SVANTEK

USER MANUAL

SV 106D

HUMAN VIBRATION ANALYSER

Warsaw, 2023-10-02
Rev. 1.01

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1 INTRODUCTION

SV 106D is a six-channel human vibration meter and analyser (Whole-Body and Hand-Arm). The instrument complies with ISO 8041-1:2017 and it is an ideal choice for measurements according to ISO 2631-1,2&5, ISO 10326, ISO 5349-1&2 and EU Directive 2002/44/EC.

This compact instrument performs simultaneous measurements with two triaxial accelerometers (e.g., both-hands vibration or triaxial SEAT transmission measurements are possible). The **RMS**, **VDV**, **CRF**, **OVL**, **PEAK**, **P–P**, **MTVV**, **MAX**, **VECTOR**, **A(8)**, **ELV**, **EAV** results are available with all the weighting filters required for HVM measurements.

Using the processing power of its digital signal processor, the instrument can perform real-time 1/1 octave or 1/3 octave analysis (optional) simultaneously with the broad band meter mode.

Advanced time history logging and time domain signal recording (according to ISO 2631-5) on the built-in micro-SD card provide almost unlimited data storage capabilities. Results can be easily downloaded to a PC using the USB interface and the *Supervisor* software.

SV 106D can be supplied with a choice of Svantek accelerometers: **SV 105** for the hand-arm vibration measurements or SV 38V for the whole-body vibration measurements.

Grip force evaluation is possible with the special “integrated adapter” **SV 105F**.

The fast USB 2.0 interface provides a real-time link for the PC "front-end" application of the SV 106D instrument. Measurement results can be downloaded to a PC via the above interfaces.

The instrument is powered by four standard AA alkaline or rechargeable batteries, e.g., NiMH (a separate charger is required). Power can also be supplied via the USB interface.

The robust and lightweight design provides the exceptional features of this new generation human vibration exposure instrument.

1.1 SV 106D MAIN FEATURES

- Human Vibration meter meeting ISO 8041-1:2017,
- Measurements in accordance with ISO 2631-1,2&5 (including VDV and MTVV) and ISO 5349-1&2
- Six channels for acceleration and two channels for force measurements
- Whole-Body measurements with:
  - **SV 38V** low power seat accelerometer
- Hand-Arm measurements with:
  - **SV 105** integrated triaxial accelerometer including hand straps
  - **SV 105F** integrated triaxial accelerometer including hand straps and grip force sensor
  - **SV 150** triaxial accelerometer with adapter for direct attaching to hand-held power tools
- SEAT transmissibility measurements with **SV 151** integrated triaxial accelerometer
- Time-domain signal waveform recording (meeting ISO 2631-5) as option
- 1/1 octave and 1/3 octave spectral calculations (option)
- Advanced data logger including spectral analysis

- Micro SD flash card for almost unlimited mass data storage
- USB 2.0 Client interface
- A(8) daily exposure automatic calculation
- Integration time programmable up to 24 h
- Supervisor software for easy instrument setup and data download
- Easy to use, operator friendly interface with high contrast full colour display
- Pocket size (140 x 83 x 33 millimetres – 5.5 x 3.3 x 1.3 inches)
- Light weight (only 390 grams – 13.9 oz) including 4 x AA batteries

1.2 ACCESSORIES INCLUDED

- **SV 106D** instrument with micro-SD card 32 GB and 4xAA batteries,
- **SC 158** USB type C to USB type A cable.

1.3 ACCESSORIES AVAILABLE

- **SV 38V** triaxial Whole-Body SEAT accelerometer (MEMS type, sensitivity 50 mV/ms^{-2})
- **SV 39A/L** triaxial Whole-Body SEAT accelerometer (IEPE type, sensitivity 10 mV/ms^{-2})
- **SV 105** triaxial Hand-Arm accelerometer (MEMS type, sensitivity 0.661 mV/ms^{-2}) with adapter
- **SV 105F** triaxial Hand-Arm accelerometer (MEMS type, sensitivity 0.661 mV/ms^{-2}) with adapter & grip force sensor
- **SV 150** triaxial Hand-Arm accelerometer (MEMS type, sensitivity 0.661 mV/ms^{-2}), direct fixing to the tool
- **SV 151** triaxial accelerometer (MEMS type, sensitivity 5.81 mV/ms^{-2}) for measurements on vehicle floor
- **SV 50** triaxial accelerometer set, including Dytran 3023M2 (IEPE type, sensitivity 1 mV/ms^{-2}) and adapters
- **SC 118** LEMO 5 pin to LEMO 4 pin connector
- **SC 125** LEMO 5 pin to LEMO 5 pin extension cable (5 m)
- **SC 139P** LEMO 5 pin (plug) to 3 x BNC sockets cable (0.7 m)
- **SC 149** LEMO 5 pin (plug) to 3 x TNC sockets (0.7 m)
- **SV 110** hand-held vibration calibrator
- **SV 111** portable vibration calibrator for HVM
- **SA 38** calibration adapter for SV 38/38V
- **SA 40** calibration adapter for Dytran 3233A, 3143M1, SV 150, SV 151
- **SA 54** power supply unit by USB interface using cables SC 16 or SC 56 (without cables)
- **SA 47_M** carrying bag and accessories (fabric material)
- **SA 89** carrying belt-bag (fabric material)
- **SA 146** carrying case

1.4 SOFTWARE OPTIONS

- **SV_106_LIC_1** 1/1 octave analysis
- **SV_106_LIC_2** 1/3 octave analysis
- **SV_106_LIC_15** Time domain signal recording

1.5 TECHNICAL SPECIFICATIONS

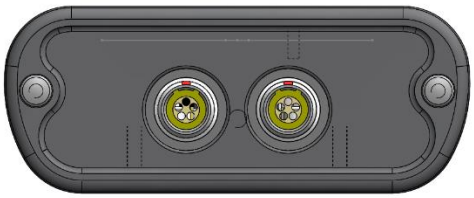
Standards	ISO 8041-1:2017; ISO 2631-1:1997; ISO 2631-2:2003; ISO 2631-5:2004; ISO 5349-1:2001; ISO 5349-2:2001
Meter Mode	ahw (RMS HAND-ARM), ahv (VECTOR HAND-ARM), aw (RMS WHOLE-BODY), awmax (RMS MAX WHOLE-BODY), VDV, MaxVDV, awv (VECTOR WHOLE-BODY), A(8) Daily Exposure, ELV Time (TIME LEFT TO LIMIT), EAV Time (TIME LEFT TO ACTION), MTVV, Max, Peak, Peak-Peak
Profiles per Channel	2
Filters in Profile (1)	Wd, Wk, Wm, Wb, Wc, Wj, Wg, Wf (ISO 2631), Wh (ISO 5349)
Filters in Profile (2)	HP, KB, Vel3 (for PPV measurement), Band Limiting Filters according to ISO 8041-1:2017
RMS & RMQ Detectors	Digital true RMS & RMQ detectors with Peak detection, resolution 0.1 dB
Measurement Range	Transducer dependent: 0.01 m/s^2 RMS ÷ 50 m/s^2 Peak (with SV 38V and Wd filter) 0.1 m/s^2 RMS ÷ 2000 m/s^2 Peak (with SV 105 and Wh filter)
Frequency Range	0.1 Hz ÷ 2 kHz (transducer dependent)
Data Logger	Time-history data including meter mode results and spectra
Time-Domain Recording	Simultaneous 6-channel time-domain signal recording, sampling frequency 6 kHz (optional)
Analyser	6-channel 1/1 octave real-time analysis with centre frequencies from 0.5 Hz to 2000 Hz (optional)
	6-channel 1/3 octave real-time analysis with centre frequencies from 0.4 Hz to 2500 Hz (optional)
Accelerometer (optional)	SV 38V integrated triaxial accelerometer for Whole-Body measurements
	SV 105 integrated triaxial accelerometer including hand straps
	SV 105F integrated triaxial accelerometer with force sensors including hand straps
	SV 150 integrated triaxial accelerometer with adapter for direct attaching to hand-held power tools
	SV 151 integrated triaxial accelerometer for SEAT transmissibility measurements
Input	2 x LEMO 5-pin: six channels Direct or IEPE type and 2 channels for the force transducers
Dynamic Range	90 dB
Force Range	0.2 N ÷ 200 N (dedicated channels for the force transducers)
Sampling Rate	6 kHz
Display	Blanview TFT-LCD 2.4” colour display (320 x 240 pixels)
Memory	Internal 16 MB non-volatile memory
	32 GB Micro SD card included
Interfaces	USB 2.0 interface (real time PC "front end" application supported), Extended I/O - AC output (1 V Peak) or Digital Input/Output (Trigger - Pulse)
Power Supply	Four AA batteries (alkaline), operation time > 12 h (6.0 V / 1.6 Ah) Four AA rechargeable batteries, operation time > 16 h (4.8 V / 2.6 Ah) (not included) USB interface, 500 mA HUB
Environmental Conditions	Temperature from -10 °C to 50 °C
	Humidity up to 90 % RH, non-condensed
Dimensions	140 x 83 x 33 mm (without accelerometer)
Weight	Approx. 390 grams including batteries (without accelerometer)

2 GENERAL INFORMATION

2.1 INPUT AND OUTPUT SOCKETS OF THE INSTRUMENT

Instrument top cover

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



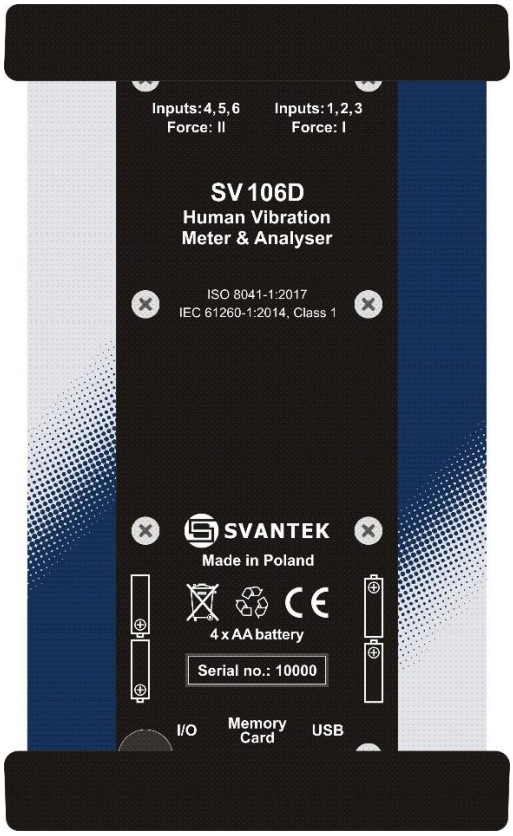
Instrument bottom cover

There are two sockets on the bottom cover, arranged from left to the right as follows: **USB** interface and multi-purpose input/output socket **I/O**.

