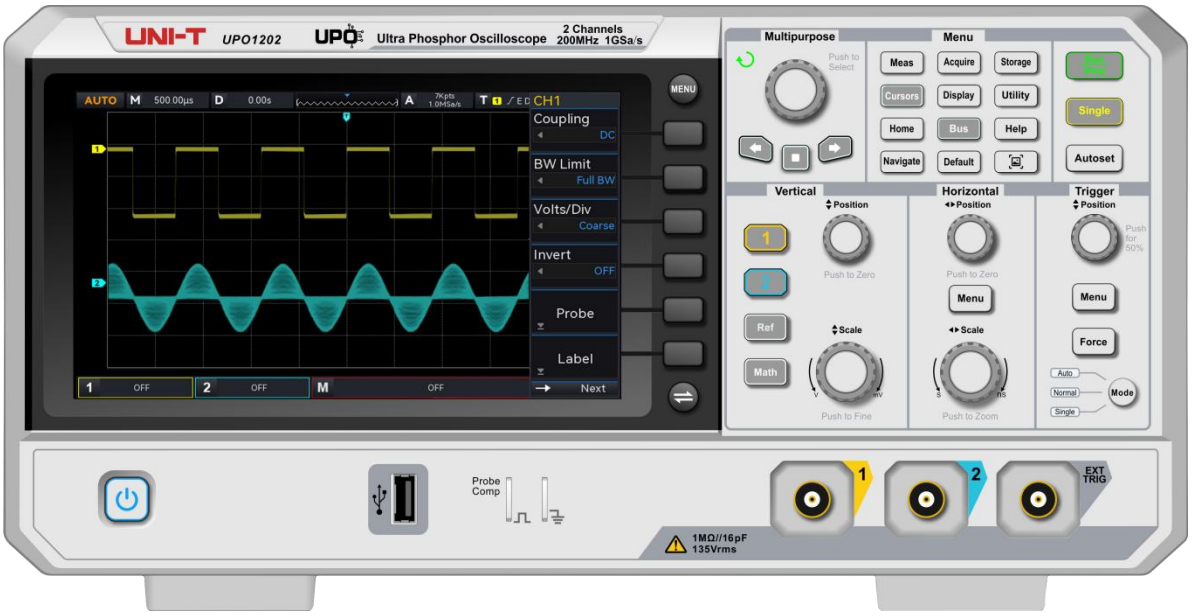
UNI-T®

Instruments.uni-trend.com



Datasheet

UPO1002 Series Digital Phosphor Oscilloscope

V1.3

2024.07

Features and Merits

- Analog channel bandwidth: 200 MHz, 100 MHz
- Analog channel number: 2
- Maximum sampling rate: 1 GSa/s (non-interleaving: independent sampling per channel)
- Vertical scale: 500 μV/div to 20 V/div
- Low-ground noise: < 60 μVrms
- Maximum memory depth: 56 Mpts
- Maximum of waveform capture rate: 500,000 wfms/s (Fast Acquire)
- The real-time waveform of hardware can be continuously recording of 120,000 frames
- Automatic measurement of 36 waveform parameters, the measurement range divides into screen and cursor area
- Supports 6-digit hardware frequency counter measurement
- Multi-Scopes 2.0 supports independent fluorescent display for dual channel
- DVM supports AC/DC RMS (true RMS) measurement
- Waveform calculation function (FFT, add, subtract, multiply, divide, digital filter, logical operation, and advanced operation)
- 1M sampling point enhance FFT function, it supports frequency setting, waterfall curve, demodulation mode, and marker measurement
- Multiple trigger functions (edge, pulse width, video, slope, runt, window, delay, timeout, duration, setup & hold, Nth edge, and pattern)
- Supports trigger of RS232, I2C, and SPI
- RS232, I2C and SPI support full memory hardware for real-time decoding
- Ultra phosphor display with 256 levels of grayscale
- 7 - inch WVGA (800×480)TFT LCD
- Multiple interfaces: USB Host, USB Device, LAN, EXT Trig, AUX Out (Trig Out, Pass/Fail, DVM)
- Supports waveform navigation, marker, and segment
- Supports SCPI (Standard Command for Programmable Instrument)
- Supports web access and control

Product Introduction

UPO1002 series digital phosphor oscilloscope adopts innovative technique Ultra Phosphor 2.0 with new appearance upgrade and the function of deep storage, high waveform capture rate, real-time waveform recording and playback and 256-level grayscale display.

