• Required to order RP1000P power supply.
	Current Probe	<ul style="list-style-type: none">• BW: DC to 2 MHz• Maximum Input AC P-P: 700 A peaks, non-continuous• AC RMS: 500 A• Compatibility: All models of RIGOL's digital oscilloscopes• Required to order RP1000P power supply.
	4-CH Power Supply	Power supply for RP1003C, RP1004C, RP1005C, and RP1006C; supporting 4 channels.
Logic Analyzer Probe		
	Logic Analyzer Probe	MSO5000, DHO900, MHO900 series, MHO98 dedicated logic analyzer probe.
PLA2216		

Specifications

All the specifications are guaranteed except the parameters marked with "Typical" and the oscilloscope needs to operate for more than 30 minutes under the specified operation temperature. All the specifications are measured when the oscilloscope is grounded properly.

Overview of the MHO900 Technical Specifications

Technical Specifications

Model	MHO984	MHO954	MHO934
Max. Analog Bandwidth (50 Ω, -3 dB)	800 MHz (single-channel ^[1] & half-channel ^[2]) 400 MHz (all-channel ^[3])	500 MHz (single-channel ^[1] & half-channel ^[2]) 400 MHz (all-channel ^[3])	350 MHz (for any number of channels)
Max. Analog Bandwidth (1 MΩ, -3 dB)	500 MHz (single-channel ^[1] & half-channel ^[2]) 400 MHz (all-channel ^[3])	500 MHz (single-channel ^[1] & half-channel ^[2]) 400 MHz (all-channel ^[3])	350 MHz (for any number of channels)
Calculated Rising Time under 50 Ω (10%-90%, typical)	437 ps	700 ps	1 ns
No. of Analog Channels	4		
Function/Arbitrary Waveform Generator (AFG) ^[4]	2-Channel, 100 MHz, 1 GSa/s (Opt.) 2-Channel, 50 MHz, 1 GSa/s (Opt.)		
Bode Plot ^[5]	Sweep Range: 10 Hz to 30 MHz		

General Specifications

Specification	Specification
Sampling Mode	Real-time Sampling
Max. Real-time Sample Rate	4 GSa/s (single-channel ^[1]) 2 GSa/s (half-channel ^[2]) 1 GSa/s (all-channel ^[3])

Specification	Specification
Max. Memory Depth	Standard: 100 Mpts (single-channel ^[1]); 50 Mpts (half-channel ^[2]); 25 Mpts (all-channel ^[3]) Optional: with 500 Mpts memory depth option installed, 500 Mpts (single-channel ^[1]); 250 Mpts (half-channel ^[2]); 125 Mpts (all-channel ^[3])
Input Impedance	50 Ω ± 1%, 1 MΩ ± 1%
Max. Waveform Capture Rate	30,000 wfms/s (in Vector mode) 1,000,000 wfms/s ^[6] (in fast recording mode)
Vertical Resolution	12-bit (4,096 digitalizing levels)
Hardware Real-time Waveform Recording and Playing	Max. 500,000 frames
Peak Detection	Captures 500 ps glitches
LCD Size and Type	7-inch multi-touch screen, gesture enabled operation
Display Resolution	1024*600 (16:9)
Communication Interface	HDMI, LAN (100M), USB2.0 Host&Device
Programming Standard	Supports standard SCPI instruction sets
Digital Phosphor Display	256-level intensity grading

Vertical System Analog Channel

Vertical System Analog Channel	
Input Coupling	DC, AC, or GND
Input Impedance	1 MΩ ± 1% 50 Ω ± 1%
Input Capacitance	18 pF ± 3 pF
Probe Attenuation Coefficient	0.001X, 0.002X, 0.001X, 0.002X, 0.005X, 0.01X, 0.02X, 0.05X, 0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X, 15X, 20X, 50X, 100X, 150X, 200X, 500X, 1000X, 1500X, 2000X, 5000X, 10000X, 15000X, 20000X, 50000X; user-defined

