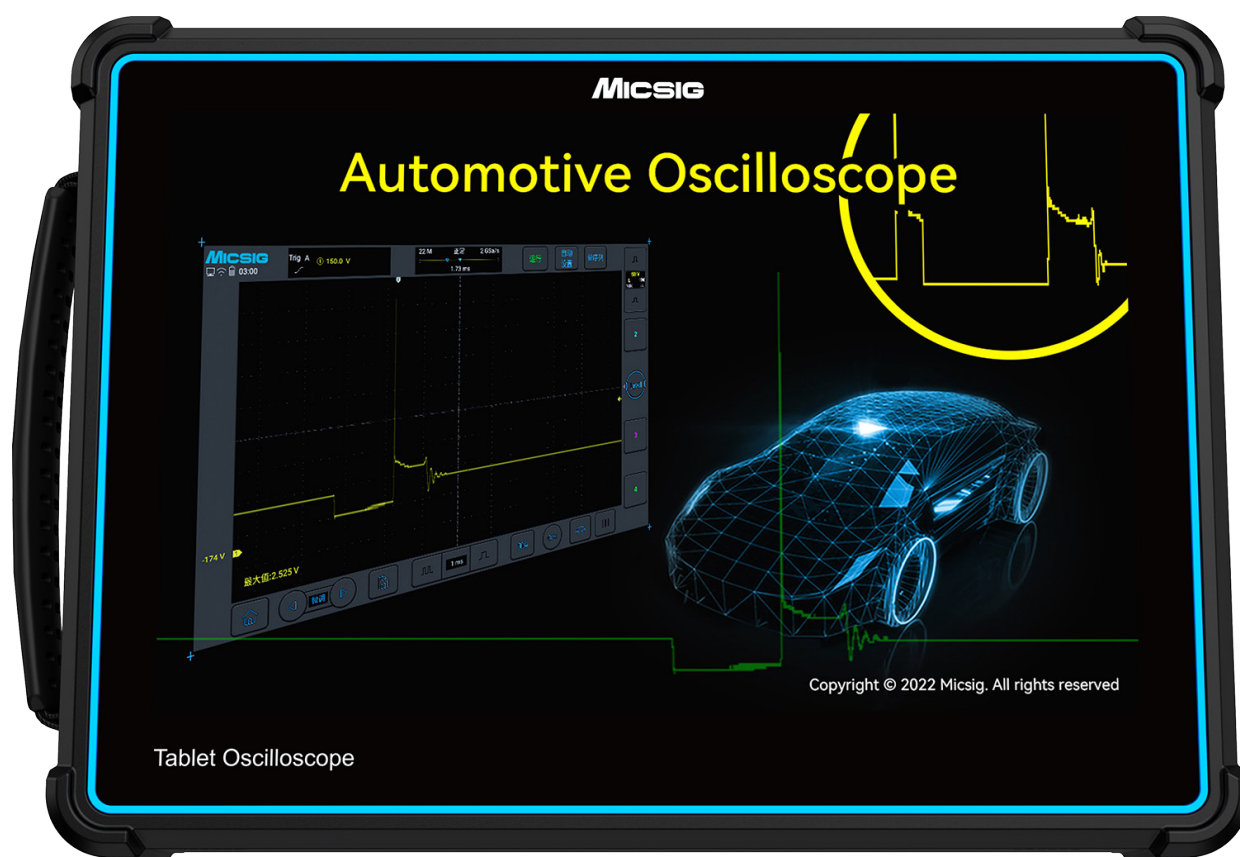


# Automotive Oscilloscope ATO Series



**MICSIG** Shenzhen Micsig Technology Co., Ltd.

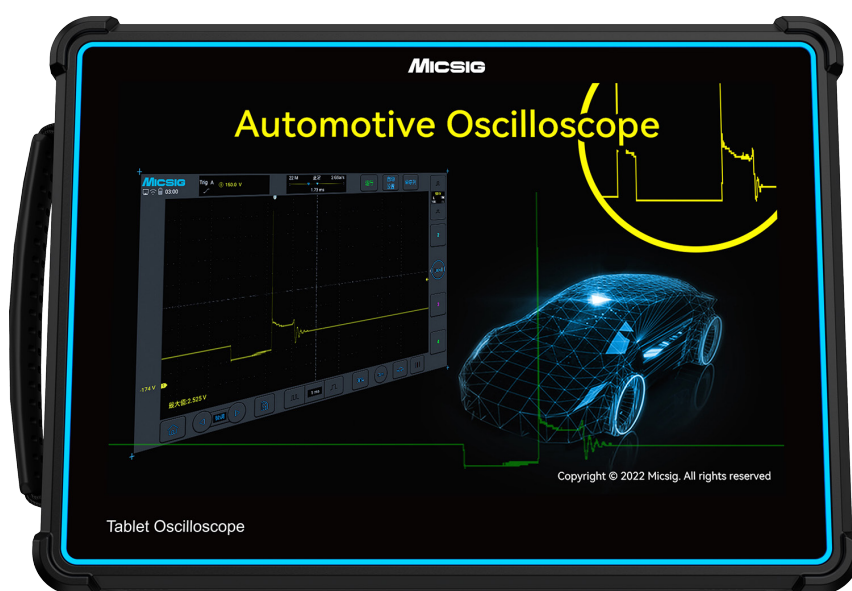
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## PRODUCT OVERVIEW

ATO series oscilloscope is an oscilloscope dedicated to automotive maintenance and diagnostics. Equipped with professional automotive diagnostic functions, it comes with 2 and 4 channels, max. 300MHz bandwidth, up to 2GSa/s sampling rate and 220Mpts memory depth, delivers most powerful signal capture and analysis capability.

With 10.1-inch high-resolution full touch screen, large built-in battery, and Micsig's dedicated SigtestUI™ multi-tasking system, the ATO automotive oscilloscope making modern automotive diagnostics much easier than ever before.



- ▶ Professional automotive diagnostic tests
- ▶ Compact portable design, best for field work
- ▶ Large battery support continual field work
- ▶ Support segmented storage acquisition
- ▶ Switchable 1MΩ/50Ω input impedance
- ▶ Deep memory to display all signal details
- ▶ Comprehensive serial bus trigger & decoding
- ▶ Support WIFI, USB, PC and SCPI control
- ▶ Hardware-based filter to eliminates interferences

## Key Specifications

| Model                        | ATO3004                                                    | ATO2004  | ATO2002       | ATO1004 |
|------------------------------|------------------------------------------------------------|----------|---------------|---------|
| Bandwidth                    | 300MHz                                                     | 200MHz   | 200MHz        | 100MHz  |