The series is equipped with the bandwidth of 100 MHz and 200 MHz, real-time sampling rate up to 1 GSa/s, 2 analog channels, maximum memory depth of 56 Mpts, maximum waveform capture rate of 500,000 wfms/s, hardware real-time waveform uninterrupted recording and waveform analysis up to 120,000 waveform frames, support DVM module, rich trigger and bus decoding functions, and support full memory hardware real-time decoding.

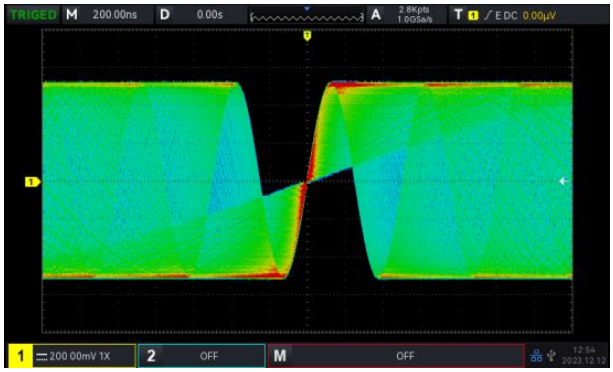
It is widely used in many fields, including communication, semiconductor, IC design, instrumentation, industrial electronics, consumer electronics, automotive electronics, field maintenance, R&D, and education.

Design Highlights

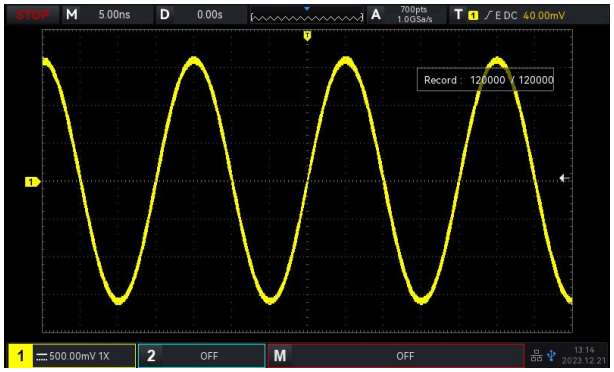
256 grayscale display

Use the original Ultra Phosphor technique to display the waveform details.





Hardware real-time maximum recording up to 120,000 frames



UPO1002 series hardware real-time maximum recording rate up to 120,000 frames.

Maximum memory depth of 56 Mpts



It is convenient for the oscilloscope to maintain the high sampling rate in a wider time base range, while taking into account the overall waveform and detail. It greatly improves the capture rate of abnormal waveforms.

Maximum waveform capture rate of 500,000 wfms/s



Uses an innovative digital signal parallel processing technique. Allows normal sampling of 100,000wfms to reach up to 500,000 wfms/s in Fast Acquire mode.

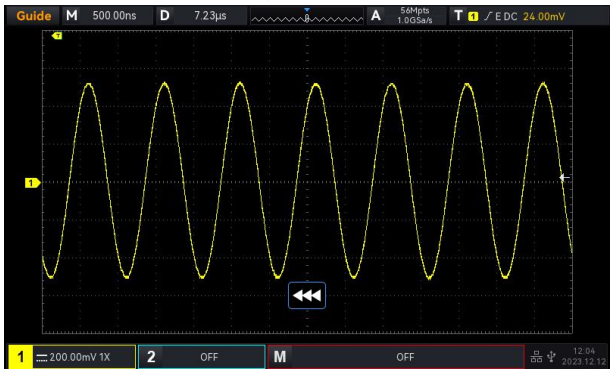
Cursor Area Measurement



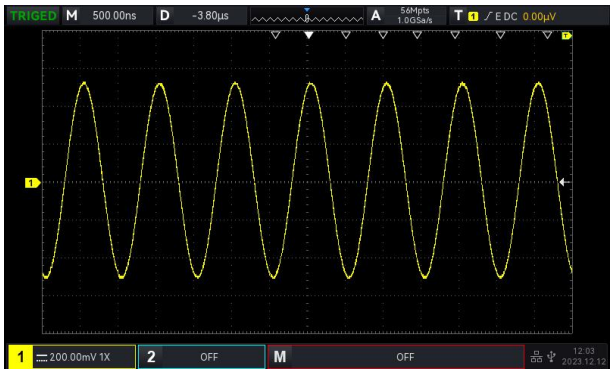
When the Cursor is activated, the waveform in the cursor area can be measured for parameters. It is convenient for user to process the waveform measurement in the specified area, it enhances the flexible and operability for the measurement area.

