CVK
Vibration & Noise

Whole-body vibration measurement

Manual

HealthVib® WBV500 Measurement System

a CVK product

Table of Content

Manual – HealthVib® WBV500 measurement system

Version: 15.04

Revised: April 23th, 2015

Aurorum Science Park 1C
SE- 977 75 Luleå
Phone: +46 (0) 920 560 000
E-mail: info@cvk.se
www.cvk.se

Short notice to the user

This manual describes how to use the HealthVib® WBV 500 vibration measurement system.

All products are patented and product names are registered trademarks.

Limited Warranty

CV- Vibration & Noise AB guarantee their products free from material and function defects 2 years from date of purchase, if the product is used under normal circumstances. This warranty includes products bought within EU as well outside EU. The warranty is limited to repair or exchange of the product to what CVK finds necessary. To claim warranty CVK needs to be contacted and written report about problems that occurred and receipt where date and location report for purchase can be cleared from.

CVK supply free repair or exchange of product if the product has not been exposed to violence due to incorrect management or been taken apart by unauthorized personnel. CVK does not take responsibility to damage or misplacement that occurred during delivery, if the delivery is taken care of others than CVK. CVK do not take responsibility for any shipment costs regarding warranty matters.

Terms and Conditions

HealthVib®WBV measurement system is designed for measurement of whole body vibrations (WBV) in three directions according to ISO2631, ISO 8041:2005 and requirements in 2002/44/EG.

Before start of measurement, please make sure that the units are unharmed, fully functional, are not used in unsuitable environment, are properly placed and battery level is sufficient.

Recommendations

- The recommended mode of use of the equipment is the HealthVib WBV and analyse results with CVK VibNoiseView 3.0.
- Optional mode of use is the HealthVib WBV with WBV shock indicator.
- HealthVib WBV is IP-classed to IP40.
- Shock indicator WBV is IP-classed to IP40.
- Do not expose the product for harmful damage.
- In case of using Shock indicator:
  Do not exceed recommended 2 meter transmission range between HealthVib WBV and Shock indicator WBV.

Available systems

Equipment list

HealthVib WBV measurement system is developed to meet the requirement of 2002/44/EG in order to measure whole body vibrations.

Table1: The two available packages with corresponding equipment

Available systems	HealthVib WBV	Shock indicator WBV	Seat plate	VibNoiseView 3.0	USB-cable and chargers	Manual and certificates
HealthVib WBV500 system	●		●		1	●
HealthVib WBV500 driver system	●	●	●	●	2	●

.

HealthVib WBV500 measurement systems contains:

HealthVib® WBV500 with seat plate

Measures and calculates whole body vibrations according to ISO 2631.Mounted on the seat of a machine or directly on floor.Data can be read out on display.

Shock indicator ™ WBV

The results are displayed simultaneously on an intuitive scale of LED's.

USB-cable

The USB- cable is used for recharging and exportation of data to a PC.

Battery charger

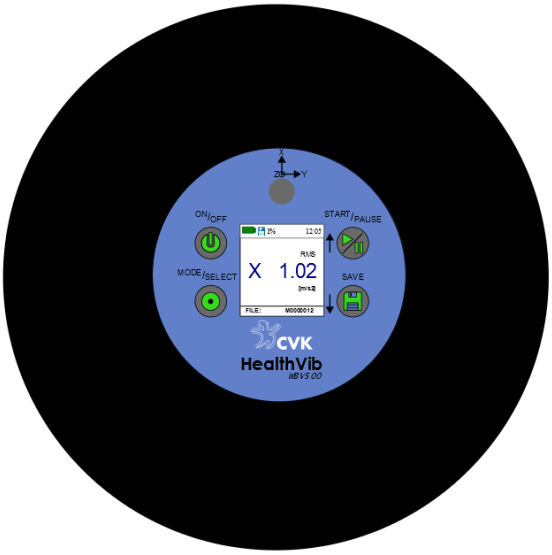
100-240V to 5 Volt

-Compact disc containing computer software and manuals
-CE-declaration and calibration certificate for HealthVib® WBV
-CE- declaration for Shock indicator™ WBV

Specifications

The HealthVib WBV measurement system is designed to measure whole body vibrations. The quantities measured are the frequency weighted 1 second root mean square (RMS), vibration dose value (VDV) and values of three axis. Filter used are band pass filter 0-160 Hz with weightings described in ISO 2631 (Wk, Wd). Value according to the daily dose value (A (8)) described by ISO 2631 and 2002/44/EC is calculated on the direction with highest vibration dose. On the Shock indicator WBV a ten second moving window is used to display the real time indication of the weighted RMS vibration levels.

CVK HealthVib® WBV 500



- Measures vibrations in three directions for sitting or standing posture.
- Measures and analysis vibrations according to approved regulations and ISO-standardizations.
- Displays instantaneous vibrations 1 second RMS, VDV, Peak, A (8) and VDV - value for different measurement files.

Functions – HealthVib ® WBV500

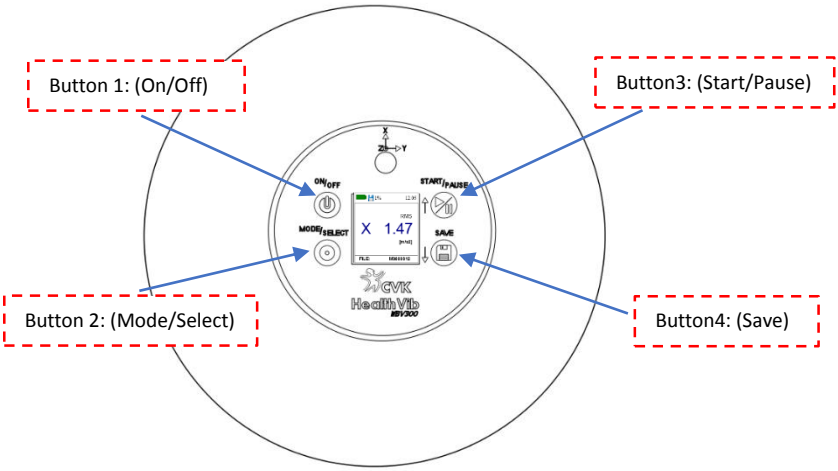


Figure 1-a: HealthVib WBV 500 overview

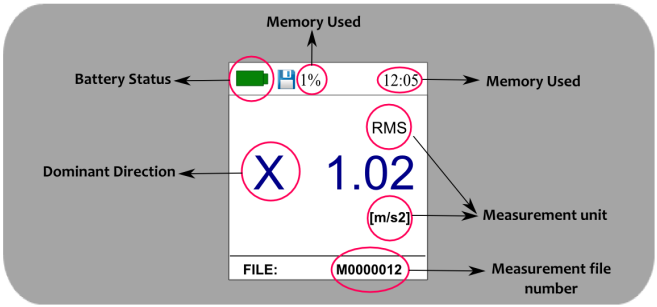


Figure 1-b: HealthVib WBV 500 display

1. Activate by pressing button 1.
2. Press “mode” button to choose new measurement, saved measurement files or calibration or going back to previous stage.
   If you chose ‘new measurement’; *go to step 3*, if you chose ‘saved measurement’; go to step 7.

