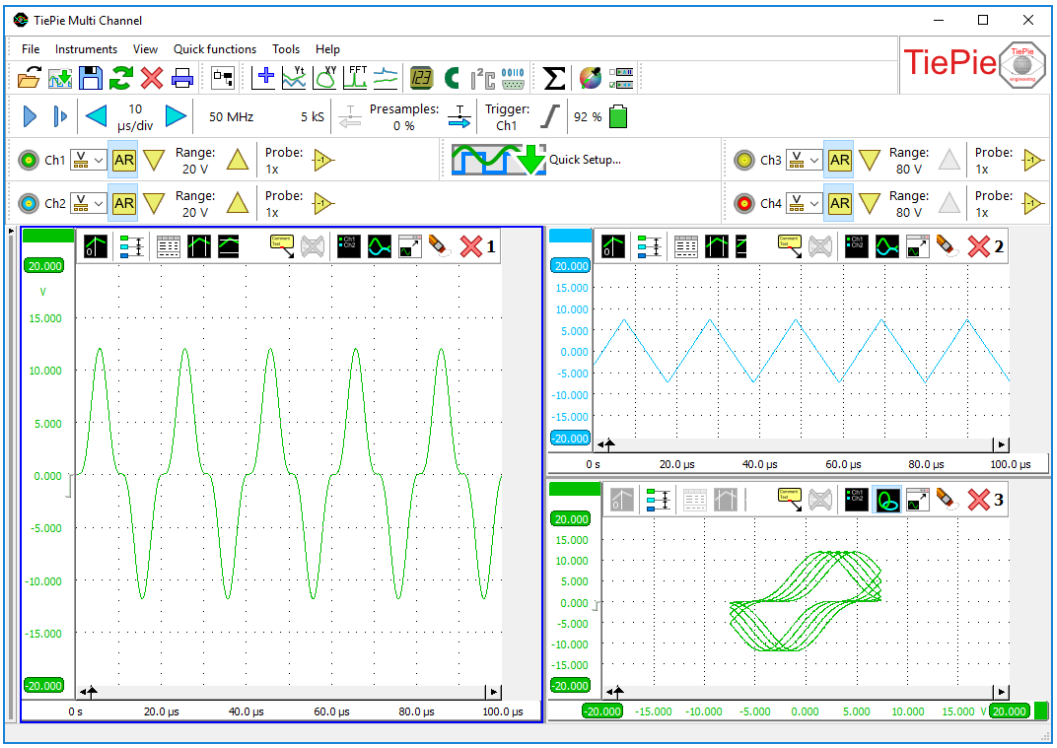
WiFiScope WS4 DIFF

50 MHz bandwidth, 50 MSa/s, 128 kpts 12 bit wireless connected differential WiFi PC oscilloscope

Data sheet

The high resolution WiFi oscilloscope with the lowest noise and high sensitivity with 4 differential input channels and 128 thousand point record length that can be filled with a sample rate of 50 MSa/s. This is the a powerful, portable, battery powered and versatile WiFi PC oscilloscope, high resolution multimeter and more..., with a universal connection through WiFi, wired LAN and SuperSpeed USB 3.0.



Step into the Next Generation of High Performance WiFi PC oscilloscopes.

The best way to experience that superiority of the WiFiScope WS4 DIFF series PC oscilloscopes is to use one.

TiePie engineering

WiFiScope WS4 DIFF, the differential WiFi oscilloscope full of technology

Key facts of this high sensitivity best in class WiFi oscilloscope:

- WiFi connection, wired LAN connection and SuperSpeed USB 3.0 connection
- Battery powered for hours of fully galvanically isolated measuring
- 50 MSamples per second sample rate WiFi oscilloscope
- 12-14-16 bit High Resolution, 256 times more amplitude resolution than an 8 bit oscilloscope
- Lowest noise WiFi oscilloscope in the market
- DC Accuracy of 0.3 %
- Differential inputs.
- 50 MHz analog bandwidth
- Low power consumption, good for many hours of battery operation
- Unlimited zoom in the full buffer memory
- High Performance Digital Multimeter (DMM)
- Fast 500 kSamples per second data acquisition via USB
- Protocol analyzer
- Quick Setup fast to work with all types of measurements
- I/O blocks to build your own measurement
- An API and SDK to build your own software
- WiFi, 1 Gbit LAN and SuperSpeed USB 3.0 connection
- Free software and firmware updates
- 2 years warranty, 5 years optional

The WiFiScope WS4 DIFF provides the best that is available in industry, for a limited budget. The flexibility and quality that the WiFiScope WS4 DIFF offers is unparalleled by any other oscilloscope in its class.

