SVAN 106

Vibration Meter

USER'S MANUAL

SVANTEK Sp. z o.o.

WARSAW, August 2012

Notice: *This user's manual presents the software revision named 3.13.1 (cf. the description of the* ***Unit Label*** *position of the* ***Instrument*** *list). The succeeding software revisions (marked with the bigger numbers) can slightly change the view of some displays presented in the text of the manual.*

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1. INTRODUCTION

The SV 106 is a new six-channel human vibration meter and analyser. Instrument meets ISO 8041:2005 standard and it is an ideal choice for measurements according to ISO 2631-1,2&5 and ISO 5349.

pocketUsing computational power of its digital signal processor the **SVAN 106** instrument can, simultaneously to the meter mode, perform real time **1/1 Octave** or **1/3 Octave** analysis.

Advanced time-history logging and time-domain signal recording (according to the ISO 2631-5) to built-in Micro SD flash card give almost unlimited capabilities of data storage. Results can be easily downloaded to PC using USB interface and SvanPC+ software.

The Whole-Body vibration measurement is easier thanks to SV 38 seat-accelerometer which can be placed directly on the seat-cushion, floor or fixed to the back of the seat.

The SV 50 set with triaxial accelerometer enables Hand-Arm vibration measurements regardless of the type of evaluated tool.

Additionally, for measurements of very high impulse vibration the special adapter SA 55, with low pass mechanical filter protecting accelerometer from DC shift effect, is available. Evaluation of the grip force will be accessible with dedicated “integrated adapter” SV 105 (under development stage).

Fast USB 1.1 interface (12 MHz) creates real time link for the PC "front-end" application of the **SVAN 106** instrument. The measurement results can be downloaded to PC using all mentioned above interfaces.

The instrument is powered from four AA standard or rechargeable batteries (i.e. NiMH - separate charger is required). The powering of the instrument from the USB interface is also provided. Robust and lightweight design accomplishes the exceptional features of this new generation instrument.

1.1. SVAN 106 main features

- Human Vibration measurements meeting ISO 8041:2005,
- ISO 2631-1,2&5 (including VDV and MTVV) and ISO 5349
- Six channels for acceleration (IEPE type) and two channels for force measurements
- Whole-Body measurements:
  - Low-cost seat accelerometer SV 38V
- Hand-Arm measurements:
  - SV 50 triaxial accelerometer with set of adapters
  - SA 55 adapter with triaxial mechanical filter

- SV 105 integrated triaxial accelerometer adapter including grip force sensor (under development)

- Time-domain signal recording (meeting ISO 2631-5)
- 1/1 octave and 1/3 octave spectrum parallel calculations,
- Advanced data logger including spectral analysis
- Micro SD flash card for mass data storage
- USB 1.1 Client interface
- Integration time programmable up to 24 h
- SvanPC+ software for easy instrument setup and data download
- Easy in use, user friendly interface with colour display
- Pocket size (140 x 83 x 33 millimetres)
- Weight only 390 grams including batteries

1.2. Accessories included

The **SV 106** set consist of the following parts:

- **SV 106** instrument with 4 AA batteries or 4 rechargeable AA batteries installed.
- **SC 56** mini USB 1.1 cable (typical 2m)
- **SC 118** LEMO 4-pin to LEMO 5-pin connector
- **SV 38V** triaxal accelerometer for Whole—Body measurements (MEMS type)
- **SV 105** integrated triaxal Hand-Arm adapter with grip force sensor (under development)

1.3. Accessories available

- Power supply unit with USB Connector
- **SC 38** Cable used to connect the triaxial accelerometer with the SV106 (4 pin Microtech to LEMO 4 pin (typical 2.7 m))
- **SA 50** Hand-Arm measurement adapter, "shaped base" (for SV 3023M2 accelerometer)
- **SA 51** Hand-Arm measurement adapter, "flat base" (for SV 3023M2 accelerometer)
- **SA 52** Hand-Arm measurement adapter, "direct" (for the SV 3023M2 accelerometer)
- **SC 14** LEMO 5 pin to LEMO 5 pin extension cable (10 m)
- **SA 55** adapter with low pass mechanical filter
- **SV 39A\L** Seat Accelerometer (including SV 3143M1 and SC 38 cable)
- **SV 50** set for Hand-Arm measurement (Dytran accelerometer 3023M2; adapters SA 50, SA 51, SA 52
- **SV 111** vibration calibrator (100 rad/1ms^{-2}, 500 rad/10ms^{-2}, 1000 rad/10ms^{-2})

2. MANUAL CONTROL OF THE INSTRUMENT

The control of the instrument is developed in the fully dialogue way. The user can operate the instrument by selecting the proper position from the **Menu** list. Thanks to that, the number of the control push-buttons of the instrument is reduced to nine.

2.1 Control push-buttons on the front panel

On the front panel of the instrument, there are located the following control push-buttons:

- **<ENTER>**, **(<Menu>)**, **[<Save>]**,
- **<ESC>**, **(<Cal.>)**, **[<S/P>]**,
- **<Shift>**, [Markers]
- **<Alt>**, [Markers]
- **<▲>**,
- **<◀>**,
- **<▶>**,
- **<▼>**,
- **<Start/Stop>**.

The name given in (...) brackets denotes the second push-button function which is available after pressing it in conjunction (or in sequence) with the **<Shift>** push-button. For the first two push-buttons the name given in square brackets […] denotes also the third push-button function which is available after pressing it in conjunction (or in sequence) with the **<Alt>** push-button.

<Shift> The second function of a push-button (written in red colour on a push-button) can be used when the **<Shift>** push-button is pressed. This push-button can be used in two different ways:

- as **Shift** in the keyboard (e.g. while typing the filename); both **<Shift>** and the second push-button must be pressed in parallel;
- as **2nd Fun**; this push-button can be pressed and released before pressing the second one or pressed in parallel (while operating in *"**2nd Fun**"* mode, see the following notice) with the second push-button.

The **<Shift>** push-button pressed in conjunction with the **<Alt>** one enables the user to enter the **Markers** on the plots during the measurement.

<Alt> This push-button enables one to choose the third push-button function in case of **[<Save>]** and **[<Pause>]** push-buttons. In order to select the third function the user must press the **<Alt>** and the second push-button simultaneously.

Notice: *The simultaneous pressing of the **<Alt>** and **<Start/Stop>** push-buttons switches the instrument on and off.*

<Start/Stop> This push-button enables one to start the measurement process, when the instrument is

not measuring or to stop it, when the instrument is in course of the measurement. It is also possible to set such mode of this push-button, in which in order to start or stop the measurements the user has to press it simultaneously with the **<Shift>** one.

Notice: *The change of the* ***<Start/Stop>*** *push-button mode is performed in the* ***Keyboard Settings*** *window of the* ***Instrument*** *list (see description of the* ***Instrument*** *list).*

<ENTER> This push-button enables one to enter the selected operation mode or to confirm the control options. Some additional functions of this push-button will be described in the following chapters of this manual.

(<Menu>) This push-button (pressed together with the **<Shift>** one) enables the user to enter the main list containing six sub-lists: **Function**, **Measurement**, **Display**, **File**, **Instrument**, **Auxiliary Setup**. Each of the mentioned above sub-lists consists of the sub-lists, elements and data windows. These main sub-lists will be described in details in the following chapters of the manual. Double pressed **<Menu>** push-button enters the list containing eight last opened sub-lists. It often speeds up the control of the instrument as the user has the faster access to the frequently used sub-lists.

[<Save>] This push-button (pressed together with the **<Alt>** one) enables the user to save measurement results as a file in the internal instrument's memory or on the SD-card.

<ESC> This push-button closes the control lists, sub-lists or windows. It acts in opposite to the **<ENTER>** push-button. When the window is closed pressing the **<ESC>** push-button, any changes made in it are ignored in almost all cases.

([Cal.]) This push-button (pressed together with the **<Shift>** one) enters the **Calibration** sub-list in which the user can enter one of the available sub-lists (**Calibr. by Sensitivity**, **Calibr. by Measurement**, **Last Calibration** and **Clear Calibr. History**).

[<S/P>] This push-button enables one to jump to the **Setup Manager** window or to break the measurement process temporarily.

<◀>, <▶> These push-buttons enable one, in particular, to:

- select the column in a multi column parameter list;
- select the parameters value in an active position (e.g. filter Z, A or C, Integration period: 1s, 2s, 3s, … etc.);
- control the cursor in Spectrum and Logger modes of result's presentation;
- select the position of the character in the text edition;
- activate markers 2 and 3
- speed up the changing of the numerical values of the parameters when pressed and hold.

(<◀>, <▶>) The **<◀>**, **<▶>** push-buttons pressed in conjunction (or in sequence) with the **<Shift>** enable one, in particular, to:

- • speed up the changing of the numerical values of the parameters (i.e. the step is increased from 1 to 10 in the setting of **Start Delay** - *path: Menu / Measurement / General Settings / Start Delay*);
- jump to the end or first character of edited text line in the text edition modes,

[<◀>, <▶>] The **<◀>**, **<▶>** push-buttons pressed in conjunction (or in sequence) with the **<Alt>** enable one, in particular, to:

- select the parameters value in the multi column list,
- insert or delete a character in the text edition modes.

<▲>, <▼> The **<▲>**, **<▼>** push-buttons enable one, in particular, to:

- select lines in the list;
- select the proper character from the list in the text edition mode;
- activate markers 1 and 4

(<▲>, <▼>) The **<▲>**, **<▼>** push-buttons pressed in conjunction (or in sequence) with the **<Shift>** enable one, in particular, to:

- change the relation between the Y-axis and X-axis of all plots presented on the screen

[<▲>, <▼>] The **<▲>**, **<▼>** push-buttons pressed in conjunction (or in sequence) with the **<Alt>** enable one, in particular, to:

- change the mode of result's presentation;
- programme the Real Clock (**RTC**) and **Timer**;

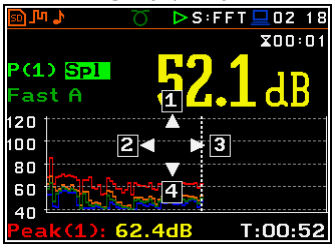
[Info] The **<Info>** push-button (simultaneous pressing the **<◀>**, **<▶>** push-buttons) opens the window with the help information in the measurement display modes.

[Markers] The **Markers** enable the user to mark special events, which occurred during the performed measurements (i.e. the airplane flight, the train's drive etc.). Event function is active only when Logger is active. In order to activate the markers the logger has to be switched on (*path: <Menu> / Measurement / General Settings / Logger Mode= Logger*) and one or more logger results (**PEAK**, **P–P**, **MAX**, **RMS**, **VDV**) in profiles have to be activated (*path: <Menu> / Measurement / Data Logging / Logger Results*).

In order to enter the marker the user must press **<Shift>** and **<Alt>** push-buttons simultaneously during the measurement. Then four available markers appears on the screen. To choose marker number 1 the user must press **<▲>** push button (number 2 - **<◀>**, number - 3 **<▶>** and number 4 - **<▼>**).

The markers disappear automatically and chosen marker is activated (after pressing **<Shift>** + **<Alt>** again active marker number will be highlighted). In order to switch off the marker, the user has to pressing **<Shift>** + **<Alt>** and press the arrow push-button, which refers to the marker to be switched off.

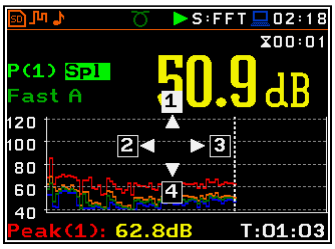
<Shift> / <Alt>

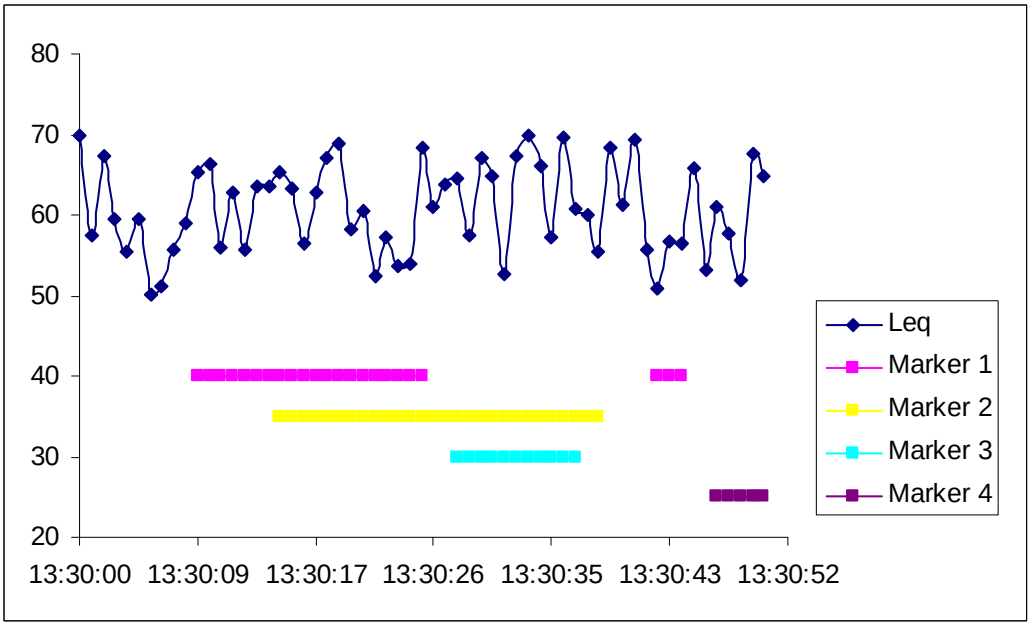


<▲>

The current state of the markers is indicated in the logger's file (cf. App. B for details) and can be used to show them using dedicated presentation software.

The exemplary presentation of the markers on the time history plot is shown below (to view a plot with markers the user has to transfer data to the proper software).





2.2 Input and output sockets of the instrument

Top cover of the instrument

The measurement inputs are placed on the top cover of the instrument: two 5-pins Lemo compatible sockets type ENB.0B.304 for **Channels 1–3** and **Channels 4-6**, all with IEPE power supply for the accelerometers.

Bottom cover of the instrument

In the bottom cover there are two sockets, placed from the right to the left as follows: **USB** Device 1.1 interface and multi purpose input / output socket **I/O**.

The **USB** Device 1.1 interface is the serial interface working with 12 MHz clock. Thanks to its speed, it is widely used in all PC. In the instrument, the standard 4-pins socket is used described in details in Appendix C.

The additional multi purpose input / output socket, called **I/O**, is a two-pins LEMO socket. On this socket, in the case when the Analogue Output functionality is selected, the signal from the input of the analogue / digital converter (before the correction) is available. This signal can be registered using magnetic recorder or observed on the oscilloscope. The Digital Input as another functionality serves as the external trigger, while the Digital Output is used to generate the trigger pulse or alarm pulse from the instrument.

Notice: *Switch the power off before connecting the instrument to any other device (e.g. a printer or a Personal Computer).*

3. SETTING THE INSTRUMENT

In order to perform the measurements using the instrument the user has only to plug-in the proper transducer and to switch the power on.

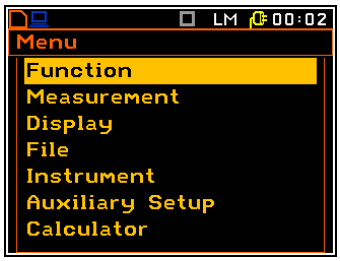
3.1. Basics of the instrument's control

The instrument is controlled by means of nine push-buttons of the keyboard. Using these push-buttons one can access all available functions and change the value of all available parameters. The functions are placed in the system of lists and sub-lists.

The instrument's menu consists of different type of windows, which may be: main menu list, sub-menu list, option list, parameter list, text editor window, information window and file manager window with file command list.

Main menu

The main list contains the headers of six lists, which also contain sub-lists or positions. The main list is opened after pressing the **<Menu>** push-button. This list contains the following sub-lists: **Function**, **Measurement**, **Display**, **File**, **Instrument** and **Auxiliary Setup**.

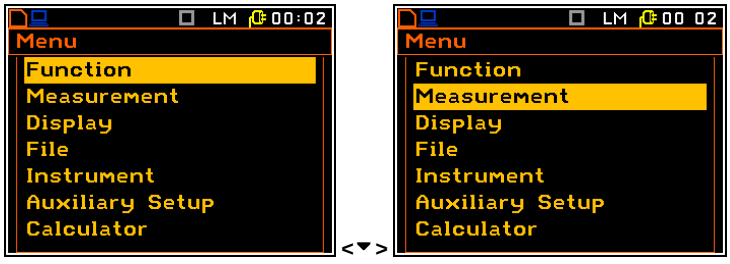


Recent Items list

The double pressing of the **<Menu>** push-button opens the list of recently accessed menu items. Such solution enables one to access the most frequently used lists quickly, without the necessity of passing the whole path.

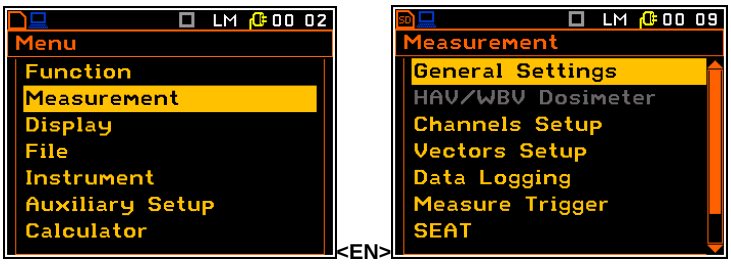
Position selection

The desired position in menu list is selecting with the use of **<▲>** or **<▼>** push-buttons.

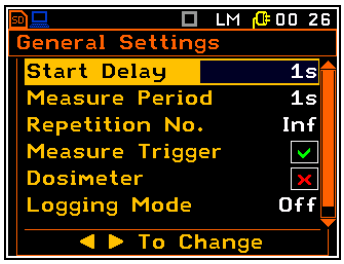


Entering position

After the selection of the desired position in the menu list, the user has to press the **<ENTER>** push-button in order to enter it. After this operation new sub-menu, option list, parameter list or information window appears on the display.



List of parameters



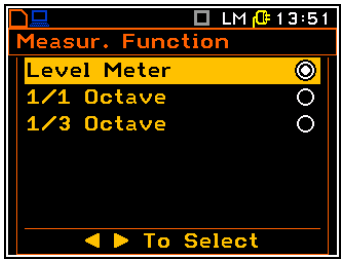
The parameter list contains parameters for which the user may select the value from the certain range. Next pressing of the **<ENTER>** push-button enables one to access mentioned above sub-lists.

- The desired position of a list is accessed after pressing the **<▲>** or **<▼>** push-button.
- The change of the value in a selected position is performed by the **<◀>** or **<▶>** push-buttons (or pressed together with the **<Shift>** one).

If the parameter has numerical value the user may to speed up it's selection keep pressing the **<◀>** or **<▶>** push-buttons (or pressed together with the **<Shift>** one) longer than 1 second. In this case parameter starts to change automatically until the user releases the pressed buttons.

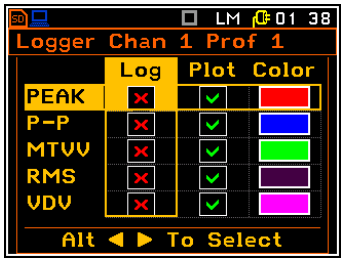
The user may change the numerical parameter value with the step (usually 10, 20) by means of the **<◀>** or **<▶>** push-buttons pressed together with the **<Alt>** one.

Option list



The option list consists of different options, from which the only one may be selected. The selection of the option is performed next way. The user has to highlight the desired option by means of **<▲>** or **<▼>** push-buttons and then press the **<ENTER>** one. This option became active and the list is closing. When the user enters this list again the selected option will be marked.

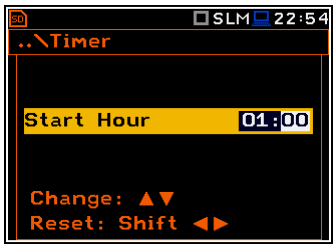
Matrix of parameters

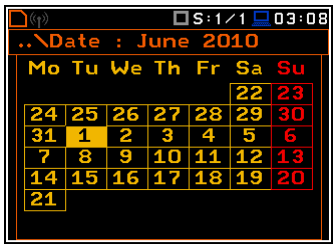


When the list of parameters consists of more than one column the user may change:

- column by means of **<◀>** or **<▶>**
- line in the same column by means of **<▲>** or **<▼>**
- value in a selected position by means of **<◀>** or **<▶>** with **<Alt>**
- all values in the same column by means of **<▲>** or **<▼>** with **<Shift>**
- all values in the same line by means of **<◀>** or **<▶>** with **<Shift>**.

Complex parameters

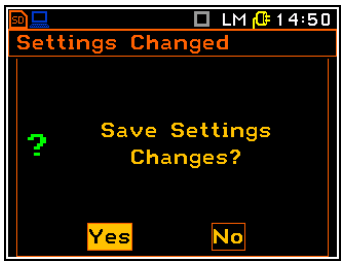




Some parameters like **Start Hour**, **Start Day** etc. are complex (consists of more that one value field). The selection of values for such parameters is performed in a special window, which is opened with the **<◀>** or **<▶>** push-buttons. In the special window the value is selected with the use of **<◀>**, **<▶>** or **<▲>**, **<▼>** push-buttons and then is confirmed by **<ENTER>**.

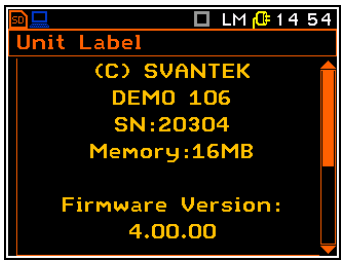
In all cases the **<ENTER>** push-button is used for the confirmation of the selection in a position and for closing the opened sub-list.

The sub-list is closed ignoring changes made in a sub-list by pressing the **<ESC>** push-button.



Information window

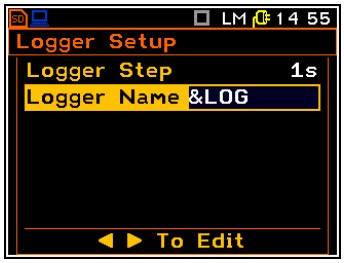
Some windows inform the user about the state of the instrument, available memory, not existing files or loggers, standards fulfilled by the unit, etc. In order to scroll the list, the user has to use the **<▲>** or **<▼>** push-button. In order to close such window, the user has to press the **<ESC>** push-button.



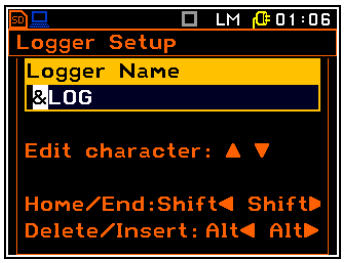
Text edition window

There are also windows, in which the user may edit some text (i.e. the name of the file, the header for the printed reports from the measurements). This window consists the help information to guide the user how to edit the text. The displayed inversely character may be edited.

- One can select the position of the character in the edited text using the **<◄>**, **<►>** push-buttons.
- The available ASCII characters can be changed using the **<▲>** or **<▼>** push-button. The subsequent digits, underline, big letters and space appear on the display in the inversely displayed position after each pressing of the mentioned above push-buttons.
- One can insert or delete the position in the edited text using the **<◄>**, **<►>** push-buttons pressed together with the **<Alt>** one.

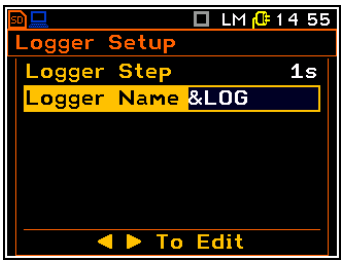


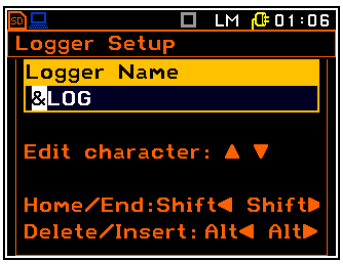
<►>



Help information

In the most windows the last line or several lines consist the help information. It informs the user how to select or modify the parameter's value, change the character in the text line etc.

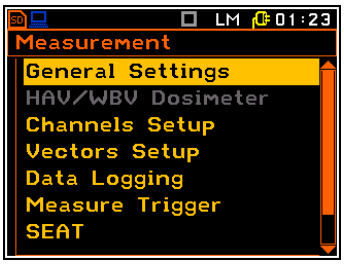


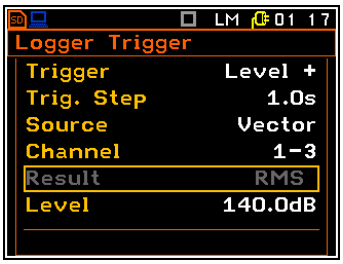


Not active parameters

If some functions or parameters are not active, the positions in the menu or parameter lists linked with this function or parameter became not active (their colour became grey). For example, if ***Dosimetr*** (*path: <Menu> / Measurement / General Settings / Dosimetr: Off*) is switched off the **HAV/WBV Dosimetr** line is **not** active!

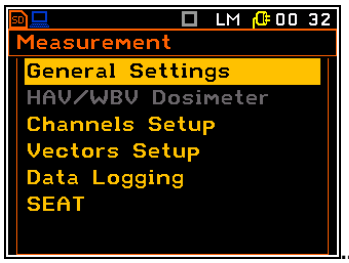
Grey colour of parameter position means that this parameter has only one value and it is not possible to change it.

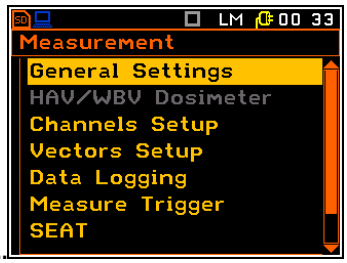




Simple and advanced menu modes

There are two instrument modes, which define scope of available functions: **Simple Mode** and **Advanced Mode**. These modes can be selected in the **Instrument Mode** window of **Auxiliary Setup** menu. **Simple Mode** defines basic instrument functions, while **Advanced Mode** defines full scope of functions. Many window thus have different views. Below is an example of **Measurement** window for simple and advanced modes.





3.2. Powering of the instrument

The **SVAN 106** can be powered by one of the following sources:

- Four AA standard internal batteries. In the case of alkaline type, fully charged set can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary, four AA rechargeable batteries can be used (for charging them the separate charger is required). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- **USB** interface – 500 mA HUB

In the **Power Supply** window of the **Instrument** list one can see the information about the power source.

When the instrument is powered from batteries, the **"Battery"** icon is presented on the top of the display. When voltage of the batteries is too low, the icon is flashing or during attempt of switching on the **Low Battery** message occurs on the display for 2 seconds and the instrument switches off by itself. To change the batteries the user has to switch off the instrument, take off the black bottom cover of the instrument, unscrew battery cover, change the batteries and reassemble the parts of the instrument. The fully charged battery ensures more than 12 hours of the continuous work of the instrument (with the backlight off). The battery condition can be checked by means of the **Battery** function. It is also

presented continuously on the display by means of the **"Battery"** icon.

When there is a connection to the USB interface (USB Device socket is connected by means of the cable to a PC), the **"Computer"** icon is presented on the top of the display and in the **Battery** window, there is the **USB Power: 0.00V** message.

Notice: *In the case when* ***"Battery"*** *icon is red, it is strongly recommended to use as soon as possible the external power adapter or USB interface. In the other case the instrument after a while will be switched off automatically!*

The saving of the internal source of the instrument's power can be achieved by means of reducing the brightness of the screen when possible. The settings of **Brightness** and power saver function may be done in the **Screen Setup** window (*path: <Menu> / Display / Screen)*.

3.3. Initial Setup of the instrument

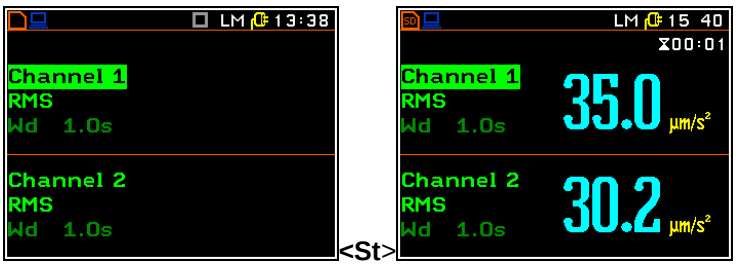
Switching the instrument on

To switch the power on the user should press the **<Alt>** and **<Start/Stop>** push-buttons in parallel. The instrument passes the self-test after switching on (in this time the producer and the name of the instrument is displayed on the display) and then it enters the **Select Setup** window. This window enables one to select predefined setup for specific measurements. To ignore the selection one should press **<Esc>** push-button.

After selection or skip the predefined setup the unit has to warm-up during one minute and then the measurement screen with two results appears.

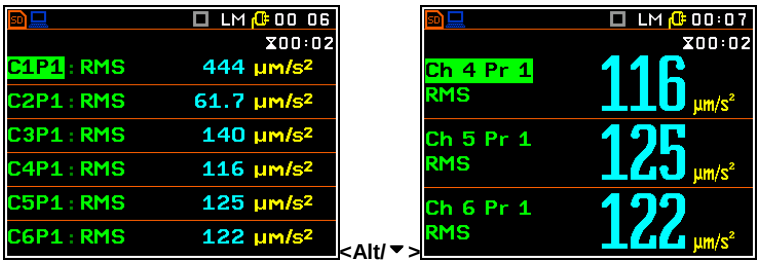
Starting measurement

To start the measurements the user has to press the **<Start/Stop**> push-button. The result of the measurement is displayed with the unit of the measurement in so-called two profile mode. Two results mode is always available for most Functions of the instrument.



Presentation modes

The results of the measurements can be also presented in **6 Channels** or **3 Profiles** modes. In these modes the results for six channels or 3 profiles are presented on the screen. The user can switch the presentation modes by means of **<Alt>** and **<▲>**, **<▼>** push-buttons pressed simultaneously.



Default settings measurements:

The default settings (set up by the producer) for the profiles of all channels are as follows:

- signal type: **Type: IEPE**;
- weighting filter: **Filter: Wd**;
- type of the RMS detector: **1.0s**;
- dose meter: **1-3 Dosimeter: WBV**; **4-6 Dosimeter: HAV**.

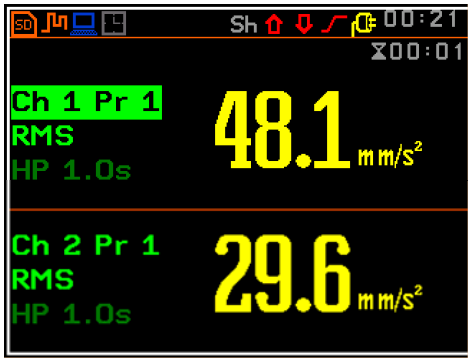
The user can change all mentioned above settings using **Measurement** list. The instrument remembers all changes. The return to the default settings (set up by the producer) is possible after the execution of the **Factory Settings** position available in the **Auxiliary Setup** list.

3.4. Icons description

Description of the instrument state

Additional information about the instrument's state is given by means of the icon's row visible in the top of the display.

The type of measurement function and the measurement mode (LM, DLM, 1/1 and 1/3 etc.) as well as RTC is also displayed in the same line together with icons.



The meanings of the icons are as follows:

	**"play"** icon is displayed when the instrument is the measurement is started and executed the measurement. .		**"plug"** icon is displayed when the instrument is powered from the external source.
	**"stop"** icon is displayed when the measurement is stopped.		**"Internal memory"** icon is displayed when internal memory is assigned for file saving.
	**"pause"** icon is displayed when the measurement is paused.		"**SD Card**" icon is displayed when external SD card memory is assigned for file saving. Micro SD card is connected.
	**"computer"** icon is displayed when there is the USB connection with the PC.		**"Trigger Level +"** icon is displayed when the trigger condition is set up to „**Level+**". The icon appears alternately with the „play" icon.

	**“curve”** icon is presented when the current measurement results are logged in the instrument’s logger file.		**“Trigger Level –“** icon is displayed when the trigger condition is set up to „**Level-**”.
	**“arrow up”** icon is displayed when overload appears.		**“Trigger Slope +”** icon is displayed when the trigger condition is set up to „**Slope+**”.
	**“arrow down”** icon is displayed when underrange appears.		**“Trigger Slope –“** icon is displayed when the trigger condition is set up to „**Slope-**”
	**“tone”** icon is displayed during wave recording and event recording.		**“Alt”** icon is displayed when the **<Alt>** push-button is pressed.
	**“clock”** icon is displayed when timer is **On**. Is active when the instrument is waiting for the measurement start up. When the measurement start up is close, the icon change its colour to green and stats to blink.		**“battery”** icon is displayed when the instrument is powered from the batteries. Icon corresponds to the batteries state (three, two, one or none vertical bars in side of the icon). When voltage of batteries is too low, the icon became red.
	**“Shift”** icon is displayed when the **<Shift>** push-button is pressed.		

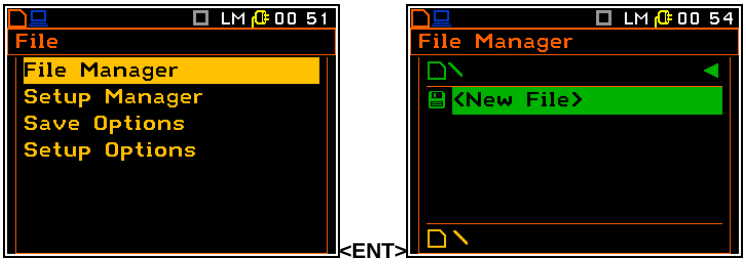
3.5. Memory organisation

All available measurement results as well as measurement and device settings can be stored in the internal FLASH type memory of the instrument (16 MB) or in the external Memory (**SD Card**). Logger, wave and event results can be save only in the external Memory.

The **SD Card** external memory is activated automatically after insertion of the card. The **SD Card** memory is organised as standard memory with directories and sub-directories. It is possible to create and to delete the directory.

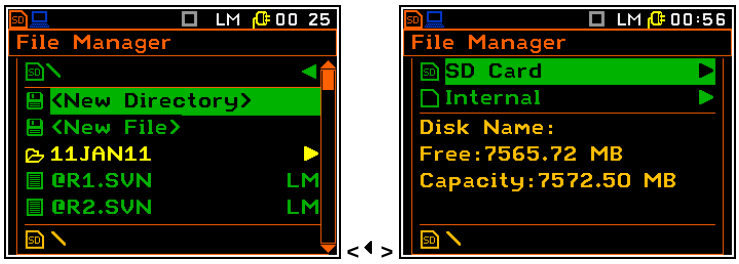
The content of each memory type can be checked with the help of the **File Manager** or **Setup Manager** function of the **File** menu.

The **File Manager** is used for checking the contents of the memory and make operation on result and logger files such as: open, delete, copy, move, rename, create new files or catalogues and display file and catalogue information.



Memory selection

To change the memory type one should press the <◄►> push-button in the **File Manager** window, select the memory type by means of the <▲>, <▼> push-buttons and press the <►> one.



The file are saved in the Memory and in the catalogue which was set up as a working. The working Memory type is displayed as the icon in the left position of the icon line.

"Internal" memory icon is displayed when internal memory is assigned for file saving.

"SD Card" icon is displayed when external SD card memory is assigned for file saving. Micro SD card is connected.

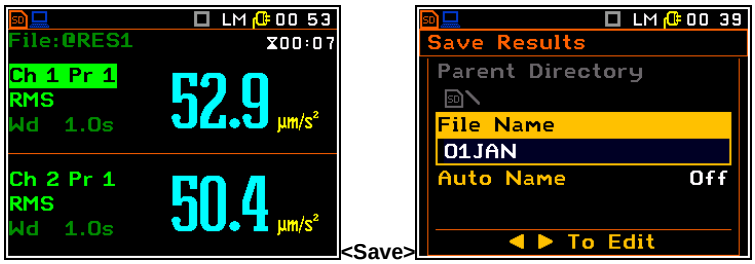
The working directory is described in the bottom line of the **File Manager** window.

To change the working directory and/or working memory one should select the Memory type and in case of **SD Card** the desired directory and press the **<ENTER>** push-button. After the new window is opening one should select the **Set Working Directory** position and press the **<ENTER>** push-button again. The icon on the upper line and the directory path on the bottom line will be changed accordingly. Same algorithm is applied for directory changing for **SD Card** memory.

There are two options for storing result data in the internal or external memory. One option is to press **<Save>** push-button right after the measurement performance. Another option is to create **<New File>** in the **File Manager**.

After pressing the **<Save>** push-button the **Save Results** window appears.

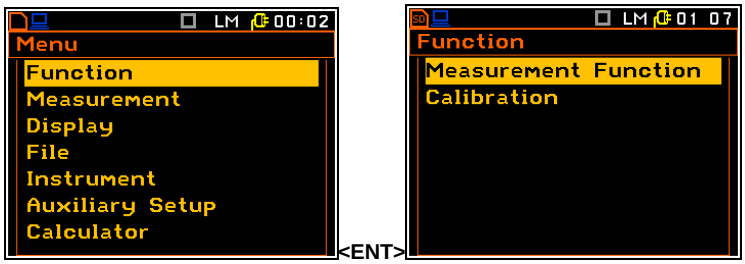
After pressing the **<Save>** push-button the **Save Results** window appears. In the **Save Results** window the user can give the name for the result file or choose automatic name generation option.



The Setup files can be stored also by means of **<S/P>** push-button and creating the **<New File>** in the **Setup Manager** list. The logger, wave and event files are created automatically in the assigned directory on the external memory drive.

4. FUNCTIONS OF THE INSTRUMENT – Function

In order to select the **Function** list one has to press the **<Menu>** push-button, select the **Function** text and press **<ENTER>**. The **Function** list contains two elements: **Measurement Function** and **Calibration**.



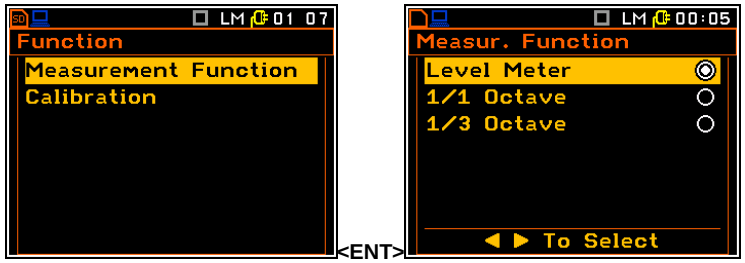
4.1. Measurement functions of the instrument - Measurement Function

The main function of the instrument is the measurement of Vibration level (**Level Meter**) meeting the ISO 8041:2005 standard. The instrument can also be used for the long-term vibration monitoring using for this purpose the huge logger, in which the measurement results are stored.

The user may also use 1/1 and 1/3 octave analysis functions. These functions broaden the main Level Meter functions of the instrument, because 1/1 and 1/3 analysis is performed together with all calculations of Level Meter functions.

In all functions it is possible to perform additionally dose measurements. Dose parameters are setting up in **HAV/WBV Dose** window (path: <Menu>/ Measurement).

In order to select the required function the user has to enter the **Measurement Function** list. After entering the **Measurement Function** list, the set of the available functions appears on the display: **Level Meter**. Currently active function is marked.



The type of measurement function and the measurement mode is displayed at the upper line of the screen:

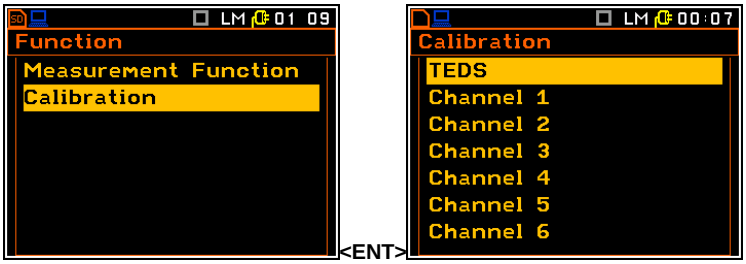
- ***LM*** ***Level Meter***,
- ***1/1*** ***1/1 Octave***,
- ***1/3*** ***1/3 Octave***,
- ***DLM*** ***Dose & Level Meter***,
- ***D1/1*** ***Dose & 1/1 Octave***,
- ***D1/3*** ***Dose & 1/3 Octave***.

Optional functions that broadening the applications of the instrument can be install. These options can be supported by the producer or purchased later.

Notice: *It is not possible to change the measurement function during the measurements. The instrument displays in this case for about 3 seconds the text:* ***"Measurement in Progress"****. In order to change the mode of the instrument the measurement must be finished!*

4.2. Instrument's calibration – Calibration

The instrument is factory calibrated with the supplied accelerometers. In case of using other transducers the calibration of the measurement channels has to be done. Periodic calibration of standard accelerometers is also required. In order to select a calibration function the user has to enter the **Calibration** sub-list.

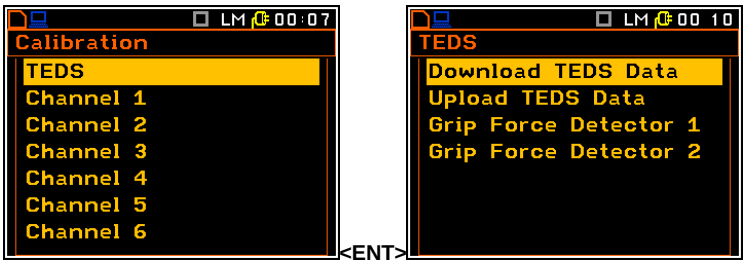


The **Calibration** list consists of six positions: **Channel 1**, **Channel 2** … **Channel 6** which are used to perform the calibration of each channel of the unit.

4.3.1. Downloading and uploading TEDS data – TEDS

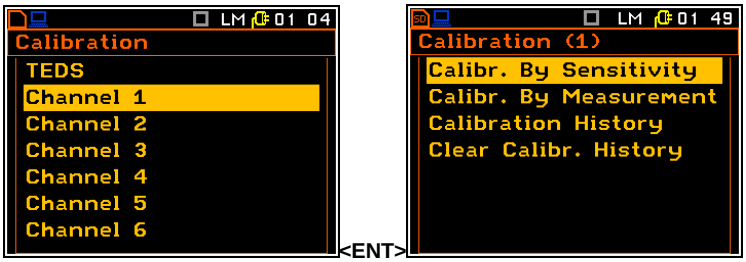
If accelerometer with new TEDS system is connected before switching the instrument on the TEDS data are downloading automatically. TEDS data usually include: serial number, producer name, calibration factor, etc.

The **TEDS** position enables the user to **Download TEDS Data**, when accelerometer is connected during instrument's working session. It enables also to **Upload TEDS Data** from the instrument to the accelerometer's TEDS memory - calibration results, performed by user.



4.3.2. Calibration of the instrument channels – Channel x

The **Channel x** sub-list consists of three positions: **Calibr. By Sensitivity**, **Calibr. By Measurement**, which are used to perform the calibration and **Calibration History** used for checking the parameters of the previous calibrations.



Notice: *The calibration factor is always added to the results in the* ***Level Meter****,* ***1/1 Octave****,* ***1/3 Octave****,* ***FFT*** *and other modes.*

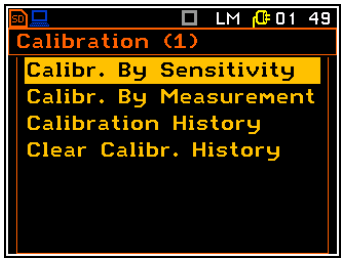
Notice: *The calibration level and the calibration result is expressed in different units depending on the settings of the instrument. The metric or non-metric Vibration units are set in the* ***Vibration Units*** *(path: <Menu> / Auxiliary Setup / Vibration Units). Additionally, the linear or logarithmic units are set in the* ***Display Scale*** *(path: <Menu> / Display / Display Scale).*

Notice: *It is not possible to calibrate the instrument during the execution of the measurements. It is possible to open different lists and sub-lists but the positions in these lists are not displayed inversely and so - not accessible. The "play" icon indicates that the instrument is in the measurement process. In order to change the sensitivity the measurement must be finished!*

4.3.3. Calibration by transducer's sensitivity – Calibr. By Sensitivity

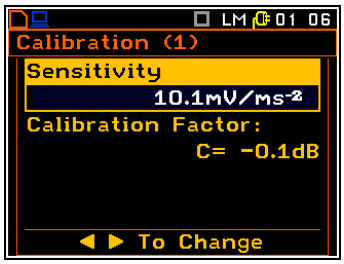
The calibration by the accelerometer's sensitivity introduction can be done in the following way:

1. Select this type of the calibration (highlight the **Calibr. By Sensitivity** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.



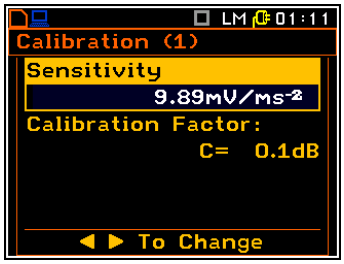
2. Set the sensitivity of the accelerometer taken from its calibration certificate using the **< ◀ >, < ▶ >** push-buttons (or combination of the **<Shift>** and **< ◀ >, < ▶ >** push-buttons).

The calibration factor is calculated, after pressing the **< ◀ >, < ▶ >** push-buttons, in the relation to 10.0 mV / ms^{-2}. For the sensitivity of the accelerometer higher than 10.0 mV / ms^{-2} the calibration factor is negative.



For the sensitivity of the accelerometer lower than 10.0 mV / ms^{-2} the calibration factor is positive.

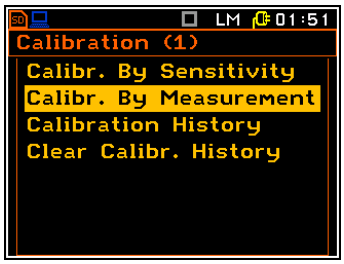
The lowest applicable value of the sensitivity to be introduced is equal to 10.0 μV / ms^{-2} (it conforms to the calibration factor equal to 60.0 dB) and the highest one – 10.0 V / ms^{-2} (calibration factor equal to -60.0 dB).



In order to save the selected calibration factor the user has to press **<ENTER>**. In order to return to the **Calibration** sub-list the user has to press the **<ESC>** push-button.

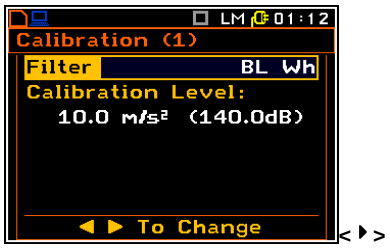
4.3.4. Calibration by measurement – Calibr. By Measurement

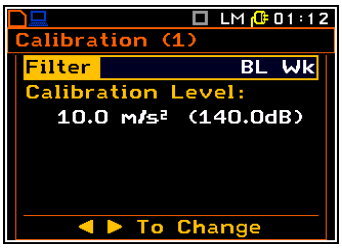
The calibration by measurements can be done in the following way:



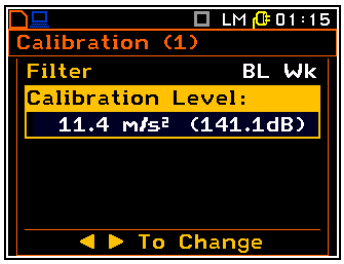
1. Select the calibration by measurement (highlight the **Calibr. By Measurement** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.

2. Select filter: for hand-arm transducer – **BL Wh**, for whole-body transducer – **BL Wk** or equivalent.

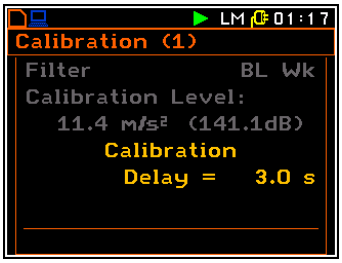


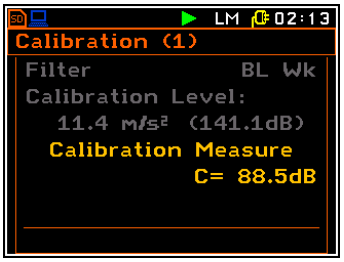


3. Select the calibrator signal level.
4. Attach the vibration calibrator to the instrument's accelerometer.
5. Switch on the calibrator and wait approximately 30 seconds before starting the calibration measurement.
6. Start the calibration measurement by pressing the **<Start/Stop>** push-button.



The measurement starts after 5 seconds delay. The measurement time is also predefined to 5 seconds. During the calibration period, the **<ESC>** and **<Pause>** push-buttons do not operate but it is possible to stop the measurement using the **<Start/Stop>** push-button. Waiting for the calibration measurement to begin, a **Start Delay** is counted down. At the end of the measurement, the result is displayed on the display in the bottom line.





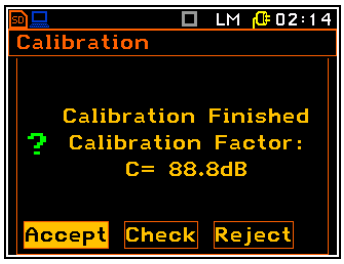
The calibration procedure should be repeated a few times to ensure the integrity of the calibration. The obtained results should be almost identical (with ±0.1 dB difference). The reasons for unstable results are as follows:

- the calibrator is not properly attached to the instrument,
- there are external disturbances,
- the calibrator or the measurement channel (the accelerometer or the instrument itself) are damaged.

Notice: *During the calibration period, external disturbances (vibrations or acoustic noise) should not exceed 100 dB.*

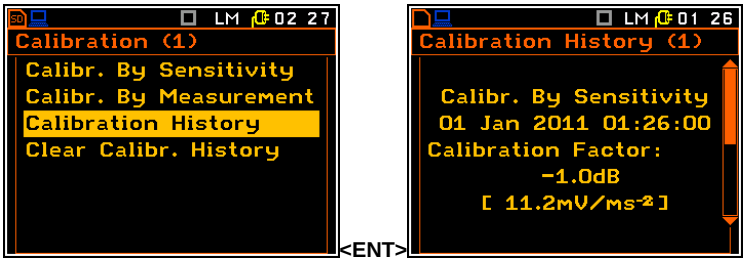
7. Press the **<ENTER>** push-button in order to accept the measurement result.

The calibration factor is calculated, stored and displayed after pressing the **<ENTER>** push-button.

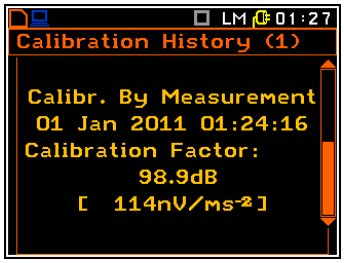


4.3.5. History of the calibrations – Calibration History

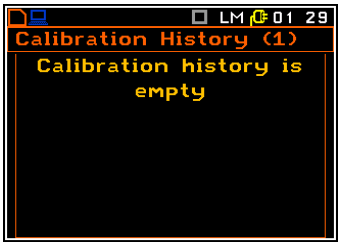
The **Calibration History** window displays up to ten last calibration records.



In order to review all calibration record, the user has to use the **<▲>**, **<▼>** push-buttons. The opened window contains the date and time of the performed calibration measurement, the way the calibration was done (**Calibr. By Measurement** or **Calibr. By Sensitivity**) and the obtained calibration factor (**Calibration Factor**).

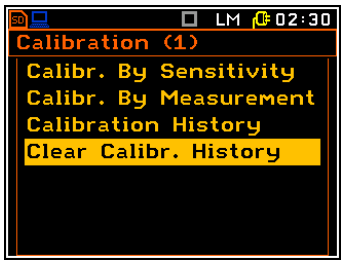


In the case when the calibration measurements were not performed, the **Calibration History** window does not contain any record. The content of this window is cleared after the **Clear Calibr. History** operation.



4.3.6. Clear calibration records - Clear Calibr. History

The user can clear all calibrations records. In order to do this the user has to choose the position **Clear Calibr. History** in the **Calibration** sub-list and press **<ENTER>**.

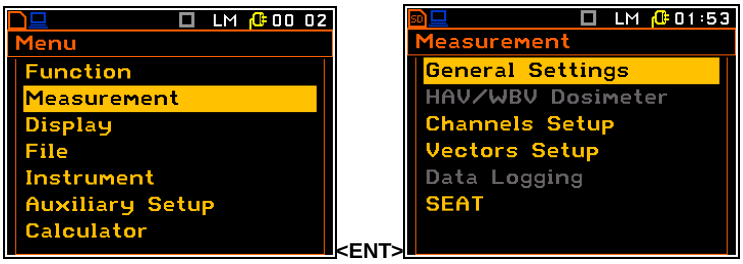


The instrument requests the confirmation of the operation. The next pressing of the **<ENTER>** push-button, when the **No** option is selected, causes the closing of the window and the return to the **Calibration** sub-list.

