



# **HANDYSCOPE instrument description**

## **HANDYSCOPE MODEL HS3 A Portable 100 MHz Instrument Connected to USB 2.0 and USB 1.1**



### **MOST PORTABLE**

TiePie engineering introduces the Handyscope model HS3, a portable and compact MOST (Multimeter, Oscilloscope, Spectrum analyser and Transient recorder). As two channel measuring device with a 100 MHz sample frequency, an 8-16 resolution and 128 Kbyte memory per channel, the Handyscope HS3 is the first MOST in the world which can be connected to a PC (USB2.0 and USB 1.1 compatible), without external power supply. The standard AWG (Arbitrary Waveform Generator) has a 14 bit resolution, 256 Kbyte memory and an output voltage of 0 to  $\pm 12$  Volt (24 Vpp). Because of the very extensive and accessible Windows based software, the user is offered many measuring possibilities

With good reason you can say the Handyscope is really:

"Plug in and Measure"

"Plug in" = connect one cable and finished

"Measure" = reading the SET file and measuring can start.

By the availability of the four different measuring instruments; oscilloscope, spectrum analyser, voltmeter and transient recorder almost every measuring problem can be solved.

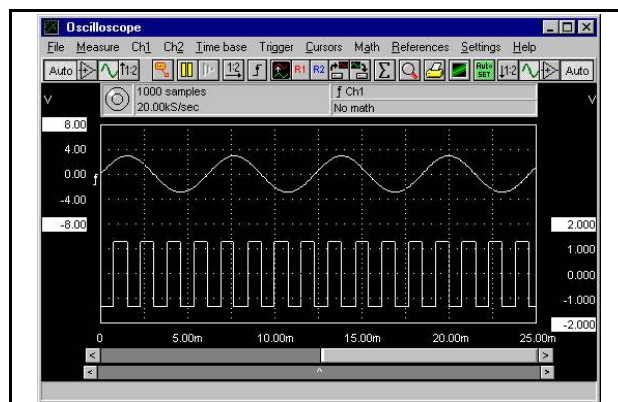
### **General**

The interesting point of the Handyscope is that once it is connected to a standard PC, there are offered a lot of measuring options which are normally only obtained by using several instruments.

The range of applications for the Handyscope are fast signals; like serial data communication, frequency regulators, TV signals as well as many low-frequency measuring applications as industrial production machines, office automation (photocopier, telephone exchange), sensor measurements, mains voltage measurements, start-up current at motors, mains pollution measurements, checking slow running processes (like temperature, pressure and moisture), sound analyses, vibration measurements (like machines, buildings), trend measurements and single failure detection measurements.

### **Software**

Besides the very good hardware qualities (100 MHz sample speed, 0.2 up to 80 Volt input range, 8-16 bit resolution, 128 Kword memory per channel and fine trigger options), the Handyscope also has a powerful software pack. Because of all these qualities, there is no better measuring instrument, in the same pricing range and with the same possibilities, for sale in the world. The software is object oriented and has a build in option that prevents "jamming". Other strong points are that most adjustments graphically can be done by the mouse. You can "grab" the tips of the x-axis and y-axis scrollbars and "live" increase and decrease them. The diagrams are directly enlarged or reduced.



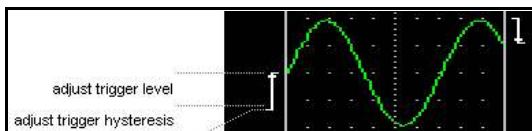
## Handyscope 3 general description

### Instrument settings

The practical side of the software is that the "software instruments", for instance the oscilloscope and spectrum analyser, are linked to each other. When in the oscilloscope the input sensitivity is changed, this is also immediately visible in the spectrum analyser (and voltmeter). Striking are the extensive possibilities of the cross wires. A remarkable point is the auto correction option of the cross wires. Through this the cross wires are put in such a way that over a complete number of periods, for example the true RMS values are determined. Besides that, many time and voltage options are available with the cross wires. Naturally there can be stored an unlimited number of instrument settings to disk. These instrument settings can easily be read which also ensures the instrument is set properly.

