

# DS2000A Series Digital Oscilloscope

*UltraVision*

- Wider vertical range(500uV/div ~ 10V/div), lower noise floor, Better for small signal capturing
- Bandwidth 70MHz,100MHz,200MHz,300MHz,standard 50Ω input
- Max. Sample Rate 2G Sa/s
- Standard Memory Depth up to14Mpts,Optional Memory Depth up to 56Mpts
- Innovative "UltraVision" technology
- Waveform capture rate up to 50,000 wfs/s
- Up to 256 Levels intensity grading waveform display
- Up to 65,000 frames Hardware based Real Time waveform, Record, Replay & Analysis functions(Std.)
- A variety of trigger and serial bus decoding functions(RS232,I2C,SPI,CAN)
- Built-in 2 Ch Waveform generator (DS2000A-S)
- Complete connectivities: USB Host& Device, LAN(LXI), AUX
- Compact size, light weight, easy to use
- 8 inch TFT (800x480) WVGA

DS2000A Series is the new mainstream digital scope to meet the customer's applications with its innovative technology, industry leading specifications, powerful trigger functions and broad analysis capabilities.



# DS2000A Series Digital Oscilloscope



Product Dimensions: Width X Height X Depth=361.6 mm×179.6 mm×130.8 mm Weight: 3.9 kg ± 0.2 kg(Without Package)

## ► Innovative UltraVision technology



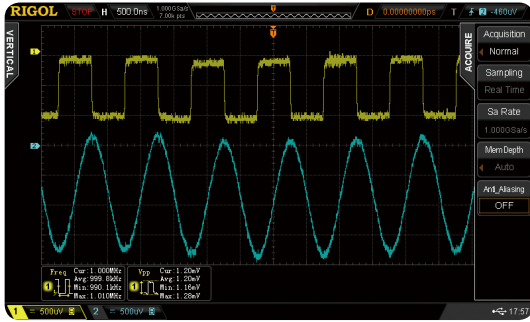
- Deeper Memory Depth (Std.14Mpts,Opt.56Mpts)
- Higher Waveform Capture Rate (Up to 50,000 wfms/s)
- Realtime Waveform Record,Replay & Analysis (Up to 65,000 frames)
- Multi-level Intensity Grading Display (Up to 256 Levels)

## ► Models and Key Specifications

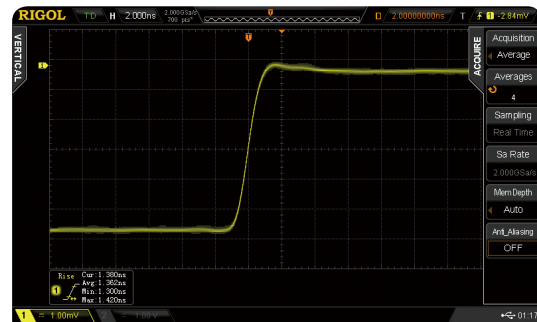
Model Number	DS2072A	DS2072A-S	DS2102A	DS2102A-S	DS2202A	DS2202A-S	DS2302A	DS2302A-S
Analog BW	70 MHz		100MHz		200 MHz		300 MHz	
Channels	2							
Max. Sample rate	2GSa/s (Single-channel)、 1GSa/s(Dual-channel )							
Max. Memory Depth	14Mpts ( std. ) 、 56Mpts ( option )							
Max. Waveform Capture rate	50,000 wfms/s							
Real Time waveform Record, Replay and Analysis function	Up to 65, 000 Frames							
Std. Probes	RP3300A 350MHz BW Passive Probe:2 sets							
Built-in 2Ch 25MHz Source	No	Yes	No	Yes	No	Yes	No	Yes