Models

The WiFiScope WS4 DIFF is available in two different models.

WiFiScope WS4 DIFF model	WS4 DIFF-50	WS4 DIFF-25
Maximum sampling rate	50 MSa/s	25 MSa/s
Maximum streaming rate	500 kSa/s	250 kSa/s

The right choice

The WiFiScope WS4 DIFF series WiFi PC oscilloscope, fully packed with technology for all your advanced measurements now and in the future.

This small, light and portable WiFi oscilloscope captures and displays significantly more signal to solve your measurement problem. Because of this, the WiFiScope WS4 DIFF series is an ideal choice for demanding measurements.

WiFi connected

Using a computer based oscilloscope was never easier than with the WiFiScope WS4 DIFF: simply switch it on and start the software on the computer:

- no power cables required as it is battery powered and can operate hours on a fully charged battery
- no interface cables required as it uses WiFi to connect to the computer

This allows you to measure fully floating, fully isolated from your computer. The WiFiScope WS4 DIFF can be placed near any test subject that may be hard to reach, or on moving objects, where wired connections are not possible.

Because the WiFiScope WS4 DIFF is not connected to the computer, there is no risk of damaging the computer.

LAN connected

When measuring in remote locations where a wired network is available, the WiFiScope WS4 DIFF can also be used through its LAN port. Measurements can then be performed from any location via the network, without having the computer to be close to the test subject.

USB 3.0 connected

When wireless measuring or LAN connected measuring is not required or not possible, the WiFiScope WS4 DIFF can also be connected via its USB3 port.

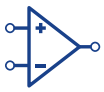
Rugged industrial design

The WiFiScope WS4 DIFF features a rugged design. Its enclosure is fitted with rubber protectors at the front and the rear. These help absorbing shocks and protect the WiFiScope WS4 DIFF against damage by mechanical shocks.

The rubber protects the connectors at the front and the rear of the WiFiScope WS4 DIFF.

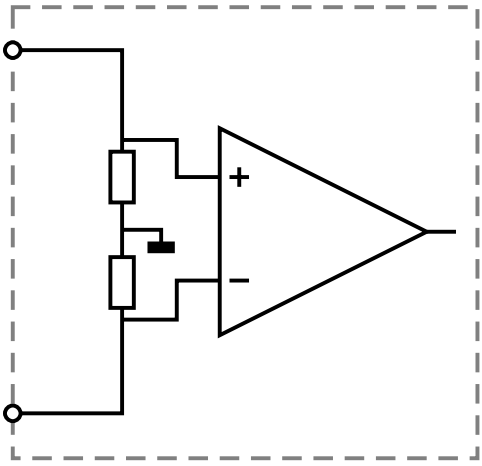
Additionally, the rubber prevents your WiFiScope WS4 DIFF from sliding. The rubber protectors have special notches that simplify stacking instruments. Holes are included that allow to connect a strap to hang the instrument near the test subject.

Safe measuring using differential inputs



Most oscilloscopes are equipped with standard, single ended inputs, which are all referenced to ground. The grounds of all inputs are connected to each other and to the ground of the scope. This means that one side of the input is always connected to ground and the other side to the point of interest in the circuit under test. Therefore the voltage that is measured with an oscilloscope with standard, single ended inputs is always measured between that specific point and ground.

The WiFiScope WS4 DIFF is a four channel oscilloscope with **differential inputs**. A differential input is not referenced to ground, but both sides of the input are "floating". The inputs do not have a common ground connection. It is therefore possible to connect one side of the input to one point in the circuit and the other side of the input to the other point in the circuit and measure the voltage difference directly.



Differential inputs: no risk of damaging the test subject, the oscilloscope or the computer.

With the differential inputs it is possible to measure four totally unrelated signals simultaneously. It is not possible to create a short circuit through the oscilloscope or through a second device connected to your computer and to the test subject, like e.g. a logic analyzer.

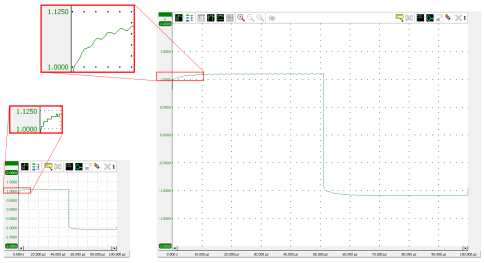
Read more at www.tiepie.com/articles/differential-measurements

High amplitude resolution, 256 times more than a standard oscilloscope

A standalone oscilloscope usually has a low resolution of 8 or 9 bit, combined with a limited display of just 5.7" or 8.5", displaying the measured signals in their actual resolution. Zooming in will then not reveal more details.