3. Activate body sensor or not by clicking “Yes” or “No”. The presentation of measured data starts.
4. If activate body sensor, the measurement will be saved when body is in contact with seat plate. If not activated; the measurement is saved without body contact.
5. The measurement can be paused by pressing button 3 or saved by pressing button 4. If paused mode, you need to resume the mode to be able to save. (Press ‘Start/Pause’ again.)
6. After saving, you are automatically back to main page.

If you chose saved measurements

7. Select the file of interest by scrolling with button 3 and 4. Press button 2 to select measurement file.
8. Data for selected measurement file; measurement time with A (8) value, RMS, VDV and Peak data for the three directions are shown.
9. To delete the file; once the file is selected; Press “mode/Select” button to delete the file or all files.

**body sensor- recognize when body is in contact with seat plate.*

Step-by-step operations guide

Step 1: Check the equipment

Make sure that the HealthVib is unharmed, is used in correct environment and handled according to this instruction.

Step 2: Check battery status

Once you turn the unit on, the battery status is shown on display, see figure 2. The battery symbol shows the status. Maximum voltage is 4.2 V. The lowest limit is 3.5 V.

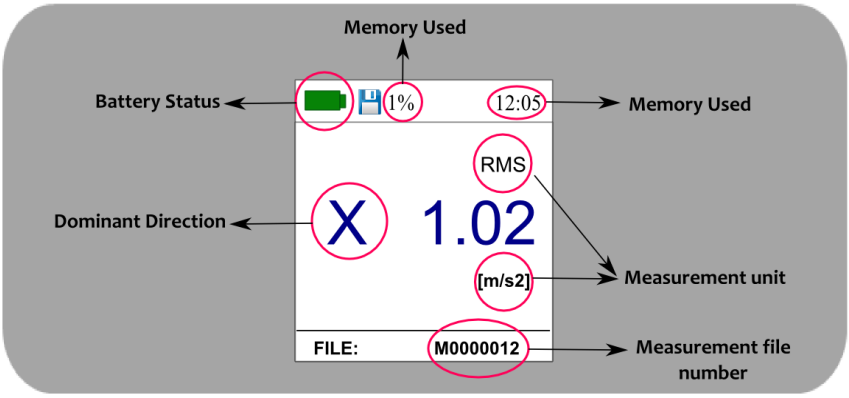


Figure 2: HealthVib WBV500 Display

Recharge HealthVib

1. Make sure the HealthVib is turned off by checking the display is empty. If not, press On/Off (Button 1) once to turn it off.
   OBS! *It should remain turned off during the complete charging cycle.*
2. Connect the charger to wall socket and the USB-cable.
3. Connect USB-cable to HealthVib.
4. Recharge time: about 6 hours.

Step3: Place the HealthVib

Place the HealthVib and seat plate on driver seat to measure on sitting operator or on floor beneath the feet on standing operator. The *X-mark* and arrow on the seat plate should be pointing the operator forward direction, see figure 3.

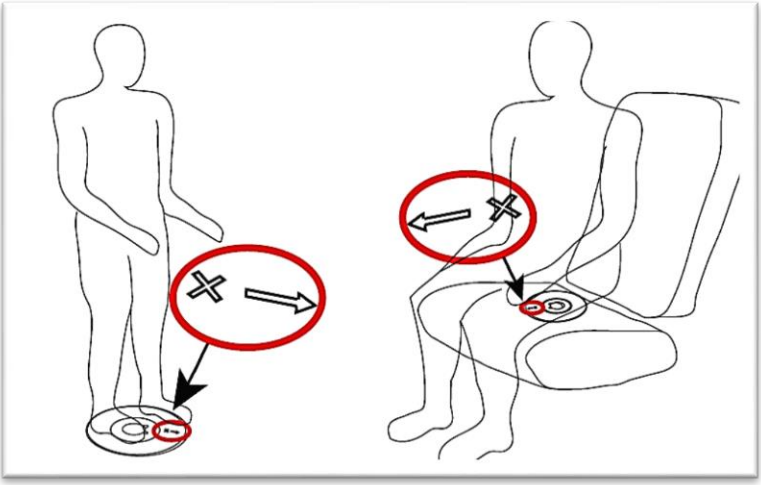


Figure 3: HealthVib WBV500 position

Step 4: Turn on the HealthVib

Press On/Off button (Button1) once to turn the instrument on. The starting page appears. See figure 4.

Figure 4: HealthVib WBV 500 start-up page

Step 5: New Meas/manage saved files

Press ''MODE'' button (Button 2) to choose either starting a new ''measurement'' or managing the ''saved files'' from previous measurements. See figure 5.

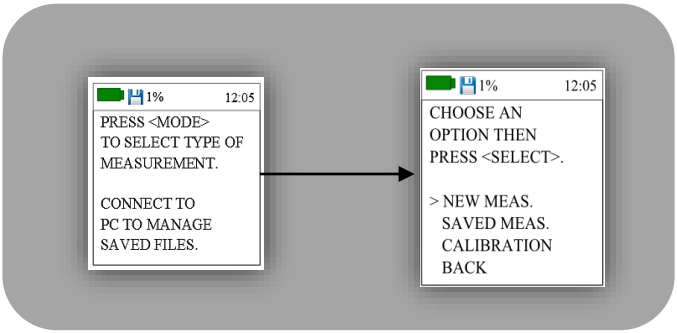


Figure 5: Choose New Measurement or manage saved files.

If you chose ''NEW MEAS.'' Go to step 6, if you chose '' SAVED MEAS.''; go to step 9.

Step 6: Body sensor activation

If you want to activate body sensor; Choose ''Yes'' and if not choose ''No''. See figure 6.

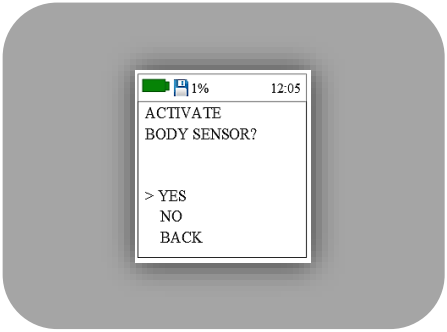


Figure 6: Body sensor Activation

It is recommended that you activate the body sensor when the operator will use the instrument in sitting position. The battery operation time is also extensively extended.

Step 7: Start measurement

If the body sensor is activated; measurement is saved when body is in contact with seat plate. If the body sensor is not activated; measurement is directly performed and saved.

During measurement HealthVib WBV displays RMS once a second. The vibrations are based on acceleration (m/s^2) and direction with the highest level is momentary presented.

The x, y and z indicates the direction that dominates the last second of measure. X means forward, Y sideways and Z vertical direction.

Step 8: Pause/Save measurement

To pause measurement, press Start/Pause button (button 3). The display indicate measurement is paused. To continue measurement again, press Start/pause button (button 1) again. See figure 7.

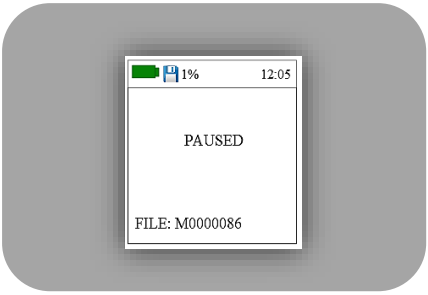


Figure 7: Pause Mode

***Note**! If paused mode, you need to resume the mode to be able to save the measurement.*

To stop and save measurement, press button 4. The display show that measurement is saved, see figure 8. Saved measurement can be analysed from the mode options. After saving, the main page is automatically shown.