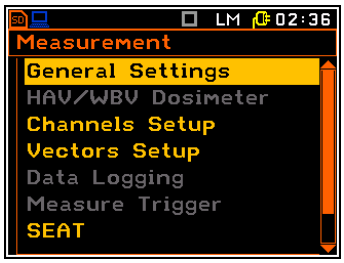
After **Clear Calibr. History** operation the **Calibration History** window does not contain any record.

5. MEASUREMENT PARAMETERS SETTING – Measurement

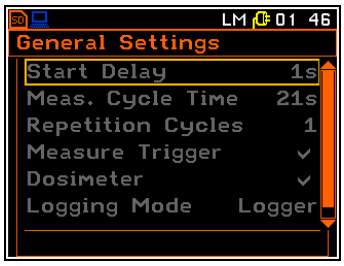
The **Measurement** list contains the elements, which enable one to programme the measurement parameters for all channels and profiles. The **Measurement** list appears after pressing the **<Menu>** push-button, selecting the **Measurement** text and pressing **<ENTER>**.



The **Measurement** list and some of sublist (**General Settings** and **Data Logging**) contents depend on **Instrument Mode** selection from menu **Auxiliary Setup**: **Simple Mode** or **Advanced Mode**. In **Advanced Mode** some additional functions like triggering, markers, event and wave recording appear.



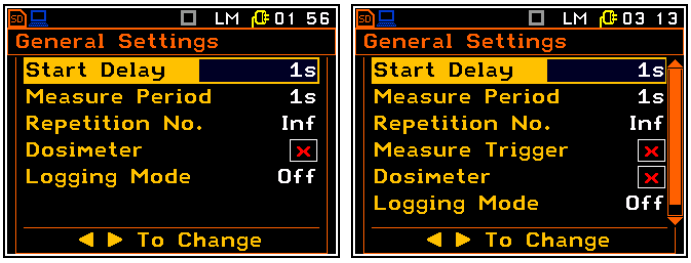
Notice: *Any parameter in the lists of the* ***Measurement*** *menu can be changed only when the instrument does not execute a measurement. The parameters are displayed with different colour and any marker movement is impossible. The blinking "play" icon indicates that the instrument is performing the measurements.*



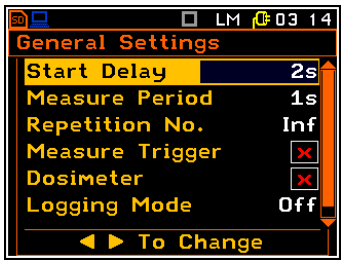
Notice: *The parameters can be presented in* ***Logarithm*** *(decibels) or* ***Linear*** *(m/s^2) units. It depends on the* ***Scale*** *position value (path: Menu / Display / Results Scale), e.g. 10 m/s^2 can be presented as 140 dB.*

5.1 Selection of measurement parameters - General Settings

The **General Settings** list consists of the following parameters: the delay of the start of measurements (**Start Delay**), the integration period (**Meas. Period**) and the repetition of the measurement cycles (**Repetition No.**). In **Advanced** menu mode there are three additional parameters: **Measure Trigger**, **Logging Mode** and **Event Recording**.



Setting time delay before the start of measurements

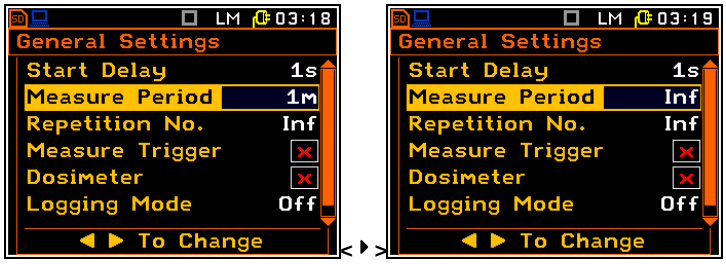


The **Start Delay** defines the delay period from the **<Start/Stop>** push-button pressing to the start of the measurements (the digital filters of the instrument analyse constantly the input signal even when the measurements are stopped). This delay period can be set from **0 second** to **60 seconds** (with 1 second step by means of the **< ◀ >**, **< ▶ >** push-buttons and with 10 seconds step with the **< ◀ >**, **< ▶ >** push-buttons pressed together with the **<Shift>** one.

Notice: *The minimum delay period is equal to 0 second. In the* ***Calibration*** *mode, the delay period is equal to 5 seconds.*

Setting the integration period

The **Measure Period** defines the period in which the signal is being averaged during the measurements. The definitions of the measurement results in which the integration period is used is given in App. D.



The required value of this parameter can be set in the range of:

- from **1 s** to **59 s** (with **1 second** or **10 seconds** step),

  from **1 m** (min) to **59 m** (with **1 minute** or **10 minutes** step),

- from **1 h** to **24 h** (with **1 hour** or **10 hours** step).

It is also possible to set **Inf** value. The **Inf** value denotes the infinite integration of the measurements (until the pressing the **<Start/Stop>** push-button or after receiving the remote control code).

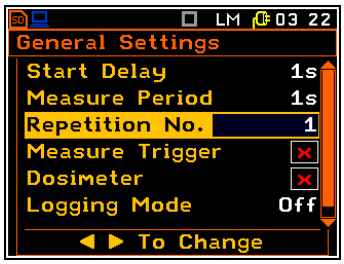
Additionally, the predefined periods: **1 m**, **5 m**, **15 m**, **1 h**, **8 h**, **24 h** and **Inf**, which are enumerated in the standards, are also available (by pressing the **< ◀ >** push-button or **< ◀ >** with **<Shift>**; these values are placed in the mentioned above sequence on the left in relation to **1 s**).

Notice: *In the case of switching on the* ***Auto Save*** *function, the minimum value of the integration period should be equal to 10 seconds.*

If the user wants to switch on **Auto Save** option *(path: Menu / File / Save Options)* the integration period value has to be greater or equal than 10 seconds. When **Auto Save** option was switched on and new entered integration period value is less than 10 seconds **Auto Save** option switches off and **Integration Period Too Short / Autosave Not Available** message appears on the display.

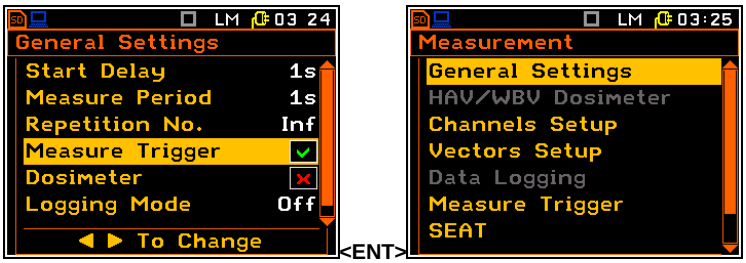
Setting the number of repetition of measurement cycles

The **Repetition No.** defines the number of cycles (with the measurement period defined in the **Meas. Period**), which should be performed by the instrument. The **Repetition No.** values are within the limits [1, 1000].



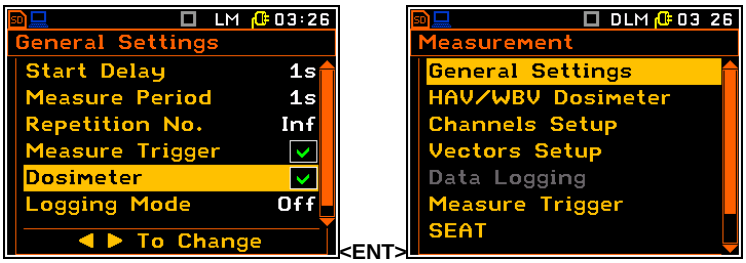
Activation of the measure trigger

The **Measure Trigger** position activates or deactivates the measure trigger function. This position doesn't appear in the **Simple Mode** (*path: <Menu> / Auxiliary Setup / Instrument Mode*). If the **Measure Trigger** function is switched off, then the **Measure Trigger** position in the **Measurement** list will be not active.



Activation of the dose meter function

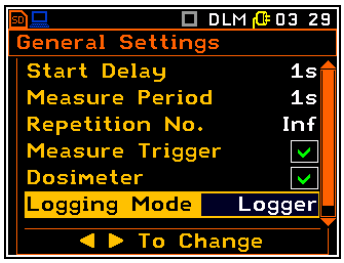
The **Dosimeter** position activates or deactivates the dose meter function. If the **Dosimeter** function is switched on, then all channels will be assigned for whole-body (**WBV**) or hand-arm (**HAV**) dose measurement.



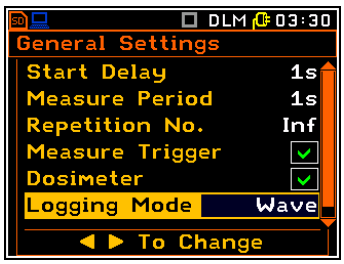
Dosimeter parameters can be setup in the **HAV/WBV Dosimeter** window, opened from the **Measurement** list. If the **Dosimeter** function is switched on, then the **HAV/WBV Dosimeter** position in the **Measurement** list will became active and **DLM**, **D1/1** or **D1/3** function abbreviations appear in the upper line.

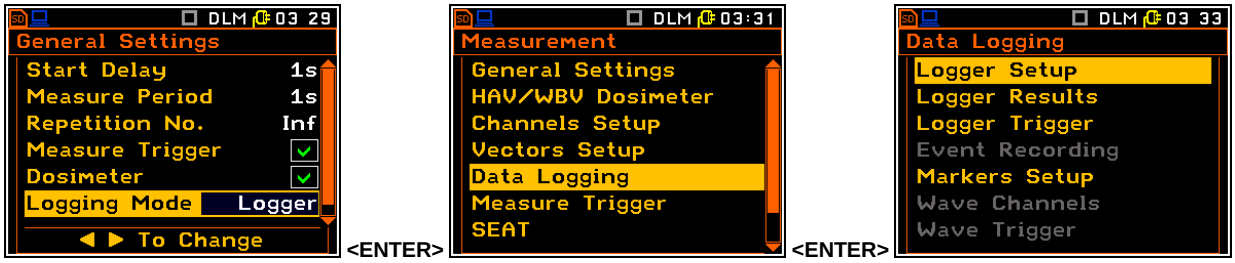
Setting the Logger mode

The **Logger Mode** position enables one to deactivate the logger function (**Off**) or to activate this function by choosing the logger mode (**Logger** or **Wave**). **Wave** option doesn't appear in the **Simple Mode** (*path: <Menu> / Auxiliary Setup / Instrument Mode*). In case the **Logger** is selected the history of results will be saved in the logger file.

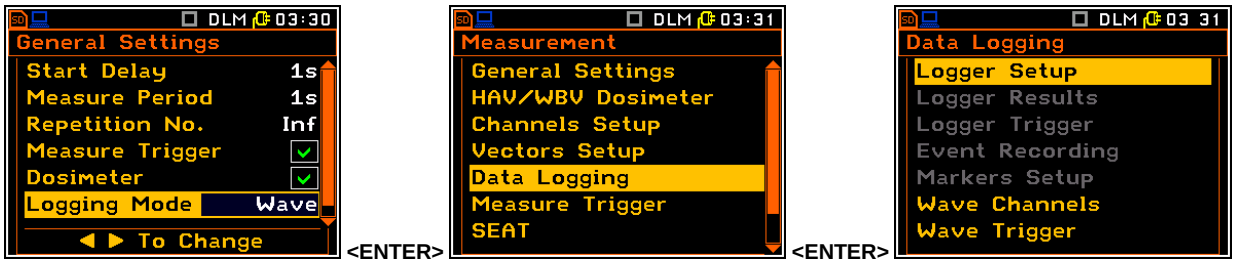


In case the **Wave** is selected the wave signals for the channels, selected in the window **Wave Channels**, will be recorded in the logger file. The file name is defining in the **Logger Setup** window and for history results will have predefined name **&LOG#**, and for wave recording - **&REC#**. Depending on what parameter of **Logger Mode** was chosen some positions in the **Measurement** and **Data Logging** lists are not active.





Data Logging screen view when Logger mode is switched on

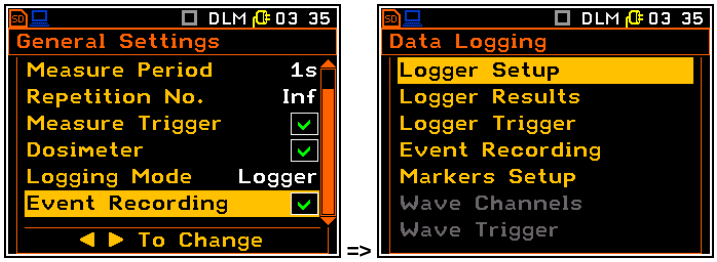


Data Logging screen view when Wave mode is switched on

Activation of the event recording function

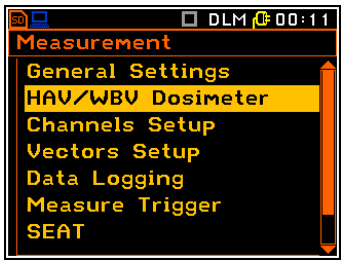
The **Event Recording** position enables one to activate the event recording function. This position doesn't appear in the **Simple Mode** (*path: <Menu> / Auxiliary Setup / Instrument Mode*).

If the **Event Recording** function is switched off, then the **Event Recording** position in the **Data Logging** list will be not active.



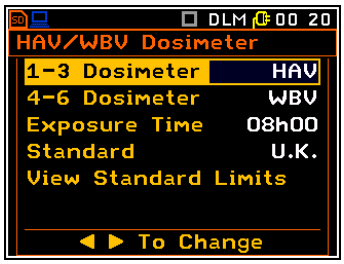
5.2 Setting the parameters for dose measurements – HAV/WBV Dosimeter

The **HAV/WBV Dosimeter** list is opening from the **Measurement** menu. This list enables one to set up the parameters for dose measurements, like: exposition period, type of measurement (whole body or hand arm), performed in channels 1-3 and 4-6, limits, used for some standards (**U.K.**, **Italy**, **Poland**, **France** and **Germany**), as well as limits, defined by the user (**User**).



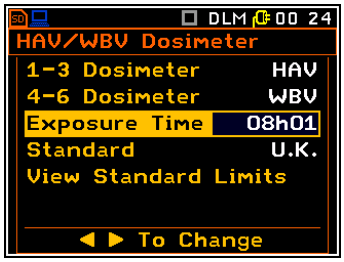
Setting the measurement type for channels 1-3 and 4-6

Positions **1-3 Dosimeter** and **4-6 Dosimeter** enable the user to set the desired type of the measurement, performed with the use of channels 1,2,3 and 4,5,6 – hand-arm (**HAV**) or whole-body (**WBV**) vibration.



Setting the exposure time

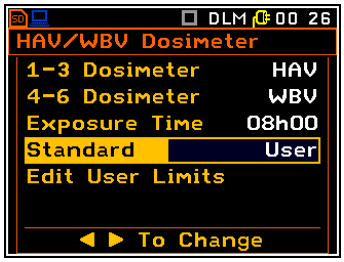
The **Exposure Time** enables the user to set the desired value of the exposure time that is used for the calculation **HAV/WBV Dose** results. The **Exposure Time** values are within the range [**00h01**, **24h00**].



Setting the standard for dose measurements

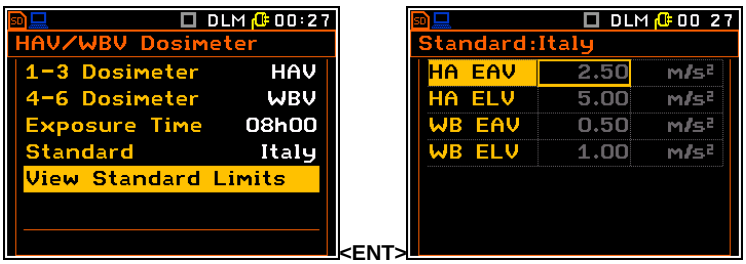
The **Standard** position enables the user to set the standards for the measurements of the **HAV/WBV Dosimeter**. The available values of this position are **U.K.**, **Italy**, **Poland**, **France**, **Germany** and **User**.

Depending of settings in the position **Standard** it is possible to view (**U.K.**, **Italy**, **Poland**, **French**, **Germany**) or edit (**User**) limits for dose calculation.

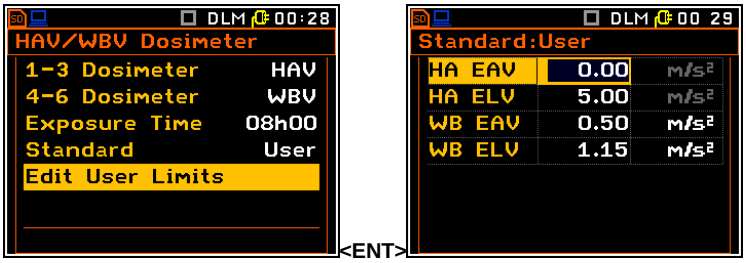


View or edition of the limits for dose calculation

The **View Standard Limits** position opens the window with the coefficients for the selected standard.

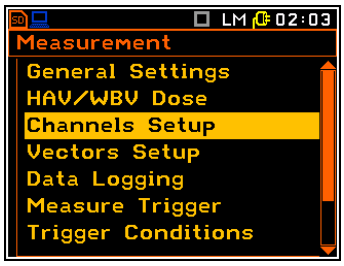


When the **User** is selected in the **Standard** position then the **Edit User Limits** position appears on the screen where the user can set up its own coefficients.



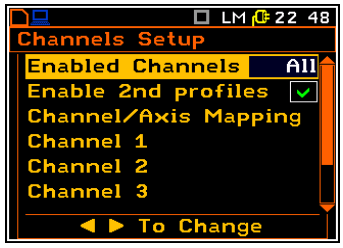
5.3 Setting parameters in a channels – Channels Setup

The **Channel x** position enables the user to assign the axis of three-axial accelerometer for the specific channels, switch on or off channels or second profiles, and to program the channels parameters as: transducer type (**Type**) and weighting filter (**Filter**). The measurement range cannot be changed and is displayed only for information purpose. The **Channels Setup** list is opened from the **Measurement** list.



Notice: *The change of the profile parameters is not possible when the measurement is performed. The user has to finish the current measurement.*

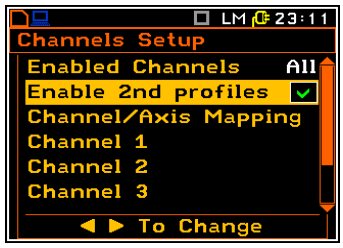
Activation of channels



The first two positions enable one to switch on or off some channels and the second profile from the calculation process.

In the **Enabled Channels** the user may select **All**, **1-3** or **4-6** channels to be active during measurement. Other channels will be disabled and will not be displayed.

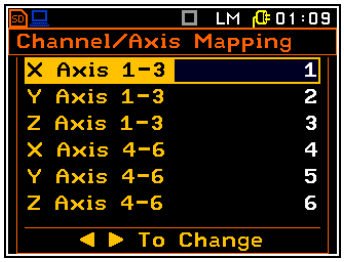
Activation of second profiles



In the **Enabled 2nd profiles** the user may switch on or off result calculations for the second profiles.

If second profiles are switched off, there will no be calculations performed and displayed in different presentation modes and all positions with settings for second profiles will be not active.

5.3.1 Assignment channels for the accelerometer axis - Channel/Axis Mapping



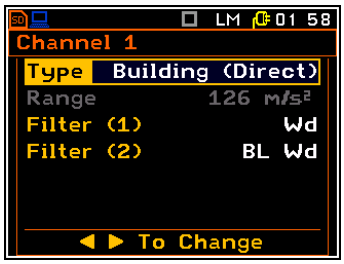
The **Channel/Axis Mapping** position enables one to assign channels to the transducer's axis. The user can assign channels **1**,**2**,**3** to the axis X, Y, Z of the first transducer, connected to the Lemo compatible sockets type ENB.0B.304 for **Channels 1–3** and channels **4**,**5**,**6** to the axis X, Y, Z of the second transducer, connected to the Lemo compatible sockets type ENB.0B.304 for **Channels 4-6**.

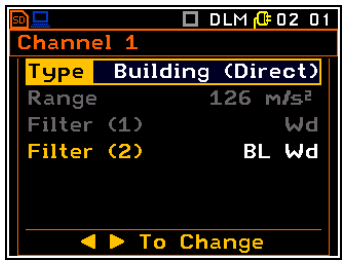
If same channel is assigned to the more than one axis there will be error detected and the user will be proposed to reassign the channels.

5.3.2 Setting parameters for channels – Channel x

The **Channel x** positions enable one to set up or display parameters for the individual channel, like input type and filters for profiles.

If Dosimeter is active the first profile filter is set by default and it cannot be changed. When second profile is switched off the filter for second profile doesn't appear as parameter in the list.

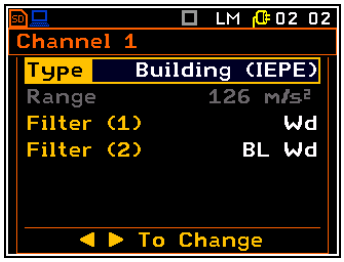




Input type and range selection

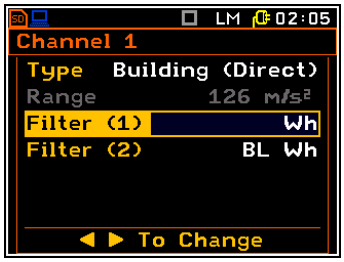
The following inputs are available: **IEPE** and **Direct**.

The **Range** value cannot be changed; it always depends on the filter type and calibration factor. If calibration factor is equal to zero the range is equal to **126 m/s^2**. .

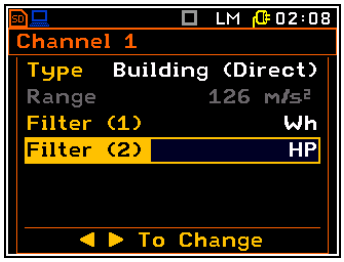


Weighting filter selection

The following weighting filters are available for the first profile of the instrument: **Wh**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wg**, **Wb** and **Wf**. The characteristics of the filters are given in App. D.



The set of filters for the profile two is depending of the filter selected for profile one. There is always available filter **HP**. Second available filter for profile 2 is one of: **BL Wh**, **BL Wk**, **BL Wd**, **BL Wc**, **BL Wj**, **BL Wm**, **BL Wg**, **BL Wb** and **BL Wf**; according to the rule – if **Wh** filter is selected in the profile 1 then the apart of **HP** only **BL Wh** filter is available for profile 2. If **Wk** filter is selected in the profile 1 then the apart of **HP** only **BL Wk**, filter is available or profile 2. And so on.



When **Dosimeter** function is active the filters for first profiles are predefined and depend on type of dosimeter measurements for the channels – **WBV** or **HAV**.

If **WBV** measurements are performed in channels **1-3** or **4-6** the filters defined for channels are as follows:

Channel 1 or 4: **Wd**, Channel 2 or 5: **Wd**, Channel 3 or 6: **Wk**.

If **HAV** measurements are performed in channels **1-3** or **4-6** the filters defined for channels are as follows:

Channel 1 or 4: **Wh**, Channel 2 or 5: **Wh**, Channel 3 or 6: **Wh**.

If second profile is active during **Dosimeter** measurements, the filter can be **HP** or one of from **BL Wd**, **BL Wk** or **BL Wh** depending on what filter was predefined for the first profile of the chosen channel, according to the rule described above.

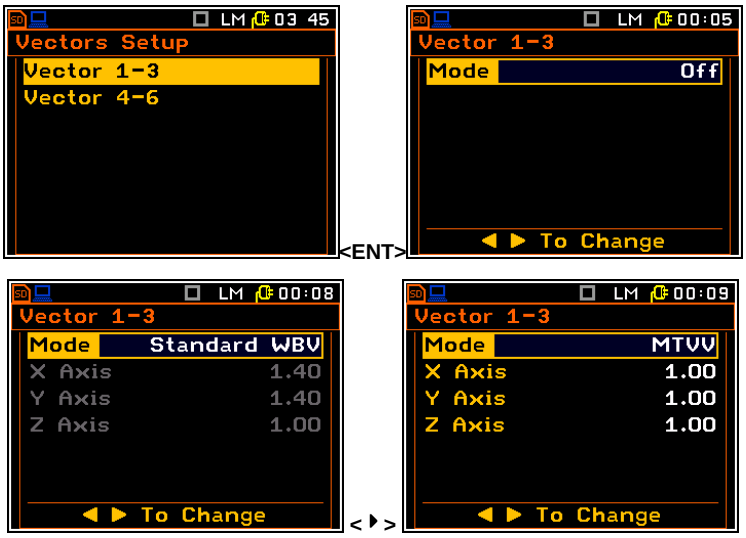
RMS detector

In the instrument the **only one 1.0s** RMS detectors is available.

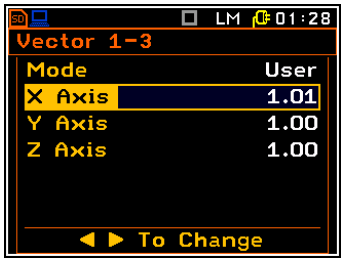
5.4 Setting the vector parameters – Vector Setup

The **Vector Setup** position enables the user to select the coefficients to calculate the vector for channels 1, 2, 3 and 4, 5, 6.

Vector is calculated based on different set of coefficients for three axis (X, Y, Z), which may be selected in the position **Mode**: for hand-arm measurements (**Standard H-A**), for whole body measurements (**Standard WBV**), for measurements with user defined coefficients (**User**) and for MTVV measurements (**MTVV**). For **Standard H-A** and **Standard WBV** modes coefficients are predefined. For **User** and **MTVV** modes it is possible to define coefficients for vector calculation.



When the user needs to calculate vector with other than standard coefficients, it is possible to select the coefficient within the values from **0.00** to **2.00**.



The values presented above are taken into account during the calculations of the measurement results. **VECTOR** is calculated according to the formulae:

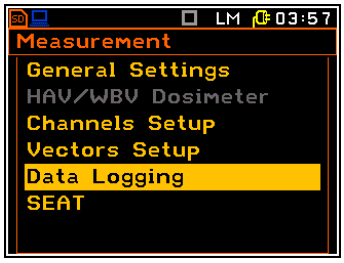
$$VECTOR = \sqrt{k_1^2 x_1^2 + k_2^2 x_2^2 + k_3^2 x_3^2}$$

Where k_1, k_2 and k_3 are the coefficients and x_1, x_2 and x_3 are RMS results for different channels. It is important that the user should choose only coefficients corresponding with the proper channels.

5.5 Setting of the logging functionality – Data Logging

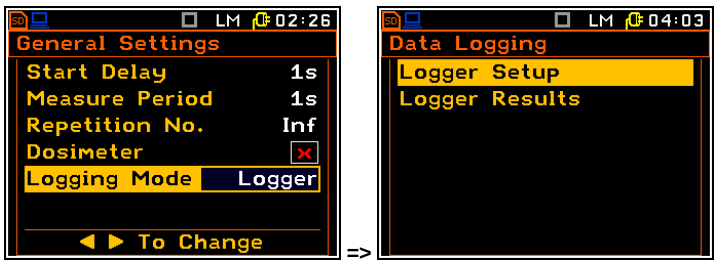
The **Data Logging** list enables one to program the logger functions – history of results measurements, events and wave recording for all six channels.

The **Data Logging** list content depends on **Instrument Mode** selection from menu **Auxiliary Setup**: **Simple Mode** or **Advanced Mode**. In **Advanced Mode** appear some additional functions like triggering, markers, event and wave recording.



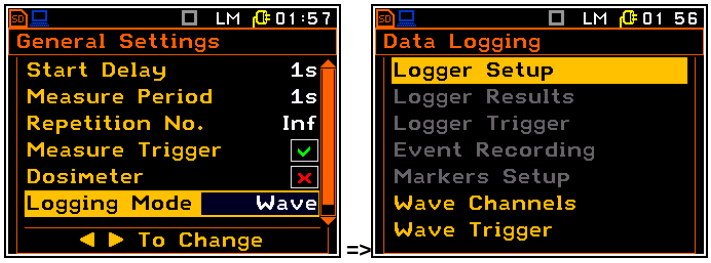
Depending on **Logging Mode** (**Logger** or **Wave**), set up in the **General Settings** list the **Data Logging** window will have different view.

This is an example of **Data Logging** window in **Simple Mode** and **Logging Mode** = **Logger**.



Wave recording is enabled only in advanced instrument mode.

When **Wave** function is chosen for the **Logging Mode**, the **Data Logging** list consists of three active positions: **Logger Setup**, **Wave Channels** and **Wave Trigger**.



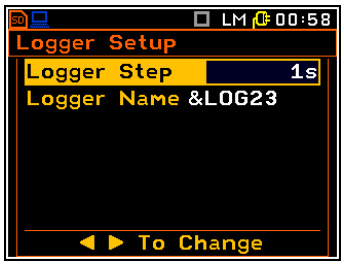
5.6 The results history logging

When **Logger** function is chosen for the **Logging Mode**, the **Data Logging** list enables one to program saving the history of results in the logger file.

Depending on the **Instrument Mode**, the **Data Logging** list consists of two positions in case of **Simple Mode**: **Logger Setup**, **Logger Results**; or consists of four to five active positions in case of **Advanced Mode**: **Logger Setup**, **Logger Results**, **Logger Trigger**, **Event Recording** (which in turn is active when **Event Recording** position in the **General Settings** list would be active) and **Marker Setup**.

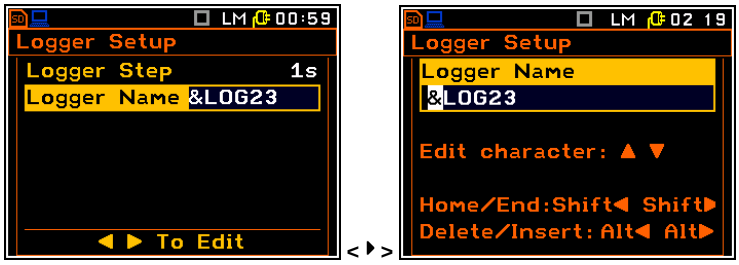
5.6.1 Data logger programming – Logger Setup

The **Logger Setup** list enables the user to edit the name of the logger file (history of results measurements or wave records) and to set other general parameters. Depending on what **Logging Mode** was selected (**Logger** or **Wave**) in **General Settings** window, the **Logger Setup** window has different view.



When **Logger** mode was selected apart from logger file name the user may define the interval of the data logging in a file (**Logger Step**). The **Logger Step** can be set from 100 milliseconds to 1 hour.

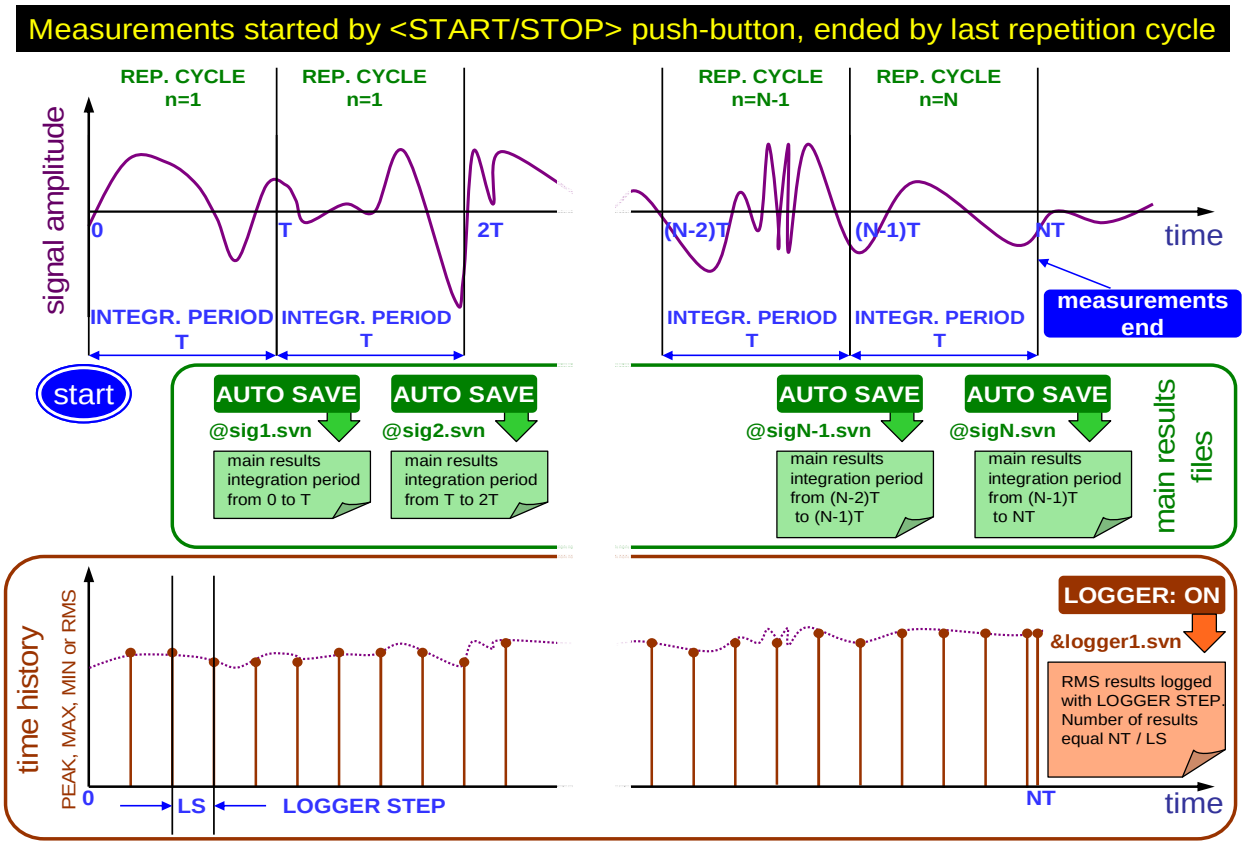
The **Logger Name** enables the user to name the logger file. The default one is **LOG#** for **Logger** files and **&REC#** for **Wave** files. The name cannot be longer than eight characters. After pressing the **<◀>**, **<▶>** push-buttons, the special window with text editor function is opening.



The edited name is accepted and the file is saved after pressing the **<ENTER>** push-button. The special warning is displayed in the case the file with the edited name already exists in the memory. The instrument waits then for a reaction of the user (any push-button should be pressed except the **<Shift>** or the **<Alt>** one).

The main measurement results (cf. App. B) are calculated in the period set on in the **Meas. Period**. These results can be saved in the result files in the instrument's or external memory. In the case the **Meas. Period** is greater than 9 seconds, it can be done also by means of the **Auto Save** operation. In case the **Repetition No.** is greater than one, the **Auto Save** operation will be performed after the period set on in the **Meas. Period**. The name of the file with the main results is increased by one after each saving.

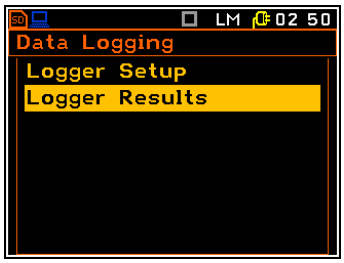
In the same, when the **Logger Mode** is switched on (**On**), the partial measurement results are calculated in the period set on in the **Logger Step**. Up to 60 results can be logged simultaneously from all channels and profiles of the instrument (**PEAK** / **P–P**/ **MAX** / **RMS** / **VDV**) and two vectors (**VEC13** and **VEC46**) with time step down to 100 ms. These results are saved in one logger file. The name of the file is set on in the **Logger Name** position. The registration in the logger's memory is stopped after the period, which is equal to **Meas. Period** multiplied by **Repetition No.**, after pressing the **<Start/Stop>** push-button or after stopping the measurements remotely.

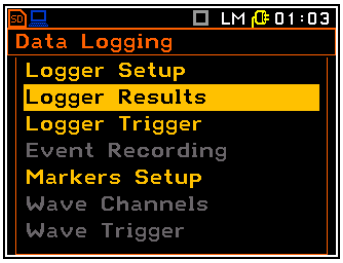


Relations between Measurement Cycle (Integration Period) and Logger Step

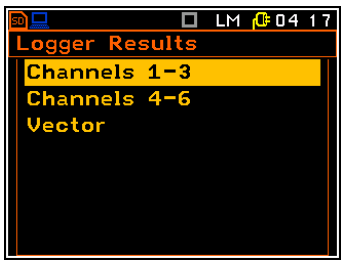
5.6.2 Results selection – Logger Results

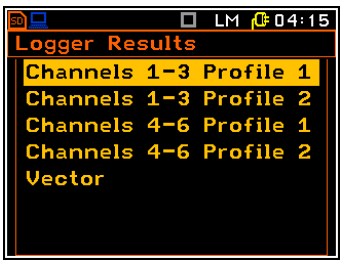
The **Logger Results** list enables the user to activate the results for all channels and profiles (**Channel x Profile x**) and for vectors (**Vector**) for recording their history in the logger file.



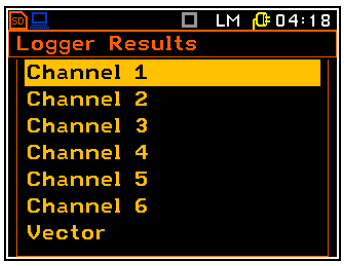


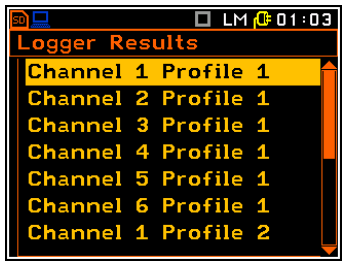
The view of the **Logger Results** list depends on the settings of the **Enabled Channels** and **Enabled 2nd profiles** parameters (*path: <Menu> / Measurement / Channels Setup*).





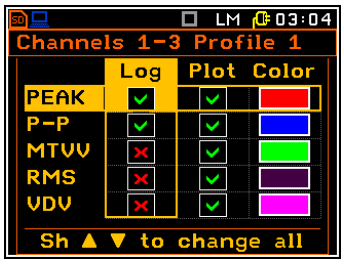
In **Advanced Mode** it is possible to define logger results for each channel and profile individually.





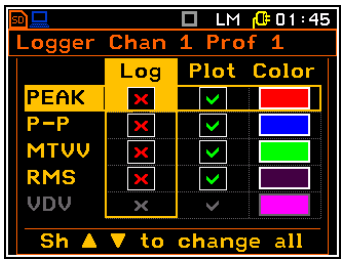
Selection results for channels and profiles

Depending on **Instrument Mode** and **Enable 2nd profiles** parameter the user may activate the results for channels and profiles (**PEAK**, **P-P**, **MAX**, **RMS** and **VDV**), which will be recorded to the logger file (column **Log**), activate plot (column **Plot**) and select its colour (column **Color**) in the windows with names: **Channels x-y / Channels x-y Profile z / Channel x / Channel x Profile y**.

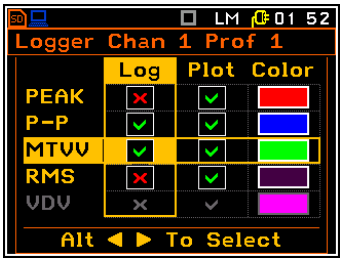


The **VDV** history will not be recorded if **Wh** filer is chosen in this profile.

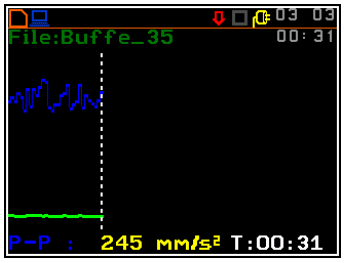
Activation / deactivation can be done by means of the **<◀>**, **<▶>** push-buttons pressed together with the **<Shift>** one. The position is changed by means of **<◀>**, **<▶>** and **<▲>**, **<▼>** push-buttons.



Example display of Logger with two selected results.

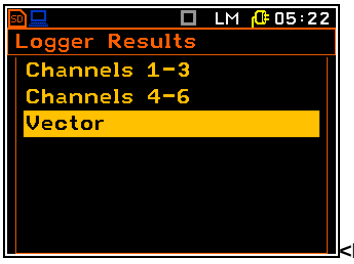


=>

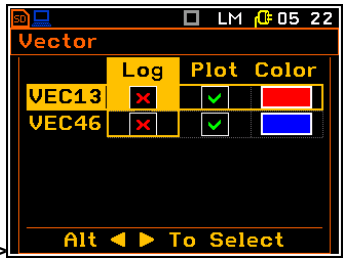


Selection vectors for logging

The **Vector** list enables the user to activate the vectors (**VEC13** and **VEC46**), which will be recorded to the logger file, activate plot and select its color.



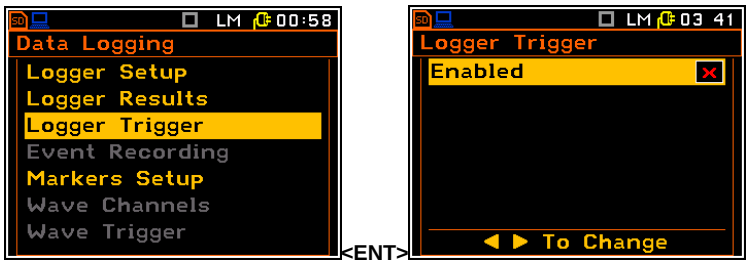
<ENT>



5.6.3 Logger trigger parameters setup – Logger Trigger

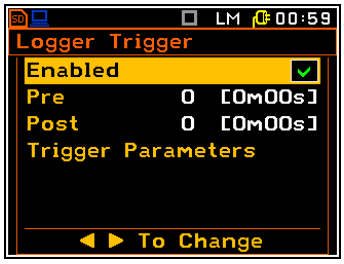
The **Logger Trigger** position appears only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

The **Logger Trigger** parameters influence the way the measurement results are saved in the logger. The **Logger Trigger** switches on the result logging.



The logger triggering of the measurements (**Enabled**) can be switched on with the **< ▶ >** push-button.

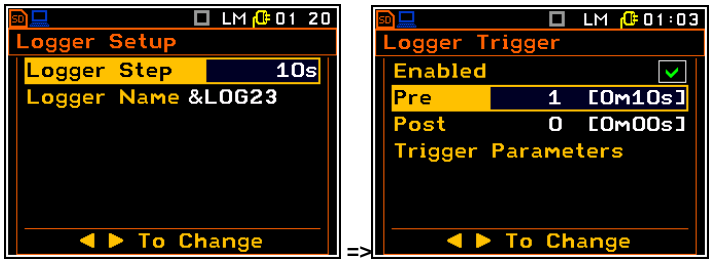
In this sub-list the triggering of logger can be switched off or on (**Enabled**), the parameters of the triggering signal determined (**Trigger Parameters**), the number of the results saved in the logger before the fulfilment of the triggering condition (**Pre**) and the number of the results saved in the logger after the fulfilment of the triggering condition (**Post**) be select. If the triggering condition is fulfilled, the logger contains:



- the measurement results registered directly before the fulfilment of the triggering condition; time of the registration can be calculated by multiplying the value set in the **Pre** by the time period taken from the **Logger Step** (*path: Menu / Measurement / Data Logging / Logger Setup*);
- all measurement results up to the moment the triggering condition disappears;
- the results registered directly after the moment the triggering condition disappears; time of the registration can be calculated by multiplying the value set in the **Post** position by the time period taken from the **Logger Step** position (*path: Menu / Measurement / Data Logging / Logger Setup*).

Pre and post trigger registration

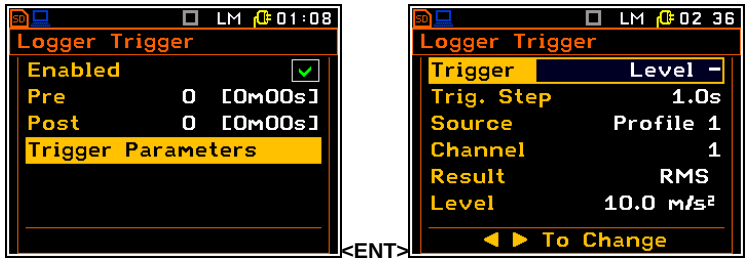
In the **Pre**/**Post** line the number of the results registered in the logger's file before/after the fulfilment of the triggering condition can be set. This number is within the limit 0..20 for **Pre** trigger and 0..200 for **Post** trigger.



Trigger parameters setting

The position **Trigger Parameters** enables to define the parameters of the triggering signal. To open this position one should select it and press **<ENTER>** push-button.

The **Trigger** position enables one to select the trigger type: **Level -**, **Level +**, **Slope -**, **Slope +**, **Gradient -** and **Gradient +**.



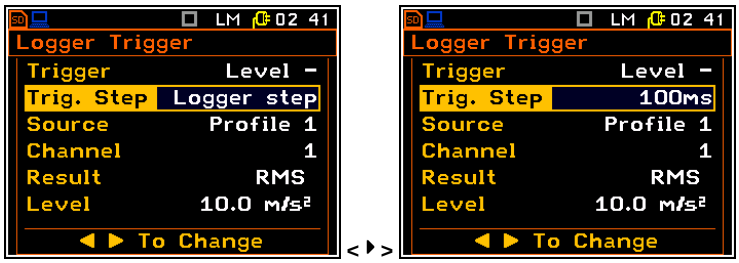
In each **Trig. Step** of the measurement the triggering condition is checked and:

- in the case of **Level +** is selected, the triggering condition is fulfilled only when the **Source** has the greater value than this determined in the **Level** position and in the other cases the triggering condition is not fulfilled.

- in the case of **Level –** is selected, the triggering condition is fulfilled only when the **Source** has the lower value than this determined in the **Level** position and in the other cases the triggering condition is not fulfilled.
- in the case of **Slope +** is selected, the triggering condition is fulfilled only when the arising value of the **Source** is passing the level determined by the **Level** parameter.
- in the case of **Slope –** is selected, the triggering condition is fulfilled only when the falling down value of the **Source** is passing the level determined by the **Level** parameter.
- in the case of **Gradient +** is selected, the triggering condition is fulfilled only when the signal has the greater level than this determined in the **Level** and the gradient of the signal is greater than this determined in the **Gradient** position. In the other cases the triggering condition is not fulfilled.
- in the case of **Gradient -** is selected, the triggering condition is fulfilled only when the signal has the lower level than this determined in the **Level** and the gradient of the signal is lower than this determined in the **Gradient** position. In the other cases the triggering condition is not fulfilled.

Step for checking the triggering condition

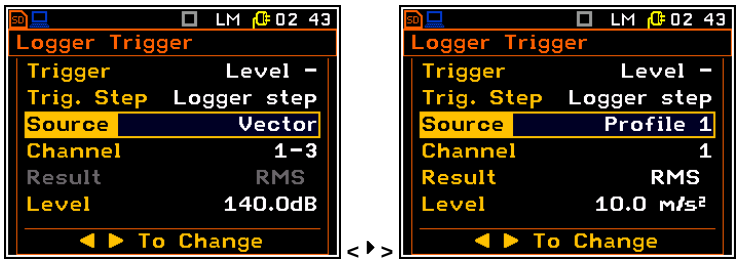
The **Trig. Step** position enables one to select integration time for condition evaluation: **Logger step**, **100ms**, **1.0s**, **Meas. Time** and **Meas. Period**.



Source for triggering condition and channel of triggering signal

The **Source** position enables one to select the type of source for triggering condition calculation: **Vector** or **Profile 1**.

The **Channel** position enables one to select the channel of triggering source. Depending on value of the **Source** parameter, the value of **Channel** will be different.



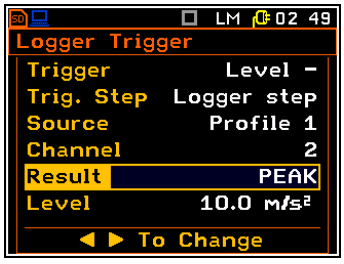
Function for triggering condition definition and threshold

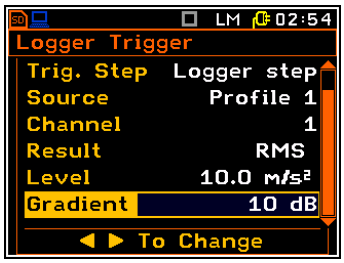
The **Result** position enables one to select the function for triggering condition: **PEAK**, **P-P**, **MAX**, **MIN**, **RMS** or **VDV**. When **Vector** is selected as a **Source** the only one function is available – **RMS**.

The **Level** position enables one to select the value of threshold for triggering condition. The level of the triggering source can be set in a range from **60 dB** to **200 dB** or from **1.00 mm/s^2** to **10.0 km/s^2**, depending on what scale type was selected in the **Scal**e position (*path: <Menu> / Display / Results Scale*).

Speed of the triggering signal change

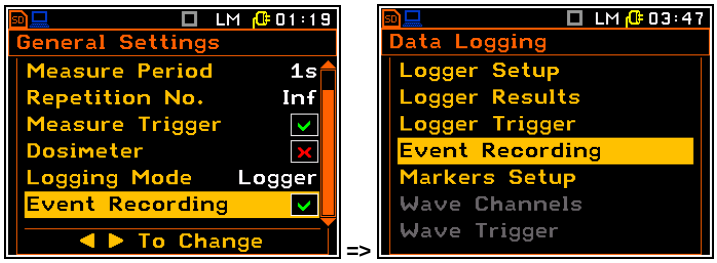
This position appears when the **Gradient -** or **Gradient +** trigger is chosen. The speed of the triggering signal changes (**Gradient**) can be set from **1 dB** to **100 dB** range. Speed is defined as **dB** per **Logger Step**.





5.6.4 Event recording setup – Event Recording

The **Event Recording** position appears only in **Advanced Mode** (*path: <Menu> / Auxiliary Setup / Instrument Mode*) and became active after **Event Recording** parameter in the **General Settings** list was switched on.

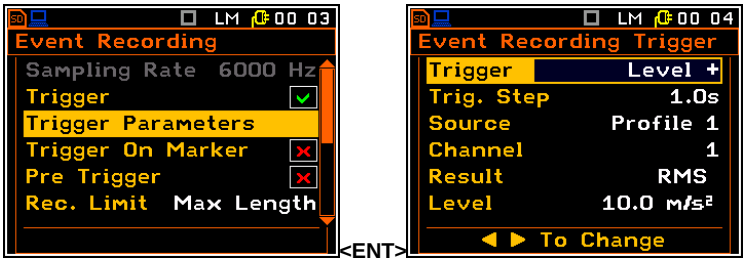


The **Event Recording** enables the user to activate and to set the parameters of event signal recording in the same logger file as for results history.

The **Sampling Rate** position displays the sampling frequency of event recording – **6000 Hz**.

When **Trigger** position is selected then event recording will start by trigger.

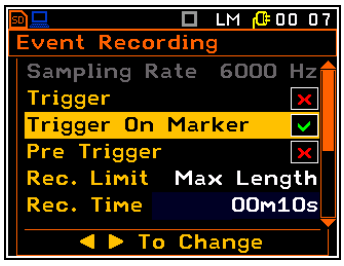
Trigger condition is set up in the window, opened by position **Trigger Parameters**. This position appears in the list after activation the **Trigger**.



When **Trigger On Marker** position is selected then event recording will start by the marker, initiated by the user. Markers for triggering are defined in the **Markers Setup** window.

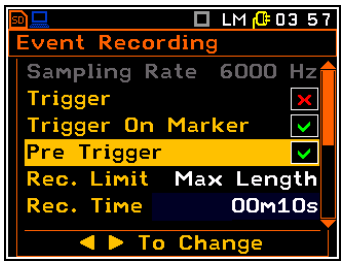
When **Trigger** and **Trigger On Marker** event recording are chosen then event recording will start when one of these triggering conditions are fulfilled.

When **Trigger** or **Trigger On Marker** event recording is chosen then additional positions appears. These positions enable one to programme additional parameters for the event recording.



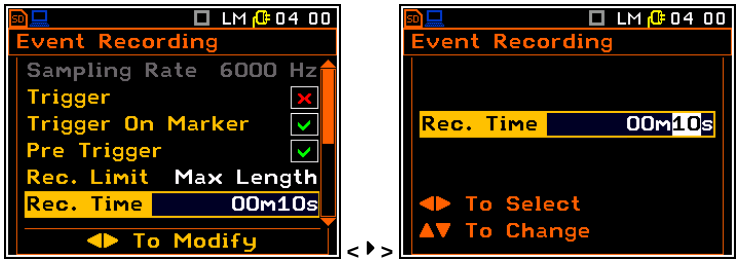
When **Pre Trigger** position is switched on then the signal is recorded before the triggering condition with interval, defined by the position **Pre** of the **Logger Trigger** window (*path: <Menu> / Measurement / Data Logging*).

