



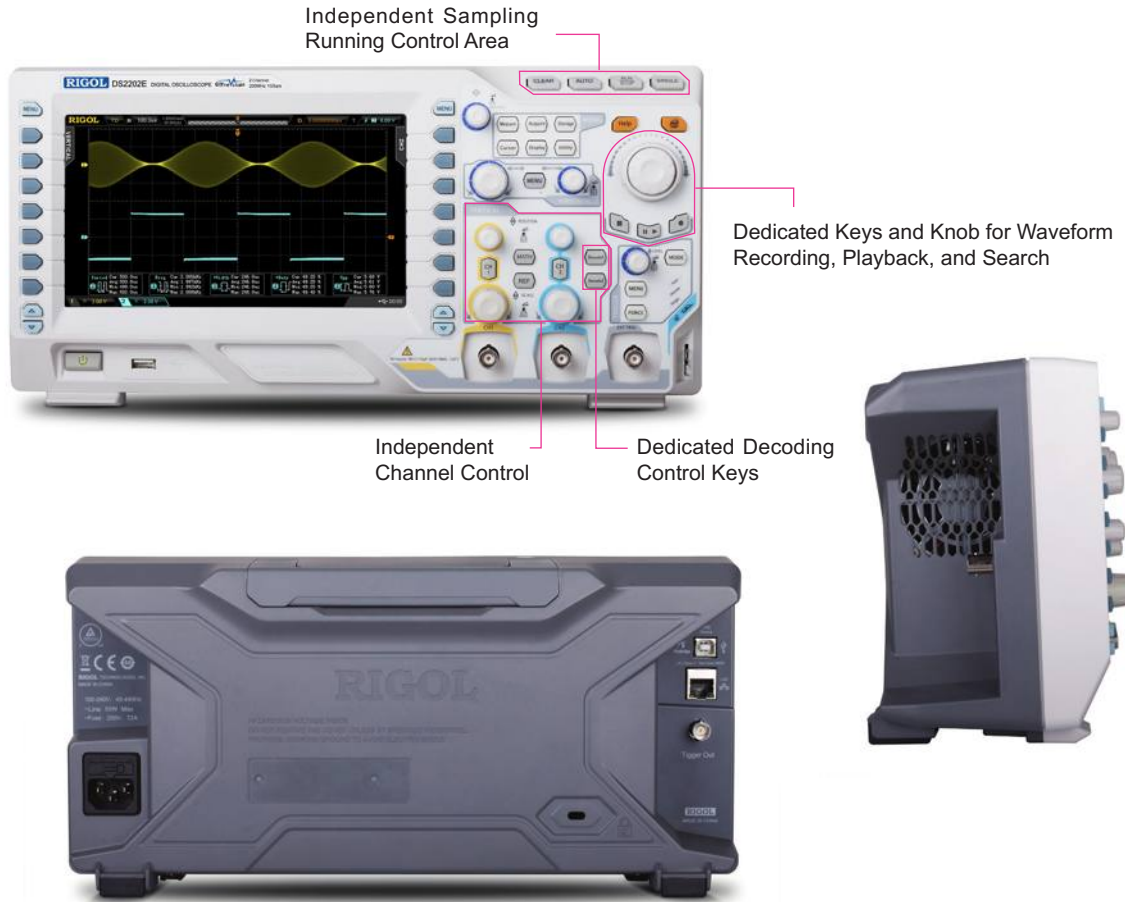
DS2000E Series Digital Oscilloscope

UltraVision

- 100 MHz and 200 MHz bandwidth models
- 2 analog channels, 50 Ω input impedance (standard)
- Vertical range: 500 μ V/div ~ 10 V/div
- Real-time sample rate: up to 1 GSa/s on both channels
- Memory depth: up to 28 Mpts on both channels
- Waveform capture rate: up to 50,000 wfms/s
- Real-time hardware waveform recording, playback, and analysis of up to 65,000 captured frames
- Various serial trigger and decode (RS232/UART, I2C, SPI, CAN and LIN)
- Complete connectivity: USB DEVICE, USB Host, LAN, and optional GPIB
- 8-inch WVGA (800x480), 256-level intensity grading display

Engineers and technicians needing higher performance test solutions for more advanced debug tasks will appreciate the unique price/performance attributes of the DS2000E. Based on our UltraVision technology the DS2000E delivers advanced performance and analysis capabilities, a large intensity graded display, and a proven and reliable hardware platform at an unprecedented price point.

