

**UNI-T**

# MSO7000X Series Mixed Signal Oscilloscope

10GSa/s | 2GHz | 1Gpts | 2,000,000wfms/s



**Datasheet REV 3.1**

**2025.7**

## Extraordinary performance contributes to high-quality testing

The MSO7000X series consists of two models, with bandwidth ranging from 1GHz to 2GHz, sample rate up to 10GSa/s, all equipped with 4 analog channels, adopting the brand-new UltraAcq® technology to achieve the industry-leading waveform capture rate of 600,000wfms/s. The integration of all-in-one measurement instrument functions prepares you for future testing needs. The advanced measurement functions help you easily complete complex tests, and the simple and easy-to-use operation platform makes all the impossible possible.

## The user-friendly and perfect design makes your experience easier

Ingenious product design, a brand-new touch and peripheral interaction mode, equipped with a 15.6-inch high-definition capacitive touch screen, an instrument control panel deeply optimized, shortcut keys that take into account the attributes of the instrument, an agile multi-window layout design to provide the maximum display for your waveforms and allow viewing multiple signals at once. At the same time, the easy-to-use WebServer remote debugging capability of MSO7000X, only requiring an instrument IP address, you will be able to debug the oscilloscope in any comfortable posture.

## Rich-in-function test software speeds up your design pace

More than 6 kinds of advanced power analysis to accelerate the completion of the design and verification of power supply products. More than 11 kinds of industry protocol analysis to accelerate the diagnosis of system faults and the analysis of debugging. Jitter analysis and eye diagram test to accelerate the location of jitter in clock and data signals. Limit and mask tests to accelerate the incoming inspection at the production end.

### MSO7000X Series key features

|                         |                                                                                                       |                |                                       |
|-------------------------|-------------------------------------------------------------------------------------------------------|----------------|---------------------------------------|
| Bandwidth               | 1GHz/2GHz                                                                                             | Sample rate    | 10GSa/s                               |
| Maximum memory depth    | 1Gpts (standard)                                                                                      | Input channels | 4+16                                  |
| Waveform capture rate   | Up to 2,000,000wfms/s                                                                                 | Trigger type   | 22 +                                  |
| Measurements            | 58+                                                                                                   | Display        | 15.6-inch FHD capacitive touch screen |
| Cross-platform access   | Webserver instrument access control, support for mobile devices                                       |                |                                       |
| Advanced analysis tools | Power analysis、Jitter analysis and eye diagram、Mask and limit test、Histogram、Trace、and Tendency chart |                |                                       |
| Interface               | USB Host 3.0×4, USB Device 3.0×1, 10M Ref IN\Out, AUX In\Out, 10/100/1000LAN、HDMI                     |                |                                       |

| Integrated tools                      | Std/Option                                                                        |
|---------------------------------------|-----------------------------------------------------------------------------------|
| Spectrum analyzer                     | Standard                                                                          |
| Digital voltmeter                     | Standard                                                                          |
| Frequency counter                     | Standard                                                                          |
| Limit Template Testing                | Standard                                                                          |
| Function/Arbitrary waveform generator | Optional: MSO7000X-AWG                                                            |
| Logic analyzer                        | Optional: MSO7000X-LA                                                             |
| Protocol Analyzer                     | Standard : RS232/422/485/UART、I <sup>2</sup> C、SPI、CAN、LIN                        |
| Protocol Analyzer                     | Optional: MSO7000X-CANFD、MSO7000X-FLEX、MSO7000X-SENT、MSO7000X-AUDIO、MSO7000X-AERO |
| Jitter analysis and eye diagram       | Optional: MSO7000X-JITTER                                                         |
| Ethernet compliance analysis          | Optional: MSO7000X-CTS100                                                         |
| USB2.0 compliance analysis            | Optional: MSO7000X-CTSUSB20                                                       |
| Power analysis                        | Optional: MSO7000X-PWR                                                            |
| Advanced Filter Designer              | Optional: MSO7000X-FILTER                                                         |
| Matlab Embedded Programming           | Optional: MSO7000X-MAT                                                            |
| Upgrade suit                          | Optional: MSO7000X-BND                                                            |
| Bandwidth upgrade                     | Optional: MSO7000X-BW-10T20                                                       |

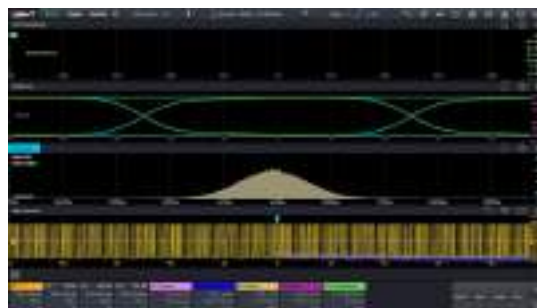
## Extraordinary performance contributes to high-quality testing

The integration of the functions of many independent measurement instruments, any measurement task can be easily handled, and preparations are made for your future testing needs.



### Oscilloscope

- Two bandwidth options: 1GHz/2GHz
- Input channel: 4+16
- Sample rate: 10GSa/S
- waveform capture rate reach to 600,000wfms/s at UltraAcq mode, 2,000,000wfms/s at sequence mode.
- The memory depth: 1Gpts (single channel), 250Mpts (full channel)



### Function/Arbitrary Waveform Generator (opt)

- dual-channel function/arbitrary waveform generator with equal performance.
- The maximum output frequency is 60MHz, and the sample rate is 625MSa/s.
- Vertical resolution is 16 bits.
- Built-in many kinds of standard waveforms: sine, square, pulse, ramp, noise, DC. Built-in more than 200 kinds of arbitrary waveforms.
- Support the modulation and sweep of various signals



### Spectrum analyzer

- Enhanced FFT with a maximum of 1Mpts signal analysis
- Frequency analysis range: analog bandwidth of the oscilloscope
- Support multiple spectrum view displays: Amplitude



spectrum, Power spectrum, Psd, Real part, Imaginary part, Phase spectrum.

- Two spectrum analysis windows can be added simultaneously to meet the visual display under different window functions.

### Digital voltmeter

- 4-digit DC/AC RMS/DC + AC RMS voltage measurement



### Frequency counter

- 8-digit high-precision hardware frequency meter as standard



### Logic analyzer (opt)

- The standard configuration includes a 16-channel logic analyzer. You only need to select MSO7000X-LA to obtain the service.
- Digital channel sample rate: 1.25GSa/s
- Digital channel memory depth: 125Mpts
- The minimum identifiable pulse width is as low as 3.2ns
- The digital probe provides a signal input socket with the upper eight bits separated from the lower eight bits, and simplifies the connection with the device under test. When connected with square pins, the UT-M15 can be directly connected to an 8X2 square pin header with pins of 2.54mm
- The UT-M15 provides excellent electrical characteristics, with an input impedance of  $101k\Omega \pm 1\%$



### Protocol analyzer (opt)

MSO7000X provides various serial bus analysis and multiple protocol trigger modes, which can trigger specific packet contents, identify polarities, chip selects, etc. The trigger events are displayed in a list, and protocol search can be performed to accurately locate protocol frames.

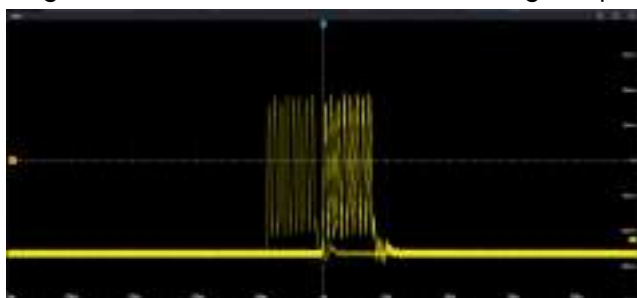
It covers commonly used protocols in Computer\Embedded\Automotive\Aero\Audio design.



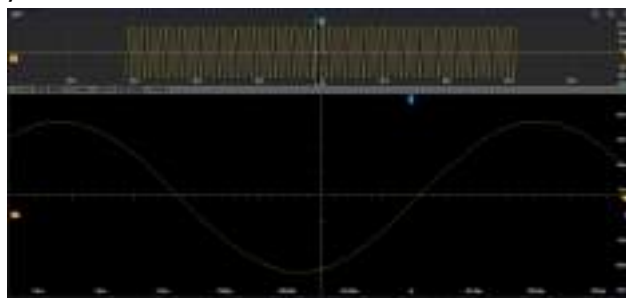
### The patented UltraAcq® technology, perfectly captures, showing every detail

Different from before, the MSO7000X provides a unique physical button UltraAcq. With a gentle press, the oscilloscope enters the ultra-fast acquisition mode, increasing the real-time waveform capture rate to 600,000wfms/s, and reducing the dead time of the oscilloscope to the lowest  $< 1\mu s$ , which improves the probability of viewing common sporadic problems in digital systems, such as Runt pulses, Glitch, Timing issues etc. The MSO7000X can smoothly switch between DSO (Digital Storage) and UPO (Ultra Phosphor) through the UltraAcq mode. You can focus on

the superimposed waveforms to quickly discover sporadic signal abnormalities, or switch to a single waveform to focus on the true signal quality of the waveform.



*The high capture rate in the UPO mode makes the oscilloscope capture sporadic waveform reflections*



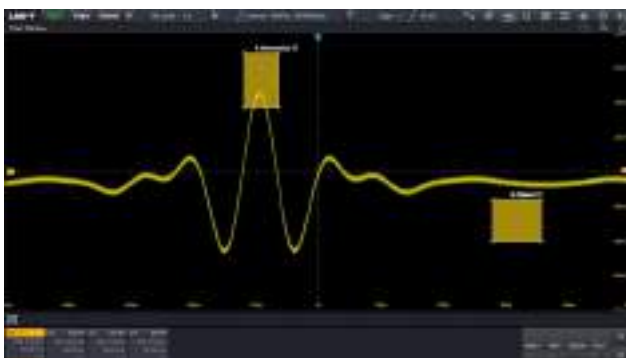
*Under the DSO mode, there is no envelope of the fast-acquired quickly waveform, and you can easily see the point details of the waveform*

### **Unparalleled triggering capability, also handles complex debugging with ease**

The MSO7000X series is equipped with more than 22 kinds of advanced trigger modes, and all modes is equipped with memory depth of 1Gpts as standard. When you are debugging complex systems, you can easily find abnormalities in extremely long data. More than 11 kinds of serial trigger modes help you quickly debug in complex bus debugging, enabling you to have unprecedented in-depth insight into signal details. The flexibly configured zone trigger allows the waveform to roam in the configured area, quickly isolating irrelevant signals. The area trigger can reduce the workload during capture or manual search, quickly find key events in a very short time, and complete the debugging and analysis work.



*Use the zone trigger to quickly isolate unconcerned signals, quickly find key information, and there is no need to spend too much time learning advanced trigger mode*



### **Powerful mathematical waveform operation to finely process your signal**

#### **Digital filter, User-defined filter design (opt)**

Any signal processing system can be regarded as a filter. such as the 20MHz bandwidth limit of an oscilloscope, can be regarded as a low-pass filter, which is used to filter high-frequency noise in the signal. Compared with analog oscilloscopes, digital oscilloscopes have obvious advantages. For example, analog oscilloscopes are affected by circuit components, and it is costly and difficult to achieve high-order filter design. High-order filtering can be easily achieved by digital filter. Digital filter can be implemented as infinite impulse response (IIR) and finite impulse response (FIR), and you can choose which filter designer to apply according to the design requirements. The MSO7000X can specify the filter to be applied to the mathematical waveform

through the Math function, adding support for standard filters and user-defined application-centered filter designs.

