Scientech

Handyscope HS5

TiePie Engineering from Scientech

Speed up your innovation with a USB oscilloscope

This powerful high speed USB oscilloscope combines fast sampling up to 500 MSa/s with high resolutions of 12, 14 and 16 bit, a large memory of 64 Mpts and an extremely accurate built-in 40 MHz 14 bit Constant Data Size (CDS) arbitrary waveform generator with 24 V peak to peak output, generating true form signals. The oscilloscope supports continuous streaming measurements up to 20 MSa/s and can be synchronized with other oscilloscopes using the CMI interface to form a multi channel combined instrument with synchronized time base. The CMI interface is available by default on the Handyscope HS5. Optionally, the Handyscope HS5 can be delivered with SureConnect connection test and resistance measurement on each channel.

Do you want to use the Handyscope HS5 (remotely) via a network connection? Transform the Handyscope HS5 to a network oscilloscope using an Instrument Sharing Server with TPISS installed.

The flexibility and quality that the Handyscope HS5 offers is unparalleled by any other oscilloscope and function generator in its class.

SureConnect

The SureConnect connection test feature of the tells you immediately whether your test probe or clip actually makes electrical contact or not. No more doubt whether your probe doesn't make contact or there really is no signal.

Revolutionary real-time probe connection verification.

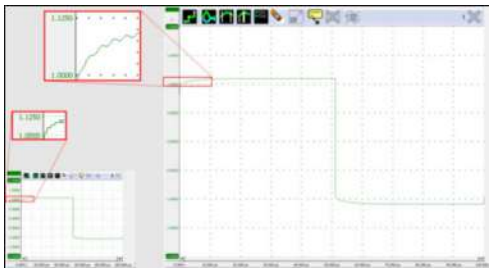
TiePie engineering is the first oscilloscope manufacturer to implement SureConnect technology. While measuring, the revolutionary SureConnect technology checks in real time whether a test probe is in physical and electrical contact with the test subject. SureConnect is the right option for every engineer for performing quick and perfect measurements. SureConnect is available as an option on the WiFiScope WS6 DIFF, WiFiScope WS6, WiFiScope WS5, Handyscope HS6 DIFF and Handyscope HS5.

Assuring a good connection of a probe with a test subject may not always be easy. The subject under measurement may be dirty, oxidized or an (invisible) protective layer may be present. Also, the test subject may be hidden, making visible contact confirmation impossible. As can be seen in the SureConnect video, capacitive coupling between test probe and test subject can result in measuring a distorted version of the actual signal, wrongly suggesting a connection. SureConnect however immediately shows you whether a good connection is present.

Multi oscilloscope synchronisation

The Handyscope HS5 is equipped with a sophisticated CMI synchronization bus, allowing to connect multiple Handyscope HS5s to each other by means of TP-C50H Coupling cable CMIs, to use them as a combined instrument. All instruments will measure at the same sample frequency (0 ppm deviation!). Apart from a synchronization bus, the CMI also contains a trigger bus and a detection bus. The maximum number of instruments is only limited by the number available USB ports.

High accuracy

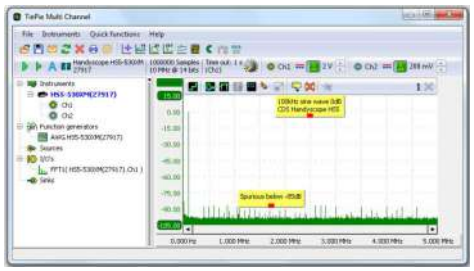


The Handyscope HS5 measures with high resolutions of 14 and 16 bit. A signal measured with the Handyscope HS5 therefore has 256 times more resolution than most standalone oscilloscopes, which usually have a low resolution of 8 or 9 bit. The high resolution of the Handyscope HS5 precision oscilloscope allows for measuring signals with more accuracy, because the quantization error is much lower.