## ► Features and Benefits

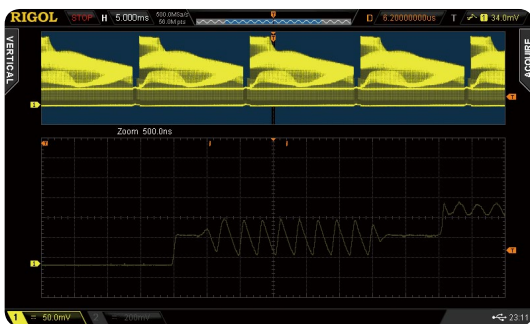
Wider Vertical range(500uV/div~10V/div),Lower noise floor, Better for small signal capturing



Full bandwidth,Lower Overshoot, Perfect frequency response design



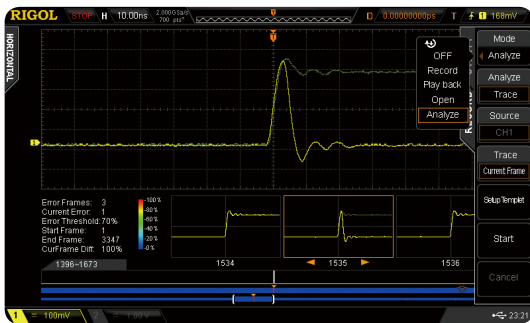
UltraVision: Deeper memory(Std.14Mpts,Opt.56Mpts)



UltraVision: Up to 50,000 wfms/s Waveform capture rate



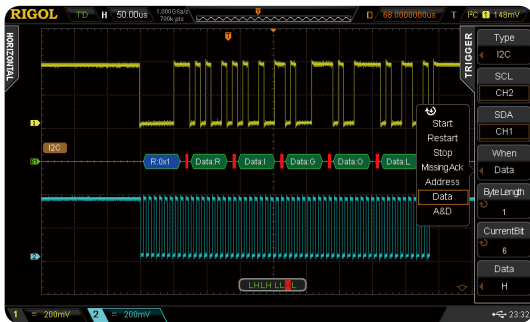
UltraVision:Realtime waveform record,replay,analysis function (std.)



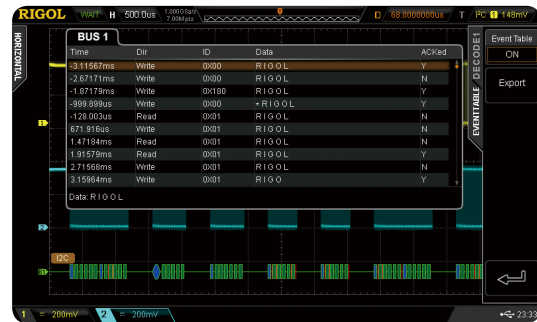
UltraVision: Deeper Memory with Multi-Level intensity grading display(Up to 256 levels)



Std. serial bus trigger functions(RS232,I2C,SPI)



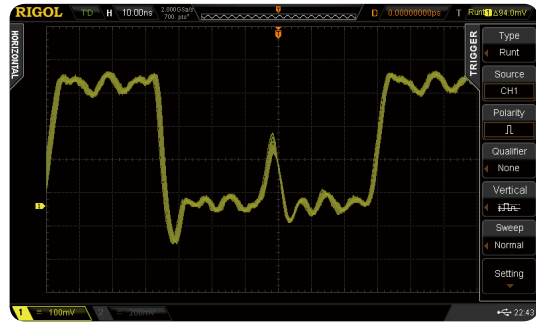
Optional Serial bus decoding function with listing display



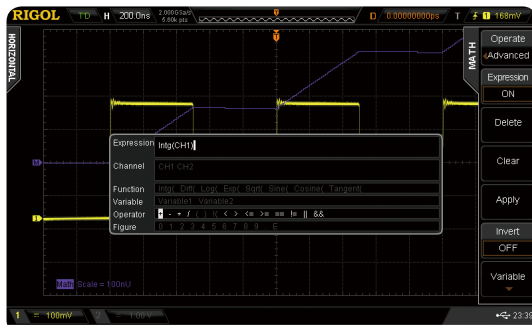
Versatile Trigger Functions(Runt, Nth Edge,Setup/Hold ...)