In the **Rec. Limit** position it is possible to select the time of event signal recording after triggering. If the triggering condition appears then the signal will be recording during the period defined in **Rec. Time**. The available values of **Rec. Limit** are: **Max Length**, **Fixed Len.** or **Off**.

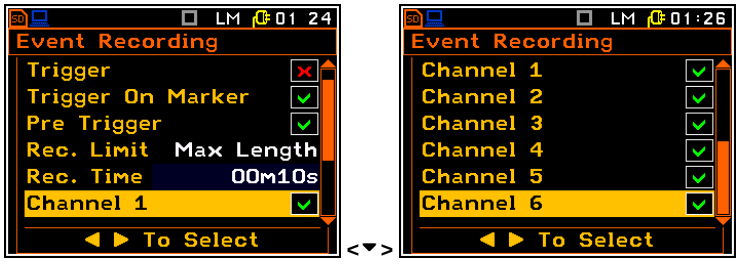


When **Off** is chosen then the event signal will be recording as long as memory was filled or until the trigger condition was ceased. When **Max Length** is chosen then the signal will be recording during period defined in the **Rec. Time**, but can be stopped earlier if trigger condition was ceased. When **Fixed Len.** is chosen then the signal will be recording during period defined in the **Rec. Time**, even when trigger condition ceased.

In the **Rec. Time** position it is possible to select the time of signal recording after triggering. If next triggering condition appears then the signal will be recording additional **Rec. Time**.



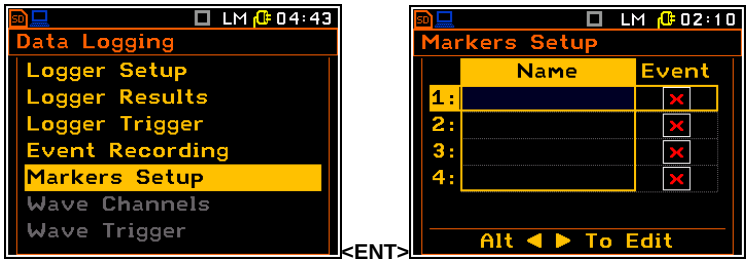
The **Channel x** positions switch on or off the channels for event recording.



5.6.5 The marker setup – Marker Setup

The **Marker Setup** position appears only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

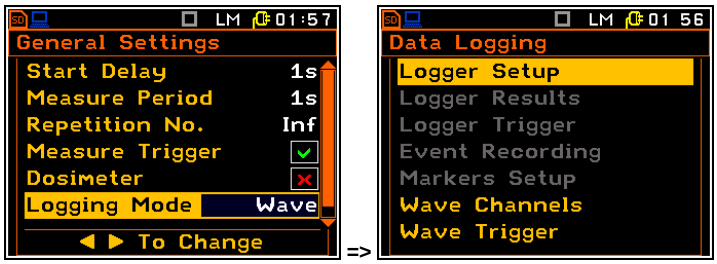
The **Marker Setup** enables the user to assign the name for each marker and define markers for event recording.



5.7 Wave recording

All positions connected with wave recording in **Data Logging** list appear only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

When **Wave** function is chosen for the **Logging Mode**, the **Data Logging** list consists of three active positions: **Logger Setup**, **Wave Channels** and **Wave Trigger**.

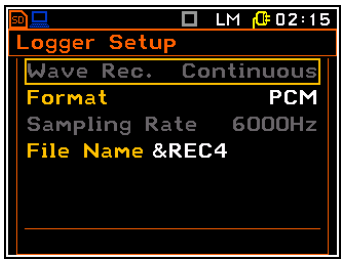


Setting-up the Wave recorder function

The **Logger Setup** list enables the user to edit the name of the logger file (history of results measurements or wave records) and to set other general parameters.

The **Wave Rec.** position is not active. It only informs about the used type of wave recording: **Continuous**.

The user may define the format of the wave file header (**Format**). Format of the wave file header may be **PCM** or **Extensible**.

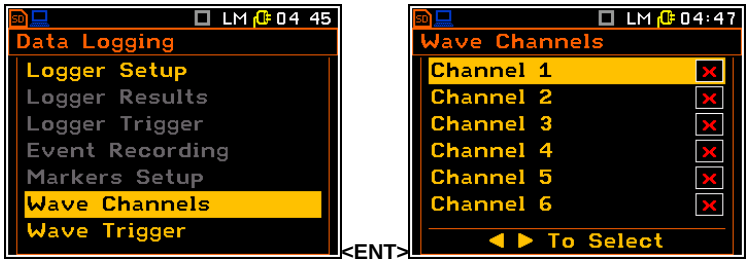


The **Sampling Rate** position is not active. It only informs about the used sampling rate: **6000Hz**.

Selecting the channels for Wave recording

The **Wave Channels** position appears only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

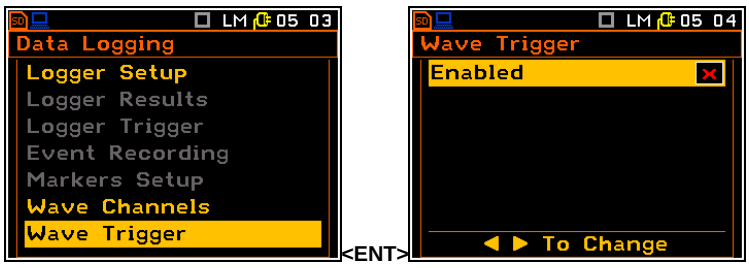
The **Channel x** positions enable the user to select the channels which signal will be recorded.



Wave recorder trigger setup

The **Wave Trigger** position appears only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

The **Wave Trigger** enables the user to activate and programme the wave recorder trigger.

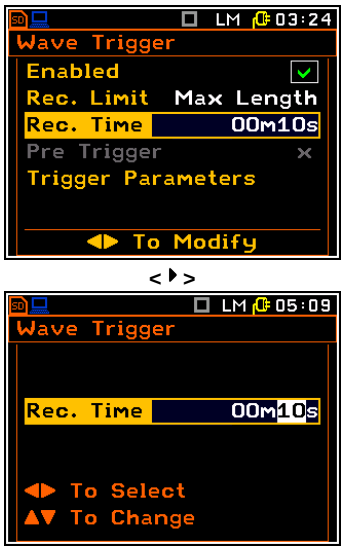


The position **Enabled** switches on/off the **Wave Trigger**.

In the **Rec. Limit** position it is possible to select the time of signal recording after triggering. If the triggering condition appears then the signal will be recording during the period defined in **Rec. Time**. The available values of **Rec. Limit** are: **Max Length**, **Fixed Len.** or **Off**.

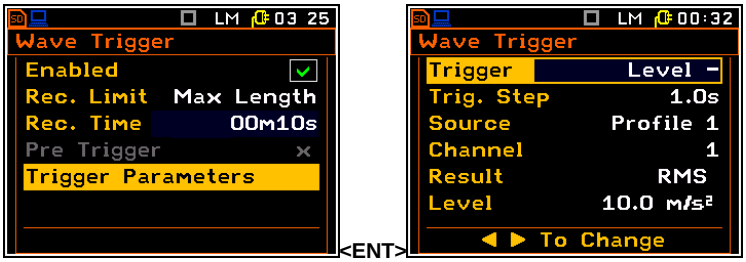
When **Off** is chosen then the event signal will be recording as long as memory was filled or until the trigger condition was ceased. When **Max Length** is chosen then the signal will be recording during period defined in the **Rec. Time**, but can be stopped earlier if trigger condition was ceased. When **Fixed Len.** is chosen then the signal will be recording during period defined in the **Rec. Time**, even when trigger condition ceased.

In the **Rec. Time** position it is possible to select the time of event signal recording after triggering. If next triggering condition appears then the signal will be recording additional **Rec. Time**.



The position **Trigger Parameters** enables to define the parameters of the triggering signal. To open this position one should select it and press **<ENTER>** push-button.

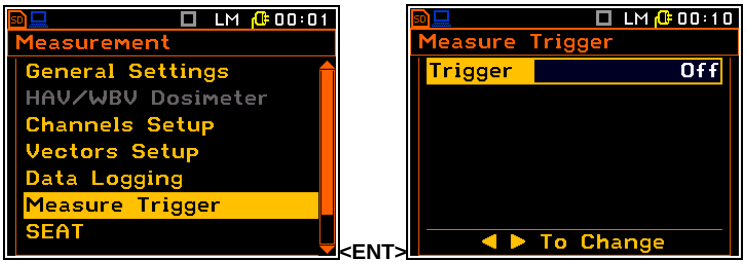
The **Trigger Parameters** window and meaning of all positions is identical as for **Logger Trigger** case.



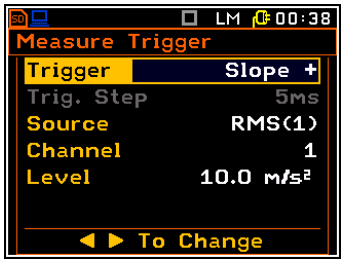
5.8 Measure triggering parameters selection – Measure Trigger

The **Measure Trigger** position appears only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

The **Measure Trigger** sub-list enables the user to set the parameters for triggering the measurement.



The **Measure Trigger** is a contexts sub-list in which the triggering can be switched off or on (**Trigger**), in the case when on - the source of the triggering signal can be determined (**Source**), channel of source signal (**Channel**), its level (**Level**) and sometimes also the speed of changes (**Gradient**). If **RTC** is selected as trigger type, start time (**RTC Start**) and repetition of triggering (**Repeat Every**) is defined.

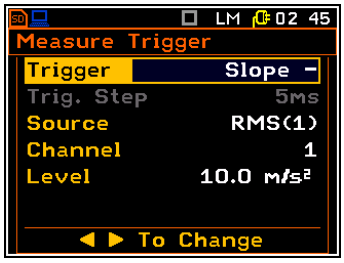


Switching the triggering on and off

The triggering of the measurements (**Trigger**) can be switched off using the **<◄ >** push-buttons.

The triggering is switched on if one of its six modes is selected: **Slope +**, **Slope –**, **Level +**, **Level –**, **Grad +** or **RTC**. If the instrument works with the triggering switched on, the appropriate icon appears on the display in the case when the triggering condition was not fulfilled. The triggering condition is checked every 0,5 seconds.

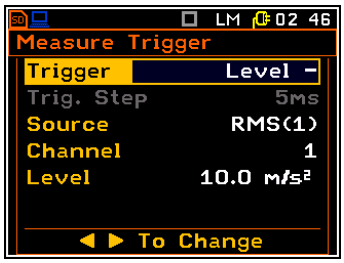
Switching the triggering by means of measured result - Slope/Level/Grad



In the case when the **Slope +** is selected, the measurement starts when the arising result value (**Source**) will pass the level determined in the **Level** position. In the case when the **Slope –** is selected, the measurement starts when the falling down result value (**Source**) will pass the level determined in the **Level** position.

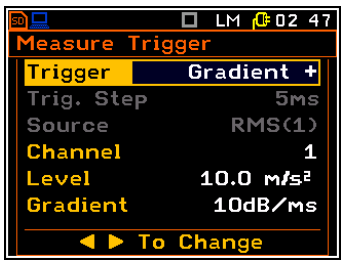
The measurement is stopped when the conditions set in the **General Settings** sub-list are fulfilled, after pressing the **<Start/Stop>** push-button or after receiving the proper control code remotely.

The next sources of the triggering signal are available: **RMS(1)**, **VEC46**, **VEC13** or **External**. **External** source means that the triggering will take place from the positive, or negative slope of the signal on the input/output socket (**I/O**).



In the case when the **Level +** or **Level –** is selected, every 5 millisecond the triggering condition is checked and the measurement is registered only when the result value (**Source**) has the greater / lower level than this determined in the **Level** position and in the other case the measurement result is skipped.

The next sources of the triggering signal are available: **RMS(1)**, **VEC46** or **VEC13**.



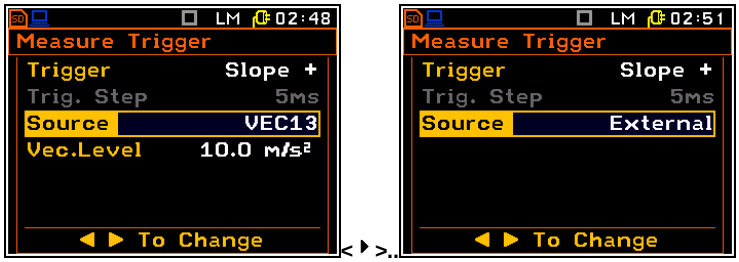
In the case when the **Gradient +** is selected, every 5 millisecond the triggering condition is checked and the measurement is registered only when the result value (**Source**) has the greater level than this determined in the **Level** position and the gradient of the signal is greater than this determined in the **Gradient** position. In the other case the measurement result is skipped. The only one sources of the triggering signal is available: **RMS(1)**.

Checking the triggering condition

The triggering condition is checked every 5 millisecond. The position **Trig. Step** informs this.

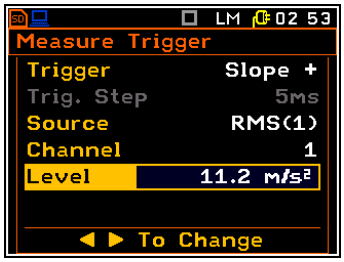
Selection of the triggering signal

The user can select several sources of the: vectors (**VEC13** and **VEC46**), RMS of the first profile (**RMS(1)**) and external signal of the I/O socket (**External**).



Setting the channel of the triggering signal

The **Channel** parameter denotes the channel of the triggering signal.

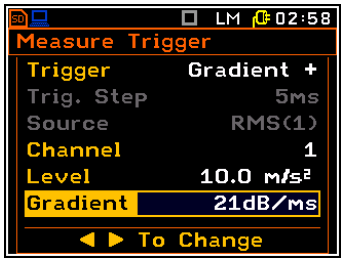


Setting the level of the triggering signal

The **Level** position enables one to select the value of threshold for triggering condition. The level of the triggering source can be set in a range from **60 dB** to **200 dB** or from **1.00 mm/s^2** to **10.0 km/s^2**, depending on what scale type was selected in the **Scal**e position (*path: <Menu> / Display / Results Scale*).

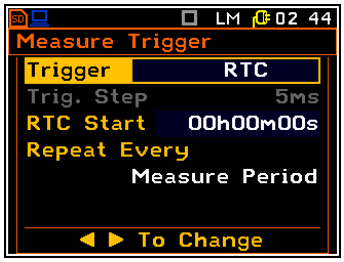
Setting the speed of the triggering signal changes

This position appears when the **Gradient -** or **Gradient +** trigger is chosen. The speed of the triggering signal changes (**Gradient**) can be set from **1 dB** to **100 dB** range. Speed is defined as **dB** per **Logger Step**.

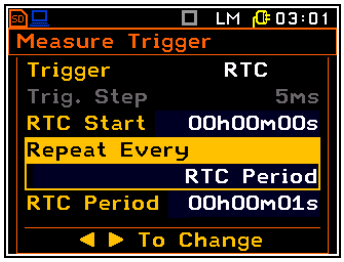


Switching the triggering by means of RTC

In the case when the **RTC** (Real Time Clock) is selected the triggering starts at the time set up by **RTC Start**. The user has to press **<Start>** push-button and the measurement will be triggered on time selected in **RTC Start**.

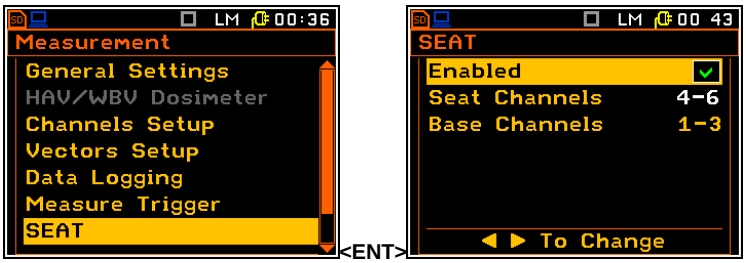


The measurement is repeated with the step selected in **Repeat Every** position. The parameter **Repeat Every** can have values: **Measurement Cycle** or **Period**. If **Period** is selected then additional position **RTC Period** appears.



5.9 Settings whole body measurements with the use of seat accelerometer – “SEAT”

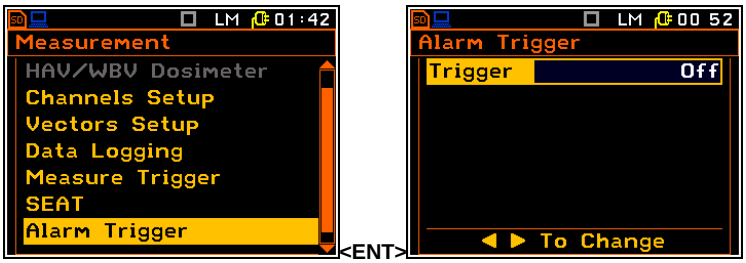
The **"SEAT"** window enables the user to switch on "SEAT" measurements and to assign channels for tree axial seat accelerometer (**Seat channels**) or accelerometer for base measurements (**Base channels**).



5.10 The alarm trigger setting– Alarm Trigger

The **Alarm Trigger** position appears only in advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode: Advanced Mode*).

The **Alarm Trigger** position enables the user to program the trigger, which generates alarm pulse on the I/O socket, if **Mode** parameter of **Multifunction I/O** window is set to **Digital Out**.

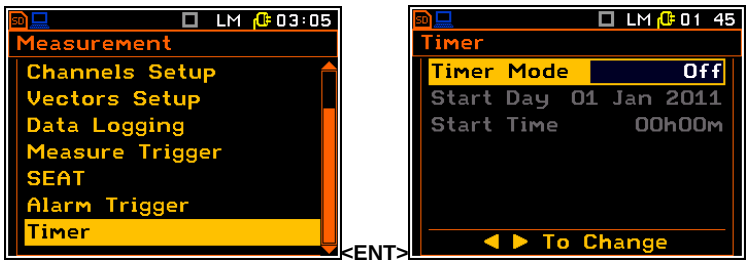


The **Alarm Trigger** window and meaning of all positions is identical as for **Logger Trigger** case.

5.11 Programming the instrument's internal timer – Timer

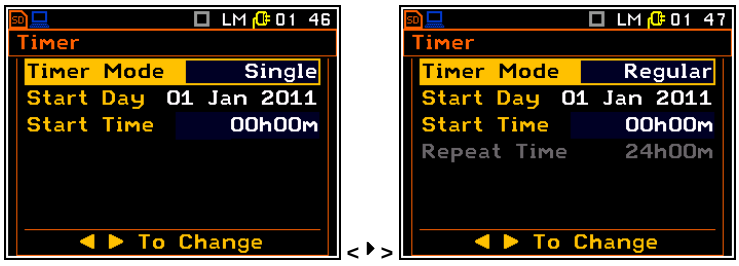
The **Timer** position appears only in **Advanced Mode** (*path: <Menu> / Auxiliary Setup / Instrument Mode*).

The **Timer** enables one to programme the internal timer. The instrument can be switched on automatically in the programmed time and perform the measurement with settings used before the instrument was switched off.



Selecting the mode of the timer function

The timer can be switched off – **Off**, switched on only once – **Single**, or switched on many times regularly – **Regular** with the period between two consecutive measurements set in the **Repeat Time** line as 24 hours. It means that the unit will be switched on once a day

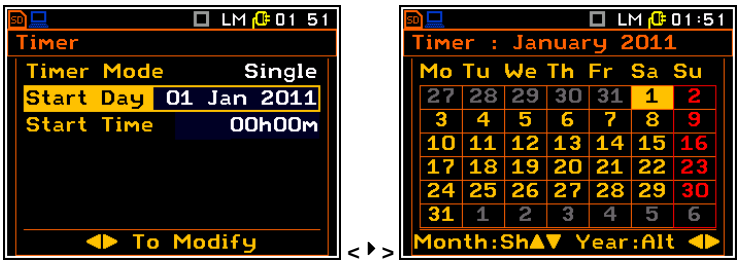


at the same time until one disables timer function.

If the instrument was switched on by means of Timer then the "**clock**" icon appears on the screen.

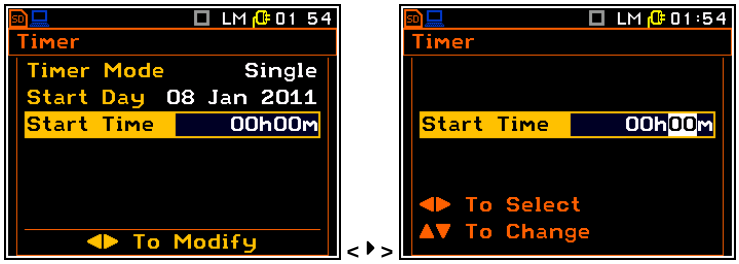
Setting day of the instrument's switch on

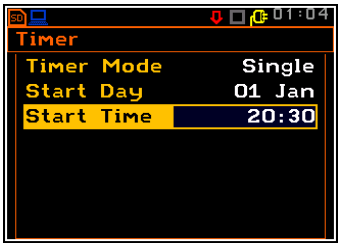
The **Start Day** determines the date of the measurement start. The timer can be programmed up to one month ahead and during the date setting the current state of the **R**eal **C**lock is taken into account. The required date can be selected in the special window, which is opened by means of the **< ◀ >**, **< ▶ >** push-buttons.

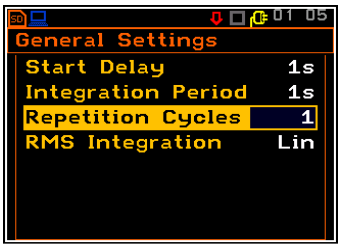


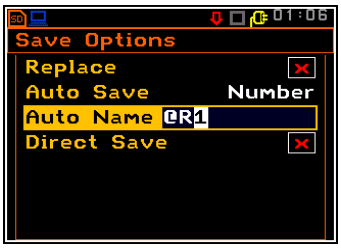
Setting time of the instrument's switch on

The **Start Time** determines hour of the measurement start. The required hour can be selected in the special window, which is opened by means of the **< ◀ >**, **< ▶ >** push-buttons.



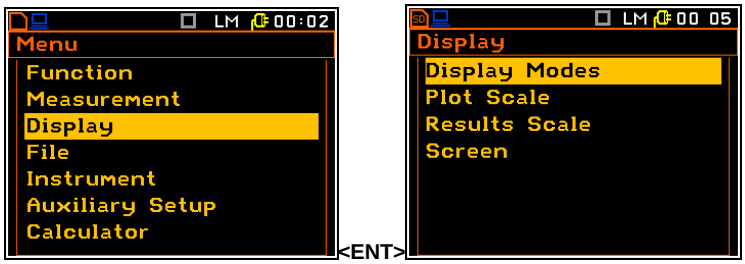





01:06
Save Options
Replace
Auto Save
Number
Auto Name @R1
Direct Save

6. DATA AVAILABLE ON THE DISPLAY – Display

The **Display** list contains the elements that enable one the independent programming of the display parameters. In order to open the **Display** list the user has to press the **<Menu>** push-button, select the **Function** text and press **<ENTER>**.



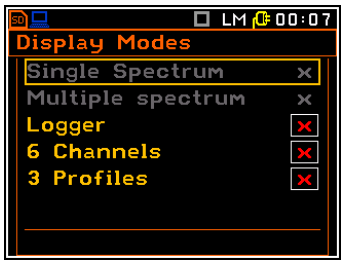
The **Display** list is used for setting the various parameters, which are mainly dedicated for the control of the display. The list consists of:

Display Modes	enables one to select the mode of the measurement results presentation;
Plot Scale	enables one to change the plot scale of results presentation;
Results Scale	enables one to change the scale of result's presentation;
Screen	enables one to set the brightness and the switch on/off the screen saver of the instrument's display.

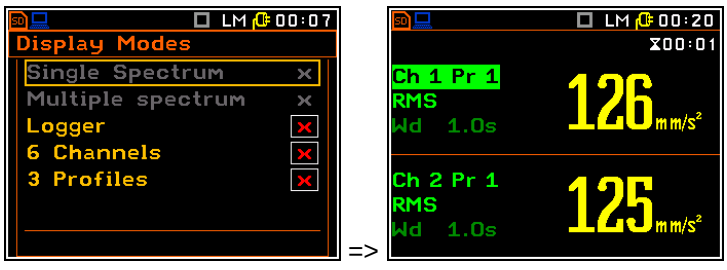
6.1 Selection of the modes of measurement results presentation - Display Modes

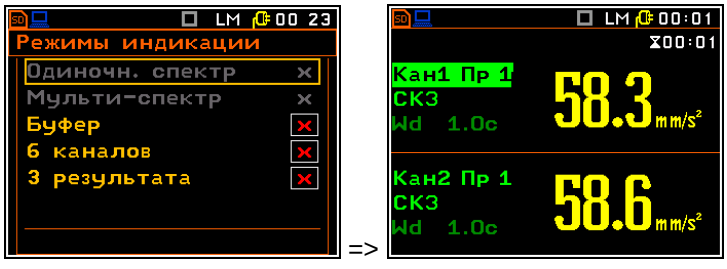
The **Display Modes** list enables one to switch on or off the currently available modes of displaying the results of measurement. The mode of the results presentation is related with the selection of the instrument's function (**LM**, **1/1 Octave**, **1/3 Octave**, etc.).

When all display modes in the **Display Modes** list are switch off the only main presentation mode with two results is available. Any attempt to switch the mode by means of **<Alt>** and **<▲>**, **<▼>** push-buttons gives no results.

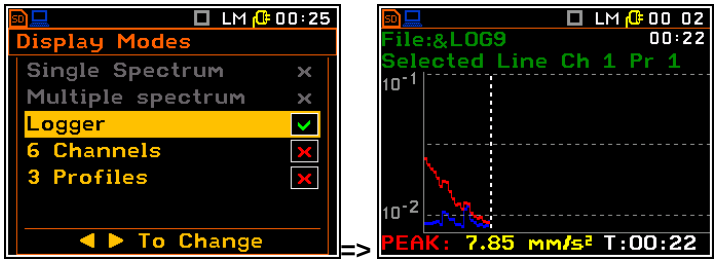


Two results main presentation mode

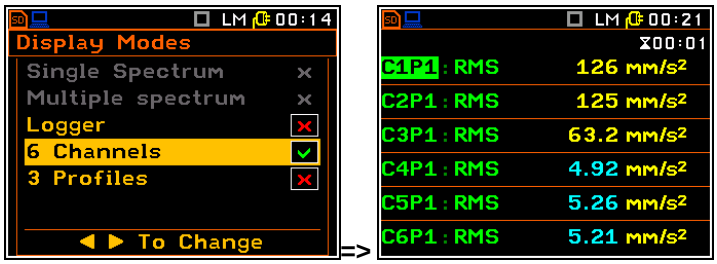




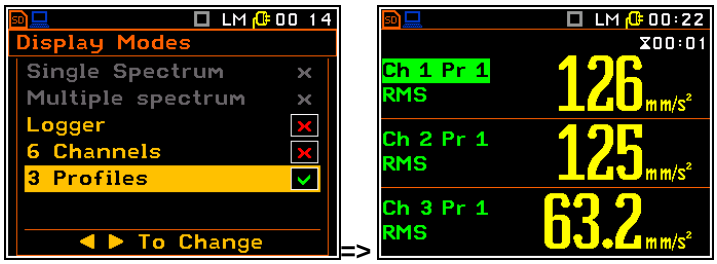
Logger presentation mode



6 Channels presentation mode



6 Profiles presentation mode



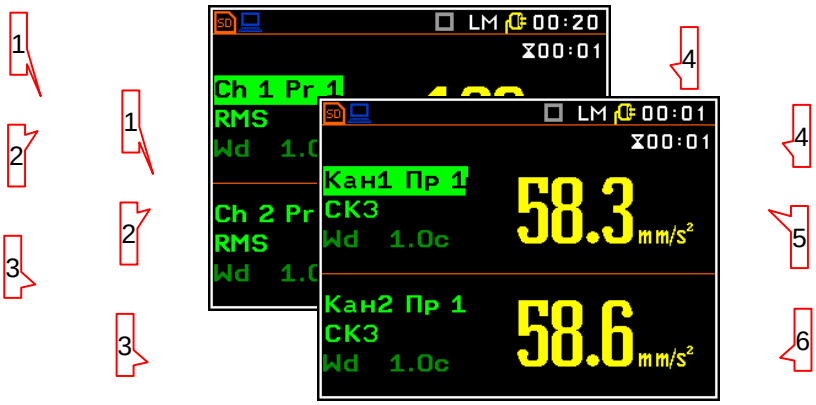
When all display modes in the **Display Modes** list are switched on they all are available and can be selected by means of **<Alt>** and **<▲>**, **<▼>** push-buttons.

6.1.1 Main presentation mode

Fields description of the <u>two results</u> view

The main presentation mode is always active and it is not possible to switch it off.

1. Channel and Profile number.
2. Function name: **RMS**, **VDV**, **CRF**, **OVL**, **PEAK**, **P–P**, **MTVV**.

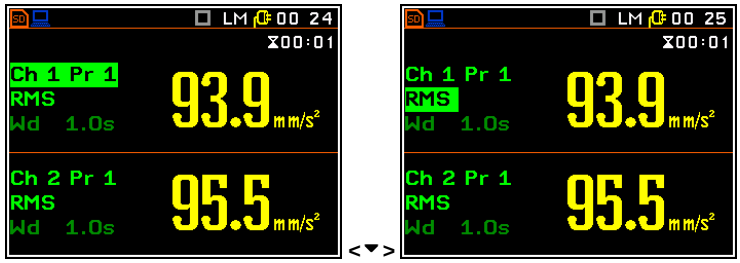


3. The name of the implemented filter: **Wh**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wg**, **Wb**, **Wf** (for first profiles) and **HP**, **BL Wh**, **BL Wk**, **BL Wd**, **BL Wc**, **BL Wj**, **BL Wm**, **BL Wg**, **BL Wb**, **BL Wf** (for second profiles); and detector time constant: **1.0 s**.

4. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Meas. Period**].
5. The value of measured function.
6. Units of measured value.

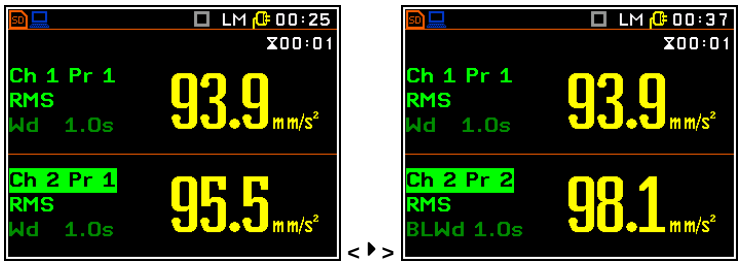
Changing the active fields

The change between positions is made by pressing the **<▲>** or **<▼>** push-buttons.



Changing the field content

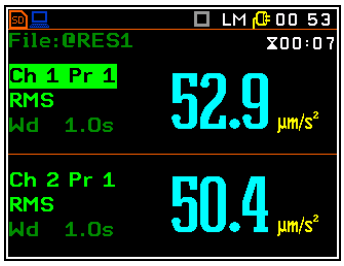
When Profile or Function position is chosen, then the profile number or function name is changed after pressing the **<◀>** and **<▶>** push-buttons.



Changing the presentation mode

The presentation mode is changed after pressing the **<▲>** or **<▼>** push-buttons pressed together with the **<Alt>** one.

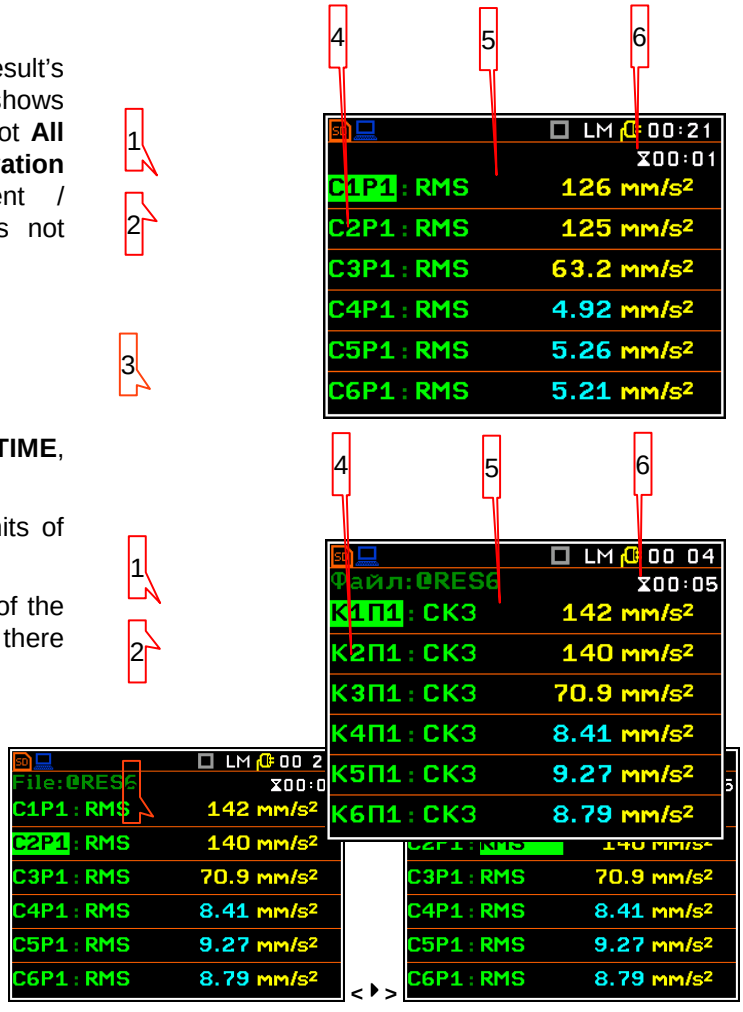
When **Auto Save** function is active the file name is indicated on the upper screen field.



Presentation mode for all channels

The six channels measurement result's presentation mode (**6 Channels**) shows simultaneously results for six channels. If not **All** channels are enabled in **Channel Activation** window (path: <Menu> / Measurement / Channels Setup) the **6 Channels** mode is not active.

1. Result line for Channel 1.
2. Result line for Channel 2.
3. Result line for Channel 6.
4. Function name: **RMS**, **VDV**, **CRF**, **OVL**, **TIME**, **PEAK**, **P–P** and **MTVV**.
5. The value of measured function and units of measured value.
6. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Meas. Period**].

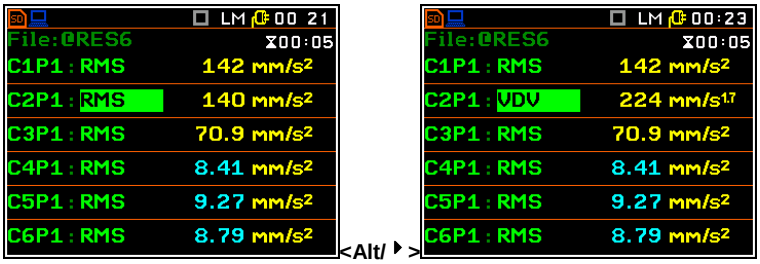


Changing the active fields

The change between position is made by pressing the <▲> , <▼> or <◀> , <▶> push-buttons.

Changing the field content

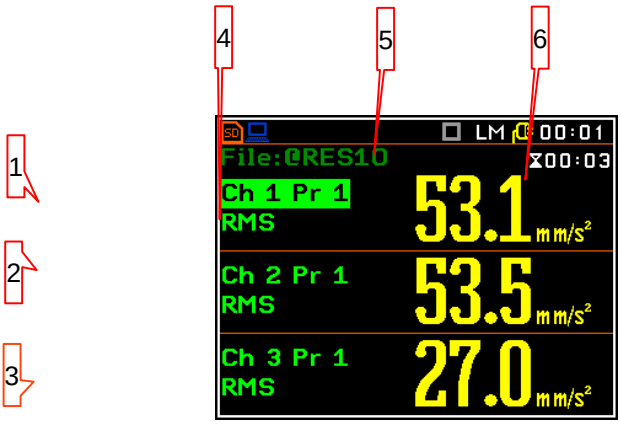
When Channel or Function position is chosen, then the profile number or function name is changed after pressing the <◄> or <►> push-buttons in conjunction with the **<Alt>** one.

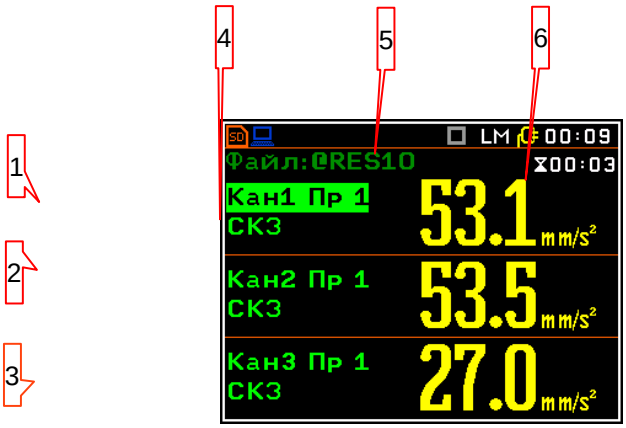


Presentation mode for three results

The three profiles measurement result's presentation mode (**3 Profiles**) shows simultaneously results for three profiles.

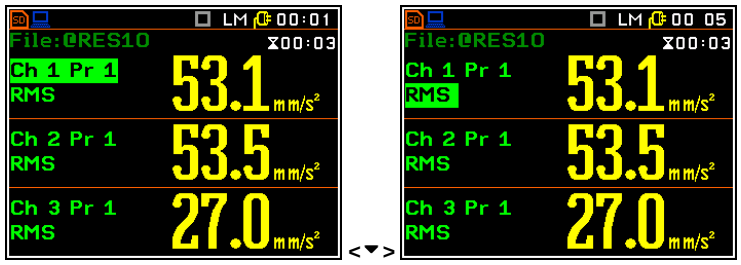
1. Line for first result.
2. Line for second result.
3. Line for third result.
4. Function name: **RMS**, **VDV**, **CRF**, **OVL**, **TIME**, **PEAK**, **P–P** and **MTVV**.
5. File name when **Auto Save** function is active (*path: <Menu> / File / Save Options*)
6. The value of measured function and units of measured value.
7. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Integration Period**].





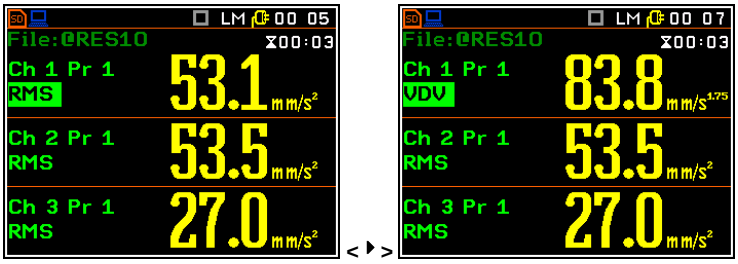
Changing the active fields

The change between positions is made by pressing the <▲> or <▼> push-buttons.



Changing the field content

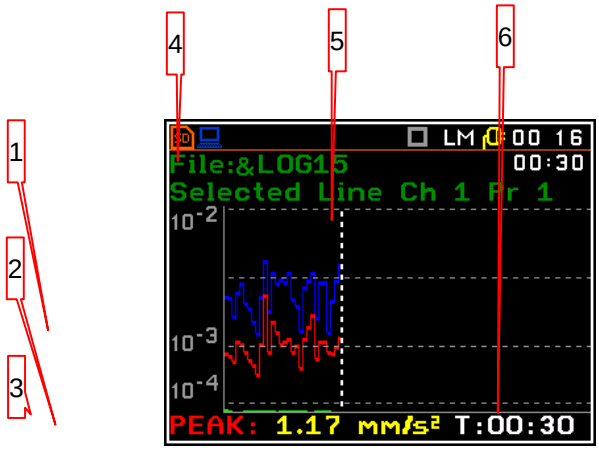
When Profile or Function position is chosen, then the profile number or function name is changed after pressing the < ◂ > and < ▸ > push-buttons.



Presentation mode for logger view

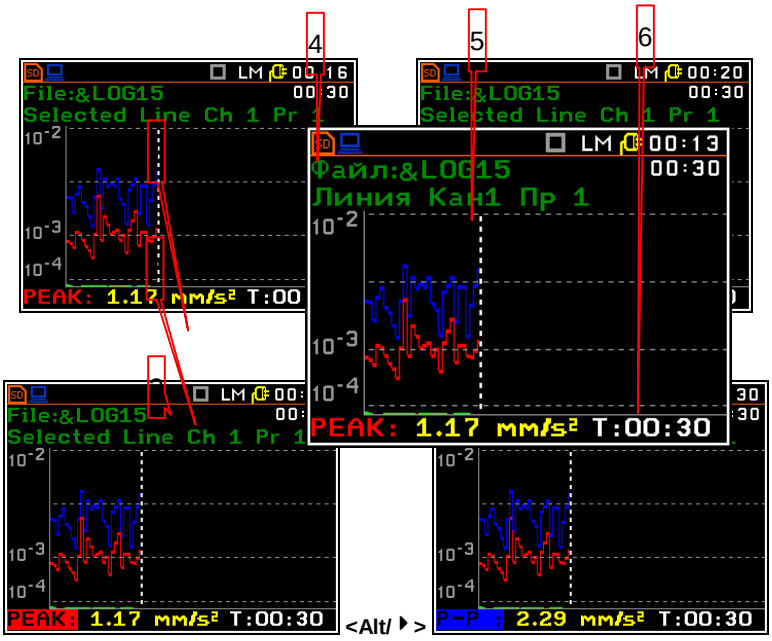
The history of results saved in the logger can be presented in the special **Logger** mode. The **Logger** mode can be activated or deactivated in the **Display Modes** window.

1. Logger plot
2. Result value for the cursor position
3. Name of the logged result
4. Name of the logger file
5. Cursor
6. Cursor position.
6.



Changing the active fields

The result field activation is made by pressing the < ▲ > or < ▼ > push-buttons.

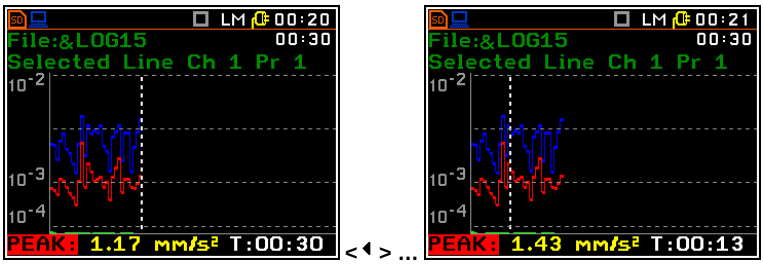


Changing the field content

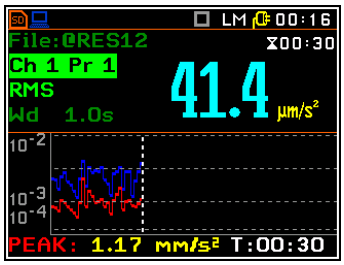
When Profile or Function position is chosen, then the profile number or function name is changed after pressing the < ◂ > and < ▸ > push-buttons.

Changing the cursor position

The user may change the cursor position by means of the **< ◀ >**, **< ▶ >** push-buttons. The appropriate value is presented in the line below the plot.

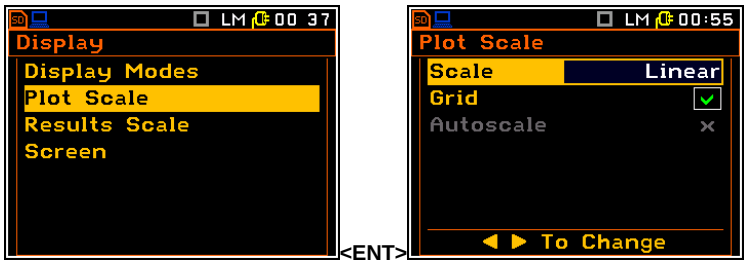


When **Logger** view is switched on there is also combined view of logger plot and the result presentation available.



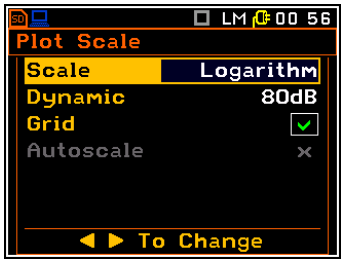
6.2 Setting the result presentation parameters – Plot Scale

The **Plot Scale** sub-list enables the user to change the plot scale of results presentation.



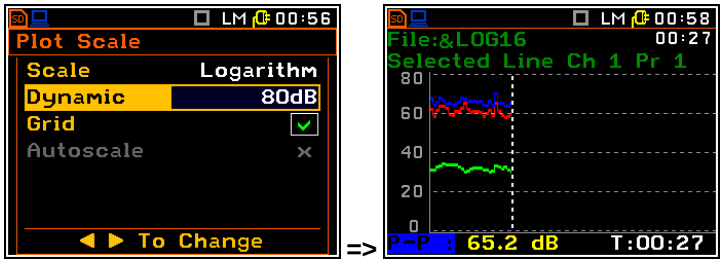
Setting the scale of the measurement results presentation

Two options are available: **Linear** and **Logarithm**. In the case of the first one the graphical presentation and the units both are linear. In the latter case the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** (*path: Menu / Auxiliary Setup / Reference Levels*).

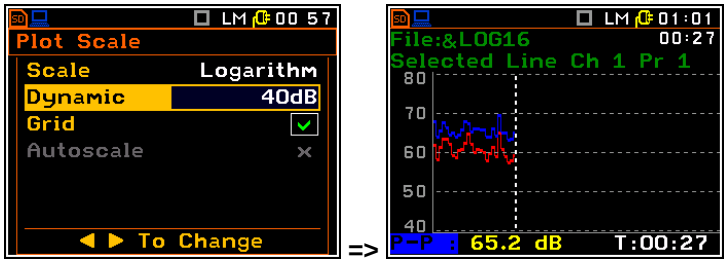


Scaling the vertical axis of the graphical mode presentation

The **Dynamic** position appears when the **Logarithmic** value of **Scale** parameter was chosen. The **Dynamic** parameter enables the user to select the proper scaling of the graphical mode presentation. In the case of the vertical axis one can obtain the double, four times and eight times expansion (as the default the vertical axis corresponds to



80 dB, after expansion it corresponds to **40 dB**, **20 dB** and **10 dB** – respectively).

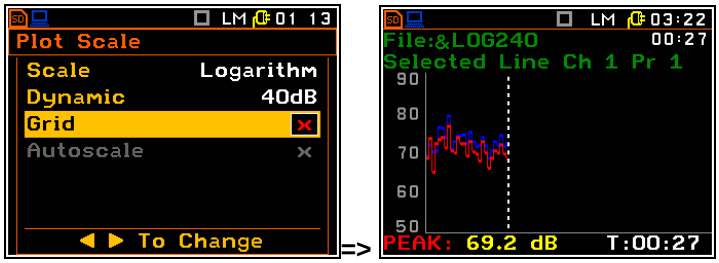


Switching on/off the grid in the graphical mode presentation

The **Grid** enables the user to switch on or off the grid in any graphical presentation.

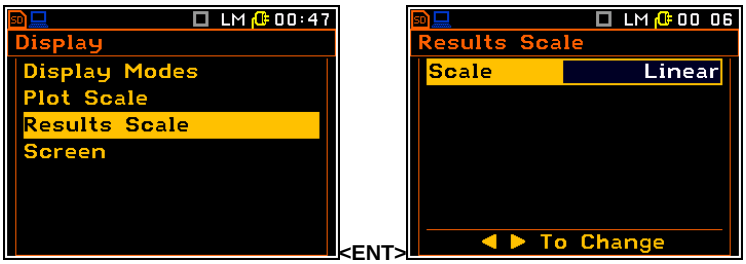
Switching on/off the automatic Y-scale adjustment

The **Autoscale** position switch on the automatic adjustment of scale Y. This position is under development.

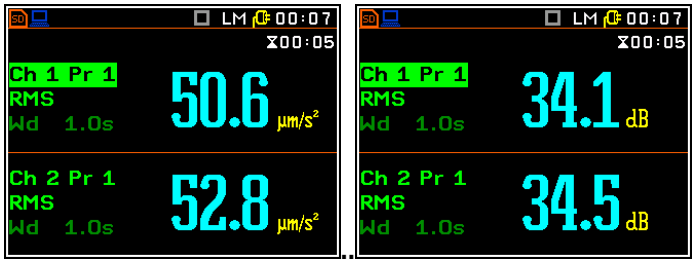


6.3 Setting the scale of result's presentation– Results Scale

The **Results Scale** sub-list enables the user to change the scale in the available modes of the measurement results.

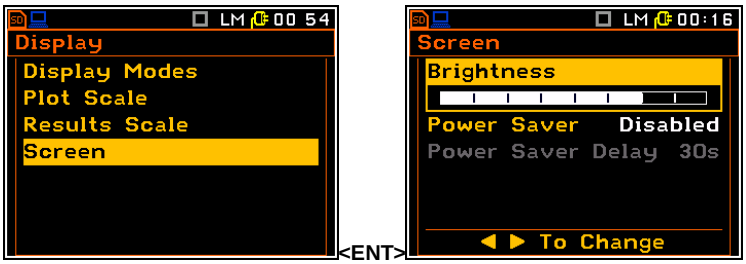


There are two options for **Scale** parameter: **Linear** and **Logarithm**. In the case of the first one the units are linear. In the latter case the measurement results are expressed in decibels (the results are related to the values set in the **Reference Level** (*path: <Menu> / Auxiliary Setup / Reference Levels*).



6.4 Setting the display brightness and power saver- Screen

The **Screen** window enables the user to set the brightness of the display and switch on the screen saver.

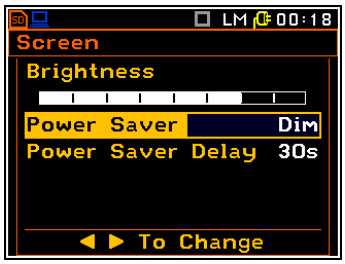


Setting the brightness of the display

The **Brightness** enables the user by means of the **<◄>**, **<►>** push-buttons to set the proper brightness of the display. The user can select 20 different values of this parameter.

Notice: *The new value of the brightness is confirmed after each pressing of the <◄> or <►> push-buttons (new value is selected without any confirmation from the* ***<ENTER>*** *push-button).*

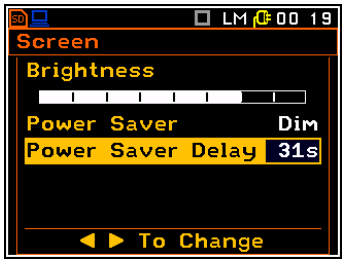
Setting the power saver function



The saving of the internal source of the instrument's power can be achieved by means of reducing the brightness of the screen when possible.

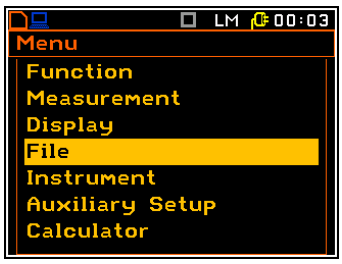
It is possible to set the **Power Saver** automatically. The screen may be switch off (**Screen Off**) or dimmed (**Dim**). In the case when any of these options is set, after 15 seconds from pressing **any push-button** the screen is switched off or dimmed. If it happened, the first pressing of any push-button would cause the switch on of the screen. **Power Saver** function may also be deactivated if **Disabled** parameter is selected.

Setting the power saver delay



The **Power Saver Delay** defines the delay period from last use of any push-button to the Power saver mode. This delay period can be set from **5 s** to **60 s** .

7. SAVING THE MEASUREMENT RESULTS – File



The **File** list contains the elements that enable one to manage the files, created and saved in the internal memory of the instrument or external memory carriers.

The registration of the measurement results is an essential task for the efficient use of the instrument. All available measurement results and also instrument's settings are stored as a file in the internal FLASH type memory of the instrument or on the external **SD Card** memory.

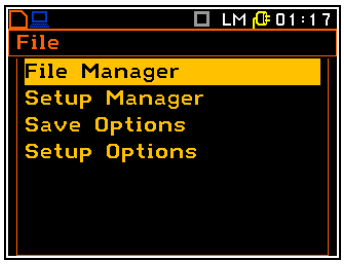
Instrument's files containing data:

- from **Level Meter**;
- measurement results from 1/1 Octave analysis;
- measurement results from 1/3 Octave analysis;
- stored in the logger file,
- stored in the wave file,
- settings.

Result files can be saved manually or automatically, Setup files are saved manually, Logger and Wave files are saved automatically.

Each file consists of some elements, which are the same for all kind of files:

- a file header;
- the unit and software specification;
- the user's text stored together with the measurement data;
- the parameters and global settings;
- the special settings for profiles;
- the marker of the end of the file.