The USB-C Device 2.0 interface is the serial interface that operates at 12 MHz clock in the Full Speed mode and at 480 MHz in the High Speed mode.

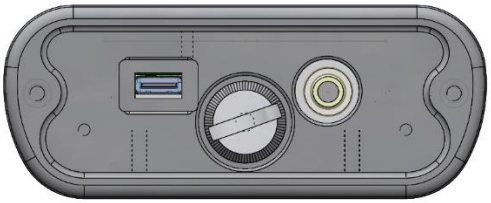
The additional multi-purpose input/output socket, called **I/O**, is a 3.5 mm jack socket. If the Analogue Output functionality is selected, the signal from the input of the analogue/digital converter (before any frequency correction) is available on this socket. This signal can be recorded with a magnetic recorder or viewed on an oscilloscope. The Digital Input, as another functionality, serves as an external trigger for the instrument, while the Digital Output is used to generate the trigger or alarm pulse from the instrument.

There is a slot for a micro-SD memory card under the bottom cover of the instrument and spaces for the 4 x AA batteries.



You can access the card and batteries by unscrewing the coin slot screw and removing the bottom cover – see Chapter 11.2.

All sockets are described in detail in Appendix C of this manual.



Note: *The originally supplied Kingston Industrial memory card has been tested by SVANTEK and cards of this type are strongly recommended for use when the original card needs to be replaced.*

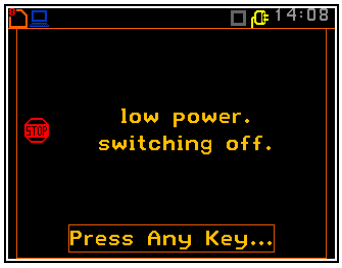
Note: *Switch off the instrument before connecting it to another device (e.g., printer or PC).*

2.2 INSTRUMENT POWER

SV 106D can be powered from any of the following sources:

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

The **Power Supply** screen of the **Instrument** list displays information about the current power source.



When the instrument is powered by its internal batteries, the **"Battery"** icon is displayed on the top line of the display. If the voltage of the batteries is too low for reliable measurements, the icon flashes, or if an attempt is made to switch on the instrument, the **Low power** message appears on the display for 2 seconds and the instrument switches off automatically.

A fully charged set of 4 batteries will provide more than 12 hours of continuous operation of the instrument (with **Dim** switched on). The battery status can be checked using the **Battery** function. The status is also continuously indicated on the top line of the display by the **"Battery"** icon.

If there is a connection to the USB port (the USB device socket is connected to a PC or a USB power supply via the cable), the **"Computer"** icon is displayed on the top line of the display and the message **USB Power: 0.00V** appears on the **Battery** screen.

Note: *If the **"Battery"** icon is red, it is strongly recommended to use the external power supply or USB interface as soon as possible. to ensure reliable operation. The instrument will switch off automatically after a short time if no suitable external power source is connected!*

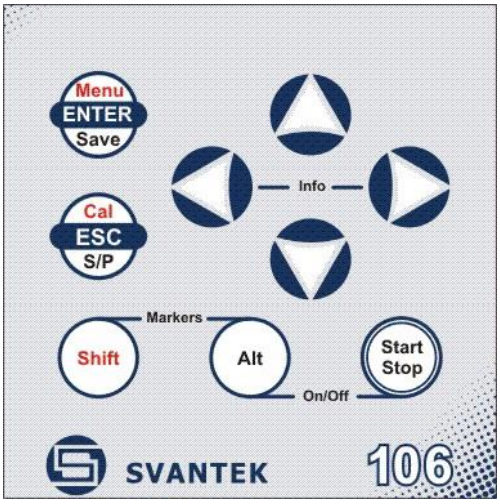
The internal power source of the unit can be extended by reducing the brightness of the screen whenever possible. The Brightness and Power Saving settings can be made from the **Screen Setup** screen (*path: <Menu> / Display / Screen)*.

2.3 CONTROL KEYS ON THE FRONT PANEL

The control of the instrument is designed to be fully interactive. You can operate the instrument by selecting the appropriate item from the selected menu list. As a result, the number of control buttons on the instrument has been reduced to nine for ease of use and convenience.

The following control keys are located on the front panel of the instrument:

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



The name given in (...) brackets denotes the second function of the key, which is available when pressed it in conjunction (or in sequence) with the **<Shift>** key. For the first two keys, the name in square brackets […] also indicates the third key function available when pressed it in conjunction (or in sequence) with the **<Alt>** key.

<Shift> Enables the second function of some keys (e.g., **<Menu>**).

<Alt> Enables the third function of some keys (e.g., **<S/P>**).

Note: *These keys can be used in two different modes, configured in the* ***Keyboard*** *screen (path: <Menu> / Instrument / Keyboard):*

- *as on a computer keyboard, when both the* ***<Shift>/<Alt>*** *key and the second key must be pressed simultaneously (****Direct*** *mode);*
- *as on a smartphone keyboard, when the first* ***<Shift>/<Alt>*** *key should be pressed and released and then the second key pressed (****2nd Function*** *mode).*

Note: *Pressing* ***<Alt>*** *and* ***<Start/Stop>*** *at the same time turns the instrument on or off.*

<Start/Stop> This key starts or stops the measurement. You can set the mode of this key so that to start or stop the measurements by pressing **<Start/Stop>** and **<Shift>** simultaneously. This can prevent a measurement from being started or stopped accidentally.

<ENTER> This key opens the selected item in the list and confirms the selected settings. Some additional functions of this key are described in the following chapters of this manual.

(<Menu>) This key (**<Shift> + <ENTER>**) opens the main **Menu** in Configuration mode. Double pressing the **<Menu>** key opens the list of recently opened configuration screens. This provides quick access to frequently used configuration screens for easy navigation.

[<Save>] This key (**<Alt> + <ENTER>**) allows you to save measurement results as a file in the instrument memory.

<ESC> This key is used to exit parameter list without saving changes, menu lists or other screens and return to the top screen. It has the opposite effect to the **<ENTER>** key.

([Cal.]) This key (**<Shift> + <ESC>**) opens the **Calibration** menu.

[<S/P>] This key (**<Alt> + <ESC>**) temporarily interrupts the measurement or allows the setup file to be saved if the instrument is not performing the measurement.

◄, ► These keys allow you to:

- select the column in a multi column parameter list,
- select the parameter value in an active item (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 item of the character in the text editing mode,
- activate markers 2 and 3,
- speed up changing the numerical values of the parameters when pressed and held.

(◄, ►) The ◄ / ► keys used in conjunction with **<Shift>** allow you to:

- speed up changing 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 last or first character of an edited text line in the text edition modes,

[◄, ►] The ◄ / ► keys used in conjunction with **<Alt>** allow you to:

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

▲, ▼ These keys allow you to:

- select lines in the list,
- select the correct character from the list in the text edition screen,
- activate markers 1 and 4.

(▲, ▼) The ▲ / ▼ keys used in conjunction with **<Shift>** allow you to:

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

[▲, ▼] The ▲ / ▼ keys used in conjunction with **<Alt>** allow you to:

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

[Info] The **<Info>** key (by pressing the ◄ / ► keys simultaneously) opens the help screen in the measurement display modes.

[Markers] The **Markers** keys allow you to mark special events that have occurred during the measurement. The event function is only active when the Logger is active. To activate the markers, the logger must be switched on (*path: <Menu> / Measurement / General Settings / Logger Mode = Logger*) and one or more logger results (**PEAK**, **P–P**, **MAX**, **RMS**, **VDV**) must to be activated in profiles (*path: <Menu> / Measurement / Data Logging / Logger Results*).

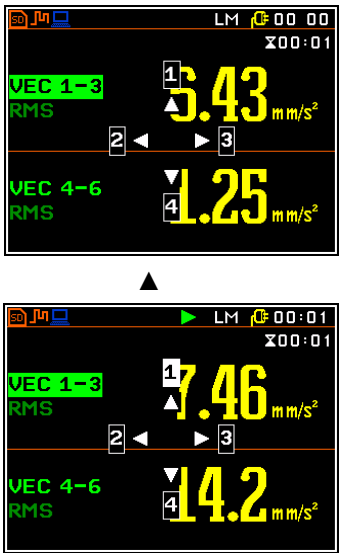
To enter the marker mode, the user must press the **<Shift>** and **<Alt>** keys simultaneously during the measurement (available when the instrument is in Advanced Mode). Four available markers will then appear on the screen. To select marker number 1, press the ▲ key (number 2 - ◄, number - 3 ► and number 4 - ▼).

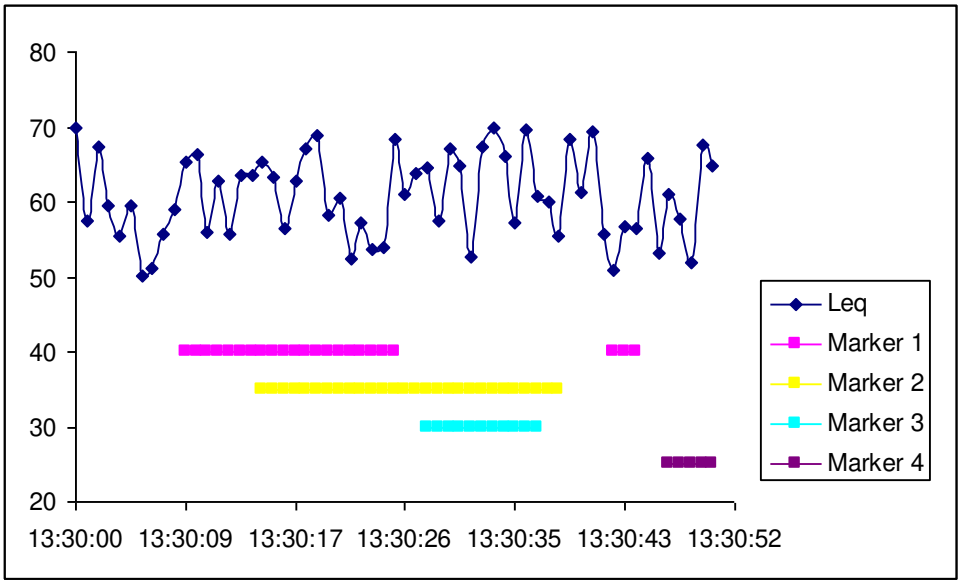
The markers will automatically disappear and the selected marker will be activated (press **<Shift>** + **<Alt>** again to highlight the active marker number). To deactivate a marker, press **<Shift>** + **<Alt>** and press the arrow key, corresponding to the marker to be deactivated.