### Triggering

Besides the normal triggering there is also a window triggering. With this window triggering a trigger moment occur when the signal gets outside the set window. In combination with the AUTO-DISK function, it is very simple to measure the voltage dip or peak, which occasionally do occur.



A serviceman of UPS systems is continuously measuring the mains voltage (=voltage of the public electricity network) with the Handyscope. There is set up a minimum and maximum voltage the UPS has to go into service. There is triggered with the AUTO-DISK function. When the mains voltage is cut off or if the voltage becomes too high, a triggering appears (the UPS system should enter into operation and there is measured how the mains voltage behaves during switching over). The measurement (with set number of pre and post samples) is saved to disk and measuring is automatically started again. After a certain time there is checked how the UPS responded on the mains voltage peaks and dips. Through this it could easily be checked whether the UPS did its job well.

### Input range

The complete Handyscope gain and offset calibration is controlled by the software. The mechanical potentiometers are replaced by digital adjustable types. The gain and offset resolution can be adjusted better than 0.2%. Nice to know is that your own calibration files can be saved and read. For the Handyscope, calibration files are available for other input range's. (e.g. an input range of 0.2 to 1.2 Volt with steps of 0.1 Volt). The minimum input range is 200 mVolt and the maximum input range is 80 Volt.

### Resolution

The Handyscope has a resolution range of 8 up to 16 bit.

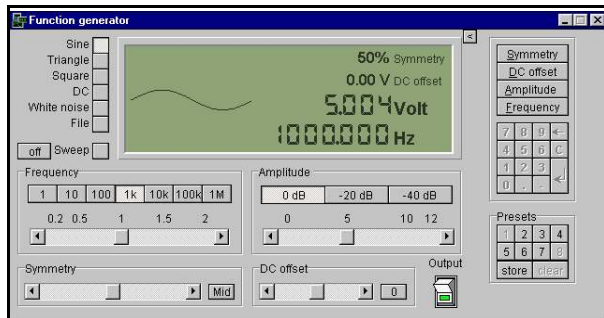
| Resolution | Signal/noise ratio | levels | Maximum sample frequency | percentage proportion |
|------------|--------------------|--------|--------------------------|-----------------------|
| 8          | 48dB               | 256    | 100MHz                   | 0,39%                 |
| 12         | 72dB               | 4096   | 50MHz                    | 0,024%                |
| 14         | 84dB               | 16384  | 2MHz                     | 0,0061%               |
| 16         | 96dB               | 65535  | 100kHz                   | 0,0015%               |

Through the high flexible resolution it is possible to perform measurements to very fast signals. Because of the high resolution there can be performed good measurements when a large dynamic range is required. If for example you want to measure an interference of 40 mVolt on a sine wave with a 10 Volt amplitude, an 8 bit measuring device is not sufficient. Though with a 16 bit resolution the interference can be measured and analysed well.

### AWG

The standard AWG (Arbitrary Waveform Generator) has a 14 bit resolution. The output voltage is adjustable from 0 up to  $\pm 12$  Volt. There can be chosen three output range's; 0-120 mVolt, 0-1.2 Volt and 0-12 Volt. The amplitude of each output range can be adjusted with a resolution of 8192 steps. In the 120 mVolt range the amplitude can be adjusted with a resolution of 15 micro Volt.

## Handyscope 3 general description



The signal shape always has a 14 bit resolution. Besides that the AWG offset is variable from 0 up to  $\pm 12$  Volt. This adjustment also has a resolution of 8192 steps. Because the 14 bit resolution of the AWG it is possible to generate distortion free signals. It is also possible to generate a previous measured signal via de AWG. The AWG runs completely independent from the two measuring inputs.

## DLL and personal software

The Handyscope DLL's are delivered with an example program (source code in Delphi), to easily write your own measuring application. The DLL's also can be used in other developing environments, like Dasy-lab and Labview. Because the software (and hardware) are completely developed and produced by TiePie engineering in the Netherlands, the TiePie engineers can simply (and fast) make adjustments. Software updates can be downloaded free of charge from internet <http://www.tiepie.nl>). The DLL's and the example measuring program can also be downloaded from our web page (<http://www.tiepie.nl>).

