



RIGOL

# DS80000 Series

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## Digital Oscilloscope

**Data Sheet**  
DSA38100-1110  
Sept. 2024

# Product Overview

DS80000 series high-bandwidth real-time digital oscilloscope is the 8th generation of RIGOL's self-developed oscilloscopes. It provides 13 GHz analog bandwidth, 40 GSa/s real-time sample rate, 4 Gpts memory depth. It supports the compliance analysis of various protocols, helping you locate the problem in high-speed design and address the verification problem.



## Customer Value

### High Performance

- Up to 13 GHz analog bandwidth, powerful high-speed signal analysis;
- Up to 40 Gsa/s real-time sample rate on each channel, powerful signal acquisition capability;
- Up to 4 Gpts memory depth, allowing signal details to be presented clearly.

### High Availability

- The tilt of the 15.6-inch high-definition large touch screen can be electronically adjusted with one button, supporting gesture-enabled operation, multi-pane windowing;
- High-definition smart and quick-responsive shortcut menu display can be extended as a secondary display with user-defined quick operation menu;
- Control with the SCPI command sets;
- Provides USB/LAN/HDMI® interfaces to meet diversified test application scenarios.

### Powerful Analysis Capability

Various advanced analysis functions, compliance analysis tests of various protocols, jitter analysis, etc.



## Typical Application

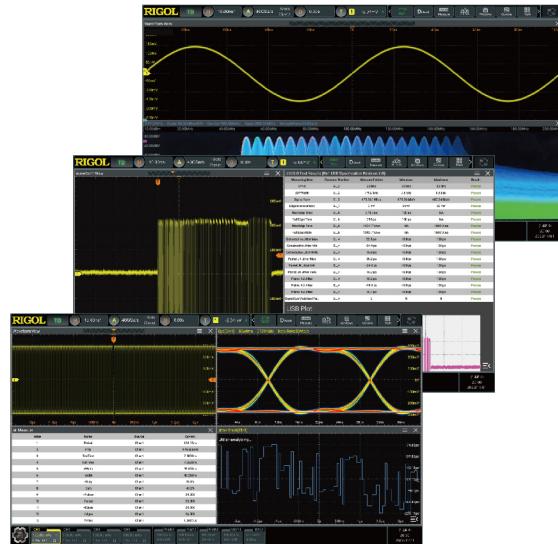
### 1 High-Speed Signal Protocol Compliance Analysis

With the 13 GHz bandwidth and 40 Gsa/s real- time sample rate, the DS80000 series digital oscilloscope can cover more high-speed signal protocol compliance analysis application scenarios, providing more compliance analysis tests such as PCIe, and USB2.0.



### 2 High-Speed Components and System Performance Validation

DS80000 series provides advanced jitter and eye diagram analysis functions, which can be widely applied to the following scenarios such as complex embedded system debugging, high-speed serial and parallel bus performance test, clock jitter, signal integrity, and PLL performance validation.



# Product Features

## Product Features

- Built on RIGOL's brand new core module
- 4 analog channels, 1 EXT channel
- Analog channel bandwidth: Max. 13 GHz
- Up to 40 GSa/s sample rate
- Max. 2 Gpts or 4 Gpts memory depth (opt.)
- Max. waveform capture rate: 250,000 wfms/s
- Vertical resolution: 8-16 bits adjustable
- Vertical sensitivity range: 1 mV/div ~ 1 V/div (50Ω)
- Timebase range: 20 ps/div~1 ks/div
- N-in-1 instrument, including digital oscilloscope, digital voltmeter, 8-digit frequency counter and totalizer, and protocol analyzer (option)
- Various trigger functions: Zone trigger, Edge trigger, Pulse trigger, Slopetrigger, Video trigger, Pattern trigger, Duration trigger, Timeout trigger, Runtrigger, Window trigger, Delay trigger, Setup/Hold trigger, Nth Edge trigger, RS232/UART, I2C, SPI, CAN, FlexRay, LIN, I2S, and MIL-STD-1553
- Various serial bus decodings (opt.): RS232/UART, I2C, SPI, CAN, CAN-FD, FlexRay, LIN, I2S, MIL-STD-1553, USB2.0; 4 decode channels
- Support Ethernet, USB2.0, and other protocol compliance analysis functions
- Auto measurement of 41 waveform parameters; full-memory hardware measurement function
- Various math operations: 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 built-in peak search functions
- Real-time eye diagram and jitter analysis (opt.)
- Recording and playback functions for a maximum of 2,000,000 frames of hardware real-time and ceaseless waveforms
- Multiple interfaces available: USB HOST&DEVICE, LAN(LXI), HDMI, AUX OUT; Web Control supported
- 15.6" HD capacitive multi-touch screen with one-button electronic tilt; multi-pane windowing
- The photoelectric encoder operating knob prolongs its service life, guaranteeing more than 100,000 times of pressing operation and 1 million times of rotation operation, greatly improving its service life
- High-definition smart and quick-responsive shortcut menu display
- Support online upgrade