Vertical System Analog Channel

1 MΩ: CAT I 300 V_{rms}, 400 V_{pk} (DC + V_{peak})50 Ω: 5 V_{rms}

Maximum Input Voltage	Whether the probe is used, the 50 Ω or 1 MΩ route does not allow transient overvoltage to occur.
Remarks	Please use the instrument dedicated for the specified measurement category (not applicable to CAT II, III, and IV)
Vertical Resolution	12-bit (up to 16-bit in high resolution mode)
Effective Number of Bits (ENOB) (typical) ^[7]	MHO984: 8 MHO954: 8.1 MHO934: 8.5
Vertical Sensitivity Range ^[8]	50 Ω: 200 μV/div to 1 V/div 1 MΩ: 1 mV/div to 10 V/div
Offset Range	1 MΩ: ±1 V (≥ 1 mV/div, ≤ 65 mV/div) ±10 V (> 65 mV/div, ≤ 274 mV/div) ±20 V (> 274 mV/div, ≤ 2.79 V/div) ±100 V (> 2.79 V/div, ≤ 10 V/div) 50 Ω: ±1 V (≥ 1 mV/div, ≤ 136 mV/div) ±4 V (> 136 mV/div)
Dynamic Range	±4 div
Bandwidth Limit (Typical)	20 MHz, 250 MHz, FULL
DC Gain Accuracy ^[8]	±1% (≥ 5 mV/div) ±2% (< 5 mV/div)
DC Offset Accuracy	≤ 200 mV/div (±0.1 div ± 2 mV ± 1.5% of offset value) ≥ 200 mV/div (±0.1 div ± 2 mV ± 1.0% of offset value)
Channel-to-Channel Isolation	≥ 100:1 (DC to full bandwidth)
ESD Tolerance	±8 kV

Vertical System Digital Channel

Vertical System Digital Channel

Number of Channels	16 input channels (D0 to D15) (D0 to D7, D8 to D15)
Threshold Range	± 15.0 V, in 10 mV step
Threshold Accuracy	$\pm (100.00 \text{ mV} + 3\% \text{ of threshold setting})$
Threshold Selection	User (adjustable threshold for 8 channels in a group)
Max. Input Voltage	± 40 V peak CAT I; transient overvoltage 800 Vpk
Max. Input Dynamic Range	± 10 V + threshold
Minimum Voltage Swing	500 mVpp
Input Impedance	About 101 k Ω
Probe Load	≈ 8 pF
Vertical Resolution	1-bit

Noise Floor

Noise Floor at 50 Ω (800 MHz BW)

200 μ V/div (20 MHz BW Limit)	66 μ V _{rms}
500 μ V/div (250 MHz BW Limit)	74.4 μ V _{rms}
1 mV/div	139.2 μ V _{rms}
2 mV/div	136.8 μ V _{rms}
5 mV/div	145.2 μ V _{rms}
10 mV/div	406.8 μ V _{rms}
20 mV/div	465.6 μ V _{rms}
50 mV/div	694.8 μ V _{rms}
100 mV/div	1152 μ V _{rms}
200 mV/div	4.92 mV _{rms}

Noise Floor at 50 Ω (800 MHz BW)500 mV/div 7.2 mV_{rms}1 V/div 11.52 mV_{rms}**Noise Floor at 1 MΩ (500 MHz BW)**1 mV/div 130.8 μV_{rms}2 mV/div 127.2 μV_{rms}5 mV/div 160 μV_{rms}10 mV/div 270 μV_{rms}20 mV/div 331.2 μV_{rms}50 mV/div 614.4 μV_{rms}100 mV/div 3 mV_{rms}200 mV/div 3.6 mV_{rms}500 mV/div 12.84 mV_{rms}1 V/div 16.08 mV_{rms}2 V/div 24.36 mV_{rms}5 V/div 117.84 mV_{rms}10 V/div 156.36 mV_{rms}**Horizontal System--Analog Channel****Horizontal System--Analog Channel**

Range of Time Base 500 ps/div to 500 s/div

Time Base Resolution 100 ps

Time Base Accuracy ±1.5 ppm ± 1 ppm/year

Horizontal System--Analog Channel

	Pre-trigger	-5 div
Time Base Delay Range	Post-trigger	1 s or 100 div, whichever is greater
Delta Time Accuracy		$\pm(\text{Time Base Accuracy} \times \text{Readout}) \pm (0.001 \times \text{Screen Width}) \pm 20 \text{ ps}$
Channel-to-Channel Skew Correction		Channel-to-Channel Skew Correction Range $\pm 100 \text{ ns}$, Accuracy $\pm 1 \text{ ps}$
Analog Channel-to-Channel Delay (Typical) ^[9]		$\leq 200 \text{ ps}$
Horizontal Mode	YT	Default
	XY	Channel 1/2/3/4
	SCAN	Time base $\geq 200 \text{ ms/div}$
	ROLL	Time base $\geq 50 \text{ ms/div}$, available to enter or exit the ROLL mode by rotating the Horizontal SCALE knob

Horizontal System--Digital Channel**Horizontal System--Digital Channel**

Min. Detectable Pulse Width	5 ns
Maximum Input Frequency	200 MHz (accurately copied as the sine wave of the maximum frequency of the logic square wave; input amplitude is the minimum swing; the shortest the ground cable is required for the logic probe)
Channel-to-Channel Skew (Typical) ^[10]	$\pm 5 \text{ ns}$

Acquisition System**Acquisition System**

Max. Sample Rate of Analog Channel	4 GSa/s (single-channel ^[1]), 2 GSa/s (half-channel ^[2]), 1 GSa/s (all-channel ^[3])
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Acquisition System