Runt Trigger



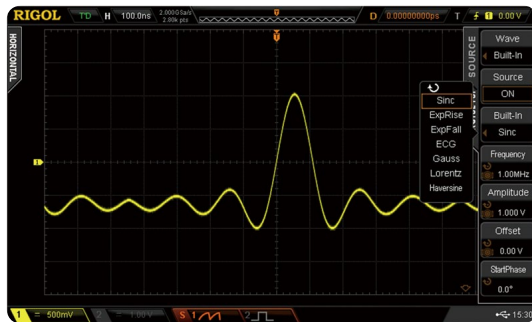
Std. Advanced Math Function



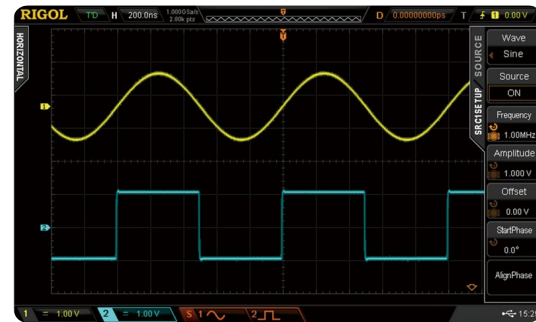
Std. Mask Test Function



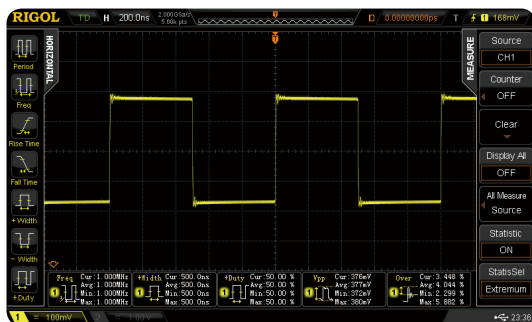
Built-in 2CH Source(DS2000A-S)



Arb function of the Built-in 2CH Source (DS2000A-S)



Automatic measurements with statistics








Complete Connectivity(USB Host,USB Device,LAN,AUX)









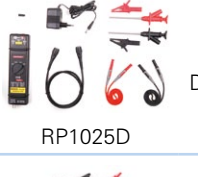




# RIGOL Probes supported by DS2000A Series:

## ► RIGOL Passive Probes

Model Number	Type	Description
 RP2200	High Z Probe	1X: DC~7MHz 10X:DC~150MHz Compatibility: All RIGOL Scopes.
 RP3300A	High Z Probe	1X: DC~8MHz 10X:DC~350MHz Compatibility: All RIGOL Scopes.
 RP3500A	High Z Probe	DC~500MHz Compatibility: All RIGOL Scopes.
 RP1300H	High Voltage Probe	DC~300MHz CATI 2000V(DC+AC), CATII 1500 V(DC+AC) Compatibility: All RIGOL Scopes.
 RP1050H	High Voltage Probe	DC~50MHz DC:0~15KV DC,AC:pulse <=30KVp-p, AC:sine wave <=10KVrms Compatibility: All RIGOL Scopes.

## ► RIGOL Active & Current Probes

Model Number	Type	Description
 RP1001C	Current Probe	BW:DC~300kHz, Max.DC: ± 100A, AC P-P:200A,AC RMS:70A Compatibility: All RIGOL Scopes.
 RP1002C	Current Probe	BW:DC~1MHz, Max.DC: ± 70A, AC P-P:140A,AC RMS:50A Compatibility: All RIGOL Scopes.
 RP1003C	Current Probe	BW:DC~50MHz, Max.AC RMS:30A AC Peak:50A(Noncontinuous) Compatibility: All RIGOL Scopes. Must order RP1000P Power supply.
 RP1004C	Current Probe	BW:DC~100MHz, Max. AC RMS:30A, AC Peak:50A(Noncontinuous) Compatibility: All RIGOL Scopes. Must order RP1000P Power supply.
 RP1005C	Current Probe	BW:DC~10MHz, Max. 150 A rms, 300 A peak (Noncontinuous), 500 A peak (@pulse width <=30 ms) Compatibility: All RIGOL Scopes. Must order RP1000P Power supply.
 RP1000P	Power Supply	Power supply for RP1003C,RP1004C,RP1005C, support 4 channels.
 RP1025D	High Voltage Differential Probe	BW:25MHz; Max. Voltage ≤ 1400Vpp Compatibility: All RIGOL Scopes.
 RP1050D	High Voltage Differential Probe	BW:50MHz; Max. Voltage ≤ 7000Vpp Compatibility: All RIGOL Scopes.
 RP1100D	High Voltage Differential Probe	BW:100MHz; Max. Voltage ≤ 7000Vpp Compatibility: All RIGOL scopes