DS2000E Series Digital Oscilloscope



Dimensions: W×H×D = 361.6 mm×179.6 mm×130.8 mm
 Weight: 3.9 kg±0.2 kg (Package Excluded)

► Unique UltraVision technology



- High memory depth (up to 28 Mpts on both channels)
- High waveform capture rate (up to 50,000 waveforms per second)
- Real-time waveform recording, playback, and analysis functions (up to 65,000 frames)
- Multi-level intensity grading display (up to 256-level)

► Models and Specifications

| Model | DS2102E | DS2202E |
|---|---|---------|
| Analog Bandwidth | 100 MHz | 200 MHz |
| No. of Analog Channels | 2 | |
| Max. Real-time Sample Rate | 1 GSa/s (for both channels) | |
| Max. Memory Depth | 28 Mpts (for both channels) | |
| Max. Waveform Capture Rate | 50,000 wfms/s | |
| Hardware Real-time and Ceaseless Waveform Recording, Playback, and Analysis Functions | Up to 65,000 frames can be recorded. | |
| Standard Probe | All the models include two PVP2350 350 MHz passive high-impedance probes. | |

► Features and Benefits

Wide range (500 μ V/div~10 V/div), low noise floor, clearly capture the low-level signals



UltraVision: waveform capture rate up to 50,000 wfms/s



UltraVision: high memory depth up to 28 Mpts on both channels



UltraVision: multi-level intensity grading display (256-level)



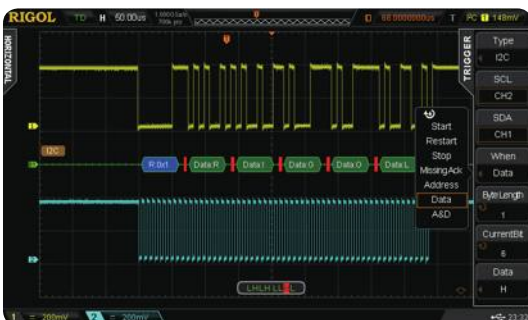
UltraVision: real-time and ceaseless waveform recording, playback, and analysis functions



Abundant advanced triggering functions (e.g. Runt Trigger, Setup/Hold Trigger, and Nth Edge Trigger)



Serial bus trigger and decoding functions (supporting RS232/UART, I2C, SPI, CAN and LIN)









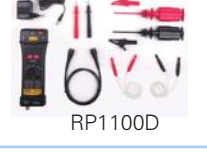


RIGOL Probes and Accessories Supported by the DS2000E Series

► RIGOL Passive Probes

| Model | Type | Description |
|--|----------------------|---|
|  PVP2150 | High-impedance Probe | 1X: DC to 35 MHz 10X: DC to 150 MHz Compatibility: All models of RIGOL 's digital oscilloscopes |
|  PVP2350 | High-impedance Probe | 1X: DC to 35 MHz 10X: DC to 350 MHz Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP3500A | High-impedance Probe | DC to 500 MHz Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1300H | High-voltage Probe | DC to 300 MHz CAT I 2000 V (DC+AC), CAT II 1500 V (DC+AC) Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1010H | High-voltage Probe | DC to 40 MHz DC: 0 to 10 kV DC, AC: pulse ≤ 20 kVpp, AC: sine wave ≤ 7 kVrms Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1018H | High-voltage Probe | 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 |

► RIGOL Active & Current Probes

| Model | Type | Description |
|--|---------------------------------|--|
|  RP1001C | Current Probe | BW: DC to 300 kHz Maximum Input DC: ± 100 A, AC P-P: 200 A, AC RMS: 70 A Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1002C | Current Probe | BW: DC to 1 MHz Maximum Input DC: ± 70 A, AC P-P: 140 A, AC RMS: 50 A Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1003C | Current Probe | BW: DC to 50 MHz Maximum Input AC P-P: 50 A (non-continuous), AC RMS: 30 A Compatibility: All models of RIGOL 's digital oscilloscopes Required to order RP1000P power supply. |
|  RP1004C | Current Probe | BW: DC to 100 MHz Maximum Input AC P-P: 50 A (non-continuous), AC RMS: 30 A Compatibility: All models of RIGOL 's digital oscilloscopes Required to order RP1000P power supply. |
|  RP1005C | Current Probe | 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 digital oscilloscopes Required to order RP1000P power supply. |
|  RP1000P | Power Supply | Power supply for RP1003C, RP1004C and RP1005C, supporting 4 channels. |
|  RP1025D | High-voltage Differential Probe | BW: 25 MHz Max. voltage ≤ 1400 Vpp Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1050D | High-voltage Differential Probe | BW: 50 MHz Max. voltage ≤ 7000 Vpp Compatibility: All models of RIGOL 's digital oscilloscopes |
|  RP1100D | High-voltage Differential Probe | BW: 100 MHz Max. voltage ≤ 7000 Vpp Compatibility: All models of RIGOL 's digital oscilloscopes |

► 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.