Large memory

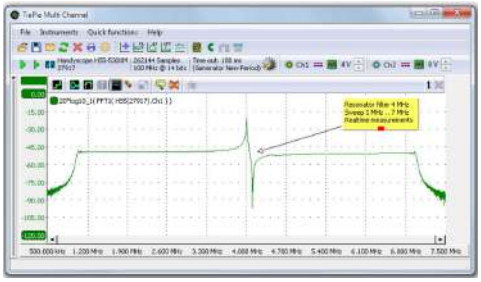
When measuring at high sample rates, a long record length/large memory is necessary to be able to record a complete signal in the acquisition buffer. Where most oscilloscopes have 2.5 kSamples or 100 kSamples memory, the Handyscope HS5 has 32 MSamples memory per channel. This gives the user 300 to 10000 times more memory. An advantage of a large memory is that once-only fast phenomena can be captured completely. For example complete serial communications, like CAN bus signals, can be measured all in one record to be reviewed and analyzed afterwards.

Low distortion Arbitrary Waveform Generator



The Handyscope HS5 is the first High Resolution USB oscilloscope with built-in 30 MHz low distortion function generator. The built-in Arbitrary Waveform Generator uses CDS signal synthesis technology, developed by TiePie engineering, resulting in the best signal fidelity in its class, generating the true form of your signals. With spurious distortion as low as -85 dB at 100 kHz signal frequency, a very flat amplitude spectrum and a rise time of 8 ns, the low distortion function generator creates signals that approach perfection.

Oscilloscope and Generator synchronization



The High Resolution USB oscilloscope and the arbitrary waveform generator in the Handyscope HS5 can be easily synchronized by setting the trigger source of the oscilloscope to one or more generator trigger events: start, stop and new period. 100 kHz signal frequency, a very flat amplitude spectrum and a rise time of 8 ns, the low distortion function generator creates signals that approach perfection.

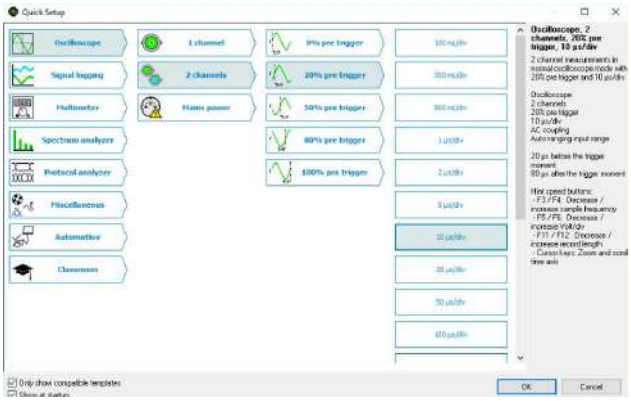
Software features

Versatile multi channel oscilloscope software

The Handyscope HS5 is delivered with the versatile multi channel oscilloscope software, which transforms the Handyscope HS5 into an oscilloscope, spectrum analyzer, data logger, multimeter and protocol analyzer.

Some of the powerful features of the multi channel oscilloscope software are indicated below, for a full description of the multi channel oscilloscope software, refer to the multi channel oscilloscope software pages.

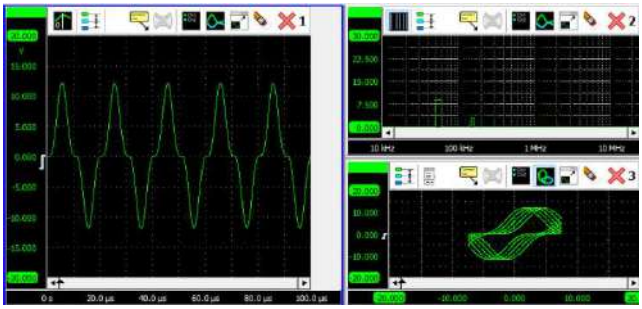
Quick Setup



To simplify setting up the measurements, the multi channel oscilloscope 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 your Handyscope 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.

