

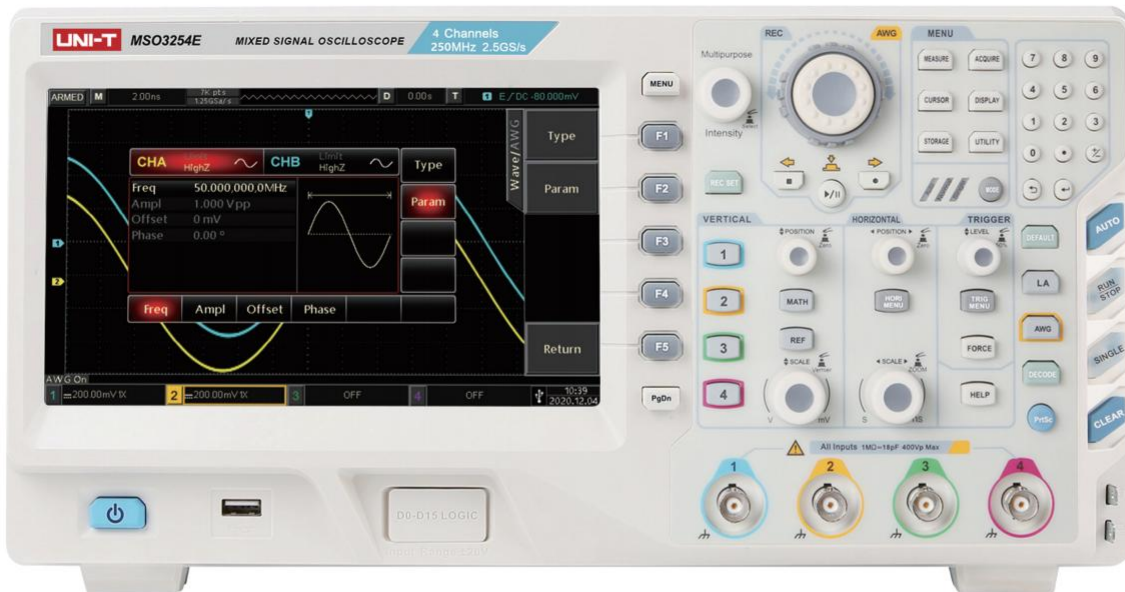
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# Data Sheet