Waveform Navigation

Navigation includes time navigation, marker navigation, and segment navigation. The user can select the best navigation mode to observe and analyze the waveform.

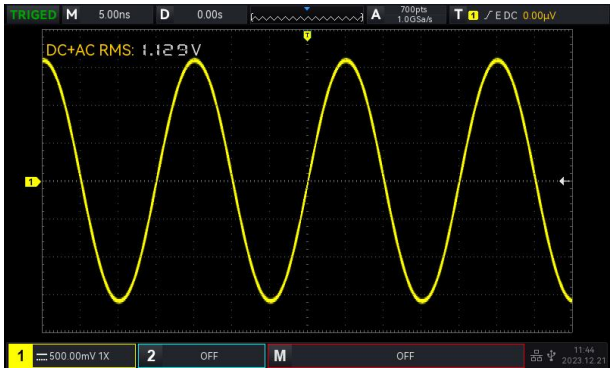


Waveform Navigation



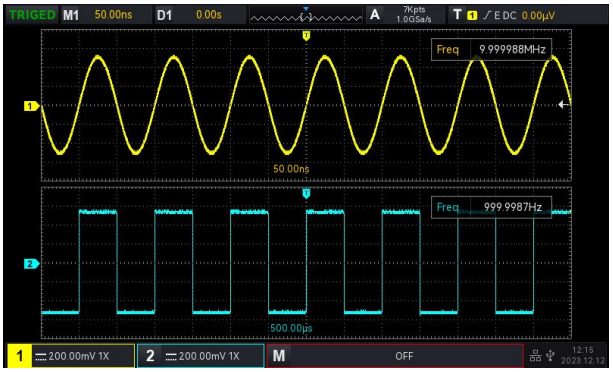
Marker Navigation

DVM (Digital Voltage Meter)



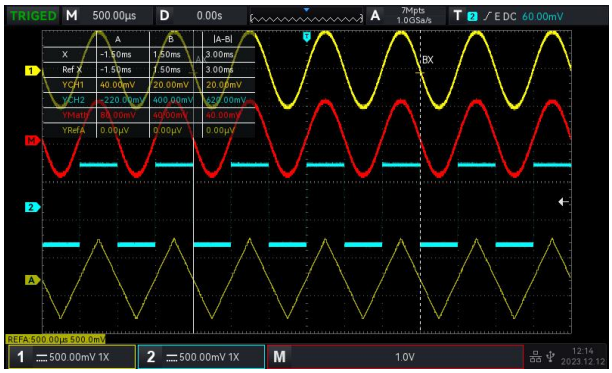
UPO1002 series has built-in DVM (Digital Voltage Meter). It can trigger an alert when a measurement is under or over a specified range. It provides a more accurate measurement and can improve the measurement experience for the user.

Multi-Scopes 2.0



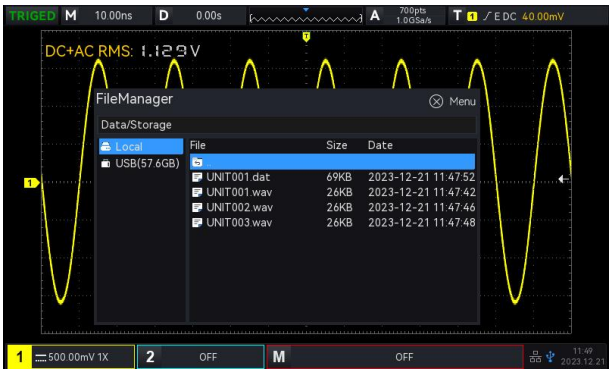
Multi-Scopes 2.0 can separate the time base and volts/div of two channels, so the user can observe two completely different signals in one window at the same time.

Cursor Measurement



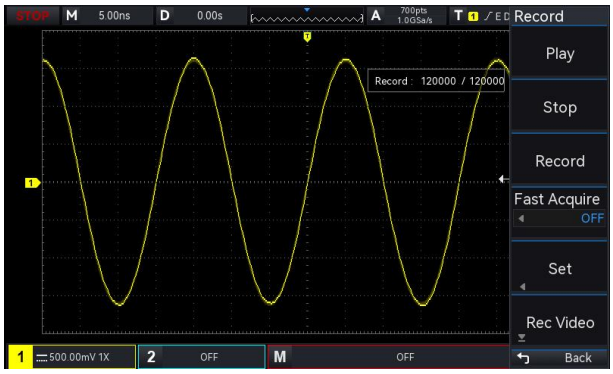
It can measure time and voltage of CH1, CH2, MATH, REFA and REFB.