Max. Memory Depth of Analog Channel	Standard:	100 Mpts (single-channel ^[1]); 50 Mpts (half-channel ^[2]); 25 Mpts (all-channel ^[3])
	Optional:	with 500 Mpts memory depth option installed, 500 Mpts (single-channel ^[1]); 250 Mpts (half-channel ^[2]); 125 Mpts (all-channel ^[3])
	Normal	Default
Acquisition Mode	Peak Detection	Captures 500 ps glitches
	Average Mode	2, 4, 8, 16...65536 are available for you to choose
	High Resolution	14-bit, 16-bit

Trigger System**Trigger System**

Trigger Source	Analogue channels (CH1-CH4), digital channels (D0-D15)	
Trigger Mode	Auto, Normal, Single	
Trigger Coupling	DC	DC coupling trigger
	AC	AC coupling trigger
	High Frequency Rejection	Cut-off frequency to 200 kHz ± 20% (internal trigger only)
Low Frequency Rejection	Cut-off frequency to 180 kHz ± 20% (internal trigger only)	
Noise Reject	Increases delay for the trigger circuit (internal trigger only), On/Off	
Holdoff Range	8 ns to 10 s	
Trigger Bandwidth	Internal trigger: analog bandwidth of the oscilloscope	
Trigger Sensitivity	Internal trigger: 0.5 div, ≥50 mV/div; 0.7 div (with noise rejection enabled)	

Trigger System

Trigger Level
Range

Internal trigger: ± 4 div from the center of the screen

Trigger Type**Trigger Type**

Trigger Type	Standard: Edge trigger, Pulse trigger, Slope trigger, Video trigger, Pattern trigger, Duration trigger, Timeout trigger, Runt trigger, Window trigger, Delay trigger, Setup/Hold trigger, Nth Edge trigger, RS232, I2C, SPI, CAN, LIN Option: FlexRay, I2S, and MIL-STD-1553
Edge	Triggers on the threshold of the specified edge of the input signal. The edge types can be Rising, Falling, or Either. Source channel: CH1 to CH4, D0 to D15 ^[11]
Pulse	Triggers on the positive or negative pulse with a specified width. The pulse width is greater or smaller than a certain value or within a certain time range. Source channel: CH1 to CH4, D0 to D15 ^[11]
Slope	Triggers on the positive or negative slope of the specified time. The slew time is greater or smaller than a certain value or within a certain time range. Source channel: CH1 to CH4
Video	Triggers on all lines, specified line, odd field, or even field that conforms to the video standards. The supported video standards include NTSC, PAL/SECAM, 480p/60Hz, 576p/50Hz, 720p/60Hz, 720p/50Hz, 720p/30Hz, 720p/25Hz, 720p/24Hz, 1080p/60Hz, 1080p/50Hz, 1080p/30Hz, 1080p/25Hz, 1080p/24Hz, 1080i/60Hz, and 1080i/50Hz. Source channel: CH1 to CH4
Pattern	Identifies a trigger condition by searching for a specified pattern. The pattern is a combination of multiple selected channel sources. The logic pattern of each channel is H, L, X, Rising, or Falling. Source channel: CH1 to CH4, D0 to D15 ^[11]
Duration	Triggers when the specified pattern meets the specified duration condition. The pattern is a combination of multiple selected channel sources. The logic pattern of each channel is H, L, and X. The duration is greater or smaller than a certain value, or within a certain time range, or outside a certain time range. Source channel: CH1 to CH4, D0 to D15 ^[11]
Timeout	Triggers when duration of a certain event exceeds the specified time. The event can be specified as Rising, Falling, or Either. Source channel: CH1 to CH4, D0 to D15 ^[11]

Trigger Type

Runt	Triggers when the pulses pass through one threshold but fail to pass through another threshold. Source channel: CH1 to CH4
Window	Triggers in a specified window state when the rising edge of the signal crosses the upper threshold or the falling edge crosses the lower threshold. The window state can be Enter, Exit, or Time. Source channel: CH1 to CH4
Delay	Triggers when the time difference between the specified edges of Source A and Source B meets the preset time. The duration is greater or smaller than a certain value, or within a certain time range, or outside a certain time range. Source channel: CH1 to CH4, D0 to D15 ^[11]
Setup/Hold	When the setup time or hold time between the input clock signal and the data signal is smaller than the specified time. Source channel: CH1 to CH4, D0 to D15 ^[11]
Nth Edge	Triggers on the Nth edge that appears after the specified idle time. The edge can be specified as Rising or Falling. Source channel: CH1 to CH4, D0 to D15 ^[11]
RS232/UART	Triggers on the Start, Error, Check Error, or Data frame of the RS232/UART bus (up to 20 Mb/s). Source channel: CH1 to CH4, D0 to D15 ^[11]
I2C	Triggers on the Start, Stop, Restart, MissedACK, Address (7 bits, 8 bits, or 10 bits), Data, or Address Data of the I2C bus. Source channel: CH1 to CH4, D0 to D15 ^[11]
SPI	Triggers on the specified pattern of the specified data width (4~32) of SPI bus. CS and Timeout are supported. Source channel: CH1 to CH4, D0 to D15 ^[11]
CAN	Triggers on the start of a frame, end of a frame, Remote ID, Overload, Frame ID, Frame Data, Data&ID, Frame Error, Answer Error, Check Error, Format Error, Bit Fill, and Random of the CAN signal (up to 5Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF. Source channel: CH1 to CH4, D0 to D15 ^[11]
LIN	Triggers on the Sync, ID, Data (length settable), Data&ID, Wakeup, Sleep, and Error of the LIN bus signal (up to 20 Mb/s). Source channel: CH1 to CH4, D0 to D15 ^[11]