## ► Specifications

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

### Sample

Sample Mode	Real-time Sample
Real Time Sample Rate	2 GSa/s (single-channel) 1 GSa/s (dual-channel)
Peak Detect	500 ps (single-channel) 1 ns (dual-channel)
Averaging	After both the channels finish N samples at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096 or 8192.
High Resolution	12 bits of resolution when $\geq 5 \mu\text{s}/\text{div}$ @ 1 GSa/s (or $\geq 10 \mu\text{s}/\text{div}$ @ 500 MSa/s).
Memory Depth	single-channel: Auto, 14k pts, 140k pts, 1.4M pts, 14M pts and 56M pts (option) are available dual-channel: Auto, 7k pts, 70k pts, 700k pts, 7M pts and 28M pts (option) are available

### Input

Number of Channels	Two channels
Input Coupling	DC, AC or GND
Input Impedance	( $1\text{M}\Omega \pm 1\%$ )    ( $16 \text{ pF} \pm 3 \text{ pF}$ ) or $50 \Omega \pm 1.5\%$
Probe Attenuation Coefficient	0.01X to 1000X, in 1-2-5 step
Maximum Input Voltage (1M $\Omega$ )	Maximum Input Voltage of the Analog Channel CAT I 300 Vrms, CAT II 100 Vrms, Transient Overvoltage 1000 Vpk with RP2200 10:1 probe: CAT II 300 Vrms with RP3300A 10:1 probe: CAT II 300 Vrms with RP3500A 10:1 probe: CAT II 300 Vrms

### Horizontal

Timebase Scale	DS2302A: 1 ns/div to 1000 s/div DS2202A: 2.000 ns/div to 1000 s/div DS2102A/DS2072A : 5.000 ns/div to 1000 s/div
Timebase Accuracy <sup>1</sup>	$\leq \pm 25 \text{ ppm}$
Clock Drift	$\leq \pm 5 \text{ ppm/year}$
Max Delay Range	Pre-trigger (negative delay): $\geq 1$ screen width Post-trigger (positive delay): 1 s to 100,000 s
Timebase Mode	Y-T, X-Y, Roll, Delayed Sweep
Number of XYs	1
Waveform Capture Rate <sup>2</sup>	50,000 wfms/s (dots display)

### Vertical

Bandwidth (-3dB)	DS2302A: DC to 300 MHz DS2202A: DC to 200 MHz DS2102A: DC to 100 MHz DS2072A: DC to 70 MHz
Single-shot Bandwidth	DS2302A: DC to 300 MHz DS2202A: DC to 200 MHz DS2102A: DC to 100 MHz DS2072A: DC to 70 MHz
Vertical Resolution	8bit
Vertical Scale	500 $\mu\text{V}/\text{div}$ to 1 V/div (50 $\Omega$ ) 500 $\mu\text{V}/\text{div}$ to 10 V/div (1M $\Omega$ )
Offset Range	500 $\mu\text{V}/\text{div}$ to 50 mV/div: $\pm 2 \text{ V}$ 51 mV/div to 200 mV/div: $\pm 10 \text{ V}$ 205 mV/div to 2 V/div: $\pm 50 \text{ V}$ 2.05 V/div to 10 V/div: $\pm 100 \text{ V}$
Bandwidth Limit <sup>1</sup>	DS2302A/DS2202A : 20 MHz/100 MHz DS2102A/DS2072A : 20 MHz
Low Frequency Response (AC Coupling, -3dB)	$\leq 5 \text{ Hz}$ (on BNC)
Calculated Rise Time <sup>1</sup>	DS2302A: 1.2ns DS2202A: 1.8 ns DS2102A: 3.5 ns DS2072A: 5 ns
DC Gain Accuracy	$\pm 2\%$ full scale