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# Overview of RIGOL's Medium and High-end Series Products

	MSO8000/A	DS70000	DS80000
<b>Analog Channel</b>	4	4	4
<b>Digital Channel</b>	16	N/A	N/A
<b>Analog Bandwidth</b>	600 MHz to 3 GHz	3 GHz to 5 GHz	6 GHz to 13 GHz
<b>Max. Sample Rate</b>	10 GSa/s	20 GSa/s	40 GSa/s
<b>Max. Memory Depth</b>	500 Mpts	2 Gpts (option)	2 Gpts or 4 Gpts (option)
<b>Waveform Capture Rate</b>	>600,000 wfms/s	>1,000,000 wfms/s	> 250,000 wfms/s
<b>Max. Frames of Waveform Recording</b>	450,000	2,000,000	2,000,000
<b>LCD</b>	10.1" capacitive multi-touch screen	15.6" capacitive multi-touch screen with one-button electronic tilt	15.6" Capacitive multi-touch screen with one-button electronic tilt
<b>Hardware Mask Test</b>	Standard	Standard	Standard
<b>Arbitrary Waveform Generator</b>	2 CH, 25 MHz (opt.)	N/A	N/A
<b>Digital Voltmeter</b>	Standard	Standard	Standard
<b>Hardware Counter</b>	6-digit frequency counter + totalizer	8-digit frequency counter + totalizer	8-digit frequency counter + totalizer
<b>Search and Navigation</b>	Support table display	N/A	Support table display
<b>Power Analysis</b>	Built-in UPA (opt.) + PC	N/A	N/A
<b>Real-time Eye Diagram</b>	Option	Option	Option
<b>Jitter Analysis</b>	Option	Option	Option
<b>Protocol Compliance Analysis</b>	N/A	USB2.0 (opt.), LAN (opt.)	USB2.0 (opt.), LAN (opt.)
<b>Serial Protocol Analysis (Option)</b>	RS232/UART, I2C, SPI, CAN, LIN, FlexRay, I2S, and MIL-STD-1553	RS232/UART, I2C, SPI, CAN, CAN-FD, LIN, FlexRay, I2S, and MIL-STD-1553	RS232/UART, I2C, SPI, CAN, CAN-FD, LIN, FlexRay, I2S, MIL-STD-1553 and USB2.0
<b>Waveform Color Persistence</b>	Standard	Standard	Standard
<b>Histogram</b>	Standard	N/A	Standard
<b>FFT</b>	FFT, standard	FFT, standard	FFT, standard

	<b>MSO8000/A</b>	<b>DS70000</b>	<b>DS80000</b>
<b>MATH</b>	Displays 4 functions at the same time	Displays 4 functions at the same time	Displays 4 functions at the same time
<b>Connectivity</b>	Standard: USB, LAN, and HDMI	Standard: USB, LAN, and HDMI	Standard: USB, LAN, and HDMI

# RIGOL Probe Adapters Supported

## Probe Adapter

Name	Type	Description
BNC Adapter Input 50Ω	BNC Adapter	50 Ω to 3.5 mm (F)-BNC(F) Connector
High Impedance Adapter	High-impedance Probe Adapter	3.5 mm to BNC (1 MΩ)