Sample

| | |
|-----------------------|---|
| Sample Mode | Real-time Sampling |
| Real-time Sample Rate | 1 GSa/s on both channels |
| Peak Detection | 500 ps |
| Averaging | After all the channels have reached N times of sampling at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, or 8192. |
| High Resolution | 12-bit resolution when $\geq 5 \mu\text{s}/\text{div}$ @ 1 GSa/s |
| Memory Depth | Auto, 7 kpts, 70 kpts, 700 kpts, 7 Mpts, and 28 Mpts |

Input

| | |
|---------------------------------------|---|
| Number of Channels | 2 analog channels |
| Input Coupling | DC, AC or GND |
| Input Impedance | $(1 \text{ M}\Omega \pm 1\%) \parallel (16 \text{ pF} \pm 3 \text{ pF})$ or $50 \Omega \pm 1.5\%$ |
| Probe Attenuation Coefficient | 0.01X-1000X, at 1-2-5 step |
| Maximum Input Voltage (1 M Ω) | CAT I 300 Vrms, CAT II 100 Vrms, Transient Overvoltage 1000 Vpk |

Horizontal

| | |
|--------------------------------------|--|
| Timebase Scale | DS2102E: 5.000 ns/div to 1.000 ks/div DS2202E: 2.000 ns/div to 1.000 ks/div |
| Channel to Channel Skew | 1 ns (typical), 2 ns (maximum) |
| Max. Record Length | 28 Mpts on both channels |
| Timebase Accuracy ^[1] | $\leq \pm 25 \text{ ppm}$ |
| Clock Drift | $\leq \pm 5 \text{ ppm/year}$ |
| Max. Delay Range | Negative Delay: ≥ 1 screen width Positive Delay: 1 s to 100 ks |
| Timebase Mode | Y-T, X-Y, Roll |
| Number of X-Ys | 1 path |
| Waveform Capture Rate ^[2] | 50,000 wfms/s (dots display) |

Vertical

| | |
|---|---|
| Bandwidth (-3 dB) (50 Ω) | DS2102E: DC to 100 MHz DS2202E: DC to 200 MHz |
| Single-shot Bandwidth (50 Ω) | DS2102E: DC to 100 MHz DS2202E: DC to 200 MHz |
| Vertical Resolution | 8 bit |
| Vertical Scale ^[3] | When the input impedance is 50 Ω : 500 μ V/div to 1 V/div When the input impedance is 1 M Ω : 500 μ V/div to 10 V/div |
| Offset Range | When the input impedance is 50 Ω : 500 μ V/div to 50 mV/div: ± 2 V 51 mV/div to 200 mV/div: ± 10 V 205 mV/div to 1 V/div: ± 12 V When the input impedance is 1 M Ω : 500 μ V /div to 50 mV/div: ± 2 V 51 mV/div to 200 mV/div: ± 10 V 205 mV/div to 2 V/div: ± 50 V 2.05 V/div to 10 V/div: ± 100 V |
| Bandwidth Limit ^[1] | DS2102E: 20 MHz DS2202E: 20 MHz/100 MHz |
| Low Frequency Response (AC Coupling, -3 dB) | ≤ 5 Hz (on BNC) |
| Calculated Rise Time ^[1] | DS2102E: 3.5 ns DS2202E: 1.8 ns |
| DC Gain Accuracy ^[3] | $\pm 2\%$ of full scale |
| DC Offset Accuracy | ± 0.1 div ± 2 mV $\pm 1\%$ of offset value |
| Channel to Channel Isolation | DC to maximum bandwidth: > 40 dB |