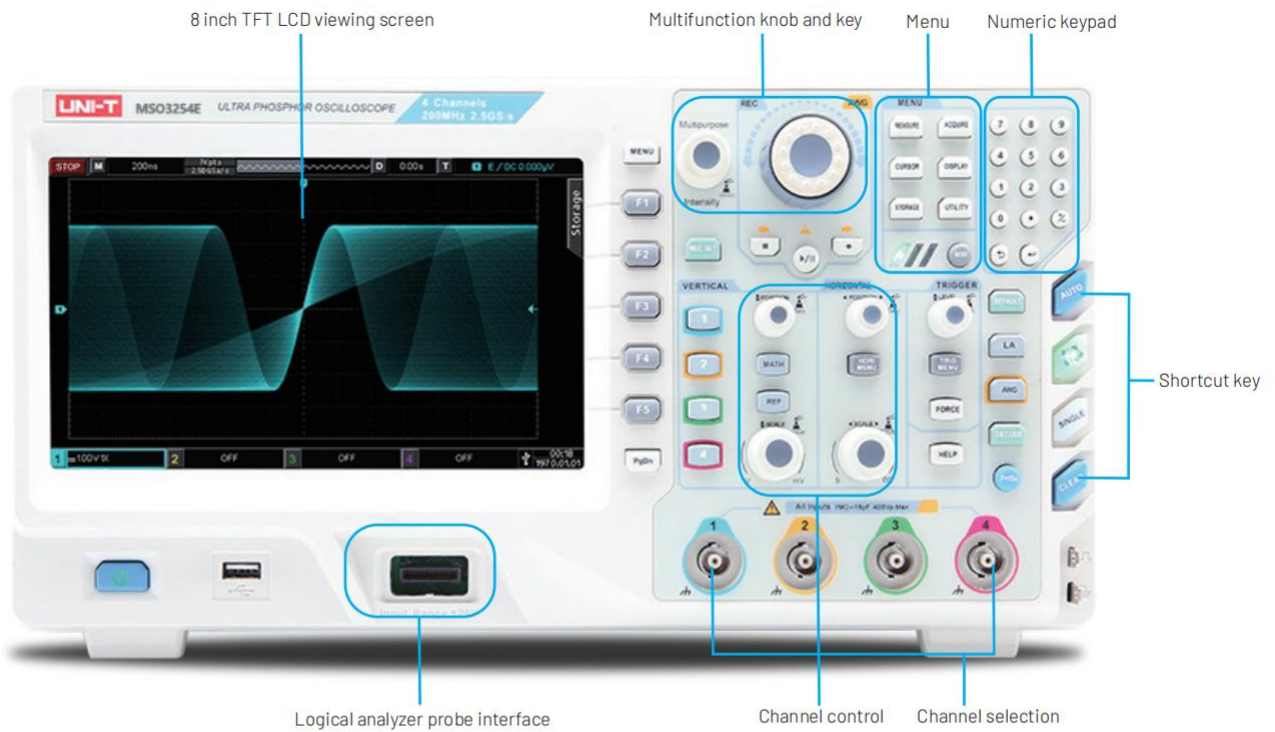
## MSO3000E Series Digital Oscilloscope



## Main Features

- Bandwidth: 150MHz/250MHz
- Measurement channel: 2/4 analog channel, 16 digital channel
- Real-time sampling rate: 2.5GS/s
- Storage depth: 70Mpts per channel
- Waveform capture rate: 200,000wfms/s
- Gray level: 256
- Auto measurement: 34 waveform types
- Waveform record: record original data 100,000 frame at the same time
- Abundant trigger: edge, pulse width, runt, exceed-amplitude, N-edge, delay, timeout, duration, setup hold, slope, video, code pattern
- Bus encoding: RS232, IIC, SPI, USB, CAN
- Independent time base: each channel can adjust independently
- Display: 8inch WVGA (800×480) TFT LCD, super-widescreen, vivid color, clean display
- Peripheral interface: USB Host, USB Device, LAN, EXT Trig, AUX OUT(Trig out, Pass/Fail) output, signal source output interface AWG, VGA and multimeter module UT-M12 (optional)
- Waveform generator: built-in double channel, maximum 50MHz arbitrary waveform generator

# Oscilloscope Panel



# Product Introduction

MSO3000E series is UNI-T original Ultra Phosphor technology with multifunction and high-performance oscilloscope. It is facility, great technology index and features for measurement work.

Application area: communication, semiconductor, computer, aerospace, national defense, instrument and apparatus, industrial electronics, consumer electronics, automobile electronics, field maintenance, research and education field.

## Signal Capture

MSO3000E series has 200,000 wfms/s waveform capture function to acquire glitch and abnormal signal of waveform more quickly and effectively. It is convenient to detect product's flaw and improve it immediately.



## Storage Depth

MSO3000E series can turn on four channels simultaneous and each channel storage depth stay at 70Mpts. That is, user can get more data points and events with high resolution in one-time trigger sampling. It provides a large number of sources for analysis work.



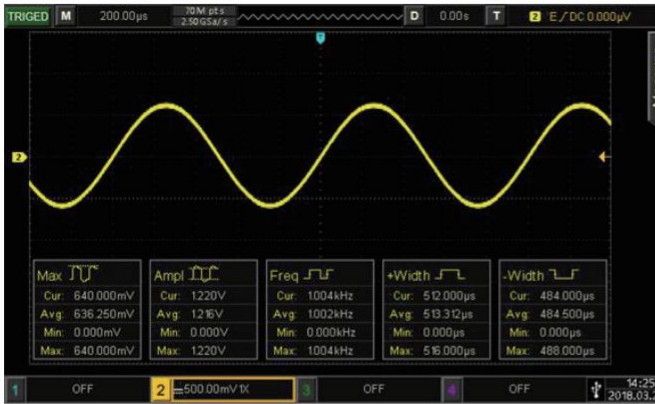
## Multi-mode Trigger

MSO3000E series has a complete set of trigger system. It has edge trigger to acquire edge hopping change. Based on waveform feature to select trigger mode, there are pulse width, runt, exceed-amplitude, N-edge, delay, timeout, duration, setup hold, slope, video and code pattern. It helps to trigger target waveform fast and accurately. Abundant bus encoding function make interface more flexible and effectively.