The MSO7000X supports the filter response type:

- High pass
- Low pass
- Band pass
- Band stop

The MSO7000X supports the filter type

- Butterworth
- Chebyshev I
- Chebyshev II
- Elliptic
- Sampling
- Remez
- Window



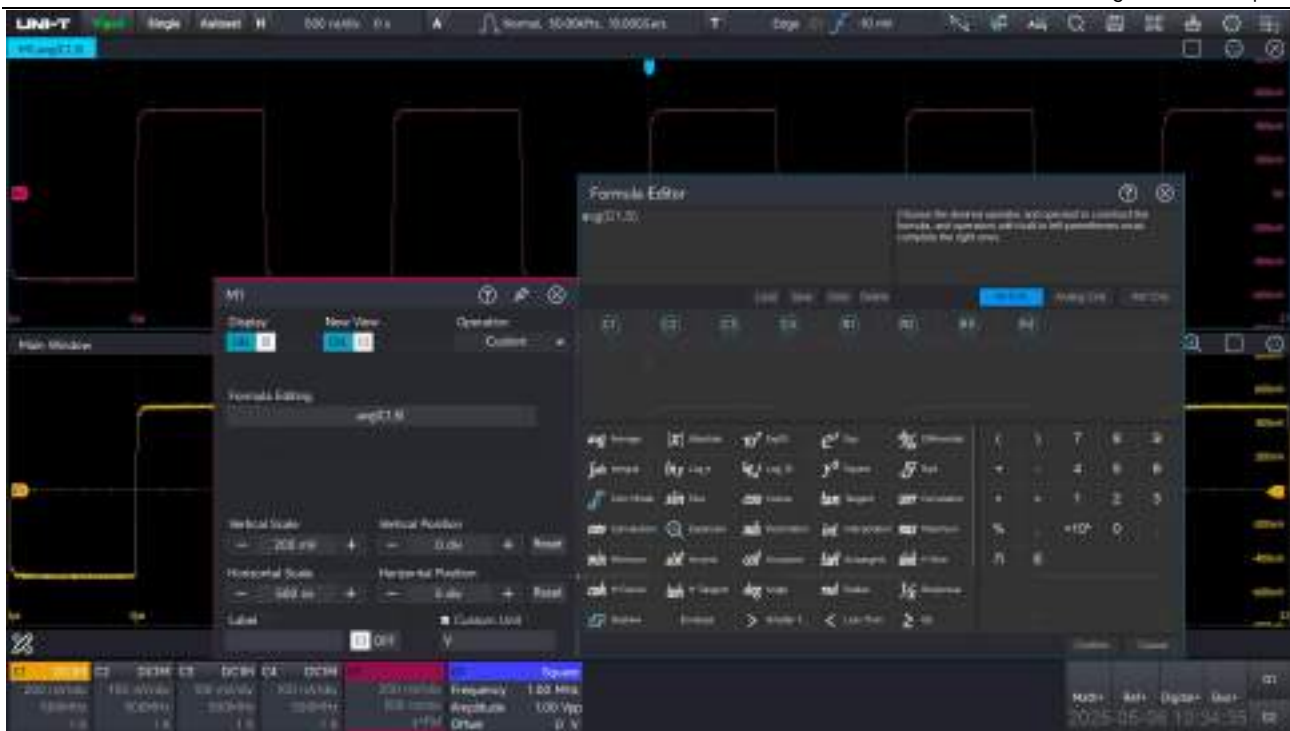
*Use the user-defined filter creation dialog box to graphically display the filter type, response, order, etc., and the filter design can be saved and recalled*

## Eres mode

Eres itself is also a kind of filter, mainly used in small signal amplitude measurement. FIR filter is used to low-pass filter the captured signal. Users can adjust the enhancement bits to select the FIR filter with corresponding length and bandwidth, and adjust the bit within the maximum sampling bandwidth range to match the bandwidth of the low-pass filter. Each channel can be set independently, with a maximum enhancement of 3 bits. If the trade-off between resolution and bandwidth is acceptable, then filter is the best method.

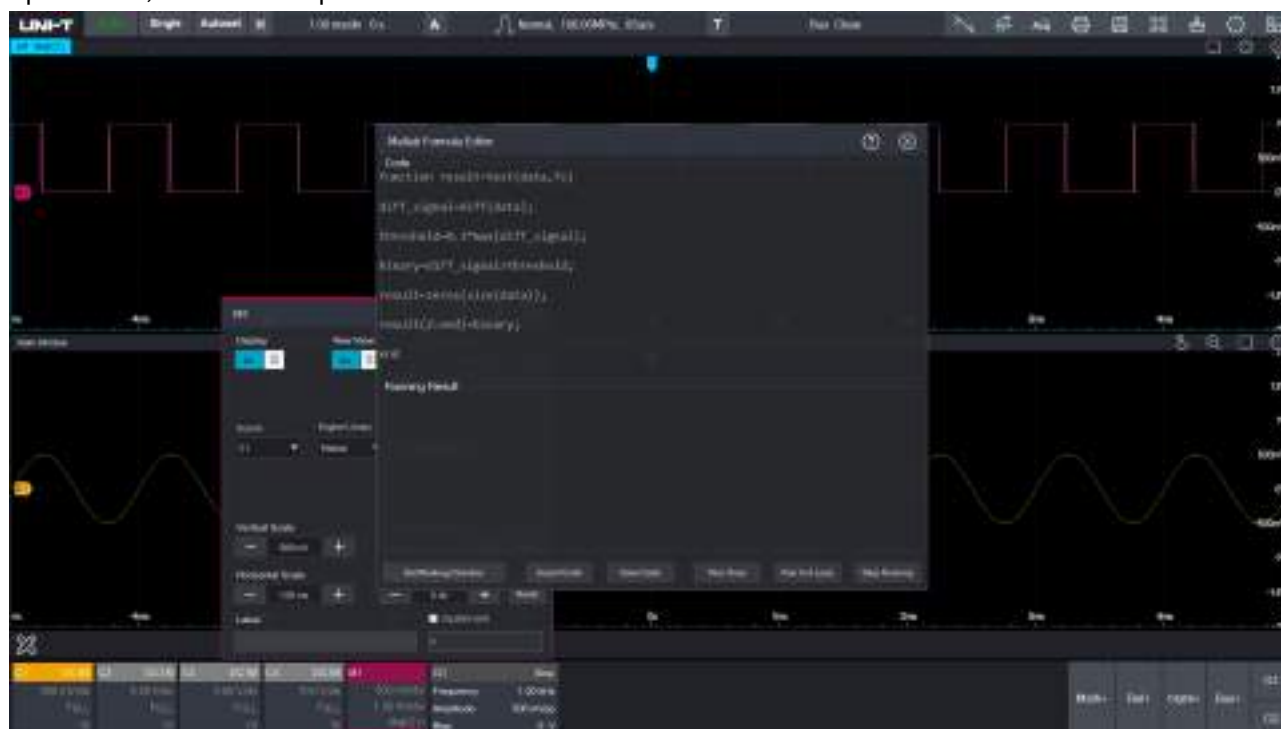
## User-defined advanced function operation

The MSO7000X creates dozens of advanced mathematical function operations for users. Users only need to input according to the function parameter prompts to call the function formula to perform operation processing on the waveform.



The above figure uses the AVG function to average the waveform of channel 1, with an average number of 5 times.

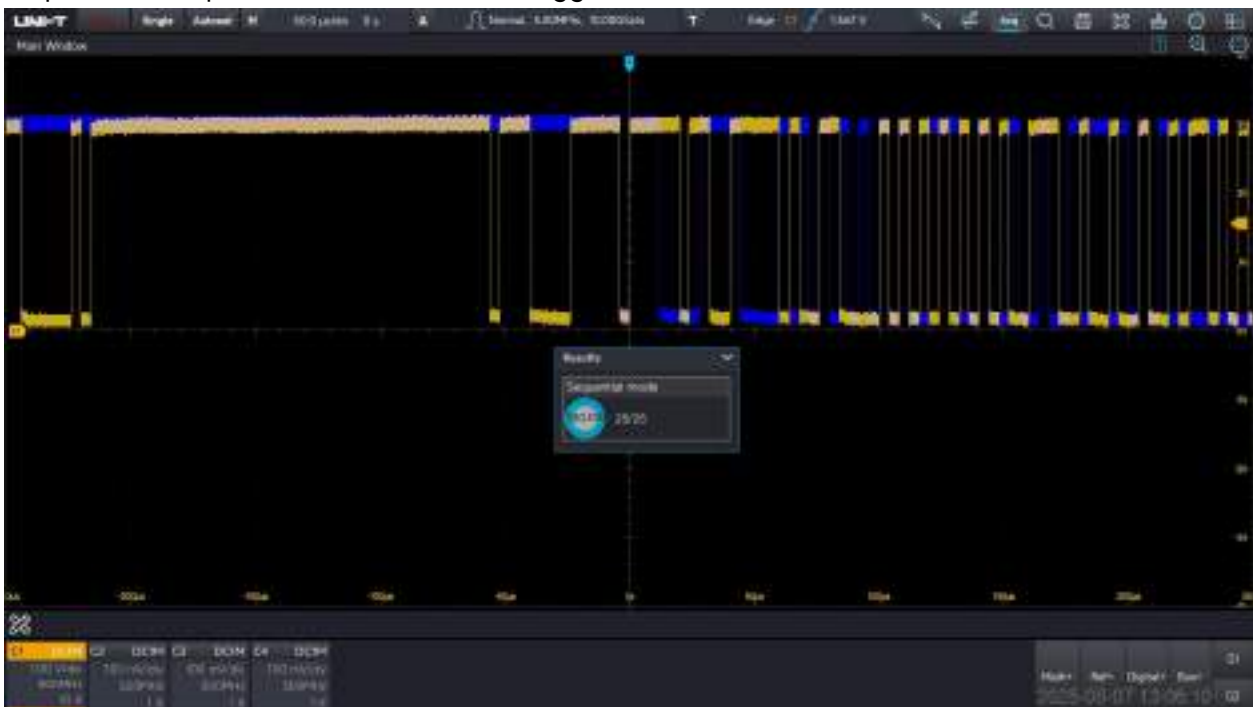
Using the Matlab code compiler embedded in MSO7000X, users can directly write Matlab language and run the script code, and return the running result of the script to render it into the mathematical waveform of the oscilloscope. When the above advanced formulas and basic operation formulas still cannot meet your needs, you can directly write a script for mathematical operations, and the script can also be saved for the next recall.



The above figure uses the matlab script to perform differential processing on the sine waveform of channel 1, and then converts it into a square wave

## Sequence mode provides you with more signal information

The sequence mode adopts the segment storage technology to efficiently utilize the memory depth of the oscilloscope, allowing you to effectively save enough trigger events within 1Gpts memory space, while eliminating the long intervals between events. In this mode, the oscilloscope does not render the waveform before the acquisition stops, greatly reducing the acquisition time interval (dead time) of the oscilloscope and increasing the waveform capture rate to 2,000,000wfms/s. After the acquisition is completed, you can view the waveform in a single frame or playback it frame by frame, or view the waveform within up to 40 continuous frames in the form of 45°/Stack/Superposition/splicing. The sequence mode supports the acquisition of up to 520,000 frames of triggered waveforms



Utilize the fast capture rate of the sequence mode to effectively capture 25 complete CAN protocol frames, and compare each frame. It is found that there is a timing error in the transmission bit. The blue part in the figure is the reference frame, the maroon is completely overlapped, and the yellow part has deviations

## The user-friendly and perfect design makes your experience easier

### Truly born for product design, with a brand-new touch interaction experience

The use of touch screens on oscilloscopes is not uncommon, but most oscilloscopes still retain the original independent menu buttons and waste a lot of space. The MSO7000X provides a 15.6-inch high-definition capacitive touch screen, while optimizing the proprietary interface of the instrument. While providing the same touch experience as mobile phones and tablets, it retains the instrument's unique knobs and shortcut keys, taking into account the proprietary attributes of the instrument. It supports external Bluetooth mouse/keyboard, and easily turns into a personal workstation in seconds. At the same time, in terms of the instrument UI design, it is more in line with the thinking of engineers, and the expandability of multiple windows also enables engineers to handle measurement tasks more efficiently.

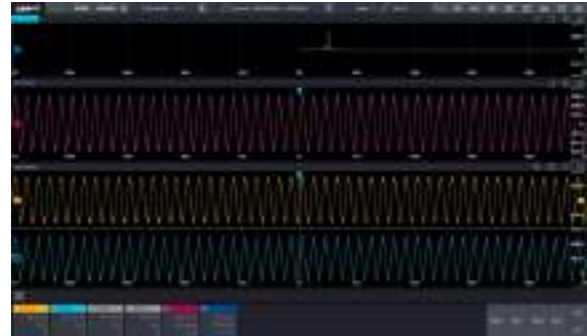


## Multi-window, flexible layout, enhance cross-application collaboration capabilities

Have you ever been unable to switch between multiple tasks during the use of the oscilloscope; needed to frequently switch applications when multiple measurement items were carried out simultaneously; been distressed that the layout designed by the manufacturer did not meet your aesthetic standards; been limited by the number of windows and wanted to expand the task windows? The MSO7000X window design will help you solve such troubles. It is specially designed for engineers, and the thinking is more in line with the working habits of engineers.

When using multiple windows, you can:

- Move and zoom the waveforms in a single window;
- Drag the window to change the layout and adjust the window size arbitrarily;
- Set the pop-up window to be pinned, the event table to be floating or embedded; reduce frequent switching between multiple windows;
- Set the pop-up window to be pinned, the event table to be floating or embedded; reduce frequent switching between multiple windows;
- Perform full screen/split screen for the independent window and maximize the display;
- Adjust the waveform brightness of the independent window arbitrarily;
- Perform cursor measurement on the waveform of the independent window;



## WebServer remote debugging. You can use the oscilloscope in any position

Using the MSO7000X WebServer, you can connect the oscilloscope to your local network. Just enter the IP address of the instrument in the browser, and you can use the oscilloscope for real-time control and analysis on mobile device/PC. At the same time, WebServer also supports online SCPI programming commands, and you can directly export waveform data, take quick screenshots, and browse the instrument manual online on the client side. As long as the network permits, you can even use all the functions of the oscilloscope in any comfortable position.



## Search and navigation

If the appropriate search tools are lacking, finding the corresponding events in a 1Gpts long record waveform may consume a significant amount of time. MSO7000X provides search and navigation functions. All search events are highlighted with different colored search markers when they occur. During pauses, simple navigation can be achieved using the previous (←) and next (→) buttons on the search box or the search markers on the display screen. You can define multiple unique search conditions simultaneously for searching, and the event table will display the time of each search occurrence and the search measurement parameters. Up to 10 search settings can be made simultaneously.