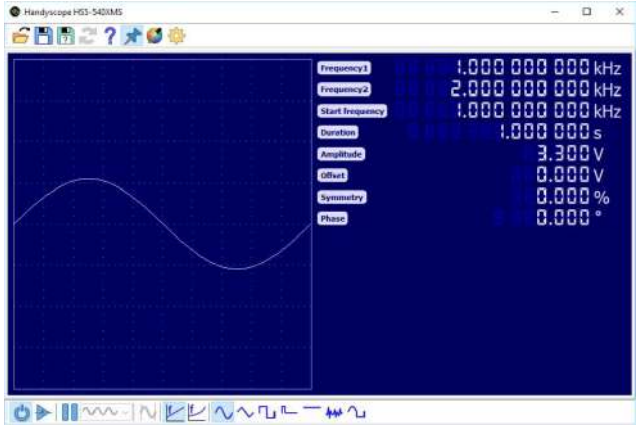
The Quick Setups are carefully organized in a tree structure, ordered by application. Just a few mouse clicks allow to perform a complex measurement.

Flexible signal displays



The multi channel oscilloscope software scope, spectrum analyzer and datalogger offer an ultimately flexible way to display all aspects of the measured signals. They can have one or more graphs, each displaying one or more signals, where each graph can display different parts of a signal. Graphs can display the signal(s) of your Handyscope in Yt mode, in XY mode or as frequency spectrum, with or without interpolation. Colors of all items in a graph can be set to any required value. Graph dimensions can be adjusted to any required size, graphs can be located in one single window or in separate windows, which can be located anywhere on the desktop.

Comprehensive Arbitrary Waveform Generator



To generate your test signals, the multi channel oscilloscope software also includes a comprehensive Arbitrary Waveform Generator.

An arbitrary waveform generator is an instrument that can generate repetitive or single shot signals. The signals can have a predefined standard shape like a sine wave or a square wave as in a conventional function generator. However, the signals can also have an arbitrary shape, defined by the user. These signals can be created using the multi channel oscilloscope software or an external program or can be signals previously measured by the Handyscope and loaded in the generator.

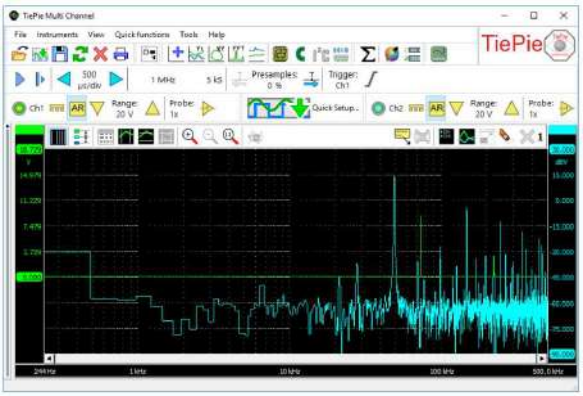
Unlimited zoom

When measuring at high sample rates, a long record length is a must, otherwise the acquisition buffer is full before the signal is measured. Therefore, our Handyscopes can have up to 256 MSamples record length per channel.

To view all that data conveniently and yet being able to see all details of the signals, the multi channel oscilloscope software scope, spectrum analyzer and data logger support sophisticated signal drawing routines with unlimited zooming capabilities. The full signal can be shown on any display size, without loss of information. Yet, you can zoom in to any required level, to see the finest details in the signals. Zooming factors of 1 million of even more are no problem, you can zoom in far beyond sample level.

The multi channel oscilloscope software generator can be fully synchronized with the multi channel oscilloscope software oscilloscope, using the dedicated generator trigger signals, allowing the scope to trigger on the start of the generated signal, on each new period or on the end of the generated signal.

High detail spectrum analyzer



The high detail multi channel oscilloscope software spectrum analyzer takes full benefit of the deep memory of the high resolution USB Handyscopes. Not only gives the deep memory an incredible low resolution bandwidth of just 7.45 Hz at a frequency span of 500 MHz, it also gives a vertical dynamic range of 140 dB. The fast and powerful FFT routines with many user selectable window functions allow you to see the smallest frequency components in your signals.