| Analog Channels              | 4                                                          | 4        | 2             | 4       |
| Rise Time                    | ≤ 1.16ns                                                   | ≤ 1.75ns | ≤ 1.75ns      | ≤ 3.5ns |
| Sampling Rate (Max.)         | 2GSa/s                                                     | 2GSa/s   | 1GSa/s        | 1GSa/s  |
| Memory Depth                 | 220Mpts                                                    |          | 110Mpts       |         |
| Input Impedance              | 1MΩ/50Ω                                                    |          | 1MΩ           |         |
| Waveform Capture Rate (Max.) | 300,000 wfms/s                                             |          | 78,000 wfms/s |         |
| Interfaces                   | USB 3.0/2.0 Host, USB Type-C, Grounding, HDMI, Trigger out |          |               |         |
| Bandwidth Filter             | Full bandwidth, Low pass                                   |          |               |         |
| Display                      | Industrial 10.1" TFT-LCD (1280*800)                        |          |               |         |
| Dimension / Net Weight       | 265*192*50mm / 1.9kg (with battery)                        |          |               |         |
| Battery                      | 7.4V, 7500mAh, Li-ion battery                              |          |               |         |

# CHARACTERISTICS & FEATURES

## Portable Design

ABS+TPU protector, pre-installed handstrap, only 1.9kg, one hand to hold.

## Friendly UI

Fast Android OS experience, updated UI design, easy to use

## Robust Hardware

Upgraded core hardware, fast CPU, support video recording.



