

MHO2000 Series

Digital Oscilloscope

Data Sheet

DSA44100-1110 Mar. 2025

Product Features

Product Features

- Based on RIGOL's brand new self-developed Centaurus technical platform
- 12-bit resolution^[1]
- Max. 350 MHz bandwidth, 4 analog channels, and 1 external trigger channel
- Standard configuration of 16 digital channels (required to purchase the logic analyzer probe)
- Real-time sample rate: up to 2 GSa/s
- Max. memory depth 500 Mpts
- Vertical sensitivity up to 200 μV/div
- Max. waveform capture rate of 1,000,000 wfms/s (in fast recording mode)
- Arbitrary/Function Waveform Generator (AFG)^[2], power analysis, histogram, digital signal analysis, Bode plot, and protocol decodings
- Search and navigation functions enable users to quickly search for the signals with exceptions and locate them accurately
- 256-level intensity grading display, with digital real-time fluorescence technology
- 10.1" 1280*800 high-definition touch screen
- Brand new Flex knob brings friendly user experience
- Standard configuration of USB Device, USB Host, LAN, HDMI interfaces
- Battery pack-powered, convenient to charge anytime and anywhere, providing great feasibility for measurement
- Online upgrade
- Standard configuration of the photoelectric encoder operating knob to improve the service life of the instrument

The MHO2000 series is a high-resolution 4-CH digital oscilloscope designed for the vast mainstream digital oscilloscope market to meet the design, debugging, and test demands. It is developed based on RIGOL's brand new self-developed Centaurus technical platform. Its 1,000,000 wfms/s waveform capture rate (in fast recording mode), 500 Mpts memory depth, 12-bit resolution, excellent noise floor and vertical measurement accuracy can meet the test demands for higher accuracy. The MHO2000 series digital oscilloscope supports AFG, digital signal analysis, Bode plot, and other functions. It is powered by battery pack, applicable for various complex test scenarios.

Note:

[1]: Up to 16-bit in high resolution mode

[2]: AFG is the optional configuration.

Overview of RIGOL's Mediumend Series Products

	DHO1000U	DHO1000	DHO4000	MHO/ DHO5000	мно2000
Analog channel	2/4 + EXT	2/4 + EXT	4 + EXT	4/6/8 + EXT	4 + EXT
Digital Channel	N/A	N/A	N/A	Standard for MHO5000 series	Standard
Analog Bandwidth	200 MHz	200 MHz	800 MHz	1 GHz	350 MHz
Max. Sample Rate	2 GSa/s	2 GSa/s	4 GSa/s	4 GSa/s	2 GSa/s
Max. Memory Depth	50 Mpts	100 Mpts (option)	500 Mpts (option)	500 Mpts	500 Mpts
Waveform Capture Rate	≤ 500,000 wfms/s	≤ 1,500,000 wfms/s	≤ 1,500,000 wfms/s	≤ 1,000,000 wfms/s	≤ 1,000,000 wfms/s
Max. Frames of Waveform Recording	500,000	500,000	500,000	500,000	500,000
LCD	10.1" High- Definition Touch Screen				
Hardware Mask Test	Standard	Standard	Standard	Standard	Standard
Built-in Arbitrary Waveform Generator	N/A	N/A	N/A	Option	Option
Built-in Digital Voltmeter	Standard	Standard	Standard	Standard	Standard
Built-in Hardware Counter	6-digit frequency counter + totalizer				
Search and Navigation	Supports table display				
Power Analysis	N/A	N/A	Option	Option	Option
Histogram	N/A	N/A	N/A	Standard	Standard

	DHO1000U	DHO1000	DHO4000	MHO/ DHO5000	МНО2000
Serial Protocol Analysis	RS232/UART, I2C, SPI, CAN, CAN-FD, LIN, FlexRay, I2S, and MIL- STD-1553				
Waveform Color Persistence	Standard	Standard	Standard	Standard	Standard
FFT	FFT, standard				
MATH	Displays 4 functions at the same time				
Connectivity	Standard: USB, LAN, and HDMI				