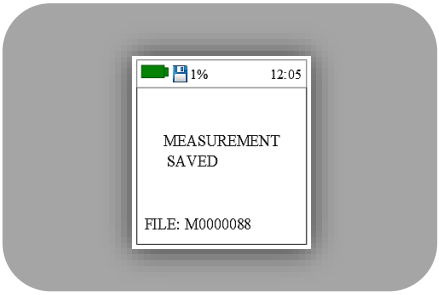


Figure 8: Saving measurement

If you choose 'Saved measurement:

Step 9: Measurement results

Select file of interest by scrolling with Button 3 (Up) & 4 (Down). Then press ‘’select’’ (button 2) to choose file.

Data from selected measurement file; measurement time; A(8) value, Sed, RMS, VDV and Peak values for three directions are shown, see figure 9.

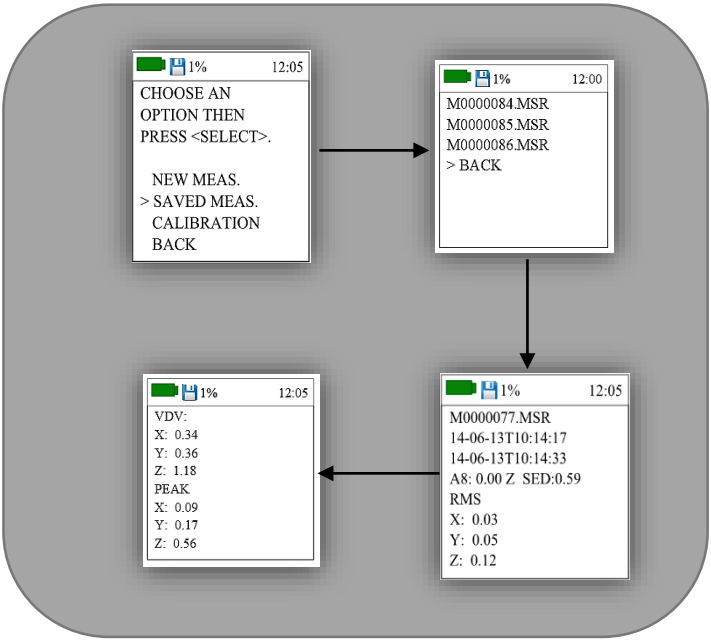


Figure 9: Measurement results

Step 10: Erase Data

To delete a file or all files; once the file is selected;
Press ‘’mode/select’’ button to delete the file(s).

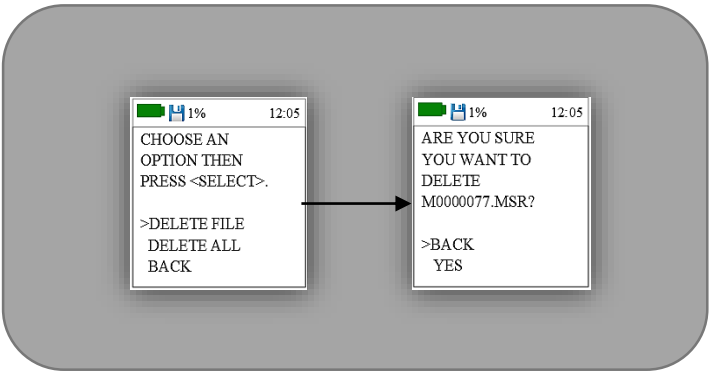


Figure 10: Erase data

Step 11: Turn off Unit

Press On/Off (button 1) once to turn off HealthVib500, see figure 11.

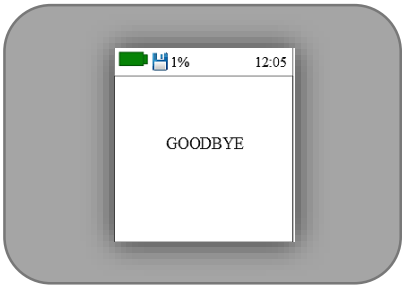
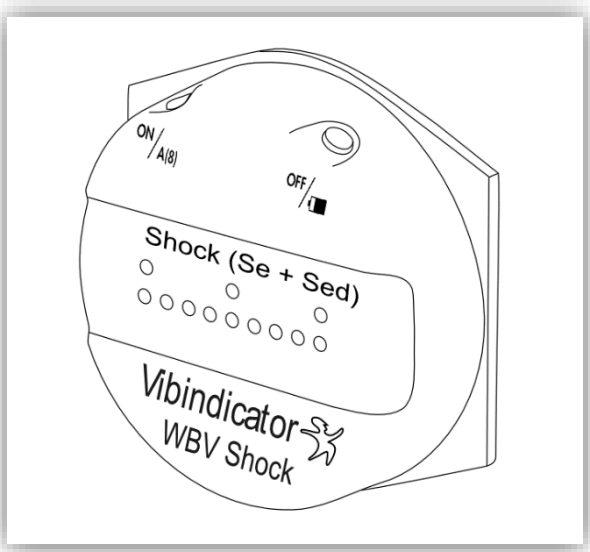


Figure 11: Turn off HealthVib

Shock indicator ™ WBV



- Display current vibration shock level *Se* from HealthVib WBV500 and accumulated dose *Se*.
- Wireless transmission from HealthVib WBV500.

Functions – Shock indicator™ WBV Shock

The Shock indicator WBV shock operates only with a HealthVib WBV500.

- Place the Shock indicator shock in front of the operator where it is easy to perceive. Velcro patches can be used for mounting.
- Transmission of signals is done over 869, 8 MHz. Clear the path between the units to establish reliable transmission.
  Shock indicator WBV Shock and HealthVib WBV500 are assured to work up to 2 meters with free path between them.
- Turn on Shock indicator WBV shocks by pressing left button once. All LEDs (light emitting diode) will be lit and wait for the user to verify by pressing one of the buttons. The three upper LEDs will flash when connected to a HealthVib WBV500.
- Current vibration shock level, based on 1 second, will be displayed by the number of LEDs on the lower row of LEDs. This is updated once every second.
- Press left button to view the accumulated vibration shock dose. This is based on the *Sed* value and can be directly compared with the directives.
- Press or hold right button to view battery status. The number of LEDs that lits indicates the

current status. If all LEDs are lit the Shock indicator is fully charged (Note! After 5 seconds the unit turns off)

- The data is erased when turning off the unit.
- Turn off the Shock indicator by pressing and holding the right button for 5 seconds.

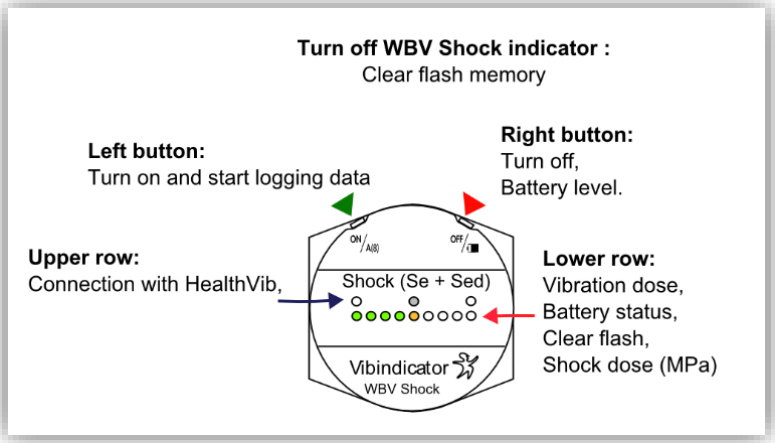


Figure 12: Shock indicator function overview

The three LEDs on the upper row flash indicating connection with the HealthVib WBV500.