## Protocol Decoding

RS-232/422/485/UART、CAN、CAN FD、LIN、SPI、I<sup>2</sup>C

## Smooth Touch

10.1" integrated seamless touch screen, ultra-high 1280\*800 resolution.

## Auto-diagnostic Presets

Dedicated software for auto repair engineers, covering most of the auto repair tests.

## Auto-diagnostic Presets:

**Charging/Start Circuit:** 12V&24V charging, Alternator AC Ripple, Ford smart Alternator, 12V&24V Start, Cranking Current

**Sensor:** ABS, Accelerator Pedal, Air Flow Meter, Camshaft, Coolant Temperature, Crankshaft, Distributor, Fuel pressure, Knock, Lamda, MAP, Road Speed, Throttle Position

**Actuators:** Carbon Canister Solenoid Valve, Diesel Glow Plugs, EGR Solenoid Valve, Fuel Pump, Idle Speed Control Valve (IAC), Injector (Petrol), Injector (Diesel), Pressure Regulator, Quantity Control Valve, Throttle Servomotor, Variable-speed cooling fan, Variable Valve Timing

**Ignition:** Primary, Secondary, Primary + Secondary

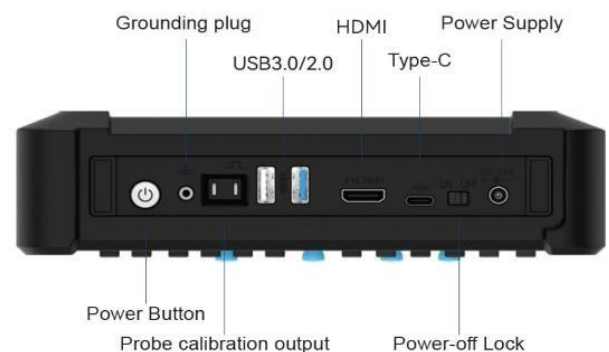
**Networks:** CAN High & CAN Low, CAN FD, FlexRay, K line

**Combination Tests:** Crankshaft + Camshaft, Camshaft + Primary Ignition, Primary ignition + Injector Vol, Crankshaft + Camshaft + Injector Vol.+ Secondary Ignition

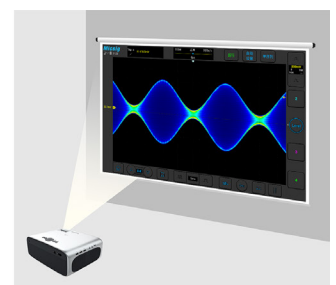
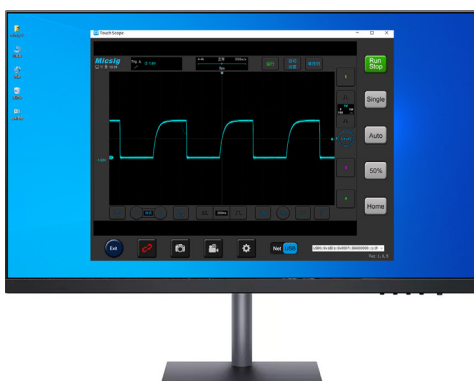
**Pressure Tests:** Intake Manifold, Exhaust Tailpipe, In-Cylinder, In-Crankcase



- Built-in large Li-ion battery, work where you work



- Complete connectivity (\*switch Power-off lock to ON for first-time use)



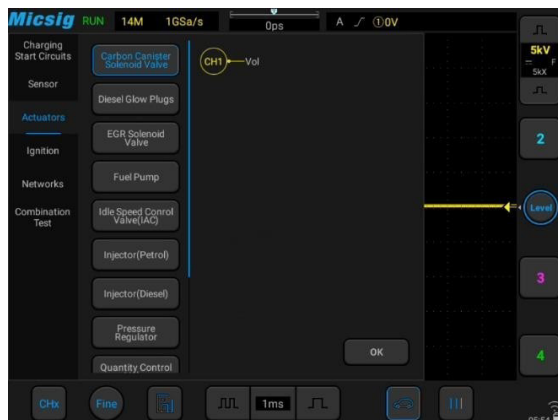
- The ATO series supports PC software + Mobile App (Android / iOS) remote control via Wi-Fi, USB to access internet for online upgrade, it also can be projected through HDMI port for demonstrations for training and education purpose.