Trigger Type

FlexRay (Option)	Triggers on the specified position (TSS End, FSS_BSS End, FES End, DTS End), frame (null, Sync, Start, All), symbol (CAS/MTS and WUS), error (Head CRC Err, Tail CRC Err, Decode Err, and Random Err) of the FlexRay signal (up to 10 Mb/s). Source channel: CH1 to CH4, D0 to D15 ^[11]
I2S (Option)	Triggers on 2's complement data of audio left channel, right channel, or either channel (=, ≠, >, <, <>, ><). The available alignment modes include I2S, LJ, and RJ. Source channel: CH1 to CH4, D0 to D15 ^[11]
MIL-STD-1553B (Option)	Triggers on Sync (Data Sync, Cmd/Status Sync, and All Sync), Data, RTA, RTA +11Bit, and Error (Sync Error and Check Error) of the MIL-STD-1553B bus. Source channel: CH1 to CH4, D0 to D15 ^[11]

Search & Navigation**Search & Navigation**

Type	Edge, Pulse
Source	Analog channel
Copy	Copies the search settings from or to the trigger settings mutually, including threshold setting and search condition settings
Save	Saves the search event to the internal or external memory
Navigation	Time navigation: navigates to the acquired waveforms in time order. Event navigation: uses the navigation keys to scroll through the event search results and navigates to the specified event.

Waveform Measurement

Waveform Measurement

	Number of Cursors	2 pairs of XY cursors
	Manual Mode	Voltage deviation between cursors (ΔY) Time deviation between cursors (ΔX) Reciprocal of ΔX (Hz) ($1/\Delta X$)
Cursor	Track Mode	Fix Y-axis to track X-axis waveform point's voltage and time values Fix X-axis to track Y-axis waveform point's voltage and time values
	Auto Measurement	Allows to display cursors during auto measurement
	XY Mode	Measures the voltage parameters of the corresponding channel waveforms in XY time base mode. X = Channel 1, Y = Channel 2

Waveform Measurement

Auto Measurement	Number of Measurements	41 auto measurements; and up to 14 measurements can be displayed at a time.
	Measurement Source	CH1 to CH4, D0 to D15 ^[11] , Math1 to Math4
	Measurement Range (Region)	Main, Zoom, and Cursor
	All Measurement	Displays 33 measurement items (vertical and horizontal) for the current measurement channel; the measurement results are updated continuously.
	Vertical	Vmax, Vmin, Vpp, Vtop, Vbase, Vamp, Vupper, Vmid, Vlower, Vavg, VRMS, Per. VRMS, AC. RMS, Overshoot, Preshoot, Area, and Period Area.
	Horizontal	Period, Frequency, Rise Time, Fall Time, +Width, -Width, +Duty, -Duty, Positive Pulse Count, Negative Pulse Count, Rising Edge Count, Falling Edge Count, T _{vmax} , T _{vmin} , +Slew Rate, and -Slew Rate
Statistics	Others	Delay(A _↑ -B _↑), Delay(A _↑ -B _↓), Delay(A _↓ -B _↑), Delay(A _↓ -B _↓), Phase(A _↑ -B _↑), Phase(A _↑ -B _↓), Phase(A _↓ -B _↑), and Phase(A _↓ -B _↓)
	Statistics	Items: Current, Average, Max, Min, Standard Deviation, Count Statistical times settable

Waveform Calculation**Waveform Calculation**

No. of Math Functions	4 math functions available to be displayed at one time
Operation	A+B, A-B, A×B, A/B, FFT, A&&B, A B, A [^] B, !A, Intg, Diff, Sqrt, Lg, Ln, Exp, Abs, AX+B, LowPass, HighPass, BandPass, and BandStop
Color Grade	FFT supported
Record Length	Max. 1 Mpts; for FFT operation, max. 1 Mpts for analysis
FFT Window Type	Rectangular, Blackman-Harris, Hanning (default), Hamming, Flattop, and Triangle.
Peak Search	A maximum of 15 peaks, determined by the user-defined threshold and offset threshold