# 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 DS80000 Series Technical Specifications

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Model	DS80604	DS80804	DS81004	DS81304
No. of Analog Channels	4	4	4	4
Max. Analog Bandwidth <sup>[1]</sup>	6 GHz	8 GHz	10 GHz	13 GHz
Total Sample Rate	160 GSa/s			
Channel Sample Rate	40 GSa/s <sup>[1]</sup>			
Max. Memory Depth	Standard: 500 Mpts Option: 2 Gpts or 4 Gpts <sup>[1]</sup>			
Sampling Mode	Real-time sampling			
Rise Time	$\leq 73$ ps (6 GHz); $\leq 55$ ps (8 GHz); $\leq 44$ ps (10 GHz); $\leq 33$ ps (13 GHz) (50 $\Omega$ impedance, 10%-90%, typ.)			
Max. Waveform Capture Rate	250,000 wfms/s			
Vertical Resolution	8-16 bits; selectable			
Max. Frames of Recording	Max. 2,000,000 frames			
Peak Detection	Captures 100 ps glitches			
LCD	Main display: 15.6" capacitive multi-touch screen with one-button electronic tilt Secondary display: 3.5" capacitive multi-touch screen with user-defined shortcut key menu, supporting quick-responsive touch operation with vibration			
Display Resolution	Main display: 1920x1080; secondary display: 480x320			

## Vertical System--Analog Channel

### Vertical System--Analog Channel

Input Impedance	50 Ω ± 3%
Input Coupling	DC <sup>[2]</sup>
Probe Attenuation Coefficient	Probe Ratio 0.0001X, 0.0002X, 0.0005X, 0.001X, 0.002X, 0.005X, 0.01X, 0.02X, 0.05X, 0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X, 20X, 50X, 100X, 200X, 500X, 1000X, 2000X, 5000X, 10000X, 20000X, and 50000X
	Attenuation Ratio ±60 dB
Maximum Input Voltage	50 Ω ≤10 mV/div Scale: 2 V <sub>rms</sub> >10 mV/div Scale: 5 V <sub>rms</sub>
	Remarks The probe allows a higher voltage test technically. Transient overvoltage is not allowed whether the probe is used or not. Please use the instrument dedicated for the specified measurement category (not applicable to CAT II, III, and IV)
Vertical Resolution	8 bits
	9-16 bits (selectable) (high-resolution mode)
Vertical Sensitivity Range <sup>[3]</sup>	50 Ω 1 mV/div to 1 V/div
Offset Range	50 Ω ±0.6 V (≤60 mV/div)
	±2.5 V (>60 mV/div, ≤200 mV/div) ±4 V (>200 mV/div, ≤1 V/div)
Dynamic Range	±5 div (8-bit)
Bandwidth Limit (Typical)	50 Ω 500 MHz, 1 GHz, 2 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, 7 GHz, 8 GHz, 9 GHz, 10 GHz, 11 GHz, and 12 GHz; independently selectable for each channel <sup>[4]</sup>
	The bandwidth limit is automatically set to 500 MHz when the vertical scale is smaller than 5 mV.
DC Gain Accuracy <sup>[3]</sup>	± 2% of full scale
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	≥60 dB

## Horizontal System--Analog Channel

Horizontal System--Analog Channel							
	6 GHz	8 GHz	10 GHz	13 GHz			
Range of Time Base	100 ps/div to 1 ks/div	50 ps/div to 1 ks/div	50 ps/div to 1 ks/div	20 ps/div to 1 ks/div			
	Fine						
Time Base Resolution	1 ps	0.5 ps	0.5 ps	0.2 ps			
Time Base Accuracy	$\pm 0.2$ ppm (initial calibration accuracy) $\pm 1$ ppm/year (aging rate)						
Time Base	Pre-trigger	-5 div					
Delay Range	Post-trigger	Acquisition Time for the Max. Memory Depth					
Time Interval ( $\Delta T$ )							
Measurement (using Cursor)	$\pm (\text{Time Base Accuracy} \times \text{Readout}) \pm (0.001 \times \text{Screen Width}) \pm 20$ ps						
Inter-channel Offset Correction Range	$\pm 100$ ns, Accuracy $\pm 1$ ps						
Analog Channel-to-Channel Skew (Typical)	$\leq 50$ ps <sup>[5]</sup>						
Horizontal Mode	YT	Default					
	XY	Channel 1/2/3/4					
	SCAN	Time base $\geq 200$ ms/div					
	ROLL	Time base $\geq 50$ ms/div, available to enter or exit the ROLL mode by adjusting the horizontal timebase knob					