▲ Support 12/24V Charging & Start circuit, AC Ripple, Cranking Current tests



▲ Directly measure the waveform of various Sensors, by comparing with standard waveform, helps user easily find out possible problem.



▲ Support multiple Actuator tests, including Carbon Canister & EGR solenoid valve, Fuel Pump, Injectors, Cooling fan, Pressure Regulator, etc.



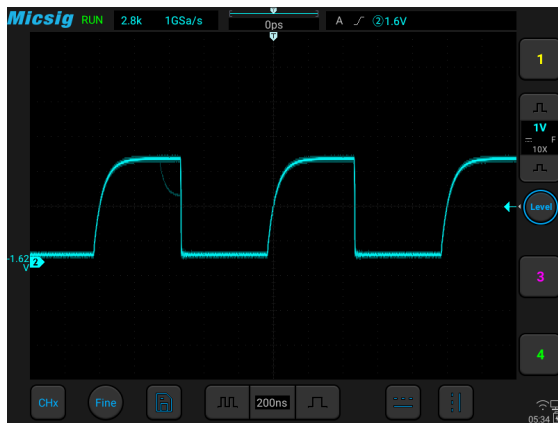
▲ The ignition system of a car is usually composed of primary and secondary coils and spark plugs. Can test both Primary and Secondary ignition signals, to find out possible malfunction.



▲ ATO is capable of acquiring and decoding CAN High /CAN Low, CAN FD, LIN, FlexRay, and K line signals, delivers professional Network communication tests on vehicles.

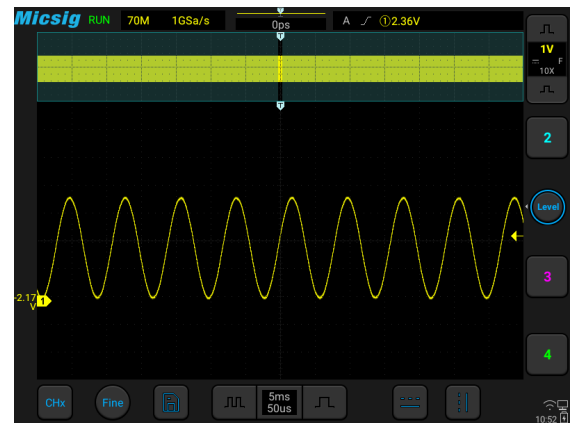


▲ The electronic faults can be complicated, by comparing the collected various waveforms, users judge faults by analyzing the timing and quantitative relationships between waveforms.



### High Waveform Update Rate

With a waveform update rate of up to 300,000 wfm/s, the ATO can easily capture unusual or low probability events.



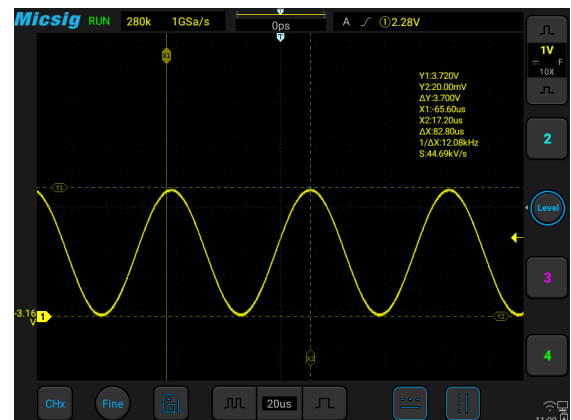
### Ultra-deep Memory

Using hardware-based Zoom technique and memory depth of up to 220Mpts, users can move and browse waveforms much easier and quickly zoom in to focus the area of interest.