RIGOL Probes and Accessories Supported by the Series

Model	Туре	Description
Passive High-imped	ance Probe	
PVP2150	Passive High- impedance Probe	 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
PVP2350	Passive High- impedance Probe	 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
PVP3150	Passive High- impedance Probe	 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
RP3500A	Passive High- impedance Probe	 Attenuation Ratio: 10:1 BW: DC to 500 MHz Compatibility: MSO/DS7000, MSO8000/A, DHO4000/1000, MHO/DHO5000, MHO2000, and DS70000/80000 series
High-voltage Single	-ended Probe	
RP1010H	High-voltage Probe	 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	Туре	Description
RP1018H	High-voltage Probe	 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
Р1300Н	High-voltage Probe	 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 Differ	ential Probe	
рна0150	High-voltage Differential Probe	 BW: DC to 70 MHz Max. voltage ≤ 1500 Vpp Compatibility: All models of RIGOL's digital oscilloscopes
PHA1150	High-voltage Differential Probe	 BW: DC to 100 MHz Max. voltage ≤ 1500 Vpp Compatibility: All models of RIGOL's digital oscilloscopes
PHA2150	High-voltage Differential Probe	 50X BW: DC to 160 MHz 500X BW: DC to 200 MHz Max. voltage ≤ 1500 Vpp Compatibility: All models of RIGOL's digital oscilloscopes
- *** 🚑 6 6 6 0 RP1025D	High-voltage Differential Probe	 BW: DC to 25 MHz Max. voltage ≤ 1400 Vpp (DC + AC P-P) Compatibility: All models of RIGOL's digital oscilloscopes
RP1050D	High-voltage Differential Probe	 BW: DC to 50 MHz Max. voltage ≤ 7000 Vpp (DC + AC P-P) Compatibility: All models of RIGOL's digital oscilloscopes

Model	Туре	Description
RP1100D	High-voltage Differential Probe	 BW: DC to 100 MHz Max. voltage ≤ 7000 Vpp (DC + AC P-P) Compatibility: All models of RIGOL's digital oscilloscopes
Low-voltage Diffe	rential Probe	
RP7080	Low-voltage Differential Probe	 Input Dynamic Range: ±6.25 V BW: DC to 800 MHz 30 Vpeak CAT I Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
RP7150	Low-voltage Differential Probe	 Input Dynamic Range: ±6.25 V BW: DC to 1.5 GHz 30 Vpeak CAT I Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
PVA7250	Low-voltage Differential Probe	 Input Dynamic Range: ±2 V BW: DC to 2.5 GHz 30 Vpeak CAT I Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
Low-voltage Single	e-ended Probe	
RP7080S	Single-ended Active Probe	 Input Dynamic Range: ±6.25 V BW: DC to 800 MHz 30 Vpeak CAT I Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
RP7150S	Single-ended Active Probe	 Input Dynamic Range: ±6.25 V BW: DC to 1.5 GHz 30 Vpeak CAT I Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series

Model	Туре	Description
PVA8150S	High-impedance Single-ended Active Probe	 BW: ≥1.5 GHz Input Impedance: 1 MΩ Input Capacitance: ≤1 pF Compatibility: MSO8000/A, DHO4000/1000, MHO/DHO5000, MHO2000, and DS70000/80000 series
Current Probe		
PCA1030	Current Probe	 BW: DC to 50 MHz (-3 dB) Max. continuous input range: 30 Arms Max. peak-peak current value: 50 A peak, non-continuous Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
PCA1150	Current Probe	 BW: DC~10 MHz (-3 dB) Max. continuous input range: 150 A Max. peak-peak current value: 300 A (non-continuous), 500 A (pulse width ≤ 30 μs) Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
PCA2030	Current Probe	 BW: DC to 100 MHz (-3 dB) Max. continuous input range: 30 Arms Max. peak-peak current value: 50 A peak, non-continuous Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series
PCA1500	Current Probe	 BW: DC~2 MHz (-3 dB) Max. continuous input range: 500 Arms Max. peak-peak current value: 700 A peak, non-continuous Compatibility: MSO/DS7000, MSO8000/A, DHO4000, MHO/DHO5000, MHO2000, and DS70000/80000 series