Waveform Analysis

Waveform Analysis

Waveform Recording	Source	Stores the signal under test in segments according to the trigger events, that is, saves all the sampled waveform data as a segment to the RAM for each trigger event. The maximum number of the sampled segments reaches 500,000.
	Analysis	Supports playing waveforms frame by frame or continuous playing; capable of calculating, measuring, and decoding the played waveforms
PassFail	Source	Compares the signal under test with the user-defined mask to provide the test results: the number of successful tests, failed tests, and the total number of tests. The pass/fail event can enable immediate stop, beeper, and the screenshot.
	Analysis	Any analog channel
Histogram	Source	The waveform histogram provides a group of data, showing the number of times a waveform hits within the defined region range on the screen. The waveform histogram not only shows the distribution of hits, but also the ordinary measurement statistics.
	Type	Any analog channel, auto measurement item
Measure	Source	Horizontal, vertical, and measure histogram
	Measure	Measure histogram statistics: Type, Sum, Peaks, Max, Min, Pk_Pk, Mean, Median, Mode, Bin Width, Sigma, and XScale Histogram statistics: Sum, Peaks, Max, Min, Pk_Pk, Median, Mode, Bin Width, Sigma, $\mu \pm \sigma$, $\mu \pm 2\sigma$, and $\mu \pm 3\sigma$
Sampling Mode	Sampling Mode	Supports all modes, except the Zoom, XY, and ROLL modes
	Color Grade	Provide a dimensional view for color grade waveforms, color grade > 16 , 256-level color scale display
Color Grade	Source	Any analog channel
	Color Theme	Temperature and intensity
Sampling Mode	Sampling Mode	Supports all modes

Serial Decoding

Serial Decoding

Number of Decodings	Four protocol types can be decoded and enabled at the same time
Decoding Type	Standard: Parallel, RS232/UART, I2C, SPI, LIN, CAN Option: CAN-FD, FlexRay, I2S, and MIL-STD-1553B
Parallel	Up to 4 bits of Parallel decoding, supporting any analog channel Supports user-defined clock and auto clock settings. Source channel: CH1 to CH4, D0 to D15 ^[11]
RS232/UART	Decodes the RS232/UART (up to 20 Mb/s) bus's TX/RX data (5-9 bits), parity (Odd, Even, or None), and stop bits (1-2 bits) Source channel: CH1 to CH4, D0 to D15 ^[11]
I2C	Decodes the address (with or without the R/W bit) of the I2C bus, data, and ACK. Source channel: CH1 to CH4, D0 to D15 ^[11]
SPI	Decodes the MISO/MOSI data (4-32 bits) of the SPI bus. The available mode includes "Timeout" and "CS". Source channel: CH1 to CH4, D0 to D15 ^[11]
CAN	Decodes the remote frame (ID, byte number, CRC), overload frame, and data frame (standard/extended ID, control domain, data domain, CRC, and ACK) of the CAN bus (up to 5 Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF. Source channel: CH1 to CH4, D0 to D15 ^[11]
LIN	Decodes the protocol version (1.X or 2.X) of the LIN bus (up to 20 Mb/s). The decoding displays sync, ID, data, and check sum. Source channel: CH1 to CH4, D0 to D15 ^[11]
CAN-FD (Option)	Decodes the remote frame (ID, byte number, CRC), overload frame, and data frame (standard/extended ID, control domain, data domain, CRC, and ACK) of the CAN-FD bus (up to 10 Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF. Source channel: CH1 to CH4, D0 to D15 ^[11]
FlexRay (Option)	Decodes the frame ID, PL (payload), Header CRC, Cycle Count, Data, Tail CRC, and DTS of the FlexRay bus (up to 10 Mb/s). The supported signal types include BP, BM, and RX/TX. Source channel: CH1 to CH4, D0 to D15 ^[11]

Serial Decoding

I2S (Option)	Decodes I2S audio bus left channel data and right channel data, supporting 4-32 bits. The alignment modes include I2S, LJ, and RJ. Source channel: CH1 to CH4, D0 to D15 ^[11]
MIL-STD-1553B (Option)	Decodes the MIL-STD-1553B bus signal's data word, command word, and status word (address+last 11 bits). Source channel: CH1 to CH4, D0 to D15 ^[11]

Bode Plot^[5]**Bode Plot**

Start Freq 10 Hz to 3 MHz

Stop Freq^[12] 100 Hz to 30 MHz

Points/Decade 10 to 100

Output Amplitude 20 mV to 10 V

Function/Arbitrary Waveform Generator (AFG)^[4]**AFG (technical specifications are typical values)**

Number of Channels 2

Output Mode Normal 2-channel output

Sample Rate 1 GSa/s

Vertical Resolution 16-bit

Max. Frequency Option AFG100: 100 MHz
Option AFG50: 50 MHzOutput Waveform Basic waveforms: Sine, Square, Ramp, DC, Noise, Arb; built-in waveforms: Sinc, Exp.Rise, Exp. Fall, ECG1, Gauss, Lorentz, and Haversine
User-defined waveform: supported

AFG (technical specifications are typical values)