The nine lower LEDs consists of four green, three yellow and two red LEDs. See table 2 for LEDs versus vibration shock levels. Current vibration shock level *Se* calculated from *last 1 seconds* is updated every second.

Press and hold left button to see the shock dose (*Sed-Value*). This dose can be directly compared with the health risk limits defined in ISO 2631-5.

Table 2: Respective LEDs Vibration dose

Shock dose when LEDs are lit		
	LEDs	Sed (MPa)
1	green	≥ 0.2
2	green	≥ 0.4
3	green	≥ 0.5
4	green	≥ 0.62
5	yellow	≥ 0.7
6	yellow	≥ 0.8
7	yellow	≥ 0.9
8	red	≥ 1.0
9	red	≥ 1.1

Table2: shows respective LEDs vibration shock dose. Green indicate the shock dose means low probability for

health risk. Yellow means moderate health risks. Red means that there is a high probability for health risk.

Step-by-step operation guide

Step1: Check the equipment

Make sure that the Shock indicator is unharmed, is used in correct environment and handled according to instruction.

Step2: Check battery status

To check battery status the Shock indicator needs to be turned on (press left button once to turn it on). Press once or hold down right button to check battery status. Battery status is indicated by the number of LEDs that are lit, see figure 13.

Maximum battery voltage is 4.2 V. (all LEDs are lit)

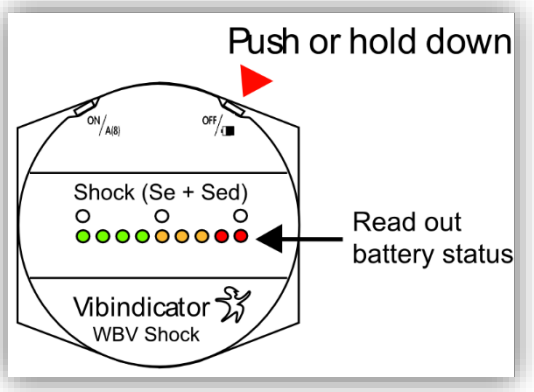


Figure 13: Check WBV Shock indicator battery status

Figure 13: Check battery status by pressing right button

Recharge Shock indicator

1. Make sure that Shock indicator is turned off. If not, press and hold the right button for approx. 5 seconds.
   Note! *It should remain turned off during the computer charging cycle.*
2. Connect the charger to wall socket and the USB-cable.
3. Connect USB- cable to Shock indicator
4. Recharge time: about 6 hours.

Step3: Place the Shock indicator

Place the Shock indicator visible, for example in center of the steering wheel. Attach it with provided Velcro patches.

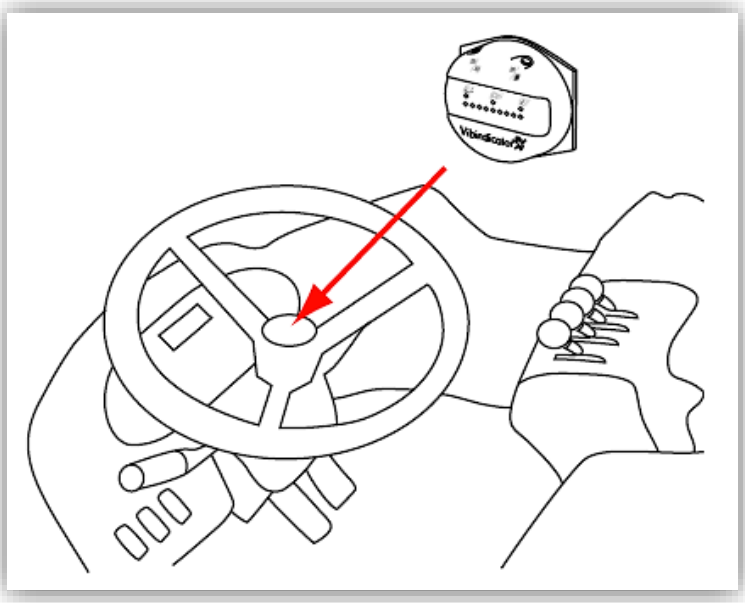


Figure 14: Place Shock indicator visible

Step4: Turn on Shock indicator

Press left button once to turn on Shock indicator, see figure 15. Transmission of data is possible when transmitter (HealthVib) and receiver (Shock indicator) are turned on and within the range for transmission (Shock indicator has to be turned on before the healthVib). When HealthVib and Shock indicator is connected the upper row of LEDs flash.

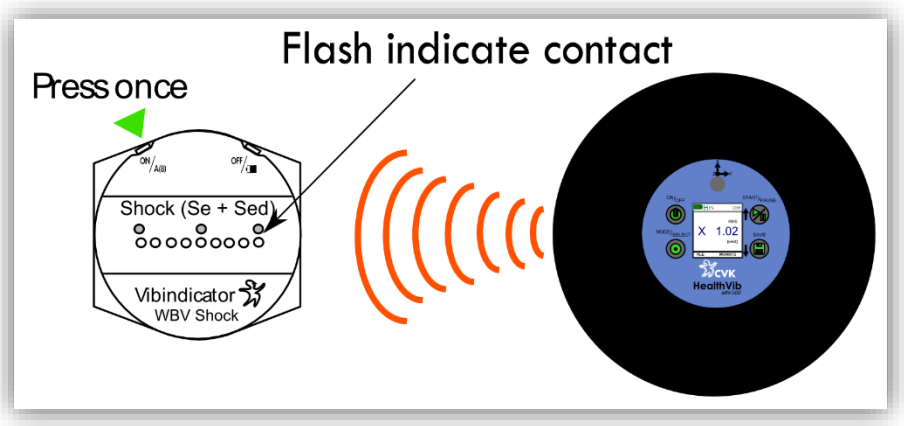


Figure 15: Turn on Vibindicator and check transmission

Step5: Analyse with Shock indicator

Current shock dose

The upper LED indicates transmission by blinking once every second. The nine LEDs (four green, three yellow and two red) indicates the vibration shock dose Se which are updated every second. Green light indicates low probability for health risk, yellow indicates moderate health risks and red indicates that there is a high probability for health risk. See figure 16

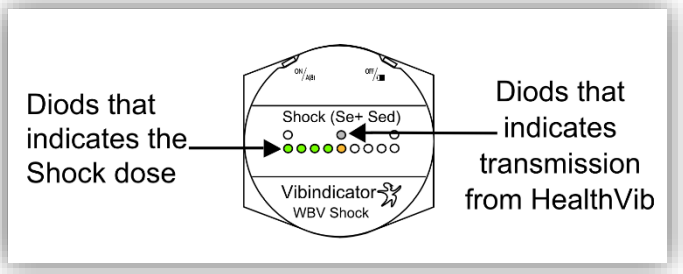


Figure 16: How to interpret WBV Shock indicator

Accumulated shock dose

Press left button to display the accumulated vibration dose (*Sed*). This status can be compared with the regulations for vibration shock exposure in ISO2631-5. Green light indicates low probability for health risk, yellow indicates moderate health risks and red indicates that there is a high probability for health risk. (See figure 17)