File Management



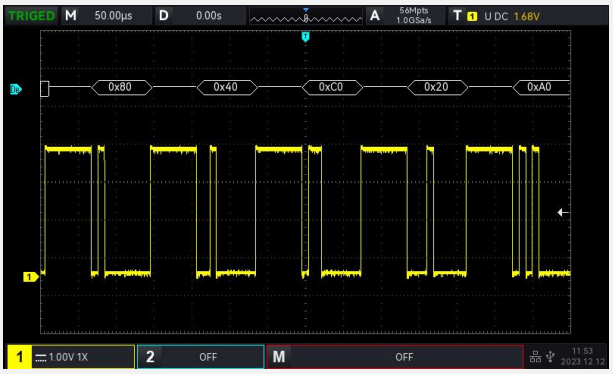
UPO1002 series adds file management function. The user can save the waveform, settings, picture to the specified Local file or the file folder USB.

Recording converts to video



When the recording waveform is completed, the recorded waveform can save to USB. The waveform can be played back and observed on the PC, which is convenient for users to import the waveform to the PC and improve the user experience.

Serial bus trigger and decoding



The innovative hardware decoding enables real-time decoding.

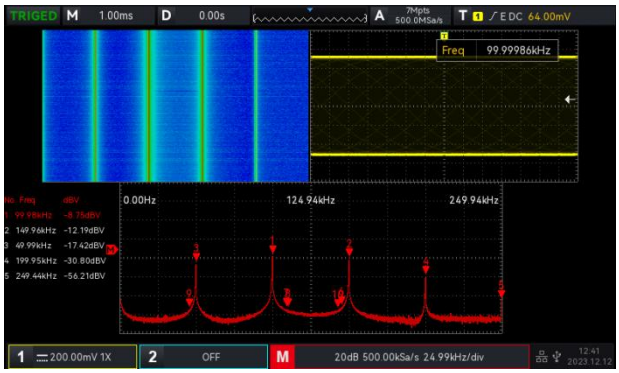


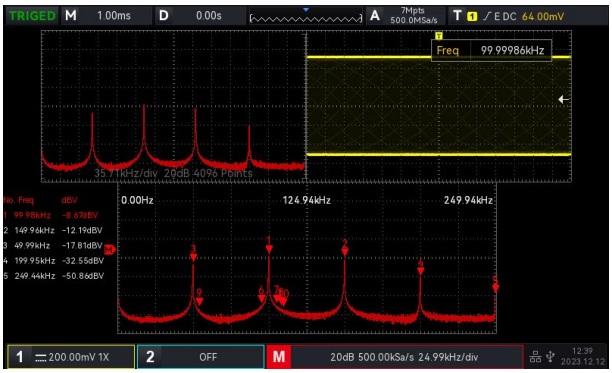
The decoding rate is greatly improved. Full-memory hardware decoding with deep storage of 56 Mpts improves the decoding time from tens of seconds to milliseconds, realizes real-time decoding, and greatly improves the efficiency of problem diagnosis for users.

(1) The waveform refresh rate will not be affected while decoding, and the waveform will display with digital phosphor;
(2) The event list can display the decoding data under the deep storage and time of data packet;
(3) The recorded waveform is also support full memory hardware real-time decoding.

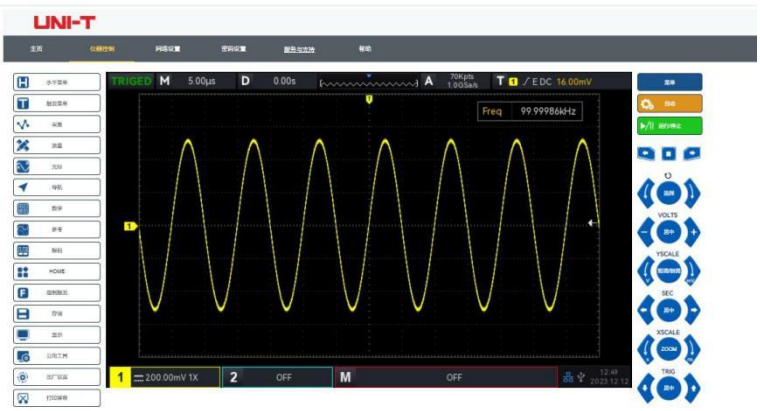
1M points FFT enhancement

FFT function can set the frequency range, demodulation mode and spectrum marker, waterfall curve, automatic mark peak and user-preset function. FFT function facilitates frequency domain analysis of signals.