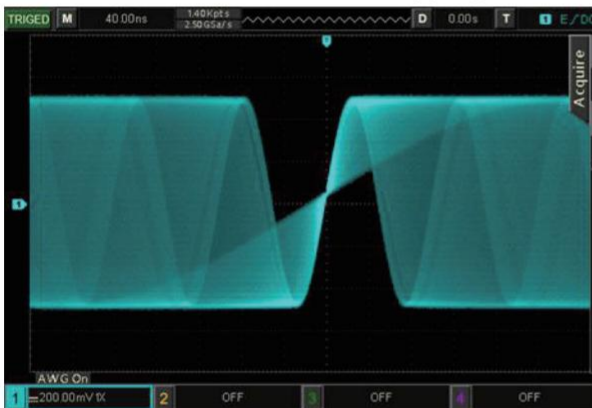
## Auto Measurement

MSO3000E series has a complete set of analytical tools. Menu can open 34 auto measurement items to provide a large number of testing source, directly to display signal measurement. It is perfectly meet the requirements of signal quality measurement.



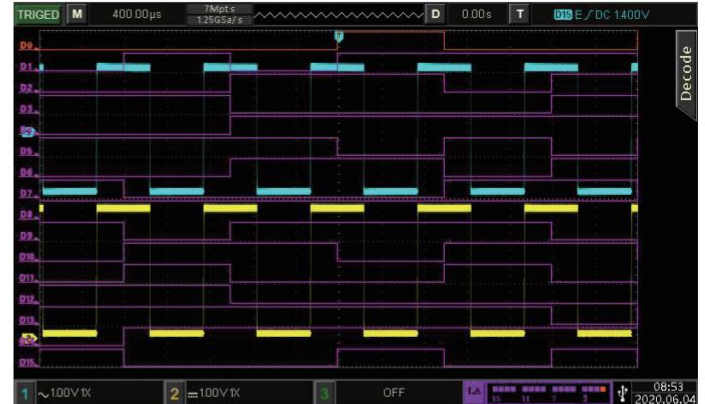
**Steady Persistence Display**

MSO3000E series has 256 level gray display, which can effectively show the cumulative effect over a long time. The dense accumulation of waveform in frequent signal areas is highlighted, which can record the historical trajectory of active signal. 200,000 wfms/s waveform capture rate to presents waveform whether is abnormal hopping.



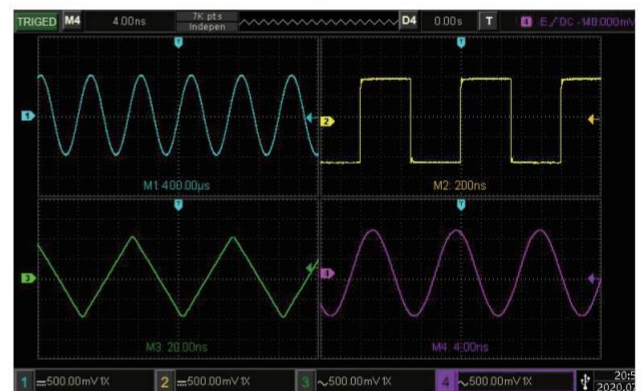
**Digital Channel**

In order to analyze logical relationship of digital circuit, MSO3000E series has UT-M15- logical analyzer probe which provide 2 group of 16 digital channel to acquire and display digital level signal. It is convenient to measuring multiple associated signals.



**Independent Time Base**

If measured four signal frequencies has great difference, turn on independent time base function to presents signal waveform details in different time base. It can also viewed by split screen.



**Mathematical Operation**

MSO3000E series can execute multiple mathematical operation, such as Math, FFT, logical operation and advanced operation. Enter mathematical operation menu, rotate knob to select operation mode, result waveform will be lighted by red M mark after operation.



### Built-in Waveform Generator

MSO3000E series has built-in 50M signal generator Which is sine, square, slope, pulse, noise, DC and arbitrary wave. It cooperates with code pattern generator to quick located abnormal position. It can use as temporary code pattern generator when not use oscilloscope.