*Search for the set conditions, such as pulse width search, and all pulse widths that meet the conditions can be found. The triangles with colors mark the positions, and the lengths of the searched pulse widths are displayed. If you are interested in pulse widths with too large differences, you can pause and navigate to the pulse width position for further analysis.*

## Rich-in-function test software speeds up your design pace

### Advanced Power Analysis- MSO7000X-PWR

With the development of chip technology, the requirements for power supply systems are getting higher and higher. Currently, small voltage and large current in power supply networks have become a trend, especially for power supply networks composed of chips or precision components. It is required to ensure reliable power supply and noise suppression for each part of the circuit, as well as complete signal transmission between each chip. Power supply testing also faces greater challenges. Designers are more concerned about the energy saving and response speed of the power supply to ensure the stability and cleanliness of the power supply. The rich advanced power analysis software of MSO7000X helps engineers complete reliable power supply design and power integrity testing. The complete advanced power analysis option for MSO7000X enables rapid and repeatable analysis of:

Input: Power quality, harmonic analysis, inrush current\*

Output: Ripple analysis, efficiency\*, Turn On/Off time\*

Switching analysis: Switching losses, safe operating area,  $di/dt^*$ ,  $dv/dt^*$ ,  $RDS(on)$ , modulation analysis

Frequency response analysis: Control loop response (Bode), power supply rejection ratio (PSRR)\*

Note: Items marked with \* are new. The test diagrams below only show some of the test functions.

#### Input power quality test

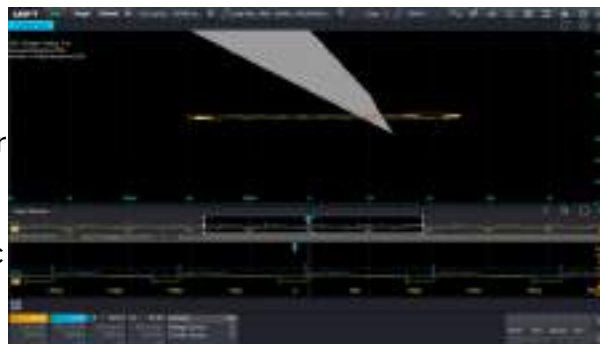
By testing the voltage, current and power at the input terminal, the quality of the input AC line can be effectively evaluated. This test is for the optimization design of the industrial frequency and is also the first hurdle for the quality of the power input.



The indicators of the input power supply are analyzed using MSO7000X-PWR. The yellow one is the voltage waveform, the blue one is the current waveform, and the purple one is the power graph.

#### Switching device evaluation test

The dynamic parameters of switching devices made of MOSFET/IGBT and third-generation semiconductor SiC and GaN are effectively evaluated, such as power/energy loss, safe working area (SOA), dynamic on-resistance  $R_{ds(on)}$ ,  $di/dt$ ,  $dv/dt$ , PWM modulation information and trends in the switch-on-on-turn-off



The SOA stress mask test is performed by MSO7000X-PWR software, and the waveform data is automatically collected and the Pass/Fail is judged

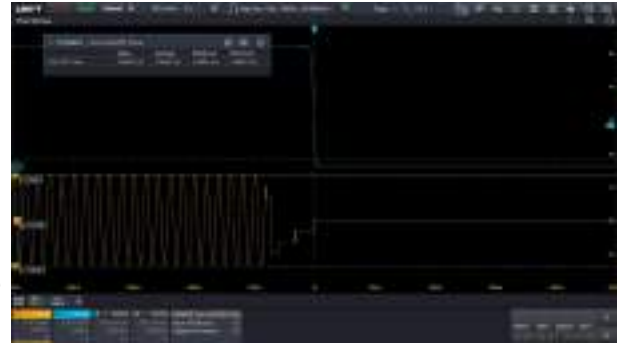
stage.

### Output-side testing:

Ripple analysis: analyze the RMS and peak-to-peak value of the output ripple;

Efficiency: Analyze the percentage of AC-DC power conversion efficiency;

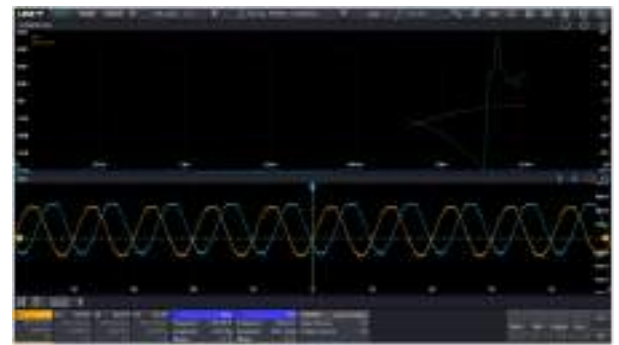
Start-up/Shutdown Time: Analyzes the time when the power supply is fully powered on/powered down



The turn-off event is used to evaluate the response time of a power device when, after removing the input voltage, the input voltage approaches zero.

### SMPS Loop stability test

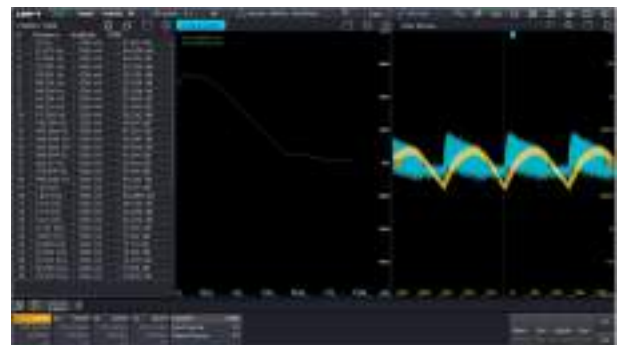
By injecting a disturbance signal with a constantly changing frequency into the switching power supply and based on its output situation, the dynamic modulation ability of the circuit system for each disturbance signal at each frequency point can be judged. By using the Bode plot and gain/phase margin measurement, designers can determine the stability of the power supply control loop.



The loop analysis test is automatically carried out through the MSO7000X-PWR software, and the software automatically evaluates the phase margin and gain margin. To complete the loop stability test, the MSO7000X-AWG signal generator option and the UT-ISOT isolation transformer need to be selected.

### Power supply ripple suppression test

PSRR (Power Supply Rejection Ratio) is a term used to describe the amount of output signal that is affected by the power supply, and the larger the PSRR, the less the output signal is affected by the power supply. The PSL measures the modulated input and output AC voltage levels, and then calculates the rejection ratio at each frequency in the swept band. It is calculated as:  $PSRR = 20\log[Ripple(in)/Ripple(out)]$



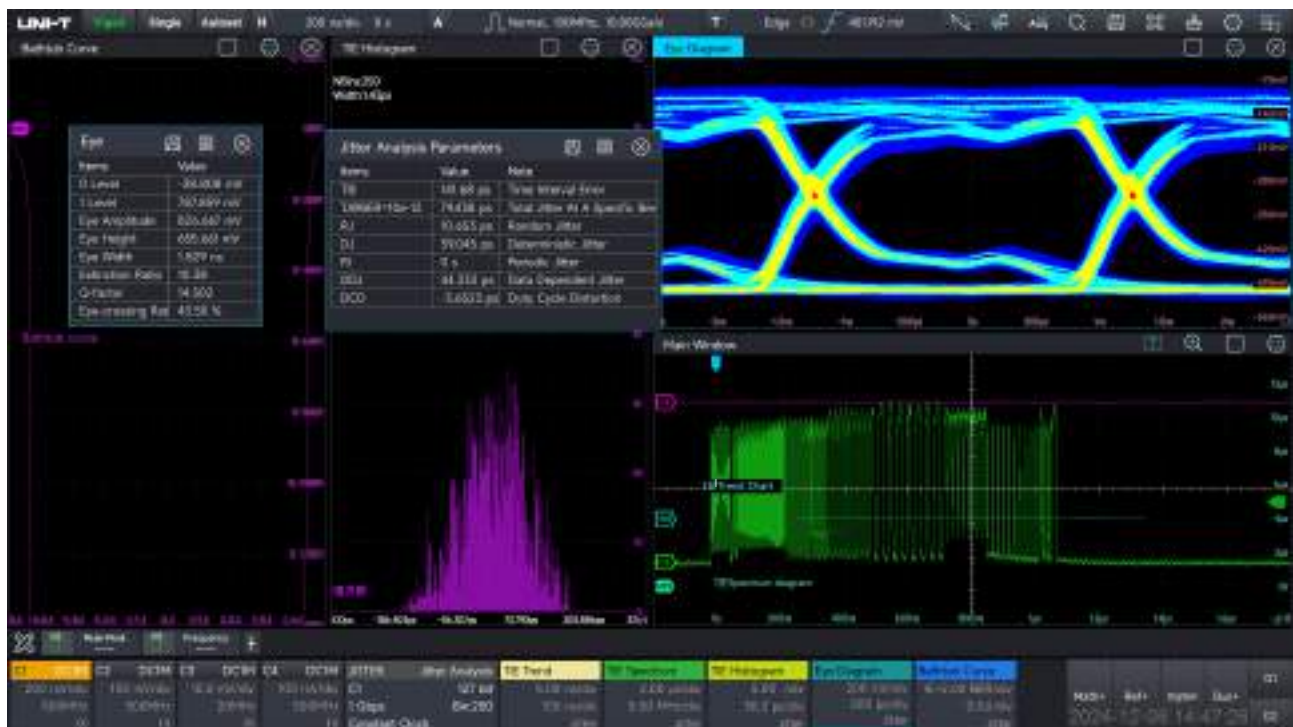
The ripple rejection capability of the power supply linear regulator module (LDO) can be analyzed using the PSRR scan curve, and as can be seen from the figure above, the power supply rejection capability is optimal at 17.1Hz at 54.14dB, and at about 1.3MHz, the worst is 0.907dB

## Jitter analysis and eye diagram pre-test

In electronic devices and communication systems, jitter analysis and eye diagram pre-tests play important roles and their applications are also very extensive.

Using the MSO7000X-JITTER jitter analysis and eye diagram option, you can easily complete such as:

- Evaluate the clock jitter, data jitter and eye diagram openness of serial data communication systems;
- Test the signal integrity, clock synchronization and anti-interference ability of high-speed digital signal transmission systems;
- Evaluate the performance of clock and data recovery systems, including clock extraction, data demodulation and clock reconstruction, etc;
- Evaluate the transmission performance, timing consistency and signal integrity of high-speed interfaces;
- Locate clock jitter, signal distortion and frequency interference;



The MSO7000X-JITTER jitter analysis and eye diagram option has complete jitter measurement algorithms and rich jitter analysis views

## Industry serial protocol test

The MSO7000X provides a kit for industry serial data bus decode and trigger, which can measure more than 11 protocols including low-speed/high-speed RS232/422/485/UART, I2C, SPI, CAN, CAN-FD, LIN, AUDIO BUS (I2S, LJ, RJ, TDM), MIL-STD-1553, ARINC 429, etc. Protocol search enables you to search the long acquisition data of serial packets to find the packet parameters of specific content. You can also use the standard serial trigger function to find such events and search and navigate in the event list.

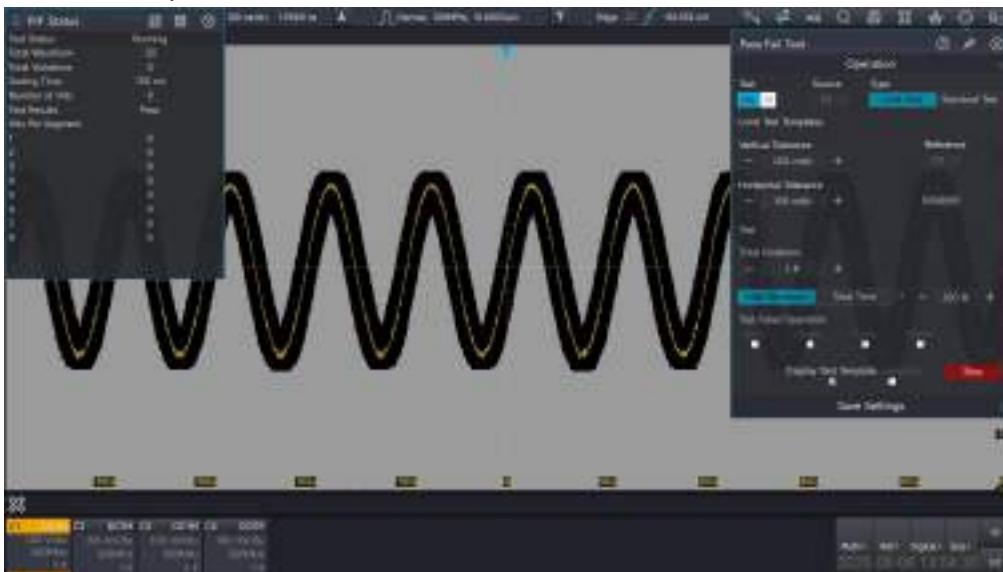


Trigger the CAN-FD bus. The bus waveform provides time-dependent decoded packet content, including standard ID, extension ID, control domain, data domain, check bit, answer bit, packet end frame, and check failure information, etc., and the event list will display all the collected packet content, triggering the CRC check error pattern.

