

## USB250: 3 Channel Portable Instrument connected to USB 2.0 or USB 1.1



### MOST PORTABLE

Acquitek introduces the USB250 model, 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 USB250 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. Because of the very extensive and accessible Windows based software, the user is offered many measuring possibilities. With good reason you can say the USB250 is really: "Plug in and Measure".

"Plug in" = connect one cable and finished  
"Measure" = reading the SET file and measuring can start.

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

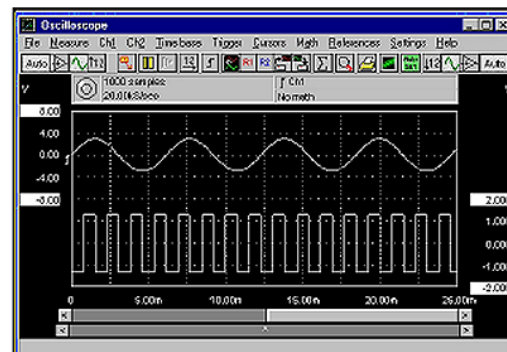
### General

The interesting point of the USB250 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 USB250 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,

### 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 USB250 also has a powerful software pack. Because of all these qualities, here 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 built 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.

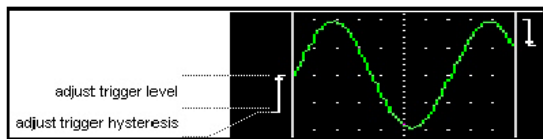


## Instrument settings

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 USB250. 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 USB250 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 USB250, calibration files are available for other input range's. The minimum input range is 200 mVolt and the maximum input range is 80 Volt.

## Resolution

The USB250 has a resolution range of 12 up to 16 bit.

Through the high flexible resolution it is possible to perform measurements to very fast signals. Because of the high resolution there can performed good measurements when a large dynamic range is required. If, for example, you want to measure an interference of 2 mVolt on sine wave with a 10 Volt amplitude, a 12 bit measuring device is not sufficient. Though with a 16 bit resolution the interference can be measured and analysed well.

## DLL and personal software

The USB250 DLL's are delivered with an example program (source code in Delphi, C++, CVI, Mathlab), to easily write your own measuring application. The DLL's also can be

Resolution	SNR	levels	Max S/R	% proportion
8	48db	256	100MHz	0,39%
12	72dB	4096	50MHz	0,024%
14	84dB	16384	3.125MHz	0,0061%
16	96dB	65535	195.3125kHz	0,0015%

used in other developing environments, like Dasy-lab and Labview.

Software updates can be downloaded free of charge from internet ([www.acquitek.com](http://www.acquitek.com)).

The DLL's and the example measuring program can also be downloaded from our web page (<http://www.acquitek.com>).

## Data export

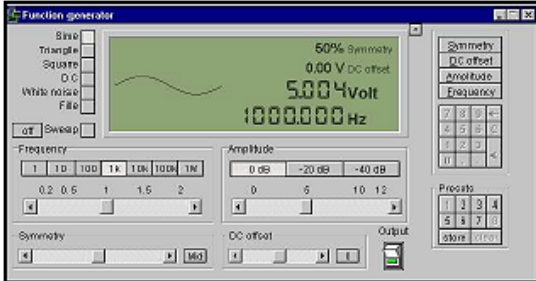
The measured data can easily be processed in a spreadsheet. Exporting data can be done in ASCII (CSV), so it can be read in a spreadsheet program. All instrument settings can be saved in SET files according the Windows INI file structure. By reading the SET file, the instrument is completely configured 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 127 USB250 to a PC. Through this, 254 channels can be measured at the same moment. One USB250 can be set as master. Then the other USB250's have to be set as slave.

## 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 ranges; 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.



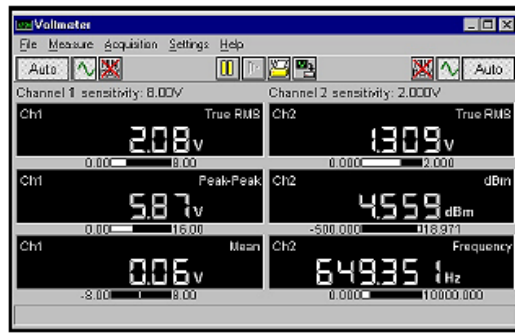
The signal shape always has a 14 bit resolution. Besides that the AWG offset is variable from 0 up to  $\pm 12$  Volt. This adjustment also has a resolution of 8192 steps. Because the 14 bit resolution of the AWG it is possible to generate distortion free signals. It is also possible to generate a previous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

## 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 USB250 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 USB250 meets that requirement very well. Besides that, easily (dis-)connecting of the device is important. This makes that the USB250 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 possibilities, the SET file is a grateful tool for fast and good performance of the measurement. The SET file contains all instrument settings, so cannot 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 USB250 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 free of charge.

## Dimensions

The dimensions of the USB250 (25x170x140mm) are comparable to a palm of the hand. Through this small dimensions, 25mm height, the USB250 can simply be taken, since there is only required an USB connection to make the USB250 work everywhere together with a laptop. So, an external power supply is not needed.

## USB port

The USB250 is connected to the USB port of a PC. The USB250 supports both USB2.0 as USB 1.1. Through this, it should not give any problem when using the USB250 on older PC's. Because the USB250 is suitable for USB 2.0, a very high data transfer rate can be obtained.