DC Offset Accuracy	$\pm 0.1 \text{ div} \pm 2 \text{ mV} \pm 1\% \text{ offset value}$
Channel to Channel Isolation	DC to maximum bandwidth: >40 dB

## Trigger

Trigger Level Range	Internal EXT	$\pm 5 \text{ div}$ from center of the screen $\pm 4 \text{ V}$
Trigger Mode	Auto, Normal, Single	
Holdoff Range	100 ns to 10 s	
High Frequency Rejection <sup>1</sup>	75 kHz	
Low Frequency Rejection <sup>1</sup>	75 kHz	
Trigger Sensitivity	1 div (below 10 mV or noise rejection is enabled) 0.3 div (above 10 mV and noise rejection is disabled)	
<b>Edge Trigger</b>		
Edge Type	Rising, Falling, Rising&Falling	
<b>Pulse Trigger</b>		
Pulse Condition	Positive Pulse Width (greater than, lower than, within specific interval) Negative Pulse Width (greater than, lower than, within specific interval)	
Pulse Width Range	2 ns to 4 s	
<b>Runt Trigger</b>		
Pulse Width Condition	None, >, <, <>	
Pulse Polarity	Positive, Negative	
Pulse Width Range	2 ns to 4 s	
<b>Windows Trigger (Option)</b>		
Windows Type	Rising, Falling, Rising&Falling	
Trigger Position	Enter, Exit, Time	
Windows Time	16 ns to 4 s	
<b>Nth Edge Trigger (Option)</b>		
Edge Type	Rising, Falling	
Idle Time	16 ns to 10 s	
Edge Number	1 to 65535	
<b>Slope Trigger</b>		
Slope Condition	Positive Slope (greater than, lower than, within specific interval) Negative Slope (greater than, lower than, within specific interval)	
Time Setting	2 ns to 4 s	
<b>Video Trigger (HDTV Option)</b>		
Signal Standard	Support standard NTSC, PAL and SECAM broadcasting standards; support 480P, 576P, 720P, 1080P and 1080I HDTV standards	
<b>Pattern Trigger</b>		
Pattern Setting	H, L, X, Rising, Falling	
<b>Delay Trigger (Option)</b>		
Edge Type	Rising, Falling	
Delay Type	>, <, <>, ><	
Delay Time	2 ns to 4 s	
<b>TimeOut Trigger (Option)</b>		
Edge Type	Rising, Falling, Rising&Falling	
Timeout time	16 ns to 4 s	
<b>Duration Trigger (Option)</b>		
Pattern	H, L, X	
Trigger Condition	>, <, <>	
Duration Time	2 ns to 4 s	
<b>Setup/Hold Trigger</b>		
Edge Type	Rising, Falling	
Data Type	H, L	
Setup Time	2 ns to 1 s	
Hold Time	2 ns to 1 s	
<b>RS232/UART Trigger</b>		
Polarity	Normal, Invert	
Trigger Condition	Start, Error, Check Error, Data	
Baud Rate	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, User	
Data Bits	5 bit, 6 bit, 7 bit, 8 bit	
<b>I2C Trigger</b>		
Trigger Condition	Start, Restart, Stop, Missing ACK, Address, Data, A&D	
Address Bits	7 bit, 8 bit, 10 bit	
Address Range	0 to 127, 0 to 255, 0 to 1023	
Byte Length	1 to 5	