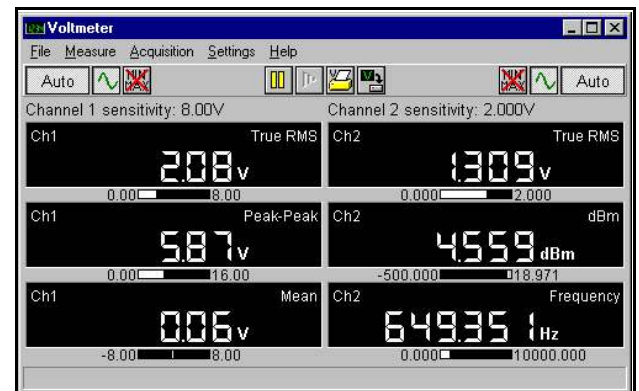
## Data export

The measured data can easily be processed in a spreadsheet. Exporting data can be done in ASCII (CSV), so it can be read in a spreadsheet program. All instrument settings can be saved in SET files according the Windows INI file structure. By reading the SET file, the instrument is completely configured so the measurement can start immediately. At each datafile the information file is stored. In the datafile are all measured samples (ASCII or binair). In the

information file are all instruments settings. The information file is always in ASCII and can easily be read by other programs.

## More than 2 channels

There can be connected maximal 8 Handyscope's to a PC. Through this, 16 channels can be measured at the same moment. One Handyscope can be set as master. Then the other Handyscope's have to be set as slave.



## Documentation

To document the measure values there are three tools available. For general documentation, there are three text lines printed at each printout. You can for example put your company name and address in these text lines. For measuring specific documentation, there are 240 characters available. There can be put "text balloons" at the measured signals. The text balloons can be configured to your own view. Both black-and-white as color printers are supported.

## General comment

The Handyscope is a compact measuring device. Many people in the service departments have a laptop and like to use a compact and complete measuring device with it (instead of a separate oscilloscope, spectrum analyser, transient recorder or voltmeter). The Handyscope meets that requirement very well. Besides that, easily (dis-)connecting of the device is important. This makes that the Handyscope can be used by several people. Because a measuring device most of the time is not used every day, and the device has many settings

## Handyscope 3 general description

---

possibilities, the SET file is a grateful tool for fast and good performance of the measurement. The SET file contains all instrument settings, so there can not be made a setting error. By making your own SET files, the inexperienced user still can directly carry out a complicated measurement without first adjusting the instrument. Furthermore, convenient copies for reportage can be made and measure values can be processed in external programs like spreadsheet programs.

## Software and hardware updates

The Handyscope uses hardware which can be configured over and over again. The hardware configuration is controlled by the USB port. In this way it is possible to carry through hardware updates besides the software updates. With this option the user always has access to the latest hardware options. The hardware and software updates can be downloaded from our web site [www.tiepie.nl](http://www.tiepie.nl) free of charge.

## Dimensions

The dimensions of the Handyscope (25x170x-140mm) are comparable to a palm of the hand. Through this small dimensions, 25mm height, the Handyscope can simply be taken, since there is only required an USB connection to make the Handyscope work everywhere together with a laptop. So, an external power supply is not needed.

## USB port

The Handyscope is connected to the USB port of a PC. The Handyscope supports both USB2.0 as USB 1.1. Through this, it should not give any problem when using the Handyscope on older PC's. Because the Handyscope is suitable for USB 2.0, a very high data transfer rate can be obtained.

## Virtual instrumentation

TiePie engineering is one of the few manufacturers who is developing and selling virtual instruments for more than 15 years, over the whole world.

## Price performance

The price performance of the Handyscope is that good that there is not a compative device and you can fairly say the Handyscope is a "Plug in an Measure" device. Our advice: Let the Handyscope "look" at your measuring problems so they become visible to you too.