Remote control via Web



Built-in Web Server can remote control, observe waveform, acquire the measured results of the oscilloscope through the browser. It can be applied to the scenario of remote monitoring, telecommuting and data sharing.

This feature allows cross-platform control without installing driver software and host computer software. UPO1002 series embedded virtual control panel and oscilloscope physical panel are exactly the same, making it simple and convenient to use.

Performance Characteristics

All specifications are guaranteed except those marked "typical".

Unless otherwise stated, performance characteristics are applicable to probes with attenuation switches set to 10× and UPO1000 series digital phosphor oscilloscope. In order to achieve these specifications, the oscilloscope must satisfy the following two conditions at first.

- The instrument must operate continuously for at least 30 minutes at the specified operating temperature.
- If the operating temperature range reaches or exceeds 5 degrees Celsius, the system function menu must be opened to perform the self-calibration function.

Model	**UPO1102**	**UPO1202**
Analog bandwidth	100 MHz	200 MHz
Calculated rise time (10 to 90%) (typical)	≤ 3.5 ns	≤ 1.8 ns
	The typical rise time of 1 mV/div and 2 mV/div is 2.0 ns	
Input/output channel number	2	
Sampling mode	Real-time sampling	
Acquisition mode	Normal, peak detect, high resolution, and averaging	
Maximum sample rate	1GSa/s (non-interleaving: independent sampling per channel)	
Average	Average: 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, and 8192	
Maximum memory depth	56 Mpts	
Maximum waveform capture rate	100,000 wfms/s	
	500,000 wfms/s (Fast Acquire)	
Hardware real-time waveform recording and playing	120,000 frames	
Screen	7-inch 800×480 TFT LCD	
Vertical system		
Input coupling	DC, AC, GND	
Input impedance	(1 MΩ ± 2%)‖ (16 pF ± 2 pF)	
Probe attenuation factor	Voltage probe ratio: 0.001X, 0.01X, 0.1X, 1X, 10X, 100X, 1000X, 2000X, and Custom Current probe ratio: 5 mV/A, 10 mV/A, 50 mV/A, 100 mV/A, and Custom	

Maximum input voltage	135 V_{RMS}
Vertical resolution	8-bit
Vertical scale	500 μV/div to 20 V/div
Offset range	±8 div
Band limit(typical)	20 MHz
Low frequency response	(AC coupling, -3 dB), ≤ 5 Hz (on BNC)
DC gain accuracy	± 3% Full scale
DC offset accuracy	± (2%+0.1 div+2 mV)
Channel-to-channel isolation(typical)	DC to maximum bandwidth: > 40 dB
Horizontal system	
Time base range	1 ns/div to 1000 s/div (Display current sampling rate, memory depth)
Time base accuracy	≤ ± (50 + 2 × Service life) ppm
Timebase delay time range	Pre-trigger (negative delay): ≥ 1 screen width Post-trigger (positive delay): 1 s to 10 s
Time base mode	Y-T, X-Y, and Roll
Number of X - Y	1
Time base mode	Y-T (default)
	X-Y, CH1-CH2
	Roll, time base ≥ 50 ms/div, automatically enter or exit Roll mode by adjusting the horizontal time base knob
Multi-Scopes 2.0	Number of independent time base channels: 2 Each channel can be displayed independently and the time base can be adjusted independently
Trigger	
Trigger level range	Inside: ± 5 Spaces from the center of the screen External: EXT ± 7 V
Trigger modes	Auto, Normal, Single
Trigger holdoff	100 ns to 10 s
Trigger coupling (typical)	DC: Passes all components of the signal
	AC: The direct current component that blocks the input signal
	HF reject: Attenuates the high-frequency components above 40 kHz
	LF reject: Blocks the DC component and attenuates the low-frequency