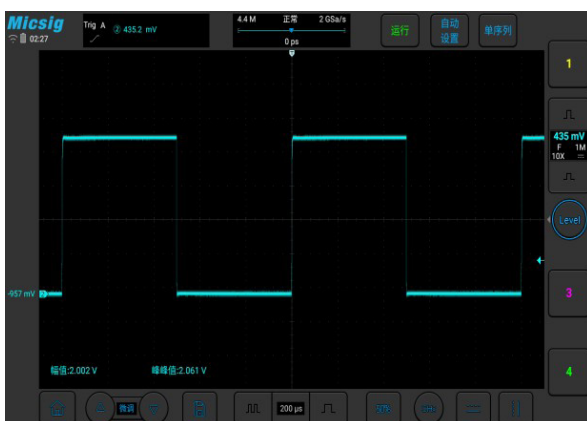
### Powerful Trigger Functions

Support Edge, Pulse, Logic, N Edge, Runt, Slope, Timeout, Video and Serial trigger, most intuitive trigger settings.



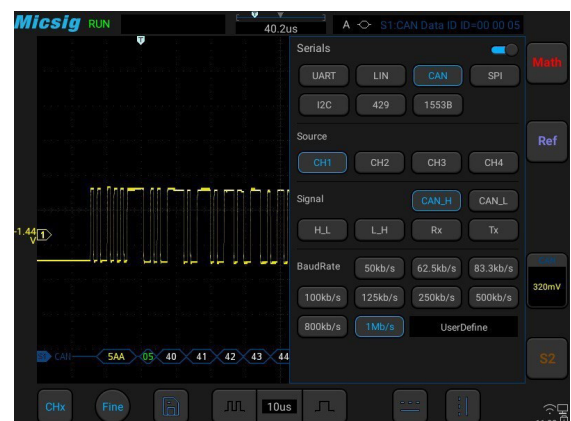
### Convenient Cursor Measurement

One touch to open horizontal and vertical cursors, each cursor can be moved separately or simultaneously.



### Vertical scale fining

By pinching two fingers apart on the screen, you can adjust the vertical scale as you like, no longer limited by the 1/2/5 step limit.



### Serial Bus Decoding and Analysis

Support RS-232/422/485/UART, LIN, CAN, CAN FD, I<sup>2</sup>C, SPI serial bus decoding and triggering options, display waveform and data at the same time.

## Specifications

| Vertical System                          |                                                                                                                                                |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Bandwidth Filter                         | ATO3004 / ATO2004: Full bandwidth, Low pass (to 30Hz)<br>ATO2002 / ATO1004: Full bandwidth, Low pass (to 30KHz)                                |
| Input Coupling                           | DC、AC、GND                                                                                                                                      |
| Input Impedance                          | ATO3004 / ATO3002 / TO2004: $1M\Omega \pm 1\% \parallel 50\Omega \pm 1\%$<br>ATO2002 / ATO1004: $1M\Omega \pm 1\%$                             |
| Vertical Resolution                      | 8 bits                                                                                                                                         |
| Vertical Divisions                       | 10div                                                                                                                                          |
| Input Sensitivity Range                  | ATO3004 / ATO3002 / ATO2004: 1mV/div~10V/div ( $1M\Omega$ ) 1mV/div~1V/div ( $50\Omega$ )<br>ATO2002 / ATO1004: 1mV/div~10V/div ( $1M\Omega$ ) |
| DC Gain Accuracy                         | 5mV/div ~10V/div: $\leq \pm 2.0\%$ ;<br>$\leq 2mV/div$ : $\leq \pm 3.0\%$                                                                      |
| Offset Range ( $1M\Omega$ , $50\Omega$ ) | $\pm 2.5V$ (Probe @ X1, <500mV/div), $\pm 120V$ (Probe @ X1, $\geq 500mV/div$ )                                                                |
| Noise                                    | $\leq 1.2mV_{pp}$ (1mV/div, $1M\Omega$ )                                                                                                       |
| Maximum Input Voltage                    | CAT I 300Vrms 400Vpk ( $1M\Omega$ ) , 5Vrms ( $50\Omega$ )                                                                                     |
| Ch-to-Ch Isolation DC to Max. Bandwidth  | > 40dB ( $\leq 100MHz$ ) , > 35dB (> 100MHz)                                                                                                   |