## To conclude

What you just read means TiePie engineering is the only manufacturer on the world who has made a low power "high speed" and "high resolution" data acquisition device with AWG and very complete software. So, you might understand that we had to put a lot of technical knowledge together to bring the Handyscope on this level. The only thing you as user will notice is that you only have to connect one cable and can start measuring. Furthermore the data tranfer from Handyscope to PC is kept very high (50 frames/sec) to get a "live" measuring feeling. Also, the software is developed in such a way (TiePie has more than fifteen years experience in the PC controlled measuring device field), that a wide audience can work with it (we sell to more than 74 countries and to a diversity of sectors).

# Software specifications Handyscope model HS3

### Oscilloscope

|                               |  |
|-------------------------------|--|
| Display channels              | CH1, CH2, CH1 and CH2  |
| Display mode                  | Envelope   |
| Envelope                      | On/Off   |
| Averaging                     | 1.. 256 averaging  |
| Math mode                     | CH1+CH2, CH1-CH2, CH2-CH1  |
| Polarity                      | Normal, Invert   |
| Vertical position setting     | 200mVolt, 500mVolt, 1V, 2V, 5V, 10V, 20V, 40V 80 Volt full scale   |
| Vertical gain setting         | 0.25 to 8 magnifying   |
| Input coupling                | AC/DC  |
| Time base minimum             | 20 day's/div   |
| Time base maximum             | 100nsec/div (model HS3-100MHz)<br>200nsec/div (model HS3-50MHz)<br>400nsec/div (model HS3-25MHz)<br>1µsec/div (model HS3-10MHz)<br>2µsec/div (model HS3-5MHz)  |
| Time base gain                | 0.25 to 8 magnifying   |
| Record length                 | 1 to 131060 samples per channel  |
| Record view scroll bar gain   | 1 to 125   |
| Trigger mode                  | free run, delayed run, auto, single, edge triggerd, window, peak, extrenal   |
| Trigger system                | two digital trigger levels, 4096 positions   |
| Trigger source                | CH1, CH2, External, Keyboard and Master  |
| Trigger level                 | 0-100% full input range  |
| Pre trigger                   | 1 to 131060 samples per channel  |
| Post trigger                  | 1 to 131060 samples per channel  |
| Trigger delay                 | 1 to 131060 samples per channel  |
| Trigger hysteresis            | 0 to 100% full input range   |
| Trigger hysteresis resolution | 0.025 % full scale   |
| Auto disk measuring           | 1 to 1000 file's   |
| Auto setup                    | connect and show   |
| Zooming                       | mouse window control, gain vertical and gain horizontal  |
| Cursor system                 | two cursors, autotracking, auto correct points   |
| Cursor mode                   | large cursors, small cursors   |
| Cursor measurements:          | rise time left<br>rise time right<br>sample time left<br>sample time right<br>sample time difference<br>cursor frequency<br>Voltage left<br>Voltage right<br>Voltage difference<br>slew rate left<br>slew rate right<br>fase difference in Degrees, Radials or cos() |
| Color settings                | CH1, CH2, Ref CH1, Ref CH2, math, trigger, timebase, background, raster, cursors   |
| Fonts                         | user selectable  |

### Voltmeter

|                  |                       |
|------------------|-----------------------|
| Display channels | CH1, CH2, CH1 and CH2 |
|------------------|-----------------------|

## Handyscope 3 general description

---

|                        |   |
|------------------------|---|
| Display size           | user selectable   |
| Number of displays     | 1 to 6 user selectable  |
| Frequency range        | 10 Hz to 10 MHz, model HS3-50 and HS3-100   |
|                        | 10 Hz to 2 MHz, model HS3-10 and HS3-25   |
|                        | 10 Hz to 500 kHz, model HS3-5   |
| Full scale reading     | 2000 counts   |
| Accuracy DC coupled    | 0.2% $\pm$ 10 counts  |
| Accuracy AC coupled    | 0.3 % $\pm$ 10 counts(10 to 1 MHz)  |
|                        | 0.7 % $\pm$ 20 counts(1 MHz to 5 MHz)   |
|                        | 2.5 % $\pm$ 20 counts(1 MHz to 5 MHz)   |
|                        | low frequency roll of frequency is 10 Hz  |
| Measurements           | True RMS, Peak-Peak, Mean, Max, Min, dBm, Power, Crest, Frequency, Duty cycle, Moment. value                                    |
| Display mode           | CH1, CH2, CH1*CH2, CH1/CH2, CH1-CH2, CH2-CH1, CH1+CH2, >the Hi, <then Lo, ><COMP, <> HI LO,MAX, MIN, LOG(CH1/CH2), LOG CH2/CH1) |
| Measure units          | Volt, Amp, °C, °F, Watt, %, Meter, Colomd, Hertz, Bar, user defined   |
| Relative               | CH1, CH2, user defined value  |
| Sound settings         | No sound, 100Hz, 200Hz, 500Hz, 1kHz, 2kHz, and 10 kHz   |
| Data storing           | direct on paper, on disk and on network   |
| Acquisition hysteresis | used defined value  |