## Acquisition System

Acquisition System	
Max. Sample Rate of Analog Channel	40 GSa/s <sup>[1]</sup>
Max. Memory Depth of Analog Channel	Standard: 500 Mpts Option: 2 Gpts or 4 Gpts <sup>[1]</sup>

## Acquisition System

	Normal	Default
Acquisition Mode	Peak Detection	Captures 100 ps glitches
	Average Mode	2, 4, 8, 16...65536 are available for you to choose
	High Resolution	9-16 bits

## Vertical Resolution

### Vertical Resolution (@40 GSa/s)

Effective Resolution (bitN)	9-bit	10-bit	12-bit	14-bit	16-bit
High-Resolution Bandwidth (BW_bitN)	4 GHz	2 GHz	800 MHz	500 MHz	200 MHz
(Typical) <sup>[6]</sup>					

## Trigger System

### Trigger System

Trigger Source	Analog channel (CH1~CH4), EXT TRIG	
Trigger Mode	Auto, Normal, Single	
Trigger Coupling	DC	DC coupling trigger
	AC	AC coupling trigger
Trigger Coupling	High Frequency Rejection (Low Pass Filter)	High frequency rejection, cut-off frequency~75 kHz (internal trigger only)
	High Frequency Rejection (High Pass Filter)	Low frequency rejection, cut-off frequency~75 kHz (internal trigger only)
Noise Rejection	Increases delay for the trigger circuit (internal trigger only), On/Off	

## Trigger System

Trigger Bandwidth	Internal Trigger	Analog Bandwidth
	External Trigger	200 MHz
Trigger Sensitivity		3 div, $\leq 2$ mV/div
		1.5 div, 2 mV/div to 5 mV/div
	Internal Trigger	1 div, 5 mV/div to 50 mV/div
Trigger Sensitivity		0.5 div, $\geq 50$ mV/div
		0.75 div or 0.8 div, @500mV/div
	External Trigger	500 mVpp (DC to 200 MHz)
EXT TRIG	Input Impedance	$1 M\Omega \pm 1\%$ , SMA connector
	Trigger Jitter (Typical)	$\leq 1$ ns <sub>rms</sub> Normal acquisition, Edge trigger, trigger level located near 50% of EXT input signal
	Internal Trigger	$\pm 5$ div from the center of the screen
Trigger Level Range	External Trigger	$\pm 4$ V

## 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 Option: RS232/UART, I2C, SPI, CAN, FlexRay, LIN, I2S, and MIL-STD-1553
Edge	Triggers on the threshold of the specified edge of the input signal. The types can be Rising, Falling, or Either Source channel: CH1 to CH4, or EXT
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

Trigger Type	
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 (200 ps to 10 s). Source channel: CH1 to CH4
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/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, and Falling Source channel: CH1 to CH4
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
Timeout	Triggers when duration of a certain event exceeds the specified time (200 ps to 10 s). The event can be specified as Rising, Falling, or Either. Source channel: CH1 to CH4
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. Delay 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
Setup/Hold	When the setup time or hold time between the input clock signal and the data signal is smaller than the specified time (200 ps to 10 s). Source channel: CH1 to CH4

Trigger Type	
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
RS232/UART (Option)	DS80000-EMBDA option 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
I2C (Option)	DS80000-EMBDA option 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
SPI (Option)	DS80000-EMBDA option 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
CAN (Option)	DS80000-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 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
FlexRay (Option)	DS80000-AUTOA 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
LIN (Option)	DS80000-AUTOA option Triggers on the Sync, ID, Data (length settable), Data&ID, Wakeup, Sleep, and Error frame of the LIN bus signal (up to 20 Mb/s). Source channel: CH1 to CH4