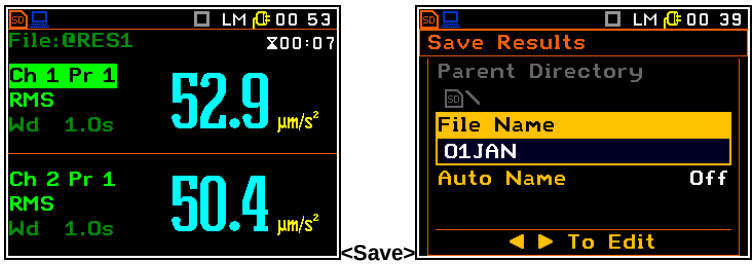
The **File** list contains the following items:

File Manager	enables one to manage the files saved in the instrument's or on external memory;
Setup Manager	enables one to manage the Setup files;
Save Options	enables one to set the options of the measurement result savings.
Setup Options	enables one to set the options of the setup savings.

7.1 Saving files in the instrument's memory or external memory

There are two options for storing result data in the internal or external memory. One option is to press **<Save>** push-button right after the measurement performance. Another option is to create **<New File>** in the **File Manager**.

After pressing the **<Save>** push-button the **Save Results** window appears.



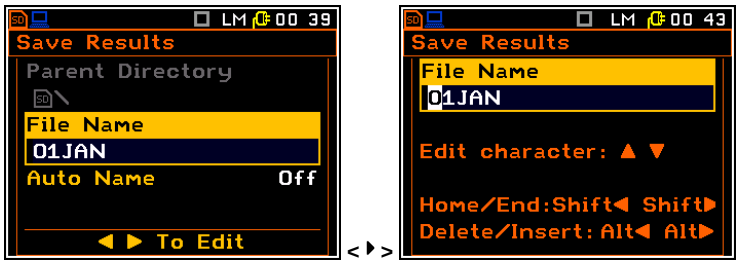
There are two available options for saving files: with the edited name, or with the name automatically changed with the name increased by one. These options can be selected in the position **Auto Name**. If **Auto Name** is switched off (**Off**) the name of the saved file is like in the position **File Name**. This file name can be edited in the special window, which is opening by means of **< ▸ >** push-button. When the **Auto Name** function is set on **Number**, then a file is saved with the name as displayed above, but after the last non-numeric letter of the text there will be added digit 0. If there already exists any chain of digits on the end of the file text the number that these digits create will be increased by one.

The number can be changed from 0 to N. The only limitation of the N value is the length of the file name, which cannot be longer than eight characters. In the case, when such limitation is achieved and the instrument can not change automatically the file's name the only possibility is to edit new file name.

The default name for a file is displayed in the case of the first entering to this position (after power on). The default name consists of the day and the month's abbreviation and cannot exceed 8 characters.

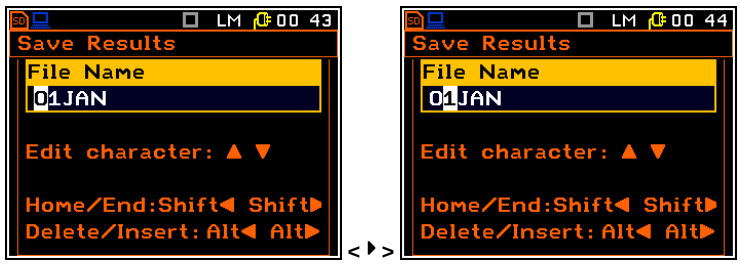
The user can skip the file's name edition and start saving file pressing the **<ENTER>** push-button or return to the **File** list or measurement display by pressing the **<ESC>** one.

To start file edition the user has to select the File name position and to press **< ◂ >** or **< ▸ >** push-button. After that the special window with edition function is opening. The edition process is presented on the Figure below.



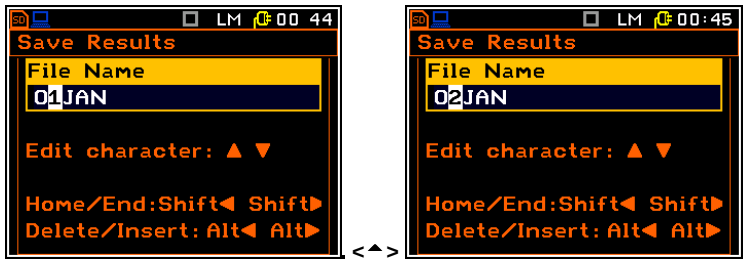
Selection of the character's position to be edited

One can select the position of the character in the edited text using the **< ◂ >**, **< ▸ >** push-buttons. For the current position the character can be changed, position can be deleted or inserted.



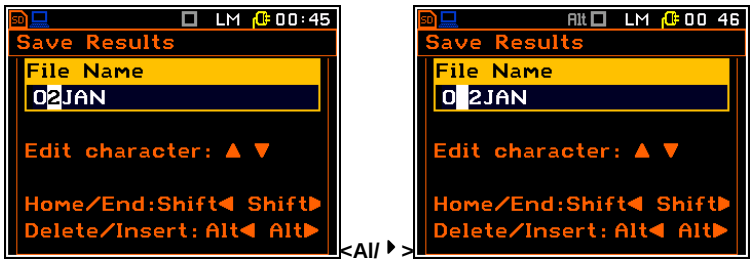
Changing the edited character

The available ASCII characters can be changed using the <▲> (or <▼>) push-button. The subsequent digits, letters and other characters appear on the display in the inversely displayed position after each pressing of the mentioned above push-buttons.



Position insertion, deletion

One can delete or insert the position in the edited text using the <◀>, <▶> push-buttons, pressed together with the **<Alt>** one.



The edited name is accepted and the instrument returns to the **Save Results** window after pressing the **<ENTER>** push-button. The second pressing of the **<ENTER>** push-button saves the file in the working directory. The special warning is displayed in the case the file with the edited name already exists in the memory. The instrument waits then for a reaction of the user (any push-button should be pressed except the **<Shift>** or the **<Alt>** one).

Notice: *The files can be overwritten (the use of the same file name) without any warning if the* ***Replace*** *option is switched on (path: <Menu> / File / Save Options).*

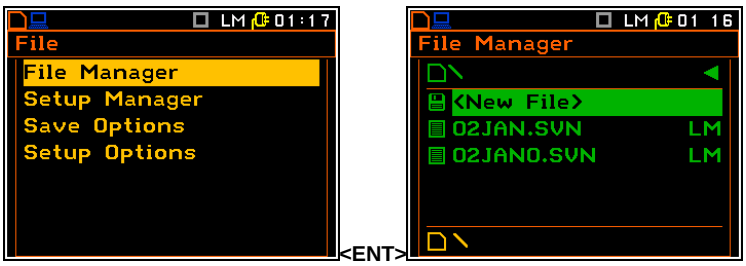
The saving is not possible in the case when the instrument is measuring the signal. The message “Measurement in progress!” is displayed for about 3 seconds.

The presented below message is displayed after trying to execute the save operation in the case when no measurements were performed and there are no results to be saved. The instrument then waits for the reaction of the user (any push-button should be pressed except the **<Shift>** or the **<Alt>** one) and after pressing a push-button it returns to the **Save Results** window.

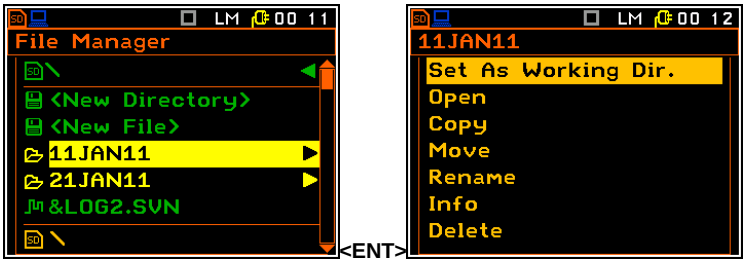
Notice: *The direct access to the* ***Save Results*** *window is possible after pressing simultaneously the* ***<ENTER>*** *and* ***<Alt>*** *push-buttons if the* ***Auto Save*** *option is switched off (path: Menu / File / Save Options). In another case, (****Auto Save*** *option is switched on) the results are saved, after pressing these push-buttons, in the file with the automatically incremented name.*

7.2 Managing the files saved in the internal and external memory – File Manager

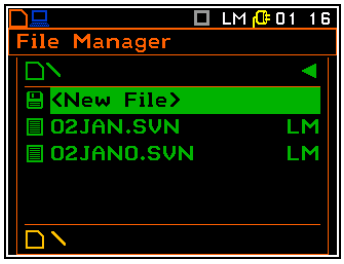
The **File Manager** is used for checking the contents of the memory and make operation on result and logger files such as: open, delete, copy, move, rename, create new files or catalogues and display file and catalogue information.



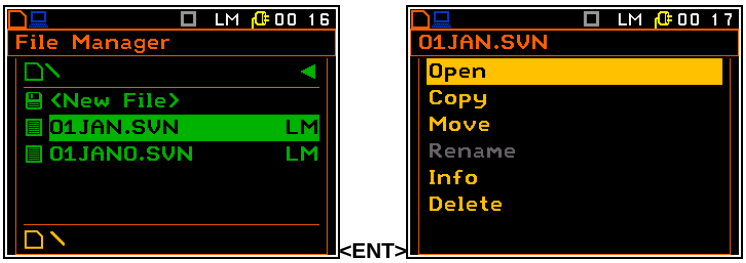
In the **File Manager** window the list of files, catalogues and memory devices is presented. Files are stored in catalogues, which are organised hierarchically. Catalogues names are of capital letters and have no extensions. By pressing the **<ENTER>** push-button the window with the list of available operations is opening for marked (highlighted) position.



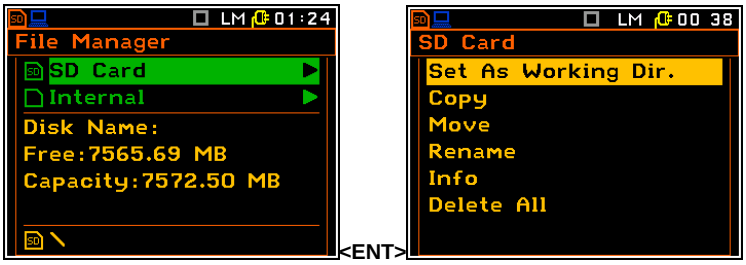
When **SD Card** is selected the first two positions **<New Directory>** and **<New File>** can be used to create new elements. When **Internal** memory is selected the only **<New File>** position is available.



The list of operations on files saved in the **Internal** memory differs from that one for the **SD Card** by one position. It is not possible to rename the files saved in the **Internal** memory and thus **Rename** position in this list is not active.

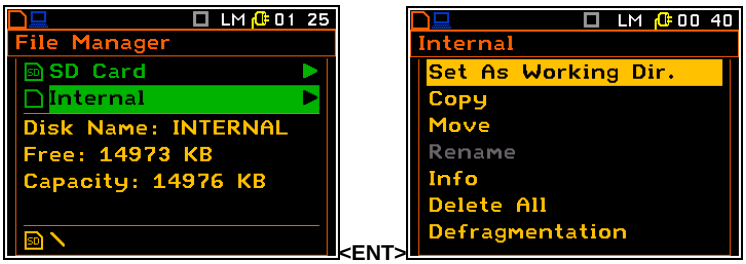


When the memory disk is selected after pressing the **<ENTER>** push-button the list of operations on disk appears.

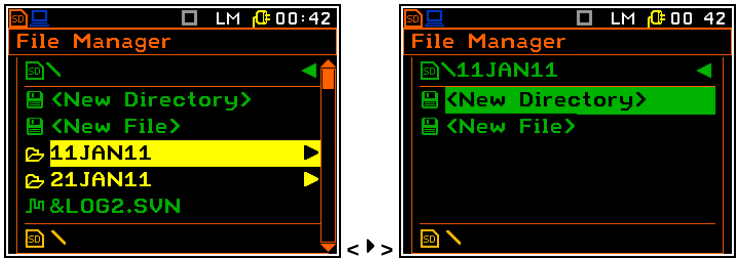


If **SD Card** is not installed it's position in the **File Manager** window became unavailable.

The list of operations on the **Internal** memory differs from that one for the **SD Card** by one position. It is not possible to rename the **Internal** memory and thus **Rename** position in this list is not active. The **Internal** memory can be also defragmentated and this is performed by operation **Defragmentation**.

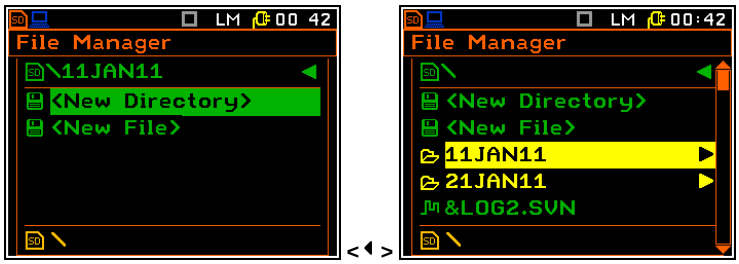


The selected catalogue can be opened by two ways: after pressing the **< ▸ >** push-button or after opening the operation list by means of **<ENTER>** push-button, then selection the position **Open** and pressing the **<ENTER>** push-button once again. The **File Manager** window is closed and the instrument returns to the **File** list after pressing the **<ESC>** push-button.



To return to the upper catalogue the user has to press the **< ◂ >** push-button.

The upper (highest) catalogue contains the names and icons of memories available for files: **SD Card** and **Internal**. The description of the memory is presented below the memories list: **Disk Name**, **Free** memory and **Capacity** (total memory space).



In the **File Manager** window files are described by file name with extension (**SVN** or **WAV**) as well as additional icon and measurement abbreviation (SLM, S:1/1 etc.). The names in which the first character is @ are coming from the **Auto Save** function. Below the table with the description of icons is presented.


Catalogue


Result file


Logger file

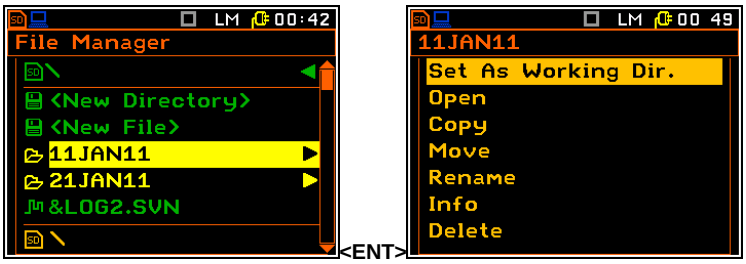

Setup file


Wave file


New file or catalogue

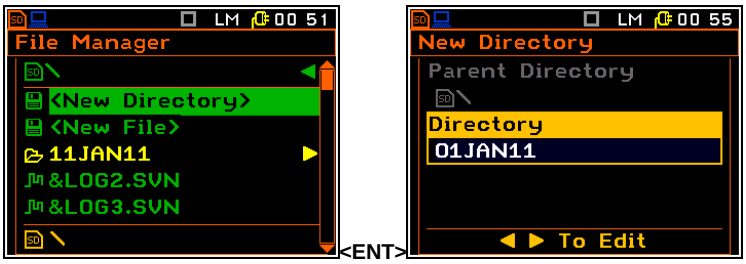
7.2.1 Setting the directory for saving files – Set Working Directory

It is possible to assign the catalogue for automatic saving logger files and result files. In order to do this one should choose the required catalogue and press the **<ENTER>** push-button. After opening the list of operations one should press the **<ENTER>** push-button and **Set Working Directory** operation will be performed. The new catalogue name will appear at the bottom line of the display. Starting from this moment all files will be saved in this catalogue.

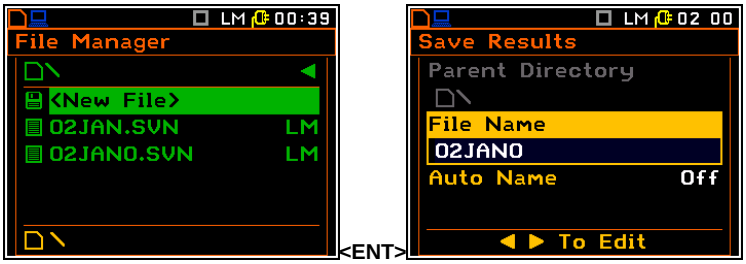


7.2.2 Creating new catalogue and new file

It is possible to create new catalogue in the file system on **SD Card**. In order to do this one should enter the catalogue in which the new one will be created and press the **<ENTER>** push-button at the **<New Directory>** position. The proposition of new catalogue name will appear at the bottom line of the display. If there already exists a directory with such name the warning message will appear. In other case this operation will be performed.

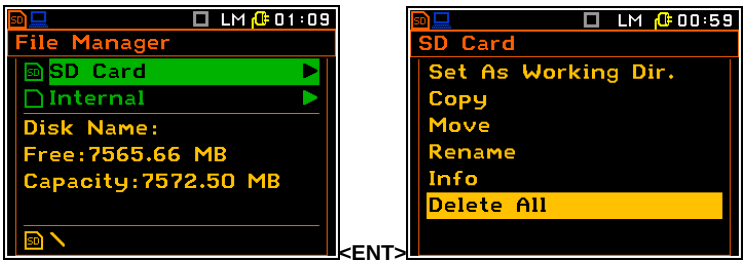


There is another than pressing the **<Save>** push-button way of saving results as a file in the internal or external memory. This can be done in the **File Manager** window by creating new file in the file system. In order to this one should enter the catalogue in which the new file will be created and press the **<ENTER>** push-button at the **<New File>** position.

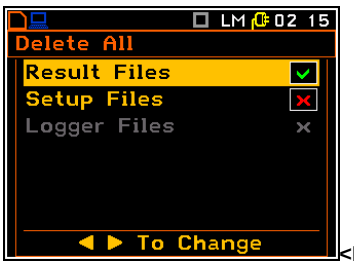


7.2.3 Deleting all files from Internal memory – Delete All

It is possible to delete all result and/or setup files from the instrument's memory. In order to do this one should select the memory and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Delete All** position and press the **<ENTER>** push-button again.



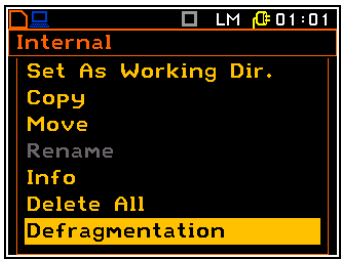
To delete files from the **Internal** memory the user shall mark the desired file type then press the **<ENTER>** push-button. The **Delete All** window with the list of file types will be opened.



<ENT>

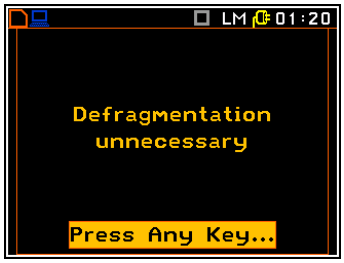
7.2.4 Merging result and setup files memory – Defragmentation

The **Defragmentation** is used to make the **Internal** memory continuous. All new files are saved starting from the beginning of the free memory space. The memory occupied by the deleted file, assuming that the file was not the last one, remains unused for the next files saving. After the removing a file the files memory becomes discontinuous, with unused parts, which cannot be utilized in the future.

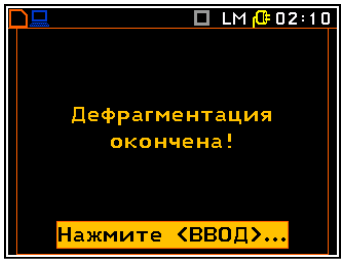


The situation changes after the process called defragmentation. During this process, the files saved in the files memory are moved in order to obtain the continuous occupied space.

After pressing the **<ENTER>** push-button on the active **Yes** option, the instrument checks whether the used result and Setup files memory is continuous or not. If this memory is continuous, the **Defragmentation** operation is not executed and the special message is displayed. The instrument waits for the reaction of the user (any push-button should be pressed except the **<Shift>** and **<Alt>** one) and after pressing a push-button it returns to the **Defragmentation** sub-list.

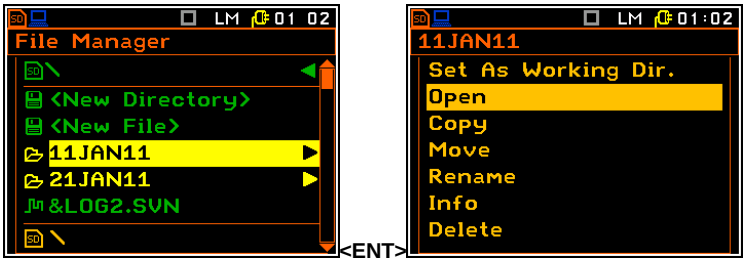


If there are conditions to execute the **Defragmentation** operation the current progress of defragmentation is shown on the display. After the successful defragmentation, the special message is displayed and the instrument waits for the reaction of the user. Any push-button should be then pressed except the **<Shift>** and **<Alt>** one. After pressing a push-button, the instrument returns to the **Defragmentation** sub-list.

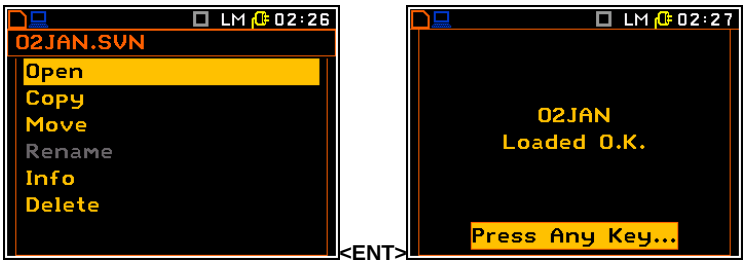


7.2.5 Opening file/catalogue – Open

It is possible to open file or catalogue from the file/catalogue list. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Open** position and press the **<ENTER>** push-button again. The effect of such operation for the catalogue is the same as opening the catalogue by means of the **<▶>** push-button.

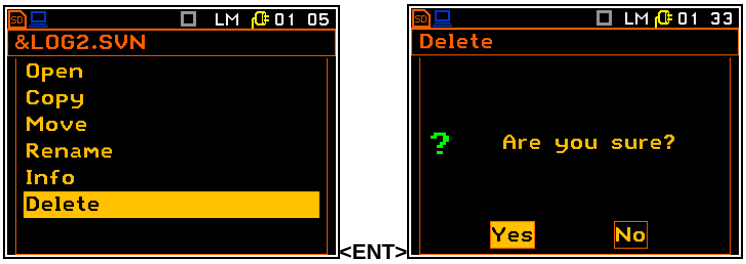


Opening the measurement file means that the measurement results saved in this file will be loaded to the instrument's operation memory.



7.2.6 Deleting file/catalogue – Delete

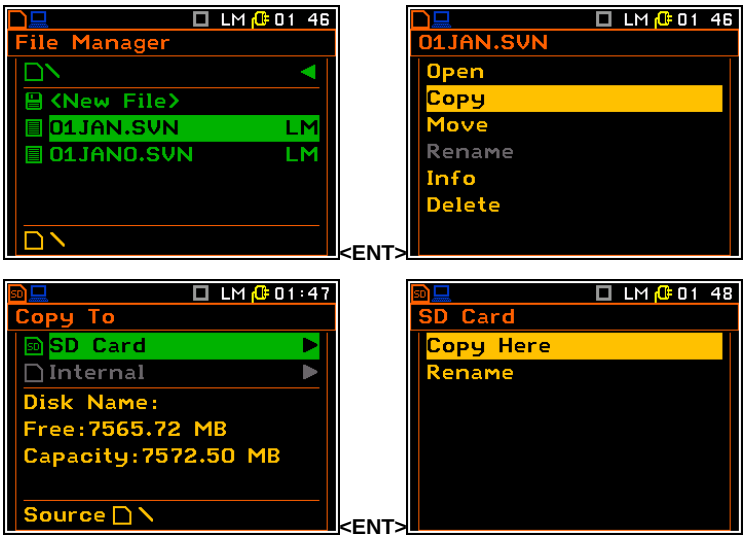
It is possible to delete file or catalogue from the file/catalogue list. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select the **Delete** position and press the **<ENTER>** push-button again.



7.2.7 Copying file/catalogue – Copy

It is possible to copy file or catalogue from the file/catalogue list in one memory type to another or from one catalogue of external memory to another catalogue same memory. It is not possible to copy logger files to the **Internal** memory since this type of memory do not accept such files.

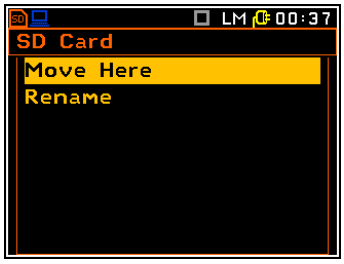
In order to do this operation one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select the **Copy** position and press the **<ENTER>** push-button again. The instrument then will propose to choose the target catalogue for copying. After selection of the target catalogue the user should press the **<ENTER>** push-button. The window with two options will appear: **Copy Here** and **Rename**.



7.2.8 Moving file/catalogue – Move

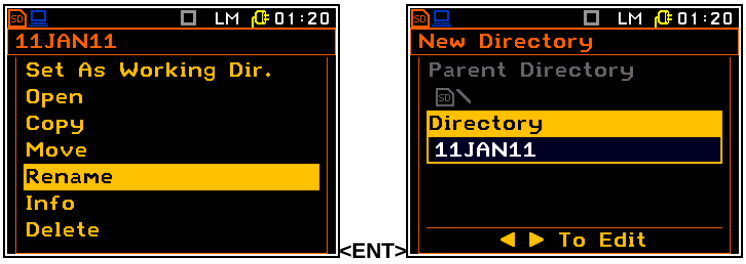
It is possible to move file or catalogue from the file/catalogue list in one memory type to another or from one catalogue of external memory to another catalogue same memory. . It is not possible to move logger files to the **Internal** memory since this type of memory do not accept such files.

In order to do this operation one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select the **Move** position and press the **<ENTER>** push-button again. The instrument then will propose to choose the target catalogue for copying. After selection of the target catalogue the user should press the **<ENTER>** push-button. The window with two options will appear: **Move Here** and **Rename**.



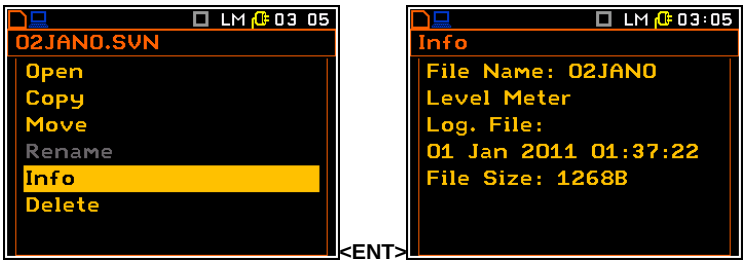
7.2.9 Renaming file/catalogue – Rename

It is possible to rename file or catalogue. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select the **Move** position and press the **<ENTER>** push-button again. The window with text editor function will appear.



7.2.10 Information about file/catalogue – Info

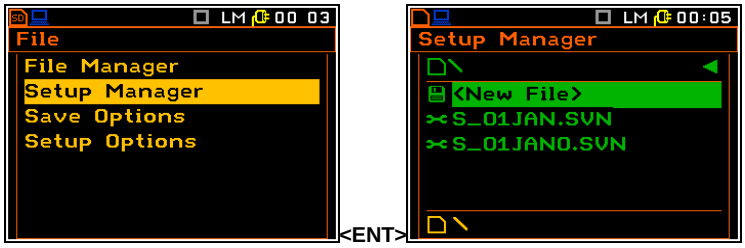
It is possible to get information about file or catalogue. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select the **Info** position and press the **<ENTER>** push-button again. The instrument then will display the information about selected file/catalogue.



7.3 Managing the setup files – Setup Manager

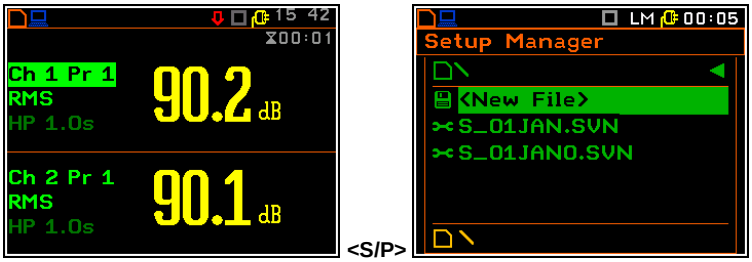
The **Setup Manager** is used for checking the contents of the memory and make operation on Setup files such as: open, delete, copy, move, rename files, create new files and display file information.

In the **Setup Manager** window only setup files are displayed. Setup files have extension **SVN** and icon attribute  .

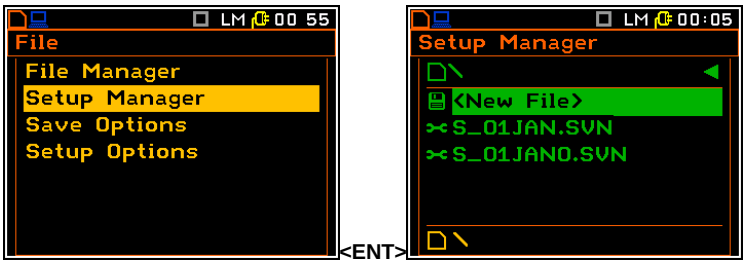


7.3.1 Saving the setup files

There are two options to open the **Setup Manager** window. One option is to press **<S/P>** push-button when the measurement is not performed. Another option is to open the **Setup Manager** position from **File** menu.

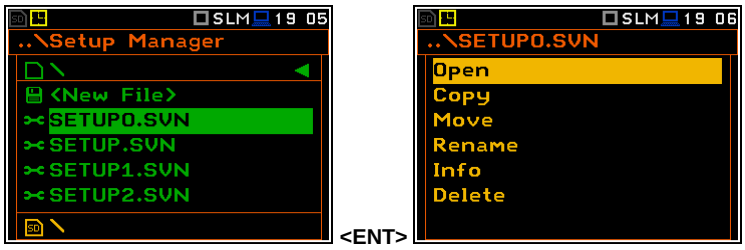


In order to save the setup file one should enter the catalogue in which the new file will be created and press the **<ENTER>** push-button at the **<New File>** position. **Save Setup** window is opening then.

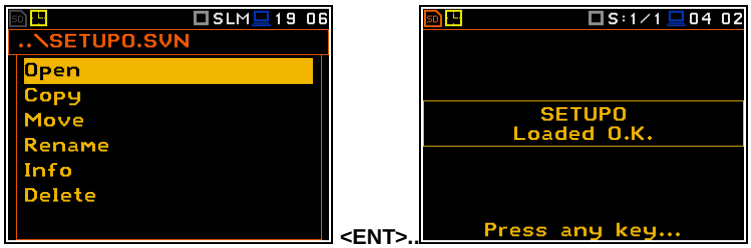


7.3.2 Operations on the setup files

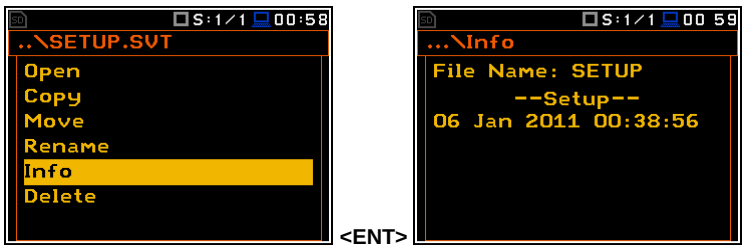
The **Setup Manager** enables one to perform operations on the setup files the same way as it was described above for the **File Manager** position. To perform any of operation like: **Open**, **Copy**, **Move**, **Rename**, **Info** and **Delete** one should choose the file for which this operation will be applied and press the **<Enter>** push-button. The list of operations then will open.



Opening the setup file means that the settings saved in this file will be loaded to the instrument's operation memory. So if the user press **<Start/Stop>** push-button the instrument will start the measurement with the loaded settings.



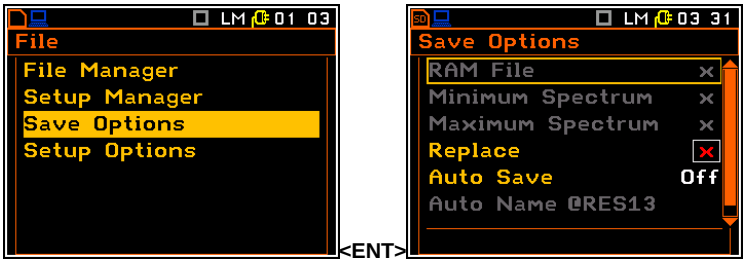
To get information about the setup file one should for selected file press the **<ENTER>** push-button on the **Info** position in the file operations list. After opening the list of operations one should select the **Info** position and press the **<ENTER>** push-button again.



7.4 Controlling the data storing in the instrument's memory - Save Options

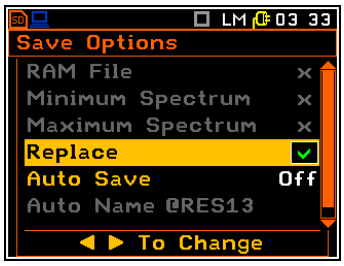
The **Save Options** sub-list is used for the selection of the options of data storing in the instrument's files.

It is possible to replace the existing in the memory file by the new with the same name (**Replace**), to save automatically the results of the measurements (**Auto Save**), to save the results with the automatically incremented name (**Direct Save**).



Replacement of the existing files by the new ones

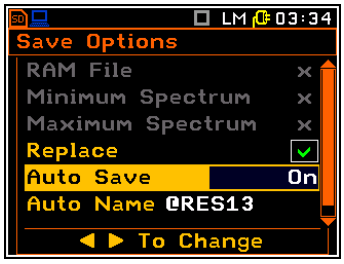
This option is used in remote mode and for the files created by with the use of **Auto Save** function. The result of the attempt to save the file with the name, which already exists in the memory, depends on the setting of the **Replace**. If position is active then the old file will be erased and the new file will be saved with the same name.



The message is displayed that such operation is not available in the case when this position is not active – cf. the description of the **Save**. In the other case, the existing file is overwritten.

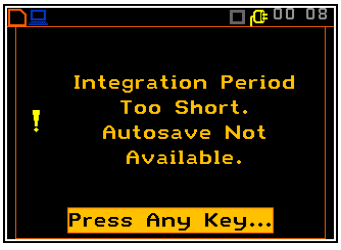
Controlling the measurement results savings

Using the **Auto Save** one can set the self-saving of the measurement results with automatic number increment (**Number)** or to switch it off (**Off**). This position was also established in order not to waist too much memory of the instruments when the self-saving is not necessary. The **Auto Name** position appears after switching on the **Auto Save** function.



Notice: *The* ***Auto Save*** *function can be performed only in the case when the* ***Meas. Period*** *(path: Menu / Measurement / General Settings) is not less than 10 seconds. If it is less than 10 seconds, the measurement results are not saved without any indication of that fact! There is only one exception - when the* ***Repetition Cycles*** *(path: Menu / Measurement / General Settings) is equal to one, the* ***Auto Save*** *function is executed disregarding of the value of the integration period.*

When the **Meas. Period** is too short for switching on the **Auto Save** option or the **Repetition No.** is set to one the following message appears on the display:

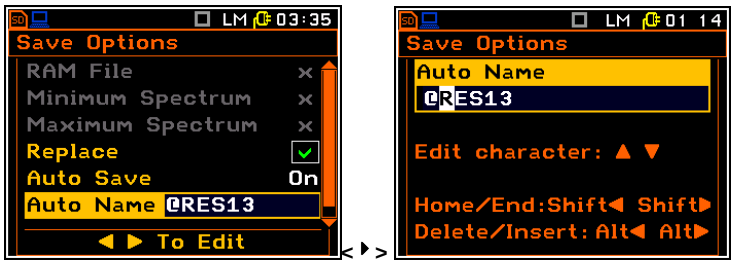


When the **Auto Save** option is active, after starting the measurements by pressing the **<Start/Stop>** push-button the results are saved in the file with the selected name.

Another measurement is started after next pressing of the **<Start/Stop>** push-button. The measurement is stopped after the selected **Measa. Cycle Time** (*path: Menu / Measurement / General Settings*). The name numbers of the next saved files are automatically incremented by one. The same remarks are valid in this case as it was already stated in the description of the **Save Next** function.

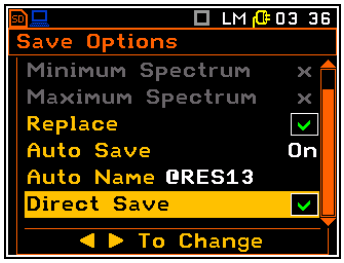
Edition the name of the Auto Save file

The **Auto Name** enables one to edit the name of the Auto Save file. To edit the file name the user has to press the **< ▸ >** push-button. The text edition window is opening.



Direct access to the Save function

The **Direct Save** enables one to select the instrument's reaction on the simultaneous pressing of the **<ENTER>** and **<Alt>** push-buttons. If this option is not active, after pressing these push-buttons the **Save** window is accessed (if the measurements are not performed). If the option is active, after pressing the **<ENTER>** and **<Alt>** push-buttons the results are saved in the file with the automatically incremented name.

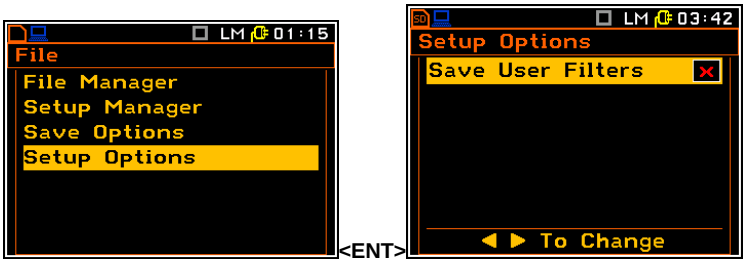


Press the **<ENTER>** and **<Alt>** push-buttons during the execution of the measurements causes, disregarding the option set in the **Direct Save**, that the message "Measurement in Progress" is displayed.

7.5 Options for setup files - Setup Options

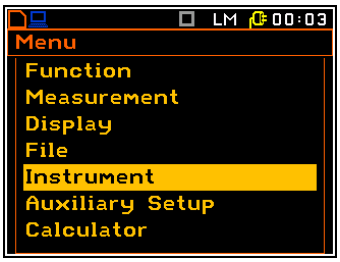
The **Setup Options** sub-list is used for the selection of the options for storing setup files.

The **Save User Filters** is used for saving the user filters together in the setup files.

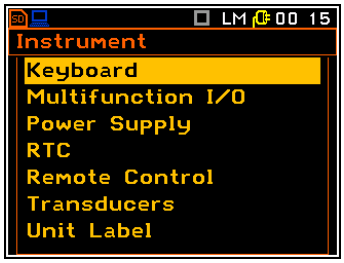


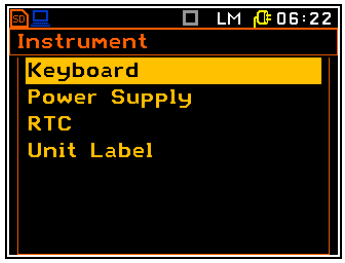
8. SETTINGS OF THE INSTRUMENT PARAMETERS – Instrument

The **Instrument** list contains different sub-lists and positions, which are directly related with the settings of the hardware components of the instrument. In order to open the **Instrument** list one has to press the **<Menu>** push-button, select the **Instrument** text and press **<ENTER>**.



The **Instrument** list contents depend on **Instrument Mode** selection from menu **Auxiliary Setup**: **Simple Mode** or **Advanced Mode**.



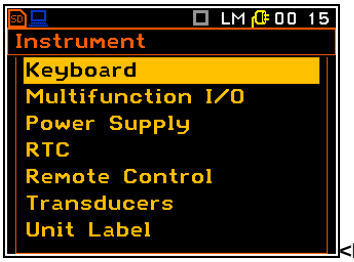


In the **Instrument** list, the following items are available:

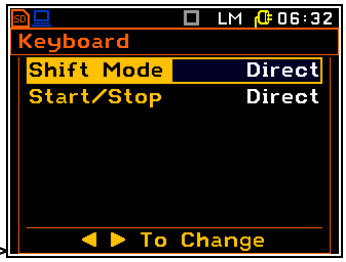
Keyboard	it enables the user to set the operating mode of the **<Shift>** and the **<Start/Stop>** push-buttons.
Multifunction I/O	it enables the user to select the available functionality of the I/O port.
Power Supply	it enables the user to check the powering source of the instrument.
RTC	it enables the user to set the Real Time Clock.
Remote Control	it enables the user to activate or deactivate error confirmation function.
Transducers	it enables the user to activate or deactivate the transducer's compensation.
Unit Label	it enables the user to check the type of the instrument, its serial number and the current software version installed in it and the standards, which the instrument fulfils.

8.1 Selection of keyboard modes – Keyboard

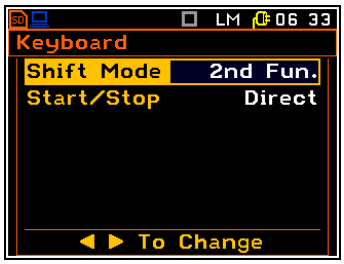
The **Keyboard** position enables the user to programme the operation mode of the **<Shift>**, **<Alt>** and **<Start/Stop>** push-buttons.



<ENT>

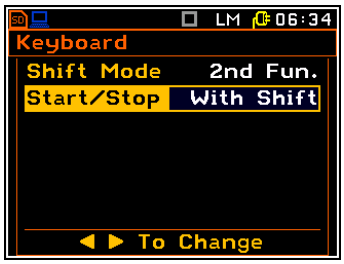


<Shift> / <Alt> push-button working mode selection



In the **Shift Mode** position the user can choose between **2nd Fun.** and **Direct**. When the **Direct** option is selected, the **<Shift>** and **<Alt>** push-buttons operates as in the keyboard of a computer – in order to achieve the desired result, the second push-button has to be pressed in conjunction with the **<Shift>/<Alt>** one. When the **2nd Fun.** option is selected the **<Shift>/<Alt>** push-button operates in the sequence with the other one.

<Start/Stop> push-button working mode selection

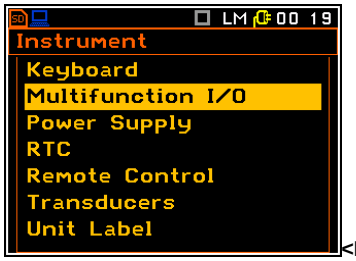


In the **Start/Stop** position the user can choose between **Direct** and **With Shift**. When the **Direct** option is selected the instrument reacts on each of the **<Start/Stop>** push-button pressing, starting or stopping the measurements.

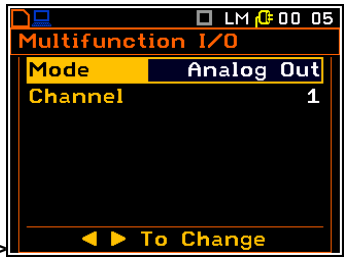
When the **With Shift** option is selected the **<Start/Stop>** push-button operates in conjunction or in a sequence with the **<Shift>** one. The measurements are started or stopped after pressing both push-buttons.

8.2 Setting parameters of the I/O port - Multifunction I/O

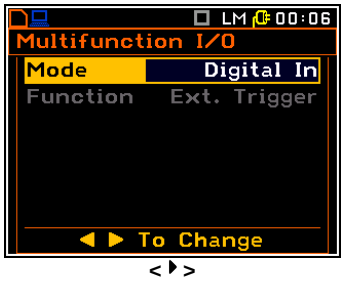
The **Multifunction I/O** enables the user to select the available functionality of the **I/O** port.



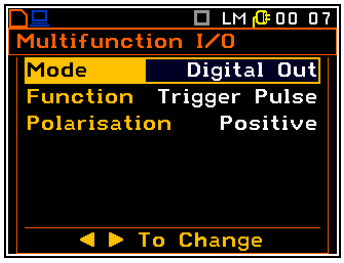
<ENT>



Mode selection of the I/O port



<>



In the **Mode**, it is possible to select the function of the instrument's socket named as **I/O**. This socket can be used as

- the output of the analogue signal (**Analog Out**) transmitted from the input of the instrument to its output without any digital processing (i.e. filtering),
- the input of the digital signal used as an external trigger to start the measurements (**Digital In**) in the "slave" instrument,
- the digital output (**Digital Out**) used for triggering other "slave" instrument from the "master" one,
- the source of any alarm signal in the case of certain circumstances occurred during the measurements (i.e. the level of the input signal was higher than selected one).

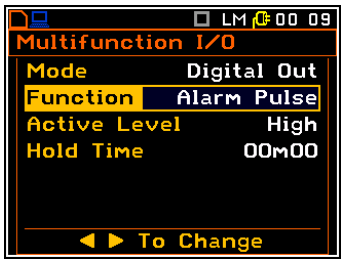
The more detailed description of the **I/O** is given in App. C.

Selection the channel for analogue output

In the **Channel** position it is possible to select the channel which signal is assigned to the analogue out.

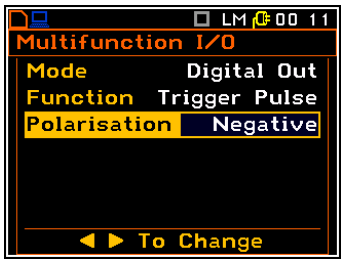
Digital output function selection of the I/O socket

In the **Function** position**,** it is possible to set the function of the digital output of the **I/O** instrument's socket. The socket can be used as the source of the trigger pulse (**Trig. Pulse**) which starts the measurement in another "slave" instrument linked to the "master" one or the alarm signal which appears there after fulfilling certain measurement conditions (**Alarm Pulse**).



Polarisation selection of the digital output signal

In the **Polarisation** position, it is possible to select which polarisation of the signal (negative or positive) will be valid.

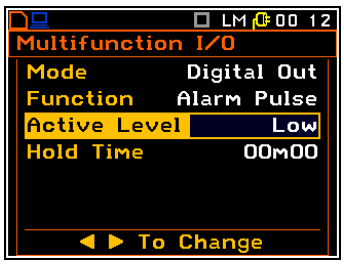


Active level selection of the digital output signal

In the **Active Level** position, it is possible to select which level of the signal should be treated as a valid one ("negative" or "positive" logic): **Low** or **High**.

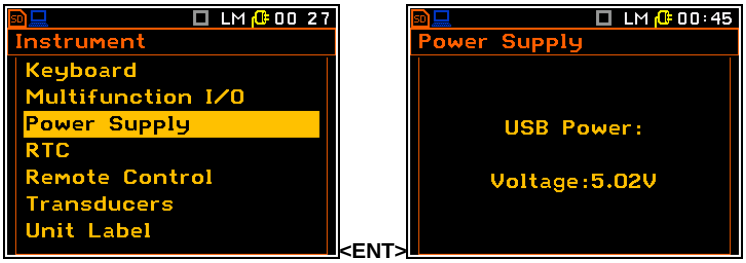
Alarm duration selection

In the **Hold Time** position, it is possible to select the minimum duration of alarm signal.

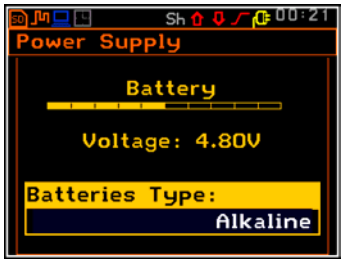


8.3 Checking the powering of the instrument – Power Supply

The **Power Supply** enables the user to check the powering of the instrument: internal battery condition, source and voltage of the external power supply, and also set the battery type for checking their condition.



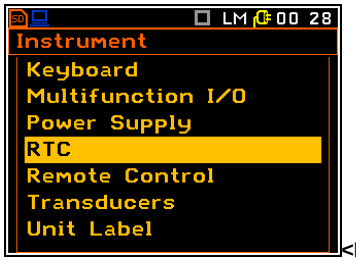
The instrument can be powered from four AA rechargeable or standard batteries or from the USB interface when its USB Device socket is connected by means of the cable to a PC. The view presented on the display for each powering sources is different. The current battery voltage is displayed together with its approximate state (in the graphical form).



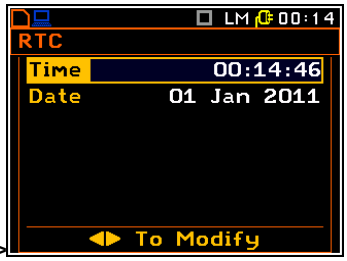
8.4 Programming the instrument's internal Real Time Clock – RTC

The **RTC** enables one to programme the internal **Real Time Clock**. This clock is displayed in the different places depending on the selected presentation mode.

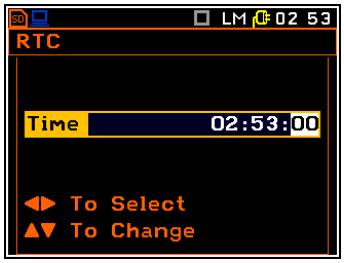
The window is closed and the instrument returns to the **Instrument** list after pressing the **<ENTER>** or **<ESC>** push-button.



<ENT>

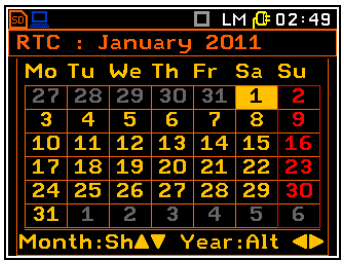


The time edition is doing in the special window, which is opening after pressing the **<▶>** push-button. The selection of the setting parameter (hour, minute, second, and also day, month and year) is performed using the **<◀>**, **<▶>** push-buttons and the change of its value – using the **<▲>, <▼>** push-buttons pressed together with the **<Alt>**.



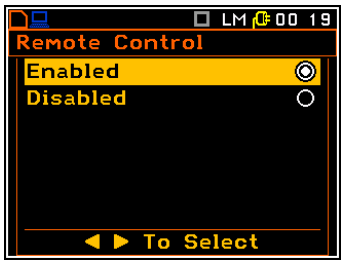
The required date can be selected in a special window, which is opening after pressing the **<◀>**, **<▶>** push-buttons when the **Start Day** text is displayed inversely in the **Timer** sub-list.

In order to set data one has to select its position by means of the **<◀>** , **<▶>** and **<▲>, <▼>** push button and then press the **<ENTER>** push-button.



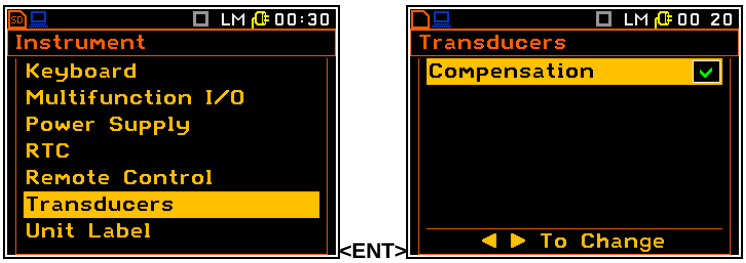
8.5 Activation the remote control error confirmation - Remote Control

The **Remote Control** position enables the user to activate or deactivate error confirmation function. If **Remote Control** function is **Enabled** then the instrument confirms warnings after 5 seconds and the user reaction is not required. This function is very useful when the instrument is working as remote controlled. If **Remote Control** function is **Disabled** then the instrument waits for the user reaction. This mode is used in normal mode.



8.6 Transducer's compensation activation – Transducers

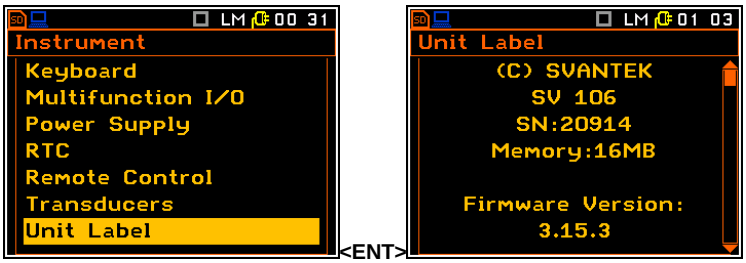
The **Transducers** position enables the user to activate or deactivate the transducer's noise compensation.



8.7 Checking the specification of the instrument - Unit Label

The **Unit Label** enables the user to check the type of the instrument, its serial number, the current software versions installed in it and the standards, which the instrument fulfils.

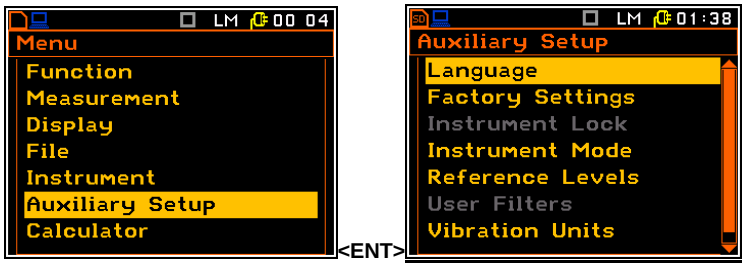
The displayed text is scrolled on the display after pressing the **<▲>**, **<▼>** push-buttons.