## Limit and mask test

The MSO7000X allows the creation of limit templates through standard waveforms to achieve functions such as incoming material screening or quality control in the production line, and improve the consistency and reliability of product design. For example, noise limit tests help evaluate the sensitivity and anti-interference performance of the receiver, the signal-to-noise ratio test of the sensor, the clarity and quality of the audio signal, the safety of medical equipment, etc.

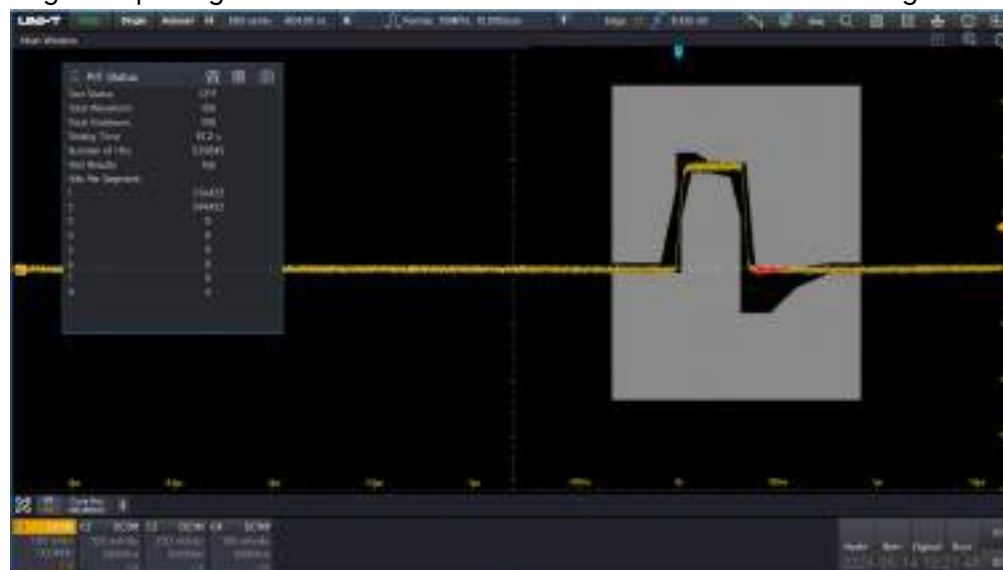
You can customize the vertical and horizontal capacity of the template test, set the total number of violations, set the number of waveforms or the total time of the test, and set the waveform to save, alarm, pulse or take a screenshot when the test fails.



Create a test template using the worst limit of noise, and the waveform screening that meets the standard can be completed in a few seconds

## Standard mask test

For your particular attention to signal integrity testing, the MSO7000X also offers industry standard mask as judgment criteria. Use the standard mask to make judgments on the eye diagram opening or conduct standard evaluations on time-domain signals.



The carrier system uses a standard network transmission rate of 1.544Mb to test the signal edge to ensure that the bit transmission rate meets the standard

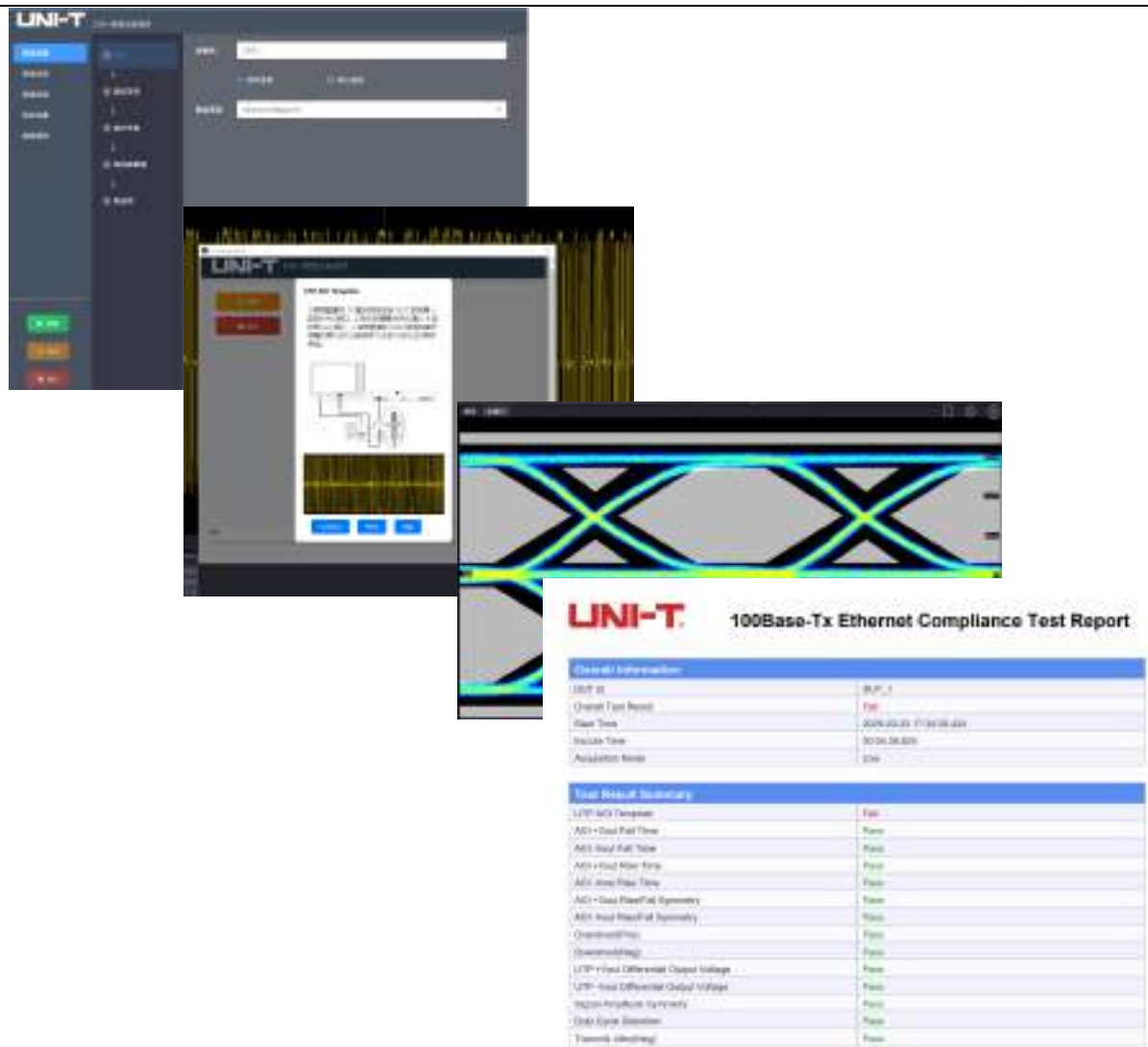
## Consistency analysis

The purpose of the compliance testing for high - speed serial interfaces is to ensure the consistency of interface and protocol technologies produced by different manufacturers, so that the same type of interfaces generated by different manufacturers can successfully interoperate when interconnected. However, the compliance testing specifications for different interfaces are developed by different associations or institutions. For example, the USB interface is developed by the USB - IF Association, and Ethernet complies with the IEEE802.3 standard. Similarly, there are also HDMI, PCIe, MIPI Alliance, etc.

Manually conducting compliance testing of protocol standards will cost users a lot of time and cannot guarantee a sufficient error tolerance rate. UNI - T, by continuously updating and conforming to the latest industry standards, has launched a high - speed protocol compliance testing solution based on an oscilloscope + active probe + test fixture. Currently, the types of protocols covered include USB2.0, 100/1000 Ethernet, and 10/100/1000 automotive Ethernet. The protocols are constantly updated and iterated, and in the future, it will cover the compliance testing of more mainstream interfaces such as MIPI and PCIe.

The compliance analysis software launched by UNI - T includes:

- Allows users to perform single or multiple tests.
- A highly optimized and intuitive user interface enables users to visualize the oscilloscope and the connection process under test, quickly configure tests, and verify electrical performance.
- A fully automated oscilloscope testing process automatically sets up the oscilloscope software for each test item.
- Detailed test reports include results, pass/fail information, test margins, and test waveform images.
- Users can customize test standards or perform compliance tests according to association standards.
- Allows multiple rounds of tests to verify and analyze test results.



*The compliance testing software automates the execution process and generates test reports through standardized signal and testing instrument connections, reducing users' execution time and the rate of operational errors.*

## probe

### UT-PA2000/1000 Active single-ended probe

The UT-PA2000/1000 are active, single-ended probes designed for high-frequency measurements, incorporating many of the features required for today's general-purpose high-speed probes. Active single-ended probes are widely used in high-speed digital circuits, bus analysis, signal integrity analysis and many other high-speed fields, UT-PA2000 can more accurately and quickly obtain signal information in the circuit, which helps to improve the efficiency and accuracy of engineers.



|                   |                                      |
|-------------------|--------------------------------------|
| bandwidth         | UT-PA2000:2GHz<br>UT-PA1000:1GHz     |
| Rise time         | UT-PA2000:≤175ps<br>UT-PA1000:≤350ps |
| Attenuation ratio | 10:1±5%                              |
| dynamic range     | ±4V                                  |
| Bias range        | ±4V                                  |
| Input capacitance | ≤1.3pF                               |
| Input resistance  | 1MΩ±1%                               |
| Output impedance  | 50Ω                                  |
| Probe noise       | < 7mV ACRMS                          |

### UT-PD2500/1500 Active Differential Probe



|                   |                                                          |
|-------------------|----------------------------------------------------------|
| bandwidth         | UT-PD2500:2.5GHz<br>UT-PD1500:1.5GHz                     |
| Rise time         | UT-PD2500:≤150ps<br>UT-PD1500:≤245ps                     |
| Attenuation ratio | 10:1±5%                                                  |
| dynamic range     | ±4V                                                      |
| Bias range        | ±4V                                                      |
| Input capacitance | ≤1pF                                                     |
| Input resistance  | 200kΩ±2%<br>(differential)<br>100kΩ±2%<br>(single-ended) |
| Output impedance  | 50Ω                                                      |
| Probe noise       | < 7mV ACRMS                                              |

## Passive Probe

| Model                                                                                                | Type                 | Description                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UT-P07</b><br>   | High impedance probe | 1X: DC ~ 8MHz<br>10X: DC ~ 500MHz<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b>                                                                             |
| <b>UT-P20</b><br>   | High impedance probe | DC ~ 100MHz<br>Probe coefficient: 100:1<br>Maximum operating voltage: 1500Vrms<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b>                                |
| <b>UT-V23</b><br>   | High voltage probe   | DC ~ 100MHz<br>Probe coefficient: 100:1<br>Input resistance: 100MΩ ± 2%<br>Maximum operating voltage: 2000Vpp<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b> |
| <b>UT-P21</b><br> | High voltage probe   | DC ~ 50MHz<br>Probe coefficient: 1000:1<br>Maximum operating voltage:<br>DC 15kVrms, AC 10kV (sine wave)<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b>      |

## Current Probe

| Model                                                                                                | Type          | Description                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UT-P40</b><br>   | Current probe | DC ~ 100kHz<br>Range: 50mV/A, 5mV/A<br>Current Range: 0.4A ~ 60A<br>Maximum operating voltage: 600Vrms<br>Oscilloscope compatibility: all series of <b>UNI-T</b>    |
| <b>UT-P41</b><br>   | Current probe | DC ~ 100kHz<br>Range: 100mV/A, 10mV/A<br>Current Range: 0.4A ~ 100A<br>Maximum operating voltage: 600Vrms<br>Oscilloscope compatibility: all series of <b>UNI-T</b> |
| <b>UT-P42</b><br> | Current probe | DC ~ 150kHz<br>Range: 100mV/A, 10mV/A<br>Current Range: 0.4A ~ 200A<br>Maximum operating voltage: 600Vrms<br>Oscilloscope compatibility: all series of <b>UNI-T</b> |
| <b>UT-P43</b><br> | Current probe | DC ~ 25MHz<br>Range: 100mV/A<br>Maximum measuring current: 20A<br>Rise time: 14ns<br>Oscilloscope compatibility: all series of <b>UNI-T</b>                         |
| <b>UT-P44</b><br> | Current probe | DC ~ 50MHz<br>Range: 50mV/A<br>Maximum measuring current: 40A<br>Rise time: 7ns<br>Oscilloscope compatibility: all series of <b>UNI-T</b>                           |