## Trigger Type

	DS80000-AUDIOA option
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
	DS80000-AEROA option
MIL-STD-1553 (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-1553 bus. Source channel: CH1 to CH4

## Waveform Measurement

### Waveform Measurement

	Number of Cursors	2 pairs of XY cursors
		Voltage deviation between cursors ( $\Delta Y$ )
	Manual Mode	Time deviation between cursors ( $\Delta X$ ) Reciprocal of $\Delta X$ (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

Number of Measurements	41 auto measurements; and up to 14 measurements can be displayed at a time.
Measurement Source	CH1 to CH4, Math1 to Math4
Measurement Mode	Normal (realized by software) and Precision (W); for Precision, only supported by analog channel
Measurement Range	Main, Zoom, Cursor, Full-memory
Auto Measurement	All Measurement Displays 41 measurement items for the current measurement channel; the measurement results are updated continuously; you can switch the measurement channel.
	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, T <sub>vmax</sub> , T <sub>vmin</sub> , +Slew Rate, and -Slew Rate
	Others Delay(A <sub>↑</sub> -B <sub>↑</sub> ), Delay(A <sub>↑</sub> -B <sub>↓</sub> ), Delay(A <sub>↓</sub> -B <sub>↑</sub> ), Delay(A <sub>↓</sub> -B <sub>↓</sub> ), Phase(A <sub>↑</sub> -B <sub>↑</sub> ), Phase(A <sub>↑</sub> -B <sub>↓</sub> ), Phase(A <sub>↓</sub> -B <sub>↑</sub> ), and Phase(A <sub>↓</sub> -B <sub>↓</sub> )
	Analysis Frequency counter, DVM, histogram, zone trigger, eye diagram (option), and jitter analysis (option)
	Statistics Items: Current, Average, Max, Min, Standard Deviation, Count Max. 1,000 times statistics supported

## Waveform Calculation

### Waveform Calculation

No. of Math Functions	4, 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 <sup>^</sup> B, !A, Intg, Diff, Sqrt, Lg, Ln, Exp, Abs, AX+B, LowPass, HighPass, BandPass, and BandStop
Color Grade	Supporting FFT

## Waveform Calculation

	Record Length	Max. 10 Mpts
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

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 is 2,000,000

Waveform Recording	Source	All enabled analog channels
	Analysis	Supports playing frame by frame or continuous playing; capable of calculating, measuring, and decoding the played waveforms

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.

Pass/Fail Test	Source	Any analog channel
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.		

Histogram	Source	Any analog channel
	Type	Horizontal and vertical
	Measure	Sum, Peaks, Max, Min, Pk_Pk, Mean, Mode, Bin width, Sigma, and XScale

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
	Mode	Supports all modes

## Waveform Analysis

Makes measurements for the clock or data signal over time, analyze the variance of the technical specifications.

Real-time Eye Diagram (Option)	Source	Any analog channel
	Clock Recovery	Clock recovery for software, constant clock, first-order PLL, second-order PLL, and explicit clock
	Type	Fully automatic, semi automatic, and manual
	Eye Measurement Item	one level, zero level, eye height, eye width, eye amplitude, crossing percentage, Q Factor, extinction ration, DCD (duty cycle distortion), rise time, fall time, bit rate, etc.
Makes measurements for the clock or data signal over time, analyzes the variance of the technical specifications.		
Jitter Analysis (Option)	Source	Any analog channel
	Clock Recovery	Constant, PLL, and Explicit
	Type	Fully automatic, semi automatic, and manual
	Jitter Measurement	TIE, Cycle to Cycle, +Width to +Width, -Width to -Width, Pk_Pk, 6-sigma, and RMS
Jitter Analysis	Jitter Analysis	Jitter separation, including TJ (Total Jitter), RJ (Random Jitter), DJ (Deterministic Jitter), PJ (Periodic Jitter), DDJ (Data Dependent Jitter), DCD (Duty Cycle Distortion), ISI (Inter-symbol Interference), and BR (Bit Ratio). Jitter analysis source: TIE, Cycle to Cycle, +Width to +Width, and -Width to -Width
	Measurement Display	Trend, Spectrum, Histogram, and BathCurve