Frequency Range	Option AFG100: 2 mHz to 100 MHz
	Option AFG50: 20 mHz to 50 MHz
Flatness	Typical (in relative to 1 kHz Sine, 0 dBm)
	<10 MHz: ± 0.2 dB ≥ 10 MHz to <100 MHz: ± 0.5 dB
Harmonic Distortion	Typical (0 dBm)
	10 Hz to <10 MHz: <-55 dBc
	≥ 10 MHz to <50 MHz: <-50 dBc ≥ 50 MHz: <-40 dBc
Sine	Typical (1 Vpp)
	Spurious (non-harmonics) 10 Hz to <10 MHz: <-60 dBc ≥ 10 MHz to <50 MHz: <-50 dBc ≥ 50 MHz: <-50 dBc + 6 dBc/Octave
	Total Harmonic Distortion (THD) Typical (1 Vpp) 10 Hz to 20 kHz: <0.1%
Phase Noise	Typical (1 Vpp amplitude, 10 kHz offset) 20 MHz: <-110 dBc/Hz
Residual Clock Noise	Typical (0 dBm), -50 dBm
Channel-to-Channel Crosstalk	Typical (1 Vpp amplitude, 0 V offset) <100 MHz: <-35 dBc
Phase	0° to 360°, 0.01° resolution
Frequency Range	Option AFG100: 2 mHz to 20 MHz
	Option AFG50: 20 mHz to 10 MHz
Rise/Fall Time	Typical (amplitude \leq 2 Vpp, 50 Ω load), < 10 ns
Square	Overshoot Typical (0 dBm amplitude, frequency > 1 MHz), <5%
	Duty Cycle 1% to 99%, adjustable
Jitter (rms)	Typical (0 dBm amplitude, frequency > 1 kHz), 500 ps
Phase	0° to 360°, 0.01° resolution

AFG (technical specifications are typical values)

	Frequency Range	Option AFG100: 2 mHz to 2 MHz Option AFG50: 20 mHz to 1 MHz
Ramp	Linearity	Typical (frequency 1 kHz, amplitude 1 Vpp, symmetry 100%) $\leq 1\%$ of peak output (within the 10%~90% amplitude range)
	Symmetry	0% to 100%
	Phase	0° to 360°, 0.01° resolution
Noise	Type	White Noise
	-3 dB Bandwidth	Typical (0 dB), > 100 MHz
Arbitrary Waveforms	Frequency Range	Option AFG100: 2 mHz to 20 MHz Option AFG50: 20 mHz to 10 MHz
	Waveform Length	16 kpts
	File Type	CSV
	Built-in Waveform	Frequency Range Option AFG100: 2 mHz to 20 MHz Option AFG50: 20 mHz to 10 MHz
Frequency	Accuracy	$\pm 1.5 \text{ ppm} \pm 1 \text{ ppm/year}$ (@10 MHz)
	Resolution	0.1 Hz or 10 digits, whichever is greater
Amplitude	Output Range (into 50 Ω)	1 mVpp to 10 Vpp ($\leq 50 \text{ MHz}$) 1 mVpp to 5 Vpp ($\leq 100 \text{ MHz}$)
	Output Range (into HighZ)	2 mVpp to 20 Vpp ($\leq 50 \text{ MHz}$) 2 mVpp to 10 Vpp ($\leq 100 \text{ MHz}$)
	Resolution	0.1 mVpp or 3 digits, whichever is smaller
	Accuracy	$\pm (1.5\% \text{ of the setting value} + 5 \text{ mVpp})$ (1 kHz Sine, 0 V offset)
	Unit	Vpp

AFG (technical specifications are typical values)

	Range	±5 Vpk (AC + DC) (into 50 Ω) ±10 Vpk (AC + DC) (into HighZ)
DC Offset	Resolution	1 mV or 4 digits
	Accuracy	±(1.5% of offset setting value + 5 mV + 0.5% of amplitude (Vpp)) (into 50 Ω) ±(1.5% of offset setting value + 5 mV + 1% of amplitude (Vpp)) (into HighZ)
Output Impedance		Typical (0 dBm amplitude, 0 Vdc offset), 50 Ω ± 1%
AM		Modulating waveform: Sine, Square, Triangle, UpRamp, DnRamp, Noise Carrier waveform: Sine, Square, Ramp Modulation Source: Internal Modulation Depth: 0% to 120% Modulation Frequency: 2 mHz to 1 MHz
		Modulating Waveform: Sine, Square, Triangle, UpRamp, DnRamp, and Noise Carrier Waveform: Sine, Square, Ramp Modulation Source: Internal
		Frequency Deviation: 2 mHz to set carrier frequency (limited by the carrier frequency setting; the sum of the frequency deviation and carrier frequency shall not exceed the upper limit of the carrier frequency) Modulation Frequency: 2 mHz to 1 MHz
		Modulating Waveform: Sine, Square, Triangle, UpRamp, DnRamp, Noise Carrier Waveform: Sine, Square, Ramp Modulation Source: Internal
		Phase Shift: 0° to 360°, default 90° Modulation Frequency: 2 mHz to 1 MHz
Modulation	FM	
	PM	