**UT-P4030D**

Current probe

Bandwidth: DC ~ 100MHz

Range: 1X:5A, 10X:30A

Rise time:  $\leq 3.5\text{ns}$ 

Maximum continuous current: 30Arms

Resolution: 5A:1mA, 30 A:10mA

Oscilloscope compatibility: all series of **UNI-T****UT-P4150**

Current probe

Bandwidth: DC ~ 12MHz

Range: 10X:30A, 100X: 150A

Rise time:  $\leq 29\text{ns}$ 

Maximum continuous current: 150Arms

Resolution: 30A:10mA, 150A:100mA

Oscilloscope compatibility: all series of **UNI-T****UT-P4500**

Current probe

Bandwidth: DC ~ 5MHz

Range: 10X:75A, 100X:500A

Rising time:  $\leq 70\text{ns}$ 

Maximum continuous current: 500Arms

Resolution: 75A: 10mA, 500A:100mA

Oscilloscope compatibility: all series of **UNI-T****UT-P4100A**

Current probe

Bandwidth: DC ~ 600kHz

Current range:

low-scale 50mA-10A, high-scale 1A-100A

Range sensitivity:

low-scale 0.1V/A, high-scale 0.01V/A

Oscilloscope compatibility: all series of **UNI-T****UT-P4100B**

Current probe

Bandwidth: DC ~ 2MHz

Current range:

low-scale 50mA-10A, high-scale 1A-100A

Range sensitivity:

low-scale 0.1V/A, high-scale 0.01V/A

Oscilloscope compatibility: all series of **UNI-T**

## High voltage differential probe

| Model                                                                                                | Type                            | Description                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UT-P30</b><br>   | High voltage differential probe | DC ~ 100MHz<br>Attenuation ratio: 100:1, 10:1<br>Differential input voltage: $\pm 800\text{Vpp}$<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b>    |
| <b>UT-P31</b><br>   | High voltage differential probe | DC ~ 100MHz<br>Attenuation ratio: 1000:1, 100:1<br>Differential input voltage: $\pm 1.5\text{kVpp}$<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b> |
| <b>UT-P32</b><br> | High voltage differential probe | DC ~ 50MHz<br>Attenuation ratio: 1000:1, 100:1<br>Differential input voltage: $\pm 3\text{kVpp}$<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b>    |
| <b>UT-P33</b><br> | High voltage differential probe | DC ~ 120MHz<br>Attenuation ratio: 100:1, 10:1<br>Differential input voltage: $\pm 14\text{kVpp}$<br>Oscilloscope compatibility:<br>all series of <b>UNI-T</b>    |

**UT-P35**

High voltage  
differential probe

DC ~ 50MHz  
Attenuation ratio 500:1, 50:1  
Rise time: 7ns  
Accuracy: 2%  
Differential input voltage:  
1/50: 130 (DC + peak AC);  
1/500: 1300 (DC + peak AC);  
Common input voltage:  
100Vrms, CATI; 600Vrms, CATII  
Oscilloscope compatibility:  
all series of **UNI-T**

**UT-P36**

High voltage  
differential probe

DC ~ 50MHz  
Attenuation ratio 2000:1, 200:1  
Rising time 3.5ns  
Accuracy: 2%  
Differential input voltage:  
1/200:560 (DC + peak AC);  
1/2000:5600 (DC + peak AC);  
Common input voltage:  
2800Vrms, CATI; 1400Vrms, CATII;  
Oscilloscope compatibility:  
all series of **UNI-T**

## Technical Parameter

All specifications are guaranteed, except those marked "typical". The instrument must be operated continuously for at least thirty minutes at the specified operating temperature.

| Main parameters                             | MSO7204X                                                                                                                                                                                                           | MSO7104X |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Bandwidth (-3dB) @50Ω* <sup>1</sup>         | 2GHz                                                                                                                                                                                                               | 1GHz     |
| Bandwidth (-3dB) @1MΩ                       | 500MHz                                                                                                                                                                                                             |          |
| Rise time @50Ω(typical)                     | 175ps                                                                                                                                                                                                              | 350ps    |
| Analog channels                             | 4+EXT                                                                                                                                                                                                              |          |
| Digital channels (opt)                      | 16 (option of MSO7000X-LA is required to purchase)                                                                                                                                                                 |          |
| Sample rate* <sup>2</sup>                   | 10GSa/s (Single channel); 5GSa/s (Dual channel); 2.5GSa/s (Full channel)                                                                                                                                           |          |
| Vertical resolution                         | 8-bit (HD12-bit)                                                                                                                                                                                                   |          |
| Maximum memory depth                        | 1Gpts (Single channel); 500Mpts (Dual channel); 250Mpts (Full channel)                                                                                                                                             |          |
| Waveform capture rate* <sup>3</sup>         | 2,000,000wfms/s                                                                                                                                                                                                    |          |
| Function/Arbitrary waveform generator (opt) | The Maximum frequency output of waveform: 60MHz,<br>Sample rate: 625MSa/s,<br>Supports arbitrary waveform and provides arbitrary waveform editor, Supports modulation and sweep.                                   |          |
| Digital voltmeter                           | 4-bit, DC, AC RMS, DC+AC RMS                                                                                                                                                                                       |          |
| Frequency counter                           | 8-bit                                                                                                                                                                                                              |          |
| Serial protocol analysis                    | Standard: RS-232/422/485/UART, SPI, I <sup>2</sup> C, CAN, LIN<br>Option: CAN-FD, SENT, FlexRay, AudioBus(I <sup>2</sup> S/LJ/RJ/TDM), MIL-STD-1553, ARINC429                                                      |          |
| Measurement                                 | Supports 58 kinds of automatic parameter measurement, quick Meas; and statistical analysis, histogram, trend chart and trace analysis                                                                              |          |
| Mathematical operation                      | Up to 8 number of math waveforms at same time, Enhanced FFT, Basic mathematical operation, Filter, Advanced function editor, Embedded matlab programming operation and render(opt), Advanced Filter Designer (opt) |          |
| Analysis tool                               | Histogram, Area histogram, Trend chart, Trace                                                                                                                                                                      |          |

| Advanced analysis function     | Power analysis (option), Jitter analysis and eye diagram (opt), Mask and limit test, Sequence mode, Search and navigation                                                                             |               |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Interface                      | USB Device, USB Host*4, LAN (10/100/1000Mb/s), HDMI, AuxIn (trigger sync input, AWG external trigger input), AuxOut (trigger sync output, pass the test result, AWG trigger output), 10MHz REF In/Out |               |
| Display screen                 | 15.6-inch FHD capacitive touch screen (1920*1080) + Gesture touch                                                                                                                                     |               |
| Analog channel                 | MSO7204                                                                                                                                                                                               | MSO7104X      |
| Channels                       | 4+EXT                                                                                                                                                                                                 |               |
| Bandwidth limit @50Ω (typical) | 1GHz, 500MHz, 20MHz                                                                                                                                                                                   | 500MHz, 20MHz |
| Bandwidth limit @1MΩ (typical) | 20MHz                                                                                                                                                                                                 |               |
| Input sensitivity range*4      | 1MΩ: 1mV/div ~ 10V/div                                                                                                                                                                                |               |
|                                | 50Ω: 1mV/div ~ 1V/div                                                                                                                                                                                 |               |
| Input coupling                 | AC, DC, GND                                                                                                                                                                                           |               |
| Input impedance                | 1MΩ ± 1% (15 ± 3pF), 50Ω ±2%                                                                                                                                                                          |               |
| DC gain accuracy *4            | <b>50Ω:</b> ± 1.5% (± 2.0% at ≤5mV/div) ± full scale division of 1% (≤5mV/div: ± full scale division of 1.5%)                                                                                         |               |
|                                | <b>1MΩ:</b> ± 1.2% (± 1.5% at ≤5mV/div) ± full scale division of 1% (≤5mV/div: ± full scale division of 1.2%)                                                                                         |               |
| Offset range                   | <b>1MΩ:</b> 1mV/div-50mV/div:±2V; 100mV/div-500 mV/div:±20V; 1V/div:±40V; 2V/div-10V/div:±100V                                                                                                        |               |
|                                | <b>50Ω:</b> 1mV/div-100mV/div:±2V; 200mV/div-1V/div:±5V                                                                                                                                               |               |
| DC offset accuracy             | ≤ 200mV/div (± 0.1div ±2mV ± offset of 1.5%)<br>> 200mV/div (± 0.1div ±2mV ± offset of 1.0%)                                                                                                          |               |
| Probe attenuation coefficient  | 1X, 5X,10X, 100X, User: 0.001X~1000X                                                                                                                                                                  |               |
| Maximum input voltage          | 1MΩ: ≤300Vrms, CAT I; 50Ω: ≤5Vrms                                                                                                                                                                     |               |
| Channel-to-channel isolation   | ≥500:1 (DC ~ 1GHz)                                                                                                                                                                                    |               |

- ★ 1. The 2G bandwidths are only available in single-channel mode
- ★ 2. Dual channel mode: it can only open C1 and C2; or C3 and C4.
- ★ 3. The highest waveform capture rate is available for sequential mode on, single channel mode settings
- ★ 4. 1mV/div is a digital amplification of 2mV/div. For the calculation of vertical accuracy, the 1mV/div vertical sensitivity should be calculated using 16mV at the full scale of 2mV/div

### Digital channel (opt)

|                                |                                                                                                                                                                                                                            |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital input channels         | 16                                                                                                                                                                                                                         |
| Sample rate                    | 1.25GSa/s                                                                                                                                                                                                                  |
| Memory depth                   | 125Mpts                                                                                                                                                                                                                    |
| Maximum input toggle rate      | 500MHz                                                                                                                                                                                                                     |
| Minimum detectable pulse width | 3.2ns                                                                                                                                                                                                                      |
| Thresholds                     | A total of 4 groups are adjustable, each group has 4 channels                                                                                                                                                              |
| Threshold selection            | TTL (1.4V) / 5.0V CMOS (+2.5V), 3.3V CMOS (+1.65V) / 2.5V CMOS (+1.25V), 1.8V CMOS (+0.9V)<br>ECL (-1.3V) / PECL (+3.7V) / LVDS (+1.2V) / 0V / User-defined<br>(4 channel in one group, and the threshold can be adjusted) |
| Threshold range*               | $\pm 20.0V$ , 20mV stepping                                                                                                                                                                                                |
| Threshold resolution*          | 20mV                                                                                                                                                                                                                       |
| Threshold accuracy*            | $\pm(100mV + 3\%$ of threshold setting after calibration)                                                                                                                                                                  |
| Maximum input voltage*         | $\pm 40V_{peak}$                                                                                                                                                                                                           |
| Maximum input dynamic range*   | $\pm 10V + threshold$                                                                                                                                                                                                      |
| Minimum voltage swing *        | 500mVpp                                                                                                                                                                                                                    |
| Input impedance*               | $101k\Omega \pm 1\%$                                                                                                                                                                                                       |
| Vertical resolution            | 1bit                                                                                                                                                                                                                       |
| Inter-channel delay*           | 1.6ns (typical value)                                                                                                                                                                                                      |

Notes: \* indicates the indicator after the oscilloscope is connected to the digital probe

## Horizontal System

|                                             |                                                                        |
|---------------------------------------------|------------------------------------------------------------------------|
| Time base range                             | 100ps/div - 1000s/div                                                  |
| Time base accuracy                          | $\pm (1.6+0.5 \cdot \text{the number of years after calibration})$ ppm |
| Time base delay time range                  | Pre-trigger: $\geq 0.5$ screen width; Post-trigger: $\leq 5000$ s      |
| Channel-to-channel deskew range             | $\pm 100$ ns                                                           |
| Channel-to-channel synchronization accuracy | $\leq 100$ ps                                                          |
| Horizontal mode                             | Y-T/X-Y/ROLL                                                           |

## Acquisition System

|                 |                                                                        |
|-----------------|------------------------------------------------------------------------|
| Peak detect     | Captures glitches as narrow as 400ps                                   |
| High resolution | High resolution mode: 8~12 bits                                        |
| Averaging       | 2 ~ 65536                                                              |
| UltraAcq®       | In UltraAcq mode, the waveform capture rate can reach to 600,000wfms/s |
| ERes            | Enhance bits: 0.5,1,1.5,2,2.5,3                                        |