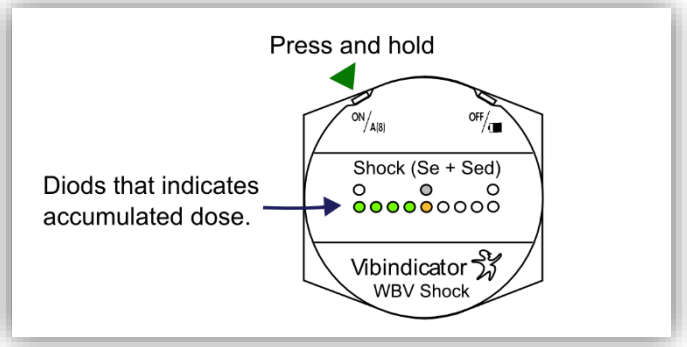


Figure 17: How to interpret WBV Shock indicator

Step 6: Turn off Shock indicator

Press and hold right button for 5 seconds to turn Shock indicator off, see figure 18. Before it turns off, battery status is shown. When Shock indicator is turned off; the data is erased.

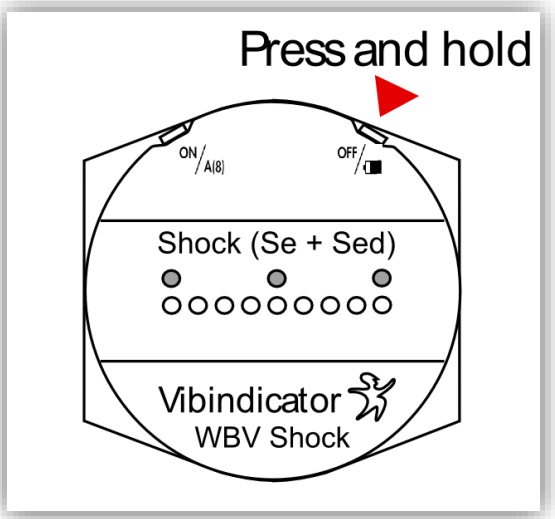
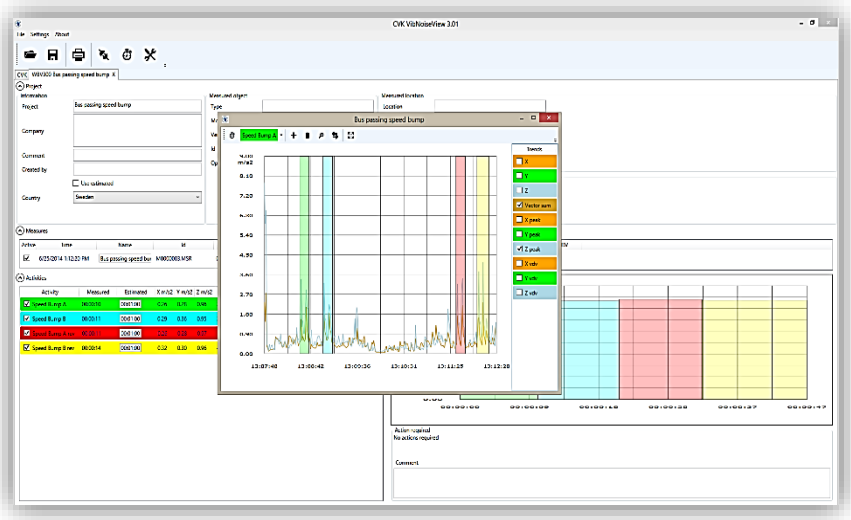


Figure 18: Turn off Vibindicator

Step 7: Erase data in Shock indicator

The data in Shock indicator is erased when turned off.

CVK VibNoiseView 3.0



- Import and manage measurements from CVK products. Raw data export to text format is possible.
- Perform different analysis as RMS, 1sec RMS, VDV, *Se*, *Sed*, FFT.
- Cut and trim measured data.
- Synchronize data from CVK products.
- Create and save exposure reports.
- Store measured data and create projects.

Terms and Conditions

CVK VibNoiseView 3.0 ™ is a measurement analysis software for hand and arm vibration (HAV), Whole body vibration (WBV) and Noise in accordance to ISO 5349, ISO 2631-1, requirements of 2002/44/EG, ISO 60491, requirements of 2003/10/EG. The software is compatible with windows 7 and 8.

Before installation, please make sure that you have approvement from computer administration and right to install this software onto the computer. User license is included in instrument package.

To be able to have software updates and support, the support license purchase is needed.

Recommendations

- Do backup of important data before installation.
- Close all programs before installation.

Installation guide

Run the CVK VibNoiseView 3.0 setup-file provided. This will install the necessary files to the computer and create a start menu icon.

When the CVK VibNoiseView setup is launched:

1. The serial number will show up in License window.
2. In order to receive the License key, please provide your supplier with the serial number.

OBS! *Without License key, the software can be used for 10 days.*

3. Once entered the license key; the software is activated.

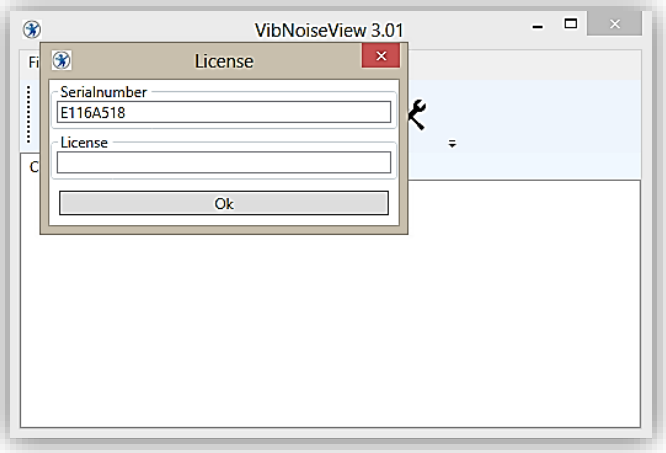


Figure 19: VibNoiseView Start- up

Functions – CVK VibNoiseView 3.0

CVK VibNoiseView 3.0 main functions:

1. Manage and store measurement files in the file management window. Export data as .txt-file or .xls-file.
2. Cut, trim and organize measurements in the graph window.
3. Create, activities in the Activity list and calculate exposure using measured or estimated exposure time.
4. Print or save report by using report button.
   (See figure 20)

Acquire Data from HealthVib WBV

First, run the software; VibNoiseView and connect unit to computer using USB cable:

1. Open a New HAV/WBV/Noise project tab from ‘File’ menu.
2. Click on ‘Connect’ button on top of the main window or Select ‘Read from hardware’ from ‘File’ menu to import the measurements.