## Search&Navigation

### Search, Navigation, and Table

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

## Search, Navigation, and Table

Result Display	Displays the result in the form of the mark table in the multi-pane window. The search results such as the time, pulse width, data, and address of each event can be exported to the external storage device or internal memory as a file suffixed with ".csv".
Navigation	Time navigation: navigates to view 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.

## Serial Decoding

### Serial Decoding

Number of Decodings	Four protocol types can be decoded and enabled at the same time
Decoding Type	Standard: GPIO Option: RS232/UART, I2C, SPI, CAN, CAN-FD, FlexRay, LIN, I2S, MIL-STD-1553, USB2.0
GPIO	Up to 4 bits of Parallel decoding, supporting any analog channel; supports user-defined clock and auto clock settings. Source channel: CH1 to CH4
RS232/UART (Option)	DS80000-EMBDA option 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
I2C (Option)	DS80000-EMBDA option Decodes the address (with or without the R/W bit), data, and ACK of the I2C bus. Source channel: CH1 to CH4
SPI (Option)	DS80000-EMBDA option Decodes the MISO/MOSI data (4-32 bits) of the SPI bus. CS and Timeout are supported. Source channel: CH1 to CH4

## Serial Decoding

	DS80000-AUTOA option
CAN (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 bus (up to 5 Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF. Supports 10 Mb/s CAN-FD baud. Source channel: CH1 to CH4
	DS80000-AUTOA option
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
	DS80000-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
	DS80000-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
	DS80000-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
	Decodes the data frame such as SNYC, PID, and data packets, and completes the CRC check. Source channel: CH1 to CH4

# Protocol Compliance Analysis

## Protocol Compliance Analysis (Option)

		DS80000-USBC option
Protocols	USB 2.0	Test Item: sync width, EOP width, signal rate, rise time, fall time, edge monotonicity, rise edge rate, fall edge rate, paired JK jitter, paired KJ jitter, consecutive jitter, eye diagram
	100Base-T	DS80000-ENETC option Test Item: Output Voltage, Amplitude Symmetry, Rise/Fall Time, Rise/Fall Time Symmetry, Overshoot, Distortion Based on Duty Cycle, Eye, and Jitter
	1000Base-T	DS80000-ENETC option Test Item in Test Mode1: Template/Volt/Droop Test Item in Test Mode2: Master Mode Jitter Test Item in Test Mode3: Slave Mode Jitter Test Item in Test Mode4: Transmitter Distortion and Common-mode Output Voltage
Report		Measurement data include: test item, test results, data range, reference standards, pass/fail test results; supporting exporting the report in HTML format

## Auto

## Auto

AutoScale	Min. voltage > 10 mVpp, duty cycle > 1% (35 Hz to 10 GHz period signal)
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## Digital Voltmeter

## Digital Voltmeter

Source	Any analog channel
Function	DC, AC+DC <sub>rms</sub> , AC <sub>rms</sub>
Resolution	ACV/DCV: 3-digit
Limits Beeper	Sounds an alarm when the voltage value is within or outside of the limit range
Range Measurement	Displays the latest measurement results in the form of a diagram, and display the extrema over the last 3 seconds; support Trend

# High-precision Frequency Counter

## High-Precision Frequency Counter

Source	Any analog channel	
Measure	Frequency, period, totalizer	
Counter	Resolution	3-8 bits, user-defined
	Max. Frequency	Max. analog bandwidth
Totalizer	64-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	15.6" capacitive multi-touch screen with one-button electronic tilt, supports gesture-enabled operation
Resolution	1920x1080 (Screen Region) 16:9
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	Dual-core Cortex-A72 up to 1.8 GHz
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## Processor System