## Trigger System

|                       |                      |                                                     |
|-----------------------|----------------------|-----------------------------------------------------|
| Trigger modes         | Auto, Normal, Single |                                                     |
| Trigger coupling      | HF rejection         | Suppresses high-frequency signals above 40kHz       |
|                       | LF rejection         | Suppresses low-frequency signals smaller than 40kHz |
|                       | Noise rejection      | Trigger hysteresis to turn on or off                |
|                       | DC                   | DC-coupled trigger                                  |
|                       | AC                   | AC-coupled trigger                                  |
| Trigger holdoff range | 6.4ns ~ 10s          |                                                     |
| Trigger sensitivity   | Internal:C1 ~ C4     | $\leq 5$ mV: 1div; $> 5$ mV: 0.5div                 |

|                     |                   |                                                                                                              |
|---------------------|-------------------|--------------------------------------------------------------------------------------------------------------|
| Trigger level range | External          | EXT: 100mVpp DC ~ 100MHz,<br>150mVpp 100MHz ~ 200MHz<br>EXT/5: 500mVpp DC ~ 100MHz,<br>750mVpp 100MHz~200MHz |
|                     | Internal          | ±4divs from the center of the screen                                                                         |
|                     | External          | EXT: ±1V; EXT/5: ±5V                                                                                         |
|                     | AC Line           | Fixed at about 50% of line voltage                                                                           |
| <b>Trigger Type</b> |                   |                                                                                                              |
| Zone trigger        | Source            | C1-C4                                                                                                        |
|                     | Zone              | Up to 2 zones                                                                                                |
|                     | attribute         | Intersect/Non-intersect                                                                                      |
| Edge trigger        | Source            | C1 ~ C4/EXT/(EXT/5)/D0 ~ D15/AC                                                                              |
|                     | Slope             | Rising edge, Falling edge, Any edge                                                                          |
| Pulse width trigger | Source            | C1 ~ C4/D0~D15                                                                                               |
|                     | Polarity          | Positive pulse width,<br>Negative pulse width                                                                |
|                     | Limit condition   | Less than, greater than, within range                                                                        |
|                     | Pulse width       | 3.2ns ~ 10s                                                                                                  |
| Slope trigger       | Source            | C1 ~ C4                                                                                                      |
|                     | Slope             | Rise, Fall                                                                                                   |
|                     | Limit condition   | Less than, greater than, within range                                                                        |
|                     | Time setting      | 3.2ns ~ 10s                                                                                                  |
| Video trigger       | Source            | C1 ~ C4                                                                                                      |
|                     | Standard          | NTSC, PAL                                                                                                    |
|                     | Trigger condition | All lines, specified line, odd field or even field                                                           |
| Pattern trigger     | Source            | C1 ~ C4                                                                                                      |
|                     | Pattern setting   | H, L, X, rising edge, falling edge                                                                           |
| Timeout trigger     | Source            | C1 ~ C4/D0~D15                                                                                               |

|                             |                   |                                                                            |
|-----------------------------|-------------------|----------------------------------------------------------------------------|
|                             | Edge type         | Rising edge, Falling edge, Any edge                                        |
|                             | Time setting      | 3.2ns ~ 10s                                                                |
| Runt trigger                | Source            | C1 ~ C4                                                                    |
|                             | Polarity          | Positive pulse width, negative pulse width                                 |
|                             | Limit condition   | Less than, greater than, within range, outside the range                   |
|                             | Time setting      | 3.2ns ~ 10s                                                                |
| Setup/Hold trigger          | Clock source      | C1 ~ C4                                                                    |
|                             | Clock edge        | Rising edge, falling edge                                                  |
|                             | Data source       | C1 ~ C4                                                                    |
|                             | Condition         | Setup, hold, setup & hold                                                  |
|                             | Time setting      | 3.2ns ~ 10s                                                                |
| Delay trigger               | Source            | C1 ~ C4                                                                    |
|                             | Edge type         | Rising edge, falling edge                                                  |
|                             | Delay type        | Less than, Greater than, Within range, Outside the range                   |
|                             | Delay time        | 3.2ns to 10s                                                               |
| Duration trigger            | Source            | C1 ~ C4                                                                    |
|                             | pattern setting   | H, L, X                                                                    |
|                             | Trigger condition | Greater than, Less than, Within range                                      |
|                             | Duration          | 3.2ns to 10s                                                               |
| Nth edge trigger            | Source            | C1 ~ C4/D0~D15                                                             |
|                             | Edge type         | Rising edge, Falling edge                                                  |
|                             | Free time         | 3.2ns to 10s                                                               |
|                             | Edge number       | 1 to 65535                                                                 |
| RS-232/422/485/UART trigger | Trigger mode      | Start bit, Parity error, Data content, Stop bit                            |
| I <sup>2</sup> C trigger    | Trigger mode      | Start, Restart, Stop, Missing Acknowledge, Address, Data, Address and Data |

|                            |              |                                                                                                                                                  |
|----------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| SPI trigger                | Trigger mode | Start bit, Data                                                                                                                                  |
| CAN trigger                | Trigger mode | Start of frame, Frame type, Identifier ID, Data, Identifier ID & Data, End of Frame, Error                                                       |
| LIN trigger                | Trigger mode | Frame start, ID, data, ID and data, wake-up frame, sleep frame, synchronization error, ID check error, checksum error                            |
| CAN-FD trigger (opt)       | Trigger mode | Start of frame, Frame type, Identifier ID, Data, Identifier ID & Data, End of Frame, Error                                                       |
| SENT trigger (opt)         | Trigger mode | Fast Channel: Sync, Status, Data, CRC, Status + Data, Status + Data + CRC, Error<br>Slow Channel: ID, Data, CRC, ID Data, Slow Channel CRC Error |
| AudioBus trigger (opt)     | Trigger mode | Data, Sync, Channel + Data                                                                                                                       |
| FlexRay trigger (opt)      | Trigger mode | Frame head, indicator, ID, Cycle count, data, ID & data, End of Frame, error                                                                     |
| MIL-STD-1553 trigger (opt) | Trigger mode | Command/Status Word, Data, Error, Synchronization                                                                                                |
| ARINC 429 trigger (opt)    | Trigger mode | Frame Start, Frame End, Label, SDI, Data, SSM, Label & Data, Error                                                                               |

### Waveform Measurement

### Cursor Measurement

|        |                                                                                                                                                                                                                                  |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source | C1 ~ C4, Math, Ref                                                                                                                                                                                                               |
| Type   | Vertical cursor measuring time and voltage (X,Y ), reciprocal of $\Delta X$ (Hz ) ( $1/\Delta X$ ), $\Delta Y/\Delta X$ (V/s );<br>Horizontal cursor measuring voltage (Y ) and $\Delta Y$ ;<br>Supports automatic trace cursor; |

### Automatic Measurement

|                                 |                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vertical measurement parameters | Maximum, Minimum, Peak-to-Peak, Top, Base, Middle, Amplitude, Average, RMS, AC RMS, Positive overshoot, Negative overshoot, Maximum cycle, Minimum cycle, Cycle RMS, Cycle average, Cycle Peak-to-Peak, Cycle middle, Positive pre-shoot, Negative pre-shoot |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Horizontal measurement parameters | Period, Frequency, Rise time, Fall time, + pulse width, - pulse width, + duty cycle, - duty cycle, Time @Max, Time @Min, Rise time @Lv, Fall time @Lv, Period @Lv, Frequency @Lv, Pulse width @Lv, Duty cycle @Lv, Phase different @Lv, RRD @Lv, FFD @Lv, RFD @Lv, FRD @Lv, Skew, Data count, Setup time, Hold time, Cycle count, The number of rising edges, the number of falling edges, the number of positive pulses, the number of negative pulses |
| Other measurements                | Area, Absolute Area, Postive Area, Negative Area, Cycle Area, Cycle abs Area, Cycle Pos Area, Cycle Neg Area                                                                                                                                                                                                                                                                                                                                            |
| Histogram parameter               | $\mu \pm 1\sigma$ , $\mu \pm 2\sigma$ , $\mu \pm 3\sigma$ , mode, mean, standard deviation, maximum, minimum, median, peak-to-peak, peak count, total sample size                                                                                                                                                                                                                                                                                       |
| Measurement source                | C1 ~ C4, R1~R4                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Number of measurements            | 58 kinds of automatic measurement, it can display 10 parameters at the same time                                                                                                                                                                                                                                                                                                                                                                        |
| Measurement range                 | Screen or Cursor                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Quick Meas                        | Display 38 measurement items of the current measurement source, the source can be switched                                                                                                                                                                                                                                                                                                                                                              |
| Measurement statistics            | Current value, Average value, Maximum value, Minimum value, Standard deviation, Measure the count, Histogram, Trend chart, Trace                                                                                                                                                                                                                                                                                                                        |

### Waveform math

|                          |                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of math waveforms | Supports 8 math waveforms and it can display at the same time                                                                                                                                                                                                                                                                                      |
| Source                   | C1 ~ C4, R1 ~ R4                                                                                                                                                                                                                                                                                                                                   |
| Advanced operation       | supporting matlab embedded programming and data presentation                                                                                                                                                                                                                                                                                       |
| Basic operation          | Add, Subtract, Multiply, Divide, AND, OR, NOT, XOR, Average, Absolute value, Exp10, Exp, Differential, Integral, Ln, Lg, Square, Square root, common, Sine, cos, tan, Correlation, Convolution, extended-value, Extraction, Interpolation, maximum, minimum, user-defined function expression (editable and performs composite formula operations) |
| FFT                      | Function<br>Amplitude spectrum, Power spectrum, Psd, Real part, Imaginary part, Phase spectrum                                                                                                                                                                                                                                                     |

|                |                                       |                                                                                       |
|----------------|---------------------------------------|---------------------------------------------------------------------------------------|
| Digital filter | Window functions                      | Rectangular/Hanning/Blackman-Harris/Hamming/Flat top                                  |
|                | Display                               | Full screen (spectrum view), multi-window                                             |
|                | Vertical units                        | Vrms/dBrms                                                                            |
|                | Filters type                          | Low pass, High pass, Band pass, Band stop, User-defined filters                       |
|                | User-defined the filter design method | FIR,IIR                                                                               |
|                | User-defined the filter type          | Sampling, Window function, Lemmez, Butterworth, Chebyshev I, Chebyshev II, Elliptical |
|                | Response type                         | Low pass, High pass, Band pass, Band stop                                             |
| Digital filter | Filter order                          | FIR:2-1000;<br>IIR:2-50;                                                              |
|                | Filter characteristics                | Amplitude-Frequency response, Phase-Frequency response, Impulse response              |

### Measurement Analysis

|                        |                      |                                                                                                                                                             |
|------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital voltmeter      | Source               | C1 ~ C4                                                                                                                                                     |
|                        | Mode                 | DC, AC RMS, DC+AC RMS                                                                                                                                       |
|                        | Voltage resolution   | 4 digits                                                                                                                                                    |
| Frequency counter      | Frequency resolution | 8 digits                                                                                                                                                    |
| Mask and limit testing | Source               | C1 ~ C4                                                                                                                                                     |
|                        | Test mask            | User-defined test mask or load standard test mask                                                                                                           |
|                        | Test failure         | Stop, Save, Alarm, Pulse, Take a screenshot                                                                                                                 |
| Histogram              | Source               | P1 ~ P10                                                                                                                                                    |
|                        | Type                 | Horizontal, vertical and measurement                                                                                                                        |
|                        | Measurement item     | $\mu\pm1\sigma$ , $\mu\pm2\sigma$ , $\mu\pm3\sigma$ , mode, mean, standard deviation, maximum, minimum, median, peak-to-peak, peak count, total sample size |

|                                         |                                   |                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Jitter analysis and eye diagram         | Source                            | C1 ~ C4, Ref                                                                                                                                                                                                                                                                                                                                          |
|                                         | Clock recovery                    | Constant frequency: automatic/user-defined<br>PLL: First-order phase locked loop;<br>Second-order phase-locked loop;                                                                                                                                                                                                                                  |
|                                         | Jitter View                       | TIE histogram, TIE trend chart,<br>TIE spectrum, Bath-Tub Curve                                                                                                                                                                                                                                                                                       |
|                                         | Jitter Measurement parameter      | TIE, TJ@BER, RJ, DJ, PJ, DDJ, DCD, Cycle-Cycle                                                                                                                                                                                                                                                                                                        |
|                                         | Eye diagram measurement parameter | Eye amplitude, Eye Height, Eye Width, Level 1, Level 0, Q factor, Eye crossover ratio, Extinction ratio                                                                                                                                                                                                                                               |
| Power analysis (opt)                    | Analysis item                     | Input Analysis: Power Quality, Harmonic Analysis, Inrush Current<br>Output Analysis: Ripple Analysis, Modulation Analysis, Efficiency, Start - up/Shutdown Time<br>Frequency Response Analysis: Control Loop Response (Bode), Power Supply Rejection Ratio (PSRR)<br>Switching Analysis: Switching Losses, Safe Operating Area, di/dt, dv/dt, RDS(on) |
|                                         |                                   |                                                                                                                                                                                                                                                                                                                                                       |
| Loop analysis (optional power analysis) | Start frequency                   | 50Hz~50MHz                                                                                                                                                                                                                                                                                                                                            |
|                                         | Stop frequency                    | 60Hz~50MHz                                                                                                                                                                                                                                                                                                                                            |
|                                         | Points                            | 1~1000                                                                                                                                                                                                                                                                                                                                                |
|                                         | Output amplitude                  | High Z: 20mVpp to 6Vpp<br>50Ω: 10mVpp to 3Vpp                                                                                                                                                                                                                                                                                                         |
| <b>Serial Bus Decode</b>                |                                   |                                                                                                                                                                                                                                                                                                                                                       |
| Channels of decode                      | 2-channel                         |                                                                                                                                                                                                                                                                                                                                                       |
| RS-232/422/485/UART decode              | Source                            | C1 ~ C4, R1-R4                                                                                                                                                                                                                                                                                                                                        |
|                                         | Data width                        | 5-bit, 6-bit, 7-bit, 8-bit                                                                                                                                                                                                                                                                                                                            |
|                                         | Parity check                      | Odd parity, even parity or no parity                                                                                                                                                                                                                                                                                                                  |