The WiFiScope WS4 DIFF has high resolutions of 14 and 16 bit, making it a truly high precision oscilloscope. With a high resolution, the original signal is sampled much more accurate, the quantization error is much lower.

To display a signal measured with the WiFiScope WS4 DIFF high resolution oscilloscope at the same level of detail as the standalone oscilloscope, the display can be 256 times larger. Viewing the signals on a 24" monitor immediately gives a very detailed impression of the signal. The smallest deviations are very well visible and because of the high resolution, it is still possible to zoom in and reveal additional details.



Shown are two displays, both showing a measurement of the same signal. The left display size corresponds to a size comparable to a standalone oscilloscope; at 8 bit resolution, zooming will not reveal more details. The right display corresponds to a maximized window on a standard PC screen; at 14 bit resolution, zooming will still reveal more details.

Low noise differential measuring lead

The Measure lead TP-C812B is the only **low noise differential measure lead** in the market. It is designed to be used with the WiFiScope WS4 DIFF. This 2 meter long measure lead splits in two individual ends of each 1.2 meter long. The BNC connector at one end plugs directly on the instrument. The two other ends each feature a single 4 mm banana plug, on which application specific test points, clamps or probes can be plugged. The Measure lead TP-C812B is very flexible, uses shrouded banana plugs and a heat and oil resistant silicone isolation.

The Measure lead TP-C812B is very insensitive to external interfering signals. The two ends can be placed up to two meters apart, while picking up very little interference. With a conventional oscilloscope with standard oscilloscope probes this is not possible. The maximum distance between the positive side and ground of a standard oscilloscope probe is usually limited to approximately 20 cm. The Measure lead TP-C812B for the WiFiScope WS4 DIFF does not have this limitation and allows you to measure between points that are more than 2 meters apart, without picking up external interferences.

The unique Measure lead TP-C812B is your first requirement to measure between two distant points.

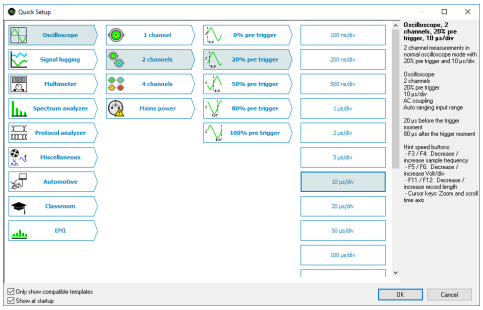
Differential attenuator

Increase the input range of your WiFiScope WS4 DIFF. The Differential attenuator TP-DA10 is a differential 1:10 attenuator, specially designed to be used with the WiFiScope WS4 DIFF. The Differential attenuator TP-DA10 is placed directly on the input of the instrument and the measuring lead on the other end of the attenuator.

The Differential attenuator TP-DA10 is required when measuring voltages higher than 80 V.

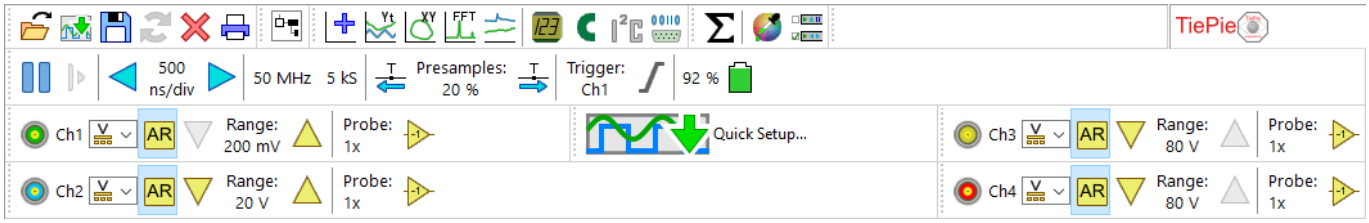
Fast to work with the WiFiScope WS4 DIFF and Quick Setups

To simplify setting up measurements, the Multi Channel software contains a large number of Quick Setups, for almost any application. A Quick Setup contains the basic settings for a specific measurement as well as additional information regarding the selected Quick Setup, like e.g. how the instrument and/or accessories need to be connected. Quick Setups can also contain reference signals. After loading the Quick Setup, that specific measurement can be performed and if needed, small adjustments to the setup can be made.