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

Below is an example of how the markers are displayed on the time history plot (to view a plot with markers, you should transfer the data to the appropriate software such as Supervisor or SvanPC++).

<Shift> / <Alt>





2.4 WORKING WITH THE INSTRUMENT

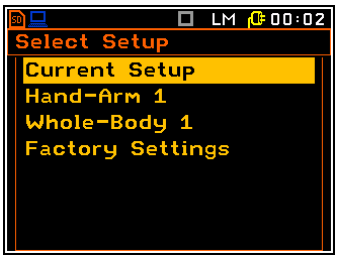
The instrument is controlled by nine keys on the keypad. These keys allow access to all the available functions and change the value of all the available parameters.

The instrument is equipped with a Blanview TFT-LCD 2.4" colour display (320 x 240 pixels), which shows the measurement results and the configuration menu.

The instrument has two operating modes: measurement mode with result preview and configuration mode using the Menu functionality.

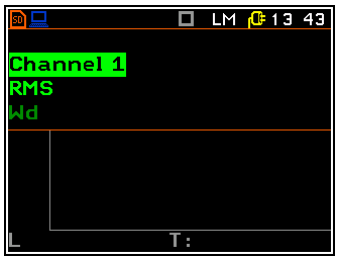
2.4.1 Turning the instrument on

To switch on the instrument, press the **<Alt>** and **<Start/Stop>** keys simultaneously.



The instrument will perform the self-test routine on power-up (displaying the manufacturer logo) and then enter the **Select Setup** screen. This screen allows you to select the predefined setup for specific measurements. To ignore the selection, press **<Esc>**.

After selecting or skipping the predefined setup, the instrument will warm up for one minute and then display the measurement screen with one result and the logger graph if the Logger is enabled, or two results if the Logger is disabled. Press **<ESC>** to bypass the warmup time and go straight to the measurement if required.



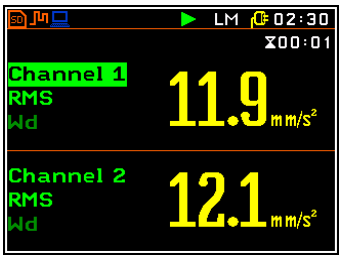
2.4.2 Measurement mode

The measurement results can be viewed in a number of different display modes, depending on the selected **Measurement Function**, which you can change and activate/deactivate.

Displaying readings

In the measurement mode, the readings are displayed as well as additional information using icons relating to:

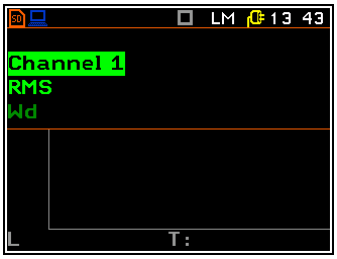
- instrument status: memory, power, real time, etc.,
- measurement status: measurement elapsed time, measurement start/stop/ pause, trigger, logger etc.,
- measurement parameters: measured result, channel number, file name, filter etc.



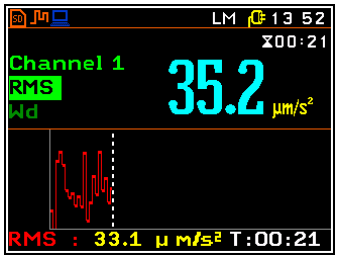
All icons are described in Chapter 2.5, other fields and view control functions are described in Chapter 5.

Starting a measurement

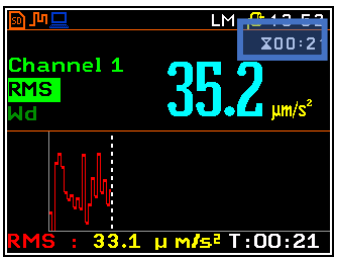
To start the measurement, press the **<Start>** key. The flashing  icon will appear, and the measurement will be taken using the current settings, stored in the instrument's internal memory.



<Start>



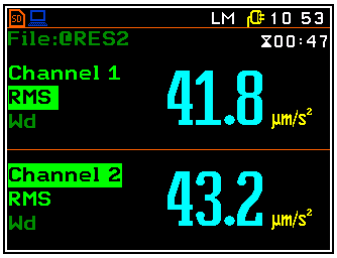
The time elapsed since the start of the measurement (elapsed time) is displayed in the upper right corner of the measurement screen in the format ⌛ **mm:ss** in the range from 00:00 to 59:59, or in the format ⌛ **hh:mm:ss** in the range from 01:00:00 to 99:59:59, or in the format ⌛ **xxxh** from 100h to 999h, and ⌛ **>999h** if the elapsed time exceeds 999 hours. Its maximum value is equal to the **Integration Period** and the elapsed time is reset to zero at the start of a new measurement cycle starts (see Chapter 4.1).



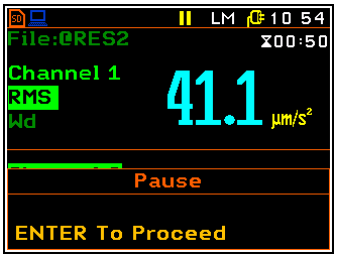
Pausing a measurement

To pause a measurement, press the **<S/P>** key (**<Alt>+<ESC>**). The measurement will be paused and the ⏸ icon will appear along with the **Pause** section at the bottom of the screen.

To resume the measurement, press **<ENTER>**.



<S/Pt>



Main default settings (factory settings)

The default function is **Level Meter** with enabled **Dosimeter** option.

Default **General Settings**:

- delay of the measurement start from the **<Start>** keystroke - **Start Delay**: **0s**,
- integration period - **Measurement Period**: **Inf**,
- number of measurement cycles - **Repetition No.**: **1**,
- logging of the time-history of the measurement results - **Logging Mode**: **Off**.

Default settings for the profiles of all channels (**Channels Setup**):

- second profile disabled,
- signal type in channels 1-6 - **Type: Direct**,
- weighting filter in channels 1-6 - **Filter: Wd**, **Wd**, **Wk**, **Wh**, **Wh**, **Wh**,
- dose meter: **1-3 Dosimeter: WBV**, **4-6 Dosimeter: HAV**, **Exposure Time**: **8h**.

Other settings:

- Vector measurement (**Vector Setup**) – Off,
- mode of the instrument interface - **Instrument Mode**: **Simple Mode**.

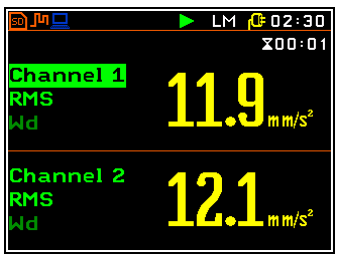
You can change all the above settings using the **Measurement** list. The instrument remembers all changes made. It is possible to return to the default settings (set up by the manufacturer) after the execution of the **Factory settings** item, which is available in the **Auxiliary settings** list.

Result views

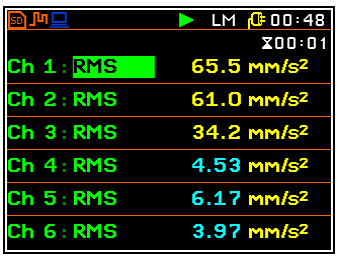
The dual result view is always available for most functions of the instrument.

You can switch between views by holding down the **<Alt>** and ▲ / ▼ keys simultaneously.

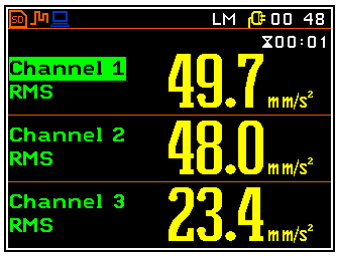
<Start>



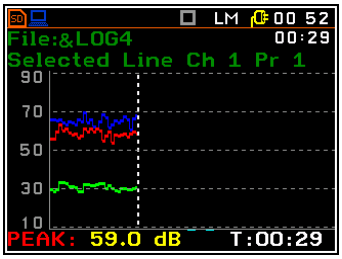
Measurement results can also be displayed in the three or six section view (three profiles or six channels).

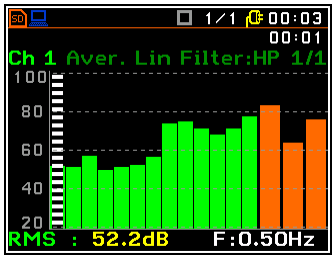


<Alt/▼>



Some views show numerical results and some show graphical results, as in the example on the right: time-history plot and spectrum.



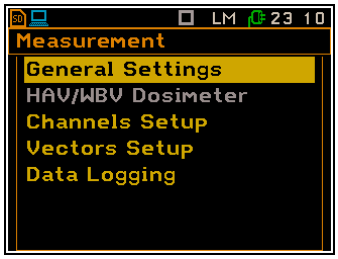


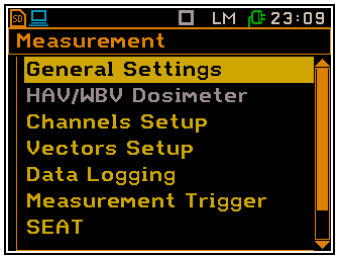
2.4.3 Configuration mode

To configure a measurement or the instrument, use the Menu mode, which is entered using the **<Menu>** key. The menu consists of different types of screens, including main menu, submenu, lists of options, lists of parameters, text editor screens, information screens etc.