|                         |                         |                                                                                                                    |
|-------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------|
|                         | Stop bit                | 1-bit, 2-bit                                                                                                       |
|                         | Polarity                | Positive, Negative                                                                                                 |
|                         | Bit sequence            | LSB, MSB                                                                                                           |
|                         | Baud rate               | 2400bps, 4800bps, 9600bps,<br>19200bps, 38400bps, 57600bps,<br>115200bps, User-defined                             |
| I <sup>2</sup> C decode | Source                  | C1 ~ C4, R1-R4                                                                                                     |
|                         | Signal                  | SCL, SDA                                                                                                           |
|                         | Address length          | 7-bit, 10-bit                                                                                                      |
| SPI decode              | Source                  | C1 ~ C4, R1-R4                                                                                                     |
|                         | mode                    | TIMEOUT, CS                                                                                                        |
|                         | Signal                  | Clock, word selection, data                                                                                        |
|                         | Clock edge              | Rise edge, Fall edge                                                                                               |
|                         | Chip selection Polarity | High level, Low level                                                                                              |
|                         | Data polarity           | Positive, Negative                                                                                                 |
|                         | Data bit width          | 4-32                                                                                                               |
|                         | Bit sequence            | Least significant bit (LSB),<br>highest significant bit (MSB)                                                      |
| CAN decode              | Source                  | C1 ~ C4, R1-R4                                                                                                     |
|                         | Signal                  | CAN_H, CAN_L, Differential                                                                                         |
|                         | Sampling points         | Positive, Negative                                                                                                 |
|                         | Sampling points         | 30%-90%                                                                                                            |
|                         | Signal rate             | 10kbps, 19.2kbps, 20kbps,<br>33.3kbps, 38.4kbps,<br>50kbps, 57.6kbps,<br>62.5kbps, 83.3kbps,                       |
|                         |                         | 100kbps, 115.2kbps,<br>125kbps, 230.4kbps,<br>250kbps, 490.8kbps ,<br>500kbps, 800kbps,<br>921.6kbps, 1Mbps 2Mbps, |

|                     |                               |                                                                                                                                                                                                                                                    |
|---------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     |                               | 3Mbps, 4Mbps, 5Mbps<br>User-defined                                                                                                                                                                                                                |
| LIN decode          | LIN protocol version          | 1.0, 2.0, Both                                                                                                                                                                                                                                     |
|                     | Source                        | C1 ~ C4, R1-R4                                                                                                                                                                                                                                     |
|                     | Baud rate                     | 2400bps, 4800bps, 9600bps,<br>19200bps, User-defined                                                                                                                                                                                               |
|                     | Polarity                      | Positive, Negative                                                                                                                                                                                                                                 |
|                     | Sampling points               | 50%-90%                                                                                                                                                                                                                                            |
|                     | ID include parity bits        | Yes/No                                                                                                                                                                                                                                             |
| CAN-FD decode (opt) | Source                        | C1 ~ C4, R1-R4                                                                                                                                                                                                                                     |
|                     | Signal type                   | CAN-FD_H, CAN-FD_L,<br>differential                                                                                                                                                                                                                |
|                     | Quorum domain sampling points | 30-90%                                                                                                                                                                                                                                             |
|                     | Data domain sampling points   | 30-90%                                                                                                                                                                                                                                             |
|                     | SD signal rate                | 10kbps, 19.2kbps, 20kbps,<br>33.3kbps, 38.4kbps, 50kbps,<br>57.6kbps, 62.5kbps, 83.3bps,<br>100kbps, 115.2kbps, 125kbps,<br>230.4kbps, 250kbps,<br>490.8kbps, 500kbps,<br>800kbps, 921.6kbps, 1Mbps,<br>2Mbps, 3Mbps, 4Mbps, 5Mbps<br>User-defined |
|                     | FD signal rate                | 250kbps, 500kbps, 800kbps,<br>1Mbps, 1.5Mbps, 2Mbps,<br>3Mbps, 4Mbps, 5Mbps,<br>6Mbps, 7Mbps, 8Mbps User-<br>defined                                                                                                                               |

|                       |                                        |                                                            |
|-----------------------|----------------------------------------|------------------------------------------------------------|
| SENT decode (opt)     | Source                                 | C1 ~ C4, R1-R4                                             |
|                       | polarity                               | Positive polarity, negative polarity                       |
|                       | Clock cycles                           | 1us, 3us, 10us, 30us, 100us, 300us User-defined            |
|                       | Clock tolerance                        | 1%-30%                                                     |
|                       | mode                                   | Fast Channel/Slow Channel                                  |
|                       | Pause bits                             | None/Yes                                                   |
|                       | Segment format                         | Nibble, fast lane                                          |
|                       | The length of the data                 | 1Nibbles, 2Nibbles, 3Nibbles, 4Nibbles, 5Nibbles, 6Nibbles |
| AudioBus decode (opt) | Source                                 | C1-C4, R1-R4                                               |
|                       | Protocol type                          | I <sup>2</sup> S, LJ, RJ, TDM                              |
|                       | The word selects polarity              | Positive polarity, negative polarity                       |
|                       | Clock edges                            | Rising edge, falling edge                                  |
|                       | Data polarity                          | Positive polarity, negative polarity                       |
|                       | Positional order                       | MSB, LSB                                                   |
|                       | Channel type                           | Left and right channels/Left channels/Right channels       |
|                       | The number of bits of data per channel | 2-64bit                                                    |
|                       | The number of channels per frame       | 4-32                                                       |
|                       | The number of clock bits per channel   | 4-32                                                       |
| FlexRay decode (opt)  | Bit delay                              | 0-31 bits                                                  |
|                       | Source                                 | C1 ~ C4, R1-R4                                             |
|                       | Signal                                 | BP, BM                                                     |
|                       | Baud rate                              | 1Mbps, 5Mbps, 10Mbps, User defined                         |

|                                             |                                                                                         |                                 |
|---------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|
|                                             | Channel type                                                                            | A/B                             |
| MIL-STD-1553 decode (opt)                   | Source                                                                                  | C1 ~ C4, R1-R4                  |
|                                             | Baud rate                                                                               | 1Mbps, 10Mbps, User-defined     |
|                                             | polarity                                                                                | Positive/negative polarity      |
|                                             |                                                                                         |                                 |
| ARINC 429 decode (opt)                      | Source                                                                                  | C1 ~ C4, R1-R4                  |
|                                             | Signal rate                                                                             | 12.5kbps, 100kbps, User defined |
|                                             | polarity                                                                                | Positive/negative polarity      |
|                                             | Decoding mode                                                                           | 9-bit,21-bit,23-bit             |
| Function/Arbitrary Waveform Generator (opt) |                                                                                         |                                 |
| Channels                                    | 2                                                                                       |                                 |
| Sample rate                                 | 625MSa/s                                                                                |                                 |
| Vertical resolution                         | 16-bit                                                                                  |                                 |
| Maximum frequency                           | 60MHz                                                                                   |                                 |
| Standard waveform                           | Sine, Square, Pulse, Ramp, Noise and DC                                                 |                                 |
| Modes of operation                          | Continuous, Modulation, Sweep                                                           |                                 |
| Built-in Wave                               |                                                                                         |                                 |
| Sine                                        | Frequency range: 1μHz to 60MHz                                                          |                                 |
|                                             | Amplitude flatness: typical value (sine waveform, 0dBm)<br>≤30MHz:± 0.5dB ≤60MHz:±0.8dB |                                 |
|                                             | Harmonic distortion: -40dBc                                                             |                                 |
|                                             | Spurious(nonharmonic):-40dBc                                                            |                                 |
|                                             | Total harmonic distortion: 1% (DC ~ 20kHz, 1Vpp)                                        |                                 |
|                                             | SNR (Signal to Noise Ratio):40dB                                                        |                                 |
| Square wave/Pulse                           | Frequency range: Square wave: 1μHz to 25MHz;<br>Pulse : 1μHz to 25MHz;                  |                                 |
|                                             | Rise/Fall time: <7ns                                                                    |                                 |
|                                             | Overshoot: <2% (1kHz, 1Vpp, 50Ω)                                                        |                                 |
|                                             | Duty cycle: 0.01% to 99.99%, it can be adjusted                                         |                                 |

|                    |                                                                                                                                          |                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
|                    | Minimum pulse width: 20ns                                                                                                                |                                            |
|                    | Jitter: 2ns                                                                                                                              |                                            |
| Ramp wave          | Frequency range: 1μHz to 1MHz                                                                                                            |                                            |
|                    | Variable symmetry: 0.01% ~ 99.99%                                                                                                        |                                            |
|                    | Linearity: < 1% of peak output<br>(typical value, 1kHz, 1Vpp, symmetry 100%)                                                             |                                            |
|                    |                                                                                                                                          |                                            |
| Noise              | Bandwidth: 60MHz (typical value)                                                                                                         |                                            |
| Arbitrary waveform | Frequency range: 100mHz to 5MHz                                                                                                          |                                            |
|                    | Waveform length: 8 to 512k points                                                                                                        |                                            |
|                    | Type: supports over 200 kinds of arbitrary waveforms, such as Sinc/ Exponential<br>Rise/Fall/Cardiac/Gaussian/Lorentz/Haversine and etc. |                                            |
|                    |                                                                                                                                          |                                            |
| Modulation         |                                                                                                                                          |                                            |
| AM modulation      | Carrier waveform                                                                                                                         | Sine/Square/Ramp/Arbitrary waveform        |
|                    | Source                                                                                                                                   | Internal                                   |
|                    | Modulation waveform                                                                                                                      | Sine/Square/Ramp/Noise/ Arbitrary waveform |
|                    | Modulation frequency                                                                                                                     | 2mHz ~ 200kHz                              |
|                    | Modulation depth                                                                                                                         | 0% ~ 120%                                  |
| FM modulation      | Carrier waveform                                                                                                                         | Sine/Square/Ramp/Arbitrary waveform        |
|                    | Source                                                                                                                                   | Internal                                   |
|                    | Modulation waveform                                                                                                                      | Sine/Square/Ramp/Noise/ Arbitrary waveform |
|                    | Modulation frequency                                                                                                                     | 2mHz ~ 200kHz                              |
|                    | Frequency deviation                                                                                                                      | DC ~ 30MHz                                 |
| PM modulation      | Carrier waveform                                                                                                                         | Sine/Square/Ramp/Arbitrary waveform        |
|                    | Source                                                                                                                                   | Internal                                   |
|                    | Modulation waveform                                                                                                                      | Sine/Square/Ramp/Noise/ Arbitrary waveform |

|                                                                                                      |                                                                                                                                     |                                     |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
|                                                                                                      | Modulation frequency                                                                                                                | 2mHz ~ 200kHz                       |
|                                                                                                      | Phase deviation                                                                                                                     | 0° ~ 360°                           |
| Sweep                                                                                                |                                                                                                                                     |                                     |
| Sweep                                                                                                | Carrier wave                                                                                                                        | Sine/Square/Ramp/Arbitrary waveform |
|                                                                                                      | Type                                                                                                                                | Lin, log                            |
|                                                                                                      | Sweep time                                                                                                                          | 1ms ~ 500s                          |
|                                                                                                      | Trigger source                                                                                                                      | Internal, external, manual          |
| Frequency Characteristics                                                                            |                                                                                                                                     |                                     |
| Signal frequency                                                                                     | Accuracy: ± 0.5ppm, 25°C    Annual aging rate ± 1ppm<br>temperature coefficient < ± 0.5 ppm/°C                                      |                                     |
|                                                                                                      | Resolution: 1μHz                                                                                                                    |                                     |
| Output Characteristics                                                                               |                                                                                                                                     |                                     |
| Signal amplitude                                                                                     | Amplitude<br>(50Ω)                                                                                                                  | ≤30MHz: 10mVpp ~ 3Vpp               |
|                                                                                                      |                                                                                                                                     | ≤60MHz: 10mVpp ~ 1.5Vpp             |
|                                                                                                      | Amplitude<br>(High Z)                                                                                                               | ≤30MHz: 20mVpp ~ 6Vpp               |
|                                                                                                      |                                                                                                                                     | ≤60MHz: 20mVpp ~ 3Vpp               |
|                                                                                                      | Resolution: 1mV                                                                                                                     |                                     |
| Accuracy: typical value (sine waveform of 1kHz, 0V offset, > 20mVpp) ± (2% of setting value + 2mVpp) |                                                                                                                                     |                                     |
| DC offset                                                                                            | Range (Peak AC + DC)                                                                                                                | ±1.5V (50Ω)                         |
|                                                                                                      |                                                                                                                                     | ±3V (High Z)                        |
|                                                                                                      | Resolution: 1mV                                                                                                                     |                                     |
| Offset accuracy: ±2% of offset setting value ± 2%±2mV of amplitude setting value                     |                                                                                                                                     |                                     |
| Waveform output                                                                                      | Impedance: 50Ω (typical)                                                                                                            |                                     |
|                                                                                                      | Protection: over voltage protection (the waveform output is closed when overvoltage occurs, and reminder will prompt in the screen) |                                     |

| Display                            |                                                                                                                                                                                                                                                                                   |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display type                       | 15.6-inch FHD capacitive touch screen                                                                                                                                                                                                                                             |
| resolution                         | 1920*1080 (H*V)                                                                                                                                                                                                                                                                   |
| Zoom                               | Horizontal and vertical zooming is supported in all waveform,supports gesture control and zooming                                                                                                                                                                                 |
| Graticules                         | 10 horizontal scale division × 8 vertical scale division                                                                                                                                                                                                                          |
| Intensity gradation                | 256                                                                                                                                                                                                                                                                               |
| Display mode                       | Point, Vector                                                                                                                                                                                                                                                                     |
| Waveform color                     | Waveform color can set by user-defined                                                                                                                                                                                                                                            |
| Persistence                        | Off, automatic, infinite                                                                                                                                                                                                                                                          |
| Computer                           |                                                                                                                                                                                                                                                                                   |
| CPU                                | Inter® core™ i5-6500 (3.2GHz, 64-bit)                                                                                                                                                                                                                                             |
| Operating system                   | Windows 10 IoT Ent LTSC (64bit)                                                                                                                                                                                                                                                   |
| Memory                             | 8GB                                                                                                                                                                                                                                                                               |
| Hard disk (SSD)                    | 128GB                                                                                                                                                                                                                                                                             |
| Interface and Protocol             |                                                                                                                                                                                                                                                                                   |
| High-definition audio/video output | One HDMI interface on the rear panel                                                                                                                                                                                                                                              |
| USB host                           | Four interfaces, two interface on the front panel and two on the rear panel                                                                                                                                                                                                       |
| USB device                         | One USB device interface on the rear panel                                                                                                                                                                                                                                        |
| LAN port                           | One Ethernet interface (10/100/1000Mb/s) on the rear panel                                                                                                                                                                                                                        |
| Probe compensator output           | Frequency: 1kHz ± 0.01%, Voltage: 3Vpp ± 3%, Square wave                                                                                                                                                                                                                          |
| 10MHz reference clock Input/output | In/Out can be opened individually and simultaneously<br>In: BNC connector on the rear panel, A reference clock that provides sampling for the oscilloscope.<br>Out: BNC connector on the rear panel, It can output its own 10MHz reference clock and provide it to other external |

instruments for inter-instrument clock synchronization.