Auto**Auto**

AutoScale	Min voltage > 10 mVpp, duty cycle > 1%, frequency > 35 Hz
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Digital Voltmeter

Digital Voltmeter

Source	Any analog channel
Function	DC, AC+DC _{rms} , AC _{rms}
Resolution	ACV/DCV: 3 digits
Limits Beeper	Sounds an alarm when the voltage value is within or outside of the limit range

High-precision Frequency Counter

High-precision Frequency Counter

Source	Any Analog Channel and digital channel ^[11]
Measure	Frequency, period, totalizer
Counter	Resolution 3-6 digits, user-defined
	Max. Frequency Max. analog bandwidth
Totalizer	48-bit totalizer
	Counts the number of the rising edges
Time Reference	Internal reference

Command Set

Command Set

Common Commands Support	IEEE488.2 Standard
Error Message Definition	Error messages
Support Status Report Mechanism	Status Reporting
Support Syn Mechanism	Synchronization

Display

Display

LCD	7-inch capacitive multi-touch screen, gesture enabled operation
Resolution	1024×600 (Screen Region) 16:9

Display

Graticule	(10 horizontal divisions) x (8 vertical divisions)
Persistence	Min, Infinite, variable persistence (100 ms to 10 s)
Brightness	256 intensity levels (LCD, HDMI)

Processor System**Processor System**

Processor	Cortex-A72 up to 1.8 GHz, 6-core processor
System Memory	4 GB RAM
Operating System	Android
Internal Non-volatile Memory	32 GB

I/O**I/O**

USB2.0 Host	1 on the front panel, 500 mA
USB2.0 Device	1 on the rear panel
LAN	1 on the rear panel, 10/100 Base-T, supporting LXI-C
Web Remote Control	Supports Web Control interface (input the IP address of the oscilloscope into the Web browser to display the operation interface of the oscilloscope)
AFG OUT	Waveform Output 2 on the rear panel, BNC connector
	1 on the rear-panel, BNC connector
	Vo (H) \geq 2.5 V open circuit, \geq 1.0 V 50 Ω to GND
Interface	Vo (L) \leq 0.7 V to load \leq 4 mA, \leq 0.25 V 50 Ω to GND
AUX OUT	rise time \leq 1.5 ns
Output	Trig Out Outputs a pulse signal when the oscilloscope is triggered
	Outputs a pulse signal when a pass/fail event occurs.
Pass/Fail	Supports user-defined pulse polarity and pulse time (100 ns to 10 ms)
HDMI HD	Video Output 1 on the rear panel, HDMI 1.4, A plug. Used to connect to an external monitor or projector

I/O

Probe Compensation Output	1 kHz frequency, 0 to 3 V _{pp} amplitude, Square, rise time < 1 μ s
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Power Supply**Power Supply**

Power Interface	Type-C interface
Power Voltage	DC 20 V, 5 A
Power	70 W (connect to various interfaces, USB)

Environment**Environment**

Temperature Range	Operating	0°C to +50°C
	Non-operating	-30°C to +60°C
Humidity Range	Operating	below +30°C: ≤90% RH (without condensation)
	Operating	+30°C to +40°C, ≤75% RH (without condensation)
	Non-operating	+40°C to +50°C, ≤45% RH (without condensation)
Altitude	Operating	below 60°C: ≤90% RH (without condensation)
	Non-operating	Below 3,000 m
		Below 15,000 m

Warranty and Calibration Interval**Warranty and Calibration Interval**

Warranty	Three years for the mainframe, excluding the probes and accessories.
Recommended Calibration Interval	18 months

Regulations

Regulations

Compliant with EMC DIRECTIVE 2014/30/EU, compliant with or higher than the standards specified in IEC 61326-1:2013/EN 61326-1:2013 Group 1 Class A

CISPR 11/EN 55011

IEC 61000-4-2:2008/EN 61000-4-2 ± 4.0 kV (contact discharge), ± 8.0 kV (air discharge)

IEC 61000-4-3:2002/EN 61000-4-3 3 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 2 GHz); 1 V/m (2.0 GHz to 2.7 GHz)

Electromagnetic Compatibility

IEC 61000-4-4:2004/EN 61000-4-4 1 kV power line

IEC 61000-4-5:2001/EN 61000-4-5 0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage)

IEC 61000-4-6:2003/EN 61000-4-6 3 V, 0.15-80 MHz

IEC 61000-4-11:2004/EN 61000-4-11 Voltage dip: 0% UT during half cycle; 0% UT during 1 cycle ; 70% UT during 25 cycles
short interruption: 0% UT during 250 cycles