The multi display option of the multi channel oscilloscope software spectrum analyzer allows viewing multiple parts of the spectrum at the same time, giving a better understanding of the signals that are analyzed.

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Technical Specification

Acquisition system

Number of input channels	:	2 analog
CH1, CH2, Ch3, CH4	:	BNC
Type	:	Single ended
Resolution	:	8, 12, 14, 16 bit user selectable
DC Accuracy	:	0.25 % (0.1 % typical) of full scale ± 1 LSB
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	:	1 MΩ / 25 pF ± 1 %
Maximum voltage	:	200 V (DC + AC peak < 10 kHz)
Maximum voltage 1:10 probe	:	600 V (DC + AC peak < 10 kHz)
Bandwidth (-3dB)	:	at 75% of full scale input
Ch1	:	250 MHz
Ch2	:	100 MHz
AC coupling cut off frequency (-3dB)	:	±1.5 Hz
SureConnect	:	Optionally available (option S)
Maximum voltage on connection	:	200 V (DC + AC peak < 10 kHz)
Resistance measurement	:	Optionally available (option S)
Ranges (Full scale)	:	100 kΩ 1 kΩ 10 kΩ 100 kΩ 1 MΩ
		200 kΩ 2 kΩ 20 kΩ 200 kΩ 2 MΩ
		500 kΩ 5 kΩ 50 kΩ 500 kΩ
Accuracy	:	1 % of full scale
Response time (to 95%)	:	< 10 µs

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Maximum sampling rate	:	HS5-540	HSS-530	HS5-220	HS5-110	HS5-055
8/12 bit						
measuring one channel	:	500 MSa/s	500 MSa/s	200 MSa/s	100 MSa/s	50 MSa/s
8/12 bit						
measuring two channels	:	200 MSa/s	200 MSa/s	100 MSa/s	50 MSa/s	20 MSa/s
14 bit	:	100 MSa/s	100 MSa/s	50 MSa/s	20 MSa/s	10 MSa/s
16 bit	:	6.25 MSa/s	6.25 MSa/s	3.125 MSa/s	1.25 MSa/s	625 kSa/s

Maximum streaming rate 1	:	HS5-540	HSS-530	HS5-220	HS5-110	HS5-055
8 bit						
measuring one channel	:	40 MSa/s	40 MSa/s	20 MSa/s	10 MSa/s	4 MSa/s
measuring two channels	:	20 MSa/s	20 MSa/s	10 MSa/s	5 MSa/s	2 MSa/s
12/14 bit						
measuring one channel	:	20 MSa/s	20 MSa/s	10 MSa/s	5 MSa/s	2 MSa/s
measuring two channels	:	10 MSa/s	10 MSa/s	5 MSa/s	2 MSa/s	1 MSa/s
16 bit	:	6.25 MSa/s	6.25 MSa/s	3.125 MSa/s	1.25 MSa/s	625 kSa/s

Memory	Standard model	XM option
Measuring one channel	256 KSamples per channel	64 MSamples per channel
Measuring two channels	128 KSamples per channel	32 MSamples per channel
Sampling clock source		
Internal	TCXO	
Accuracy	± 0.0001 %	
Stability	± 1 ppm over 0°C to 55°C	
Time base aging	±1 ppm/year	
External	LVDS, on auxiliary connectors	
Input frequency	10 MHz ± 1 %	
16.369 MHz ± 1 %		

Trigger

System	:	Digital, 2 levels
Source	:	CH1, CH2, OR, digital external, generator start, generator new period, generator stop
Trigger modes	:	Rising edge, falling edge, any edge, inside window, outside window, enter window, exit window, pulse width
Level adjustment	:	0 to 100 % of full scale
Hysteresis adjustment	:	0 to 100 % of full scale
Resolution	:	0.006 % (14, 16 bits) / 0.025% (12 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 63 MSamples, 1 sample resolution
Trigger delay	:	0 to 16 GSamples, 1 sample resolution
Segmented trigger	:	Available on models with extended memory option XM, available via LibTiePie SDK
Maximum number of segments	:	1024
Minimum segment length	:	1 sample
Maximum segment length	:	32 M / number of segments
		64 M / number of segments measuring one channel
Trigger rearm time	:	Sample frequency dependent, < 700 ns on highest sample frequency