User interface mode

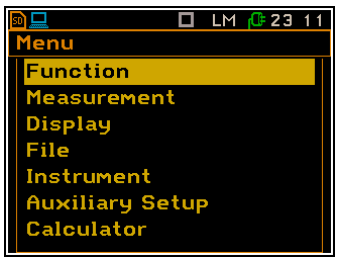
There are two user interface modes that define the level of functionality available: **Simple Mode** and **Advanced Mode**. These modes can be selected in the **Instrument Mode** screen of the **Auxiliary Setup** menu. **Simple Mode** defines the basic functions of the instrument, while **Advanced Mode** defines the full range of functions. Many screens can have different views. To the right is an example of the **Measurement** screen in the simple and advanced mode.





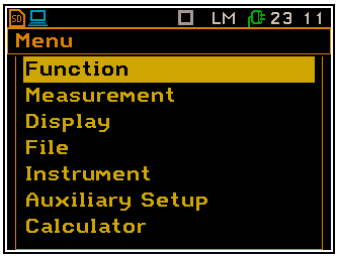
Main Menu

The main **Menu** contains the names of seven sections grouping configuration settings by functions. The main **Menu** is accessed by pressing the **<Menu>** key (**<Shift>** + **<ENTER>**). The main **Menu** list contains the following sections: **Function**, **Measurement**, **Display**, **File**, **Instrument**, **Auxiliary Setup** and **Calculator**.

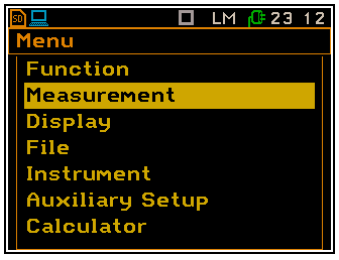


Selecting an item

Use the ▲ / ▼ keys to select the desired item in the **Menu** list.

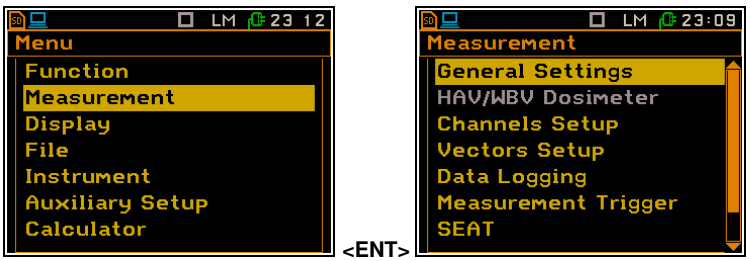


▼

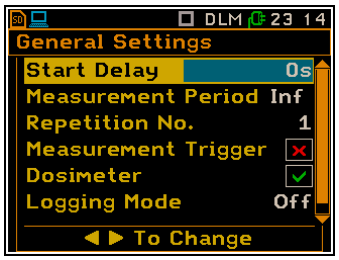


Entering an item

Press the **<ENTER>** key to enter the desired item after selecting it from the menu list. This will display a new sub-menu, option list, parameter list or information screen.



List of parameters



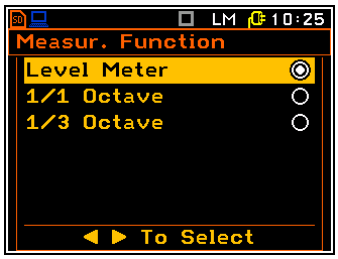
The list of parameters contains parameters whose value is selected from the available range or set.

- Use the ▲ / ▼ keys to select the desired item in a list.
- Use the ◄ / ► keys to change the value in of the selected item.
- Use the **<ENTER>** key to save all changes made to the parameter list.

If the parameter has a numerical value, you can speed up the selection by pressing the ◄ or ► keys (or together with **<Shift>**) for more than 1 second. The parameter will change automatically until you release the keys.

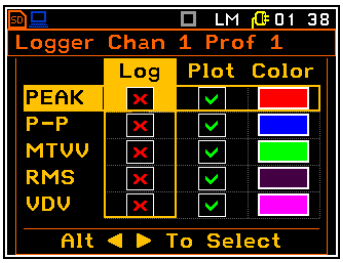
The numerical parameter value can be changed by a larger increment (10 or 20) by pressing the ◄ / ► key together with **<Alt>**.

Options list



The options list consists of several options, only one of which can be selected. To selection an option, proceed as follows. Highlight the required option using the ▲ / ▼ key, then press **<ENTER>**. This option will become active, and the list will close. If you re-enter the list, the last option selected will be highlighted.

Matrix of parameters

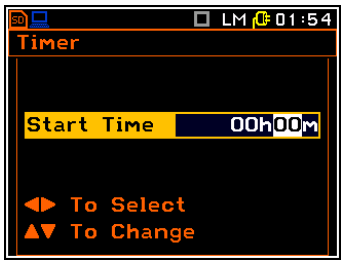


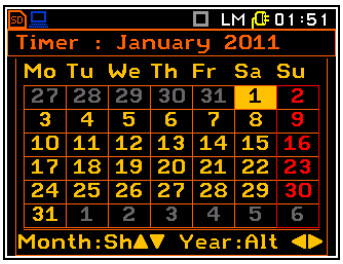
If a list of parameters consists of more than one column, you can change the:

- column with the ◄ / ► key,
- raw in the same column with the ▲ / ▼ key,
- value in a selected item with the ◄ / ► key pressed with **<Alt>**,
- all values in the same column with the ▲ / ▼ key pressed with **<Shift>**,
- all values in the same raw with the ◄ / ► key pressed with **<Shift>**.

Complex parameters

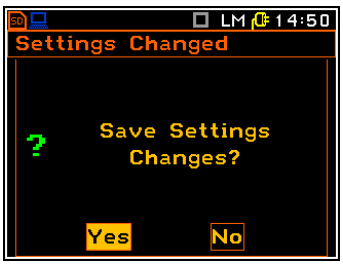
For complex parameters consisting of more than one value item, such as **Start Hour** or **Start Date**, first select the item and then change the value of that item using the help information at the bottom of the screen.





In all cases, the **<ENTER>** key is used to confirm changes and to close the opened list of parameters. The **<ESC>** key closes the parameter list, ignoring any changes.

The instrument may ask you to confirm some operations. In this case, the confirmation message appears, and the instrument waits for your confirmation: **Yes** or **No**.

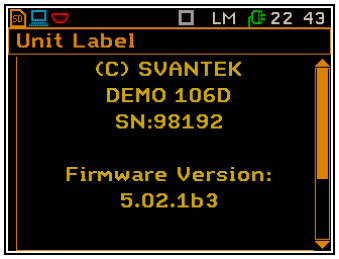


Information screen

Some screens provide information about the status of the instrument, available memory, standards met by the instrument, etc.

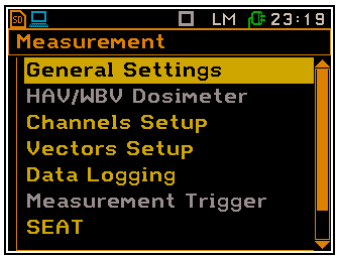
Use the ▲ / ▼ keys to scroll through the screen. P

To close such a screen, press **<ENTER>** or **<ESC>**.



Inactive parameters

When some functions or parameters are not available, the menu items associated with that function become inactive (their colour changes to grey). For example, if the ***Dosimeter*** is switched off, the **HAV/WBV Dosimeter** item is not active!



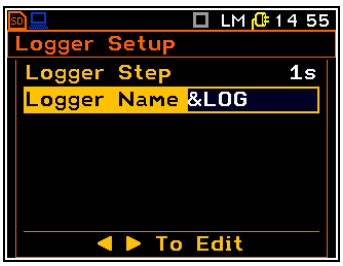
The grey colour of a parameter means that this parameter has a single value and cannot be changed.

Text editor screen

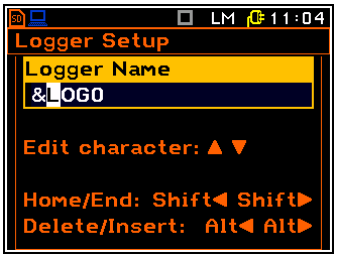
There are screens that allow you to edit text strings (i.e., the name of the file). These screens contain help information to guide you on how to edit the text.

The character displayed in reverse can be edited.

- Use the ◄ / ► keys to select the character in the edited text.
- Use the ▲ / ▼ keys to select the ASCII character. The following digits, capital letters, underscore and space appear on the display in reverse after each time the above keys are pressed.
- Use the ◄ / ► keys pressed together with **<Alt>** to insert or delete the position in the edited text.



►



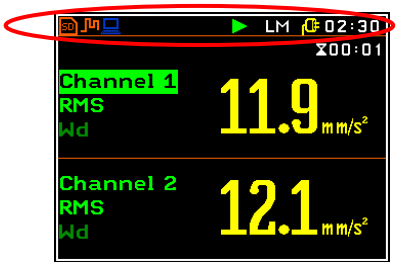
Help information

In most of the screens, the last line or several lines contain help information. It tells the user how to select or change the value of the parameter, change the character in the text line, etc.

2.5 DESCRIPTION OF ICONS

Additional information on the status of the instrument is given by the row of icons visible at the top of the display.

The type of measurement function (LM, DLM, 1/1 and 1/3 etc.) and the real-time clock (RTC) are also displayed on the same line with icons.