Notice: *The contents of the* ***Unit Label*** *should be always transmitted to the Svantek's service in the case of any problems faced by the user during the instrument's operation.*

9. AUXILIARY SETTINGS – Auxiliary Setup

The **Auxiliary Setup** list contains positions directly related with measurements and not related with the hardware components of the instrument. In order to open the **Auxiliary Setup** list the user has to: In order to open the **Auxiliary Setup** list the user has to press the **<Menu>** push-button, select the **Function** position and press **<ENTER>**.



In the **Auxiliary Setup** list, the following items are available:

Language	it enables the user to set language of the user interface.
Factory Settings	it enables the user to return to the default, factory settings.
Instrument Lock	it enables the user to lock the menu and to reduce the access to the program functions of the instrument.
Instrument Mode	it enables the user to define the scope of available instrument functions and adjust accordingly the lists in some menu windows.
Reference Levels	it enables the user to program the user filters.
User Filters	it enables the user to select the Vibration units in which the results of the
Vibration Units	it enables the user to select the Vibration units in which the results of the measurements are to be given.
Warnings	it enables the user to switch on or off the warnings that can be displayed during the operation of the instrument.

:

9.4. Setting the language of the user interface – Language

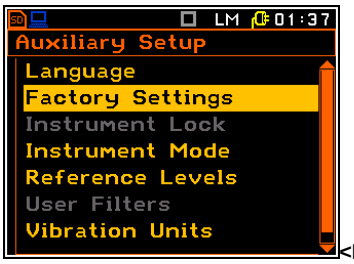
The **Language** enables one to select the language of the user interface.

For activation of the Russian version of the user interface, the special code has to be entered.

9.5. Return to the factory settings – Factory Settings

The **Factory Settings** enables the user to return to the default setup of the instrument.

The factory setup can be install also by means of **<Shift/Enter>** and **<Alt/Start>** push-buttons pressed together.



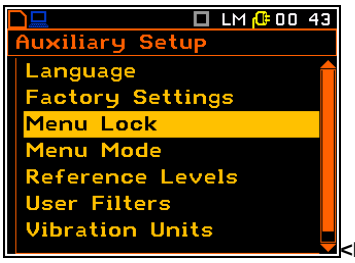
<ENT>

During the clearing process the message **WAIT...** is displayed. The following message is displayed after the return to the default settings and the instrument waits for the user's reaction.

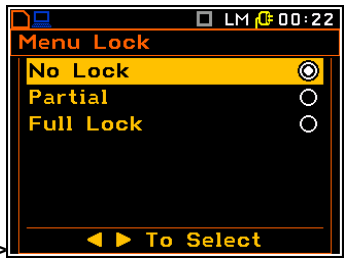
9.6. Locking the menu - Instrument Lock

The **Menu Lock** sub-list enables the user to lock (**Pertial** or **Full Lock**) and unlock the menu.

In the case of default **No Lock** option all available positions in the menu are accessible due to the settings, which were made.



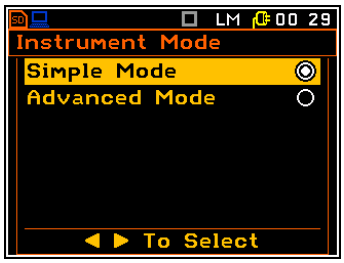
<ENT>



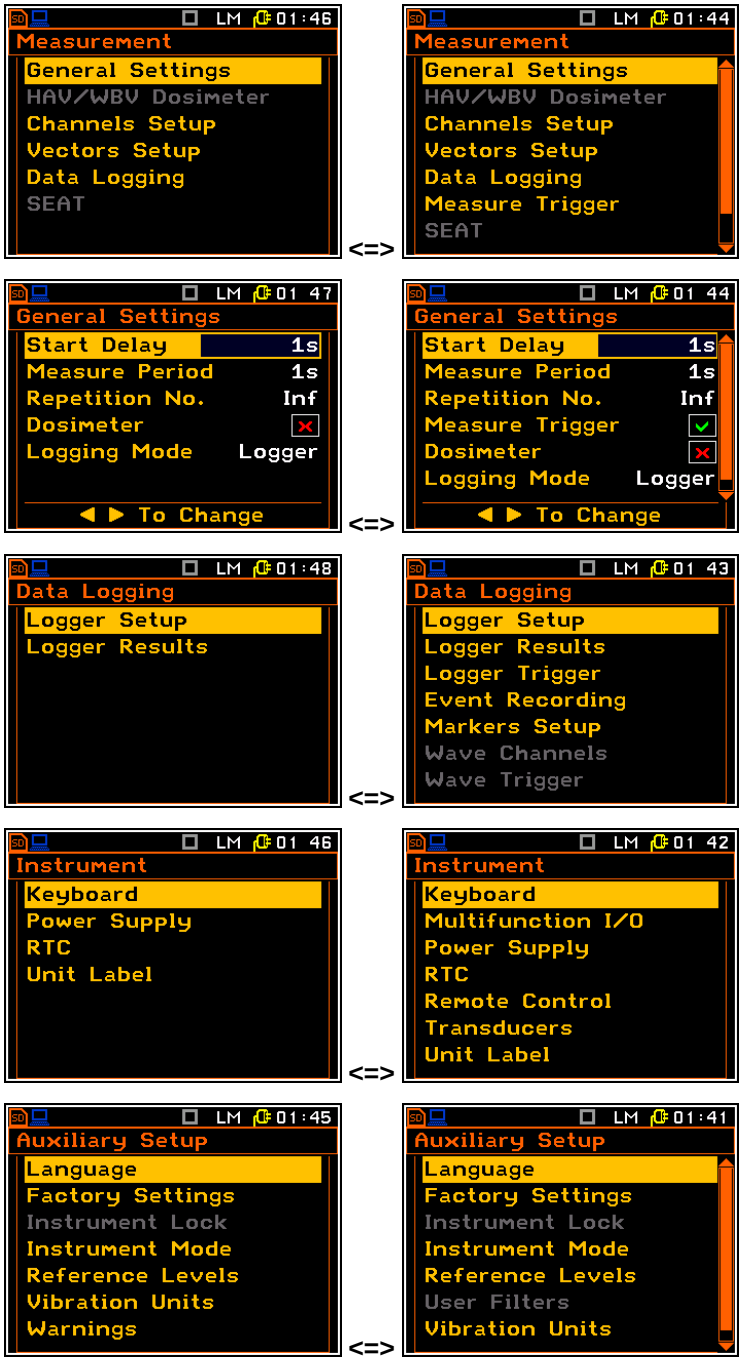
The activation of **Partial** results in locking access to the **Menu** options, which are responsible for measurement parameters. In the case of **Full Lock** no one position from the **Menu** lists is accessible and after attempt of enter **Menu** the **Menu Lock** window appears on the display. The **Menu** is available after unlocking it.

9.7. Setting the scope of instrument's functions — Instrument Mode

The **Instrument Mode** sub-list enables the user to set the scope of available instrument's functions. There are two possible modes of the instrument: **Simple Mode** and **Advanced Mode**. **Advanced Mode** defines the full scope of available functions, while **Simple Mode** defines limited scope of available functions, excluding functions which are using quite rare, like trigger, wave and event recording, user filters etc. Thus some menu lists will have different view/contetn for different instrument modes.

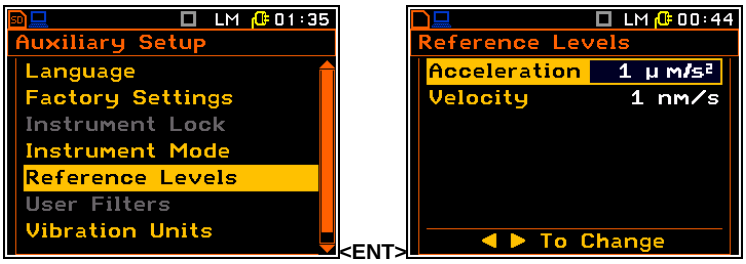


Below some windows, different in simple and advanced modes are presented.



9.8. Reference signal in vibration measurements - Reference Levels

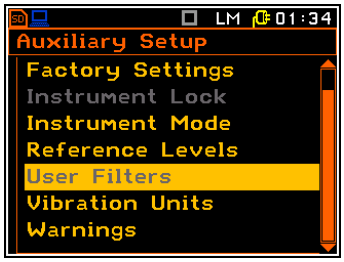
The **Reference Levels** sub-list enables the user to set the reference level of the vibration signal. The values, which are set here, are taken into account during the calculations of the measurement results expressed in the Logarithmic scale (with the **dB** as the units).



In the **Acceleration** position the user can set the reference level of the acceleration signal from **1 µms^{-2}** to **100 µms^{-2}**. In the **Velocity** position, the user can set the reference level of the velocity signal. It is possible to set this level from **1 nms^{-1}** to **100 nms^{-1}**.

9.9. User filter setting – User Filters

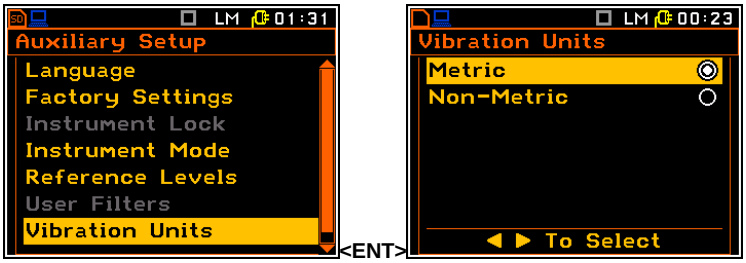
The **User Filters** position enables the user to introduce the values of the coefficients of the user filters. This position is active only in **1/1 Octave** and **1/3 Octave** modes.



9.10. Selection of the Vibration units - Vibration Units

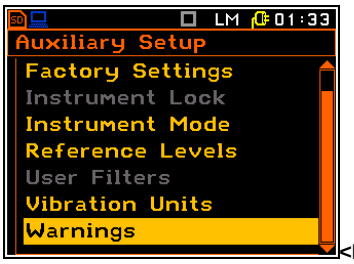
The **Vibration Units** position enables the user to select the metric or non-metric units.

It is possible to select the **Non-Metric** units (e.g. g, ips, mil etc.) or **Metric** units (e.g. m/s^2, m/s, m etc.).



9.11. Warnings selection – Warnings

The **Warnings** enables the user to select the messages, which could be displayed during the operation of the instrument.



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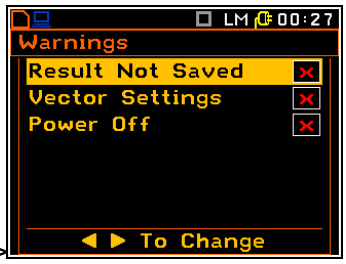
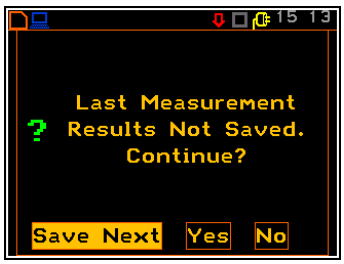


Saving the measurement results in a file

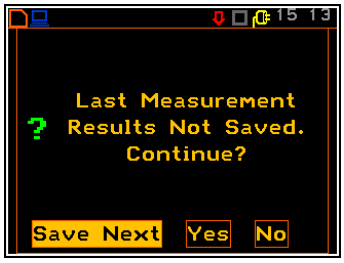


When the position is set to be active the special warning can be displayed after pressing the **<Start/Stop>** push-button. It will be happened in a case when the result of the previous measurement was not saved in a file of the instrument.

The question **Continue?** appears with the warning message. There are three options: **Yes**, **No** or **Save**. If **Yes** is chosen, the instrument returns to the active mode of result presentation starting the new measurement process. If **No** is chosen, the instrument returns to the active mode of measurement result's presentation without starting the new measurement process. If **Save** option is chosen, then the measurement results are saved.

When the **Vector Settings** position is set to be active the special warning can be displayed after

Saving the measurement results in a file

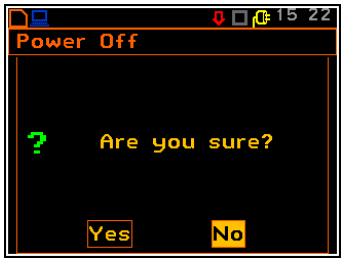


When the position is set to be active the special warning can be displayed after pressing the **<Start/Stop>** push-button. It will be happened in a case when the result of the previous measurement was not saved in a file of the instrument.

The question **Continue?** appears with the warning message. There are three options: **Yes**, **No** or **Save**. If **Yes** is chosen, the instrument returns to the active mode of result presentation starting the new measurement process. If **No** is chosen, the instrument returns to the active mode of measurement result's presentation without starting the new measurement process. If **Save** option is chosen, then the measurement results are saved.

If parameter **Power Off** is switch on then the instrument will send the message in case when the user is switching it off.

Confirmation of the instrument switch off



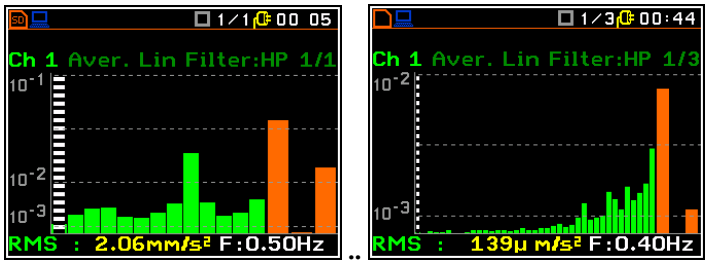
If this parameter is switch on then the instrument will send the message in case when the user is switching it off.

When the **Power Off** position is set to be active the special warning appears after pressing the **<On/Off>** push-button to switch off the instrument.

10. 1/1 AND 1/3 OCTAVE ANALYSER

The instrument operates as **1/1 Octave** or **1/3 Octave** analyser in a very similar way to the **Level Meter** mode and, in addition, 1/1-octave or 1/3-octave analysis is performed in parallel with the **Level Meter** operations. All 1/1-octave (with the centre frequencies from 2 kHz down to 0,5 Hz; in base two system) and 1/3-octave (with the centre frequencies from 2,50 kHz down to 0.40 Hz; in base two system) digital pass-band filters work in the real-time with the **HP** weighting filter (type 1 according to the IEC 61672-1 standard; the filter characteristics are given in Appendix D) and the linear RMS detector.

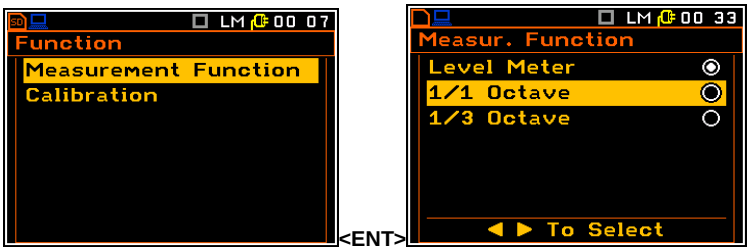
The results of **1/1 Octave** and **1/3 Octave** analysis (also called spectrum analysis) can be examined by the user on a display in the **Spectrum** presentation mode. The availability of this mode can be switched on or off by the user (*path: <Menu> / Display / Display Modes*).



1/1 Octave and **1/3 Octave** spectrum for all centre frequencies of pass-band filters together with three **Total Values** measured with selected by the user weighting filters are presented in the switched on **Spectrum** mode.

10.1. Selection of 1/1 Octave or 1/3 Octave analysis mode

In order to select the **1/1 Octave** or **1/3 Octave** analysis mode the user has to enter the **Function** list by pressing the **<Menu>** push-button, then - select the **Function** text and press the **<ENTER>** one.



Notice: *It is not possible to change the current function during the measurements. The instrument displays in this case for about 2 seconds the text:* ***"Measurement in Progress"****. In order to change the current measurement function the instrument must be stopped!*

10.2. Setting the parameters of 1/1 Octave and 1/3 Octave analysis -

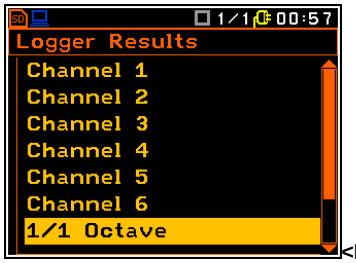
The execution of **1/1 Octave** or **1/3 Octave** analysis depends on settings of the **General Settings** list: **Measure Period** and **Repetition No.**. Other parameters are setting up by default: weighing filter (**HP**), frequency range (from 0,5 Hz up to 2 kHz for 1/1-octave analysis and from 0.40 Hz up to 2,50 kHz for 1/3-octave analysis) and measurement range (**126 m/s^2**). In every 1/1 octave or 1/3 octave bandpass the **RMS** result is measured.

Additionally to the bandpass RMS results three Total values are measured during 1/1 and 1/3 octave analysis. Total values parameters (weighting filter, type of integration filer for acceleration, velocity or displacement results and additional calibration factor) are setting up in the **Total Values** window (*path: <Menu> / Display / Spectrum Display Setup*).

The output of the selected **1/1 Octave** or **1/3 Octave** filter can be also used as the triggering signal for different trigger applications: triggering the logger, triggering the event recording, triggering the wave recording and triggering the alarms.

10.3. Activation of saving of 1/1 Octave and 1/3 Octave analysis results in the logger's file - Logger Results

The **RMS** results from **1/1 Octave** or **1/3 Octave** analysis can be saved in the logger file. The spectrum saving in the logger file can be activete for each channel in the appropriate window (*path: <Menu> / Measurement / Data logging / Logger Results / 1/1 Octave or 1/3 Octave*).



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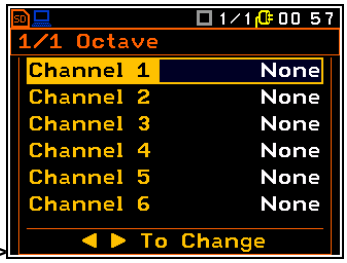
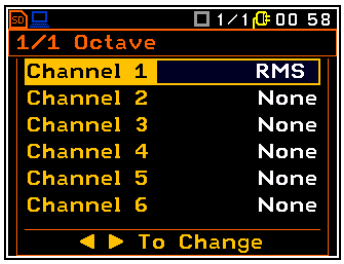


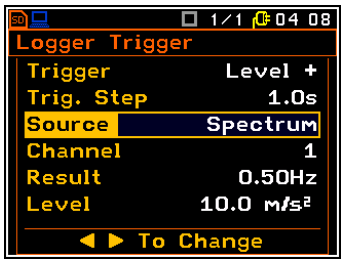
If the **None** value is selected in the position **Channel x** then spectrum data will not be saved in the logger file. If **RMS** value is selected, then RMS spectrum will be saved in the logger file for this channel.



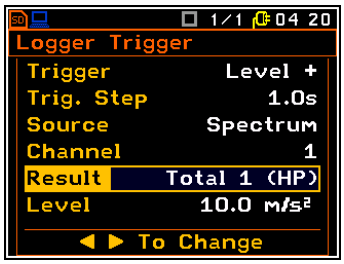
10.4. Selection of the 1/1 Octave and 1/3 Octave bandpass results as triggering source

For the **1/1 Octave** or **1/3 Octave** analysis functions it is possible to define trigger events for logger, event, wave and alarm triggers, based on the spectrum selected band level.

This trigger condition for above applications can be programmed in windows: **Logger Trigger**, **Event Recording Trigger**, **Wave Trigger** and **Alarm Trigger**. In these lists one should set up the **Source** to **Spectrum** and select required band pass in the **Result** position.

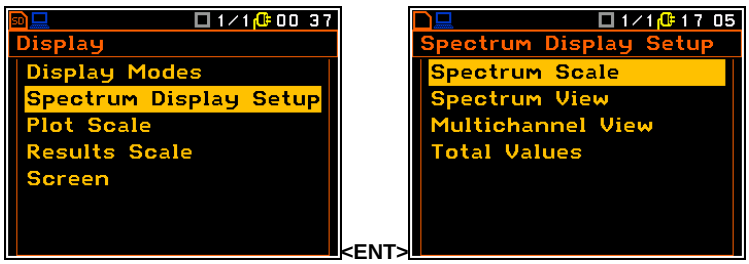


The trigger condition can be defined for the selected in the position **Result** bandpass of **1/1 Octave** filters (**0.50 Hz**, **1.00 Hz**, **2.00 Hz**, **4.00 Hz**, **8.00 Hz**, **16.0 Hz**, **31.5 Hz**, **63.0 Hz**, **125 Hz**, **250 Hz**, **500 Hz**, **1.00 kHz** and **2.00 kHz**), or **1/3 Octave** filters (**0.40 Hz**, **0.50 Hz**, **0.63 Hz**, **0.80 Hz**, **1.00 Hz**, **1.25 Hz**, **1.60 Hz**, **2.00 Hz**, **2.50 Hz**, **3.15 Hz**, **4.00 Hz**, **5.00 Hz**, **6.30 Hz**, **8.00 Hz**, **10.0 Hz**, **12.5 Hz**, **16.0 Hz**, **20.0 Hz**, **25.0 Hz**, **31.5 Hz**, **40.0 Hz**, **50.0 Hz**, **63.0 Hz**, **80.0 Hz**, **100 Hz**, **125 Hz**, **160 Hz**, **200 Hz**, **250 Hz**, **315 Hz**, **400 Hz**, **500 Hz**, **630 Hz**, **800 Hz**, **1.00 kHz**, **1.25 kHz**, **1.60 kHz**, **2.00 kHz**, and **2.50 kHz**), **Total Level** results with appropriate filters can also be selected as a source: **Total 1 (HP)**, **Total 2 (Wd)**, **Total 3 (Bl Wd)**.



10.5. Display options in 1/1 Octave and 1/3 Octave analysis mode

The **Display** list is used for setting the various parameters, which are mainly dedicated for the control of the spectrum view. The following windows contain the elements that influence the presentation of the results of **1/1 Octave** and **1/3 Octave** analysis:



Display Modes — enables one to switch on the spectrum presentation mode;

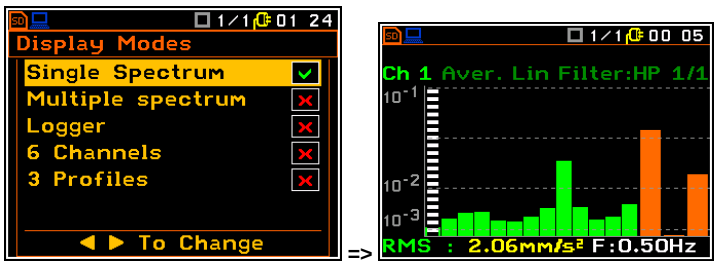
Spectrum Display Setup — enables one to select options for spectrum presentation:

- **Spectrum Scale** — to change the scale of the vertical axis of the graphical presentation, switch on or off the grid, switch on or off autoscale;
- **Spectrum View** — to choose the type of the spectrum to be presented;
- **Multichannel View** — to select how many channels will be displayed simultaneously,
- **Total Values** — to select parameters for **Total Values** presentation.

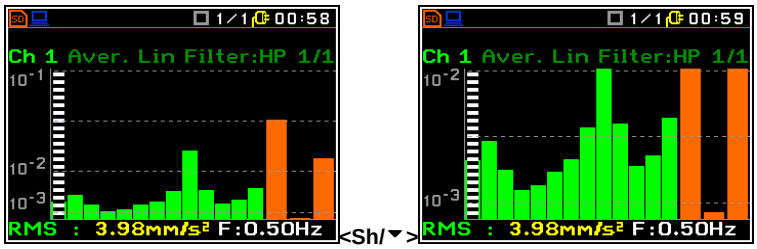
10.6. Presentation of 1/1 Octave and 1/3 Octave analysis results

The **Single Spectrum** and **Multiple spectrum** positions of the **Display Modes** list are accessible only for **1/1 Octave** and **1/3 Octave** functions.

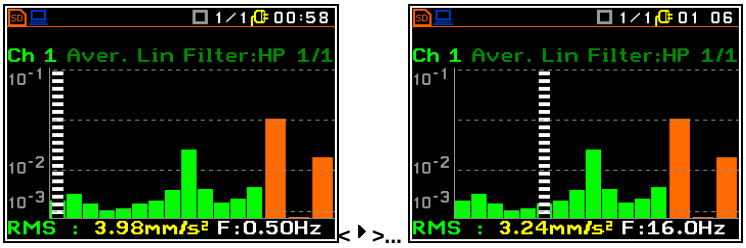
When **Single Spectrum** mode is switched on the measurement screen in Spectrum visualisation mode is like below.



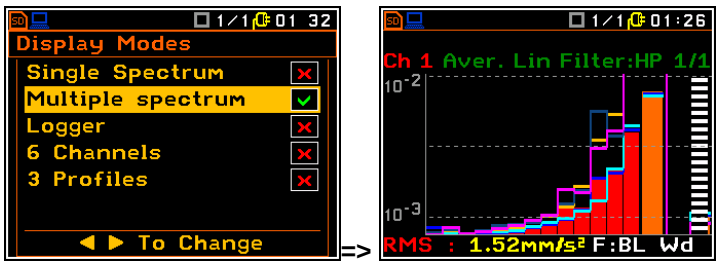
The user may shift the Y-axis during the spectrum presentation after pressing the **<Shift>** and **<▲>** (or the **<Shift>** and **<▼>**) push-buttons.



The user may change the cursor position by means of the **<◀>**, **<▶>** push-buttons. The frequency and appropriate value are presented in the line below the plot.

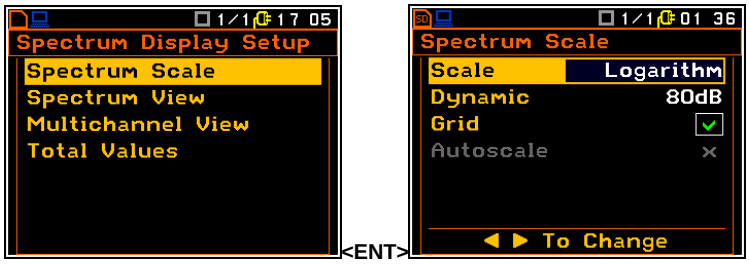


When **Multiple spectrum** mode is switched on the measurement screen in Spectrum visualisation mode is like below.



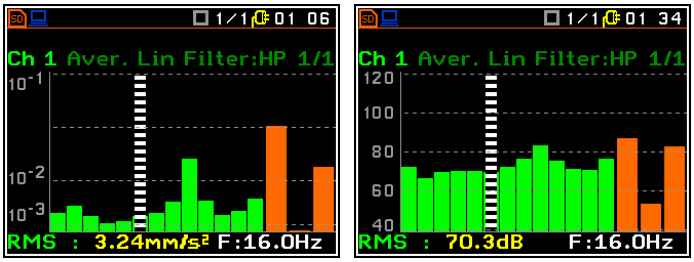
10.7. Setting the scale of the spectrum results presentation – Spectrum Scale

The **Spectrum Scale** sub-list enables the user to change the scale in the available modes of graphical presentation of the measurement results and switch on/off the grid.



Setting the scale of the measurement results presentation

Two options are available for the **Scale** position: **Linear** and **Logarithm**. In the case of the first one the graphical presentation and the units both are linear. In the latter case the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values



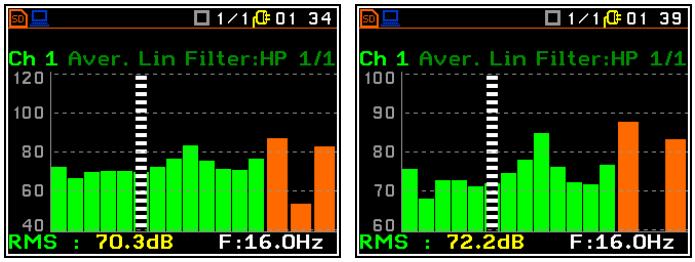
set in the **Reference Level** (*path: <Menu> / Auxiliary Setup / Reference Levels*).

Spectrum presented in linear and logarithmic scale

Scaling the vertical axis of the graphical mode presentation

The **Dynamic** position enables the user to select the proper scaling of the graphical mode presentation. In the case of the vertical axis one can obtain the double, four times and eight times expansion (as the default the vertical axis corresponds to 80 dB, after expansion it corresponds to 40 dB, 20 dB and 10 dB – respectively).

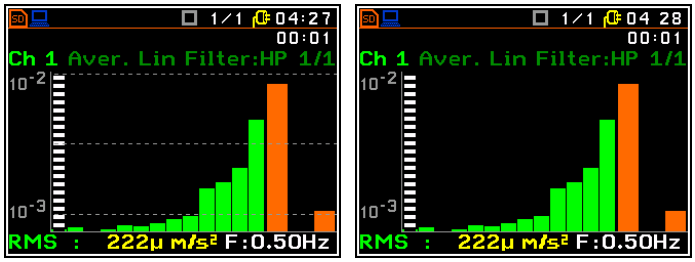
Displays with the 1/1 Octave results presented with different Dynamic parameter (80 and 40 dB) are presented.



Switching on/off the grid in the graphical mode presentation

The **Grid** enables the user to switch on or off the grid in any graphical presentation.

Displays with the grid switched on and off are presented.

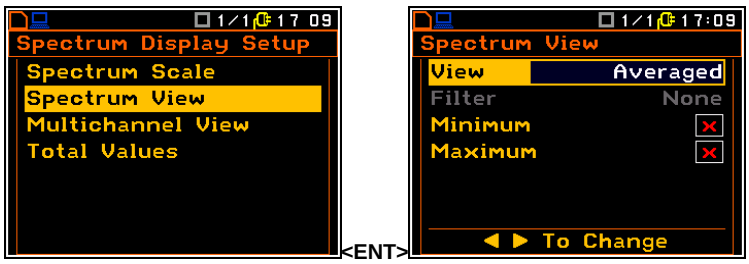


Switching on/off the automatic Y-scale adjustment

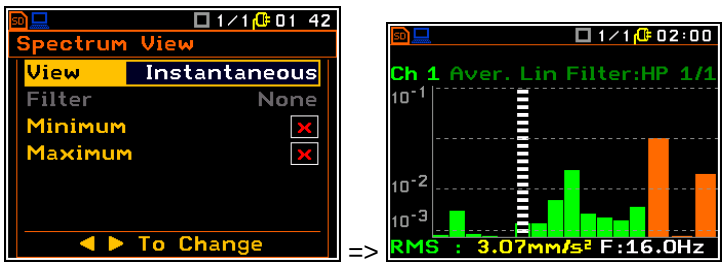
The **Autoscale** position switch on the automatic adjustment of scale Y. This position is under development.

10.8. Setting the parameters of the spectrum presentation - Spectrum View

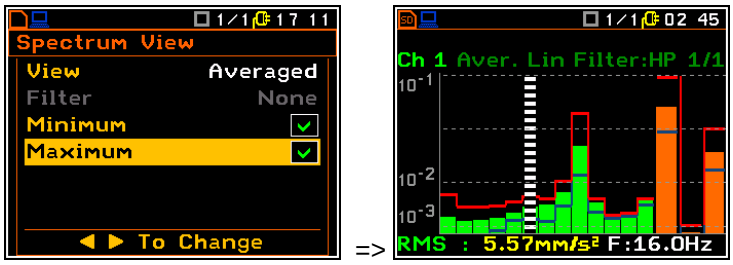
In the **Spectrum View** window the user can program the view of screen in the **Single spectrum** and **Multi spectrum** presentation modes and to set: spectrum type to view (**View**),.filter (**Filter**), minimum and maximum spectrum (**Minimum** and **Maximum**).



In the position **View** the user can select the different type of spectrum like: **Averaged**, **Instantaneous**, **Max** or **Min**.

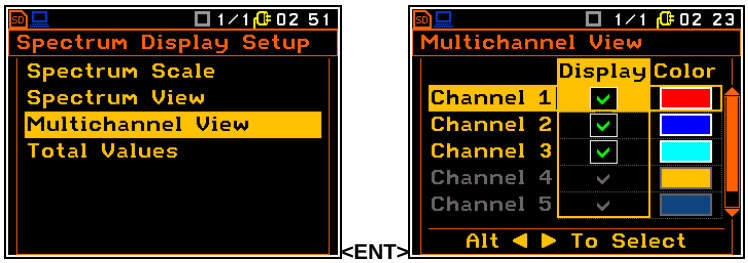


In the case when the **Averaged** or **Instantaneous** spectrum is selected the user can additionally switch on the presentation of **Max** and/or **Min** spectrum.



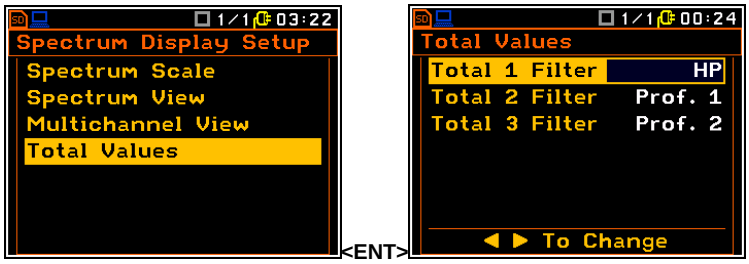
10.9. Selection of the channels for presentation – Multichannel View

The **Multichannel View** window enables one to select for which channels spectrum will be viewed during multi spectrum display mode and to assign special color for the spectrum curve.



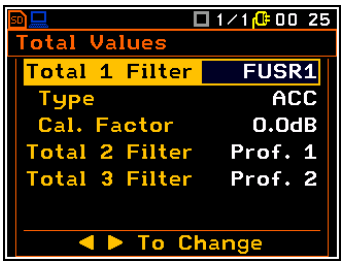
10.10. Setting the parameters for total values – Total Values

The position **Total Values** enables the user to program parameters for total values calculation. The are three total values, calculated for each channel and for all three total values it is possible to define weighting filter, integration method and accordingly type of signal measurement (acceleration, velocity or displacement) as well as calibration factor.



By default for the first Total value **HP** filter is denote. Second and third Totals have same filters as were set up for profiles (**Prof. 1** and **Prof. 2**) in the **Channels** window (*path: <Menu> / Measurement / Channels*).

It is possible to select also tree user filters: **FUSR1**, **FUSR2** and **FUSR3**. When user filter is selected, two additional position appear: **Type** and **Cal. Factor**.



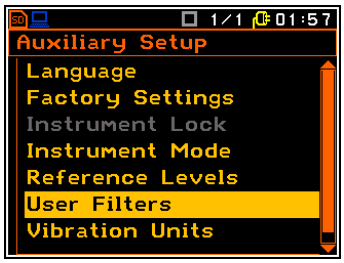
In the position **Type** one can define type of integration to present measured signal as acceleration (**ACC**), velocity (**VEL**) or displacement (**DIL**).

In the position **Cal. Factor** one can define additional calibration factor which will be applied to the calculation of Total value.

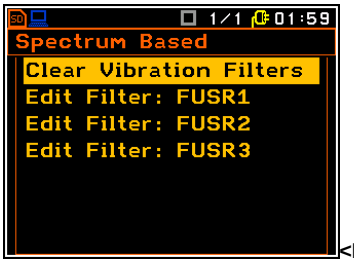
Same settings can be done for Total 2 and Total 3 values.

10.11. Setting user filter coefficients for 1/1 Octave and 1/3 Octave analysis – User Filters

The **User Filters** position (*path: <Menu> / Auxiliary Settings / User Filters*) enables the user to introduce the values of the coefficients of the user filters. This position is active only in **1/1 Octave** and **1/3 Octave** modes. The **User Filters** position opens the window in which the user can clear (**Clear Vibration Filters**) or edit (**Edit Filter**) the filter coefficients for selected user filter **FUSR1**, **FUSR2** and **FUSR3**.

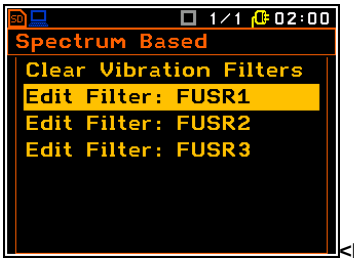


The **Clear Vibration Filters** position opens the window with warning before deletion the user filter coefficients. In case of positive answer, all coefficients of selected filter will be zeroed.

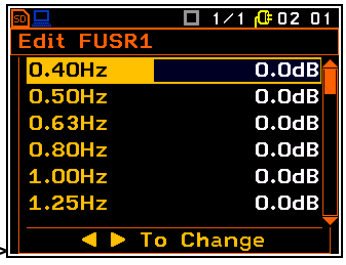


<ENT>

The **Edit Filter** position opens the window with table of filter coefficients. All positions in this table can be edited.



<ENT>



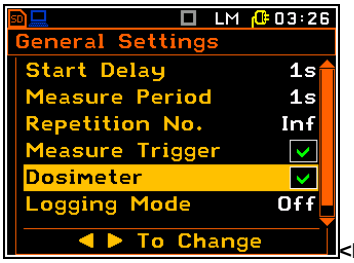
The opened window contains the centre frequencies of the filters and their coefficients:

- **0.40 Hz:** available values for 0.4 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **0.50 Hz:** available values for 0.5 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **0.63 Hz:** available values for 0.63 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **0.80 Hz:** available values for 0.8 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **1.00 Hz:** available values for 1Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **...**
- **2.50kHz:** available values for 2.50 kHz centre frequency filter: **-100.0dB ... 100.0dB**

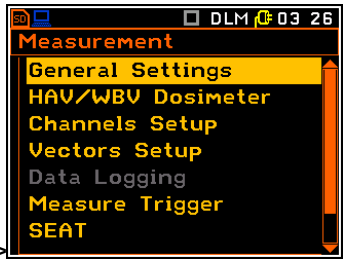
11. DOSIMETER FUNCTION

Activation of the dose meter function

The **Dosimeter** position activates or deactivates the dose meter function. If the **Dosimeter** function is switched on, then all channels will be assigned for whole-body (**WBV**) or hand-arm (**HAV**) dose measurement.



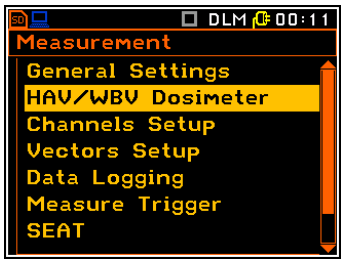
<ENT>



Dosimeter parameters can be setup in the **HAV/WBV Dosimeter** window, opened from the **Measurement** list. If the **Dosimeter** function is switched on, then the **HAV/WBV Dosimeter** position in the **Measurement** list will became active and **DLM**, **D1/1** or **D1/3** function abbreviations appear in the upper line.

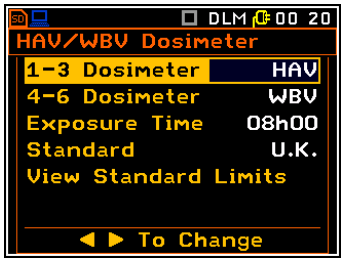
11.1. Setting the parameters for dose measurements – HAV/WBV Dosimeter

The **HAV/WBV Dosimeter** list is opening from the **Measurement** menu. This list enables one to set up the parameters for dose measurements, like: exposition period, type of measurement (whole body or hand arm), performed in channels 1-3 and 4-6, limits, used for some standards (**U.K.**, **Italy**, **Poland**, **France** and **Germany**), as well as limits, defined by the user (**User**).



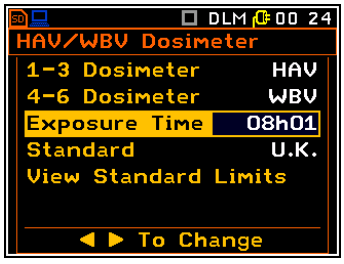
Setting the measurement type for channels 1-3 and 4-6

Positions **1-3 Dosimeter** and **4-6 Dosimeter** enable the user to set the desired type of the measurement, performed with the use of channels 1,2,3 and 4,5,6 – hand-arm (**HAV**) or whole-body (**WBV**) vibration.



Setting the exposure time

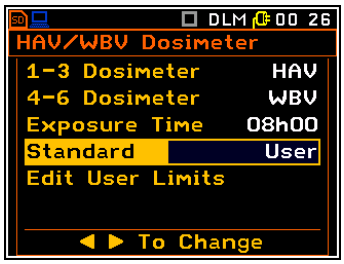
The **Exposure Time** enables the user to set the desired value of the exposure time that is used for the calculation **HAV/WBV Dose** results. The **Exposure Time** values are within the range [**00h01**, **24h00**].



Setting the standard for dose measurements

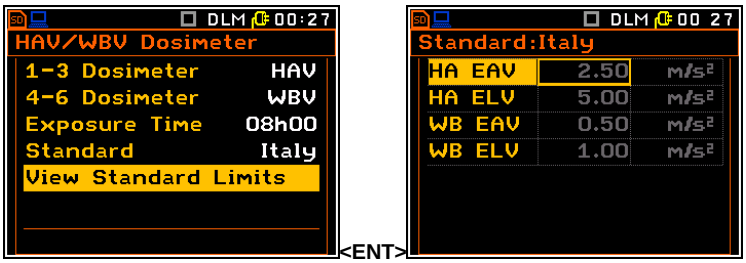
The **Standard** position enables the user to set the standards for the measurements of the **HAV/WBV Dosimeter**. The available values of this position are **U.K.**, **Italy**, **Poland**, **France**, **Germany** and **User**.

Depending of settings in the position **Standard** it is possible to view (**U.K.**, **Italy**, **Poland**, **French**, **Germany**) or edit (**User**) limits for dose calculation.

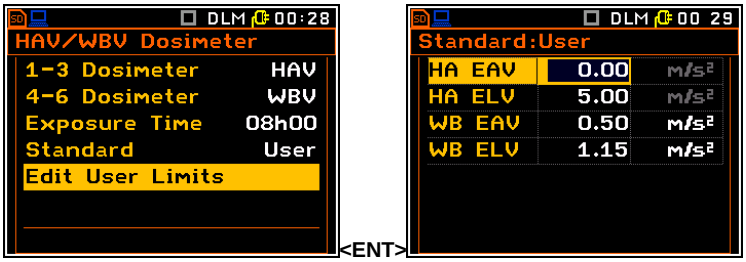


View or edition of the limits for dose calculation

The **View Standard Limits** position opens the window with the coefficients for the selected standard.



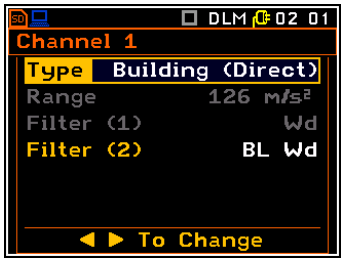
When the **User** is selected in the **Standard** position then the **Edit User Limits** position appears on the screen where the user can set up its own coefficients.



11.2. Setting parameters for channels – Channel x

The **Channel x** positions enable one to set up or display parameters for the individual channel, like input type and filters for profiles.

If **Dosimeter** is active the first profile filter is set by default and it cannot be changed. When second profile is switched off the filter for second profile doesn't appear as parameter in the list.



When **Dosimeter** function is active the filters for first profiles are predefined and depend on type of dosimeter measurements for the channels – **WBV** or **HAV**.

If **WBV** measurements are performed in channels **1-3** or **4-6** the filters defined for channels are as follows:

Channel 1 or 4: **Wd**, Channel 2 or 5: **Wd**, Channel 3 or 6: **Wk**.

If **HAV** measurements are performed in channels **1-3** or **4-6** the filters defined for channels are as follows:

Channel 1 or 4: **Wh**, Channel 2 or 5: **Wh**, Channel 3 or 6: **Wh**.

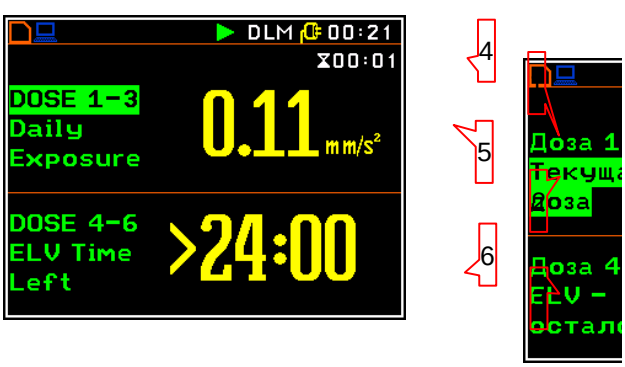
If second profile is active during **Dosimeter** measurements, the filter can be **HP** or one of from **BL Wd**, **BL Wk** or **BL Wh** depending on what filter was predefined for the first profile of the chosen channel, according to the rule described above.

11.3. Dosimeter presentation mode

The dosimeter presentation mode is always active when **Dosimeter** is switched on.

Fields description of the dosimeter view

1. Channels used for dose calculation.
2. Function name: **Daily Exposure**, **AEQ**, **MAX(RMS)**, **EAV Total Time**, **EAV Time Left**, **ELV Total Time**, **ELV Time Left**.

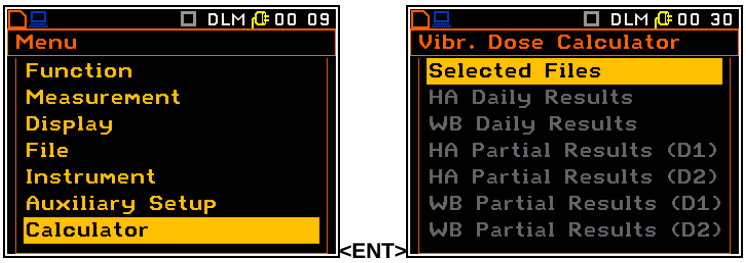


3. Second field for dose results measurement.

4. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Meas. Period**].
5. The value of measured function.
6. The value of measured function in the second field.

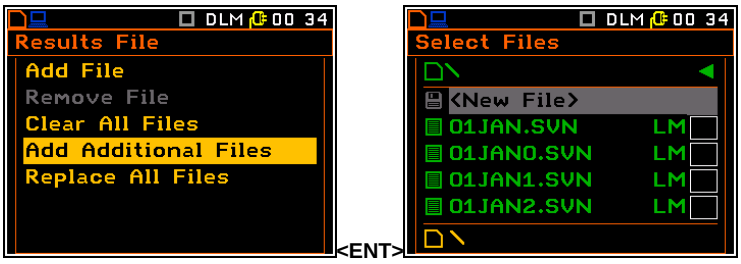
11.4. Calculation of hand-arm and whole-body daily results – Calculator

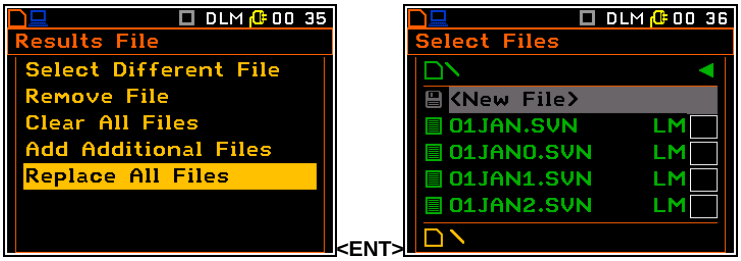
The **Calculator** position is used to calculate the various parameters, which are dedicated to the dosimeter measurements. This position opens menu **Vibr. Dose calculator**, which based on selected files with partial results (**Selected Files**) calculates HA and WB daily results.



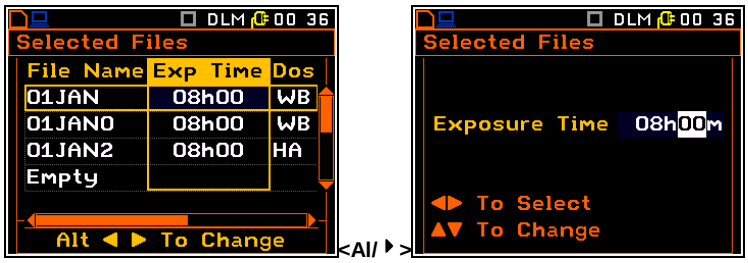
The **Selected Files** position is used to load data from the files with dosimeter results. It is possible to select up to 10 files. The name of the file is accepted and the file is loaded after pressing the **<ENTER>** push-button. The name of this file appears in a list as it is presented below.

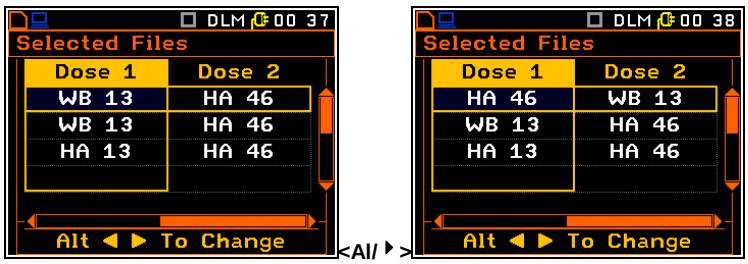
The message **Invalid File Content** is displayed when the selected file does not include dosimeter data. The instrument waits for the reaction of the user until pressing any push-button except the **<Shift>** and **<Alt>**. After that, it returns to the **Selected Files** list.

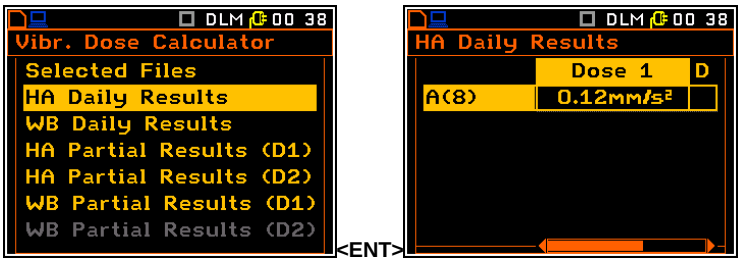


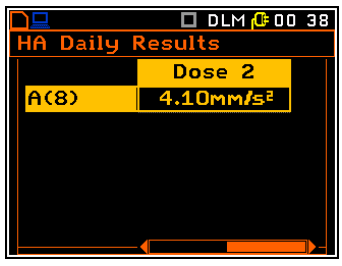


The **Exp Time** (Exposure Time) defines the period during that the measurement results are extrapolated. The required value can be set in the special window, which is opened by means of the **<◀ >**, **< ▶>** push-buttons, pressed together with the **<Alt>** one. The Exposure Time can be set from **00h00m** to **24h00m**. The user can set the Exposure Time for each file separately.

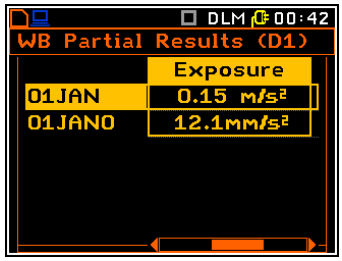


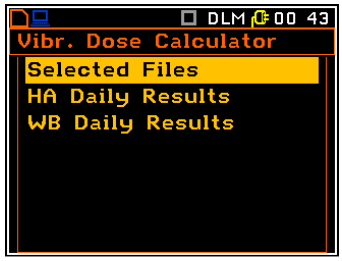







DLM 00:39
Vibr. Dose Calculator
Selected Files
HA Daily Results
WB Daily Results
HA Partial Results (D1)
HA Partial Results (D2)
WB Partial Results (D1)
WB Partial Results (D2)
<ENT>
DLM 00 39
WB Daily Results
Dose 1
A(8) 23.4mm/s²
Dose(8) 0.52 m/s^1.75
DLM 00:40
Vibr. Dose Calculator
Selected Files
HA Daily Results
WB Daily Results
HA Partial Results (D1)
HA Partial Results (D2)
WB Partial Results (D1)
WB Partial Results (D2)
<ENT>
DLM 00 40
HA Partial Results (D1)
EAV ELV
01JAN2 >24h00 >24h0
DLM 00 41
HA Partial Results (D1)
Exposure
01JAN2 0.12mm/s²
DLM 00:41
Vibr. Dose Calculator
Selected Files
HA Daily Results
WB Daily Results
HA Partial Results (D1)
HA Partial Results (D2)
WB Partial Results (D1)
WB Partial Results (D2)
<ENT>
DLM 00:41
HA Partial Results (D2)
EAV ELV
01JAN >24h00 >24h0
01JAN0 >24h00 >24h0
01JAN2 >24h00 >24h0
DLM 00 41
HA Partial Results (D2)
Exposure
01JAN 4.09mm/s²
01JAN0 0.23mm/s²
01JAN2 0.12mm/s²
DLM 00:42
Vibr. Dose Calculator
Selected Files
HA Daily Results
WB Daily Results
HA Partial Results (D1)
HA Partial Results (D2)
WB Partial Results (D1)
WB Partial Results (D2)
<ENT>
DLM 00 42
WB Partial Results (D1)
EAV ELV
01JAN >24h00 >24h0
01JAN0 >24h00 >24h0


DLM
00:42
WB Partial Results (D1)
Exposure
01JAN
0.15 m/s²
01JAN0
12.1mm/s²


DLM
00 43
Vibr. Dose Calculator
Selected Files
HA Daily Results
WB Daily Results

A. REMOTE CONTROL

The **USB 1.1** interface is the serial one working with 12 MHz clock. Its speed is relatively high and it ensures the common usage of USB in all produced nowadays Personal Computers.