Digital external trigger

Input	:	Extension connector pins 1, 2 and 3
Range	:	0 to 2.5 V (TTL)
Coupling	:	DC
Jitter	:	Depending on source and sample frequency
Source ≤ channel	:	≤ 1 sample
Source ≤ external or generator		
Sample frequency ≤ 500 MSa/s	:	≤ 8 samples
Sample frequency < 500 MSa/s	:	≤ 4 samples
Sample frequency ≤ 100 MSa/s	:	≤ 1 sample

Arbitrary Waveform Generator (independent from acquisition system)

Waveforms						
Standard	:	Sine, square, triangle, pulse, noise, DC				
Signal characteristics						
Sine	:	HS5-540	HSS-530	HS5-220	HS5-110	HS5-055
Frequency range	:	1 µHz-40 MHz	1 µHz-30 MHz	1 µHz-20 MHz	1 µHz-10 MHz	1 µHz-5 MHz
Amplitude flatness	:	Relative to 1 kHz				
< 100 kHz	:	±0.1 dB				
< 5 MHz	:	±0.15 dB				
< 20 MHz	:	±0.3 dB (Amplitude ≤ 11V (22 Vpp))				
<30 MHz	:	± 0.4 dB (Amplitude ≤ 9 V (18 Vpp))				
<40 MHz	:	± 1 dB (Amplitude ≤ 7.5 V (15 Vpp))				
Spurious (non harmonic)						
< 100 kHz	:	-75 dBc				
100 kHz to 1 MHz	:	-70 dBc				
1 MHz to 10 MHz	:	-60 dBc				
10 MHz to 15 MHz	:	-55 dBc				
15 MHz to 20 MHz	:	-45 dBc				
20 MHz to 30 MHz	:	-35 dBc				
30 MHz to 40 MHz	:	-30 dBc				
Square	:	HS5-540	HS5-530	HS5-220	HS5-110	HS5-055
Frequency range	:	1 µHz-30 MHz[2]	1 µHz-30 MHz	1 µHz-20 MHz	1 µHz-10 MHz	1 µHz-5 MHz
Rise/fall time	:	< 8 ns				
Overshoot	:	< 1 %				
Variable duty cycle	:	0.01 % to 99.99 %				
Asymmetry	:	0 % of period + 5 ns (@ 50 % Duty cycle)				
Jitter (RMS)	:	< 50 ps				
Triangle	:	HS5-540	HS5-530	HS5-220	HS5-110	HS5-055
Frequency range	:	1 µHz-30 MHz[2]	1 µHz-30 MHz	1 µHz-20 MHz	1 µHz-10 MHz	1 µHz-5 MHz
Nonlinearity (of peak output): < 0.01 %						
Symmetry	:	0 % - 100 %, 0.1 % steps				
Pulse						
Period	:	100 ns to 1000 s				
Pulse width	:	15 ns to 1000 s				
Variable edge time	:	8 ns to 1 s				
Overshoot	:	< 1 %				
Jitter (rms)	:	< 50 ps				