|                    |                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aux output         | BNC connector on the rear panel<br>1. Trigger sync output; 2. Pass the test result;<br>3. AWG trigger output                                                                                                                                                                                                                                                                  |
| Aux input          | 1. Trigger sync output<br>2. AWG external trigger output                                                                                                                                                                                                                                                                                                                      |
| EXT Trig           | BNC connector on the front panel                                                                                                                                                                                                                                                                                                                                              |
| Lock of Kensington | Standard lock key of Kensington                                                                                                                                                                                                                                                                                                                                               |
| Remote control     | Built-in WebServer: Support to input the oscilloscope IP address to enter the web interface through the web browser, it can view the instrument state, view and update the network state, view help manual and programming manual, download drive program, save the oscilloscope setting, export waveform, screenshot and remote control the instrument by keyboard and mouse |
| USBTMC             | Supports standard USBTMC interface protocol                                                                                                                                                                                                                                                                                                                                   |
| SCPI               | Supports standard SCPI                                                                                                                                                                                                                                                                                                                                                        |

### Power Supply

|               |                                                 |
|---------------|-------------------------------------------------|
| Power voltage | 100V ~ 240VAC (fluctuate $\pm 10\%$ ) 50Hz/60Hz |
| Power         | Maximum 200W                                    |
| Fuse          | 6.3A, T - class, 250V                           |

### Environment

|                   |                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------|
| Temperature range | Operating: 0°C ~ + 40°C; non-operating: -20°C ~ +60°C                                                                  |
| Cooling method    | Forced fan cooling                                                                                                     |
| Humidity range    | Operating: below +35°C, relative humidity $\leq 90\%$ ;<br>non-operating: +35°C ~ +40°C, relative humidity $\leq 60\%$ |
| Altitude          | Operating: below 2000 meters; non-operating: below 15000 meters                                                        |

### Mechanical Specifications

|                   |                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Dimension (W×H×D) | Size that not count foot pad and outer protective cover:<br>445mm×302mm×200mm<br>Size that count foot pad and outer protective cover: |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------|

|                               |                                                                                                                                                                                                         |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | 452mm×309mm×216mm<br>Size that adding rack accessories:<br>485mm×356mm×209mm                                                                                                                            |
| Weight                        | < 10.5kg                                                                                                                                                                                                |
| Installation                  | 7U (Optional MSO7000X-RM setup suit of rack mounting)                                                                                                                                                   |
| <b>Standard</b>               |                                                                                                                                                                                                         |
|                               | Compliance with EMC directive (2014/30/EU), compliance with or better than IEC 61326-1:2021/ EN61326-1:2021, IEC 61326-2-1:2021/ EN61326-2-1:2021                                                       |
| Electromagnetic compatibility | CISPR11/EN 55011<br>Conducted disturbance<br>CLASS A group1, 150kHz-30MHz<br>Radiation disturbance<br>CLASS A group 1, 30MHz-1GHz                                                                       |
|                               | IEC 61000-4-2/EN 61000-4-2<br>Electrostatic discharge (ESD)<br>4.0kV (contact), 8.0kV (air)                                                                                                             |
|                               | IEC 61000-4-3/EN 61000-4-3<br>Radio-frequency electromagnetic field immunity<br>3V/m (80MHz to 1GHz)<br>3V/m (1.4GHz to 6GHz)                                                                           |
|                               | IEC 61000-4-4/EN 61000-4-4<br>Electrical fast transient (EFT)<br>±1kV (Input AC Power ports)                                                                                                            |
|                               | IEC 61000-4-5/EN 61000-4-5<br>Surges<br>±0.5kV (live line to zero line);<br>±1kV (live/zero to ground)                                                                                                  |
|                               | IEC 61000-4-6/EN 61000-4-6<br>Radio-frequency continuous conducted Immunity<br>3V, 0.15-80MHz                                                                                                           |
|                               | IEC 61000-4-11/EN 61000-4-11<br>Voltage sag: 0% of the nominal voltage (UT) for 0.5 cycle; 0% of UT for 1 cycle; 70% of UT for 25/30 cycles.<br>Short - time interruption: 0% of UT for 250/300 cycles. |
|                               | EN 61010-1:2010+A1:2019<br>EN IEC61010-2-030:2021+A11:2021<br>UL 61010-1:2012 Ed.3+ R:06Jun2023<br>UL 61010-2-030:2018 Ed.2<br>CSA C22.2#61010-1:2012 Ed.3+U1;U2;A1;U3                                  |
| Safety specification          |                                                                                                                                                                                                         |

### Warranty and Calibration Service

Calibration interval 1 year

Warranty 1 years

### Order Information

#### Product Model

MSO7204X Bandwidth of 2GHz, the maximum sample rate is 10GSa/s (single channel 10GSa/s, dual channel 5GSa/s, 4-channel 2.5GSa/s), 4-channel oscilloscope

MSO7104X Bandwidth of 1GHz, the maximum sample rate is 10GSa/s (single channel 10GSa/s, dual channel 5GSa/s, 4-channel 2.5GSa/s), 4-channel oscilloscope

#### Standard Accessories

UT-D30 USB3.0 data cable x 1

UT-P07 500MHz passive high impedance probe x 4

UT-L45 BNC-BNC straight-through cable x 2

-- Protective cover of front panel x 1

-- National standard cable x 1

-- Calibration certificate

#### Standard Software

RS-232/422/485/UART Embedded Serial Bus Triggering and Analysis (RS-232/422/485/UART)

SPI Embedded Serial Bus Triggering and Analysis (SPI)

I2C Embedded Serial Bus Triggering and Analysis (I2C)

CAN Automotive Serial Bus Triggering and Analysis (CAN)

LIN Automotive Serial Bus Triggering and Analysis (LIN)

Extreme-template testing Extreme test, standard template test

|                    |                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|
| Spectrum analyzer  | Enhanced FFT                                                                                                    |
| Digital voltmeter  | 4-bit, DC, AC RMS, DC AC RMS                                                                                    |
| Frequency meter    | 8 bits                                                                                                          |
| Trigger software   | Edge, Pulse Width, Slope, Video, Pattern, Timeout, Runout, Setup/Hold, Delay, Persistence, N-Edge, Zone Trigger |
| WebServer          | SCPI remote control, remote viewing and control, exporting waveform files, online browsing manuals              |
| Advanced analytics | Statistical Histograms, Trend Charts, Tracking, Area Histograms                                                 |

## Option

### Option - Bandwidth Upgrade

MSO7000X-BW-10T20 MSO7000X series 1GHz upgrade to 2GHz bandwidth

### Option - Rack mount kit

MSO7000X-RM MSO7000X rack-mount kit

### Option - Upgrade 16-channel logic analyzer

MSO7000X-LA 16-channel logic analyzer option

### Options - Function/Arbitrary Waveform Generator

MSO7000X-AWG Dual 60MHz arbitrary wave generator option

### Option - Advanced Jitter Analysis and Eye Diagram

MSO7000X-JITTER Advanced jitter and eye diagram analysis

### Option - Advanced Power Analysis

MSO7000X-PWR Advanced power analysis

### Options - Protocol Triggering and Analysis

MSO7000X-CANFD Automotive serial bus trigger and analysis (CAN-FD)

MSO7000X-FLEX Automotive serial bus trigger and analysis (FlexRay)

MSO7000X-SENT Automotive sensor bus trigger and analysis (SENT)

MSO7000X-AUDIO Audio serial bus trigger and analysis (I<sup>2</sup>S, LJ, RJ, TDM)

MSO7000X-AREO Aerospace serial bus trigger and analysis (MIL-STD-1553, ARINC 429)

### Option - Advanced Filter Designer

MSO7000X-FILTER    Advanced Filter Designer

### Option - Matlab Embedded Programming

MSO7000X-MAT    The Matlab embedded programming option allows users to create Matlab code to customize mathematical functions

### Upgrade the set

MSO7000X-BND    Upgrade Kits (JITTER, PWR, CANFD, FLEX, SENT, AUDIO, AERO)

### Probe

|           |                                                                                |
|-----------|--------------------------------------------------------------------------------|
| UT-PA2000 | Active single-end probe (2GHz;10X)                                             |
| UT-PA1000 | Active single-ended probe (1GHz; 10X)                                          |
| UT-PD2500 | Active Differential Probes (2.5GHz; 10X)                                       |
| UT-PD1500 | Active Differential Probes (1.5GHz; 10X)                                       |
| UT-P07A   | Passive high impedance probe (1X: 8MHz; 10X: 500MHz)                           |
| UT-P20    | Passive high voltage probe<br>(100MHz; probe coefficient 100:1, 1.5kVrms)      |
| UT-V23    | Passive high voltage probe (100MHz; 2kVpp)                                     |
| UT-P21    | Passive high voltage probe<br>(50MHz; maximum of operating voltage DC 15kVrms) |
| UT-P40    | Current probe (100kHz; 0.4A ~ 60A)                                             |
| UT-P41    | Current probe (100kHz; 0.4A ~ 100A)                                            |
| UT-P42    | Current probe (150kHz; 0.4A ~ 200A)                                            |
| UT-P43    | Current probe (25MHz; maximum of measurement current 20A)                      |
| UT-P44    | Current probe (50MHz; maximum of measurement current 40A)                      |
| UT-P4030D | Current probe (100MHz; maximum of measurement current 30A)                     |
| UT-P4150  | Current probe (12MHz; maximum of measurement current 150A)                     |
| UT-P4500  | Current probe (5MHz; maximum of measurement current 500A)                      |
| UT-4100A  | Current probe (600kHz; maximum of measurement current 100A)                    |
| UT-4100B  | Current probe (2MHz; maximum of measurement current 100A)                      |

|        |                                                                 |
|--------|-----------------------------------------------------------------|
| UT-P30 | High voltage differential probe (100MHz; $\pm 800\text{Vpp}$ )  |
| UT-P31 | High voltage differential probe (100MHz; $\pm 1.5\text{kVpp}$ ) |
| UT-P32 | High voltage differential probe (50MHz; $\pm 3\text{kVpp}$ )    |
| UT-P33 | High voltage differential probe (120MHz; $\pm 14\text{kVpp}$ )  |
| UT-P35 | High voltage differential probe (50MHz; 1.3kV)                  |
| UT-P36 | High voltage differential probe (50MHz; 5.6kV)                  |
| UT-M15 | 16-channel logic analyzer probe                                 |

Notes: Please order all hosts, accessories and options from your local UNI-T distributor.

## Options ordering and installation

1. **Purchase options:** Based on your requirements, please purchase the specified function options from Uni-t Sales Personnel and provide the serial number of the instrument that needs the option installed.
2. **Receive certificate:** You will receive the license certificate based on the address provided in the order.
3. **Register and obtain license:** Visit the Uni-t official website license activation session for registration. Use the license key and instrument serial number provided in the certificate to obtain the option license code and license file.
4. **Install the option:** Download the option license file to the root directory of a USB storage device, and connect the USB storage device to the instrument. Once the USB storage device is recognized, the Option Install menu will be activated. Press this menu key to begin installing the option.

## Limited Warranty and Liability

UNI-T guarantees that the Instrument product is free from any defect in material and workmanship within three years from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination or improper handling. If you need warranty service within the warranty period, please contact your seller directly. UNI-T will not be responsible for any special, indirect, incidental or subsequent damage or loss caused by using this device. For the probes and accessories, the warranty period is one year. Visit [instrument.uni-trend.com](http://instrument.uni-trend.com) for full warranty information.

Learn more at: [www.instruments.uni-trend.com](http://www.instruments.uni-trend.com)



Register your product to confirm your ownership. You will also get product notifications, update alerts, exclusive offers and all the latest information you need to know.

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