Trigger

| | | |
|---|--|---|
| Trigger Level Range | Internal | ± 5 div from the center of the screen |
| | EXT | ± 4 V |
| Trigger Mode | Auto, Normal, Single | |
| Holdoff Range | 100 ns to 10 s | |
| High Frequency Rejection ^[1] | 75 kHz | |
| Low Frequency Rejection ^[1] | 75 kHz | |
| Trigger Sensitivity | 1 div (below 10 mV or noise rejection enabled) 0.3 div (above 10 mV and noise rejection disabled) | |
| Edge Trigger | | |
| Edge Type | Rising, Falling, Rising/Falling | |
| Pulse Trigger | | |
| Pulse Condition | Positive Pulse Width (greater than, smaller than, within a specific range) Negative Pulse Width (greater than, smaller than, within a specific range) | |
| Pulse Width | 2 ns to 4 s | |
| Runt Trigger | | |
| Pulse Condition | None, >, <, <> | |
| Pulse Polarity | Positive, Negative | |
| Pulse Width Range | 2 ns to 4 s | |
| Windows Trigger (Optional) | | |
| Windows Type | Rising, Falling, Rising/Falling | |
| Trigger Position | Enter, Exit, Time | |
| Windows Time | 16 ns to 4 s | |
| Nth Edge Trigger (Optional) | | |
| Edge Type | Rising, Falling | |

| | |
|------------------------------------|--|
| Idle Time | 16 ns to 4 s |
| Number of Edges | 1 to 65535 |
| Slope Trigger | |
| Slope Condition | Positive Slope (greater than, smaller than, within a specific range) Negative Slope (greater than, smaller than, within a specific range) |
| Time Setting | 10 ns to 1 s |
| Video Trigger | |
| Polarity | Positive, Negative |
| Synchrony | All Lines, Line Num, Odd Field, Even Field |
| Standard | standard: NTSC, PAL/SECAM, 480P, 576P optional: 720P, 1080P, 1080I |
| Pattern Trigger | |
| Pattern Setting | H, L, X, Rising Edge, Falling Edge |
| Delay Trigger (Optional) | |
| Edge Type | Rising, Falling |
| Delay Type | >, <, <>, >< |
| Delay Time | 2 ns to 4 s |
| TimeOut Trigger (Optional) | |
| Edge Type | Rising, Falling, Rising/Falling |
| Timeout Time | 16 ns to 4 s |
| Duration Trigger (Optional) | |
| Pattern Setting | H, L, X |
| Trigger Criteria | >, <, <> |
| Duration Time | 2 ns to 4 s |
| Setup/Hold Trigger | |
| Edge Type | Rising, Falling |
| Data Type | H, L |
| Setup Time | 2 ns to 1 s |
| Hold Time | 2 ns to 1 s |
| RS232 Trigger | |
| Polarity | Normal, Invert |
| Trigger Condition | Start, Error, Check Error, Data |
| Baud | 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, 460800 bps, 921600 bps, 1 Mbps, and User |
| Data Bits | 5 bit, 6 bit, 7 bit, 8 bit |
| I2C Trigger | |
| Trigger Condition | Start, Restart, Stop, Missing ACK, Address, Data, A&D |
| Address Bits | 7 bits, 8 bits, 10 bits |
| Address Range | 0 to 127, 0 to 255, 0 to 1023 |
| Byte Length | 1 to 5 |
| SPI Trigger | |
| Trigger Condition | Timeout |
| Timeout Value | 100 ns to 1 s |
| Data Bits | 4 bits to 32 bits |
| Data Setting | H, L, X |
| CAN Trigger (Optional) | |
| 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, Over Load |
| Error Type | Bit Fill, Answer Error, Check Error, Format Error, Random Error |
| USB Trigger (Optional) | |
| Baud | Low Speed, Full Speed |
| Trigger Condition | SOP, EOP, RC, Suspend, Exit Suspend |
| LIN Trigger (Optional) | |
| Version | 1.X, 2.X, Both |
| Trigger Condition | Sync, Identifier, Data, ID&Data, Wakeup, Sleep, Error |
| ID Range | 0 to 63 |
| Data Comparison | =, ≠, <, >, ≤, ≥ |
| Data Length | 1 to 8 |
| Data Level | H, L |
| Baud Rate | 19200 bps, 10417 bps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, User |
| Error Type | Sync, Even-Odd, Checksum |

Measure

| | | |
|------------------------|--|---|
| Marker | Manual Mode | Voltage Deviation between Cursors (ΔV) Time Deviation between Cursors (ΔT) Reciprocal of ΔT (Hz) ($1/\Delta T$) |
| | Track Mode | Voltage and Time Values of the Waveform Point |
| | Auto Mode | Allows to display cursors during auto measurement |
| Auto Measurement | Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Average, Vrms-N, Vrms-1, 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 \rightarrow B, Delay A \rightarrow B, Delay A \rightarrow B, Delay A \rightarrow B, Phase A \rightarrow B, Phase A \rightarrow B, Phase A \rightarrow B, Phase A \rightarrow B | |
| Number of Measurements | Displays 5 measurements at the same time | |
| Measurement Range | Screen region or cursor region | |
| Measurement Statistics | Current, Average, Max, Min, Standard Deviation, Number of Measurements | |
| Frequency Counter | Hardware 6-bit frequency counter (channels are selectable) | |