The Quick Setups are carefully organized in a tree structure, ordered by application. Just a few mouse clicks allow to perform a complex measurement.

Ease of use



The convenient toolbars offer many ways to control the WiFiScope WS4 DIFF. The toolbars are fully customizable to meet the user's demands. The size of the toolbar buttons can be changed to simplify touch screen control. There are toolbars available for common operations like saving or recalling measurements, for each opened instrument, for each channel and for the quick functions. Using quick functions, complex measurements can be performed immediately by a single click.

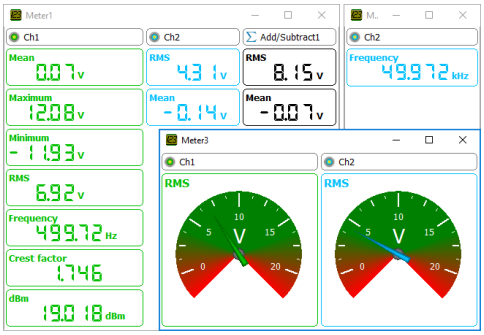
- Open the Quick Setup screen
- Create an Yt oscilloscope
- Create a data logger
- Create an I²C analyzer
- Select a color scheme
- Hide/show the Object Tree
- Create an XY oscilloscope
- Create a multi meter
- Create a serial analyzer
- Select a toolbar scheme
- Create a new graph
- Create a spectrum analyzer
- Create a CAN Bus analyzer
- Create a math channel

With the cursor measurements, individually for each graph, many signal properties can be determined.

- Sample value at the left cursor
- Sample value at the right cursor
- Value difference between right and left cursor
- Value at the top cursor
- Value at the bottom cursor
- Value difference between top and bottom cursor
- Slope between the cursors
- Maximum signal value
- Minimum signal value
- Top-bottom value
- RMS value of the signal
- Mean value of the signal
- σ^2 Variance of all signal values
- σ Standard deviation of all signal values
- Frequency of the signal
- Period time of the signal
- Duty cycle of the signal
- Crest factor of the signal
- Rise time of the signal
- Fall time of the signal
- Slew rate of the signal
- Number of periods
- Number of pulses
- Number of rising/falling edges
- dBm value of the signal
- P Power of the signal

High performance WiFi digital multimeter

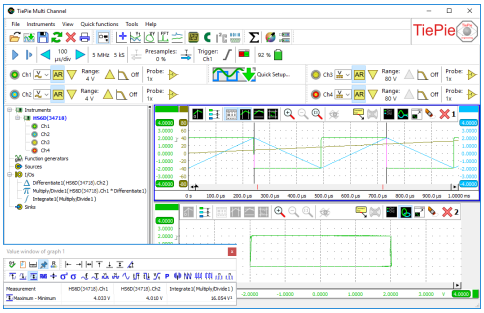
With the high resolution of 16 bits, the WiFiScope WS4 DIFF can be used as a comprehensive and accurate high performance digital multimeter with good specifications (like e.g. RMS, peak-peak, Max, Min, Mean, Variance, Standard deviation, Frequency, duty cycle, Crest factor, Rise time, Fall time, dBm, etc.). Both numerical and gauge displays are available. The stable and very accurate time base of the WiFiScope WS4 DIFF of 1 ppm make very accurate frequency and time measurements possible. These qualities make an extra multimeter or frequency counter redundant and make the WiFiScope WS4 DIFF unique in its class.



Sophisticated mathematics for in-depth signal analysis

The Multi Channel software for the WiFiScope WS4 DIFF offers a large variety of mathematical operations like e.g. adding, subtracting, multiplying, dividing, integrating, differentiating, determining the square root, determining the logarithm, etc. These mathematical operations are available in the form of processing blocks and can be used to process the measured signals and reference signals. Besides the basic mathematical operations, there are also several processing blocks to perform more complex operations on the data, like determining minimum or maximum values, limiting to specified range, averaging, filtering, applying gain and offset, resampling etc.

Combining these mathematical processing blocks gives unrivaled possibilities in constructing complex mathematical operations to analyze your measurements thoroughly and obtain all the information you need from your data. The results can be displayed in graphs, numeric displays and tables and can be written to disk in various common file formats.



This measurement determines the area of an XY graph, using multiplying, integrating and differentiating I/O's. The area is indicated in the Value window: 16 V^2.