The functions which are developed in order to control data flow in the serial interface ensure:

- bi-directional data transmission,
- remote control of the instrument.

The user, in order to programme the serial interface, has to:

1. send "the function code",
2. send an appropriate data file

or

3. receive a data file.

A.1. Input / output transmission types

The following basic input / output transmission types (called functions) are available:

#1 input / output of the control setting codes,
#2 output of the measurement data in the vibration level meter (**VLM**) mode,
#3 output of the measurement data in **1/1 OCTAVE** or **1/3 OCTAVE** mode,
#4 read out the data file from the internal Flash-disc and/or the special file located in the RAM memory,
#6 remote setting of the user filters,
#7 special control functions,
#9 send the setup file to the internal Flash-disc.

A.2. Function #1 – input / output of the control setting codes

Function #1 enables the user to send the control setting codes to the instrument and read out a file of the current control state. A list of the control setting codes is given in Tab. A.1.

The format of **#1** is defined as follows:

#1,Xccc,Xccc,(...),Xccc;

or

#1,Xccc,X?,Xccc,(...),X?,Xccc;

where:

X - the group code, **ccc** - the code value,
X? - the request to send the current X code setting.

The instrument will output a control settings file for all requests **X?** in the following format:

#1,Xccc,Xccc,(...),Xccc;

In order to read out all current control settings the user should send to the device the following characters:

#1;

The instrument will output a control settings file in the format:

#1,Xccc,Xccc,(...),Xccc;

Example: The following sequence of characters:

#1,U106,N4000,Z0:1,Z0:2,Z0:3,Z0:4,Z0:5,Z0:6,M3,Y1000,Xa1,Xv1,Xd1,XA0,XR0,S0;

means that:

- the **SV 106** is investigated (U106),
- the unit's number is **4000** (N4000),
- the **Vibration Level Mode** is selected in channel 1 (Z0:1),
- the **Vibration Level Mode** is selected in channel 2 (Z0:2),
- the **Vibration Level Mode** is selected in channel 3 (Z0:3),
- the **Vibration Level Mode** is selected in channel 4 (Z0:4),
- the **Vibration Level Mode** is selected in channel 5 (Z0:5),
- the **Vibration Level Mode** is selected in channel 6 (Z0:6),
- the **1/3 OCTAVE analyser** function is selected (M3),
- the measurement start delay is equal to **1000** milliseconds (Y1000),
- the reference level for acceleration measurement is set to **1 µms^{-2}** (Xa1),
- the reference level for velocity measurement is set to **1 nms^{-1}** (Xv1),
- the reference level for displacement measurement is set to **1 pm** (Xd1),
- the AutoSave option is switched off (XA0),
- the RAM file will not be created (XR0),
- the instrument is in the **STOP** state (S0).

Note: *All bytes of that transmission are ASCII characters.*

Note: Any setting can be changed only when the instrument is in the STOP state (S0).

A.3. Function #2 – read-out of the measurement results in the VLM mode

Function **#2** enables one to read out the current measurement data in the **VLM** Mode.

Notice: *This function can also be programmed while measurements are taking place. In this case, the RMS values measured* ***after entering #2 function*** *will be sent out.*

#2 function has a format defined as follows:

#2,p,X?,X?,X?,(...),X?;

where:

X - the code of the result,
p - the number of the results set
-1,-2 – for reading vibration dose results for channels 1-3 and 4-6
13,14 - for reading vector results for channels 1-3 and 4-6
1,2,3,..,12 – for reading profile results
(calculated from the formulae: *ChannelNumber + 6 * (ProfileNumber - 1)*

Notice: *After entering the* ***STOP*** *condition, #2 function is no longer active and has to be reprogrammed in order to read-out successive measurements.*

The instrument will send the values of the results in the format defined as follows:

#2,p,Xccc,Xccc,Xccc,(...),Xccc; (where **p** - the number of the results set)

or

#2,?; (when the results are not available).

The codes of the results in the case of **VLM** mode are defined as follows:

V the overload flag (ccc equals to 0 or 1);
T time of the measurement (ccc – value in seconds);
P the **P–P** value (ccc – the value in dB);
Q the **PEAK** value (ccc – the value in dB);
M the **MTVV** value (ccc – the value in dB);
R the **RMS** value (ccc – the value in dB);
H the **VDV** value (ccc – the value in dB);
v the underrange value (ccc – the value in dB).

Example: After sending to the instrument the string:

#2,1,T?,V?,P?,R?;

one should receive the following answer:

#2,1,T3,V0,P76.92,R64.50;

The codes of the results in the case of **Vibration Dose** mode are defined as follows:

a the **Current Dose** value (ccc – the value in dB);
b the **Daily Dose value** (ccc – the value in dB);
c the **Current Exposure** value (ccc – the value in dB);
f the **Daily Exposure** value (ccc – the value in dB);
g the **EAV Time** value (ccc – value in seconds);
h time left to reach **EAV** value (ccc – value in seconds);
i the **ELV Time** value (ccc – value in seconds);
j time left to reach **ELV** value (ccc – value in seconds).

Example: After sending to the instrument the string:

#2,-1,c?,f?,g?,h?;

one should receive the following answer:

#2,-1,c-27.89,f-13.44,g172800,h172800,i172800,j172800;

The codes of the results in the case of **Vector** mode are defined as follows:

P the **PPV** value if vector type is set to PPV (ccc – value in dB).
M the **MTVV** value if vector type is set to MTVV (ccc – value in dB).
R the **RMS** value if vector type is set to RMS (ccc – value in dB).

Notice: *All bytes of that transmission are ASCII characters.*

A.4. Function #3 – read-out of the measurement results in 1/1 OCTAVE and 1/3 OCTAVE mode

Function **#3** enables one to read out the current measurement data in **1/1 OCTAVE**, **1/3 OCTAVE**.

#3 function format is defined as follows:

#3,n;

where: **n** – the number of channel (1, 2, 3, 4, 5, or 6)

The device will respond, sending the last measured spectrum (when in STOP state) or currently measured spectrum (in RUN state) in the following format:

#3,n;<Status Byte> <LSB of the transmission counter> <MSB of the transmission counter> <data byte> (...) <data byte>

Status Byte gives the information about the current state of the instrument.

D7	D6	D5	D4	D3	D2	D1	D0

where:

D7	= 1	denotes "overload indicator",
D6	= 1	denotes "averaged spectrum",
D5	= 0	the instantaneous current result (RUN State),
	= 1	the final result (STOP State),
D0 to D4		reserved bits.

Note: *The measurement result is coded in binary form as dB•100 (e.g. 34.5 dB is sent as binary number 3450).*

A.5. Function #4 – read-out of the data file from the internal flash-disc and/or the special file located in the RAM memory

Function **#4** enables the user to read-out the data file from the internal Flash-disc memory. The data file formats are given in Appendix B.

#4 function formats are defined as follows:

#4,0,\;	the file containing the catalogue,
#4,1,FILE NAME;	the file containing the measurement results or saved setup,
#4,1,FILE NAME,addr;	the file containing the measurement results or saved setup,
#4,2,Bnnn;	the file containing logger,
#4,3;	the special file contained in the RAM memory (**RAMfile**),

where:

FILE NAME	not longer than eight-character name,
addr	is the logical address of the file in the internal Flash-disc memory,
nnn	the number of the logger file (one or more digits - depends on requirements).
RAMfile	the special name for the file contained in the RAM memory, may be used also with the format: **#4,1,RAMfile;**

Notice: The "\" character is the obligatory catalogue file name *(it must be sent to the instrument).*

The device will respond sending the specified file/catalogue in the following format:

#4,k;<4 bytes giving the file size (in binary form)><data byte>...<data byte>

where character **k** corresponds to the file type:

0 for the file containing the catalogue,
1 for the file containing the measurement results or saved setup,
2 for the file containing the logger file.

All data words are sent as **<LSB>**,**<MSB>**.

When an error is detected in the file specification or data, the instrument will send: **#4,?;**

The catalogue of the files is a set of the records containing 16 words (16 bits each). Each record describes one file saved in the instrument's Flash-disc. The record structure is as follows:

words 0 - 3 8 character file name,
word 4 file type (binary number),
word 5 reserved,
word 6 least significant word of the file size,
word 7 most significant word of the file size,
word 8 least significant word of the file logical address,
word 9 most significant word of the file logical address,
word 10 measurement start date,
word 11 measurement start time,
words 12 - 15 reserved.

For logger and the RAMfile the **logical address** is always set to 0.

For files containing saved setup measurement start date and time are always set to 0.

Notice: *If the* ***DEFRAGMENTATION*** *function is performed after the read out of the files catalogue the logical addresses of the files could be wrong.*

The measurement **start date** is coded as a word with bits:

b15 ... b3 b2 b1 b0

where:

b15 b14 b13 b12 b11 b10 b9 is a year minus 2000.
b8 b7 b6 b5 is a month (1..12),
b4 b3 b2 b1 b0 is a day (1..31).

The measurement **start time** is coded as number of seconds counted from 00:00:00 divided by 2.

The structure of the files containing the measurement results, saved setups and/or logger files is described in details in Appendix B.

A.7. Function #6 – remote setting of the user filters

Function **#6** enables one to send to the instrument the coefficients of the user filters. In the available formats description of **#6** functions the following symbols are used:

type	- 0 for the vibration filters,
	- 1 for the acoustic filters,
name, **name$_1$**, **name$_2$**	- filter names given by the user,
v	- real type value, expressed in [dB],
first	- integer type value (number of the coefficient in the user filter),
pos	- integer type value (Total value number),
avd	- for the vibration filters: 0 - Acc, 1- Vel, 2 - Dil,
	- for the acoustic filters this parameter is always equal to 0,
cal	- the calibration coefficient given as the real number expressed in [dB].
chn	- channel number (1, 2, 3 or 4).

#6 function formats are defined as follows:

#6,type,L;

This function returns the list of the defined (existing in the instrument) filters in the following format: **#6,type,n,name$_1$, ... ,name$_n$;**

#6,type,W,name,v,v,...,v;

This function sets the coefficients of the new user filter named as **name**. The **name** parameter should be unique (in the instrument there is not any other filter with the same name, otherwise it will be an error). The function answers in the format: **#6;**

#6,type,R,name;

This function returns the coefficients of the user filter named as **name**. If the **name** filter does not exist, an error occurs. The function returns in the following format: **#6,type,n,v$_1$,v$_2$, ... ,v$_n$;**

#6,type,D,name;

This function deletes from the instrument the user filter named as **name**. If the **name** filter does not exist, an error occurs. The function answers in the format: **#6;**

#6,type,S,name,v,v,...,v;

This function sets the user filter named as **name**. If the **name** filter already exists, its coefficients are redefined. If the **name** filter does not exist, the filter is created. The function answers in the format: **#6;**

#6,type,C,name,first,v,v,...,v;

This function sets the coefficients in the user filter named as name starting from the first position. If the **name** filter does not exist, an error occurs. The function answers in the format: **#6;**

#6,type,N, name$_1$, name$_2$;

This function changes the name of the user filter from **name$_1$** to **name$_2$**. The function answers in the format: **#6;**

#6,type,@,chn,L;

This function returns the names of the user filters, assigned to the channel **chn** consecutive **TOTAL** values, in the following format: **#6,type,chn,3,name$_1$,name$_2$,name$_3$;**

#6,type,@,chn,pos,?;

This function returns the description record of the user filter assigned to the **pos TOTAL** value of channel **chn** in the following format: **#6,type,@,chn,pos,name,avd,cal;** (the description record contains: the name of the filter, its type and the calibration coefficient).

#6,type,@,chn,pos,*;

This function recovers the predefined filter for the **pos TOTAL** value of channel **chn** and returns the following format: **#6,type,@,chn,pos,name,avd,cal;**

#6,type,@,chn,pos,name,avd,cal;

This function sets the description record of the user filter assigned to the **pos TOTAL** value of channel **chn** in the following format: **#6,type,@,chn,pos,name,avd,cal;**

The returned parameters: **name**, **avd** and **cal** are set in the description record after the execution of the function. In the case of an error they can differ from the current parameters of the function.

Notice: *In the case of an error all these functions return the following sequence of the characters:* ***#6?;***

A.8. Function #7 – special control functions

Function **#7** enables the user to perform special control functions. **Some of them should be used with the extreme care.**

#7 function formats are defined as follows:

#7,CB;

This function deletes all logger files in current directory on SD card. The function returns **#7,CB;** This function is not accepted while the instrument is in the RUN state.

#7,BF;

This function returns free space in the format:
#7,BF,ddddd; (**ddddd** - number of bytes in decimal format).

#7,BN;

This function returns the number of logger files created to the current time in the format: **#7,BN,ddddd;** (**ddddd** - number of logger files in decimal format).

#7,RT;

This function returns current real time clock settings in the format:
#7,RT,hh,mm,ss,DD,MM,YYYY;
where **hh:mm:ss** denotes the time and **DD**/**MM**/**YYYY** gives the date.

#7,RT,hh,mm,ss,DD,MM,YYYY;

This function sets the current real time clock and returns the following sequence of characters: **#7,RT;**

#7,AS;

This function returns current real time and date settings for the AutoStart function in the format: **#7,AS,e,hh,mm,ss,DD;** where e=1 if AutoStart function is switched ON or 0 if it is switched OFF, **hh:mm:ss** gives the time and **DD** gives the day for the current date.

#7,AS,e,hh,mm,DD;

This function uses the given time and date settings for AutoStart function and returns the following sequence of characters: **#7,AS;**

#7,SS;

This function saves the current settings of the instrument in the EEPROM memory. The function returns the following sequence of characters: **#7,SS;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DA;

This function deletes all files containing measurement results and instrument's settings from the current directory. The function returns the following sequence of characters: **#7,DA;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DF;

This function deletes all files containing measurement results from current directory. The function returns the following sequence of characters: **#7,DF;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DF,fileName;

This function deletes file named **fileName** containing measurement results. The function returns the following sequence of characters: **#7,DF;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DF,fileName<iAddr;

This function deletes file located at internal address **iAddr** containing measurement results from the internal flash memory. The function returns the following sequence of characters: **#7,DF;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DS;

This function deletes all files containing instrument's settings from the internal flash memory. The function returns the following sequence of characters: **#7,DS;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DS,fileName;

This function deletes file named **fileName** containing instrument's settings from the internal flash memory. The function returns the following sequence of characters: **#7,DS;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,DS,fileName<iAddr;

This function deletes file containing instrument's settings located at internal address **iAddr** from the internal flash memory. The function returns the following sequence of characters: **#7,DS;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,AN,FName;

This function sets the name of the file for the Autosave function as the **FName**. The given name has to start with the '@' character and contain no more than 8 characters. The function returns the following sequence of characters: **#7,AN;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,AN;

This function returns current file name used by Autosave function in the format: **#7,AN,FName;**.
This function is not accepted and not performed while the instrument is in the RUN state.

#7,AV;

This function returns analyser firmware version in the format **#7,AV,XX.XX.XXC;** where XX.XX.XX is firmware version, C – firmware subversion.

#7,US;

This function returns unit subtype in the format **#7,US,XX;** where XX is subtype number.

#7,AL,?;

This function returns activated alarms list in the format: **#7,AL,XX,XX,...,XX;** where XX is alarm identifier.

#7,AL,XX;

This function returns SMS message text for activated alarm, where XX is alarm identifier.

#7,AL,R;

This function disables all alarm conditions and returns **#7,AL,R1;**

#7,LB;

This function returns current file name used for logging in the format: **#7,LB,FName;**.

#7,UH;

This function returns device selected for file storing in the format: **#7,UH,XX;**, where XX can be one of: 0 - internal memory, 2 - SD card.

#7,UH,XX;

This function sets the device selected for file storing, where XX can be one of: 0 - internal memory, 2 - SD card. Function returns **#7,UH,XX;** where XX is selected device.
This function is not accepted and not performed while the instrument is in the RUN state.

#7,RC,?;

This function returns state of remote control mode in the format: **#7,RC,x;** where x can be 0 (disabled) or 1 (enabled).

#7,RC,x;

This function sets state of remote control mode to disabled in case X equals 0 or enabled otherwise. Function returns **#7,RC;** upon success.

#7,CS;

This function loads factory settings.
The function returns the following sequence of characters: **#7,CS;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,PO;

This function switches the instrument off.
The function returns the following sequence of characters: **#7,PO;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,LT;

This function reloads transducer parameters from TEDS.
The function returns the following sequence of characters: **#7,LT;**
This function is not accepted and not performed while the instrument is in the RUN state.

#7,IM,?;

This function returns instrument mode in the format **#7,IM,X;** where X equal to 0 means Simple mode and Advanced otherwise

#7,IM,X;

This function sets instrument mode to Simple if X equals 0, and to Advanced if X equals 1.
Function returns the following sequence of characters: **#7,IM,X;**, where X is current instrument mode.
This function is not accepted and not performed while the instrument is in the RUN state.

#7,BS;

This function returns battery charge level in the format **#7,BS,nn;** where nn is a percent value. When battery state is not available (i.e. unit is powered from external source) function returns **#7,BS,-1;**.

Notice: *For the unknown function and/or in the case of the other error, all these functions return the following sequence of characters:* ***#7,?;***

A.9. Function #9 – writing setup files to the internal flash-disc

Function #9 allows uploading files containing instrument setup to the internal Flash-disc. The function expects files in format described in Appendix B, paragraph B.9. **Function should be used with extreme care.**

The #9 function format is defined as follows:

#9,2,Len,<data byte> ... <data byte>

where:

Len - length of transferred file in bytes as ASCII,

<data byte> - byte of data in binary form.

Function responds with "**#9,1;**" on success and with "**#9,0;**" on failure.

A.10. Control setting codes

The control setting codes used in the **SV 106** instrument (starting from the internal software version 3.21.6) are given in the table below.

Table A.1. Control setting codes

Group name	Group code	Code description
Unit type	**U**	U106 (read only)
Serial number	**N**	Nxxxx (read only)
Software version number * 100	**W**	Wxxx xxx - Analyzer version number * 100 (read only)
Channel mode	**Z**	Z0:n - Vibration LM / Analyzer for channel n

Calibration factor	**Q**	Qnnnn:c nnnn - real number with the value of the calibration factor for channel c in dB ∈ (-99.9 ÷ 99.9)
Measurement function	**M**	M1 - **Level Meter** M2 - **1/1 OCTAVE analyser** M3 - **1/3 OCTAVE analyser**
Execution of **1/1 OCTAVE** or **1/3 OCTAVE** analysis in channel n	**e**	e0:n - Spectrum analysis in channel n disabled e1:n - Spectrum analysis in channel n enabled
Range of channel n	**R**	R1:n - **316 ms^{-2}** (**VLM**)
Filter type in **1/1 OCTAVE** or **1/3 OCTAVE** analysis in channel n for **VLM**	**i**	i0:n - **HP** filter in channel n (read only)
Filter type in profile for **VLM**	**I**	I0:m **HP** filter for profile m I5:m **Vel3** filter for profile m I16:m **Wk** filter for profile m I17:m **Wd** filter for profile m I18:m **Wc** filter for profile m I19:m **Wj** filter for profile m I20:m **Wm** filter for profile m I21:m **Wh** filter for profile m I22:m **Wg** filter for profile m I23:m **Wb** filter for profile m I24:m **Wf** filter for profile m I118:m **BL Wc** filter for profile m I119:m **BL Wj** filter for profile m I120:m **BL Wm** filter for profile m I121:m **BL Wh** filter for profile m I122:m **BL Wg** filter for profile m I123:m **BL Wb** filter for profile m I124:m **BL Wf** filter for profile m m = ChannelNo + 6 * (ProfileNo - 1)
Detector type in profile for **VLM**	**E**	E4:m - **1 s** detector in profile m m = ChannelNo + 6 * (ProfileNo - 1)
Logger type in profile in the case of **VLM**	**G**	G0:m - **None** logger in profile Gxx:m - xx - sum of values for profile m: 1 – logger with **PEAK** values 2 – logger with **P–P** values 4 – logger with **MAX** values 8 – logger with **RMS** values 16 – logger with **VDV** values m = ChannelNo + 6 * (ProfileNo - 1)
Storing the results of **1/1 OCTAVE** or **1/3 OCTAVE** analysis in channel n in logger file	**g**	g0:n - switched off (**none**) in channel n g4:n - switched on (**RMS**) in channel n
Logger time step	**d**	dnnnn - nnnn number in milliseconds ∈ (**100**, **200**, **500**, **1000**) dnns - nn number in seconds ∈ (1 ÷ 60) dnnm - nn number in minutes ∈ (1 ÷ 60)
Integration time	**D**	D0 “infinite” number Dnns nn number in seconds Dnnm nn number in minutes Dnnh nn number in hours

Repetition cycle	**K**	K0 - infinity (measurement stopped when the STOP button is pressed or when remote setting S0 is received) Knnnn -nnnn number of repetitions ∈ (1 ÷ 1000)
Detector type in the **LEQ** (for **SLM**) and/or **RMS** (for **VLM**) function	**L**	L0 - **LINEAR**
Measurement Trigger Mode (TriggerMode)	**m**	m0 - **OFF** m1 - **SLOPE +** m2 - **SLOPE –** m3 - **LEVEL +** m4 - **LEVEL –** m5 - reserved m6 - **GRAD +** m7 - **RTC**
Source of the triggering signal for measurement functions: M1 and M6 (TriggerSource)	**s**	s0 - Vector 1-3 value s1 - Vector 4-6 value s2 - reserved s3 - **RMS** value from profile 1 s4 - External trigger
Channel of the triggering signal	**c**	c1 - channel 1 c2 - channel 2 c3 - channel 3 c4 - channel 4 c5 - channel 5 c6 - channel 6
Source of the triggering signal for measurement function	**o**	o0 - Vector 1-3 value o1 - Vector 4-6 value o2 - reserved o3 - **RMS** value from profile 1 o4 - External trigger
Source of the triggering signal for measurement function M3	**t**	t0 - Vector 1-3 value t1 - Vector 4-6 value t2 - reserved t3 - **RMS** value from profile 1 t4 - External trigger
VLM's trigger level (TriggerLev)	**n**	nxxx - xxx level given in dB ∈ (60 ÷ 200)
VLM's vector trigger level (VecTriggerLev)	**h**	hxxx - xxx level given in dB ∈ (60 ÷ 200)
Number of the records from the logger taken into account before the fulfilment of the triggering condition (TriggerPre)	**p**	pnn - nn number of the records taken into account before the fulfilment of the triggering condition ∈ (0 ÷ 20)
Number of the records from the logger taken into account after the fulfilment of the triggering condition (TriggerPost)	**q**	qnn - number of the records taken into account after the fulfilment of the triggering condition ∈ (0 ÷ 200)
Delay in the start of measurement	**Y**	Ynn nn delay given in milliseconds ∈ (0 ÷ 60000)
Reference level for acceleration (RefLev_a)	**Xa**	Xannn nnn reference level for acceleration given in μms^{-2} ∈ (1 ÷ 100)
Reference level for velocity (RefLev_v)	**Xv**	Xvnnn nnn reference level for velocity given in nms^{-1} ∈ (1 ÷ 100)
Reference level for displacement (RefLev_d)	**Xd**	Xdnnn nnn reference level for displacement given in pm ∈ (1 ÷ 100)

AutoSave option	**XA**	XA0 - switched OFF XA1 - switched ON, file names are numbered
Using the RAMfile instead of the flash disk while storing results with the AutoSave option switched on	**XR**	XR0 - switched OFF XR1 - switched ON
Extended I/O Mode	**x**	x0 - **AC/Int.** in **Analogue** mode x1 - **AC/Int.** in **Digital In** mode x2 - **AC/Int.** in **Digital Out** mode
External I/O Channel for analogue **AC/Int.** mode	**y**	yn - n - channel number between 1 and 6
State of the instrument (Stop or Start)	**S**	S0 - **STOP** S1 - **START**
Menu lock mode	**Xb**	Xb0 - menu unlocked Xb1 - menu partially locked Xb2 - menu fully locked
Vector calculation mode	**XB**	XB0:n - switched OFF XB1:n - HAV XB2:n - WBV XB3:n - user defined XB3:n - MTVV XB4:n - PPV n - 1 for channels 1-3, 2 for channels 4-6
Channel coefficient for vector calculation	**XC**	XCxx:k:n - xx - value of coefficient *100 $\in (0 \div 200)$ - n - channel number - k: 1 - vector 1-3 2 - vector 4-6
Storing vector in logger file	**XD**	XD0:k - switched OFF XD8:k - switched ON k: 1 - channels 1-3 2 - channels 4-6
Type of vibration dose	**XE**	XE1:k - HAV XE2:k - WBV k: 1 - channels 1-3 2 - channels 4-6
Vibration dose exposure time	**XF**	XFnn nn - time in minutes $\in (0 \div 1440)$
Vibration dose standard	**XG**	XG0 - Great Britain XG1 - Italy XG2 - Poland XG3 - French XG4 - user defined XG5 - German XG6 - China
X axis channels	**XH**	XHN:1 - N - x axis channel for channels 1-3 XHN:2 - N - x axis channel for channels 4-6
Y axis channels	**XI**	XIN:1 - N - y axis channel for channels 1-3 XIN:2 - N - y axis channel for channels 4-6
Z axis channels	**XJ**	XJN:1 - N - z axis channel for channels 1-3 XJN:2 - N - z axis channel for channels 4-6

Spectrum **MAX** store	**XT**	XT0 spectrum **MAX** switched OFF XT1 spectrum **MAX** switched ON
Spectrum **MIN** store	**Xt**	Xt0 spectrum **MIN** switched OFF Xt1 spectrum **MIN** switched ON
Trigger gradient level for **VLM**	**Xh**	Xgnn - nn – gradient level in dB/ms ∈ [1,100]
RTC trigger start time	**Xr**	Xrnn - nn – time in seconds ∈ [0,86399]
RTC trigger step time	**Xs**	Xs0 - use integration time for step Xsnn - nn – step in seconds ∈ [1,86400]
Function for Digital In **AC/Int.** mode	**XP**	XP0 - trigger pulse
Function for Digital Out **AC/Int.** mode	**XQ**	XQ0 - trigger pulse XQ1 - alarm pulse
AC/Int. polarization	**XU**	XU0 - positive XU1 - negative
AC/Int. active level	**XV**	XV0 - active low XV1 - active high
Logger writing trigger	**XXk**	XXk0 - switched OFF XXk1 - switched ON
Wave writing trigger	**XXl**	XXl0 - switched OFF XXl1 - switched ON
Logging mode	**XXm**	XXm0 - switched OFF XXm1 - logger XXm2 - wave
Channel input type	**XXn**	XXn0:P - direct XXn1:P - IEPE XXn2:P - building direct XXn3:P - building IEPE P - channel number
Measurement trigger	**XXu**	XXu0 - switched OFF XXu1 - switched ON
Dosimeter enable	**XXv**	XXv0 - switched OFF XXv1 - switched ON
Noise compensation	**XXK**	XXK0 - switched OFF XXK1 - switched ON
Simple trigger mode	**XXXi**	XXXi0:K - OFF XXXi1:K - LEVEL - XXXi2:K - LEVEL + XXXi3:K - SLOPE - XXXi4:K - SLOPE + XXXi5:K - GRADIENT – XXXi6:K - GRADIENT + K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger

Simple trigger integration period	**XXXj**	XXXj0:K - logger step XXXj1:K - 100 ms XXXj2:K - 1 s XXXj3:K - elapsed integration time XXXj4:K - integration period K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger
Simple trigger source	**XXXk**	XXXk0:K:M - Vector XXXk1:K:M - PEAK XXXk2:K:M - P–P XXXk3:K:M - MAX XXXk4:K:M - RMS XXXk5:K:M - VDV XXXk6:K:M - first spectrum bar ... XXXk21:K:M - last 1/1 Octave spectrum bar XXXk22:K:M - first 1/1 Octave total XXXk23:K:M - second 1/1 Octave total XXXk24:K:M - third 1/1 Octave total XXXk44:K:M - last 1/3 Octave spectrum bar XXXk45:K:M - first 1/3 Octave total XXXk46:K:M - second 1/3 Octave total XXXk47:K:M - third 1/3 Octave total K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger M: simple trigger source type (cf. XXXm)
Simple trigger level	**XXXl**	XXXlN:K - N – level in dB*10 K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger
Simple trigger source type	**XXXm**	XXXm0:K - Vector XXXm1:K - Profile XXXm2:K - Spectrum K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger
Simple trigger source channel	**XXXp**	XXXpN:K - N - channel K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger

Simple trigger source channels	**XXXq**	XXXq0:K - Channels 1-3 XXXq1:K - Channels 4-6 K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger
Hand-Arm EAV User limit	**XXXr**	XXXrN - N – limit value*100
Hand-Arm ELV User limit	**XXXs**	XXXsN - N – limit value*100
Whole Body EAV User limit	**XXXt**	XXXtN:P - N – limit value*100 P - axis number 1 - X axis 2 - Y axis 3 - Z axis
Whole Body ELV User limit	**XXXu**	XXXuN:P - N – limit value*100 P - axis number 1 - X axis 2 - Y axis 3 - Z axis
vibration dosimeter user unit type	**XXXv**	XXXv0:P - m/s^2 XXXv1:P - $m/s^{1.75}$ P - limit index 0 - H-A EAV 1 - H-A ELV 2 - WBV EAV 3 - WBV ELV
enabled channels	**XXXw**	XXXw0 - all channels XXXw1 - channels 1-3 XXXw2 - channels 4-6
enable 2nd profile	**XXXx**	XXXx0 - 2nd profiles disabled XXXx1 - 2nd profiles enabled
interface language	**XXXy**	XXXy0 - english XXXy1 - polish XXXy2 - italian XXXy3 - russian XXXy7 - german

B. DATA FILE STRUCTURES (v3.21)

B.1. Structure of the SVAN 106 file

Each file containing data from the SVAN instrument consists of several groups of words. In the case of the **SVAN 106** there are some different types of files that contain:

- the measurement results from the **L**evel **M**eter mode (cf. App. B.3.1.);
- the results from the **L**evel **M**eter mode stored in the file in the instrument's logger (cf. App. B.3.1. and App. B.4);
- the setup data of the instrument (cf. App.B.3.3);
- the results from **1/1 OCTAVE** analysis (cf. App. B.3.4.);
- the results from **1/3 OCTAVE** analysis (cf. App. B.3.5.);
- the results from **1/1 OCTAVE** or **1/3 OCTAVE** analysis stored in the file in the instrument's logger (cf. App. B.4 and App. B.3.6);

Each file has the following elements:

- a file header (cf. Tab. B.1.1);
- the unit and internal software specification (cf. Tab. B.1.2);
- the marker for the end of the file (cf. Tab. B.1.11).

The other elements of the file structure are not obligatory for each file type stated above. They depend on the file type (**LM**, **1/1 OCTAVE**, **1/3 OCTAVE**, file from the logger, setup file). These elements are as follows:

- the parameters and global settings, common for all channels (cf. Tab. B.1.3);
- the hardware settings for channels (cf. Tab. B.1.4);
- the software settings for channels (cf. Tab. B.1.5);
- the **VECTOR** measurement settings (cf. Tab. B.1.6);
- the hand-arm and whole-body vibration dose measurement settings (cf. Tab. B.1.7);
- the main results (cf. Tab. B.1.8);
- the logger header (cf. Tab. B.1.9);
- the data stored during the measurements in the logger (cf. Tab. B.1.10);
- the setup data of the instrument (cf. Tab. B.1.12);
- the trigger settings (cf. Tab. B.1.13, Tab.B.1.14);
- event recording settings(cf. Tab.B.1.15);
- the **1/1 OCTAVE** or **1/3 OCTAVE** analysis header (cf. Tab. B.1.16);
- the results coming from **1/1 OCTAVE** analysis (cf. Tab. B.1.17);
- the results coming from **1/3 OCTAVE** analysis (cf. Tab. B.1.18);
- the totals description in **1/1 OCTAVE** or **1/3 OCTAVE** analysis (cf. Tab. B.1.19);
- the user-defined filter description (cf. Tab. B.1.21);
- the **1/1 OCTAVE** or **1/3 OCTAVE** logger header (cf. Tab. B.1.22);
- the Max results coming from **1/1 OCTAVE** analysis (cf. Tab. B.1.23);
- the Min results coming from **1/1 OCTAVE** analysis (cf. Tab. B.1.24);
- the Max results coming from **1/3 OCTAVE** analysis (cf. Tab. B.1.25);
- the Min results coming from **1/3 OCTAVE** analysis (cf. Tab. B.1.26);
- the **SEAT** measurements settings (cf. Tab. B.1.27);

Below, all file structure groups are described separately in Tab. B.1.1 ÷ Tab. B.1.27. The format used in the columns, named **Comment** with the square parenthesis (**[xx**, **yy]**), means the contents of the word with **xx** is the most significant byte (MSB) and **yy** the least significant byte (LSB) of the word. The format **0xnnnn** means that the **nnnn** is four-digit number in hexadecimal form.

Table B.1.1. File header

Word number	Name / Value	Comment
0	0xnn01	[01, nn=header_length]
1..4	FileName	file or logger name (8 characters) if the name starts with two '@' characters, following 6 bytes contain measurement date and time coded as BCD (each saved digit is increased by one)
5	FileType	0x0000 - file containing results from logger's file 0x01nn - file containing measurements results 0x0200 - file containing instrument's setup data 0x4000 - file containing time-domain signal
6	CurrentDate	file creation date
7	CurrentTime	file creation time
8..11	AssBufFileName	name of the associated logger or file (8 bytes)
…	…	…

Table B.1.2. Unit and software specification

Word number	Name / Value	Comment
0	0xnn02	[02, nn=specification_length]
1	UnitNumber	unit number
2	UnitType	unit type: 106
3	SoftwareVersion	software version * 100
4	SoftwareIssueDate	software issue date
5	UnitSubtype	unit subtype: 1
6	FilesystemVersion	file system version * 100
7	reserved	Reserved
8	0xmmcc	[mm=software minor version, cc=software subversion]
…	…	…

Table B.1.3. Parameters and global settings

Word number	Name / Value	Comment
0	0xnn04	[04, nn=block_length]
1	CycleStartDate	measurement cycle start date
2	CycleStartTime	measurement cycle start time
3	DeviceFunction	1 - **LEVEL METER**, 2 - **1/1 OCTAVE** analyser, 3 - **1/3 OCTAVE** analyser, 4 - sound **DOSE METER**, 6 - **FFT** analyser, 8 - **RT60** meter, 13 - **FFT CROSS-SPECTRUM**, 14 - **SOUND INTENSITY**, 17 - **WAVERECORDER**

4	UnitFlags	flags word (16 bits): b15 ... b3 b2 b1 b0 b0 - if set to 1: calibration coefficient is used b1 - if set to 1: overload occurred b2 - if set to 1: "Human vibrations" excluded (0 - means "Human vibrations" included and then **VDV** result is present) b5,b4,b3: type of the result Result[p][7] (p = 1,2,3,4) 000 - **Lden** result is not available 001 - **Ld** result 010 - **Le** result 011 - **Lde** result 100 - **Ln** result 101 - **Lnd** result 110 - **Len** result 111 - **Lden** result b6 - if set to 1: overload occurred in the 6th channel b7 - if set to 1: overload occurred in the 5th channel b8 - if set to 1: overload occurred in the 4th channel b9 - if set to 1: overload occurred in the 3rd channel b10 - if set to 1: overload occurred in the 2nd channel b11 - if set to 1: overload occurred in the 1st channel b12, ..., b15 - reserved
5	RepCycle	0 - infinity nnnn - number of repetitions $\in (1 \div 1000)$
6	StartDelay	start delay time specified in milliseconds $\in (1 \div 60000)$
7..8	IntTimeSec	0 - infinity integration time specified in seconds
9	MeasureTriggerChannel	source channel of the triggering signal: 0 (the 1st channel) .. 5 (the 6th channel)
10	MeasureTriggerMode	trigger mode: 0 - **OFF**, 1 - **SLOPE+**, 2 - **SLOPE–** , 3 - **LEVEL+**, 4 - **LEVEL–**, 6 - **GRADIENT+**, 7 - **RTC**
11	MeasureTriggerSource	source of the triggering signal: 0 - the **VEC 1-3** result 1 - the **VEC 4-6** result 4 - the **RMS(1)** result from the selected channel 5 - the External trigger
12	MeasureTriggerLev	level of triggering: 60..200 dB in the case of source channel in Vibration Meter mode
13	MeasureVecTriggerLev	level of triggering for **VEC** result: 60..200 dB
14	LoggerTriggerPre	number of the records taken into account before the fulfilment of the triggering condition $\in (1 \div 20)$
15	LoggerTriggerPost	number of the records taken into account after the fulfilment of the triggering condition $\in (1 \div 200)$
16	LeqInt	detector's type in the **LEQ** function: 0 - **LINEAR**, 1 - **EXPONENTIAL**
17	Reserved	Reserved
18	RefLev_a	reference level for acceleration given in $\mu ms^{-2} \in (1 \div 100)$
19	RefLev_v	reference level for velocity given in $nms^{-1} \in (1 \div 100)$
20	RefLev_d	reference level for displacement given in pm $\in (1 \div 100)$
21	NofChannels	number of channels (6)
22	NofProfiles	number of profiles (12)
23	NotSpect	number of spectrum
24	reserved	Reserved

25	CalibrType	calibration type: 0 - calibration not performed 1 - calibration by measurement 2 - calibration by sensitivity
26	CalibrDate	date of the last calibration
27	CalibrTime	time of the last calibration
28	MeasureTriggerGrad	the gradient level for gradient trigger mode
29	reserved	Reserved
30	reserved	Reserved
31	reserved	Reserved
32	reserved	Reserved
33	reserved	Reserved
34	reserved	Reserved
35	reserved	Reserved
36	CycleMeasurementStartDate	measure start date
37..38	CycleMeasurementStartTime	measure start time
39	enabledChannels	Channels used for measurement as bitfield: b0 - channel 1 enabled b1 - channel 2 enabled .. b5 - channel 6 enabled
…	…	…

Table B.1.4. Hardware settings for channels

Word number	Name / Value	Comment
0	0xnn05	[05, nn=block_length]
1	0xkk06	[06, kk=sub-block_length]
2	ChannelMode[1]	mode of the 1st channel 0 - Vibration Level Meter / Analyser
3	CalibrFactor[1]	calibration factor (*10 dB) in the 1st channel
4	Reserved	always 1
5	Reserved	Reserved
6	Reserved	Reserved
7	Reserved	Reserved
8	Reserved	Reserved
9	RangeDB[1]	Range in the 1 st channel as dB*100
…	…	…
kk*5 + 1	0xkk06	[06, kk=sub-block_length]
kk*5 + 2	ChannelMode[6]	mode of the 6 th channel: 0 - Vibration Level Meter / Analyser
kk*5 + 3	CalibrFactor[6]	calibration factor (*10 dB) in the 6 th channel
kk*5 + 4	Reserved	always 1
kk*5 + 5	Reserved	Reserved
kk*5 + 6	Reserved	Reserved
kk*5 + 7	Reserved	Reserved
kk*5 + 8	Reserved	Reserved
kk*5 + 9	RangeDB[6]	Range in the 6 th channel as dB*100

	force_flags1	flags word (16 bits): b15 ... b3 b2 b1 b0 b0 - if set to 1: 1st force channel results have been calculated b1 ... b15 – reserved
	force_buffer1	logger contents in the 1st force channel defined as a sum of: 1 - for **PEAK** results, 2 - for **MAX** results, 4 - for **MIN** results, 8 - for **AVER** results,
	force_flags2	flags word (16 bits): b15 ... b3 b2 b1 b0 b0 - if set to 1: 2nd force channel results have been calculated b1 ... b15 - reserved
	force_buffer2	logger contents in the 2nd force channel defined as a sum of: 1 - for **PEAK** results, 2 - for **MAX** results, 4 - for **MIN** results, 8 - for **AVER** results,
…	…	…

Table B.1.5. Software settings for channels

Word number	Name / Value	Comment
0	0xnn07	[07, nn=block_length]
1	0x040C	[used_channel, used profile]
2..7	ProfileSett[1]	the 1st profile settings for the 1st channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
8..13	ProfileSett[2]	the 1st profile settings for the 2nd channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
14..19	ProfileSett[3]	the 1st profile settings for the 3rd channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
20..25	ProfileSett[4]	the 1st profile settings for the 4th channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
26..31	ProfileSett[5]	the 1st profile settings for the 5th channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
32..37	ProfileSett[6]	the 1st profile settings for the 6th channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
38..43	ProfileSett[7]	the 2nd profile settings for the 1st channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
44..49	ProfileSett[8]	the 2nd profile settings for the 2nd channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
50..55	ProfileSett[9]	the 2nd profile settings for the 3rd channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
56..61	ProfileSett[10]	the 2nd profile settings for the 4th channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
62..67	ProfileSett[11]	the 2nd profile settings for the 5th channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**

68..73	ProfileSett[12]	the 2nd profile settings for the 6th channel, defined in the case of **VLM** mode - in Table **B.1.5_VLM**
…	…	…

Table B.1.5_VLM. Software settings for a channel in the case of VLM mode

Word number	Name / Value	Comment
0	0xnn08	[08, nn=sub-block_length]
1	ChannelNo	channel number: 0 - the 1st channel
2	FilterP	filter type in the channel: 0 - **HP**, 5 - **VEL3**, 16 - **Wk**, 17 - **Wd**, 18 - **Wc**, 19 - **Wj**, 20 - **Wm**, 21 - **Wh**, 22 - **Wg**, 23 - **Wb**, 24 - **Wf**, 116 - **BL Wk**, 117 - **BL Wd**, 118 - **BL Wc**, 119 - **BL Wj**, 120 - **BL Wm**, 121 - **BL Wh**, 122 - **BL Wg**, 123 - **BL Wb**, 124 - **BL Wf**
3	DetectorP	detector type in the channel: 0 - **100 ms**, 1 - **125 ms**, 2 - **200 ms**, 3 - **500 ms**, 4 - **1 s**, 5 - **2 s**, 6 - **5 s**, 7 - **10 s**
4	BufferP	logger contents in the channel defined as a sum of: 1 - for **PEAK** results, 2 - for **P–P** results, 4 - for **MAX** results, 8 - for **RMS** results, 16 - for **VDV** results
5	ProfileFlags	flags word (16 bits): b15 ... b3 b2 b1 b0 b0 - if set to 1: profile results have been calculated b1 ... b15 - reserved
…	…	…

Table B.1.6. Vector measurement settings

Word number	Name / Value	Comment
0	0xnn38	[1E, nn=sub-block_length]
1	vecNo	Vector id: 0 - **VEC 1-3**, 1 - **VEC 4-6**
2	vecChMask	Channels used for vector calculation: b0 - if set to 1: channel 1 was used for calculation b1 - if set to 1: channel 2 was used for calculation b2 - if set to 1: channel 3 was used for calculation b3 - if set to 1: channel 4 was used for calculation b4 - if set to 1: channel 5 was used for calculation b5 - if set to 1: channel 6 was used for calculation
3	Buffer	vector result logging: 0 - **OFF**, 8 – **RMS**
4	VectorCoeff[1]	vector coefficient for the RMS value from the 1st channel (*100)
5	VectorCoeff[2]	vector coefficient for the RMS value from the 2nd channel (*100)
6	VectorCoeff [3]	vector coefficient for the RMS value from the 3rd channel (*100)
7	VectorCoeff [4]	vector coefficient for the RMS value from the 4th channel (*100)

8	VectorCoeff [5]	vector coefficient for the RMS value from the 5th channel (*100)
9	VectorCoeff [6]	vector coefficient for the RMS value from the 6th channel (*100)
10	type	vector type: 0 - RMS vector, 1 - MTVV, 2 - PPV
…	…	…

Table B.1.7. Settings for vibration dose measurement

Word number	Name / Value	Comment
0	0xnn1F	[1F, nn=block_length]
1	doseIdx	0 - dosimeter 1-3 1 - dosimeter 4-6
2	doseType	type of dosimeter: 1 - Hand-Arm measurement, 2 - Whole-Body measurement
3	xAxis	channel of x axis
4	yAxis	channel of y axis
5	zAxis	channel of z axis
6	ExposureTime	exposure time in minutes
7	Standard	standard: 0 - **UK**, 1 - **Italy**, 2 - **Poland**, 3 - **French**, 4 - **User**, 5 - **German**
8	HAV_EAV_X	Hand-Arm x-axis action value*100
8	HAV_EAV_Y	Hand-Arm y-axis action value*100
8	HAV_EAV_Z	Hand-Arm z-axis action value*100
9	HAV_ELV_X	Hand-Arm x-axis limit value*100
9	HAV_ELV_Y	Hand-Arm y-axis limit value*100
9	HAV_ELV_Z	Hand-Arm z-axis limit value*100
10	WBV_EAV_X	Whole-Body x-axis action value*100
10	WBV_EAV_Y	Whole-Body y-axis action value*100
10	WBV_EAV_Z	Whole-Body z-axis action value*100
11	WBV_ELV_X	Whole-Body x-axis limit value*100
11	WBV_ELV_Y	Whole-Body y-axis limit value*100
11	WBV_ELV_Z	Whole-Body z-axis limit value*100
12	Unit[1]	type of HAV_EAV value (0 - RMS based, 1-VDV based)
13	Unit[2]	type of HAV_ELV value (0 - RMS based, 1-VDV based)
14	Unit[3]	type of WBV_EAV value (0 - RMS based, 1-VDV based)
15	Unit[4]	type of WBV_ELV value (0 - RMS based, 1-VDV based)
…	…	…

Table B.1.8. Main results

Word number	Name / Value	Comment
0	0xnn0D	[0D, nn=sub-block_length]
1	0x040C	[used_channel, used profiles]
2..15	MainResults[1]	main results from the 1st profile of the 1st channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
16..29	MainResults[2]	main results from the 1st profile of the 2nd channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
30..43	MainResults[3]	main results from the 1st profile of the 3rd channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**

44..57	MainResults[4]	main results from the 1st profile of the 4th channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
58..71	MainResults[5]	main results from the 1st profile of the 5th channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
72..85	MainResults[6]	main results from the 1st profile of the 6th channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
86..99	MainResults[7]	main results from the 2nd profile of the 1st channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
100..113	MainResults[8]	main results from the 2nd profile of the 2nd channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
114..127	MainResults[9]	main results from the 2nd profile of the 3rd channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
128..141	MainResults[10]	main results from the 2nd profile of the 4th channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
142..155	MainResults[11]	main results from the 2nd profile of the 5th channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
156..169	MainResults[12]	main results from the 2nd profile of the 6th channel, defined in the case of **VLM** mode - in Table **B.1.8_VLM**
170	Vec13	**RMS** value of vector **VEC 1-3** (*100 dB)
171	Vec46	**RMS** value of vector **VEC 4-6** (*100 dB)
172..	Force13	main results from the 1st force channel
	Force46	main results from the 2nd force channel
...	...	...