 BW: DC to 300 kHz Maximum Input AC: ±100 A AC P-P: 200 A AC P.P: 140 A AC P.P: 140 A AC P.P: 140 A AC RMS: 50 A Compatibility: All models of RIGOL's digita oscilloscopes BW: DC to 50 MHz Maximum Input AC P.P: 50 A (non-continuous) AC RMS: 30 A Compatibility: All models of RIGOL's digita oscilloscopes Required to order RP1000P power supply. BW: DC to 100 MHz Maximum Input AC P.P: 50 A (non-continuous) AC C P.P: 50 A (non-continuous) AC P.P: 50 A (non-continuous) AC RMS: 30 A Compatibility: All models of RIGOL's digita oscilloscopes Required to order RP1000P power supply. BW: DC to 10 MHz Maximum Input AC P.P: 300 A (non-continuous), 500 A (@pulse width ≤ 30 us) AC RMS: 150 A Compatibility: All models of RIGOL's digita oscilloscopes Required to order RP1000P power supply. 	Model	Туре	Description
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RP1005C AC RMS: 150 A RP1005C Compatibility: All models of RIGOL's digita oscilloscopes	200	Current Probe	
• Required to order RP1000P power supply.	RP1005C		 Compatibility: All models of RIGOL's digita oscilloscopes

Model	Туре	Description
RP1006C	Current Probe	 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.
RICOL	4-CH Power Supply	Power supply for RP1003C, RP1004C, RP1005C, and RP1006C; supporting 4 channels.
Optical-fiber Isolated Pr	robe	
PIA1000	Optical-fiber Isolated Probe	 CMRR up to 180 dB BW: DC to 1 GHz 2-meter length fiber transmission cable (Std.) Compatibility: MHO/DHO5000 and MHO2000 series
Logic Analyzer Probe		
	Active Logic Analyzer Probe	 No. of Input Channels: 4 Threshold Range: ±15 V Min. Voltage Swing: 500 mVpp Min. Detectable Pulse Width: 5 ns Max. Input Voltage: ±40 Vpp Max. Input Dynamic Range: ±10 V + Threshold Input Impedance: 100 kΩ ± 1% Input Capacitance: about 11 pF Compatibility: MHO5000 and MHO2000 series

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.

Overview of the MHO2000 Series Technical Specifications

Model	MHO2024 MHO2034		
Analog bandwidth (50 Ω, -3 dB)	200 MHz	350 MHz	
Analog bandwidth (1 MΩ, -3 dB)	200 MHz	350 MHz	
Calculated Rising Time under 50 Ω (10%-90%, typical)	2 ns	1.4 ns	
No. of Input Channels	4 analog channels + 1 EXT chan	nel	
Max. Sample Rate of Analog Channel	2 GSa/s		
Max. Memory Depth	500 Mpts (half-channel ^[1]) 250 Mpts (full-channel ^[2])		
Sampling Mode	Real-time Sampling		
Max. Waveform Capture Rate	e Rate 200,000 wfms/s (in Vector mode) 1,000,000 wfms/s (in Record mode)		
Vertical Resolution	12-bit (up to 16-bit in high resolution mode)		
Max. Frames of Waveform Recording	Max. 500,000 frames		
Peak Detection	Captures 500 ps glitches		
LCD Size and Type	10.1" capacitive multi-touch screen		
Display Resolution	solution 1280×800		