Noise					
Bandwidth (typical)	: 30 MHz				
Arbitrary	: HS5-540	HS5-530	HS5-220	HS5-110	HS5-055
Frequency range	: 0.4 nHz-30 MHz	0.4 nHz-30 MHz	0.4 nHz-20 MHz	0.4 nHz-10 MHZ	0.4 nHz-5 MHz
Maximum sample rate:	240 MSa/s	240 MSa/s	200 MSa/s	100 MSa/s	50 MSa/s
Length					
Standard model	: 1 to 256 KiSamples				
XM option	: 1 to 64 MiSamples				
Rise/Fall time	: < 8 ns				
Nonlinearity (of peak output): < 0.01 %					
Settling time	: < 8 ns to 10 % final value				
Jitter (RMS)	: < 50 ps				
Common characteristics					
Number of output channels: 1 analog, BNC					
DAC resolution	: 14 bit				
Output range	: frequency ≤ 10 MHz	frequency ≤ 20 MHz	frequency ≤ 30 MHz	frequency ≤ 40 MHz	
At open circuit	: -12 to +12V (24 Vpp)	-11 to +11 V (22 Vpp)	-9 to +9 V (18 Vpp)	-7.5 to +7.5 V (15 Vpp)	
Amplitude					
Ranges	: 0.12 V (0.24 Vpp), 1.2 V (2.4 Vpp), 12 V (24 Vpp) at open circuit				
Resolution	: 12 bit				
Accuracy	: 0.4 % of range				
DC offset					
Range	: -12 to +12 V at open circuit				
Resolution	: 12 bit				
Accuracy	: 0.4 % of range				
Noise level					
0.12 V range	: 900 µVRMS				
1.2 V range	: 1.3 mVRMS				
12 V range	: 1.5 mVRMS				
Coupling	: DC				
Impedance	: 50Ω				
Overload protection	: Output turns off automatically when overload is applied. Instrument will tolerate a short circuit to ground indefinitely.				
System characteristics					
System	: Constant Data Size				
Memory					
Standard model	: 256 KiSamples				
Option XM	: 64 MiSamples				
Operating modes	: Continuous, triggered, gated				

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Maximum sample rate	: HS5-540	HS5-530	HS5-220	HS5-110	HS5-055
	: 240 MSa/s	240 MSa/s	200 MSa/s	100 MSa/s	50 MSa/s
Sampling source	: Internal TCXO				
Accuracy	: ±0.0001 %				
Stability	: ±1 ppm over 0°C to +55°C				
Time base aging	: ±1 ppm/year				

Multi-instrument synchronization

Maximum number of instruments	:	Limited by number of available USB ports
Synchronization accuracy	:	0 ppm
CMI interface	:	2x, AUX 1, AUX 2
Required coupling cable	:	TP-C50H Coupling cable CMI
Maximum coupling cable length	:	50 cm

Interface

Interface	:	USB 2.0 High Speed (480 Mbit/s); (USB 1.1 Full Speed (12 Mbit/s) and USB 3.0 compatible)
Network support	:	Yes, via TPISS Instrument Sharing Server

Power Requirements

Power	:	From USB port or external input
Consumption	:	5 VDC 2000 mA max
External power	:	From second USB port or power adapter

Physical

Instrument height	:	25 mm (1 inch)
Instrument length	:	170 mm (6.7 inch)
Instrument width	:	140 mm (5.2 inch)
Weight	:	430 g (15 ounce)
USB cord length	:	1.8 m (70 inch)

I/O connectors

Channel 1, 2	:	BNC
Generator	:	BNC
USB	:	Fixed cable with USB 2.0 and USB 1.1 type A connector, 1.8 m
Extension connector	:	D-sub 9 pins female
Power	:	3.5 mm power socket
Auxiliary I/O connectors	:	2 x HDMI type C socket

System requirements

PC I/O connection	:	USB 1.1, USB 2.0 or newer
Operating system	:	Windows 10, 32 and 64 bits
		Linux (via LibTiePie SDK)

Environment conditions

Operating		
Ambient temperature	:	0 to 55°C
Relative humidity	:	10 % to 90 %, non condensing
Storage		
Ambient temperature	:	-20 to 70°C
Relative humidity	:	5 % to 95 %, non condensing

Certification and Compliances

CE mark compliance	:	Yes
RoHS	:	Yes

Package contents

The Handyscope HS6 DIFF is delivered with:

Instrument	:	Handyscope HS5
Oscilloscope probes	:	2 x Oscilloscope Probe 1:1-1:10 - HP-9250
Accessories	:	Handyscope / WiFiScope power supply, external power cable for USB port
Software	:	for Windows 10, via website
Drivers	:	for Windows 10, via website
Software Development Kit	:	for Windows 10 and Linux, via website
Manuals	:	instrument manual and software user's manuals color printed and digital, via website

Subject to Change

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