Table B.1.8_VLM. One-profile main results in the case of VLM mode

Word number	Name / Value	Comment
0	0xnn0E	[0E, nn=sub-block_length]
1..2	MeasureTime	time of the measurement in the channel (if the 1st profile in channel) overload time in the channel (if second profile in channel)
3	Result[1]	**PEAK** value in the profile (*100 dB)
4	Result[2]	**P–P** value in the profile (*100 dB)
5	Result[3]	reserved
6	Result[4]	reserved
7	Result[5]	**MTVV** (or **MAX**) value in the profile (*100 dB)
8	Result[6]	**VDV** value in the profile (if UnitFlags bit b2 is set to 0) (*100 dB)
9	Result[7]	**RMS** value in the profile (*100 dB)
10	Result[8]	reserved
11	Result[9]	reserved
12	Result[10]	reserved
13	Result[11]	reserved
…	…	…

Table B.1.8_FORCE. One force channel main results

Word number	Name / Value	Comment
0	0xnn49	[49, nn=sub-block_length]
1	Result[1]	**PEAK** force value (*100 N)
2	Result[2]	**MIN** force value (*100 N)

3	Result[3]	**MAX** force value (*100 N)
4	Result[4]	**AVERAGE** force value (*100 N)
…	…	…

Table B.1.9. Header of the file from the logger

Word number	Name / Value	Comment
0	0xnn18	[18, nn=header_length]
1	BufResOffs	position of the first saved result
2	BuffTSec	logger time-step - full seconds part
3	BuffTMilisec	logger time-step - milliseconds part
4..5	BuffLength	logger length (bytes)
6..7	RecsInBuff	number of records in the logger
8..9	RecsInObserv	number of records in the observation period equal to: number of records in the logger + number of records not saved
10..11	AudioRecs	number of audio records in the logger
…	…	…

Note: *The current logger time step in seconds can be obtained from the formulae:*
T = BuffTSec + BuffTMilisec / 1000*.*

Table B.1.10. Contents of the file from the logger

Word number	Name / Value	Comment
0..(BuffLength/2-1)		result#1, result#2, ... result#(BuffLength/2-1)

Table B.1.11. File end marker

Word number	Name / Value	Comment
0	0xFFFF	file end marker

Table B.1.12. Data block of instrument's setup

Word number	Name / Value	Comment
0	0x0020	[20, 00=block length in the next word]
1	BlockLength	block length
2..BlockLength-1	SetupData	saved setup values
…	…	…

Table B.1.13. Trigger settings

Word number	Name / Value	Comment
0	0x0031	[31, 00=block length in the next word]
1	BlockLen	block length
2	NProfileTriggers	number of trigger conditions per profile
3	NSpectTriggers	number of trigger conditions per spectrum channel
4	NVectTriggers	number of trigger conditions per vector
5	Vector13Condidtion	vector 1-3 trigger block (table B.1.14)
...	Vector46Condidtion	vector 4-6 trigger block (table B.1.14)
...	ProfTriggCond1	trigger condition block for the 1st profile (table B.1.14)
…	…	…
...	ProfTrigCondN	trigger condition block for the last profile (table B.1.14)
...	SpectTriggCond1	trigger condition block for the first spectrum (table B.1.14)
...	...	
...	SpectTriggCondN	trigger condition block for the last spectrum (table B.1.14)
…	AlarmCond	alarm trigger (table B.1.28)
…	LoggerCond	logger trigger (table B.1.28)
…	WaveCond	wave recording trigger (table B.1.28)
…	SMSCond	SMS alert trigger (table B.1.28)
…	MailCond	E-mail alert trigger (table B.1.28)
…	EventCond	event recording trigger (table B.1.28)
…	…	…

Table B.1.14. Trigger condition block

Word number	Name / Value	Comment
0	0xnn32	[32, nn=block length]
1..2	Flags	b1 - logger integration step b2 - 100ms integration step b3 - 1s integration step b4 - current time integration step b9 - trigger action: alarm b12 - trigger action: logger b15 - integration period step b17 - trigger action: wave b19 - trigger action: SMS b21 - trigger action: E-MAIL b23 - trigger action: event recorder
3	Mode	0 - **OFF**, 1 - **LEVEL -**, 2 - **LEVEL +**, 3 - **SLOPE -**, 4 - **SLOPE +**, 5 - **GRADIENT -**, 6 - **GRADIENT +**, 7 - **DECAY**
4	Source	0 - **VECTOR RMS**, 1 - **PEAK**, 2 - **P-P**, 3 - **MAX**, 4 - **MIN**, 5 - **RMS**, 6 - **VDV**, 7 - **PEAK**, 8 - **MAX**, 9 - **MIN**, 10 - **RMS**
5	primaryLevel	triggering level in dB*100
6	secondaryLevel	in the case of **GRADIENT** mode: gradient level in dB*100 in the case of **DECAY** mode: signal drop level in dB*100
…	…	…

Table B.1.15. Event Recording Settings

Word number	Name / Value	Comment
0	0xnn39	[39, nn=block length]
1	eventSampleRate	sampling rate: 0 - 6kHz
2	eventChannel	recorded channels mask: b0 - 1st channel b1 - 2nd channel ... b5 - 6th channel
3	event16b	1 - 16 bits per sample
4	eventGain	0 - signal gain +0dB
5	triggerEventTime	time constant for triggerEventTimeLimit in seconds
6	triggerEventTimeLimit	0 - unlimited recording time 1 - fixed length 2 - maximum length
…	…	…

Table B.1.16. Octave analysis header

Word number	Name / Value	Comment
0	0xnn09	[09, nn=block_length]
1	0xkknn	[nn=spectrum_mask, kk=used_spectrum]
2..5	OctaveHead[1]	header of the first enabled octave analysis, defined in Table **B.1.16_VLM**
…	…	…
2+4*used_spectrum..5+4*used_spectrum	OctaveHead[used_spectrum]	header of the last enabled octave analysis, defined in Table **B.1.16_VLM**
…	…	…

Table B.1.16_VLM. Octave analysis header entry

Word number	Name / Value	Comment
0	0xnn0A	[0A, nn=sub-block length]
1	SpectrumChannel	spectrum channel
2	SpectrumFilter	**1/1** or **1/3 OCTAVE** analysis filter: 0 - **HP**
3	SpectrumBuff	**1/1** or **1/3 OCTAVE** logging: 1 - **ON**, 0 - **OFF**
…	…	…

Table B.1.17. One-channel 1/1 OCTAVE analysis results

Word number	Name / Value	Comment
0	0xnn0F	[0F, nn=block_length]
1	LowestFreq	the lowest **1/1 OCTAVE** frequency (*100 Hz)
2	Noct	number of **1/1 OCTAVE** values
3	NoctTot	number of **TOTAL** values = 3
4… block_ length	Octave[i]	1/1 octave[i] value (*100 dB); i=1..NOct+NOctTot
…	…	…

Note: *The **TOTAL** values, correspond to the **HP**, **Profile 1** and **Profile 2** filters – respectively.*

Table B.1.18. One-channel 1/3 OCTAVE analysis results

Word number	Name / Value	Comment
0	0xnn10	[10, nn=block_length]
1	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz)
2	Nter	number of **1/3 OCTAVE** values
3	NterTot	number of **TOTAL** values = 3
4... block_ length	Tercje[I]	1/3 octave[i] value (*100 dB); i=1..NTer+NTerTot
…	…	…

Note: *The **TOTAL** values, correspond to the **HP**, **Profile 1** and **Profile 2** filters – respectively.*

Table B.1.19. TOTALS description

Word number	Name / Value	Comment
0	0xnn1A	[1A, nn=block_length = 1+(1 + Ntotal*4)*k (words)]
1... 1+4*Ntotal	OneChnlTotDesc[1]	one-channel totals description block for the first channel with **TOTALS** in user filters (Table **B.1.20.**)
…	…	…
	OneChnlTotDesc[k]	one-channel totals description block for the last channel with **TOTALS** in user filters (Table **B.1.20.**)
…	…	…

Note: *This data block is created only in the case when the file was saved for **1/1 OCTAVE** or **1/3 OCTAVE** analysis and the **TOTAL** values were calculated for the filters selected by the user (**USER FILTERS**). The **TOTAL** values corresponding to those filters are given in the TotValue positions and the definitions of the proper filters are presented in the Table B.1.20.*

Table B.1.20. One-channel TOTALS description

Word number	Name / Value	Comment
0	0xnn1B	[1B, nn=block_length = 1 + Ntotal*4 (words)]
1	SpectChannel	spectrum channel
2	FilterNo[1]	logical filter no. for the first total value 0, 1, 2 - standard filters 3,… - user-defined filters
3	FilterType[1]	for sound: 0 for vibration: 0 - **ACC**., 1 - **VEL**., 2 - **DIL**.
4	calFactor[1]	calibration factor used to modify the computed **TOTAL** value
5	TotValue[1]	**TOTAL** value computed for the filter with logical no. FilterNo or zero value for standard filter
…	…	…
nn-4	FilterNo[Ntotal]	logical filter no. for the last total value 0, 1, 2 - standard filters 3,… - user-defined filters
nn-3	FilterType[Ntotal]	0 - **ACC**., 1 - **VEL**., 2 - **DIL**.
nn-2	calFactor[Ntotal]	calibration factor used to modify the computed **TOTAL** value
nn-1	TotValue[Ntotal]	**TOTAL** value computed for the filter with logical no. FilterNo or zero value for standard filter
…	…	…

Table B.1.21. Description of user-defined filter

Word number	Name / Value	Comment
0	0xnn1D	[1D, nn=block_length = 5 + NTer (words)]
1	FilterNo	FilterNo as saved in one-channel description (Table **B.1.20**)
2..4	FilterName	filter name (up to 5 letters, zero-ending string)
5..49	FilterVal[i]	filter value (*10 dB) corresponding to the 1/3 octave[i] position; i=1..NTer (1..45)
…	…	…

Note: *Such data block is created for each filter with the logical number FilterNo greater or equal to 3, expressed in the TOTALS DESCRIPTION block (cf. Tab. B.1.19 and Tab B.1.20). The description of the filter with the logical number FilterNo is given only once, disregarding the number of FilterNo repetition in Tab. B.1.20.*

Table B.1.22. Spectrum header of the file from the logger

Word number	Name / Value	Comment
0	0xnn21	[21, nn=block_length=1+4*NumberOfBufferedSpectrums]
1	ChannelNo	channel number of the first logged spectrum minus 1

2	LowestFreq	the lowest **1/1 OCTAVE** or **1/3 OCTAVE** frequency (*100 Hz) of the first logged spectrum
3	NSpectRes	number of **1/1 OCTAVE** or **1/3 OCTAVE** results of the first logged spectrum
4	NTotal	number of **TOTAL** values of the first logged spectrum
…	…	…
block_ length-4	ChannelNo	channel number of the last logged spectrum minus 1
block_ length-3	LowestFreq	the lowest **1/1 OCTAVE** or **1/3 OCTAVE** frequency (*100 Hz) of the last logged spectrum
block_ length-2	NSpectRes	number of **1/1 OCTAVE** or **1/3 OCTAVE** results of the last logged spectrum
block_ length-1	NTotal	number of **TOTAL** values of the last logged spectrum
…	…	…

Table B.1.23. Maximum results of 1/3 OCTAVE analysis in one channel

Word number	Name / Value	Comment
0	0xnn2D	[2D, nn=block length]
1	LowestFreq	the lowest **1/1 OCTAVE** frequency (*100 Hz)
2	Noct	number of **1/1 OCTAVE** values
3	NoctTot	number of **TOTAL** values = 3
…	…	…
4 - length block	MaxOctave[i]	maximum result of the 1/1 octave analysis (*100 dB); i = 1…NOct + NOctTot
…	…	…

Note: *The **TOTAL** values, correspond to the **HP**, **Profile 1** and **Profile 2** filters – respectively.*

Table B.1.24. Minimum results of 1/1 OCTAVE analysis in one channel

Word number	Name / Value	Comment
0	0xnn2E	[2E, nn=block length]
1	LowestFreq	the lowest **1/1 OCTAVE** frequency (*100 Hz)
2	Noct	number of **1/1 OCTAVE** values
3	NoctTot	number of **TOTAL** values = 3
…	…	…
4 - length block	MinOctave[i]	minimum result of the 1/1 octave analysis (*100 dB); i = 1…NOct + NOctTot
…	…	…

Note: *The* ***TOTAL*** *values, correspond to the* ***HP***, ***Profile 1*** *and* ***Profile 2*** *filters – respectively.*

Table B.1.25. Maximum results of 1/3 OCTAVE analysis in one channel

Word number	Name / Value	Comment
0	0xnn2F	[2F, nn=block length]
1	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz)
2	Nter	number of **1/3 OCTAVE** values
3	NterTot	number of **TOTAL** values = 3
…	…	…
4 - length block	MaxTercje[I]	maximum result of the 1/3 octave analysis (*100 dB); i = 1…NTer + NterTot
…	…	…

Note: *The* ***TOTAL*** *values, correspond to the* ***HP***, ***Profile 1*** *and* ***Profile 2*** *filters – respectively.*

Table B.1.26. Minimum results of 1/3 OCTAVE analysis in one channel

Word number	Name / Value	Comment
0	0xnn30	[30, nn=block length]
1	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz)
2	Nter	number of **1/3 OCTAVE** values
3	NterTot	number of **TOTAL** values = 3
…	…	…
4 - length block	MinTercje[I]	minimum result of the 1/3 octave analysis (*100 dB); i = 1…NTer + NterTot
…	…	…

Note: *The* ***TOTAL*** *values, correspond to the* ***HP***, ***Profile 1*** *and* ***Profile 2*** *filters – respectively.*

Table B.1.27. Seat measurement

Word number	Name / Value	Comment
0	0xnn2C	[2C, nn=block length]
1	SEATBase	base channels: 0 - channels 1-3, 1 - channels 4-6
2	SEATSeat	seating channels: 0 - channels 1-3, 1 - channels 4-6
…	…	…

Table B.1.28. Trigger condition block

Word number	Name / Value	Comment
0	0xnn4C	[4C, nn=block length]
1..2	Flags	b1 - logger integration step b2 - 100ms integration step b3 - 1s integration step b4 - current time integration step b9 - trigger action: alarm b12 - trigger action: logger b15 - integration period step b17 - trigger action: wave b19 - trigger action: SMS b21 - trigger action: E-MAIL b23 - trigger action: event recorder
3	Mode	0 - **OFF**, 1 - **LEVEL -**, 2 - **LEVEL +**, 3 - **SLOPE -**, 4 - **SLOPE +**, 5 - **GRADIENT -**, 6 - **GRADIENT +**, 7 - **DECAY**
4	Source	0 - **VECTOR RMS**, 1 - **PEAK**, 2 - **P-P**, 3 - **MAX**, 4 - **MIN**, 5 - **RMS**, 6 - **VDV**, 7 - **PEAK**, 8 - **MAX**, 9 - **MIN**, 10 - **RMS**
5	primaryLevel	triggering level in dB*100
6	secondaryLevel	in the case of **GRADIENT** mode: gradient level in dB*100 in the case of **DECAY** mode: signal drop level in dB*100
7	srcIndex	in case of **VECTOR** Source: 0 - channels 1-3 1 - channels 4-6 other cases: channel No + 1
8	srcType	Trigger source 0 - vector 1 - profile 2 - spectrum
…	…	…

Table B.1.29. TEDS data block

Word number	Name / Value	Comment
0	0xnn4A	[4A, nn=block length]
1	TEDSCnt	Number of TEDS data blocks
2	FORCECnt	Number of force inputs
3	TEDSBlock1	first TEDS data block (cf. Tab B.1.30)
...	...	
...	TEDSBlockN	last TEDS data block (cf. Tab B.1.30)
k	valid[1]	0 - channel 1 data is valid 1 - channel 1 data is invalid
…	…	…
k+ChannelsCount-1	valid[ChannelsCount]	0 - last channel data is valid 1 - last channel data is invalid
k+ChannelsCount	validF[1]	0 - force channel 1 data is valid 1 - force channel 1 data is invalid

...	...	
k+ChannelsCount+FORCECnt-1	validF[FORCECnt]	0 - last force channel data is valid 1 - last force channel data is invalid
k+ChannelsCount+FORCECnt	calFact[1]	calibration factor read from TEDS for the first channel in dB*100
...	...	
k+2*ChannelsCount+FORCECnt-1	calFact[ChannelsCount]	calibration factor read from TEDS for the last channel in dB*100
k+2*ChannelsCount+FORCECnt	reserved	
...	...	
k+2*ChannelsCount+2*FORCECnt-1	reserved	

B.2. Structure of the block with meteorological data

In the case when the instrument is working in a monitoring station which contains also the components for the meteorological measurements (temperature, pressure, humidity, wind speed and its direction), the data coming from them are added by SvanPC+ software to all files with the data from SVAN 106. The structure of such data block is presented in the Tab. B.2.1.

Table B.2.1. METEO data from monitoring station

Word number	Name / Value	Comment
0	0x0033	[33, 00=block length in the next word]
1	BlockLen	block length
2	UnitNumber	unit number
3	UnitType	type of the unit: 211 or 210 (SV 211 or SV 210)
4	SoftVersion	software version
5..6	IntTimeSec	integration time specified in seconds
7	Temperature	temperature [*10℃]
8	Pressure	pressure [hPa]
9	Humidity	humidity [*10%]
10	AvgWindSpeed	Average wind speed [*10m/s^2]
11	WindDirection	wind direction for max wind speed [degrees]. 0xFFFF if direction is unavailable
12	MaxWindSpeed	max wind speed [*10 m/s] (ignored if WindDirection is unavailable)
13..14	WindDirTotalPuffs	number of total wind puffs in distribution vector of wind direction
15	NofWindDir	number of elements in distribution vector of wind direction

16.. 16+NofWindDir-1	WindDir[i]	WindDir[i] value [*10 %]
16+NofWindDir	NofWindMax	number of elements in distribution vector of max wind speed
17+NofWindDir.. 17+NofWindDir+ NofWindMax-1	WindMax[i]	WindMax[i] value [*10 m/s]
17+NofWindDir+ NofWindMax	NofWindAvg	number of elements in distribution vector of avg wind speed
18+NofWindDir+ NofWindMax... 18+NofWindDir+ NofWindMax+ NofWindAvg-1	WindAvg[i]	WindAvg[i] value [*10 m/s]
18+NofWindDir+ NofWindMax+ NofWindAvg	RainDetection	Rain detection flag
…	…	…

B.3.1. Structure of the file with the results from Level Meter Mode

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
Parameters and global settings - cf. Tab. B.1.3.
Hardware settings for channels - cf. Tab. B.1.4.
Software settings for channels - cf. Tab. B.1.5.
Trigger settings (cf. Tab. B.1.13, Tab.B.1.14).
Vector measurement settings - cf. Tab. B.1.6.
Settings for vibration dose measurement (the presence depends on the **MEASURE DOSE** and channel filter settings) - cf. Tab. B.1.7.
Main results - cf. Tab. B.1.8.
File end marker - cf. Tab. B.1.11.

B.3.2. Structure of the file containing LM results from logger's file

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
Parameters and global settings - cf. Tab. B.1.3.
Hardware settings for channels - cf. Tab. B.1.4.
Software settings for channels - cf. Tab. B.1.5.
Trigger settings (cf. Tab. B.1.13, Tab.B.1.14).
Vector measurement settings - cf. Tab. B.1.6.
Event Recording settings - cf. Tab. B.1.15.
Header of the file from the logger - cf. Tab.B.1.9.
Contents of the file from the logger - cf. Tab.B.1.10.
File end marker - cf. Tab. B.1.11.

B.3.3. Structure of the file containing saved instrument's setup

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
Data block of instrument's setup - cf. Tab.B.1.12.
File end marker - cf. Tab. B.1.11.

B.3.4. Structure of the file with 1/1 OCTAVE analysis results

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
Parameters and global settings - cf. Tab. B.1.3.
Hardware settings for channels - cf. Tab. B.1.4.
Software settings for channels - cf. Tab. B.1.5.
Trigger settings (cf. Tab. B.1.13, Tab.B.1.14).
Vector measurement settings - cf. Tab. B.1.6.
Octave analysis header - cf. Tab.B.1.16.
The hand-arm and whole-body vibration dose measurement settings - cf. Tab. B.1.7.
Main results - cf. Tab. B.1.8.
One-channel 1/1 Octave analysis results (one for each channel with spectrum analysis enabled) - cf. Tab. B.1.17.
TOTALS description (if needed) - cf. Tab. B.1.19.
Description of user-defined filter (if needed) - cf. Tab. B.1.21.
Maximum 1/1 Octave analysis results in one channel (one for each channel with spectrum analysis enabled, presence depends on the **MAX. SPECT.** setting) - cf. Tab. B.1.23.
Minimum 1/1 Octave analysis results in one channel (one for each channel with spectrum analysis enabled, presence depends on the **MIN. SPECT.** setting) - cf. Tab. B.1.24.
File end marker - cf. Tab. B.1.11.

B.3.5. Structure of the file with 1/3 OCTAVE analysis results

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
Parameters and global settings - cf. Tab. B.1.3.
Hardware settings for channels - cf. Tab. B.1.4.
Software settings for channels - cf. Tab. B.1.5.
Trigger settings (cf. Tab. B.1.13, Tab.B.1.14).
Vector measurement settings - cf. Tab. B.1.6.
Octave analysis header - cf. Tab.B.1.16.
The hand-arm and whole-body vibration dose measurement settings - cf. Tab. B.1.7.
Main results - cf. Tab. B.1.8.
One-channel 1/3 OCTAVE analysis results (one for each channel with spectrum analysis enabled) - cf. Tab. B.1.18.
Maximum 1/3 OCTAVE analysis results in one channel (one for each channel with spectrum analysis enabled, presence depends on the **MAX. SPECT.** setting) - cf. Tab. B.1.25.
Minimum 1/3 OCTAVE analysis results in one channel (one for each channel with spectrum analysis enabled, presence depends on the **MIN. SPECT.** setting) - cf. Tab. B.1.26.
TOTALS description (if needed) - cf. Tab. B.1.19.
Description of user-defined filter (if needed) - cf. Tab. B.1.21.
File end marker - cf. Tab. B.1.11.

B.3.6. Structure of the file containing 1/1 or 1/3 OCTAVE analysis results from logger's file

File header - cf. Tab. B.1.1.
Unit and software specification - cf. Tab. B.1.2.
Parameters and global settings - cf. Tab. B.1.3.
Hardware settings for channels - cf. Tab. B.1.4.
Software settings for channels - cf. Tab. B.1.5.
Trigger settings (cf. Tab. B.1.13, Tab.B.1.14).
Vector measurement settings - cf. Tab. B.1.6.
Header of the file from the logger - cf. Tab.B.1.9.
Octave analysis header - cf. Tab.B.1.16.
Spectrum analysis header of the file from the logger - cf. Tab.B.1.22.
Contents of the file from the logger - cf. Tab.B.1.10.
File end marker - cf. Tab. B.1.11.

B.4. Contents of the file in the logger

The records with the results and the records with the state of the markers as well as the records with the breaks in the results registration are saved in the files in the logger.

B.4.1. Record with the results

The contents of the record with the results depends on the measurement function, selected channels modes, values set in the **Logger** menu and its sub-lists. Profile results are written on 15 most significant bits in dB*10, while least significant bit is used for overload indication flag. The following elements can be present (in the given sequence):

- results of the measurement from the 1st profile of the 1st channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 1 Profile 1** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 1 Profile 1*) **Log** column was selected, up to five words are written in the given sequence:

  <result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
  <result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
  <result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
  <result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
  <result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 1st profile of the 2nd channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 2 Profile 1** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 2 Profile 1*) **Log** column was selected, up to five words are written in the given sequence:

  <result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
  <result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
  <result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
  <result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
  <result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 1st profile of the 3rd channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 3 Profile 1** (*path: MENU / Measurement / Logging /*

Logger / Logger Result / Channel 3 Profile 1) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 1st profile of the 4th channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 4 Profile 1** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 4 Profile 1*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 1st profile of the 5th channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 5 Profile 1** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 5 Profile 1*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 1st profile of the 6th channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 6 Profile 1** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 6 Profile 1*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 2nd profile of the 1st channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 1 Profile 2** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 1 Profile 2*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 2nd profile of the 2nd channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 2 Profile 2** (*path: MENU / Measurement / Logging /*

Logger / Logger Result / Channel 2 Profile 2) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 2nd profile of the 3rd channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 3 Profile 2** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 3 Profile 2*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 2nd profile of the 4th channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 4 Profile 2** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 4 Profile 2*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 2nd profile of the 5th channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 5 Profile 2** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 5 Profile 2*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- results of the measurement from the 2nd profile of the 6th channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Channel 6 Profile 2** (*path: MENU / Measurement / Logging / Logger / Logger Result / Channel 6 Profile 2*) **Log** column was selected, up to five words are written in the given sequence:

<result1> - **PEAK** result in the case of **VLM** if the first position was marked, else no value is written;
<result2> - **P–P** result in the case of **VLM** if the second position was marked, else no value is written;
<result3> - **MAX** result in the case of **VLM** if the third position was marked, else no value is written;
<result4> - **RMS** result in the case of **VLM** if the fourth position was marked, else no value is written;
<result5> - **VDV** result in the case of **VLM** if the fifth position was marked, else no value is written;

- **VECTOR 1-3** measurement result if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if position at **VEC13** row **Log** column (*path: MENU / Measurement / Logging / Logger / Logger Result / Auxiliary Logger*) is selected and **VECTOR 1-3** measurement was enabled; one word is

written;

- **VECTOR 4-6** measurement result if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if position at **VEC46** row **Log** column (*path: MENU / Measurement / Logging / Logger / Logger Result / Auxiliary Logger*) is selected and **VECTOR 4-6** measurement was enabled; one word is written;

- results of the measurement from the 1st force channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Force 1-3 Logger** (*path: MENU / Measurement / Logging / Logger / Logger Result / Auxiliary / Force 1-3 Logger*) **Log** column was selected, up to four words are written in the given sequence:

  <result1> - **PEAK** result if the first position was marked, else no value is written;
  <result2> - **MAX** result if the second position was marked, else no value is written;
  <result3> - **MIN** result if the third position was marked, else no value is written;
  <result4> - **AVER** result if the fourth position was marked, else no value is written;

- results of the measurement from the 2nd force channel if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if any position in **Force 4-6 Logger** (*path: MENU / Measurement / Logging / Logger / Logger Result / Auxiliary / Force 4-6 Logger*) **Log** column was selected, up to four words are written in the given sequence:

  <result1> - **PEAK** result if the first position was marked, else no value is written;
  <result2> - **MAX** result if the second position was marked, else no value is written;
  <result3> - **MIN** result if the third position was marked, else no value is written;
  <result4> - **AVER** result if the fourth position was marked, else no value is written;

- results of **1/1 OCTAVE** analysis from the 1st channel if **1/1 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 1** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/1 Octave Logger*) is selected; the sequence of words is written:

  <flags> <Octave[1]> <Octave[2]> ... <Octave[NOct+NOctTot]>
  where:
  flags = 1 - the overload detected, 0 - the overload not detected
  Octave[i] - the result of **1/1 OCTAVE** analysis (*100 dB); i = 1..NOct+NOctTot

- results of **1/1 OCTAVE** analysis from the 2nd channel if **1/1 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 2** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/1 Octave Logger*) is selected; the sequence of words is written:

  <flags> <Octave[1]> <Octave[2]> ... <Octave[NOct+NOctTot]>
  where:
  flags = 1 - the overload detected, 0 - the overload not detected
  Octave[i] - the result of **1/1 OCTAVE** analysis (*100 dB); i = 1..NOct+NOctTot

- results of **1/1 OCTAVE** analysis from the 3rd channel if **1/1 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 3** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/1 Octave Logger*) is selected; the sequence of words is written:

  <flags> <Octave[1]> <Octave[2]> ... <Octave[NOct+NOctTot]>
  where:
  flags = 1 - the overload detected, 0 - the overload not detected
  Octave[i] - the result of **1/1 OCTAVE** analysis (*100 dB); i = 1..NOct+NOctTot

- results of **1/1 OCTAVE** analysis from the 4th channel if **1/1 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 4** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/1 Octave Logger*) is selected; the sequence of words is written:

  <flags> <Octave[1]> <Octave[2]> ... <Octave[NOct+NOctTot]>
  where:
  flags = 1 - the overload detected, 0 - the overload not detected
  Octave[i] - the result of **1/1 OCTAVE** analysis (*100 dB); i = 1..NOct+NOctTot

- results of **1/1 OCTAVE** analysis from the 5th channel if **1/1 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 5** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/1 Octave Logger*) is selected; the sequence of words is written:

  <flags> <Octave[1]> <Octave[2]> ... <Octave[NOct+NOctTot]>
  where:
  flags = 1 - the overload detected, 0 - the overload not detected
  Octave[i] - the result of **1/1 OCTAVE** analysis (*100 dB); i = 1..NOct+NOctTot

- results of **1/1 OCTAVE** analysis from the 6th channel if **1/1 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 6** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/1 Octave Logger*) is selected; the sequence of words is written:

  <flags> <Octave[1]> <Octave[2]> ... <Octave[NOct+NOctTot]>
  where:
  flags = 1 - the overload detected, 0 - the overload not detected
  Octave[i] - the result of **1/1 OCTAVE** analysis (*100 dB); i = 1..NOct+NOctTot

- results of **1/3 OCTAVE** analysis from the 1st channel if **1/3 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 1** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/3 Octave Logger*) is selected; the sequence of words is written:

  - <flags> <Terave[1]> < Terave [2]> ... < Terave [Nter+NterTot]>
    where:
    flags = 1 - the overload detected, 0 - the overload not detected
    Terave[i] - the result of **1/3 OCTAVE** analysis (*100 dB); i = 1..Nter+NterTot

- results of **1/3 OCTAVE** analysis from the 2nd channel if **1/3 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 2** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/3 Octave Logger*) is selected; the sequence of words is written:

  - <flags> <Terave[1]> < Terave [2]> ... < Terave [Nter+NterTot]>
    where:
    flags = 1 - the overload detected, 0 - the overload not detected
    Terave[i] - the result of **1/3 OCTAVE** analysis (*100 dB); i = 1..Nter+NterTot

- results of **1/3 OCTAVE** analysis from the 3rd channel if **1/3 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 3** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/3 Octave Logger*) is selected; the sequence of words is written:
  - <flags> <Terave[1]> < Terave [2]> ... < Terave [Nter+NterTot]>
    where:

flags = 1 - the overload detected, 0 - the overload not detected
Terave[i] - the result of **1/3 OCTAVE** analysis (*100 dB); i = 1..Nter+NterTot

- results of **1/3 OCTAVE** analysis from the 4th channel if **1/3 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 4** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/3 Octave Logger*) is selected; the sequence of words is written:
  - <flags> <Terave[1]> < Terave [2]> ... < Terave [Nter+NterTot]>
    where:
    flags = 1 - the overload detected, 0 - the overload not detected
    Terave[i] - the result of **1/3 OCTAVE** analysis (*100 dB); i = 1..Nter+NterTot

- results of **1/3 OCTAVE** analysis from the 5th channel if **1/3 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 5** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/3 Octave Logger*) is selected; the sequence of words is written:
  - <flags> <Terave[1]> < Terave [2]> ... < Terave [Nter+NterTot]>
    where:
    flags = 1 - the overload detected, 0 - the overload not detected
    Terave[i] - the result of **1/3 OCTAVE** analysis (*100 dB); i = 1..Nter+NterTot

- results of **1/3 OCTAVE** analysis from the 6th channel if **1/3 OCTAVE** analysis was selected as the measurement function and if the **LOGGER** list was marked and **LOGGER MODE** was set to **ON** (*path: MENU / Measurement / Logging / Logger / Logger Setup / Logger Mode: On)* and if **Channel 6** position (*path: MENU / Measurement / Logging / Logger / Logger Result / 1/3 Octave Logger*) is selected; the sequence of words is written:
  - <flags> <Terave[1]> < Terave [2]> ... < Terave [Nter+NterTot]>
    where:
    flags = 1 - the overload detected, 0 - the overload not detected
    Terave[i] - the result of **1/3 OCTAVE** analysis (*100 dB); i = 1..Nter+NterTot

B.4.2. Record with the state of the markers

The record with the state of the markers consists of one word:

<0x8nnn>

in which 12 bits nnn denote the state of the markers:
b11 = state of #12 marker
b10 = state of #11 marker
...
b1 = state of #2 marker
b0 = state of #1 marker

B.4.3. Record with the breaks in the results registration

The record with the breaks in the results registration consists of four words:

<0xB0ii> <0xB1jj> <0xB2kk> <0xB3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter of left or skipped records: nnkkjjii (ii is the least significant byte, nn - the most significant byte).

B.4.4. Record with the breaks account PAUSE in the results registration

The record with the breaks in the results registration consists of four words:

<0xA0ii> <0xA1jj> <0xA2kk> <0xA3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter duration of PAUSE in milliseconds:
nnkkjjii (ii is the least significant byte, nn - the most significant byte).

Pause duration means time passed between pressing **<PAUSE>** key and measurement continuation key. Start delay after pressing continuation key isn't added to the counter.

B.4.5 Record with the auto-save file name

The record with the auto-save file name consists of six words:
<0xC0aa>
<0xccbb>
<0xeedd>
<0xggff>
<0xiihh>
<0xC8aa>
in which:
aa - size of record,
bb cc dd ee ff gg hh ii - 8-bytes name of auto-save file name

B.4.6 Record with Time-domain signal data

This record exists only in the case when the **Time-domain signal recording** is active. The samples of the signal are saved in the blocks. Each block is divided into frames, which are stored in a file among the logger results. The frame starting block and the frame ending it are marked with the b10 and b9 bits set in the header of the frame, respectively. It happens in the case of stopping the recording that the ending frame does not exist.
The format of the data frame is as follows:

HS	L	S	L	HE

where:
HS starting header (1 word)
L block length (1 word), expressed in words (4 + number of samples)
S samples of the measured signal (each sample is written in two bytes; the recording starts with the least significant byte)
HE ending header (1 word), which differs from the HS only on b11 bit (thanks to it, it is possible to analyse the recorded file starting from its end)
The HEADER format is as follows:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

where:
b15 - 1
b14 - 0
b13 - 0
b12 - 1, bits b15 ÷ b12 = 9 constitute the marker of the frame
b11 - header type:
0 - HS
1 - HE
b10 - 1 denotes the first frame in the block
b9 - 1 denotes the last frame in the block
b7 - 1 denotes an error (the samples were overwritten in the cycle buffer, which means that the recording in the analysed block is not correct)
b8, b6÷b0 - reserved

Appendix C. TECHNICAL SPECIFICATIONS

C1. Specification of the SV106

System configuration

The meter measured simultaneous in six channels with independent set of filters and detector constants. The **SV106** instrument meets requirements of the **ISO 8041:2005**, and **ISO 5349**.
Thus SV106 I s a convenient instrument for tests according to the ISO 2631-1,2&5

The configuration of the complete instrument and its normal mode of operation for Whole-Body measurements::

- **SV 106** vibration meter,
- **SV 38V** seat accelerometer (see Chapter C4 for specification),
- **SV 39A/L** seat accelerometer (optional, see Chapter C4 for specification),

The configuration of the complete instrument and its normal mode of operation for Hand-Arm measurements::

- **SV 106** vibration meter,
- **SV105** triaxial accelerometer with set of adapters (see Chapter C4 for specification),
- **SV 50** triaxial accelerometer (SV3023M2) with set of adapters (optional, see Chapter C4 for specification),

Accessories included

SA 61	MicroSD card 4GB,
SC 56	USB 1.1 cable,
SC 118	Integrated connector LEMO 5-pin plug to LEMO 4-pin socket,

Accessories available

Power supply unit with USB Connector

SV 38V	Whole-Body seat accelerometer,
SV 105	Hand-Arm adapter with triaxial accelerometer,
SV 111	Vibration calibrator for HVM 1 m/s2 @ 16 Hz, 10 m/s2 @ 80 Hz,
SA 47	Carrying bag,
SA 54	Power supply unit by USB interface using cables SC 56 (cables not included),
SA 105	Calibration adapter for SV 105
SA 146	Carrying case,
SA 50	Hand-Arm measurement adapter, "shaped base" (for SV 3023M2 acceler.)
SA 51	Hand-Arm measurement adapter, "flat base" (for SV 3023M2 acceler.)
SA 52	Hand-Arm measurement adapter, "direct" (for the SV 3023M2 acceler.)
SC 14	LEMO 5 pin to LEMO 5 pin extension cable (10 m)
SC 38	Cable used to connect the triaxial accelerometer with the SV106 (4 pin Microtech to LEMO 4 pin (typical 2.7 m))
SV 39A\L	Seat Accelerometer (including SV 3143M1 and SC 38 cable)
SV 3023M2	Hand-Arm accelerometer

Notice: *System conforms to the* ***ISO 8041:2005*** *and* ***ISO 5349*** *standards.*

Measured quantities

The measured quantities in the vibration meter mode are **RMS**, **VDV**, **CRF, OVL, PEAK**, **P–P**, **MTVV, MAX, VECTOR, A(8), ELV, EAV.** The definitions for mentioned parameters are given in Appendix D.

Mounting for vibration tests

The accelerometer should be connected with SV106 using proper cable provided by the manufacturer.

The accelerometer can be mounted on the plate in various ways:

- using threaded stud onto a flat, smooth surface,
- using proper adapter provided by manufacturer.

Notice: *Maximum length of the extension cable between the accelerometer and the instrument is 10m. Recommended length of the cable is 2.7 m.*

Linear operating ranges for the acceleration

The linear operating ranges for the distance from noise > 10 dB

Values of the measured acceleration using the accelerometer with the nominal sensitivity equal to 50 mV / ms^{-2} (e.g. the **SV38V** seat accelerometer):

Table C.1. Linear operating ranges with SV38V accelerometer (RMS values for the sinusoidal signals)

Filter	type **SV38V** nominal sensitivity 50mV/ms^{-2} (calibration factor = -14 dB)	
	from	to
HP	94.0 dB (50 mm/s^2)	151.0 dB (35.5 m/s^2) 153.8 dBpeak (49 m/s^2 peak)
Wf	70.0 dB (3.16 mm/s^2)	
Wc, Wk, Wh, Wb Wd, Wm, Wg BL – Wf	**80.0 dB (10.0 mm/s^2)**	
Wj	85.0 dB (17.8 mm/s2)	
BL- Wb, BL- Wc, BL- Wm, BL- Wj, BL- Wd, BL- Wg, BL- Wk	90.0 dB (31.6 mm/s^2)	

Table C.2. Linear operating ranges with SV39A/L accelerometer (RMS values for the sinusoidal signals)

Filter	type **SV39A/L** nominal sensitivity 10mV/ms^{-2} (calibration factor = 0 dB)	
	from	to
HP	94.0 dB (50 mm/s^2)	161.0 dB (112 m/s^2) 164.0 dBpeak (159 m/s^2 peak)
Wc, Wk, Wh, Wb Wd, Wm, Wg	**80.0 dB (10.0 mm/s^2)**	
BL- Wb, BL- Wc, BL- Wm, BL- Wj Wj, BL- Wd, BL- Wg, BL- Wk	90.0 dB (31.6 mm/s^2)	

Values of the measured acceleration using the accelerometer with the nominal sensitivity equal to 28 mV / ms^{-2} (e.g. the **SV105** accelerometer):

Table C.3. Linear operating ranges with SV105 accelerometer (RMS values for the sinusoidal signals)

Filter	type **SV105** nominal sensitivity 10mV/ms^{-2} (calibration factor = 0 dB)	
	From	to
Wh	**110 dB (320 mm/s^2)**	162.0 dB (125 m/s^2) 165.0 dBpeak (177 m/s^2 peak)

Values of the measured acceleration using the accelerometer with the nominal sensitivity equal to 1 mV / ms^{-2} (e.g. the **3023M2** accelerometer):

Table C.4. Linear operating ranges with 3023M2 accelerometer (RMS values for the sinusoidal signals)

Filter	type **3023M2** nominal sensitivity 1mV/ms^{-2} (calibration factor = +20.0 dB)	
	From	to
Wh	**110 dB (320 mm/s^2)**	181.0 dB (1122 m/s^2) 184.0 dBpeak (1587 m/s^2 peak)
BL-Wh	**120.0 dB (1 m/s^2)**	

Frequency range for the acceleration measurement (+/- 10%) **0.02 Hz ÷ 2 kHz**

Basic error for the acceleration measurement: **< ± 0.5 dB**

Electrical substitute for accelerometer

In order to obtain an electrical input, an accelerator must be replaced by electrical impedance **SV48/106**.

Calibration

Direct: by the measurement of the standard signal generated by the external vibration calibrator.

Indirect: by the declaration of the transducer's sensitivity (according to the calibration chart).

Notice: *Calibration procedure is given in Chapter 4 of the Manual.*

Accelerometer input

Connector	**2 x LEMO 5 -pins**: six channels IEPE type or Direct and two channels for force transducers
Impedance	**130 kΩ / 20 pF** (typical)
Vibration transducers powering	**IEPE type: 28 V / 1.5 mA** current source **Direct type: 5.15 V DC @ 20 mA** power supply, 150 mA short current limit
Range of the measured voltage	**5 V_{Peak} (indication 174 dB_{Peak} for the calibration factor 0.0)**
Maximum input voltage	

The **SV106** is the instrument with the II security class according to the international standard IEC 348. The input voltage should be within the 30 V Peak – Peak

RMS detector

- Digital "**True RMS**" **with Peak detection**
- Resolution **0.1 dB**
- Range **327.7 dB**
- Crest Factor **unlimited** for signals within 20 kHz band
- Time weighting filters: **100 ms, 125 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s and 10 s**

PEAK and P–P detectors:

Digital with 0.1 dB sampling step

Overload detector

The instrument has the built-in overload detectors. The overload in the measurement channel (in its analogue part) and the overload of the analogue / digital converter are both detected. The "overload" indication is when the input signal amplitude **is 0.5 dB above** the declared "Peak measurement range".

Underrange detector

The instrument has the built-in underrange detector. The "underrange" indication appears when the minimum value of the RMS detector output goes below the specified lower linear operating range.

Analogue/Digital conversion **6 x 16 bits resolution** (IEPE or Direct channels)

Antialiasing filter

Built-in antialiasing filter. Second-order analogue filter, active type, combined with on-chip FIR digital filter of the analog-to-digital converter, ensuring correct sampling of the measured signal.

Pass band(-1 dB)	**2500 Hz**,
Pass band(-3 dB)	**2900 Hz**,
Stop band	**5600 Hz**,
Attenuation in the stop band	**> 70 dB**.
Sampling frequency	**6 kHz** (internal only).

Reference conditions

- Reference frequency **15.915 Hz** or **79.580 Hz** ,
- Reference temperature **+23°C**,
- Reference relative humidity **50 %**,

Pre-heating time **1 minute** (for 0.1 dB accuracy).

Typical stabilization time after change in environmental conditions is 1 minute.

Notice: *When the instruments are moved from a warm environment with high humidity, to a colder environment, care should be taken not to produce condensation inside the instruments. In this case, much longer stabilization periods may be necessary.*

Digital filters

High-pass filter

HP filter (see part C.2 for the filter characteristics).

Frequency weighting filters
All filters include Band Limiting filters.
Band Limited filters are listed and available separately.
(See part C.2 for the filters characteristics).

- **Wk, BL-Wk** from **0.1 Hz to 400 Hz**
- **Wd, BL-Wd** from **0.1 Hz to 400 Hz**
- **Wc, BL-Wc** from **0.1 Hz to 400 Hz**
- **Wj, BL-Wj** from **0.1 Hz to 400 Hz**
- **Wm, BL-Wm** from **0.1 Hz to 400 Hz**
- **Wb, BL-Wb** from **0.1 Hz to 400 Hz**
- **Wg, BL-Wg** from **0.8 Hz to 100 Hz**
- **Wh, BL-Wh** from **0.8 Hz to 2000 Hz**
- **Wf, BL-Wf** from **0.02 Hz to 2 Hz**

Filters Noise Level

Typical noise level from the combination of the vibration transducer and the SV106 for the frequency-weighted response:

Table C.5 Typical noise level of the SV106 with accelerometers (for each axis)

Filter	type **SV39A\L** nominal sensitivity 10mV/ms^{-2}		type **SV38V** nominal sensitivity 50mV/ms^{-2}		type **SV105** nominal sensitivity 10mV/ms^{-2}		type **3023M2** nominal sensitivity 1mV/ms^{-2}	
Wk	**1.8 mm/s^2**	**65.0 dB**	**2.5 mm/s^2**	**68.1 dB**	-	**-**	-	**-**
BL-Wk	**3.2 mm/s^2**	**70.0 dB**	**7.9 mm/s^2**	**77.9 dB**	-	**-**	-	**-**
Wd	**1.8 mm/s^2**	**65.0 dB**	**2.7 mm/s^2**	**68.6 dB**	-	**-**	-	**-**
BL-Wd	**3.2 mm/s^2**	**70.0 dB**	**8.1 mm/s^2**	**78.2 dB**	-	**-**	-	**-**
Wc	**2.0 mm/s^2**	**66.0 dB**	**2.8 mm/s^2**	**68.9 dB**	-	**-**	-	**-**
BL-Wc	**3.2 mm/s^2**	**70.0 dB**	**11.7 mm/s^2**	**81.4 dB**	-	**-**	-	**-**
Wj	**3.0 mm/s^2**	**69.0 dB**	**4.4 mm/s^2**	**72.8 dB**	-	**-**	-	**-**
BL-Wj	**3.3 mm/s^2**	**70.4 dB**	**11.5 mm/s^2**	**81.2 dB**	-	**-**	-	**-**
Wm	**1.6 mm/s^2**	**64.0 dB**	**1.3 mm/s^2**	**65.3 dB**	-	**-**	-	**-**
BL-Wm	**3.2 mm/s^2**	**70.0 dB**	**7.9 mm/s^2**	**77.9 dB**	-	**-**	-	**-**
Wh	**1.6 mm/s^2**	**64.0 dB**	-	-	**25.1 mm/s^2**	**88 dB**	**11.1 mm/s^2**	**80.9 dB**
BL-Wh	**7.4 mm/s^2**	**77.4 dB**	-	-	**89.1 mm/s^2**	**99.0 dB**	**42.2 mm/s^2**	**92.5 dB**
Wg	**1.3 mm/s^2**	**62.5 dB**	**2.9 mm/s^2**	**69.1 dB**	-	**-**	-	**-**
BL-Wg	**3.1 mm/s^2**	**69.6 dB**	**6.5 mm/s^2**	**76.3 dB**	-	**-**	-	**-**
Wb	**1.5 mm/s^2**	**63.5 dB**	**2.0 mm/s^2**	**66.1 dB**	-	**-**	-	**-**
BL-Wb	**3.1 mm/s^2**	**69.8 dB**	**7.6 mm/s^2**	**77.6 dB**	-	**-**	-	**-**
Wf	**-**	**-**	**1.5 mm/s^2**	**63.2 dB**	-	**-**	-	**-**
BL-Wf	**-**	**-**	**2.4 mm/s^2**	**67.8 dB**	-	**-**	-	**-**

Environmental, electrostatic and radio frequency criteria

Notice: In the measurement conditions with the strong electromagnetic disturbances *(e.g. near the high-voltage transmission lines)* ***the lower measurement limit can be drastically shifted as the result of the external field influence on the measurement cables.*** *In such cases,* ***the careful shielding of the measurement cables is strongly recommended.*** *It is worth to underline that the estimation of the external influence can be performed in-site by the observations of the measurement signal spectrum.*

Effect of humidity **< 0.5 dB** (for 30% < RH < 90% at 40°C and 1000 Hz)

Effect of radio frequency fields (meets requirements of the ISO 8041:2005)

The greatest susceptibility (the least immunity) is achieved when in the SV106 the **HP** filter is selected and the RMS measurements are considered.
The greatest susceptibility is achieved when the SV106 and accelerometer with cable is placed along field and the cable is coil as solenoid.

Effect of electrostatic discharge (meets requirements of the ISO 8041:2005)

During electrostatic discharge, the influence of the displayed results could be observed.
No changes in instrument operation state, configuration or stored data corruption were found out.

Operating range	from **-10°C to + 50°C**
Storage and Transportation	from **-20°C to + 60°C**
Effect of temperature	**< 0.5 dB** (from -10°C to + 50°C)
Effect of Vibration	**< 0.1 dB** (measured at the instrument vibration 1m/s2 in the 2 kHz band)

Effect of Acoustic Signal.

Typical effect measured noise level from the combination of the vibration transducer and the SV106 for the “Human Vibration” frequency-weighted response Wb, Wd, Wk and Wh. Measured with accelerometer exposed to the acoustic sinusoidal signal of 100 dB

The effect for the SV38V transducer is marginal and can be neglected!

The effect for the SV105 transducer is marginal and can be neglected!

Table C.6 Typical effect of acoustic signal perpendicular to the z axis of 3023M2 accelerometer

filter	Wb			Wd		
	channel 1	channel 2	channel 3	channel 1	channel 2	channel 3
Typical effect of acoustic signal [mm/s^{-2}]	8,29	15,94	6,56	28,81	23,68	38,56
filter	Wk			Wh		
	channel 1	channel 1	channel 1	channel 1	channel 2	channel 3
Typical effect of acoustic signal [mm/s^{-2}]	2,38	2,38	2,38	1,28	1,18	0,65

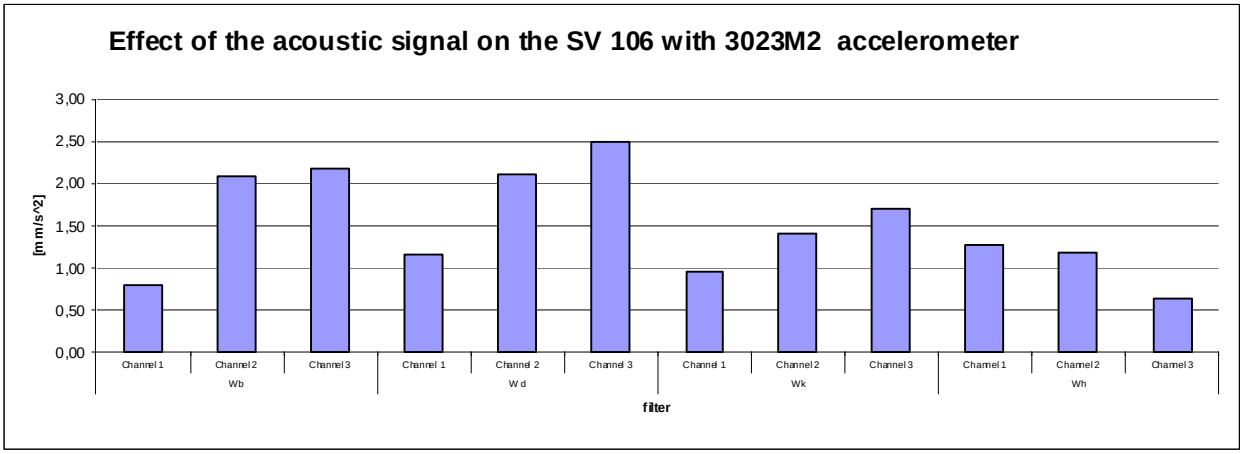
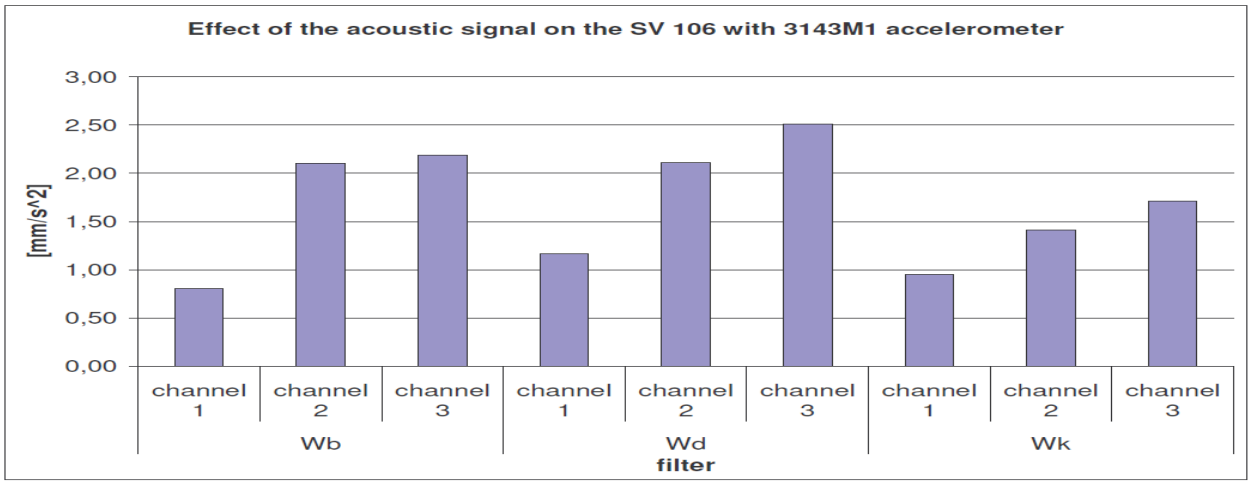


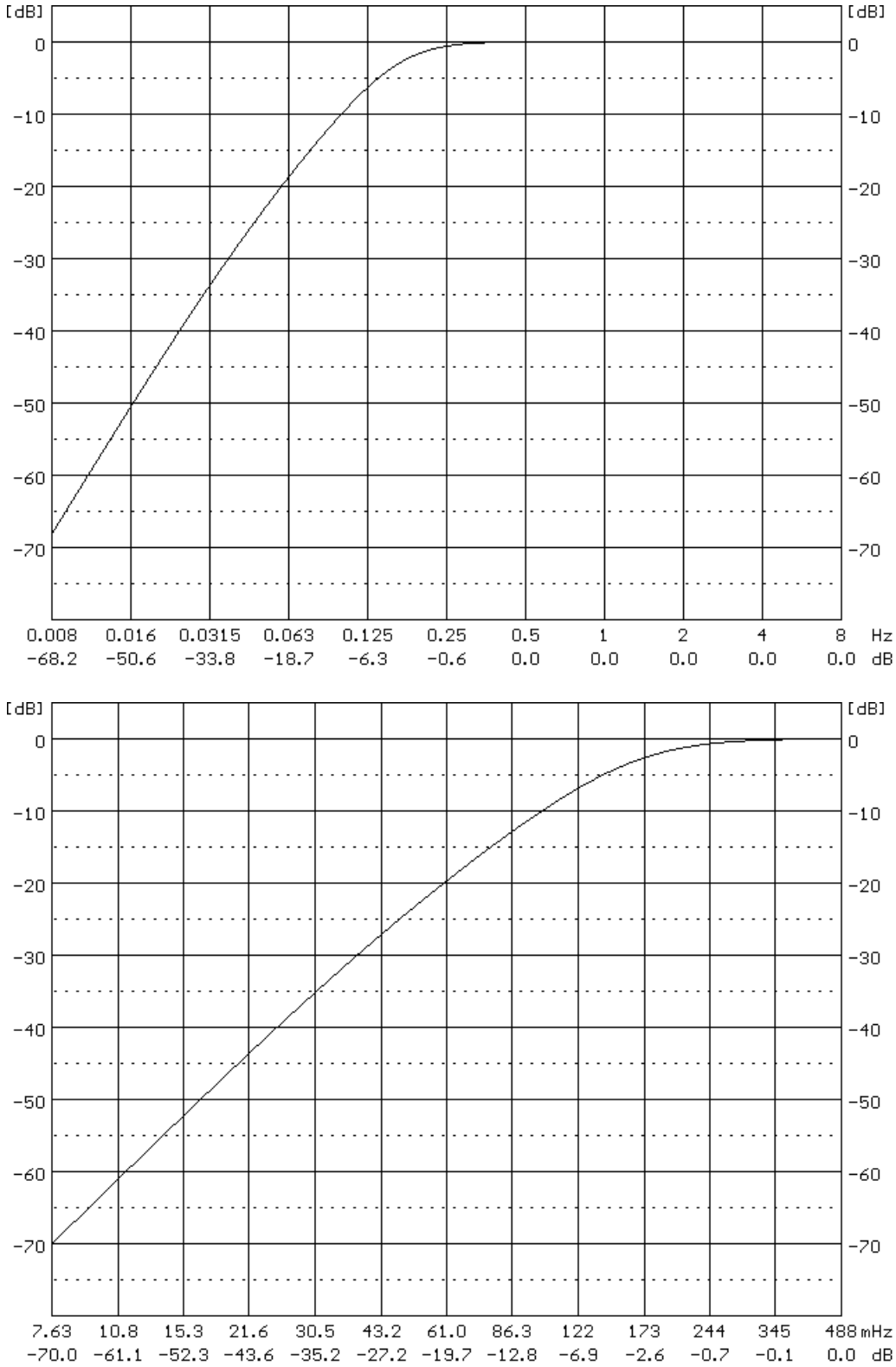
Table C.7 Typical effect of acoustic signal perpendicular to the z axis of the SV39A/L (3143M1) accelerometer

Filter	Wb			Wd			Wk		
	channel 1	channel 2	channel 3	channel 1	channel 2	channel 3	channel 1	channel 2	channel 3
Typical effect of acoustic signal [mm/s^{-2}]	0,80	2,10	2,19	1,17	2,11	2,51	0,95	1,41	1,71



C2. Frequency characteristics of the implemented digital filters

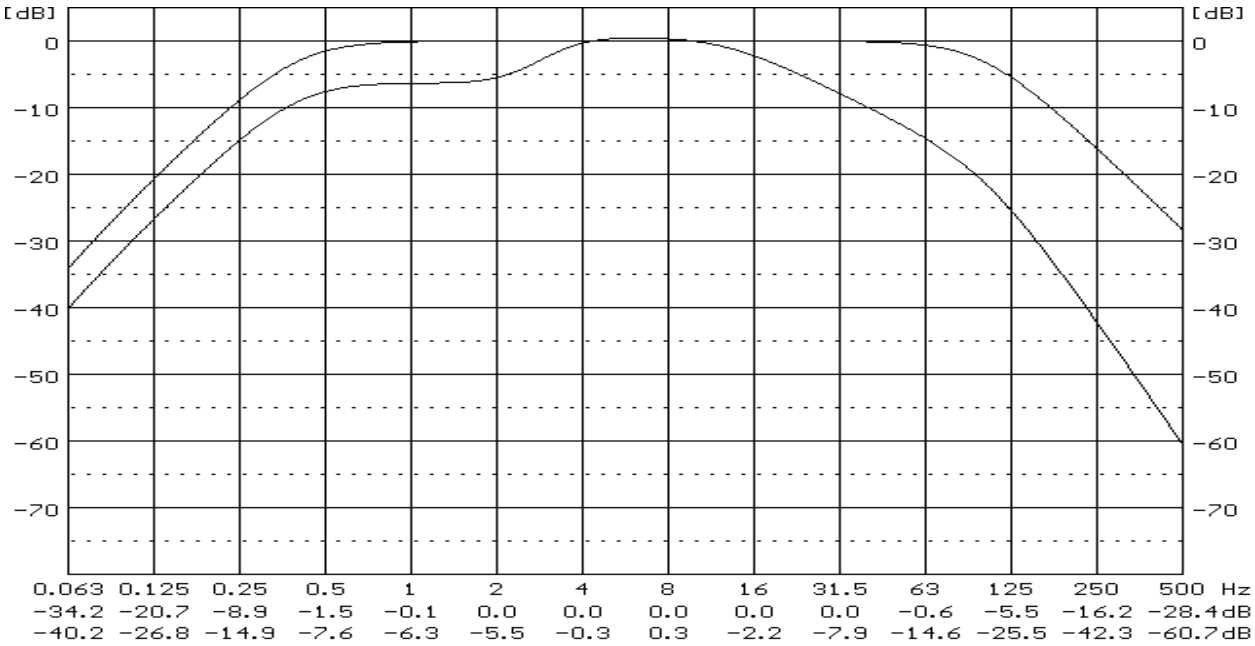
The **HP** filter is used for the acceleration measurements (the vibration signal) in the frequency range from 0.2 Hz to 2 kHz.