System Memory 4 GB RAM

Operating System Android

Internal Non-volatile Memory 128 GB

## I/O

### I/O

USB3.0 Host 2 (1 on the front panel and 1 on the rear panel)

USB3.0 Device 1 on the rear panel

LAN 1 on the rear panel, 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)

AUX Out Front-panel SMA output connector  
Vo (H)  $\geq$  2.5 V open circuit,  $\geq$  1.0 V 50  $\Omega$  to GND  
Vo (L)  $\leq$  0.7 V to load  $\leq$  4 mA,  $\leq$  0.25 V 50  $\Omega$  to GND

Rise Time  $\leq$  1 ns

10 M Input Interface 1, SMA connector on the rear panel

Output Interface 1, SMA connector on the rear panel

In/Out Input Interface 50  $\Omega$ , with the amplitude 130 mVpp to 4.1 Vpp (-10 dBm, 20 dBm), frequency 10 MHz  $\pm$  1 ppm

Output Interface 50  $\Omega$ , 1.5 Vpp sine waveform

HDMI 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, 3 Vpp square waveform

## Power Supply

### Power Supply

Power Voltage 100 V-127 V, 200 V- 240 V; 50/60 Hz

## Power Supply

Power Max. 2000 W (connect to various interfaces, USB, active probes)

## Environment

### Environment

Temperature Range	Operating	0°C~+50°C
	Non-operating	-30°C~+70°C
Humidity Range	Operating	below +30°C: ≤90% RH (without condensation)
		+30°C to +40°C, ≤75% RH (without condensation)
	Non-operating	+40°C to +50°C, ≤45% RH (without condensation)
Altitude	Operating	below 65°C: ≤90% RH (without condensation)
	Non-operating	below 3,000 meters
	Non-operating	below 15,000 meters

## 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  $\pm 4.0$  kV (contact discharge),  $\pm 8.0$  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	448 mm (W)×310 mm (H)×522.6 mm (D)
Rack Mount Kit	7U
Weight <sup>[7]</sup>	Package excluded: 28 kg
	Package included: 29.5 kg

## Non-volatile Memory

### Non-volatile Memory

Setup/Image	setup (*.stp), image (*.png, *.bmp, *.jpg)
Data/File Storage	CSV waveform data (*.csv), binary waveform data (*.bin), list data (*.csv), and reference waveform data (*.ref, *.csv, *.bin)
Waveform Data	
Internal Capacity	125 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]: CH1, CH2, CH3, and CH4 channels are independent of each other. Whatever one or multiple channels are enabled, the maximum specifications of the instrument can be reached.

[2]: Only DC is available for input coupling under the input impedance of 50 Ω.

[3]: 1 mV/div and 2 mV/div are a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 32 mV for 1 mV/div and 2 mV/div sensitivity setting.

[4]: The following table shows the available bandwidth limits under different bandwidths.

Bandwidth	BW Limit
6 GHz	500 MHz, 1 GHz, 2 GHz, 3 GHz, 4 GHz, and 5 GHz
8 GHz	500 MHz, 1 GHz, 2 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, and 7 GHz
10 GHz	500 MHz, 1 GHz, 2 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, 7 GHz, 8 GHz, or 9 GHz

Bandwidth	BW Limit
13 GHz	500 MHz, 1 GHz, 2 GHz, 3 GHz, 4 GHz, 5 GHz, 6 GHz, 7 GHz, 8 GHz, 9 GHz, 10 GHz, 11 GHz, and 12 GHz

[5]: For any two channels, with input impedance  $50 \Omega$ , DC-coupled, under the same vertical scale, the Volts/div setting is the same for 100 mV/div and 200 mV/div.

[6]: Formula of the high-resolution bandwidth@sample rates other than 40 GSa/s:  $BW\_D = BW\_bitN \times Fs / 40 G$ . Wherein,  $Fs$  indicates the new sample rate (downsampling);  $BW\_D$  indicates the new bandwidth.

[7]: Standard configuration.