	components below 40 kHz
	Noise reject: The high frequency noise in the signal is suppressed to reduce the probability of oscilloscope being triggered by mistake
Edge	
Slope	Rising, Falling, and Either
Source	CH1, CH2, AC Line, and EXT
Runt	
When	>, <, ≤ ≥, and None
Polarity	Positive, Negative
Pulse width	8 ns to 10 s
Source	CH1, CH2
Window	
Polarity	Rising, Falling, and Either
When	Enter, Exit, and Time
Set	8 ns to 10 s
Source	CH1, CH2
Nth edge	
Slope	Rising, Falling
Idle time	8 ns to 10 s
Edge number	1 to 65535
Source	CH1, CH2
Delay	
Edge type	Rising, Falling
When	>, <, ≤ ≥, and None
Delay time	8 ns to 10 s
Source	CH1, CH2
Timeout	
Slope	Rising, Falling, and Either
Timeout	8 ns to 10 s
Source	CH1, CH2
Pattern	
Code pattern	H, L, X, Rising, and Falling
Source	CH1, CH2
Duration	

Code pattern	H, L, and X
When	>, <, ⩽ ⩾
Duration	8 ns to 10 s
Source	CH1, CH2
Setup and Hold	
Clock edge	Rising, Falling
Data type	H, L
Setup	8 ns to 1 s
Hold	8 ns to 1 s
Source	CH1, CH2
Pulse width	
Polarity	Positive, Negative
When	>, <, ⩽ ⩾
Pulse width	2 ns to 4 s
Source	CH1, CH2, AC Line, and EXT
Slope	
Slope	Positive, Negative
When	>, <, ⩽ ⩾
Time	8 ns to 1 s
Source	CH1, CH2
Video	
Standard	Supports standard NTSC, PAL, and SECAM broadcast systems with line counts ranging from 1 to 525 (NTSC) and 1 to 625 (PAL/SECAM)
Source	CH1, CH2
Decoding	
Decoding type	RS232/UART, I^2C, and SPI
Number of decodes	1
RS232/UART	
When	Start, FrameErr, CheckErr, and Data
Baud rate	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, and Custom
Data bit	5 bits, 6 bits, 7 bits, and 8 bits
Source	CH1, CH2
I2C	

When	Start, Restart, Stop, Loss, Address, Data, and Address & Data
Addr mode	7 bits, 10 bits
Addr range	0 to 7F, 0 to 3FF
Byte length	1 to 5
Source	CH1, CH2
SPI	
When	Idle, Idle& Data, CS, and CS & Data
Timeout	100 ns to 10 s
Data bit	4 bits to 32 bits
Data set	H, L, X
Edge of the clock	Rising, Falling
Source	CH1, CH2
Measure	
Cursor	Voltage difference between cursors (△V) Time difference between cursors (△T) Reciprocal of △T (Hz) (1/△T)
	Voltage and time of waveform point
	Display the cursor in the automatic measurement
Automatic measurements	A total of 36 measurement parameters: Maximum, Minimum, Top, Base, Amplitude, Peak-Peak, Middle, Average, Average-Cycles, RMS, RMS-Cycles, AC RMS, Period, Frequency, Rise time, Fall time, RiseDelay, FallDelay, +Width, -Width, FRFR, FRFF, FFFR, FFFF, FRLF, FRLR, FFLR, FFLF, +Duty, -Duty, Area, Area-Cycles, Overshoot, Preshoot, Phase, and Pulse count
Measurement type	Simultaneously display 5 kinds of parameter measurement
Measurement range	Main time base, Zoom time base, and Cursor area
Measurement statistics	Mean, Maximum, Minimum, Std Dev, and Count
Frequency Counter	6-digit hardware frequency counter
XY measurement	Time, Cartesian, Polar, Product, and Ratio
Mathematical	
Waveform math	A+B, A-B, A×B, A/B, FFT, Editable advanced operations (Log, Exp, Sin, Cos, Tan, Sqrt), and Logic
Maximum FFT count	1M points
FFT window types	Hanning, Hamming, Rectangle, Blackman, and FlatTop