Vertical System Analog Channel

Vertical System Analo	g Channel		
Input Coupling		DC, AC, or GND	
Input Impedance		1 MΩ ± 1%, 50 Ω ± 1%	
Input Capacitance		19 pF ± 3 pF	
Probe Ratio	Voltage Probe	0.001X, 0.002X, 0.003X, 0.005X, 0.01X, 0.02X, 0.03X, 0.05X, 0.1X, 0.2X, 0.3X, 0.5X, 1X, 2X, 3X, 5X, 10X, 20X, 30X, 50X, 100X, 200X, 300X, 500X, 1000X, 2000X, 3000X, 5000X, 10000X, 20000X, 30000X, 50000X, User	
	Current Probe	0.001 V/A, 0.002 V/A, 0.003 V/A, 0.005 V/A, 0.01 V/A, 0.02 V/A, 0.03 V/A, 0.05 V/A, 0.1 V/A, 0.2 V/A, 0.3 V/A, 0.5 V/A, 1 V/A, 2 V/A, 3 V/A, 5 V/A, 10 V/A, User	
Probe Recognition		Auto-recognized RIGOL probe	
	1 MΩ	CAT I 300 V _{rms} , 400 V _{pk} (DC + V _{peak})	
	50 Ω	5 V _{rms}	
Maximum Input Voltage	Remarks	Whether the probe is used, the 50 Ω or 1 M Ω route does not allow transient overvoltage to occur.	
		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)		
Vertical Sensitivity	1 MΩ	200 µV/div to 10 V/div	
Range ^[3]	50 Ω	200 µV/div to 1 V/div	
Offset Range	1 ΜΩ	±1 V (≥1 mV/div, ≤65 mV/div) ±10 V (>65 mV/div, ≤270 mV/div) ±20 V (>270 mV/div, ≤2.75 V/div) ±100 V (>2.75 V/div, ≤10 V/div)	
	50 Ω	±1 V(≥1 mV/div, ≤135 mV/div) ±4 V(>135 mV/div)	
Dynamic Range		±4 div (12-bit)	

Vertical System Analog Channel	
	MHO2024: 20 MHz, FULL; selectable for each channel
Bandwidth Limit	MHO2034: 20 MHz, 250 MHz, FULL; selectable for each channel
(Typical)	 The bandwidth limit is automatically set to 250 MHz when the vertical scale is ≤500 μV. The bandwidth limit is automatically set to 20 MHz when the vertical scale is ≤200 μV.
DC Gain Accuracy ^[3]	±2% (<5 mV); ±1% (≥5 mV)
DC Offset Accuracy	\leq 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	MHO2024: ≥100:1 (DC to 200 MHz) MHO2034: ≥100:1 (DC to 350 MHz)
ESD Tolerance	±8 kV (on input BNCs)

Vertical System Digital Channel

Vertical System Digital Chann	Vertical System Digital Channel			
Number of Channels	16 input channels (D0 to D15) (D0 to D3, D4 to D7, D8 to D11, D12 to D15)			
Threshold Range	±15.0 V, in 10 mV step			
Threshold Accuracy	±(100.00 mV + 3% of threshold setting)			
Threshold Selection	TTL(1.4 V), CMOS5.0(2.5 V), CMOS3.3(1.65 V), CMOS2.5(1.25 V), CMOS1.8(0.9 V), ECL(-1.3 V), PECL(3.7 V), LVDS(1.2 V), 0.0 V User (adjustable threshold for 4 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	100 kΩ ± 1%			
Probe Load	≈11 pF			
Vertical Resolution	1-bit			

Horizontal System--Analog Channel

Horizontal SystemAnalog Channel		
Range of Time Base		MHO2024: 2 ns/div~500 s/div MHO2034: 1 ns~500 s/div
		Fine adjustment supported
Time Base Resolution		100 ps
Time Base Accuracy		±1.5 ppm ± 1 ppm/year
Time Base Delay	Pre-trigger	-5 div
Range	Post-trigger	1 s or 100 div, whichever is greater
Delta Time Accuracy		\pm (Time Base Accuracy x Readout) \pm (0.001 x Screen Width) \pm 20 ps
Channel-to-Channel Skew Correction		Channel-to-Channel Skew Correction Range ±100 ns, Accuracy ± 1 ps
Analog Channel-to-Channel Delay (Typical)		≤200 ps ^[4]
	YT	Default
	ХҮ	Channel 1/2/3/4
Horizontal Mode	SCAN	Time base ≥ 200 ms/div
	ROLL	Time base \ge 50 ms/div or \ge 100 ms/div, available to enter or exit the ROLL mode by rotating the Horizontal SCALE knob

Acquisition System

Acquisition System	
Max. Sample Rate of Analog Channel	2 GSa/s (full-channel ^[2])
Max. Memory Depth of Analog Channel	500 Mpts (half-channel ^[1]), 250 Mpts (full-channel ^[2])