<b>SPI Trigger</b>	
Trigger Condition	Timeout
Timeout Value	100 ns to 1 s
Data Bits	4 bit to 32 bit
Data Line Setting	H, L, X
<b>CAN Trigger</b>	
Signal Type	Rx, Tx, CAN_H, CAN_L, Differential
Trigger Condition	SOF, EOF, Frame Type, Frame Error
Baud	10 kbps, 20 kbps, 33.3 kbps, 50 kbps, 62.5 kbps, 83.3 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps, User
Sample Point	5% to 95%
Frame Type	Data, Remote, Error, OverLoad
Error Type	Bit Fill, Answer Error, Check Error, Format Error, Random Error
<b>USB Trigger (Option)</b>	
Signal Speed	Low Speed, Full Speed
Trigger condition	SOP, EOP, RC, Suspend, Exit Suspend

### Measure

Cursor	Manual Mode	Voltage Deviation between Cursors ( $\Delta V$ ) Time Deviation between Cursors ( $\Delta T$ ) Reciprocal of $\Delta T$ (Hz) ( $1/\Delta T$ )
	Track Mode	Voltage and Time Values of the Waveform Point
	Auto Mode	Allow to display cursors during auto measurement
	Auto Measurement	Measurements of Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Average, Mean Square Root, Overshoot, Pre-shoot, Area, Period Area, Frequency, Period, Rise Time, Fall Time, Positive Pulse Width, Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, Delay A→B $\overline{f}$ , Delay A→B $\overline{T}$ , Phase A→B $\overline{f}$ , Phase A→B $\overline{T}$
Number of Measurements	Display 5 measurements at the same time.	
Measurement Range	Screen or cursor.	
Measurement Statistic	Average, Max, Min, Standard Deviation, Number of Measurements	
Frequency Counter	Hardware 6 bits frequency counter (channels are selectable)	

### Math Operation

Waveform Operation	A+B, A-B, A×B, A/B, FFT, Editable Advanced Operation, Logic Operation
FFT Window Function	Rectangle, Hanning, Blackman, Hamming
FFT Display	Split, Full Screen
FFT Vertical Scale	Vrms, dB
Logic Operation	AND, OR, NOT, XOR
Math Function	Intg, Diff, Log, Exp, Sqrt, Sine, Cosine, Tangent
Number of Buses for Decoding	2
Decoding Type	Parallel (standard), RS232/UART (option), I2C (option), SPI (option)

### Display

Display Type	8.0 inches (203 mm) TFT LCD display
Display Resolution	800 Horizontal ×RGB×480 Vertical Pixel
Display Color	160,000 Color (TFT)
Persistence Time	Min, 50ms, 100ms, 200ms, 500ms, 1 s, 2 s, 5 s, 10 s, 20 s, Infinite
Display Type	Dots, Vectors
Real-time Clock	Time and Date (user adjustable)

### Signal Source (DS2000A-S)

	2	
Sample Rate	200 MSa/s	
Vertical Resolution	14 bits	
Max. Frequency	25 MHz	
Standard Waveform	Sine, Square, Pulse, Ramp, Noise, DC	
Arbitrary Waveform	Sinc, ExpRise, ExpFall, ECG, Gauss, Lorentz, Haversine	
Sine	Frequency Range	0.1 Hz to 25 MHz
	Flatness	±0.5 dB (relative to 1 kHz)
	Harmonic Distortion	-40 dBc
	Spurious (non-harmonic)	-40 dBc
	THD	1%
	SNR	40 dB