The meanings of the icons are as follows:

The „**measurement**" icon is displayed when the measurement is in progress and the icon shape changes from self to contoured.	The "**plug**" icon is displayed when the instrument is powered from the external power.
The **"stop"** icon is displayed when the measurement is stopped.	The **"pause"** icon is displayed when the measurement is paused.
The „**USB**" icon is displayed when there is USB connection with the PC.	The **"gradient"** icon is displayed when the trigger condition is set up to „**Gradient**"
The **"level+"** icon is displayed when the "**Level+**" trigger is waiting for a condition to be met. The icon will alternate with the "measurement", "logging" or "wave" icons.	The **"level-"** icon is displayed when the "**Level-**" trigger is waiting for a condition to be met. The icon will alternate with the "measurement", "logging" or "wave" icons.
The **"slope+"** icon is displayed when the "**Slope+**" trigger is waiting for a condition to be met. The icon will alternate with the "measurement", "logging" or "wave" icons.	The **"slope-"** icon is displayed when the "**Slope-**" trigger is waiting for a condition to be met. The icon will alternate with the "measurement", "logging" or "wave" icons.
The „**logging**" icon is displayed when the current measurement results are being logged to the instrument's logger file.	The „**wave**" icon is displayed during wave recording.
The "**overload**" icon is displayed if an overload was registered during the measurement.	The "**underrange**" icon is displayed if an underrange was registered during the measurement.
The **"shift"** icon is displayed when the **<Shift>** key is pressed.	The **"alt"** icon is displayed when the **<Alt>** key is pressed.
The **"clock"** icon is displayed when the timer is **On**. It is active when the instrument is waiting for the start of the measurement. When it is about to start, the icon turns green and starts flashing.	The **"battery"** icon is displayed when the instrument is powered by the internal batteries.. The icon corresponds to the status of the batteries (three, two, one or no vertical bars inside the icon). If the battery voltage is too low, the icon turns red.
The "**contact force**" icon is displayed when SV 105F with force sensor is connected. If the force sensor readings from any of the connected SV 105F fall below 0 N it changes colour to yellow, and if within the readings have been below 0 N for more than 15 s within last 30 s, it changes colour to red, warning of on possible poor calibration or loss of wrist strap attachment.	

2.6 DATA SAVING

Memory type

All available measurement results and settings can be saved in the instrument's memory (micro-SD card) as files in the predefined or assigned directory. Setup files are saved in the predefined SETUP directory. The predefined directories can be changed or renamed by the user.

The SD card memory is automatically activated when the card is inserted in the card slot of the instrument.

The "**SD Card**" icon is displayed when the micro-SD card is inserted in the memory slot.

Note: *Due to the limited internal memory capacity of the instrument, all files can only be saved on the SD card and no file can be created if there is no SD card in the instrument. Therefore, to save data, an SD card with sufficient free space must be inserted.*

The SD card memory is organised as a standard memory with directories and sub-directories (FAT32 file system). The directories can be created and deleted from the instrument level.

The contents of the instrument's memory can be controlled using the **File Manager** or **Setup Manager** item of the **File** menu (see Chapter 6).

In the **File Manager** or **Setup Manager** screens, data files are described by their filename with an extension (SVN or WAV), icon and measurement function (**LM**, **1/1** or **1/3**).

The file name should not exceed 8 characters.

Directory

Logger file &XXX.SVN

New file or directory

Wave file &XXX.WAV

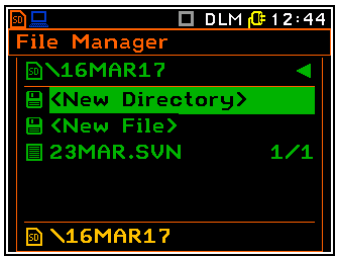
Main results file XXX.SVN or @XXX.SVN

Setup file XXX.SVN

Managing directories and files

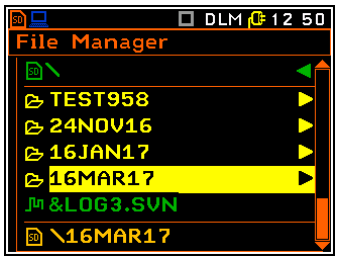
You can use the **File Manager** or **Setup Manager** to manage files saved on the SD card.

<ENT>



Files are saved in the directory assigned as the working directory. The working directory is displayed on the bottom line of the **File Manager** screen, along with the memory icon.

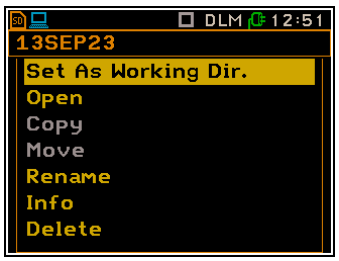
Directories are created manually by selecting the **<New Directory>** item or automatically.



Note: *The instrument automatically creates a new directory called* ***DDMMMYY****, where* ***DD*** *is a day,* ***MMM*** *is a month abbreviation and* ***YY*** *is a year, every day after the instrument is switched on for the first time and gives it the status of the working directory.*

To change the working directory, select the required directory and press **<ENTER>**. When the command list opens, select the **Set As Working Dir.** item and press **<ENTER>**. The directory path on the bottom line will change accordingly.

The **File** menu is described in more detail in Chapter 6.



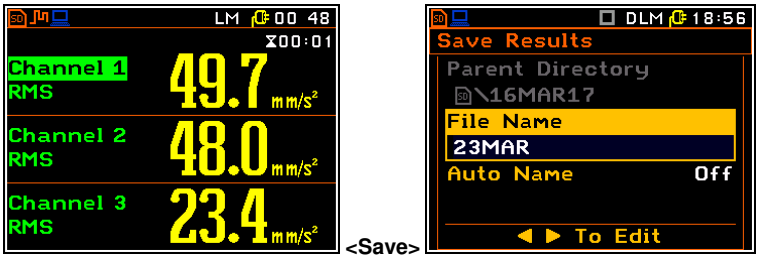
Note: *Result files can be saved manually or automatically, Setup files are saved manually, Logger and Wave files are saved automatically.*

Manual saving of main result files

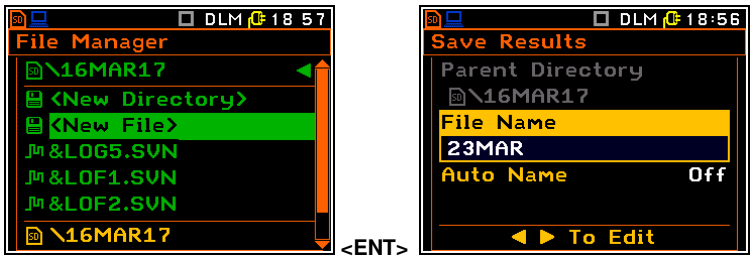
There are two ways to manually save main result files. One option is to press the **<Save>** key immediately after stopping the measurement. The other option is to create a file using the **File Manager**.

When a main result file is saved manually, its name will have the pattern **LLdd.SVN**, where **LL** is a string of letters and **dd** is a string of digits. By default, **LL** is the current date. The string of digits forms a number, which can be automatically increased if you select **Auto Name: Number** (see Chapter 6.1.2).

After pressing the **<Save>** key, the **Save Results** screen will appear. This screen allows you to enter a name for the result file or select the automatic name generation option.



The same result can be achieved by entering the **File Manager** and selecting the **<New File>** item from the list (see Chapter 6.1.2).



Note: *Manual storage is not possible when the instrument is measuring the signal. If the user tries to save data, the message "**Measurement in progress!**" will be displayed for about 3 seconds.*

Note: *If no measurements have been taken and there are no results to save, the attempt to save the file will be fail and a warning will appear on the screen.*

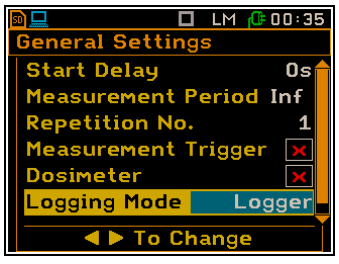
Automatic saving of logger files ( )

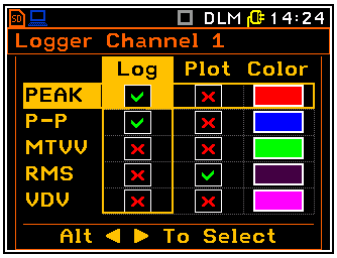
The files containing the logger results are automatically saved with names of the pattern **&LLdd.SVN**, where **LL** is the string of letters (called a prefix) and **dd** is a string of digits forming a number. The instrument remembers the highest number for all the prefixes created by the user and automatically creates new names just increasing by one the maximum number corresponding with this prefix. Any attempt by the user to create a name with an existing prefix and a number lower that the maximum will fail.

The file number is automatically incremented after each saving operation.

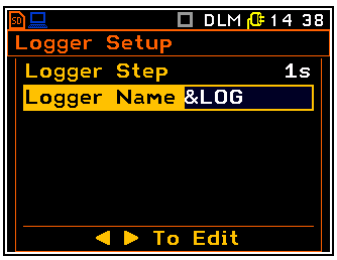
To enable automatic saving, the following conditions should be met:

- The **Logger** (*path: <Menu> / Measurement / General Settings / Logging Mode: Logger*) should be switched on.
- Logger results should be selected in in the **Logger Results** screen (*path: <Menu> / Measurement / Data Logging / Logger Results*).



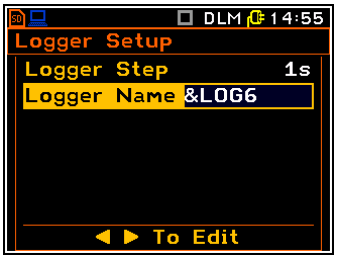


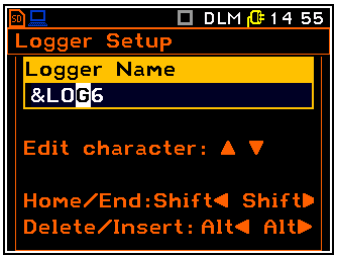
The name of the logger file is defined in the **Logger Setup** screen. The default prefix is **&LOG**.



You can change the automatically generated file name in the special editor screen that opens after pressing the ◄ / ► key.

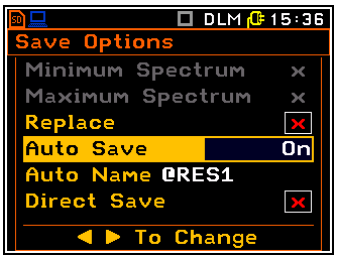
The editor screen contains help information on how to edit the file name.





Note: *During the measurement run with data logging to the logger file, the "logger" icon is displayed.*

Automatic saving of main result files

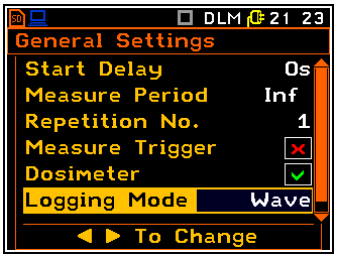


The files with main results can be automatically saved with the **@LLdd.SVN** name pattern, similar to the logger files. To enable automatic saving, the following conditions should be met:

- The **Auto Save** function must be enabled (*path: <Menu> / File / Save Options / Auto Save: On*).
- The **Measurement Period** must be longer than 15 seconds (*path: <Menu> / Measurement / General Settings*).