# Order Information and Warranty Period

## Order Information

Order Information	Order No.
<b>Model</b>	
6 GHz, 40 GSa/s, 4-CH	DS80604
8 GHz, 40 GSa/s, 4-CH	DS80804
10 GHz, 40 GSa/s, 4-CH	DS81004
13 GHz10 GHz, 40 GSa/s, 4-CH	DS81304
<b>Standard Accessory</b>	
Power Cord Conforming to the Standard of the Destination Country	— —
USB Cable x1	— —
Precision BNC Adapter, 3.5 mm to BNC (50 Ω) x2	BNC Adapter Input 50Ω
<b>Adapter Option</b>	
High-impedance Probe Adapter, 3.5 mm to BNC (1 MΩ)	High Impedance Adapter
<b>Upgrade Option</b>	
2 Gpts Memory Depth Upgrade Option	DS80000-RLU-20
4 Gpts Memory Depth Upgrade Option	DS80000-RLU-40
<b>Measurement and Analysis Option</b>	
Advanced Eye Diagram and Jitter Analysis Option	DS80000-JITTA
<b>Pre-compliance Test Option</b>	
100M/1000M Ethernet Compliance Test	DS80000-ENETC
USB2.0 Compliance Test	DS80000-USBC
<b>Serial Protocol Decoding Options</b>	
Embedded Serial Bus Trigger and Decoding (RS232/UART, I2C, and SPI)	DS80000-EMBDA
Auto Serial Bus Trigger and Decoding (CAN, CAN-FD, LIN, FlexRay)	DS80000-AUTOA
Audio Serial Bus Trigger and Decoding (I2S)	DS80000-AUDIOA
MIL-STD-1553 Serial Bus Triggers and Decodings	DS80000-AEROA

### NOTE:

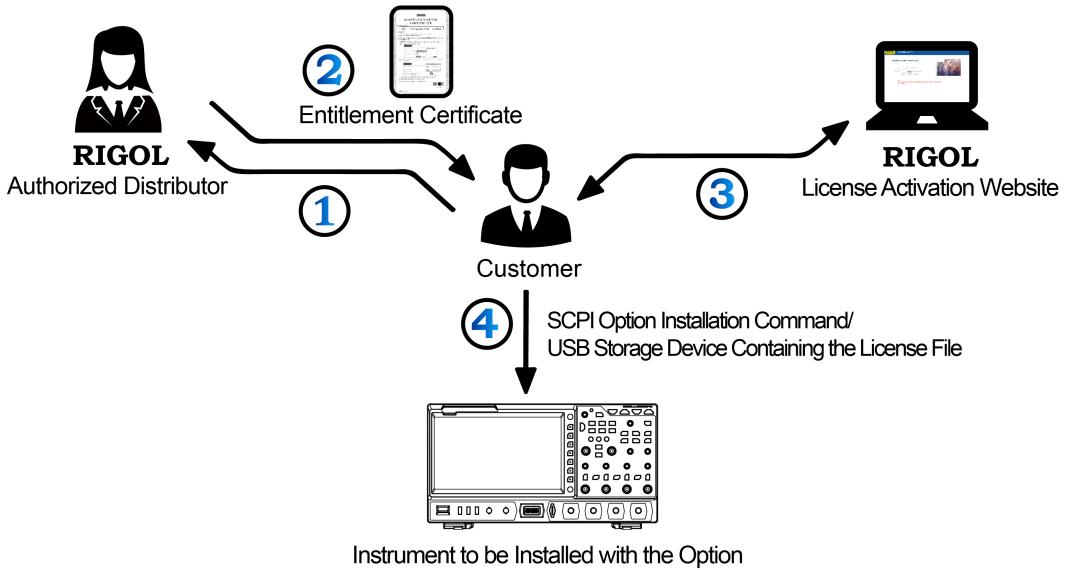
For all the mainframes, accessories, and options, please contact the local office of RIGOL.

# Warranty Period

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

# Option Ordering and Installation Process



1. 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.
2. After receiving the option order, the **RIGOL** factory will mail the paper software product entitlement certificate to the address provided in the order.
3. 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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## Provide Testing and Measuring Products and Solutions for Industry Customers

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