- Σ Add or subtract signals
- π Multiply or divide signals
- $\sqrt{}$ Determine the square root of a signal
- $|x|$ Determine the absolute value of a signal
- Δ Differentiate a signal
- $\int$ Integrate a signal
- log Determine the logarithm of a signal
- Apply gain and offset to a signal
- Apply a low pass filter to a signal
- $\overline{x}$ Average a number of consecutive measurements
- Limit the signal magnitude
- Resample a signal to a different size

The mathematical processing blocks give unrivaled possibilities in constructing complex mathematical operations.

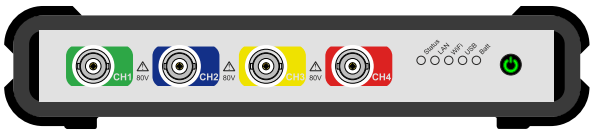
Specifications

Acquisition system		
Number of input channels	4 analog, isolated BNC	
Maximum sampling rates	On all 4 channels simultaneously	
Model	WS4 DIFF-50	WS4 DIFF-25
12 bit	50 MSa/s	25 MSa/s
14 bit	3.125 MSa/s	3.125 MSa/s
16 bit	195.3 kSa/s	195.3 kSa/s
Maximum continuous streaming rates	On all 4 channels simultaneously	
Model	WS4 DIFF-50	WS4 DIFF-25
12 bit	500 kSa/s	250 kSa/s
14 bit	480.8 kSa/s	250 kSa/s
16 bit	195.3 kSa/s	195.3 kSa/s
Sampling source		
Internal	Quartz	
Accuracy	±0.01 %	
Stability	±100 ppm over -40 °C to 85 °C	
Time base aging	±5 ppm per year	
External	LVTTL, on auxilary connectors	
Input range	100 MHz ± 2 %	
Memory	128 KiSamples per channel	

CH1, CH2, CH3, CH4	
Type	Differential inputs
Resolution	12, 14, 16 bit user selectable
DC Accuracy	0.3 % of full scale ± 1 LSB To achieve rated accuracy, allow the instrument to settle for 20 minutes. When subjected to extreme temperatures, allow additional time for internal temperatures to stabilize.
Ranges (full scale)	±200 mV ±2 V ±20 V ±400 mV ±4 V ±40 V ±800 mV ±8 V ±80 V
Coupling	AC/DC
Impedance	2 MΩ / 40 pF
Noise (at 200 mV input range)	135 μV_{rms}
Maximum voltage	200 V (DC + AC peak < 10 kHz)
Maximum common mode voltage	
200 mV to 800 mV ranges	2 V
2 V to 8 V ranges	20 V
20 V to 80 V ranges	200 V
Common Mode Rejection Ratio	-48 dB
Bandwidth (-3dB) at 75 % of full scale input	50 MHz
AC coupling cut off frequency (-3dB)	±1.5 Hz

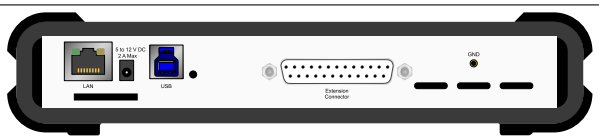
Trigger	
System	Digital, 2 levels
Source	CH1, CH2, CH3, CH4, digital external, OR
Trigger modes	Rising / falling edge, inside / outside window
Level adjustment	0 to 100 % of full scale
Hysteresis adjustment	0 to 100 % of full scale
Resolution	0.024 % (12 bits)/0.006 % (14/16 bits)
Pre trigger	0 to selected record length, 1 sample resolution
Post trigger	0 to selected record length, 1 sample resolution
Trigger hold-off	0 to 1048576 Samples, 1 sample resolution
Digital external trigger	
Input	Extension connector
Range	0 to 3.3 V (TTL)
Coupling	DC
Jitter	≤ 1 sample

I/O connectors	
Front	



CH1, CH2, CH3, CH4	Isolated male BNC

Rear



LAN	RJ45 socket
USB	USB 3.0 type B Super Speed socket
Extension connector	D-sub 25 pins female
Power	3.5 mm power socket
Extra ground	2 mm gold plated banana socket

Interface	
USB	USB 2.0 High Speed (480 Mbit/s)
LAN	1 Gbps
WiFi	802.11

Physical	
Height	44 mm (1.7 inch)
Length	187 mm (6.7 inch)
Width	215 mm (5.2 inch)
Weight	791 g (27.9 ounce)