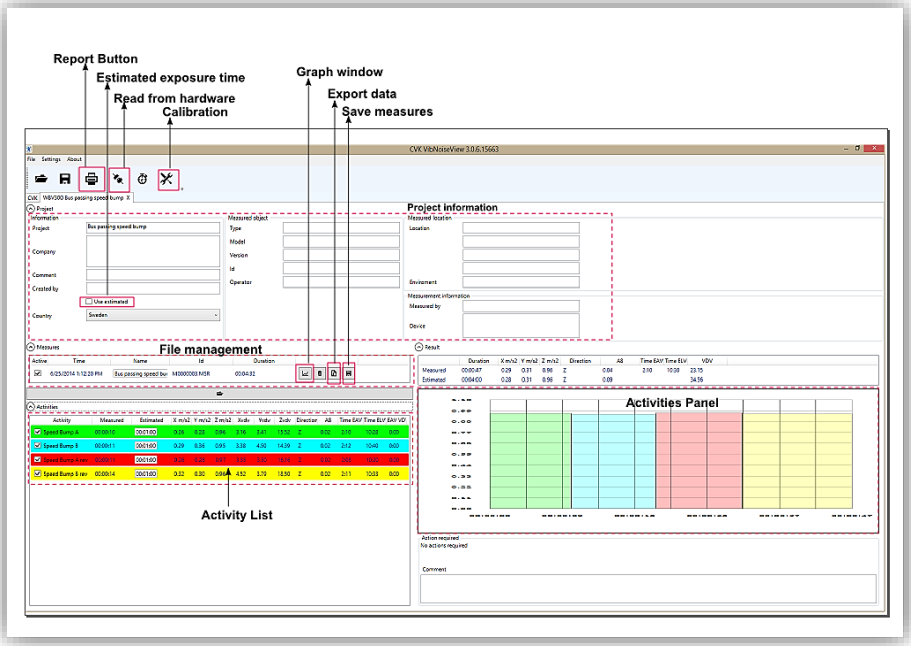


Figure 20: VibNoiseView OverView

File management

In *Measures* all measurement files are shown. Date, time, name, duration and ID file numbers are found and names can be altered in *Name* panel. A checkbox to be able to include the files in the calculation is also present. There are four options for each measurement file:

Graph window, Delete file, export file and save.

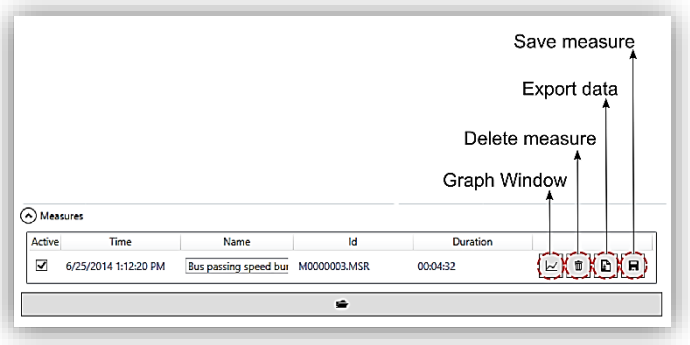


Figure 21: VibNoiseView File management

In graph window; activities are found and can be created.

It is possible to delete each measurement file by using 'Delete' button and export data to other file formats such as excel or text file.

Activity List

In activity list, different activities are presented. Different activities are created in the graph window, popping up when pressing the graph window button.

Marked activities in created activity list will be included in report and calculations.

Measured exposure time is default but estimated exposure time can be used by selecting "*use estimated*" box in "project information" window.

Estimate time

Different activities can also be time estimated by choosing "*use estimated*". By this it is possible to calculate vibration exposure i.e. when using different machines during different exposure times. It is also possible to recalculate allowed exposure time.

Graph window

In graph window; chosen file is displayed. There are tools for zoom in/out, pan and creating activities, cut and trim measurements. And activity is created in activity list.

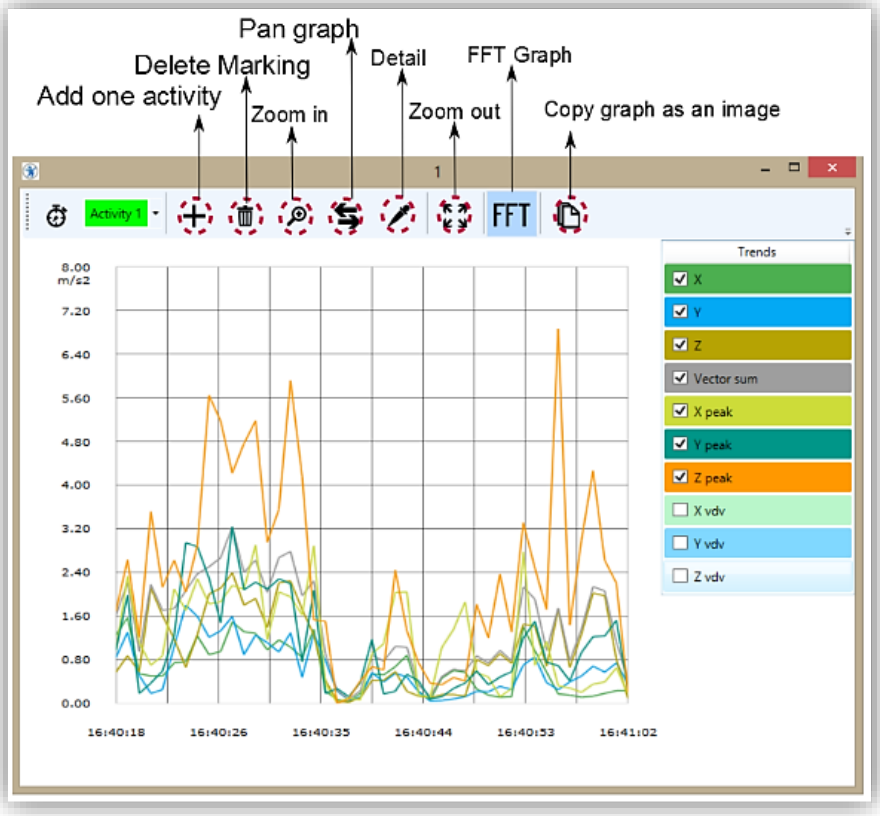


Figure 22: Graph window

Graph- Zoom, and mange data

a) It is possible to choose to display R.M.S (X, Y, Z, and Vector sum), Peak (X, Y, Z) and VDV (X, Y, Z) values by checking them on the left side of the graph window.

b) To define activity(s) in each measurement graph

1. Choose activity panel by clicking on .
2. It is possible to rename, add, and choose different colors for activities (please see figure 22&23).