## Quick Model Selection

Parameter \ Model	MSO3152E	MSO3154E	MSO3252E	MSO3254E
Bandwidth	150MHz	150MHz	250MHz	250MHz
Analog channel	2	4	2	4
Digital channel	2+16	4+16	2+16	4+16
Sampling rate	2.5GSa/s	2.5GSa/s	2.5GSa/a	2.5GSa/s
Storage depth	70Mpts per channel	70Mpts per channel	70Mpts per channel	70Mpts per channel
Capture rate	200,000wfms/s	200,000wfms/s	200,000wfms/s	200,000wfms/s
Bus trigger/Encoding	5 types	5 types	5 types	5 types
Independent time base	support	support	support	support
Waveform record	100,000 frames	100,000 frames	100,000 frames	100,000 frames

## Technical Specification

Vertical system, analog channel	
Bandwidth	150MHZ/250MHZ
Input channel	2/4
Input coupling	DC, AC, Ground
Input impedance	1M $\Omega$ $\pm$ 2%/18pF $\pm$ 3pF
Probe attenuation coefficient	0.001x, 0.01x, 0.1x, 1x, 10x, 100x, 1000x
Input sensitivity range	1mV/div~20V/div(1-2-5 system)
Vertical resolution	8bit
Maximum input voltage	CAT I 300Vrms, CAT II 100Vrms, transient over-voltage 1000Vpk
DC gain accuracy	$\leq$ $\pm$ 3% (sampling or average sampling mode)
DC offset accuracy	$\leq$ $\pm$ 3% (sampling or average sampling mode)
Interchannel isolation	DC to maximum bandwidth: >40dB
Offset range	1mV/div~50mV/div: $\pm$ 2V
	100mV/div~1V/div: $\pm$ 40V
	$\leq$ $\pm$ 3% (sampling or average sampling mode)
Bandwidth limit (typical value)	20MHZ
Vertical system, analog channel	
Input channel	2+16
Threshold value	8 channels of each group can adjust threshold value
Threshold value selection	TTL (1.4V) , 5.0V CMOS (+2.5V) , 3.3V CMOS (+1.65V) , 2.5V CMOS (+1.25V) , 1.8V CMOS (+0.9V) ,
Threshold value range	ECL (-1.3V) , PECL (+3.7V) , LVDS (+1.2V) , 0V, user-custom. $\pm$ 20.0V, 10mV stepping
Threshold value accuracy	$\pm$ (100mV+3%)
Maximum input voltage	CAT I 40Vrms
Input dynamic range	$\pm$ 10V+threshold value
Input voltage swing	500mVpp
Input impedance	101K $\Omega$ $\pm$ 1%/9pF $\pm$ 1pF
Vertical resolution	1bit
Horizontal system	
Time base range	2ns/div~ 40s/div(1-2-4 system)
Delay range	Pre-trigger (negative delay) $\geq$ 1 screen width, late-trigger (positive delay) : 1s~50s
Time base mode	YT, XY, ROLL
Time base accuracy	$\leq$ $\pm$ (50+2x service life) ppm
Waveform capture rate	YT, XY, ROLL
Delay range	200,000wfms/s

<b>Sampling system</b>	
Sampling mode	Real-time sampling
Real-time sampling	Analog channel: 2.5GS/s(single channel), 1.25GS/s(double channel), 1.25GS/s(four channel); Digital channel: 1.25G/s
Access mode	Sampling, peak value detection, high resolution, envelop, average
Average value	When all channel reach to N time sampling, N can take value among 2, 4, 6, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096 and 8192
Waveform interpolation	sin (x) / x
Storage depth	Auto, 7kpts, 70kpts, 700kpts, 7Mpts, 35Mpts, 70Mpts
<b>Trigger system</b>	
Trigger mode	Auto, normal, single
Trigger level range	Internal: distance from screen center $\pm 8$ grid; EXT: $\pm 1.8V$ ; EXT/5: $\pm 9V$
Trigger hold-off range	80ns-10s
Trigger sensitivity	$\leq 1div$
HF rejection	80kHz
LF rejection	8kHz
Noise rejection	Reduce waveform noise (10mV/div-20V/div, trigger sensitivity of DC coupling decrease 2 times)
<b>Trigger mode</b>	
Edge	Rise, fall, arbitrary edge
Pulse width	Pulse width term: > \ < \ =
	Polarity: positive pulse width, negative pulse width
Runt pulse	Pulse width range: 3.2ns-10s
	Pulse width term: > \ < \ =
Over-amplitude trigger	Polarity: positive pulse width, negative pulse width
	Pulse width range: 6.4ns-10s
N edge trigger	Over-amplitude term: Rise, fall, arbitrary edge
	Trigger position: over-amplitude enter- over-amplitude exit, over-amplitude time
Delay trigger	Over-amplitude time: 6.4ns-10s
	Edge mode: rise, fall
	Idle time: 6.4ns-10s
Timeout trigger	Edge count: 1-65535
	Edge mode: rise, fall
Duration trigger	Delay mode: greater than, less than, within range, out of range
	Delay time: normal 6.4ns-10s; lower limit of time: 6.4ns-10s; upper limit of time: 28.8ns-10s
Setup time and hold time	Edge mode: rise, fall, arbitrary edge
	Timeout: 6.4ns-10s
	Code pattern: H, L, X
Slope trigger	Trigger term: greater than, less than, within range
	Duration time: normal 6.4ns-10s; lower limit of time: 6.4ns-10s; upper limit of time: 28.8ns-10s
	Edge mode: rise, fall
Video trigger	Data type: H, L
	Setup time: 6.4ns-10s
	Hold time: 6.4ns-10s
I2C encoding	Slope term: positive slope/negative slope (greater than, less than, within specified range)
	Time: 6.4ns-10s
Code pattern trigger	Signal line frequency: support standard NTSC, PAL and SECAM broadcast system , line range 1-525 (NTSC) and 1-625 (PAL/SECAM)
	H, L, X, rise edge, fall edge
	Trigger term: initiate, restart, stop, lost confirm, address, data, address data
	Address bit wide: 7bits, 10bits
I2C encoding	Address range: 0-119, 0-1023
	Byte length: 1-5bits
	Data qualifier: equal, greater than, less than