FFT display	Split screen, Full screen, Independent, WaterFall-1, and WaterFall-2
FFT vertical scale	Vrms, dBV
FFT	Spectrum range: Start frequency, Stop frequency, Center frequency, and Span
	Detection mode: Normal, Average, Max Hold, and Min Hold
	Marker: Marker type, Marker Points, and Marker list
Digital filter	Low pass, High pass, Band pass, and Band stop
Operation	AND, OR, NOT, XOR
Function	Sin, Cos, Sinc, Tan, Sqrt, Exp, Log, ln, Floor, ABS, Acos, Asin, Atan, Sinh, Tanh, Ceil, Cosh, and Fabs
Storage	
Set	Inside and Outside
Waveform	Inside and Outside
Image	External USB memory, and can store related parameter information.
Display	
Screen	7-inch 800X480 TFT LCD
Display color	24 - bit true colors
Persistence	Minimum, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, infinite, and DSO
Display type	Point, Vector
Interface	
Standard	USB Host, USB Device, LAN, EXT Trig, and AUX Out (Trig Out, Pass/Fail, DVM)
General technical specifications	
Probe compensator output	
Output voltage	About 3V p-p
Frequency	10 Hz, 100 Hz, 1 kHz, and 10 kHz
Power Source	
Power source voltage	100 to 240 VAC (Fluctuations: ±10%), 50 Hz/60 Hz
	100 to 120 VAC (Fluctuations: ±10%), 400 Hz
Power consumption	75 W Max
Fuse	3 A, T class, 250 V
Environmental	

Temperature	Operation: 0°C to +40°C Non-operating: -20°C to +70°C		
Cooling	Forced cooling by fan		
Humidity	Operation: +35°C ≤ 90% relative humidity Non-operating: +35 °C to +40 °C ≤ 60% relative humidity		
Altitude	Operation: below 3,000 meters Non-operating: up to 15,000 meters		
Pollution degree	2		
Operating environment	In-door		
Specifications			
Dimension (W×H×D)	336mm x 164mm x 105mm		
Weight	<2.5 kg		
Calibration interval			
Calibration interval	One year		
Safety Regulations			
Electromagnetic compatibility	Comply with EMC Directive (2014/30/EU), in line with or better than IEC61326-1:2021/EN61326-1:2021 IEC61326-2-1:2021/EN61326-2-1:2021		
	Conduction disturbance	CISPR 11/EN 55011	CLASS B group 1, 150 kHz-30 MHz
	Radiated disturbance	CISPR 11/EN 55011	CLASS B group 1, 30 MHz-1 GHz
	Electrostatic discharge (ESD)	IEC 61000-4-2/EN 61000-4-2	4.0 kV (contact), 8.0 kV (air)
	Radio-frequency electromagnetic field Immunity	IEC 61000-4-3/EN 61000-4-3	0 V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2.0 GHz to 2.7GHz)
	Electrical fast transients (EFT)	IEC 61000-4-4/EN 61000-4-4	2 kV (Input AC Power Ports)
	Surges	IEC 61000-4-5/EN 61000-4-5	1 kV (Line to line) 2 kV (Line to ground)
	Radio-frequency continuous conducted Immunity	IEC 61000-4-6/EN 61000-4-6	3V, 0.15-80 MHz
	Voltage dips and interruptions	IEC61000-4-11/EN 61000-4-11	Voltage Dips: 0% UT during 1 cycle

		40% UT during 10/12 cycles 70% UT during 25/30 cycles Short interruption: 0% UT during 250/300 cycles
Safety	EN61010-1:2010+A1:2019 EN IEC61010-2-030:2021+A11:2021 BS EN61010-1:2010+A1:2019 BS EN IEC61010-2-030:2021+A11:2021 UL61010-1:2012 Ed.3+ R:19 Jul2019 UL61010-2-030:2018 Ed.2 CSA C22.2#61010-1:2012 Ed.3+U1;U2;A1 CSA C22.2#61010-2-030:2018 Ed.2	

Accessories and Option

Order information

	Description	Order No.
Model	UPO1102 (100 MHz, 2 analog channels)	UPO1102
	UPO1202 (200 MHz, 2 analog channels)	UPO1202
Standard accessories	Power cord that conforms to the standard of the destination country x1	
	USB data cable x1	UT-D14
	Passive probe (200 MHz/100 MHz) x2	UT-P05, UT-P04
Optional accessories	High voltage probe	UT-V23, UT-P20, and UT-P21
	High-Voltage Differential Probes	UT-P30, UT-P31, UT-P32, UT-P33, UT-P35, and UT-P36
	Current Probe	UT-P40, UT-P41, UT-P42, UT-P43, and UT-P44
	Bandwidth upgrade to 200 M	UPO1002X-1MT2M

Note: For all hosts, accessories and options, please order from your local UNI-T distributor.

UNI-T oscilloscope probes and accessories supported by UPO1002 series.