Square/Pulse	Frequency Range	0.1 Hz to 15 MHz
	Rise Time/Fall Time	<15 ns
	Overshoot	<5%
	Duty Cycle	10% to 90%
	Duty Cycle Resolution	1% or 10 ns (the larger one)
	Minimum Pulse Width	20ns
	Pulse Width Resolution	10 ns or 5 bits (the larger one)
Ramp	Jitter	500 ps
	Frequency Range	0.1 Hz to 100 kHz
	Linearity	1%
Noise	Symmetry	0 to 100%
Built-in Waveform	Bandwidth	25 MHz (typical)
Arbitrary Waveform	Frequency Range	0.1 Hz to 1 MHz
	Frequency Range	0.1 Hz to 10 MHz
	Length	2 to 16 kpts
Frequency	Internal Storage Locations	10
	Accuracy	100 ppm (<10 kHz) 50 ppm (>10 kHz)
	Resolution	0.1 Hz or 4 bits (the larger one)
Amplitude	Output Range	20 mVpp to 5 Vpp, HighZ 10 mVpp to 2.5 Vpp, 50 $\Omega$
	Resolution	100 $\mu$ V or 3 bits (the larger one)
	Accuracy	2% (1 kHz)
DC Offset	Range	$\pm$ 2.5 V, HighZ $\pm$ 1.25 V, 50 $\Omega$
	Resolution	100 $\mu$ V or 3 bits (the larger one)
	Accuracy	$\pm$ 2% of Offset setting

## Interface

Standard Ports	USB HOST (support USB-GPIB), USB DEVICE, LAN, Aux Output (TrigOut/PassFail)
Printer Compatibility	PictBridge

## General Specifications

<b>Probe Compensation Output</b>	
Output Voltage <sup>1</sup>	About 3 V, peak-peak
Frequency <sup>1</sup>	1 kHz
<b>Power</b>	
Power Voltage	100 to 240 V, 45 to 440 Hz
Power	Maximum 50 W
Fuse	2 A, T Degree, 250 V
<b>Environment</b>	
Temperature Range	Operating: 0°C to +50°C Non-operating: -20°C to +70°C
Cooling Method	fan cooling
Humidity Range	0°C to +30°C : $\leq$ 95% Relative Humidity +30°C to +40°C : $\leq$ 75% Relative Humidity +40°C to +50°C : $\leq$ 45% Relative Humidity
Altitude	Operating: under 3,000 meters Non-operating: under 15,000 meters

## Mechanical Specifications

Size <sup>3</sup>	Width×Height×Depth = 361.6 mm× 179.6 mm×130.8 mm	
Weight <sup>4</sup>	Package Excluded	3.9 kg $\pm$ 0.2 kg
	Package Included	4.5 kg $\pm$ 0.5 kg

### Calibration Interval

The recommended calibration interval is one year.

### Regulatory Information

Electromagnetic Compatibility	2004/108/EC Execution standard EN 61326-1:2006 EN 61326-2-1:2006
Safety	UL 61010-1:2004; CAN/CSA-C22.2 NO. 61010-1-2004; EN 61010-1:2001; IEC 61010-1:2001

Note: 1 Typical.

2 Maximum value with 20 ns, single-channel, dots display and auto memory depth.

3 Supporting legs and handle folded, knob height included.

4 Standard configuration.

## ► Ordering Information

Model	Description	Order Number
	70MHz,2-channel	DS2072A
	70MHz,2-channel + 2-channel Signal Source	DS2072A-S
	100MHz,2-channel	DS2102A
	100MHz,2-channel + 2-channel Signal Source	DS2102A-S
	200MHz,2-channel	DS2202A
	200MHz,2-channel + 2-channel Signal Source	DS2202A-S
	300MHz,2-channel	DS2302A
	300MHz,2-channel + 2-channel Signal Source	DS2302A-S
Standard Accessories	Power Cord conforming to the standard of the country	-
	USB Data Cable	CB-USBA-USBB-FF-150
	2 Passive Probes (350 MHz)	RP3300A
	Quick Guide	-
	Resource CD (User's Guide and Application Software)	-
Optional Accessories	Rack Mount Kit	RM-DS2000A
Deep Memory Option	56Mpts(single channel)/28Mpts(dual channel)	MEM-DS2000A
Advanced trigger functions	Windows, Nth Edge,HDTV,Delay, Time Out, Duration, USB	AT-DS2000A
Decoding Options	RS232,I2C,SPI Decoding Kit	SD-DS2000A
	CAN Analysis kit(Trigger+Decoding)	CAN-DS2000A

## Warranty

Three-year warranty,excluding probes and accessories.

**RIGOL**

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