The name for the main results that are automatically saved is defined in the **Save Options** screen. The default prefix is **@RES**.

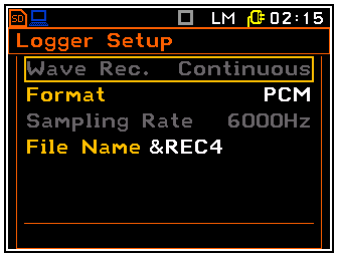
Automatic saving of Wave files ( )



Wave files containing signal recording data are automatically saved with the name pattern **&LLdd.WAV**, similar to logger files. To enable automatic saving, the following condition should be met:

- Wave recording must be enabled (*path: <Menu> /* Measurement */ General Settings / Logging Mode: Wave*).

The name of the wave file is defined in the **Logger Setup** screen. The default prefix is **&REC**.

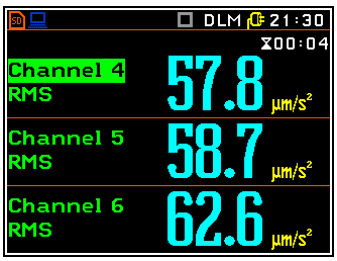


Note: *During the measurement run with wave recording to the wave file, the "wave" icon is displayed.*

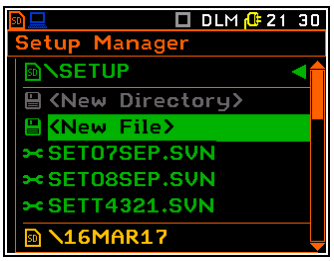
Note: *Wave files are usually large and can take up a lot of memory. As the wave file name is not displayed on the result view screen, the user should remember that the wave recording function is active and switch it off whenever wave recording is not required.*

Saving Setup files ( **)**

Setup files can be saved manually using the **<S/P>** key or by creating a **<New File>** in the **Setup Manager**.

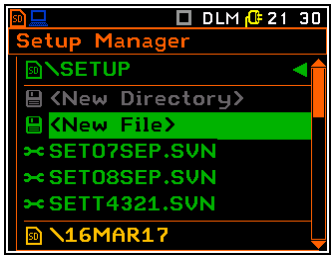


<S/P>



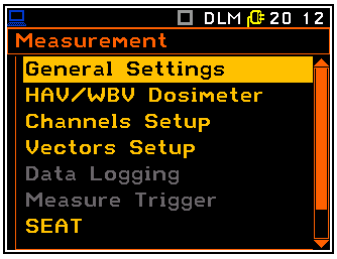
The instrument automatically generates a new name for the setup file with the default prefix **SETxxyy**, where **xx** is a day and **yy** is a month. For example, **SET23MA** means the setup file from 23rd of March.

The default name can be edited, renamed and deleted using the **Setup Manager** (see Chapter 6.2).



<ENT>

Note: *If no micro-SD card is inserted in the card slot, file saving is not possible, and a warning will appear on the screen after attempting to save the main results or setup files manually. Logger and Wave file saving is also impossible and the* ***Data Logging*** *item becomes inactive.*



Note: *Saving options and file management mechanisms are described in Chapter 6.*

2.7 DOWNLOADING AND UPLOADING FILES

Downloading files

All files stored in the memory (micro-SD card) can be downloaded to a PC. There are two ways to download files.

As the file structure of the SD card is the same as on most PCs, you can extract the SD card and use it directly on the PC. However, this is not recommended.

It is recommended to use *SvanPC++* or *Supervisor* software, which provides download and upload functions as well as data processing options. In this case the instrument should be connected to the PC with the SC 158 USB cable.

Note*: Description of SvanPC++ and Supervisor is given in the "SvanPC++ User Manual" and "Supervisor User Manual".*

Uploading files

The same approach is used for uploading files (usually setup files). Files can be uploaded via the SD card or via the *SvanPC++* or *Supervisor* software.

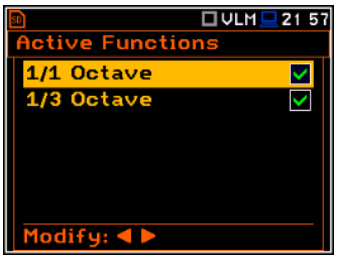
2.8 ACTIVATION OF THE OPTIONAL FUNCTIONS

The standard instrument firmware contains all the basic functions to perform measurements according to most international standards and methods. For more complex tasks, the user has the option of extending the instrument's basic functions. These functions include 1/1 and 1/3 octave analyser, signal recording and others.

If additional functions are not included in the instrument kit and have not been unlocked by the supplier, such a task is the responsibility of the user who decides to purchase additional functions at a later date.

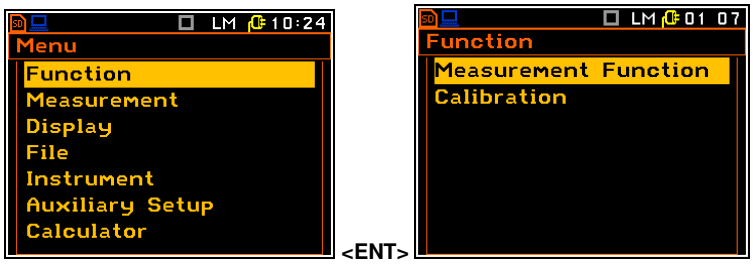
The optional function is activated the first time the user tries to use it. For example, if time signal recording (Wave or Event) was blocked, but the user later purchased this option, the first time it is tried, the instrument will require the special code to unblock this function. Once unlocked, the function will run permanently.

Pressing **<Shift>** and ◄ immediately after switching on the instrument allows you to check and to lock options that were previously unlocked.



3 MEASUREMENT FUNCTIONS AND CALIBRATION – Function

The **Function** section allows you to select the measurement function (**Measurement Funct**) and calibrate the instrument (**Calibration**).



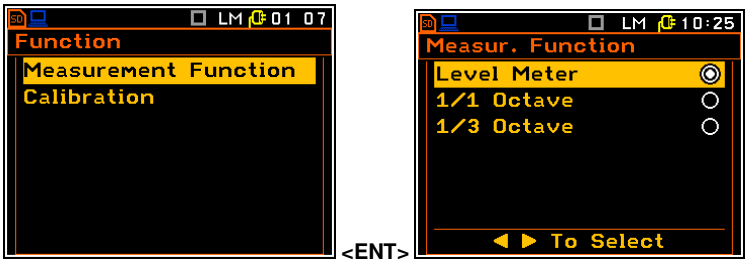
3.1 ACTIVATING MEASUREMENT FUNCTIONS – MEASUREMENT FUNCTION

The main function of the instrument is to measure broadband vibration levels (**Level Meter**) according to ISO 8041-1:2017. The instrument can also be used for medium or long-term vibration monitoring using the high-capacity data logger which stores all measurement results.

You can also use the real-time 1/1 and 1/3 octave band analysis functions. These functions extend the main Level Meter functionality of the instrument by performing 1/1 or 1/3 octave analysis along with all calculations of the broadband Level Meter results.

All of the above functions can also be used to perform vibration dose measurements. Dose parameters are set up in the **HAV/WBV Dosimeter** screen (*path: <Menu>/ Measurement*).

To activate a function, open the **Measurement Function** list, select the function (**Level Meter**, **1/1 Octave** or **1/3 Octave**) with the ▲ / ▼ key and press **<ENTER>** to confirm.



The abbreviation of the selected measurement function is displayed on the top line of the screen:

- ***VLM*** ***Level Meter***,
- ***1/1*** ***1/1 Octave***,
- ***1/3*** ***1/3 Octave***,
- ***DVLM*** ***Dose & Level Meter***,
- ***D1/1*** ***Dose & 1/1 Octave***,
- ***D1/3*** ***Dose & 1/3 Octave***.

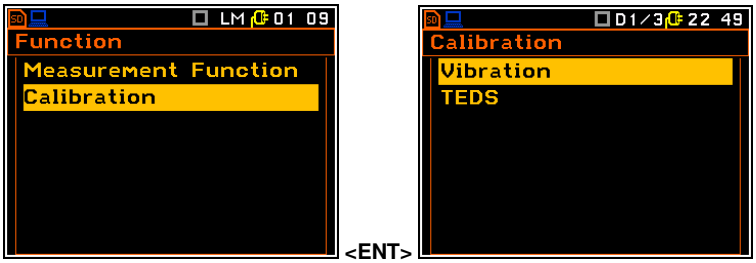
Note: *The **1/1 Octave** and **1/3 Octave** functions are optional and should be unlocked by entering the activation code in the text editor screen that opens after the first attempt to activate these functions. Once unlocked, this function is permanently available.*

Optional measurement functions that extend the application of the instrument can be initially supplied and activated by the manufacturer, or later purchased and activated by the user.

Note: *It is not possible to change the measurement function during a measurement. In this case, the instrument will display the message: **"Measurement in Progress"**. To change the function of the instrument, the current measurement must be stopped!*

3.2 CALIBRATION OF THE INSTRUMENT – CALIBRATION

The instrument is factory calibrated with the accelerometers supplied. If other transducers are used, calibration of the measurement channels should be performed by the user. Periodic calibration is also required for standard accelerometers. To calibrate the instrument, enter the **Calibration** item.

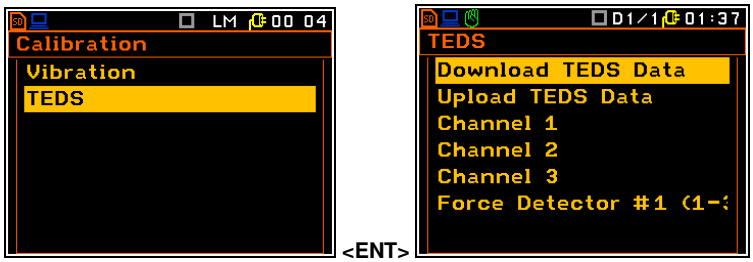


The **Calibration** list consists of two items: **Vibration** and **TEDS**. If the SV 105F transducer is used, the **Force** option is also available.