Math Operation

| | |
|------------------------------|--|
| Waveform Operation | A+B, A-B, A×B, A÷B, FFT, Digital Filter, 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, Lg, Exp, Sqrt, Sine, Cosine, Tangent |
| Number of Buses for Decoding | 2 |
| Decoding Type | Parallel (standard), RS232/UART (optional), I2C (optional), SPI (optional), CAN (optional), LIN (optional) |

Display

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

I/O

| | |
|----------------|---|
| Standard Ports | USB Host (USB-GPIB supported), USB Device, LAN, Aux Output (TrigOut/PassFail) |
|----------------|---|

General Specifications

| Probe Compensation Output | | |
|--|---|--|
| Output Voltage ^[1] | About 3 V, peak-peak | |
| Frequency ^[1] | 1 kHz | |
| Power | | |
| Power Voltage | 100 V to 240 V, 45 Hz to 440 Hz | |
| Power | Maximum 50 W | |
| Fuse | 2 A, T degree, 250 V | |
| Environment | | |
| Temperature Range | Operating: 0°C to +50°C | |
| | Non-operating: -40°C to +70°C | |
| Cooling Method | Fan cooled | |
| Humidity Range | 0°C to +30°C : ≤95%RH | |
| | +30°C to +40°C : ≤75%RH | |
| | +40°C to +50°C : ≤45%RH | |
| Altitude | Operating: below 3,000 m | |
| | Non-operating: below 15,000 m | |
| Physical Characteristics | | |
| Dimensions ^[4] | Width×Height×Depth = 361.6 mm×179.6 mm×130.8 mm | |
| Weight ^[5] | Package Excluded | 3.9 kg±0.2 kg |
| | Package Included | 4.5 kg±0.5 kg |
| Calibration Interval | | |
| The recommended calibration interval is 18 months. | | |
| Electromagnetic Compatibility and Safety | | |
| EMC | complies with EMC Directive 2014/30/EU, complies with or above the standard specified in IEC61326-1:2013/EN61326-1:2013 Group 1 Class A | |
| | CISPR 11/EN 55011 | |
| | IEC 61000-4-2:2008/EN 61000-4-2 | ±4.0 kV (contact discharge), ±8.0 kV (air discharge) |
| | IEC 61000-4-3:2002/EN 61000-4-3 | 3 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 2 GHz); 1 V/m (2.0 GHz to 2.7 GHz) |
| | IEC 61000-4-4:2004/EN 61000-4-4 | 1 kV power |
| | 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 to 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 |
| Safety | complies with IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 No. 61010-1-12+ G11+ G12 | |

Note^[1]: Typical.

Note^[2]: Maximum value. 10 ns, dots display, auto memory depth.

Note^[3]: 500 μV/div is a magnification of 1 mV/div. When calculating the DC Gain Accuracy, the full scale should be considered as 8 mV (calculated based on 1 mV/div).

Note^[4]: Supporting legs and handle folded, knob height included.

Note^[5]: Standard configuration.

► Order Information

| | Description | Order No. |
|---------------------------------|--|---------------------|
| Model | DS2102E (100 MHz, 2 analog channels) | DS2102E |
| | DS2202E (200 MHz, 2 analog channels) | DS2202E |
| Standard Accessories | Power Cord conforming to the standard of the destination country | - |
| | USB Cable | CB-USBA-USBB-FF-150 |
| | 2 Passive Probes (BW: 350 MHz) | PVP2350 |
| | Quick Guide (hard copy) | - |
| Optional Accessories | Rack Mount Kit | RM-DS2000A |
| | Passive Probe (500 MHz) | RP3500A |
| | USB-GPIB Interface Converter | USB-GPIB |
| | A Portable Bag | BAG-G1 |
| High Memory Depth Option | 28 Mpts/CH memory (offering the official option for free) | - |
| Advanced Trigger Option | Windows Trigger, Nth Edge Trigger, Delay Trigger, TimeOut Trigger, Duration Trigger, USB Trigger | AT-DS2000A |
| Decoding Options | RS232/UART, I2C, SPI Decoding Kit | SD-DS2000A |
| | CAN/LIN Protocol Analysis Kit (Trigger + Decoding) | CAN-DS2000A |
| Bundle Option | Include all the advanced trigger options and decoding options | BND-DS2000A |

Note: For all the accessories and options, please contact the local office of **RIGOL**.

Warranty Period

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



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