### Transient recorder

|                                |   |
|--------------------------------|---|
| Measuring channels             | CH1, CH2, CH1 and CH2                             |
| Measuring points               | 1 to 131060                                       |
| Measure time between to points | 0.01 sec to 500 sec                               |
| Measure time span              | 21 min to 750 days                                |
| Measure mode                   | scroll mode or scan mode                          |
| Cursor readout                 | see oscilloscope                                  |
| Time reference                 | time of start, time of measuring, time differency |

### Spectrum analyser

|                           |  |
|---------------------------|--|
| Display channels          | CH1, CH2, CH1 and CH2  |
| Display mode              | single shot, continuous  |
| Measuring mode            | max mode, standard mode  |
| Vertical position setting | 200mVolt, 500mVolt, 1V, 2V, 5V, 10V, 20V, 40V 80 Volt full scale |
| Vertical gain setting     | 0.25 to 4 magnifying   |
| Input coupling            | AC/DC  |
| Frequency axis            | Logarithmic, linear, octaves or third octave                     |
| Octave range              | 22.1Hz to 22.6 kHz   |
| Frequency range           | 0.01 Hz to 50 MHz (model HS3-100MHz)                             |
|                           | 0.01 Hz to 25 MHz (model HS3-50MHz)                              |
|                           | 0.01 Hz to 12.5 MHz (model HS3-25MHz)                            |
|                           | 0.01 Hz to 5 MHz (model HS3-10MHz)                               |
|                           | 0.01 Hz to 2 MHz (model HS3-5MHz)                                |
| Record length             | 32768 to 32 frequency components                                 |
| Windows functions         | rectangular, Hanning, Hamming, Bartlett, Blackman, Parzen        |
| Averaging                 | 1 to 256 measurements  |
| Cursor readout            | see oscilloscope   |
| Total Harmonic Distortion | 1 to 100 spectrums   |

### Arbitrary Waveform Generator

|                |   |
|----------------|---|
| Signal sources | sine, triangle, square DC white noise, user defined |
| Sweep          | locked on spectrum analyser                         |
| Frequency      | 0.01 Hz to 2 MHz                                    |
| Amplitude      | 0 $\pm$ 12 Volt, max 50 mAmp                        |
| Symmetry       | 0 to 99 %   |
| DC offset      | 0 $\pm$ 12 Volt                                     |
| Preset         | 10 storage  |
| Record length  | 256 Kwords  |



## Handyscope 3 general description

# Hardware specifications Handyscope model HS3

### Acquisition system

|                                       |   |
|---------------------------------------|---|
| Resolution                            | 8 bit @ 100 MHz<br>12 bit @ 50 MHz<br>14 bit @ 3.125 MHz<br>16 bit @ 195 kHz  |
| Bandwidth (-3dB)                      | DC to 50 MHz maximum  |
| Sample rate                           | 100 MHz, 10 nsec (model HS3-100MHz)<br>50 MHz, 20 nsec (model HS3-50MHz)<br>25 MHz, 40 nsec (model HS3-25MHz)<br>10 MHz, 100 nsec (model HS3-10MHz)<br>5 MHz, 200 nsec (model HS3-5MHz) |
| Sample source                         | internal 0,01%, external  |
| Number of input channels              | 2 analog  |
| Input sensitivity                     | 200 mVolt .. 80 Volt full scale   |
| Input protection                      | 200 Volt (DC + AC peak < 10 kHz)  |
| Input impedance                       | 1 MOhm / 30 pF  |
| Input coupling                        | AC/DC   |
| Input accuracy                        | 0.2% $\pm$ 1 LSB  |
| AC coupling cutt off frequency (-3dB) | 1 Hz with 1x probe  |
| Memory                                | 0 - 131060 samples each channel   |