| Horizontal System  |                                                      |
|--------------------|------------------------------------------------------|
| Time Base          | 1ns/div~1ks/div (ATO2002 / ATO1004: 2ns/div~1ks/div) |
| Time Base Accuracy | 20ppm                                                |
| Vertical Divisions | 11div                                                |
| Clock Drift        | $\leq \pm 5ppm$ / year                               |

| Trigger System               |                                                                             |
|------------------------------|-----------------------------------------------------------------------------|
| Trigger Mode                 | Auto, Normal, Single                                                        |
| Trigger level range (analog) | $\pm 5div$ from the center of the screen, analog channel                    |
| Trigger Holdoff Range        | 200ns~10s                                                                   |
| Trigger Coupling (frequency) | DC, AC (70Hz), high frequency (40KHz), low frequency (40KHz), noise (10MHz) |
| Trigger Types                | Edge, Pulse Width, Logic, N Edge, Runt Pulse (Runt), Slope, Time Out, Video |
| Bus decoding                 | RS-232/422/485/UART、CAN、CAN FD、LIN、SPI、I2C                                  |

| Sampling System         | ATO3004 / ATO2004 / ATO3002        | ATO2002 / ATO1004                    |
|-------------------------|------------------------------------|--------------------------------------|
| Real-Time Sampling Rate | 2G Sa/s (One CH), 1G Sa/s (All CH) | 1G Sa/s (One CH), 250M Sa/s (All CH) |
| Max. Memory depth       | 220Mpts                            | 110Mpts                              |
| Segmented Storage       | Support                            | Not Support                          |
| Average                 | 2,4,8,16,32,64,128,256             | 2,4,8,16,32,64,128,256               |
| Envelope                | 2,4,8,16,32,64,128,256, $\infty$   | 2,4,8,16,32,64,128,256, $\infty$     |

| Waveform Measurements                 |                                                                                                                                                                                                                                                                                          |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Automated Measurements                | Period, Frequency, Rise Time, Fall Time, Delay, Positive Duty Cycle, Negative Duty Cycle, Positive Pulse Width, Negative Pulse Width, Burst Width, Positive Overshoot, Negative Overshoot, Phase, Peak-to-Peak, Amplitude, High, Low, Maximum, Minimum, RMS, Cycle RMS, Mean, Cycle Mean |
| Hardware Frequency Meter & Resolution | 6 digits, 2Hz~Max bandwidth, PK-PK > 0.8div                                                                                                                                                                                                                                              |
| Cursors                               | Horizontal, Vertical, Cross                                                                                                                                                                                                                                                              |
| Waveform Math                         |                                                                                                                                                                                                                                                                                          |
| Dual Waveform                         | +, -, *, /, analog channel                                                                                                                                                                                                                                                               |
| FFT                                   | Points: max. 275kpts<br>Rectangular, Hamming, Blackman, Hanning                                                                                                                                                                                                                          |
| AX+B                                  | A: $\pm 1k$ , Min. Resolution 1p or 4it<br>B: $\pm 1k$ , Resolution 1p or 5bit<br>X: Analog channel                                                                                                                                                                                      |
| Advance math                          | Advanced input, including +, -, *, /, <, >, $\leq$ , $\geq$ , ==, !=, &&,   , (, ), !(), sqrt, abs, deg, rad, exp, diff, ln, sin, cos, tan, intg, lg, asin, acos, atan                                                                                                                   |
| Display System                        |                                                                                                                                                                                                                                                                                          |
| Display Type                          | 10.1-inch TFT LCD capacitive, 11*10 divisions                                                                                                                                                                                                                                            |
| Persistence Duration                  | Auto, 10ms~10s, $\infty$                                                                                                                                                                                                                                                                 |
| Time Base Mode                        | YT, XY, Roll, Zoom                                                                                                                                                                                                                                                                       |
| Expand Benchmark                      | Center, Trigger position                                                                                                                                                                                                                                                                 |
| Waveform Display                      | Vectors, Line, brightness adjustable                                                                                                                                                                                                                                                     |
| Waveform Update Rate                  | ATO3004/2004/3002 is 300,000 wfms/s, ATO2002 / ATO1004 is 78,000 wfms/s                                                                                                                                                                                                                  |
| Storage                               |                                                                                                                                                                                                                                                                                          |
| Storage Medium                        | Local, USB drive                                                                                                                                                                                                                                                                         |
| Waveform Storage Format               | WAV, CSV, BIN                                                                                                                                                                                                                                                                            |
| Store Waveform Quantity               | Unlimited                                                                                                                                                                                                                                                                                |
| Stored Waveform Rename                | Support                                                                                                                                                                                                                                                                                  |
| Reference Waveform Display            | 4 internal waveforms                                                                                                                                                                                                                                                                     |
| Quick Screenshot                      | Support                                                                                                                                                                                                                                                                                  |
| User Setting Storage                  | 10 internal setups                                                                                                                                                                                                                                                                       |
| User Settings Rename                  | Support                                                                                                                                                                                                                                                                                  |
| USB Flash Drive                       | Support industry standard flash drives                                                                                                                                                                                                                                                   |
| Screenshot, Video recording           | Support                                                                                                                                                                                                                                                                                  |