Characteristics of the HP digital filter implemented in the VM

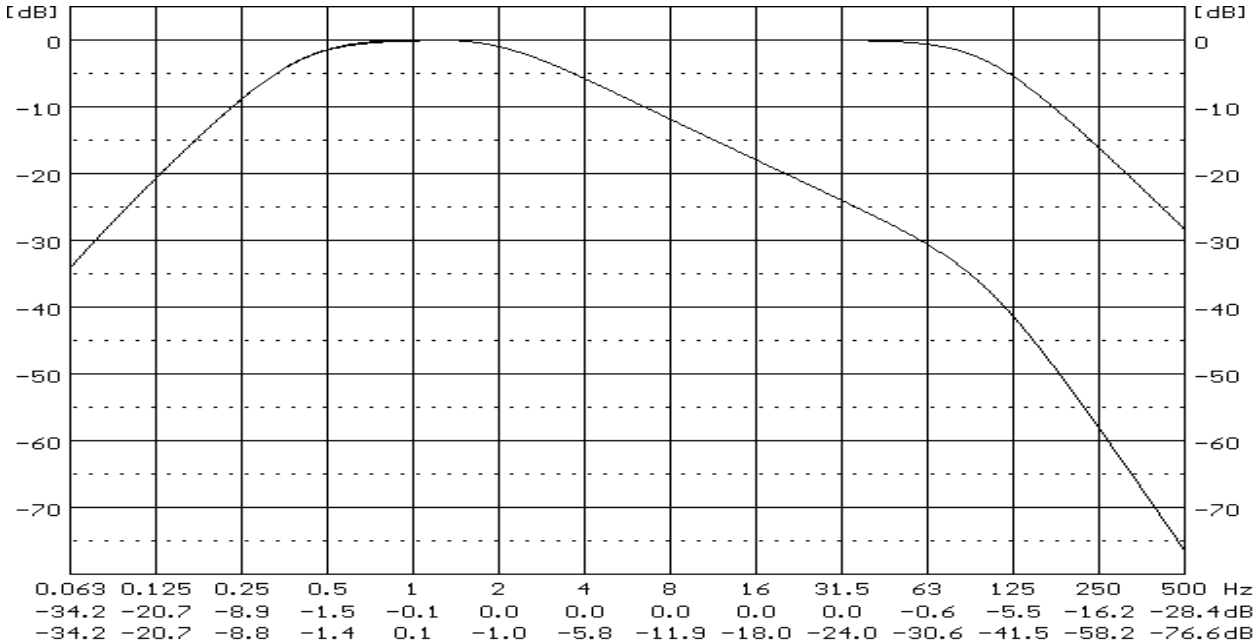
In the **SV 106** instrument there are various filters conforming to ISO 8041:2005 standards (**Wk**, **BL-Wk**, **Wd**, **BL-Wd, Wc**, **BL-Wc, Wj**, **BL-Wj, Wm**, **BL-Wm, Wh**, **BL-Wh, Wg, BL-Wg, Wb, BL-Wb, Wf,** and **BL-Wf**).

. The **Wk** filter is used for the assessment of the influence of the vibration signal on the human body in the ***z*** direction and for vertical recumbent direction. It conforms to the ISO 2631-1-97 and ISO 8041:2005 standard.



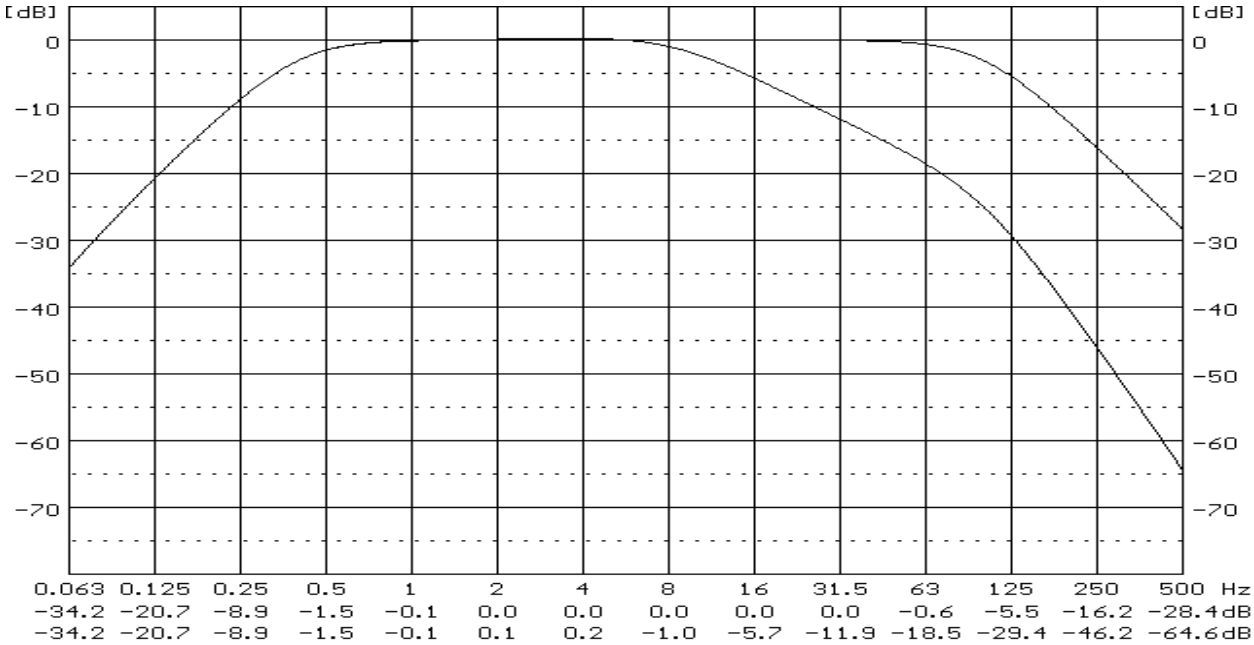
Characteristics of the BL-Wk and Wk digital filters implemented in the instrument

The **Wd** filter is used for the assessment of the influence of the vibration signal on the human body in the x and y directions and for horizontal recumbent direction. It conforms to the ISO 2631-1-97 and ISO 8041:2005 standards.



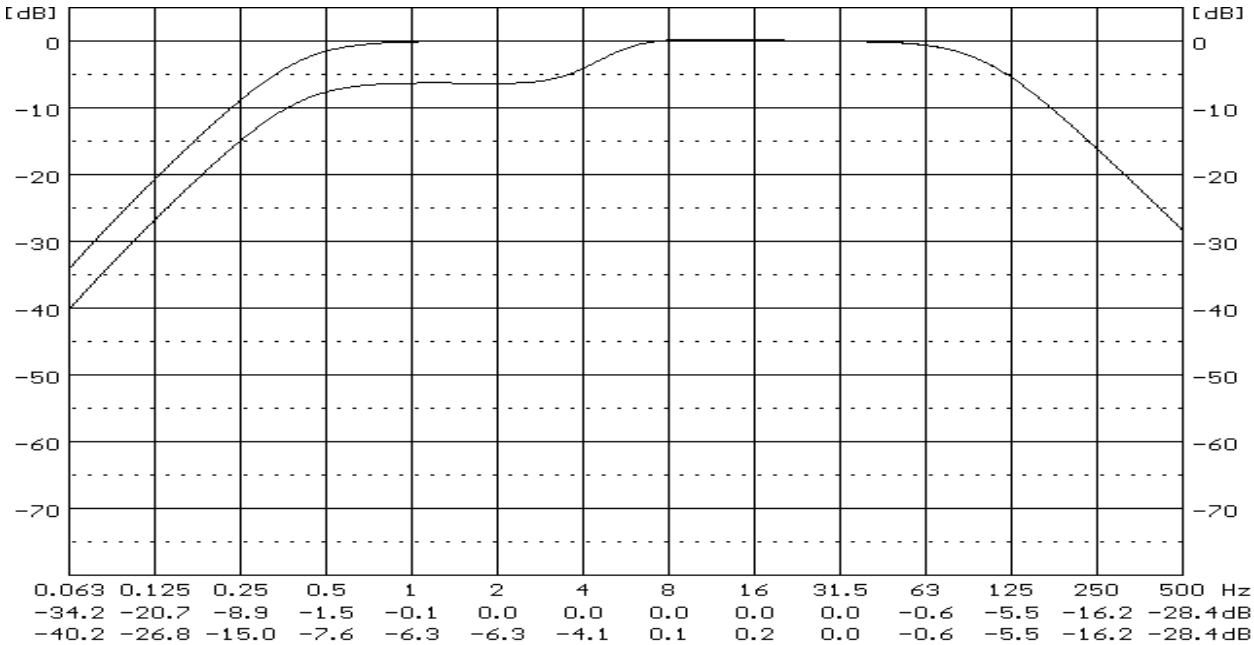
Characteristics of the BL-Wd and Wd digital filters implemented in the instrument

The **Wc** filter is used for the assessment of the influence of the vibration signal on the human body during the seat-back measurements. It conforms to the ISO 2631-1-97 and ISO 8041:2005 standards.



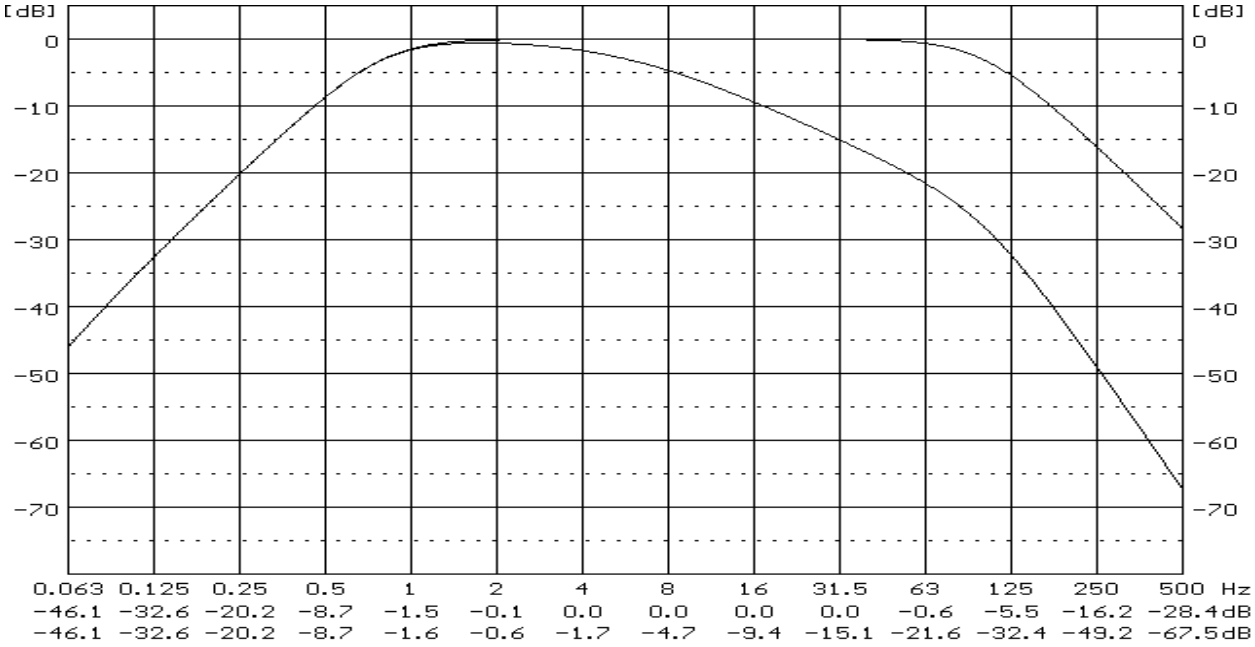
Characteristics of the BL-Wc and Wc digital filter implemented in the instrument

The **Wj** filter is used for the assessment of the influence of the vibration signal under the head of the recumbent person. It conforms to the ISO 2631-1-97 and ISO 8041:2005 standards.



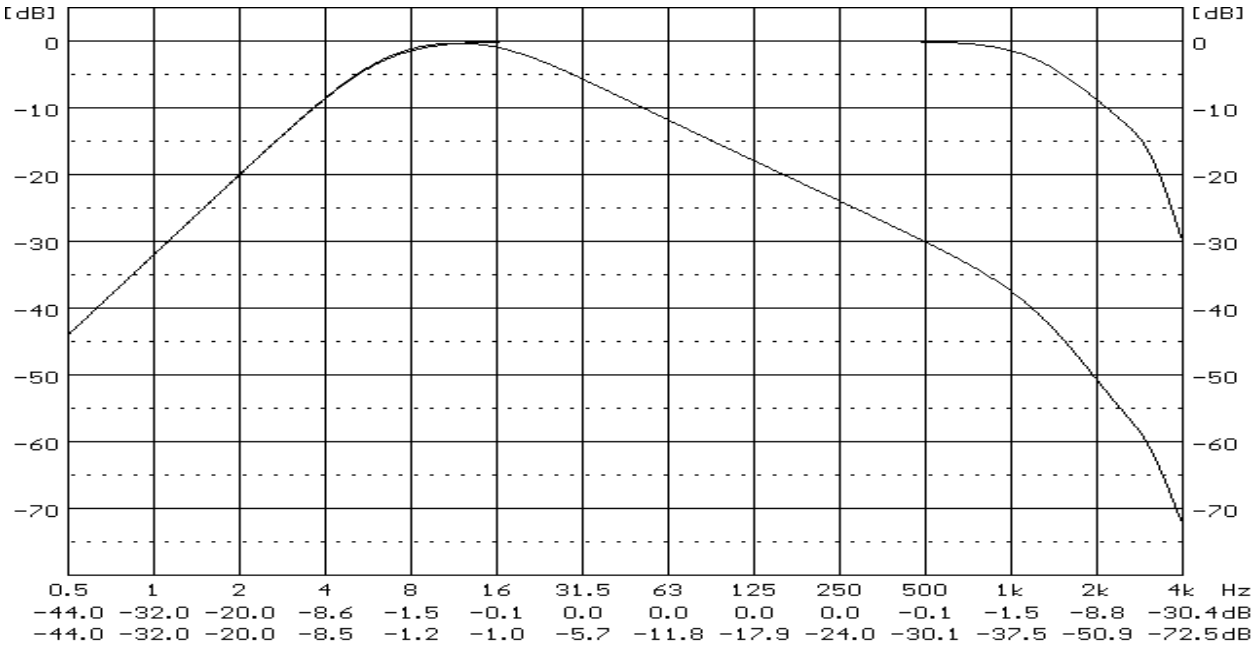
Characteristics of the BL-Wj and Wj digital filter implemented in the instrument

The **Wm** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO 2631-1-97 and ISO 8041:2005 standards.



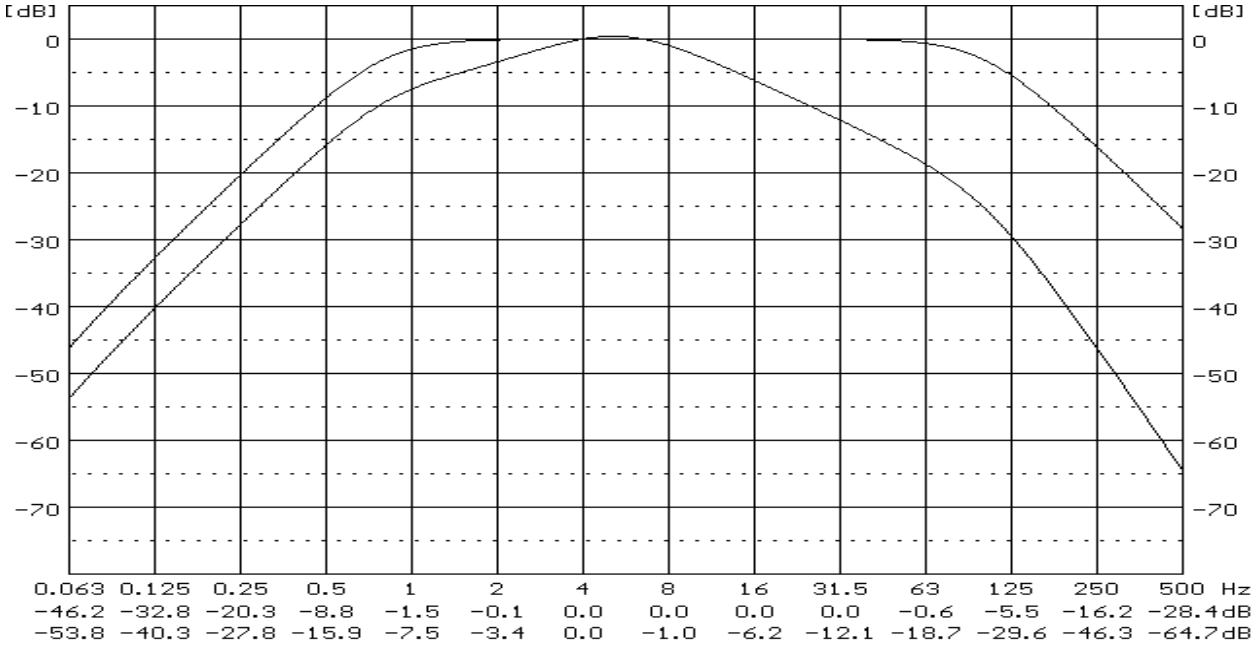
Characteristics of the BL-Wm and Wm digital filter implemented in the instrument

The **Wh** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO 2631-1-97 and ISO 8041:2005 standards.



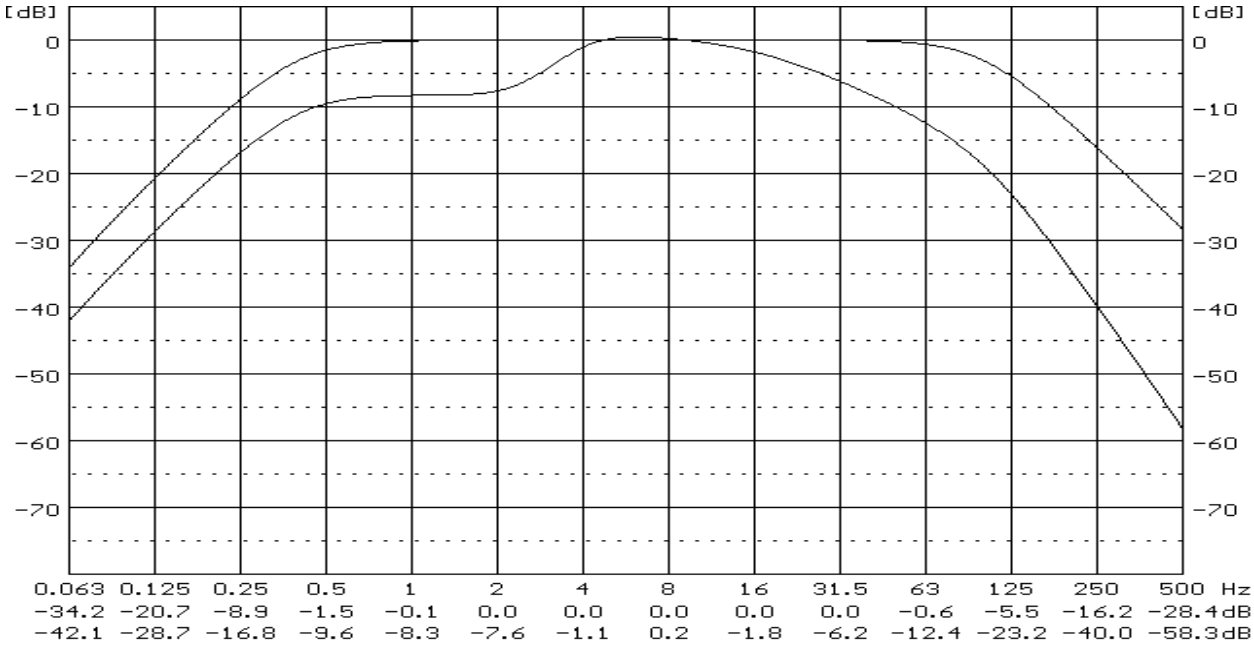
Characteristics of the BL-Wh and Wh digital filter implemented in the instrument

The **Wg** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the BS 6841:1987 standard.



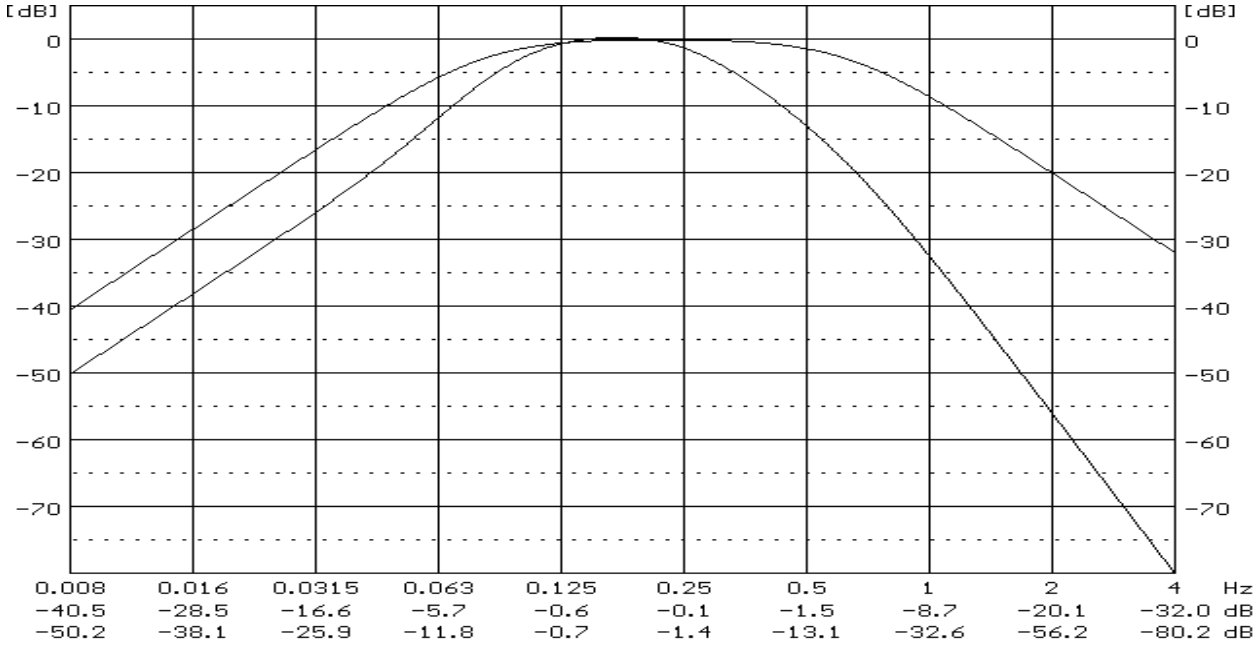
Characteristics of the BL-Wg and Wg digital filter implemented in the instrument

The **Wb** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO 8041:2005 standard.



Characteristics of the BL-Wb and Wb digital filter implemented in the instrument

The **Wf** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to the ISO 8041:2005 standard.



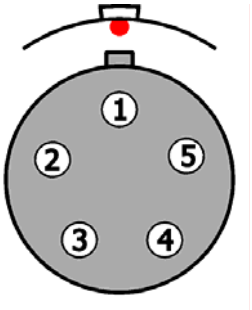
Characteristics of the BL-Wf and Wf digital filter implemented in the instrument

C3. Miscellaneous specification of the SV106

Signal input

The input of the measured signal (taken form the vibration transducer):

2 x LEMO 5-pin: six channels IEPE type or Direct and two channels for force transducers.



LEMO 5-pin connector (external view)

Table C.8 Pin out of the LEMO 5-pin (ENG.0B.305.CYM) connector

Pin number	ENG.0B.305.CYM
1	Input for channel 1 or 4
2	Input for channel 2 or 5
3	Input for channel 3 or 6
4	Input for force measurement, channels 1-3 or 4-6
5	+5.15V Supply Voltage
Shield	Signal Ground / Supply Ground, channels 1-3 or 4-6

Display

Colour OLED 2.4”, 320 x 240 pixels, super contrast 10000 : 1

Notice: The manufacturer of the color displays specify defective display. In case of defective display the number of dark dots is more than 4.

Definition of dark dots: dots appear dark and unchanged in size in which module is displaying under pure red, green, blue picture.

Memory

16 MB non-volatile flash memory and 256 kB of the RAM memory.
FLASH-disk for storing the measurement data files - **4GB MicroSD Card**

Keyboard

Nine pushbuttons – see manual for detailed description

Power supply

Instrument is dedicated for the operation from the internal exchangeable batteries.

SV 106 should be powered from the 4 x AA Type rechargeable batteries or dry alkaline cells

Typical operating time from AA NIMH 2.5 Ah rechargeable batteries with one SV 38V accelerometer is ca. 12 hours, connection second SV 38V reduce operational time about 5 %.

Notice: For the temperatures below 0℃ operating time can decrees (depending on the batteries) !

Notice: *Using of the MicroSD card (memory card) for the continuous time domain recording will increase power consumption.*
In such a case battery operating time will be reduced to approx. 8 hours!

Instrument can be also powered from the external mini USB source with the **DC Voltage from 4.5 V to 5 V.**

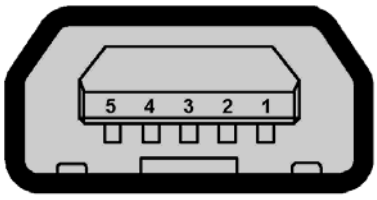
Voltage ripple should not exceed ± 5%.
External Power requirement for 5 V:

- 150 mA DC without accelerometers,
- 155 mA DC with one SV38V accelerometer,
- 180 mA DC with one IEPE 3-channel accelerometer,
- 185 mA DC with one IEPE 3-channel accelerometer and one SV38V.

Interface USB

The **SV 106** USB interface enables remote control of the instrument and data transfer with the speed up to that attainable with 12 MHz clock.

The USB interface can work as external power source of the meter.

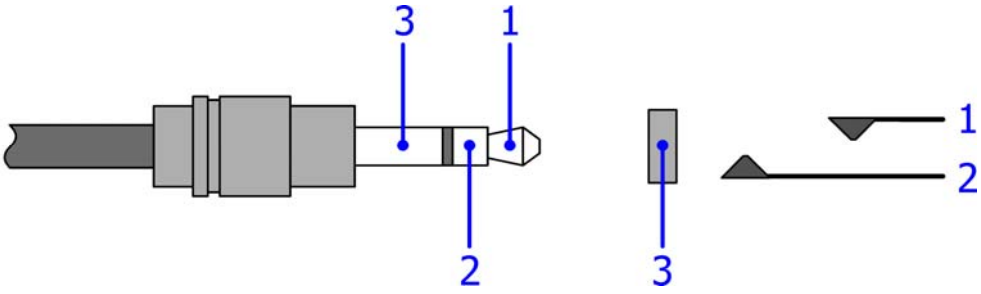


Mini USB socket (external view)

Table C.9 Pin-out of the USB-Device connector

Pin number	USB
1	Vbus
2	D-
3	D+
4	ID
5	GND
Shield	Ground

I/O – User programmable Analogue Outputs, Digital Input / Output connector



3.5 mm Mini Stereo Jack type (cable plug and instrument socket are shown)

Table C. 10 Pin out of the 3.5 mm Mini Stereo Jack

Pin Number	Function
1	Analog Output
2	Digital Input / Output
Chassis (3)	Ground

*depending on instrument set-up

The user may set-up in window *MENU / INSTRUMENT / EXTENDED I/O* one of MODES, which are available in the instrument: **ANALOG**, **DIGITAL IN**, **DIGITAL OUT**

1. **ANALOG** , in this mode analogue signal from the instrument is fed to it's **IO** connector, with following user-selectable options:

   1.1 **Analog** – when this option is selected, the measured signal from the select channel is fed to the terminal [1] of the **I/O** connector. Output voltage, frequency band and the output impedance are following:

   a) Output Voltage:

   Tthe output voltage is equal to 1.0 V_{RMS} (± 5 %) at 170 dB indication of the instrument, on measurement range, when calibration factor is set to 0.0 dB.

   b) Frequency Band (-3 dB): 0.02 Hz ÷ 4 kHz.

   c) Output Impedance: 51 Ω / 5%

2. **DIGITAL IN**, when the **EXT. TRIGGER** function is activated, the external triggering of the instrument may be provided. In order to do that the user has to select **TRIGGER** and to set **SOURCE: EXT. IO** (*path: MENU / MEASUREMENT / TRIGGER / MEASURE TRIGGER*). The external signal for triggering is specified as follows:
   2.1. Trigger voltage threshold level is set to +1 V
   2.2. Trigger voltage slope (*path: MENU / MEASUREMENT / TRIGGER / MEASURE TRIGGER / TRIGGER:*) set by the user as **SLOPE+** (uprising as default) or **SLOPE–** (falling, auxiliary)
   2.3. Minimal duration of the trigger impulse: 10 µsec.
   2.4. 100 µsec. release time after previous measurement is necessary before next trigger
   2.5. Recommended trigger voltage should not exceed ± 5 V
   2.6. Input impedance in this **DIGITAL IN** mode - ca. 10 kΩ / 100 pF, ESD type safety
   2.7. When the instrument is switched-off in the **DIGITAL IN** mode, the voltage impulse on the pin [1] will be able to switch-on the instrument, however in this case the minimal duration of the trigger impulse of 100 msec is necessary, with uprising voltage slope

3. **DIGITAL OUT** - two different functions are available in this mode:
   3.1. **FUNCTION: TRIG. PULSE**, when this function is selected, the terminal [1] is set as output, which enables one to trigger another instrument (one instrument or more with trigger inputs connected together in parallel), output trigger impulse meets specification given below:

a) trigger impulse is generated before every measurement
b) output voltage range from 0 V or 3 V
c) triggering slope: uprising
d) output impedance: 51 Ω
e) duration of the impulse: ca. 30 μsec.

3.2. **FUNCTION: ALARM PULSE**, when this function is selected, the terminal [1] is set as an output, which changes its output level, when current result of measurement exceeds user-programmable threshold level. In this case the terminal [1] output operates as an output of analogue comparator with user-programmable threshold. This feature enables one to control an external device as alarm-indicator or similar
   a) electrical specification of this output are as follows: 0 V to 3 V voltage range, 51 Ω output impedance
   b) output produces a voltage level (not impulse)
   c) **ACTIVE LEVEL** setting may be selected by the user in menu as **LOW** or **HIGH**. If **HIGH** is selected, the output alternates from 0 V to 3 V till measurement result is greater than threshold value
   d) **SOURCE** setting selects source of measurement result to be compared with the threshold value. One of three results sources may be selected **RMS(1)**, **VEC13** or **VEC46**
   e) **LEVEL** enables one setting-up threshold value

Real Time Clock

Accuracy better then **1 minute/month.**

Weight with the battery

390 g (without accelerometer).

Dimensions

140x83x33 mm (without accelerometer).

Electromagnetic Compatibility (EMC)

The product described above is compliant with the following EMC standards:

1. For the EMC emissions specification:
   according to EN ISO8041: 2005 (Chapters 7.5, 12.20.7), applying test methods in accordance with CISPR 22: 2003, Clause 10 and CISPR 16-1-1,
2. For the EMC immunity specification:
   according to EN ISO8041: 2005 (Chapters 7.4, 7.6, 12.20.6, 12.20.8), applying test methods in accordance with IEC 61000-4-2:2001, IEC 61000-4-3:2002 and IEC 61000-4-8.

Notice: EMC compatibility is guaranteed only with the original accessories supplied by SVANTEK!

Safety

The product described above is compliant with following standards:
EN 61010-1:2001 and IEC 61010-1:2001

Compliance with EU Directives

CE mark indicates compliance with EMC Directive 89/336/EEC and Low Voltage Directive 2006/95/EC.

Environmental parameters

- Working temperature range -10°C ÷ +50°C
- Storing temperature range -20°C ÷ +50°C
- Humidity up to 90% RH (non-condensed)

C4. Transducers specification

Whole-Body "Seat" Accelerometer SV 38V specification:

Performance:

Number of axis	3
Sensitivity (± 5 %)	50 mV/(m/s2) at 15.915 Hz, HP1
Measurement range	0.01 ms^{-2} RMS ÷ 50 ms^{-2} PEAK
Frequency response (by design guideline, ± 3 dB)	0.01 Hz ÷ 100 Hz
Frequency response (factory tested, ± 3 dB)	4 Hz ÷ 125 Hz
Resonant frequency	5 kHz (MEMS transducer)
Electrical noise	< 25 µV RMS, Wd weighting < 60 µV RMS, Wk weighting < 230 µV RMS, HP1 weighting

Electrical:

Supply current	< 5,0 mA
Supply voltage	5,2 V ÷ 16 V
Bias voltage	2,5 V ± 0.05 V
Output impedance	51 Ohms
Charge / discharge time constant (start-up time)	30 sec. typ.
TEDS memory	installed (power supply pin)

Environmental Conditions:

Maximum vibration	980 m/s^2 shock survival
Temperature coefficient	<+0.012 dB/°C
Temperature	from -10°C to +50°C
Humidity	up to 90 % RH, non-condensed

Physical:

Sensing element	MEMS
Cable	integrated 1.4 meters long
Connector	LEMO 5-pin plug (SV 106 compatible)
Dimensions	236 mm diameter; thickness from 3.6 mm to 12 mm
Weight	550 grams (including cable and rubber cushion)

Accessories:

SA 38 (option)	Calibration adapter

Whole Body "Seat" Accelerometer SV 39A/L specification:

(SV 106 supports SV 39A/L only in IEPE mode of input channels; SC 118 Integrated connector is required)

Physical:

Weight	16 Grams
Size, L X W X H	.82 x .82 x .34 Inches
Mounting provision, thru hole	4mm x 0.7
Connector, radially mounted	4-PIN
Material, housing & connector	TITANIUM

Performance:

Number of axis	3
Sensitivity, ± 5%	100.0 mV/g
Range F.S. FOR ± 5 VOLTS OUTPUT	± 500 g's
Frequency range, ± 5%	0.5 to 3000 Hz
Resonant frequency, NOM.	25 kHz
Equivalent electrical noise floor	.0007 g's RMS

Linearity	± 1% % F.S.
Transverse sensitivity, MAX.	5 %
Strain sensitivity	.012 g's/μσ @ 250 μσ

Environmental:

Maximum vibration/shock	600/1500 ± g's/g's PEAK
Temperature range, OPERATING	-60 to +185 °F
Temperature range, survival	-100 TO +225 °F
Seal,	(welded, glass-to-metal connector) Hermetic
Coefficient of thermal sensitivity	.03 %/oF

Electrical:

Supply current range	2 to 20 mA
Compliance voltage range	+18 to +30 Volts
Output impedance, typ.	100 Ohms
Bias voltage range	+11 to +13 VDC
Discharge time constant range	0.8 to 1.2 Sec
Output signal polarity for acceleration in direction of toward top	Positive
Electrical isolation, case ground to mounting surface	10 Mohm, min.

Hand-Arm triaxial Accelerometer SV105 specification:

Performance:

Number of axis	3
Sensitivity (± 5 %)	10 mV/(m/s2) at 79..915 Hz,
Measurement range	0.01 ms-2 RMS ÷ 50 ms-2 PEAK
Frequency response	0.1 Hz ÷ 2000 Hz
Resonant frequency	5 kHz (MEMS transducer)
Electrical noise	< 316 μV RMS, HP weighting

Electrical:

Supply current	< 5 mA ÷ per channel
Supply voltage	5.2 V ÷ 16 V
Bias voltage	2.5 V +/- 0.2 V
Output impedance	51 Ohms
Charge / discharge time constant (start-up time)	30 sec. typ.
TEDS memory	installed (power supply pin)

Environmental Conditions:

Maximum vibration	100 000 m/s2 shock survival for MEMS sensor
Temperature coefficient	<+0.012 dB/°C
Temperature	from -10°C to +50°C
Humidity	up to 90 % RH, non-condensed

Physical:

Sensing element	MEMS
Cable	integrated 1.4 meters long
Connector	LEMO 5-pin plug
Dimensions	236 mm diameter; thickness from 3.6 mm to 12 mm
Weight	550 grams (including cable and rubber cushion)

Accessories:

SA 105 (option)	Calibration adapter

Hand-Arm triaxial Accelerometer 3023M2 (SV 50 included accelerometer) specification:
(SV 106 supports 3023M2 only in IEPE mode of input channels; **SC 118 Integrated** connector is required)

Physical:

Weight 4 grams	
Size	(height x width x depth) 0.49 x .36 x .36 inch
Mounting	10-32 TAPPED HOLE IN BASE
Connector	4-PIN
Material	HOUSING/CONNECTOR TITANIUM ALLOY

Performance:

Sensitivity,-10 +15%	1mV / ms^{-2}
Range	F.S. (each axis) +/- 500 g
Frequency response	-5 / +15% Axis 1 & 2 1.5 to 5000 Hz Axis 3 1.5 to 10000 Hz
Element natural frequency	NOM. 40 kHz
Equivalent electrical noise	0.0095 g rms
Linearity	1 %F.S.
Transverse sensitivity	MAX, 5 %
Signal polarity	Positive for motion in direction of arrows on housing

Environmental:

Maximum vibration	+/- 600 gpk
Maximum shock	5000 gpk
Temperature range	-60 to +320 °F
Environmental seal	HERMETIC:
Coefficient of thermal sensitivity	0.03 %/°F

Electrical:

Supply current range, (each axis)	2-to 20 mA
Compliance (supply) voltage range	+18 to +30 VDC
Output impedance, TYP	100 OHMS
Output bias voltage, NOM.	+10 VDC
Discharge time constant, NOM.	0.3 SEC
Ground isolation	Case grounded

D. FORMULAE FOR RESULTS

D.1. BASIC RESULTS – RMS, VDV, CRF, OVL, PEAK, P-P, MTVV

NOTATION

T - measurement time

$\mathbf{T_E}$ - exposure time (period during which a person is exposed to the action of vibration).

$\mathbf{T_0}$ - period equal to 8 hours (28 800 seconds)

$\boldsymbol{\tau}$ - detector time constant (τ =1s)

$\mathbf{a_W(t)}$ - the temporary value of the measured vibration with the weighting filter **W** (e.g. **Wd**) on the input of the RMS detector

$\mathbf{p_W(t)}$ - the temporary value of the measured vibration with the weighting filter **W** (e.g. **Wd**) on the output of the RMS detector calculated from the equation:

$$\mathbf{p_W(t) = \left(\frac{1}{\tau} \int_{-\infty}^{t} a_W^2(t_x) \exp\left(\frac{t_x - t}{\tau} \right) dt_x \right)^{1/2}}$$

where:

$\mathbf{t_x}$ - time (variable of the integration)

For **RMS**, **VDV**, **PEAK**, **PEAK-PEAK**, **MTVV** results when saved in the logger T is equal to logger step

For **RMS**, **VDV**, **PEAK**, **PEAK-PEAK**, **MTVV** results when saved as the main results T is equal to measurement period value

FORMULAE

RMS

The **R**oot **M**ean **S**quare result is calculated as follows:

$$\mathbf{RMS = \left(\frac{1}{T} \int_0^T a_W^2(t)\, dt \right)^{1/2}}$$

VDV

The **V**ibration **D**ose **V**alue result (expressed in $m/s^{1.75}$) as follows:

$$\mathbf{VDV = \left(\int_0^T a_W^4(t)\, dt \right)^{1/4}}$$

CRF

The **Cr**est **F**actor value is obtained from the proportion **PEAK**/**RMS**.

OVL

The **Ov**er**l**oad presents the percentage of the time the input signal was overloaded.

PEAK

The **PEAK** value is calculated for the given **T** as follows:

$$\mathbf{PEAK = max_T \left| a_W(t) \right|}$$

P–P

The **P**eak to **P**eak result is calculated as follows:

$$\mathbf{P-P = max_T\left(0, a_W(t)\right) - min_T\left(0, a_W(t)\right)}$$

MTVV

The **M**aximum **T**ransient **V**ibration **V**alue is defined (according to the **ISO 8041** standard) as:

$$\mathbf{MTVV = max_T\left(p_W(t)\right)}$$

D.2 HAND-ARM DOSIMETER RESULTS - MAX(RMS), EAV TT, EAV TL, ELV TT, ELVTL, AEQ, Current Exposure, Daily Exposure

NOTATION

EAV - **E**xposure **A**ction **V**alue – constant value defined by USER or defaultly set for U.K., Italy, France, Germany, - according to local standards (in Poland **MNDN8h** value)

ELV - **E**xposure **L**imit **V**alue – constant value defined by USER or defaultly set for U.K., Italy, France, Germany – according to local standards (in Poland **MDND30** value)

MAX(RMS)

The **MAX(RMS)** result is the highest **RMS** value taken from three axis

$$\mathbf{MAX(RMS) = max\left\{ RMS_x, RMS_y, RMS_z \right\}}$$

EAV Total Time

The **EAV Total Time** result is calculated as follows:

$$\mathbf{EAV_{TT} = T_0\left(\frac{EAV}{AEQ}\right)^2}$$

EAV Time Left

The **EAV Time Left** result is calculated as follows:

$$\mathbf{EAV_{TL} = EAV_{TT} - T}$$

ELV Total Time

The **ELV Total Time** result is calculated as follows:

$$\mathbf{ELV_{TT} = T_0 \left(\frac{ELV}{AEQ} \right)^2}$$

ELV Time Left

The **ELV Time Left** result is calculated as follows:

$$\mathbf{ELV_{TL} = ELV_{TT} - T}$$

MNDN Total Time (result only for polish standards)

The **MNDN Total Time** result is calculated as follows:

$$\mathbf{MNDN_{TT} = T_0 \left(\frac{MNDN8h}{AEQ} \right)^2}$$

MNDN Time Left (result only for polish standards)

The **MNDN Time Left** result is calculated as follows:

$$\mathbf{MNDN_{TL} = MNDN_{TT} - T}$$

AEQ (HAND-ARM VECTOR)

The **AEQ** result is calculated as follows:

$$\mathbf{AEQ = \sqrt{RMS_x^2 + RMS_y^2 + RMS_z^2}}$$

Current Exposure

The **Current Exposure** result is calculated as follows:

$$\mathbf{CExp = AEQ \sqrt{\frac{T}{T_0}}}$$

Daily Exposure

The **Daily Exposure** result is calculated as follows:

$$\mathbf{A(8) = AEQ \sqrt{\frac{T_E}{T_0}}}$$

D.3 WHOLE-BODY DOSIMETER RESULTS – MAX(RMS), MAX(VDV), EAV TT, EAV TL, ELV TT, ELV TL, Current Dose, Daily Dose, Current Exposure, Daily Exposure, Vector

NOTATION

EAV - **E**xposure **A**ction **V**alue – constant value defined by USER or defaultly set for U.K., Italy, France, Germany according to local standards (in Poland **ONDN8h** value)

$\mathbf{EAV_A}$ - **E**xposure **A**ction **V**alue expressed in $\frac{m}{s^2}$

$\mathbf{EAV_V}$ - **E**xposure **A**ction **V**alue expressed in $\frac{m}{s^{1.75}}$ (this unit may be selected in USER option)

ELV - **E**xposure **L**imit **V**alue – constant value defined by USER or defaultly set for U.K., Italy, France, Germany according to local standards (in Poland **ONDN30** value)

$\mathbf{ELV_A}$ - **E**xposure **L**imit **V**alue expressed in $\frac{m}{s^2}$

$\mathbf{ELV_V}$ - **E**xposure **L**imit **V**alue expressed in $\frac{m}{s^{1.75}}$ (this unit may be selected in USER option)

$\mathbf{k_{x,y,z}}$ - weighting factors for x, y, z axis

MAX(RMS)

The **MAX(RMS)** result is the highest weighted RMS value taken from three axis

$$\mathbf{MAX(RMS) = max\left\{ 1.4RMS_x, 1.4RMS_y, RMS_z \right\}}$$

MAX(VDV)

The **MAX(VDV)** result is the highest weighted VDV value taken from three axis

$$\mathbf{MAX(VDV) = max\left\{ 1.4VDV_x, 1.4VDV_y, VDV_z \right\}}$$

EAV Total Time

The **EAV Total Time** result is calculated as follows:

$$\mathbf{EAV_{TTA} = min\left\{ EAV_{TTAx}, EAV_{TTAy}, EAV_{TTAz} \right\}}$$

$$\mathbf{EAV_{TTAx,y,z} = T_0\left(\frac{EAV_{Ax,y,z}}{RMS_{x,y,z}}\right)^2}$$

$$\mathbf{EAV_{TTV} = min\left\{ EAV_{TTVx}, EAV_{TTVy}, EAV_{TTVz} \right\}}$$

$$\mathbf{EAV_{TTVx,y,z} = T\left(\frac{EAV_{Vx,y,z}}{VDV_{x,y,z}}\right)^4}$$

$$EAV_{TT} = \begin{cases} EAV_{TTA} \text{ if EAV limit is in } \dfrac{m}{s^2} \\ EAV_{TTV} \text{ if EAV limit is in } \dfrac{m}{s^{1.75}} \end{cases}$$

EAV Time Left

The **EAV Time Left** result is calculated as follows:

$$EAV_{TL} = EAV_{TT} - T$$

ELV Total Time

The **EAV Total Time** result is calculated as follows:

$$ELV_{TTA} = \min\left\{ ELV_{TTAx}, ELV_{TTAy}, ELV_{TTAz} \right\}$$

$$ELV_{TTAx,y,z} = T_0 \left(\frac{ELV_{Ax,y,z}}{RMS_{x,y,z}} \right)^2$$

$$ELV_{TTV} = \min\left\{ ELV_{TTVx}, ELV_{TTVy}, ELV_{TTVz} \right\}$$

$$ELV_{TTVx,y,z} = T \left(\frac{ELV_{Vx,y,z}}{VDV_{x,y,z}} \right)^4$$

$$ELV_{TT} = \begin{cases} ELV_{TTA} \text{ if ELV limit is in } \dfrac{m}{s^2} \\ ELV_{TTV} \text{ if ELV limit is in } \dfrac{m}{s^{1.75}} \end{cases}$$

ELV Time Left

The **ELV Time Left** result is calculated as follows:

$$ELV_{TL} = ELV_{TT} - T$$

ONDN Total Time (result only for polish standards)

The **ONDN Total Time** result is calculated as follows:

$$ONDN_{TT} = T_0 \left(\frac{ONDN8h}{Vector} \right)^2$$

ONDN Time Left (result only for polish standards)

The **ONDN Time Left** result is calculated as follows:

$$ONDN_{TL} = ONDN_{TT} - T$$

Current Dose

The **Current Dose** result is calculated as follows:

$$\mathbf{CDose = VDV}$$

Daily Dose

The **Daily Dose** result is calculated as follows:

$$\mathbf{DDose = VDV}\sqrt[4]{\frac{T_E}{T}}$$

Current Exposure

The **Current Exposure** result is calculated as follows:

$$\mathbf{CExp = RMS}\sqrt{\frac{T}{T_0}}$$

Daily Exposure

The **Daily Exposure** result is calculated as follows:

$$\mathbf{A(8) = RMS}\sqrt{\frac{T_E}{T_0}}$$

Vector

The **Vector** result is calculated as follows:

$$\mathbf{Vector} = \sqrt{(k_x RMS_x)^2 + (k_y RMS_y)^2 + k_z RMS_z^2}$$

Defaultly **Vector** is calculated as follows:

$$\mathbf{Vector} = \sqrt{(1.4 RMS_x)^2 + (1.4 RMS_y)^2 + RMS_z^2}$$

D.4 CALCULATOR RESULTS – A(8), Dose(8)

NOTATION

NFiles –	number of result files
$\mathbf{T_E(i)}$ –	exposure time for i-file in seconds
T(i) -	measurement time for i-file
$\mathbf{A_{x,y,z}(8)}$ -	results for x, y, z axis
$\mathbf{Dose_{x,y,z}(8)}$ -	results for x, y, z axis
$\mathbf{k_{x,y,z}}$ -	weight factors for x, y, z axis

Hand-Arm Daily

The **Hand – Arm Daily** result is calculated as follows:

$$A(8) = \sqrt{\sum_{i=1}^{NFiles} \left(\frac{T_E(i)}{28800} \right) VEC_{HA}{}^2(i)},$$

where $VEC_{HA}(i) = AEQ = \sqrt{RMS_x^2 + RMS_y^2 + RMS_z^2}$

Whole-Body Vibration Daily

The **Whole-Body Vibration Daily** results are calculated as follows:

$$A_{x,y,z}(8) = \sqrt{\sum_{i=1}^{NFiles} \left(\frac{T_E(i)}{28800} \right) k_{x,y,z}^2 RMS_{x,y,z}^2}$$

$$A(8) = MAX\{ A_x(8), A_y(8), A_z(8) \}$$

$$Dose_{x,y,z}(8) = \sqrt[4]{\sum_{i=1}^{NFiles} \left(\frac{T_E(i)}{T(i)} \right) k_{x,y,z}^4 VDV_{x,y,z}^4}$$

$$Dose(8) = MAX\{ Dose_x(8), Dose_y(8), Dose_z(8) \}$$

B.4.6 Record with the meteo data

Word number	Name / Value	Comment
0	0xC1nn	nn= size of records
1	Temperature	temperature [*10°C]
2	Pressure	pressure [hPa]
3	Humidity	humidity [*10%]
4	AvgWindSpeed	Average wind speed [*10m/s^2]
5	WindDirection	wind direction for max wind speed [degrees]. 0xFFFF if direction is unavailable
6	MaxWindSpeed	max wind speed [*10 m/s] (ignored if WindDirection is unavailable)
7..8	WindDirTotalPuffs	number of total wind puffs in distribution vector of wind direction
9	RainDetection	Rain detection flag
10	0xC9nn	nn= size of records
…	…	…

B.5. Date and time

Following function written in C explains how the date and time are coded:

```
void ExtractDateTime(int date, int time, int dt[])
{
      int sec,year;

      sec = ((0xffff&time)<<1); /* time<<1; */
      dt[0] = sec%60; /* sec */
      dt[1] = (sec/60)%60; /* min */
      dt[2] = sec/3600; /* hour */

      dt[3] = date&0x1F; /* day */
      dt[4] = (date>>5)&0x0F; /* month */
      year = (date>>9) & 0x07F;
      dt[5] = year+2000; /* year */
}
```