Passive probe

Model	Type	
UT-P01 	High impedance probe	1X: DC to 8 MHz 10X: DC to 25 MHz Oscilloscope compatibility: UNI-T all series
UT-P03 	High impedance probe	1X: DC to 8 MHz 10X: DC to 60 MHz Oscilloscope compatibility: UNI-T all series
UT-P04 	High impedance probe	1X: DC to 8 MHz 10X: DC to 100 MHz Oscilloscope compatibility: UNI-T all series
UT-P05 	High impedance probe	1X: DC to 8 MHz 10X: DC to 200 MHz series Oscilloscope compatibility: UNI-T all series
UT-P06 	High impedance probe	1X: DC to 8 MHz 10X: DC to 300 MHz Oscilloscope compatibility: UNI-T all series
UT-P07A 	High impedance probe	10X: DC to 500 MHz Input resistance: 10 MΩ Maximum safe operating voltage: < 600 Vpk Oscilloscope compatibility: UNI-T all series

UT-P08A 	High impedance probe	10X:DC to 350 MHz Input resistance : 10 MΩ Maximum safe operating voltage : < 600 Vpk Oscilloscope compatibility : UNI-T all series
UT-P20 	High impedance probe	DC to 100 MHz Probe coefficient 100:1 Maximum operating voltage 1500 V_{rms} Oscilloscope compatibility : UNI-T all series
UT-V23 	High voltage probe	DC to 100 MHz Probe coefficient 100:1 Input resistance 100 MΩ ± 2% Maximum operating voltage 2000 Vpp Oscilloscope compatibility: UNI-T all series
UT-P21 	High voltage probe	DC to 50 MHz Probe coefficient 1000:1 Maximum operating voltage DC 15 kV_{rms}, AC 10 kV(sine wave) Oscilloscope compatibility: UNI-T all series

Current Probe

UT-P40 	Current probe	DC to 100 kHz Range 50 mV/A, 5 mV/A Current range 0.4A to 60A Maximum operating voltage 600 V_{rms} Oscilloscope compatibility: UNI-T all series
UT-P41 	Current probe	DC to 100 kHz Range 100 mV/A, 10 mV/A Current range 0.4 A to 100 A Maximum operating voltage 600 V_{rms} Oscilloscope compatibility: UNI-T all series

UT-P42 	Current probe	DC to 150 kHz Range 100 mV/A, 10 mV/A Current range 0.4 A to 200 A Maximum operating voltage 600 V_{rms} Oscilloscope compatibility: UNI-T all series
UT-P43 	Current probe	DC to 25 MHz Range 100 mV/A Maximum measurement current 20 A Rise time 14ns Oscilloscope compatibility: UNI-T all series
UT-P44 	Current probe	DC to 50 MHz Range 50 mV/A Maximum measurement current 40 A Rise time 7 ns Oscilloscope compatibility: UNI-T all series

Active Probe

Model	Type	
UT-P30 	High-Voltage Differential Probes	DC to 100 MHz Attenuation ratio 100:1, 10:1 Input differential voltage ± 800 Vpp Oscilloscope compatibility: UNI-T all series
UT-P31 	High-Voltage Differential Probes	DC to 100 MHz Attenuation ratio 1000:1, 100:1 Input differential voltage ±1.5k V_{pp} Oscilloscope compatibility: UNI-T all series
UT-P32 	High-Voltage Differential Probes	DC to 50 MHz Attenuation ratio 1000:1,100:1 Input differential voltage ±3 kV_{pp} Oscilloscope compatibility: UNI-T all series

UT-P33		
	High-Voltage Differential Probes	DC to 120 MHz Attenuation ratio 100:1, 10:1 Input differential voltage ±14 kV_{pp} Oscilloscope compatibility: UNI-T all series
UT-P35		
	High-Voltage Differential Probes	DC to 50 MHz Attenuation ratio 500:1, 50:1 Rise time 7 ns Accuracy 2% Input differential mode voltage 1/50:130 (DC+peak AC) 1/500:1300 (DC+peak AC) Input common mode voltage 100Vrms, CATI 600Vrms, CATII Oscilloscope compatibility: UNI-T all series
UT-P36		
	High-Voltage Differential Probes	DC to 50 MHz Attenuation ratio 2000:1, 200:1 Rise time 3.5 ns Accuracy 2% Input differential mode voltage 1/200:560 (DC+peak AC) 1/2000:5600 (DC+peak AC) Input common mode voltage 2800 Vrms, CATI 1400 Vrms, CATII Oscilloscope compatibility: UNI-T all series

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 for full warranty information.

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