EN 61010-1:2019

EN 61010-031:2015

IEC 61010-1:2016

IEC 61010-2-030:2017

Safety

UL 61010-1:2012 R7

UL 61010-2-31:2017 R2

CAN/CSA-22.2 No. 61010-1-12:2017

CAN/CSA-22.2 No. 61010-2-30:2018

CAN/CSA-22.2 No. 61010-031-07:201

Vibration

Meets GB/T 6587; class 2 random

Meets MIL-PRF-28800F and IEC60068-2-6; class 3 random

Regulations

	Meets GB/T 6587-2012; class 2 random
Shock	Meets MIL-PRF-28800F and IEC 60068-2-27; class 3 random
	In non-operating conditions: 30 g, half-sine wave, 11 ms duration, 3 shocks along the main axis, total of 18 shocks

Mechanical Characteristics**Mechanical Characteristics**

Dimensions	265.35 mm (W) x 161.75 mm (H) x 77.38 mm (D)
Weight ^[13]	Package excluded: approximately 1.6 kg

Weight ^[13]	Package included: approximately 2.6 kg
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Non-volatile Memory**Non-volatile Memory**

	Setup/Image	setup (*.stp), image (*.png, *.bmp, *.jpg)
Data/File Storage	Waveform Data	CSV waveform data (*.csv), binary waveform data (*.bin), list data (*.csv), and reference waveform data (*.ref)
Internal Capacity		32 GB
Reference Waveform		Displays 10 internal waveforms
Setting		Storage is limited by the capacity
USB Capacity		Supports the USB storage device that conforms to the industry standard

Note:

- [1]: Single-channel mode: If any one of the channels is enabled, it is called single-channel mode.
- [2]: Half-channel mode: If any two channels are enabled, it is called half-channel mode.
- [3]: All-channel mode: If all of the channels are enabled or any three of the channels are enabled, it is called all-channel mode.
- [4]: Optional configuration of AFG100 (2-channel, 100 MHz, 1 GSa/s Function/Arbitrary Waveform Generator) or AFG50 (2-channel, 50 MHz, 1 GSa/s Function/Arbitrary Waveform Generator).
- [5]: The optional two-channel Function/Arbitrary Waveform Generator (AFG) supports Bode plot function.
- [6]: Single-channel mode, recording mode, 20 ns/div, 1 kpts memory depth (or Auto memory depth).
- [7]: 10 MHz signal input, 100 mV/div.
- [8]: 200 μ V/div and 500 μ V/div is a magnification of 1 mV/div setting. For vertical accuracy calculations, use full scale of 8 mV.
- [9]: For any channel, under the same input impedance with DC-coupled, the Volts/div setting is the same for 100 mV/div and 200 mV/div.
- [10]: The channel-to-channel skew is ± 5 ns when the sample rate of the digital channel is 1 GSa/s and the period is 1 ns.
- [11]: The digital channels are available to choose when the logic analyzer probe is connected.
- [12]: The stop frequency shall be greater than the start frequency.

Order Information and Warranty Period

Order Information

Order Information	Order No.
Model	
800 MHz, 4 GSa/s, 100 Mpts, 4-CH digital oscilloscope	MHO984
500 MHz, 4 GSa/s, 100 Mpts, 4-CH digital oscilloscope	MHO954
350 MHz, 4 GSa/s, 100 Mpts, 4-CH digital oscilloscope	MHO934
Standard Accessory	
Power Adapter Conforming to the Standard of the Destination Country	— —
Ground Cable	— —
USB Cable	— —
4 Passive Probes (350 MHz) (Standard Configuration for MHO934)	PVP2350
4 Passive Probes (500 MHz) (Standard Configuration for MHO984 and MHO954)	RP3500A
Performance Upgrade Option	
500 Mpts Memory Depth Option	MHO900-RLU-05
350 MHz-500 MHz Bandwidth Upgrade Option	MHO900-BWU03T05
350 MHz-800 MHz Bandwidth Upgrade Option	MHO900-BWU03T08
500 MHz-800 MHz Bandwidth Upgrade Option	MHO900-BWU05T08
Function Upgrade Option	
50 MHz Function/Arbitrary Waveform Generator (AFG) option (Bode plot supported)	MHO900-AFG50

Order Information	Order No.
100 MHz Function/Arbitrary Waveform Generator (AFG) option (Bode plot supported)	MHO900-AFG100
Audio Serial Bus Trigger and Analysis Option	MHO900-AUDIOA
CAN Serial Bus Analysis with Flexible Data Rate	MHO900-AUTOA
FlexRay Serial Bus Trigger and Analysis Option	MHO900-FlexA
MIL-STD-1553 Bus Trigger and Analysis Option	MHO900-AEROA
Function and Application Bundle Options, including AFG100, AUDIOA, AUTOA, FlexA, and AEROA.	MHO900-BND
Recommended Accessories	
16-channel Logic Analyzer Probe	PLA2216
Portable Instrument Bag	BAG-800

NOTE:

For all the mainframes, accessories, and options, please contact the local office of RIGOL.

Warranty Period

Three years for the mainframe, excluding the probes and accessories.