### Arbitrary Waveform Generator (independant from acquisition system)

|                  |  |
|------------------|--|
| Resolution       | 14 bit @ 50 MHz  |
| Sample rate      | 50 MHz   |
| Bandwidth        | DC to 2MHz   |
| Impedance        | 50 Ohm   |
| Coupling         | DC   |
| Output amplitude | -12 Volt .. 12 Volt  |
| Amplitude step   | 0 - $\pm$ 0.1 V range, 8192 steps<br>$\pm$ 0.1 - $\pm$ 0.9 V range, 8192 steps<br>$\pm$ 0.9 - $\pm$ 12 V range, 8192 steps |
| DC level         | 0 - $\pm$ 12 V in 8192 steps   |
| Waveforms        | sine, triangle, square, DC, noise and user defined   |
| Symmetry         | 1 - 99%, 1% steps  |
| Memory           | 1 - 256 Kwords   |

### Trigger system

|                             |  |
|-----------------------------|--|
| System                      | digital, 2 levels  |
| Source                      | CH1, CH2, AND, OR, digital external                              |
| Trigger modes               | rising slope, falling slope, inside window, outside window, peak |
| Level adjustment            | 0 - 100% of full scale   |
| Hysteresis adjustment       | 0 - 100% of full scale   |
| Resolution                  | 0.025% (12 bits)   |
| Pre trigger                 | 0 - 131060 samples (0 - 100%, one sample resolution)             |
| Post trigger                | 0 - 131060 samples (0 - 100%, one sample resolution)             |
| Digital trigger input level | 0 - 3.3 volt (5 volt max)  |

### Power Requirements

|                               |                              |
|-------------------------------|------------------------------|
| Power from USB port           | 500 mAmp max (2.5 Watt max)  |
| Power via extention connector | 1500 mAmp max (7.5 Watt max) |

### Physical

|                   |                     |
|-------------------|---------------------|
| Instrument height | 25mm (1 inch)       |
| Instrument length | 170mm (6.7 inch)    |
| Instrument width  | 140mm (5,2 inch)    |
| Cord length       | 1.8 meter (70 inch) |

## Handyscope 3 general description

Instrument weight ..... 480 gram (17 ounce)

### I/O Connectors

Input Channel 1 ..... BNC  
Input Channel 2 ..... BNC  
Output AWG ..... BNC  
USB ..... USB 2.0 and USB 1.1 type A  
Extension connector ..... Sub-D 25 pins female

### System Requirements

PC I/O connection ..... USB 2.0 or USB 1.1 port type A  
Operating system ..... Windows 98/2000/ME/XP

### Operating Environment

Ambient temperature ..... 0 to 55 °C  
Relative humidity ..... 10 to 90% non condensing

### Storage Environment

Ambient temperature ..... -20 to 70 °C  
Relative humidity ..... 5 to 95% non condensing

### Certifications and Compliances

CE mark compliance ..... CE

### Package

Instrument ..... Handyscope  
Accessories ..... 2 oscilloscope probes 1:1 - 1:10 switchable  
Software ..... Windows 98/2000/ME/XP on CD  
Drivers ..... Windows 98/2000/ME/XP on CD  
Manual ..... color printed on paper and digital on CD

## Ordering Handyscope model HS3

### Order codes

Handyscope model HS3 full packaged 100 MHz ..... Handyscope HS3-100  
Handyscope model HS3 full packaged 50 MHz ..... Handyscope HS3-50  
Handyscope model HS3 full packaged 25 MHz ..... Handyscope HS3-25  
Handyscope model HS3 full packaged 10 MHz ..... Handyscope HS3-10  
Handyscope model HS3 full packaged 5 MHz ..... Handyscope HS3-5

### Warranty

Handyscope all models ..... 12 months starting from the date of shipment