RS-232 encoding	Trigger term: start of frame, error frame, check error, data	
	Baud rate: 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps, custom	
	Data bit wide: 5-bit, 6-bit, 7-bit, 8-bit	
CAN encoding (optional)	Signal mode: Rx/ Tx, CAN_H, CAN_L, difference	
	Trigger term: start of frame, frame type, ID, data, ACK lost, bit fill error, ID and data, end of frame	
	Signal rate: 10kbps, 20kbps, 33.3kbps, 50kbps, 62.5kbps, 83.3kbps, 100kbps, 125kbps, 1Mbps, custom	
	Sampling point: 1%-99%	
	Frame type: data frame, remote frame, error frame, overload frame	
USB encoding (optional)	Signal speed: low speed, full speed	
	Trigger term: sync, restore, pause, recover, packet tail, token packet, data packet, handshake packet, SOF, error	
<b>Waveform measurement</b>		
USB encoding (optional)	Manual mode	voltage difference between cursors( $\Delta V$ ), time difference between cursors( $\Delta T$ ), reciprocal of $\Delta T$ (Hz) ( $1/\Delta T$ )
	Track mode	voltage value and time wave of waveform point
	Indicator	display cursor when auto measurement
Auto measurement	maximum/minimum value, peak-to-peak value, middle value, top/bottom value, amplitude value, periodic average value, average value, periodic root mean square, root mean square value, overshoot, preshoot, frequency, period, rise time, fall time, positive pulse width, negative pulse width, rise delay, fall delay, FRFR, FRFF, FFFR, FFFF, FRLF, FFLR, FFLF, positive duty ratio, negative duty ratio, phase, area, periodic area measurement	
Measurement quantity	display 5 type measurement at the same time	
Measurement range	screen or cursor	
Measurement statistics	average value, maximum/minimum value, standard deviation and measurement time	
Frequency meter	6 bits hardware frequency meter	
<b>Mathematical operation</b>		
Waveform operation	A+B, A-B, AxB, A/B, FFT, logical operation, digital filter and advanced operation	
FFT window type	Rectangle, Hanning, Blackman, Hamming	
FFT display	Split screen; independent time base is adjustable	
FFT vertical scale	Vrms, dBVrms	
Digital filter	Low-pass, high-pass, band-pass, band reject	
Logical operation	Meet, OR, NOT, XOR	
Advanced operation	Log, Exp, Sin, COS, Tan, Sqrt, Inth, Diff	
<b>Storage</b>		
Setup	internal (256 groups), external USB storage	
Waveform	internal (256 groups), external USB storage	
Bitmap	external USB storage, save parameter information	
<b>Display</b>		
Display type	8-inch TFT LCD	
Display resolution	800 levelxRGBx480 vertical pixel	
Display color	24bit real color	
Duration time	minimum value, 50ms, 100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s and infinite	
Menu hold	hold time: 1s, 2s, 5s, 10s, 20s, manual	
Display mode	point, vector	
<b>Interface</b>		
Standard	USB-Host, USB-Device, LAN, VGA, EXT Trig, AUX Out, LA, signal source output interface (WaveGen)	
Optional	Multimeter module(UT-M12)	
<b>Compensation signal output of probe</b>		
Output voltage	about 3Vp-p	
Frequency	10Hz, 100Hz, 1kHz(default), 10kHz	
<b>Power source</b>		
Supply voltage	100V~240VACrms	
Frequency	45Hz~440Hz	
Fuse	2.5A, T class, 250V	