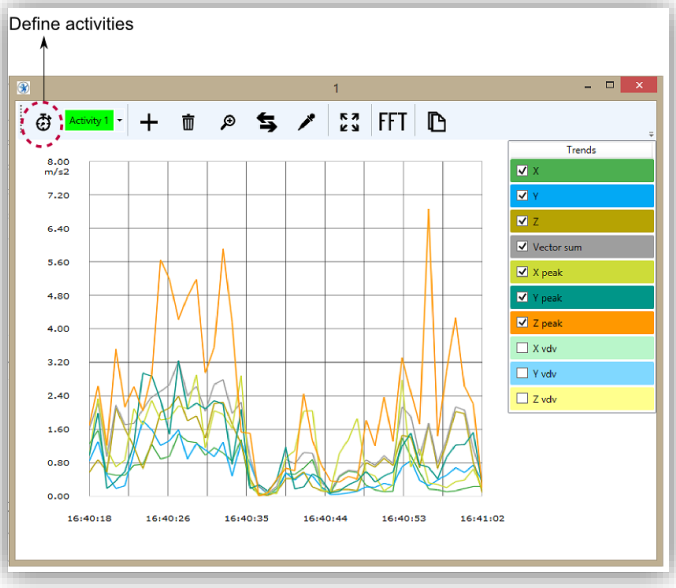


Figure 22: Graph window- Define activities

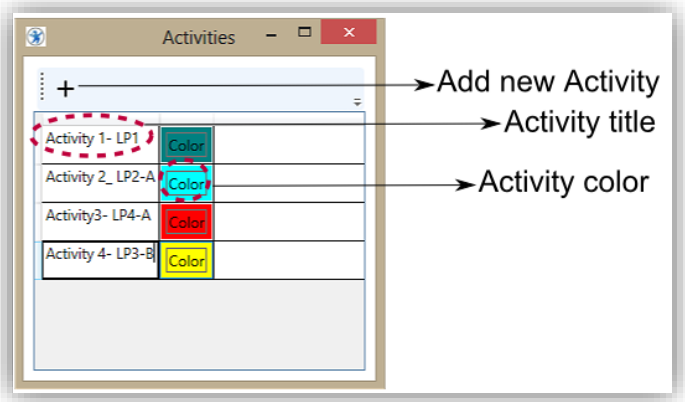


Figure 23: Define and/or add new Activities

c) To select area of each activity in the graph;

1. Select the activity you are interested from top of the graph window.
2. In graph window; select "add activity" by clicking on  .
3. Drag and mark the area. (See figure 24)

Note! *It is possible to select the whole measurement as only one activity.*

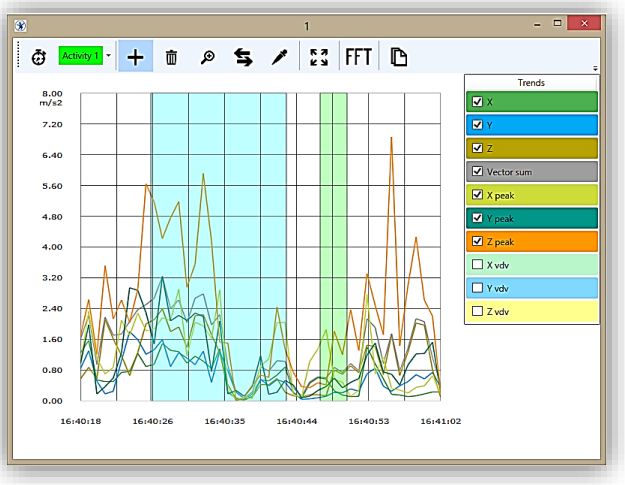


Figure 24: Graph window- With 2 activities defined.

d) To delete area(s) of each activity in the graph;

1. In graph window; select “delete activity” by clicking on  .
2. Select the marked area to delete it.

FFT window

Perform FFT analysis by selecting the FFT sign on Graph window. Then click in the time graph where the FFT analysis should be performed. From the FFT window different weighting window and sampling lenth can be chosen for the analysis.

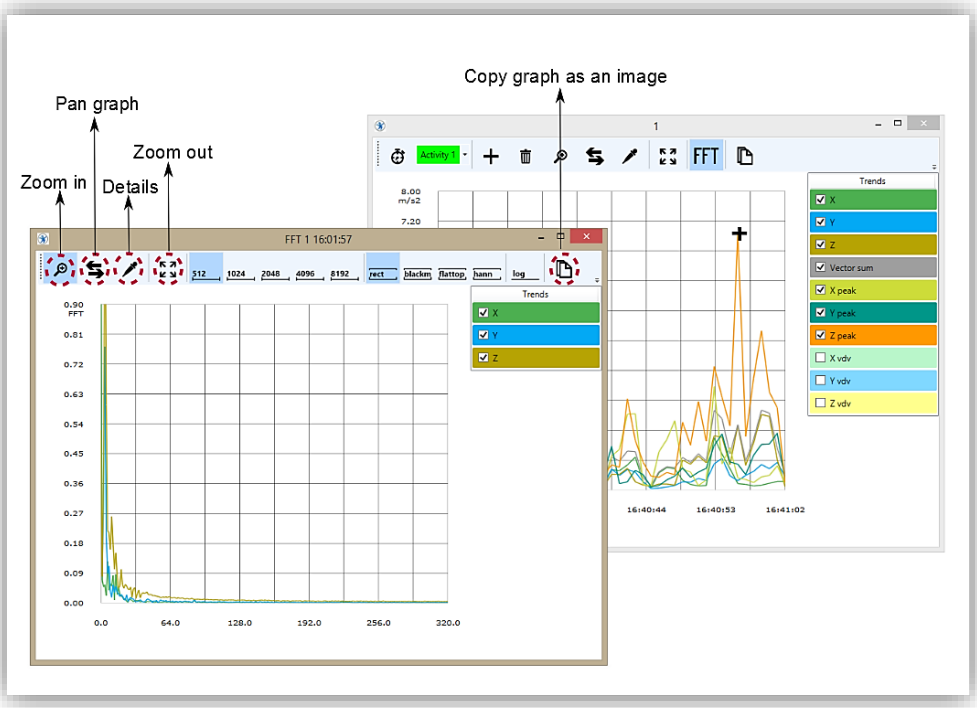


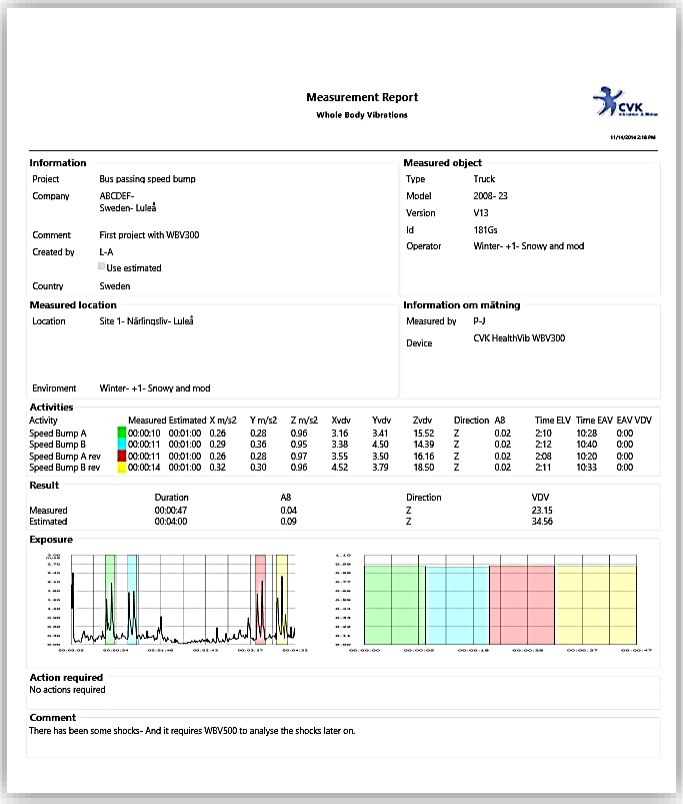
Figure 25: FFT window

Analysis methods

Different analysis methods can be chosen depending on the vibration characteristics- *RMS, VDV, and Sed*. By this, it is possible to calculate vibration exposure in accordance to ISO 2631-1 and -5 i.e. RMS and Shocks.