Power	
Power	From USB, external input or built-in battery
Consumption	12 Vdc, 2 A max
External power	From power adapter
Internal battery	Li-ion
Capacity	7000 mAh, 3.7 V
Operating time	Strongly depending on instrument setup, ≥ 6 hours

Power adapter	TP-UES24LCP-120200SPA
Input	110 to 240 Vac, 50 to 60 Hz
Output	12 Vdc, 2.0 A
Dimension (height x width x length)	88 mm (h) 30 mm (w) 57 mm (l)
Replaceable mains plugs for	EU, US, AU, UK
Order number	TP-UES24LCP-120200SPA

Environmental conditions	
Operating	
Ambient temperature	20 °C to 25 °C (10 °C to 40 °C without specifications)
Relative humidity	10 to 90 % non condensing
Charging	
Ambient temperature	0 °C to 35 °C
Relative humidity	10 to 95 % non condensing
Storage	
Ambient temperature	0 °C to 35 °C
Relative humidity	5 to 95 % non condensing

System requirements	
PC I/O connection	USB 2.0 USB 3.0 or USB 3.1 | RJ45 | WiFi
Operating System	Windows 10, 32 and 64 bits Linux (via own software using the LibTiePie SDK)

Measure lead	TP-C812B
Connectors	
Instrument side	Isolated female BNC connector
Test point side	Red and black 4 mm shrouded banana plugs
Bandwidth	4 MHz
Safety	CAT III, 1000 V, double isolated
Dimensions	
Total length	2000 mm
Length to split	800 mm
Length individual ends	1200 mm
Weight	100 g
Color	Black
Certifications and compliances	
CE conformity	Yes
RoHS	Yes
Accessories	
Color coding rings	5 x 3 rings, various colors
Order number	TP-C812B

Differential attenuators	TP-DA10	
Attenuation	X10 differential	
Bandwidth	25 MHz	
Maximum input voltage	300 V (DC + peak AC)	
Input impedance	10 MΩ / 15 pF	
Connectors	Input Female BNC	Output Male BNC
Dimensions (length x diameter)	79 mm (l)	19 mm (d)
Weight	30 g	
Order number	TP-DA10-HS6-DIFF	

Certifications and Compliances	
CE mark compliance	Yes
RoHS	Yes
EN 55011:2016/A1:2017	Yes
EN 55022:2011/C1:2011	Yes
IEC 61000-6-1:2019 EN	Yes
IEC 61000-6-3:2007/A1:2011/C11:2012	Yes
ICES-001:2004	Yes
AS/NZS CISPR 11:2011	Yes
IEC 61010-1:2010/A1:2019	Yes
UL 61010-1, Edition 3	Yes

Accessories included	
Instrument	WiFiScope WS4 DIFF : WS4 DIFF-xx (see below)
Measure leads	4 x TP-C812B Isolated female BNC to banana differential measure leads, 2 m long
Differential attenuators	4 x TP-DA10 differential attenuators 1:10
Accessories	Power adapter : TP-UES24LCP-120200SPA Ground Compensation Cable : TP-GCC150 USB cable, 1.5 m long LAN cable, 3 m long
Software	For Windows 10 via website
Drivers	For Windows 10 via website
Manual	Quick Start Guid, Instrument manual and Software manual
Carry case	1 x TP-BB453 Carry case

Optional accessories	must be ordered separately	
Optional accessories	**Order code**	
Measure lead	TP-C1812B	Isolated female BNC to banana differential measure leads, 3 m long. The TP-C1812B must be ordered separately.
Back probes	TP-BP85-Set	Set of 8 back probes, green, blue, yellow, red and 4 x black. The TP-BP85-SET must be ordered separately.

Warranty	
Warranty	Two years standard, five years optional

Customer service

The WiFiScope WS4 DIFF is designed, manufactured and tested to provide high reliability.
In the unlikely event you experience difficulties, the WiFiScope WS4 DIFF is fully warranted for two years.
This warranty includes:

- All parts and labor (excluding probes and/or measure leads **and/or batteries)**
- **Warranty on batteries is 6 months.**
- No charge for return shipping
- Long-term 7-year support
- Upgrade to the latest software at no charge

Ordering information	
WiFiScope WS4 DIFF Model	**Order code**
50 MSa/s, 2 year warranty	WS4 DIFF-50
25 MSa/s, 2 year warranty	WS4 DIFF-25

Available options for the WiFiScope WS4 DIFF are:

- **W5**: With the extended warranty option, warranty is five years on parts and labor. Add **-W5** to the order code.