## Input / Output Ports

|                                        |                                                    |
|----------------------------------------|----------------------------------------------------|
| USB3.0 Port                            | Support one USB mass storage device, read and edit |
| USB2.0 Port                            | One, read and edit                                 |
| USB Type-C                             | One, read and edit                                 |
| DC Port                                | One                                                |
| Probe Compensator                      | 1kHz、2Vpk-pk                                       |
| HDMI                                   | HDMI 1.4                                           |
| Wi-Fi                                  | Support                                            |
| Android/iOS remote control application | Support                                            |
| SCPI                                   | Support                                            |

## Power Source

|                     |                                              |
|---------------------|----------------------------------------------|
| Power Voltage Range | 100~240V AC, 50/60Hz                         |
| Power Consumption   | < 60W                                        |
| Adapter Output      | 12V DC, 5A (ATO2002 / ATO1004 is 12V DC, 4A) |
| Battery             | 7.4V, 7500mAh Li-ion battery                 |

## Environment

|               |                |
|---------------|----------------|
| Temperature   |                |
| Operating     | 0°C ~ 45°C     |
| Non-operating | -40°C ~ 60°C   |
| Humidity      |                |
| Operating     | 5% ~ 85%, 25°C |
| Non-operating | 5% ~ 90%, 25°C |
| Altitude      |                |
| Operating     | < 3000m        |
| Non-operating | < 12000m       |

## Physical Characteristics

|                        |                                                 |
|------------------------|-------------------------------------------------|
| Dimensions (W x H x D) | 265*192*50mm                                    |
| Weight                 | Net: 1.9kg (with battery), Volume Weight: 4.5kg |

## Standard Kit



\*ATO2002 are 2CH oscilloscopes, and ATO1004/2004/3004 are 4CH oscilloscopes.  
 The standard configuration of the 2CH oscilloscope includes 2 BNC banana cables, 1 pair of alligator clips, and 1 pair of soft pin probe.  
 The standard configuration of the 4CH oscilloscope includes 4 BNC banana cables, 2 pairs of alligator clips, and 2 pairs of soft pin probe.

## Master Kit



## Optional instruments

## Optical-fiber Isolated Probe

## SigOFIT series

Bandwidth: up to 1GHz, Common mode voltage: 85kVpk, DC gain accuracy: 1%, CMRR: up to 180dB

## High Voltage Differential Probe

## DP series

Bandwidth: up to 500MHz; Differential voltage (DC+AC PK) Max.7000V; Accuracy:  $\pm 2\%$

## Current Probes

## HF AC/DC current probe CP series

Bandwidth: up to 100MHz, Range: 5A/30A, Accuracy:  $\pm 1\%$

## LF AC/DC current probe CP2100 series

Bandwidth: up to 2.5MHz, Range: 10A/100A

## Rogowski AC current probe RCP series

Bandwidth: 2Hz - 30MHz, Range: 6000Apk, Accuracy: 2%

## AC Current Probe ACP1000

Bandwidth: 10Hz -100KHz, Range: 0.1Apk-1000Apk