Acquisition System Normal Default Peak Captures 500 ps glitches Detection Average 2, 4, 8, 16...65536 are available for you to choose Mode Acquisition Mode High 14-bit, 16-bit Resolution Waveform Waveform capture rate up to 1,000,000 wfms/s Recording Vector Mode Waveform capture rate ≤ 200,000 wfms/s

Trigger System

Trigger System		
Trigger Source		Analog channel (1~4), EXT TRIG, AC Line
Trigger Mode		Auto, Normal, Single
Trigger Coupling	DC	DC coupling trigger
	AC	AC coupling trigger, cut-off frequency to 16 kHz (internal trigger only)
	High Frequency Rejection	High frequency rejection, cut-off frequency~200 kHz (internal trigger only)
	Low Frequency Rejection	Low frequency rejection, cut-off frequency~180 kHz (internal trigger only)
Noise Rejection		Increases delay for the trigger circuit (internal trigger only), On/Off
Holdoff Range		8 ns to 10 s
Trigger Bandwidth	Internal Trigger	Analog Bandwidth
	External Trigger	200 MHz

Trigger System		
Trigger Sensitivity	Internal Trigger	0.50 div, ≥50 mV/div 0.7 div (with noise rejection enabled)
	External Trigger	200 mVpp, DC to100 MHz 500 mVpp, 100 MHz to 200 MHz
EXT TRIG	Input Impedance	1 M Ω ± 1%, BNC connector
	Trigger Jitter (Typical)	<1 ns _{rms} Normal acquisition, Edge trigger, trigger level located near 50% of EXT input signal
Trigger Level Range	Internal Trigger	± 5 div from the center of the screen
	External Trigger	±5 V
	AC Line	Trigger level fixed between 40% and 60%

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, I2C trigger, SPI trigger, RS232/ UART trigger, and CAN trigger
	Option: CAN-FD trigger, LIN trigger, FlexRay trigger, I2S trigger, and MIL- STD-1553 trigger
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, and AC Line
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.
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.

Trigger Type		
Video	Triggers on all lines, specified line, add 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/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.	
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.	
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.	
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.	
Duration	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.	
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.	
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.	
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.	

ame Data, Data&ID, Frame Error, Bit Fill, Answer Error, Check Error, Format	
and Timeout are supported. urce channel: CH1 to CH4, D0 to D15. ggers on the start of a frame, end of a frame, Remote ID, Overload, Frame ID, ame Data, Data&ID, Frame Error, Bit Fill, Answer Error, Check Error, Format	
ame Data, Data&ID, Frame Error, Bit Fill, Answer Error, Check Error, Format	
Triggers on the start of a frame, end of a frame, Remote ID, Overload, Frame ID, Frame Data, Data&ID, Frame Error, Bit Fill, Answer Error, Check Error, Format Error, and Random Error of the CAN signal (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.	
HO2000-AUTOA option	
Triggers on the start of a frame, end of a frame, Remote ID, Overload, Frame ID, Frame Data, Data&ID, Frame Error, Bit Fill, Answer Error, Check Error, Format Error, and Random Error of the CAN-FD signal (up to 10 Mb/s). The supported CAN-FD bus signal types include CAN_H, CAN_L, TX/RX, and DIFF.	
urce channel: CH1 to CH4, D0 to D15.	
HO2000-FLEXA option	
ggers on the specified position (TSS End, FSS_BSS End, FES End, DTS End), me (null, Syn, Start, All), symbol (CAS/MTS and WUS), error (Head CRC Err, I CRC Err, Decode Err, and Random Err) of the FlexRay signal (up to 10 Mb/s). urce channel: CH1 to CH4, D0 to D15.	
HO2000-AUTOA option	
Triggers on the Sync, ID, Data (length settable), Data&ID, Wakeup, Sleep, and Error of the LIN bus signal (up to 20 Mb/s).	
urce channel: CH1 to CH4, D0 to D15.	
HO2000-AUDIOA option	
Triggers on 2's complement data of audio left channel, right channel, or either channel (=, \neq , >, <, <>, ><). The available alignment modes include I2S, LJ, and RJ.	
urce channel: CH1 to CH4, D0 to D15.	
HO2000-AEROA option	
ggers on Sync (Data Sync, Cmd/Status Sync, and All Sync), Data, RTA, RTA 1Bit, and Error (Sync Error and Check Error) of the MIL-STD-1553 bus. urce channel: CH1 to CH4, D0 to D15.	