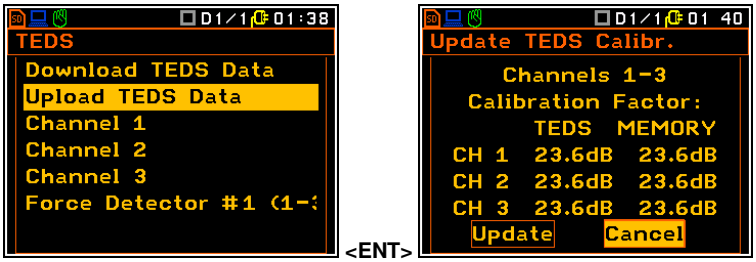
3.2.1 Downloading and uploading TEDS data – TEDS

If the accelerometer with new TEDS data is connected to the instrument, the TEDS data is automatically downloaded from the accelerometer memory when the instrument is switched on. TEDS data usually includes serial number, manufacturer name, calibration factor, etc.

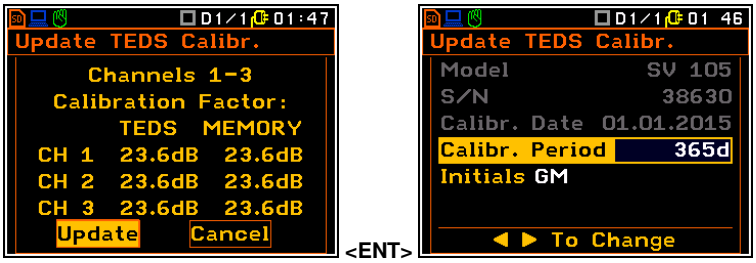
In the **TEDS** screen you can download TEDS data if the accelerometer is connected when the instrument is switched on (**Download TEDS Data**). You can also upload calibration results, performed by the user from the instrument to the accelerometer TEDS memory (**Upload TEDS Data**).



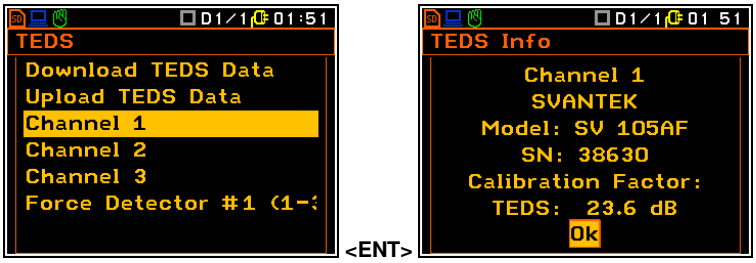
After entering the **Upload TEDS Data** item, the instrument displays the table of calibration factors stored in the transducer memory (**TEDS** column) and calibration factors stored in the instrument memory (**MEMORY** column) according to the last calibration performed or TEDS data downloaded. You can **Update** the calibration factors in the transducer memory or **Cancel** the TEDS data upload.



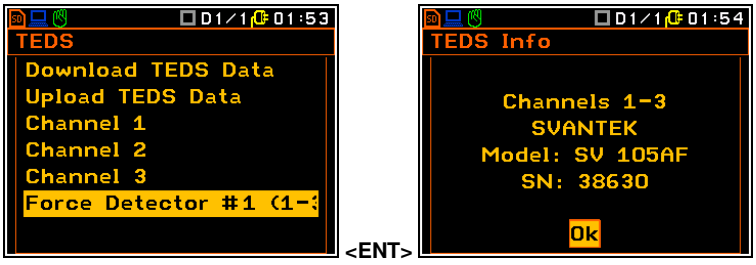
By updating TEDS with the calibration factor, it is possible to provide additional information: **Calibration Period** and **Initials** of the person responsible for the calibration. Press **<ENTER>** to confirm the TEDS upload or **<ESC>** to cancel the process.



On entering the **Channel #** item, the instrument will display information on the transducer identification and calibration factor. Press **<ENTER>** or **<ESC>** to close the screen.

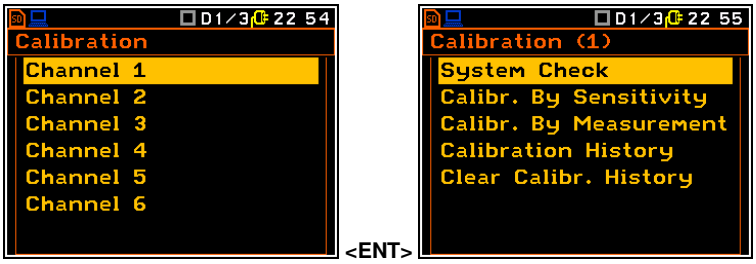


If SV 105F is used, an additional item will be available in the list: **Force Detector** with following **TEDS Info** screen.



3.2.2 Calibrating the instrument channels – Channel x

The **Channel x** items appear after selecting the **Vibration** item from the **Calibration** list. The **Calibration (x)** screen consists of five items that allow you for that channel to: check the system (**System Check**), calibrate (**Calibr. By Sensitivity**, **Calibr. By Measurement**), check the parameters of previous calibrations (**Calibration History**) and to clear the information of previous calibrations (**Clear Calibr. History**).



Note: *The calibration factor is always added to the results of the* ***Level Meter****,* ***1/1 Octave****,* ***1/3 Octave*** *functions.*

Note: *The calibration level and the calibration result can be expressed in different units depending on the instrument settings. The metric or non-metric vibration units are set in the* ***Vibration Units*** *screen (path: <Menu> / Auxiliary Setup / Vibration Units). In addition, the linear or logarithmic units are set in the* ***Display Scale*** *screen (path: <Menu> / Display / Display Scale).*

Note: *It is not possible to check the system or calibrate the instrument while measurements are being taken. It is possible to access various screens from the* ***Calibration*** *menu, but the items in these lists are not accessible. The "►" icon indicates that the instrument is performing the measurement.*

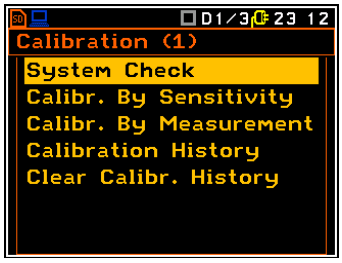
3.2.3 System Check

The ISO 8041-1:2017 standard advises users to carry out in-situ checks of measuring instruments. Checks should be carried out immediately before and after measurements. To check the instrument:

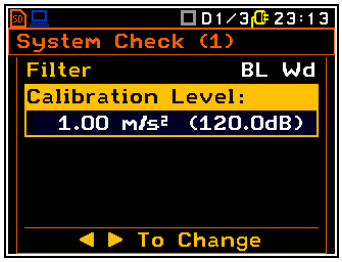
1. Attach the accelerometer connected to the channel being checked to the vibration calibrator.
2. Select the appropriate channel for the system check from the **Calibration** list.

Note: *Make sure that you have selected the channel that receives the signal from the accelerometer attached to the calibrator!*

3. Select **System Check** in the **Calibration (x)** screen and press **<ENTER>**.

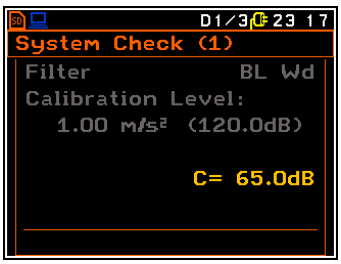


4. Select the appropriate filter: for hand-arm transducer – **BL Wh**, for whole-body transducer – **BL Wk** or equivalent.
5. Select the level of the calibrator signal.
6. Switch on the calibrator and wait about 30 seconds before starting the system check measurement.
7. Start the measurement by pressing the **<Start>** key.

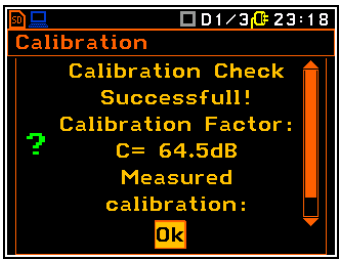


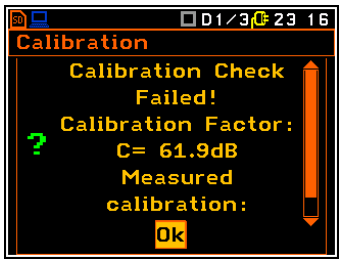
The measurement starts after a 5 second delay. The system check measurement time is also set to 5 seconds. During the system check measurement, the **<ESC>** and **<Pause>** keys do not work but it is possible to stop the measurement with the **<Stop>** key.

While waiting for the start of the measurement, a **Delay** is counted down.



The results of the measurement in relation to the calibrator level are compared with the current calibration factor and the instrument assesses whether the system check has been successful or not, displaying a message to this effect together with the current calibration factor and the measured calibration level.



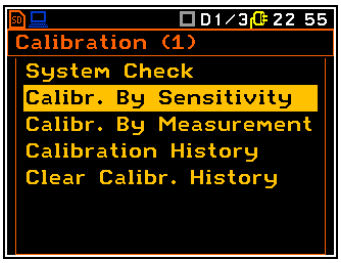


The system check is successful if the result does not exceed the current calibration factor by more than 2 dB. Press **<ENTER>** to exit the system check.

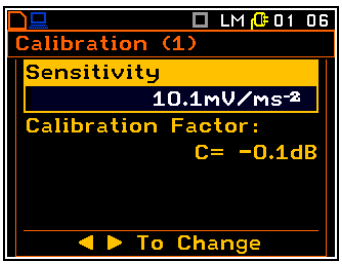
8. Detach the accelerometer from the calibrator.

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

Calibration by introducing the individual sensitivity of the accelerometer can be performed as followis:



1. Select the channel to be calibrated by sensitivity from the **Calibration** list.
2. Select the **Calibr. By Sensitivity** item from the **Calibration (x)** list and press **<ENTER>**.

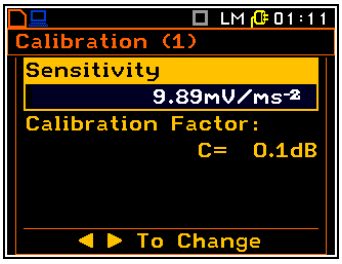


3. Set the **Sensitivity** of the accelerometer connected to this channel, as shown on its calibration certificate with the ◄ / ► keys.