<b>Environment</b>		
Temperature range	operating: 0C~+40C; not operating: -20C~+60C	
Cooling method	Fan to force cool down	
Humidity range	operating: +35C below ≤90% relative humidity; not operating: +35C~+40C ≤60% relative humidity	
Altitude	operating: 3000 meter below; not operating: 15,000 meter below	
<b>Specification</b>		
Size	370mm×195mm×125mm	
Weight	4.2kg	
<b>Calibration time</b>		
After a year		
<b>Arbitrary waveform generator</b>		
Channel	2 channels	
Maximum frequency	50MHz	
Sampling rate	250MSa/s	
Operating mode	Output channel selection, duration, modulation	
<b>Waveform</b>		
Sine wave	Frequency range	1uHz-50MHz
	Resolution	1uHz
	Accuracy	1uHz
	harmonic distortion (typical value)	±50ppm within in 90 days, ±100ppm within 1 year (18C-28C)
	total harmonic distortion (typical value)	Test term: output power 0dBm, -40dBc
Square wave	Frequency range	<1% (DC-20kHz, 1Vpp)
	Resolution	1uHz-15MHz
	Rise/fall time	1uHz
	Overshoot (typical value)	<13ns (typical value, 1kHz, 1Vpp)
	Duty ratio	<2%
Slope wave	Shake (typical value)	1%~99% ( limit by the current frequency)
	Frequency range	2ns
	Resolution	1uHz-400kHz
	Non-linearity	1uHz
Pulse wave	Symmetrical degree	1% (typical value, 1kHz, 1Vpp, symmetry 50%)
	Frequency range	0.1%-99.9%
	Resolution	1uHz-15MHz
	Pulse width	1uHz
	Adjustable edge	≥20ns
Gaussian noise	Overshoot (typical value)	12ns-8s
	Shake	<2% (typical value, 1Vpp, 1kHz, 1Vpp)
	Bandwidth	2ns
	DC offset	50MHz bandwidth(-3dB)(typical value)
Arbitrary wave	Range (peak value AC+DC)	±1.5V(50Ω)
	Offset accuracy	±3V (high resistance)
	Frequency range	Offset value ±2%
Modulation Type	Resolution	1uHz-5MHz
	Waveform length	1uHz
	Vertical resolution	8-512k point (play mode)
	Sampling rate	16bits (include mark)
	Nonvolatile memory	250MSa/s
	Carrier wave	Sinc- index rise, index fall, ECG, Gaussian, Lorentz, haversine
AM modulation	Modulating waveform	sine, square, slope, arbitrary wave
	Modulating frequency	sine, square, slope, noise arbitrary wave
	Modulating depth	2mHz-50kHz
	Carrier wave	0%-120%

FM modulation	Modulating waveform	sine, square, slope, arbitrary wave
	Modulating frequency	sine, square, slope, noise arbitrary wave
	Frequency offset	2mNz-50kHz
	10mVp-3Vpp; (50Ω)	DC-25MHz
<b>Output characteristics</b>		
Amplitude range	20mVpp-6Vpp; (high resistance)	
	±5%	
Accuracy (1kHz sine wave)	Test term: typical value (sine wave, 2.0Vpp)	
Amplitude flatness (relative to 1kHz sine wave, 1Vpp/50Ω) waveform output	±0.5dB	
	50Ω typical value	
Impedance	Channel protection	
Protection	Channel protection	

## Accessories selection

Accessory	Standard
National power cable	1
USB line	1
Passive probe	1 set (2, apply to 2 channel model) /2 set (4, apply to 2 channel model)
Logical analyzer probe UT-M15	1

## Warranty

Three-years warranty, excluding probes and accessories.

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