Report

Report can be printed or saved as pdf.



Measurement Report

Whole Body Vibrations

11/14/2014 2:18 PM

Information

Project	Bus passing speed bump
Company	ABCDEF- Sweden- Luleå
Comment	First project with WBV300
Created by	L-A Use estimated
Country	Sweden

Measured object

Type	Truck
Model	2008- 23
Version	V13
Id	181Gs
Operator	Winter- +1- Snowy and mod

Measured location

Location	Site 1- Närlingsliv- Luleå
Enviroment	Winter- +1- Snowy and mod

Information om mätning

Measured by	P-J
Device	CVK HealthVib WBV300

Activities

Activity	Measured	Estimated	X m/s2	Y m/s2	Z m/s2	Xvdv	Yvdv	Zvdv	Direction	A8	Time ELV	Time EAV	EAV VDV
Speed Bump A	00:00:10	00:01:00	0.26	0.28	0.96	3.16	3.41	15.52	Z	0.02	2:10	10:28	0:00
Speed Bump B	00:00:11	00:01:00	0.29	0.36	0.95	3.38	4.50	14.39	Z	0.02	2:12	10:40	0:00
Speed Bump A rev	00:00:11	00:01:00	0.26	0.28	0.97	3.55	3.50	16.16	Z	0.02	2:08	10:20	0:00
Speed Bump B rev	00:00:14	00:01:00	0.32	0.30	0.96	4.52	3.79	18.50	Z	0.02	2:11	10:33	0:00

Result

	Duration	A8	Direction	VDV
Measured	00:00:47	0.04	Z	23.15
Estimated	00:04:00	0.09	Z	34.56

Exposure

Action required

No actions required

Comment

There has been some shocks- And it requires WBV500 to analyse the shocks later on.

Figure 26: VibNoiseView Report preview

Open previous saves measurement files

1. Open a New HAV/WBV/Noise project tab from ‘File’ menu.
2. Click on ‘Open button’ in “Measures” section to open your saved measurement files. (see figure 27)

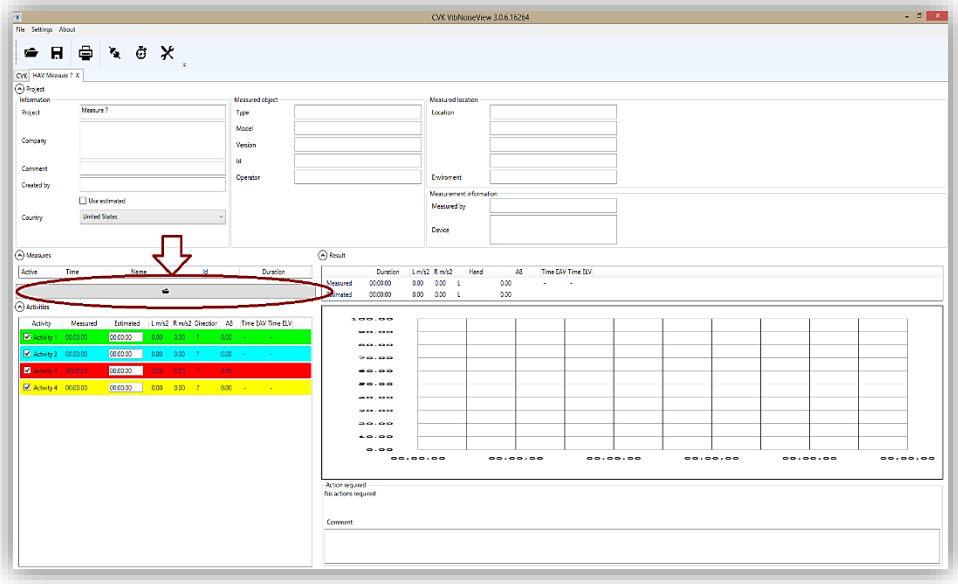


Figure 27: Open a saved measurement file

Adjust time

To change date and time in your unit:

1. Choose ‘’Calibration mode’’ on unit

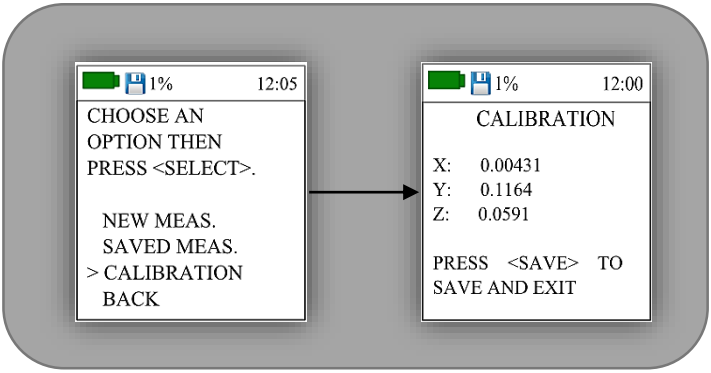


Figure 28: Choose Calibration mode on unit

2. Connect the unit to the computer and run VibNoiseView.

3. Start Calibration software by click on icon 

And the ‘’Calibrate’’ window will show up.

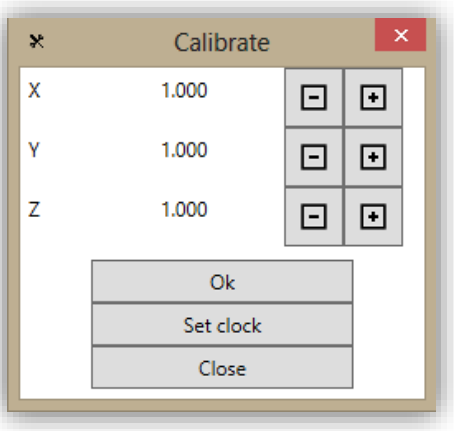


Figure29: Adjust date and time on unit

4. Press ‘’Set Clock’’ to synchronise your unit time and date with your computer.
5. Press ‘’Save’’ button on unit and close the Calibrate window. (See figure 26)

Calibration control

In order to control the measurement accuracy of measurement, shaker or Calibrator are needed. A steady state sine wave of 8, 15.92 or 159.2 Hz and an efficiency level of 2 – 10 m/s^2 root mean square (RMS) are recommended. Contact your supplier for further information about CVK calibrator adaptor and recommended calibrator/shaker.

Equipment

Equipment recommended to use for calibration:

- Shaker or calibrator with 8, 15.92 or 159.2 Hz and vibration level 2 – 10 m/s^2 (RMS).
- CVK adaptor to fasten HealthVib in three directions.
- Computer reading CVK VibNoiseView 3.0 to display R.M.S value and data for calibration.

***Note**! For WBV300/500; the sensor part has to be removed from seat plate by losing the screws under the seat plate. Firmly remove the sensor part and mount it on the CVK WBV calibrator adaptor.*

Procedure

Connect unit with USB-cable to PC, mount unit firmly on calibrator.

Start calibration software by click on icon 

Run a sine wave at 8, 15.92 or 159.2 Hz at 2-10 m/s^2. Each directions are controlled by remounting the unit for different directions.

Read out value directly in HealthVib's display or in CVK software. If measured value differs from the nominal value, the sensitivity can be adjusted by +/- in calibration software.

Figure 30: mounting HealthVib sensor unit on calibrator/shaker