Search & Navigation

Search & Navigation		
Туре	Edge, Pulse	
Source	Analog channel	
Сору	Copies the search settings from or to the trigger settings mutually, including threshold setting and search condition settings	
Result Display	Displays in event table form; can be exported to the external or internal memory	
	Time navigation: navigates to the acquired waveforms in time order.	
Navigation	Event navigation: uses the navigation keys to scroll through the event search results and navigates to the specified event.	

Waveform Measurement

Waveform Measu	irement	
	Number of Cursors	2 pairs of XY cursors
		Voltage deviation between cursors (ΔY)
	Manual Mode	Time deviation between cursors (ΔX)
Cursor		Reciprocal of ΔX (Hz) (1/ ΔX)
	Track Mode	Fixes Y-axis to track X-axis waveform point's voltage and time values
		Fixes 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		
	Number of Measurements	41 auto measurements; and up to 14 measurements can be displayed at a time.
	Measurement Source	CH1~CH4, D0~D15, Math1~Math4
	Measurement Range (Region)	Main, Zoom
Auto Measurement	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, 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, Tvmax, Tvmin, +Slew Rate, and -Slew Rate
	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; 4 math functions available to be displayed at a 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

Waveform Calcula	ation	
FFT	Record Length	Max. 1 Mpts
	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		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.	
Recording	Source	All enabled analog channels and digital channels	
	Analysis	Supports playing waveforms frame by frame or continuous playing; capable of calculating, measuring, and decoding the played waveforms	
PassFail		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.	
	Source	Any analog channel	
Color Grade		Provides a dimensional view for color grade waveforms, color grade >16, 256-level color scale display	
	Source	Any analog channel	
	Color Theme	Temperature and intensity	
	Mode	Supports all modes	

Serial Decoding

Serial Decoding	
Number of Decodings	Four protocol types can be decoded and enabled at the same time

Serial Decoding		
D I I	Standard: Parallel, RS232/UART, I2C, SPI, and CAN	
Decoding Type	Option: LIN, CAN-FD, FlexRay, I2S, and MIL-STD-1553	
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	
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.	
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.	
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.	
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, Math1 to Math4.	
	MHO2000-AUTOA option	
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-FD bus signal types include CAN_H, CAN_L, TX/RX, and DIFF.	
	Source channel: CH1 to CH4, D0 to D15, Math1 to Math4.	
	MHO2000-AUTOA option	
LIN (Option)	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.	
FlexRay (Option)	MHO2000-FLEXA 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.	

Serial Decoding		
	MHO2000-AUDIOA option	
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.	
	MHO2000-AEROA option	
MIL-STD-1553 (Option)	Decodes the MIL-STD-1553 bus signal's data word, command word, and status word (address + last 11 bits).	
	Source channel: CH1 to CH4, D0 to D15.	

Bode Plot^[5]

Bode Plot	
Start Freq	10 Hz to 3 MHz
Stop Freq ^[6]	100 Hz to 30 MHz
Points/Decade	10 to 100
Output Amplitude	20 mV to 10 V (1 MΩ); 10 mV to 5 V (50 Ω)

Arbitrary/Function Waveform Generator (AFG)^[7]

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	50 MHz	
	Basic waveforms: Sine, Square, Pulse, Ramp, and Noise	
Output Waveform	Built-in waveforms: DC, Sinc, Exp.Rise, Exp.Fall, ECG1, Gauss, Lorentz, and Haversine	
2-CH Synchronization Accuracy	200 ps	

AFG (technical specifications are typical values)