## Price performance

The price performance of the USB250 is that good that there is not a competitive device and you can fairly say the USB250 is a "Plug in an Measure" device. Our advice: Let the USB250 "look" at your measuring problems so they become visible to you too.

## To conclude

What you just read means Acquittek is the only manufacturer on the world who has made a low power "high speed" and "high resolution" four channel data acquisition device and very complete software. So, you might understand that we had to put a lot of technical knowledge together to bring the USB250 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 transfer from USB250 to PC is kept very high (50 frames/sec) to get a "live" measuring feeling. Also, the software is developed in such a way, that a wide audience can work with it (we sell to more than 74 countries and to a diversity of sectors).

## SOFTWARE SPECIFICATION

### Oscilloscope

Display channels	CH1, CH2, CH1 and CH2
Display mode	
Envelope	On/Off
Averaging	1.. 256 averaging
Math mode	CH1+ CH2, CH1- CH2, CH2-CH1
Polarity	Normal, Invert
Vertical position setting	$\pm 200\text{mV}$ , $\pm 400\text{mV}$ , $\pm 1\text{V}$ , $\pm 2\text{V}$ , $\pm 4\text{V}$ , $\pm 10\text{V}$ , $\pm 20\text{V}$ , $\pm 40\text{V}$ and $\pm 80\text{V}$ 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 USB250 -100MHz) 200nsec/div (model USB250 -50MHz) 400nsec/div (model USB250 -25MHz) 1:sec/div (model USB250 -10MHz) 2:sec/div (model USB250 -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 triggered, window, peak, external
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 rise time right sample time left sample time right sample time difference cursor frequency Voltage left Voltage right Voltage difference slew rate left slew rate right Phase difference in Degrees, Radials or cos()
Color settings	CH1...4 Ref CH1...4, math, trigger, timebase, background, raster, cursors
Fonts	user selectable

## Voltmeter

Display channels	CH1, CH2
Display size	user selectable
Number of displays	1 to 12 user selectable
Frequency range	10 Hz to 10 MHz, model USB250 -50 and USB250-100
	10 Hz to 2MHz, model USB250 -10 and USB250 -25
	10 Hz to 500 kHz, model USB250 -5
Full scale reading	2000 counts
Accuracy DC coupled	0.2% ±10 counts
Accuracy AC coupled	0.3 % ±10 counts(10 to 1 MHz)
	0.7 % ±20 counts(1 MHz to 5 MHz)
	2.5 % ±20 counts(1 MHz to 5 MHz)
	low frequency roll of frequency is 10 Hz
Measurements	True RMS, Peak-Peak, Mean, Max, Min, Bm, 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
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
Display mode	single shot, continuous
Measuring mode	max mode, standard mode
Vertical position setting	±200mV, ±400mV, ±800mV, ±2V, ±4V, ±8V, ±20V, ±40V and ±80V 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 USB250 -100MHz)
	0.01 Hz to 25 MHz (model USB250 -50MHz)
	0.01 Hz to 12.5 MHz (model USB250 -25MHz)
	0.01 Hz to 5 MHz (model USB250 -10MHz)
	0.01 Hz to 2 MHz (model USB250 -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

Singal sources	sine, triangle, square DC white noise, user defined
Sweep	locked on spectrum analyser
Frequency	0.01 Hz to 2 MHz
Amplitude	0 ± 12 Volt, max 50 mAmp
Symmetry	0 to 99 %
DC offset	0 ± 12 Volt
Presets	10 storage
Record length	256 Kwords



## HARDWARE SPECIFICATION

### Acquisition system

Resolution	8 bit @ 100 MS/s 12 bit @ 50 MS/s 14 bit @ 3.125 MS/s 16 bit @ 195.3125 kS/s
Bandwidth (-3dB)	DC to 50 MHz maximum
Sample rate	100 MS/s, 10 nsec (model USB250 -100MHz) 50 MS/s, 20 nsec (model USB250 -50MHz) 25 MS/s, 40 nsec (model USB250 -25MHz) 10 MS/s, 100 nsec (model USB250 -10MHz) 5 MS/s, 200 nsec (model USB250 -5MHz)
Sample source	internal 0,01%, external
Number of input channels	2 analog
Input sensitivity	$\pm 200$ mV, $\pm 400$ mV, $\pm 800$ mV, $\pm 2$ V, $\pm 4$ V, $\pm 8$ V, $\pm 20$ V, $\pm 40$ V and $\pm 80$ V full scale
Input protection	$\pm 200$ 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

### 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)

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

Resolution	14 bit @ 50 MS/s
Sample rate	50 MS/s
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 $\pm 0.1$ - $\pm 0.9$ V range, 8192 steps $\pm 0.9$ - $\pm 12$ 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

### Power Requirements

Power from USB port	500 mAmp max (2.5 Watt max)
Power via extention connector	500 mAmp max (2.5 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)
Instrument weight	480 gram (17 ounce)

### I/O Connectors

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

## ORDERING INFORMATION

### 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 . . . . . USB250

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

### Order codes

USB250 full packaged model 100 MS/s . . . . . USB250 -100

USB250 full packaged model 50 MS/s . . . . . USB250 -50

USB250 full packaged model 25 MS/s . . . . . USB250 -25

USB250 full packaged model 10 MS/s . . . . . USB250 -10

USB250 full packaged model 5 MS/s . . . . . USB250 -5

### Warranty

USB250 all models . . . . . 12 months starting from the date of shipment