Sine	Frequency Range	1 μHz to 50 MHz
	Flatness	±0.5 dB (relative to 1 kHz)
	Harmonic Distortion	-40 dBc
	Spurious (non- harmonics)	-40 dBc
	Total Harmonic Distortion	<1%
	S/N Ratio	40 dB
	Frequency Range	1 μHz to 20 MHz
	Rise/Fall Time	≥9 ns(10%-90%), adjustable
	Overshoot	<4%
Square/Pulse	Pulse Width	≥10 ns
	Duty	10%-90% or 10 ns, whichever is greater
	Jitter (rms)	500 ps
	Frequency Range	1 μHz to 2 MHz
Ramp	Linearity	1%
	Symmetry	0.1% to 99.9%
Noise	Cut-off Bandwidth	40 MHz
Free	Accuracy	100 ppm
Freq	Resolution	0.1 Hz or 4-bit, whichever is greater
	Output Range	2 mVpp to 10 Vpp (1 M Ω); 1 mVpp to 5 Vpp (50 Ω)
Amplitude	Resolution	100 μ V or 3-bit, whichever is greater
	Accuracy	±(2% of setting + 1 mV) (Frequency = 1 kHz)

DC Offset	Range	-10 V to +10 V
	Resolution	100 μ V or 3-bit, whichever is greater
	Accuracy	\pm (2% of offset setting + 5 mV + 0.5% of amplitude)
	AM	Modulating waveform: Sine, Square, Triangle, UpRamp, DnRamp, Noise
		Carrier waveform: Sine, Square, Ramp, and built-in waveforms
	,	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, and built-in waveforms
Modulation	FM	Modulation Source: Internal
Modulation	ΓIVI	Frequency Deviation: 0 Hz to 1 kHz (limited by the carrie frequency setting; the sum of the frequency deviation an carrier frequency shall not exceed the upper limit of the carrier frequency)
		Modulation Frequency: 2 mHz to 1 MHz
	PM	Modulating Waveform: Sine, Square, Triangle, UpRamp, DnRamp, Noise
		Carrier Waveform: Sine, Square, Ramp, and built-in waveforms
		Modulation Source: Internal
		Phase Deviation: 0° to 360°, default 90%
		Modulation Frequency: 2 mHz to 1 MHz

AutoAutoScaleMin voltage > 10 mVpp, duty cycle > 1%, frequency > 35 Hz

Digital Voltmeter

Digital Voltmete	er
Source	Any analog channel
Function	DC, AC+DC _{rms} , AC _{rms}
Resolution	ACV/DCV: 4 bits
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, digital channel, and EXT
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
Disalara	

Display

Display	
LCD	10.1-inch capacitive multi-touch screen, gesture enabled operation
Resolution	1280×800 (Screen Region) 16:9

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Display

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

Processor System

Processor System	
Processor	Cortex-A72 1.8GHz + Cortex-A53 1.4GHz 6-core
System Memory	4 GB RAM
Operating System	Android
Internal Non-volatile Memory	128 GB

I/O

I/O		
USB3.0 Host		1 on the front panel
USB3.0 Device		1 on the rear panel
LAN		1 on the rear panel, 10/100/1000 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)
		BNC output on the rear panel.
		Vo (H) \ge 2.5 V open circuit, \ge 1.0 V 50 Ω to GND
		Vo (L) \leq 0.7 V to load \leq 4 mA, \leq 0.25 V 50 Ω to GND
AUX Out	Trig Out	Outputs a pulse signal when the oscilloscope is triggered
	Pass/Fail	Outputs a pulse signal when a pass/fail event occurs. Supports user-defined pulse polarity and pulse time (100 ns to 10 ms)
	Rise Time	≤1.5 ns

I/O		
10 MHz Reference Clock Input/Output	Input Interface	1, BNC connector on the rear panel
	Output Interface	1, BNC connector on the rear panel
	Input Interface	50 Ω , with the amplitude 130 mVpp to 4.1 Vpp (-10 dBm, 20 dBm), frequency 10 MHz \pm 10 ppm
	Output Interface	50 Ω, 1.5 Vpp sine waveform
HDMI HD	Video Output	1 on the rear panel, HDMI 1.4, A plug. Used to connect to an external monitor or projector
Probe Compensation Output		1 kHz frequency, 0.3 V amplitude, Square

Power Supply

Power Supply	
Power Voltage	AC 100 V to 240 V, 50 Hz to 60 Hz
Power	Max. 400 VA (connect to various interfaces, USB, active probes)
Fuse	5 A, T degree, 250 V

Environment

Environment		
Temperature Range	Operating	-10°C to +50°C
	Non-operating	-30°C to +60°C
Humidity Range	Operating	below +30°C: ≤90% RH (without condensation)
		+30°C to +40°C, \leq 75% RH (without condensation)
		+40°C to +50°C, \leq 45% RH (without condensation)
	Non-operating	below 60°C: ≤90% RH (without condensation)
Altitude	Operating	below 3,000 m
	Non-operating	Below 15,000 m

Warranty and Calibration Interval

Warranty and Calibra	tion 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		
Electromagnetic Compatibility	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)	
	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	

Regulations		
	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	
VIDIATION	Meets MIL-PRF-28800F and IEC60068-2-6; class 3 random	
	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	335 mm (W) x 235 mm (H) x 154 mm (D)	
Rack Mount Kit	5U	
Weight ^[8]	Package excluded: 5.3 kg; package included: 6.3 kg	

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, *.csv, *.bin)
Internal Capacity		128 GB
Reference Waveform		Displays 10 internal waveforms
Setting		Storage is limited by the capacity

Non-volatile Memory

USB Capacity

Supports the USB storage device that conforms to the industry standard

NOTE:

[1]: Half-channel: when CH1 and CH3 are both enabled; or when CH2 and CH4 are both enabled, it is called half-channel mode.

[2]: Full-channel mode: If all of the channels are enabled, it is called full-channel mode.

[3]: 500 µV/div is a magnification of 1 mV/div setting. For vertical accuracy calculations, use full scale of 8 mV.

[4]: 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.

[5]: The Bode plot is only available to use when you have installed the AWG option.

[6]: The stop frequency shall be greater than the start frequency.

[7]: optional configuration. It is only available when you have installed the Arbitrary/Function Waveform Generator (AFG) option.

[8]: Standard configuration.

Order Information and Warranty Period

Order Information

Order Information	Order No.		
Model			
200 MHz, 2 GSa/s, 12-bit, 4-CH	MHO2024		
350 MHz, 2 GSa/s, 12-bit, 4-CH	MHO2034		
Standard Accessories			
Power Cord Conforming to the Standard of the Destination Country			
USB Cable			
Passive High-impedance Probe x4	PVP2350		
Recommended Accessories			
4-Channel Logic Analyzer Probe x4	PLA3204		
Protocol Decoding Option			
CAN-FD/LIN Bus Trigger and Decode Option	MHO2000-AUTOA		
MIL-STD-1553 Bus Trigger and Decode Option	MHO2000-AEROA		
FlexRay Serial Bus Trigger and Decode Option	MHO2000-FLEXA		
I2S Bus Trigger and Decode Option	MHO2000-AUDIOA		
Optional Accessories			
Built-in 2-CH 50 MHz AWG Option	MHO2000-AWG		
Power Analysis Option	MHO2000-PWRA		
Function and Application Bundle Options, including AUTOA/AEROA/FLEXA/AUDIOA/PWRA/AWG.	MHO2000-BND		

Note:

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

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

Option Ordering and Installation Process



Instrument to be Installed with the Option

- According to the usage requirements, please purchase the specified function options from RIGOL
 Sales Personnel, and provide the serial number of the instrument that needs to install the option.
- After receiving the option order, the **RIGOL** factory will mail the paper software product entitlement certificate to the address provided in the order.
- Log in to **RIGOL** official website for registration. Use the software key and instruments serial number provided in the entitlement certificate to obtain the option license code and the option license file.
- 4. Install the option by running the SCPI command concerning the option installation. You can also save the option license file to the root directory of the USB storage device. Then insert it to the instrument. After being recognized, follow the instructions to install the option.

NOTE:

If any problems occur during the option installation process, please contact RIGOL technical team.



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