The **Calibration Factor** is calculated after pressing the ◄ / ► keys in relation to 10.0 mV / ms^{-2}. If the sensitivity of the accelerometer is greater than 10.0 mV / ms^{-2}, the calibration factor will always be negative.

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

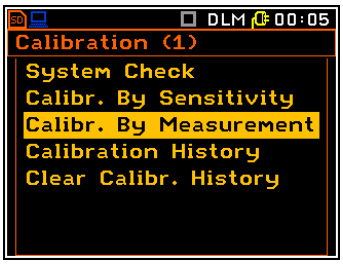
The lowest applicable value of the sensitivity to be introduced is equal to 10.0 μV / ms^{-2} (calibration factor equal to 60.0 dB) and the highest one is equal to 10.0 V / ms^{-2} (calibration factor equal to -60.0 dB).



4. Press **<ENTER>** to save the selected calibration factor. Press **<ESC>** to return to the **Calibration** screen without saving any changes made at this screen.

3.2.5 *Calibration by measurement – Calibr. By Measurement*

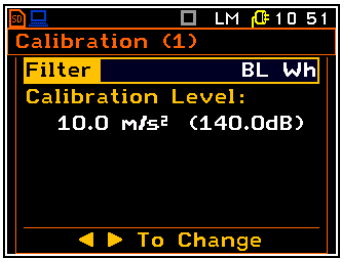
Calibration by measuring the vibration signal can be done as follows:

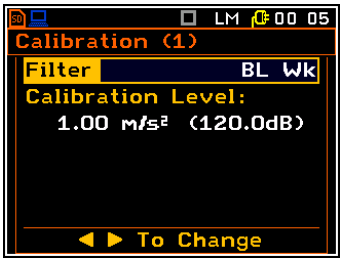


1. Attach the accelerometer connected to the calibrated channel to the vibration calibrator.
2. Select the appropriate channel for calibration from the **Calibration** list.

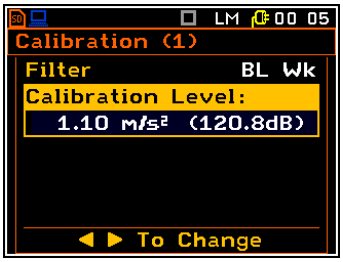
Note: *Make sure that you have selected the channel that receives the signal from the accelerometer attached to the calibrator!*

3. Select **Calibr. By Measurement** in the **Calibration (x)** screen and press **<ENTER>**.
4. Select the appropriate filter: for hand-arm transducer – **BL Wh**, for whole-body transducer – **BL Wk** or equivalent.

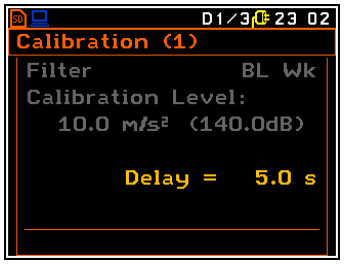


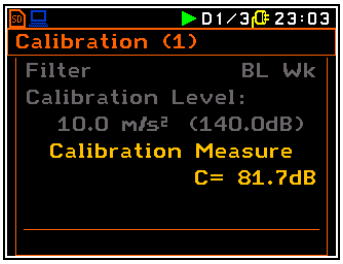


5. Select the level of the calibrator signal.
6. Switch on the calibrator and wait about 30 seconds before starting the calibration measurement.
7. Start the measurement by pressing the **<Start>** key.

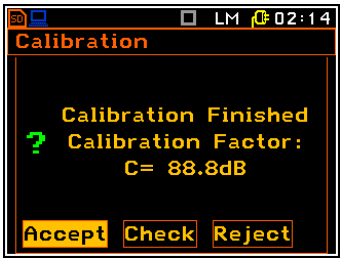


The measurement starts after a 5 second delay. The calibration measurement time is also set to 5 seconds. During the calibration measurement, the **<ESC>** and **<Pause>** keys do not work but it is possible to stop the measurement using the **<Stop>** key. While waiting for the start of the measurement, a **Delay** is counted down.





8. When the calibration measurement is complete, select **Accept** and press **<ENTER>** to save the calibration measurement result.



Select **Check** to perform a sample measurement simulating the use of the newly calculated calibration factor, assuming that the same excitation level is still applied to the transducer. If the calibration factor is correct, the measured level should match the calibrator level.

Select **Reject** to cancel the calibration procedure.

It is recommended that the calibration measurement is repeated to ensure the integrity of the calibration. The results obtained should be almost identical (with ±0.1 dB difference). Some possible reasons for unstable results are as follows:

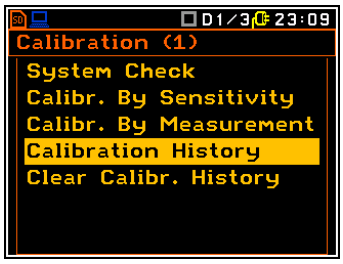
- the accelerometer is not properly attached to the calibrator,
- there is external disturbance,
- the calibrator or the measurement channel (the accelerometer or the instrument itself) is damaged.

9. Detach the accelerometer from the calibrator.

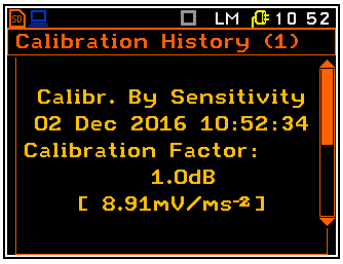
Note: *During the calibration measurement, the external disturbances (vibration or acoustic noise) should not exceed 100 dB.*

3.2.6 History of calibrations – Calibration History

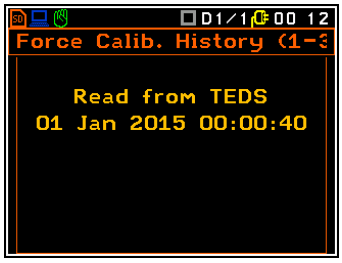
The **Calibration History** screen displays up to ten recent calibration records.



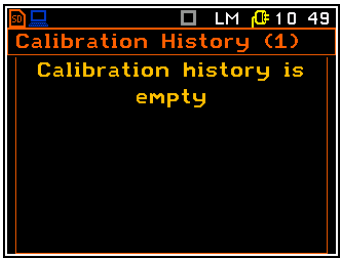
<ENT>



Use the ▲ / ▼ key to scroll the calibration record list. The calibration screen shows the date and time of the calibration measurement, how the calibration was performed (**Calibr. By Measurement** or **Calibr. By Sensitivity** or read from TEDS) and the calculated calibration factor (**Calibration Factor**).

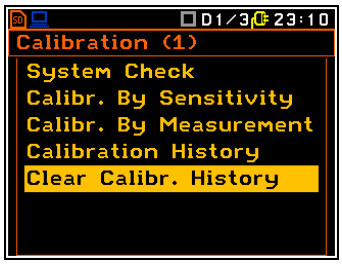


If no calibration measurements have been performed, the **Calibration History** screen will not contain any records. The contents of this screen are cleared by the **Clear Calibr. History** item.



3.2.7 Clear calibration records – Clear Calibr. History

You can clear all calibration records. To do this, select **Clear Calibr. History** from the **Calibration** list and press **<ENTER>**.



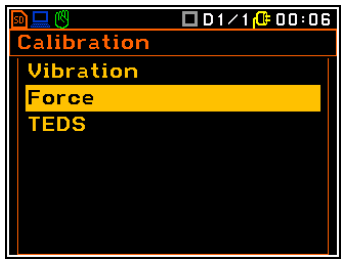
The instrument will ask you to confirm confirmation of this command. Pressing **<ENTER>** again if **No** is selected will close the screen and return the instrument to the **Calibration** list. **Yes** clears the history and returns the instrument to the previous menu.

After the **Clear Calibr. History** command, the **Calibration History** list will contain no records.

3.2.8 Contact force sensor calibration – Force

Note: *The calibration of the contact force sensor should be used for the earlier modification of the SV 105F transducers. New transducers designated SV 105FD and later modifications are factory calibrated and the* ***Force*** *option does not appear in the* ***Calibration*** *menu.*

When the SV 105F transducer is connected, the **Force** item becomes available. A list of connected transducers with contact force sensors will be displayed after entering the **Force** item.

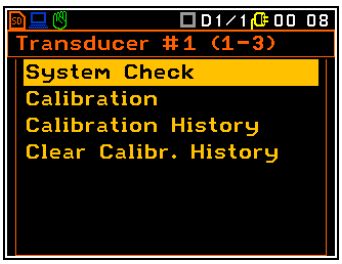


<ENT>

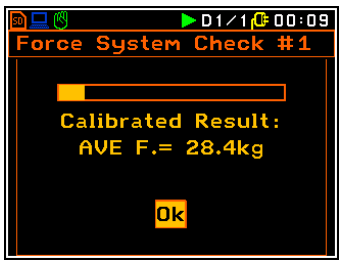
You can use a typical bathroom scale to calibrate the contact force sensors.

This calibration should be performed each time the hand straps are changed.

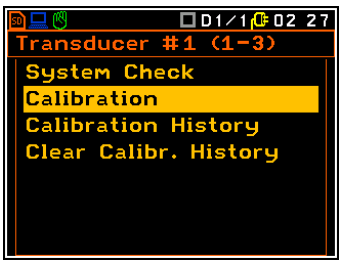
System Check allows you to compare the force level detected by SV 105F with the indication on the scale that is being pressed. The force level detected is expressed in kg. If the difference between the force detected by the instrument and that indicated by the scale is significant, it is advisable to calibrate the force sensor.



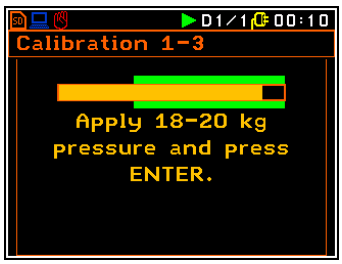
<ENT>



After entering the **Calibration** item, you will be asked to press the SV 105F sensor with hand straps against a scale so that the scale reads between 18 and 20 kg.



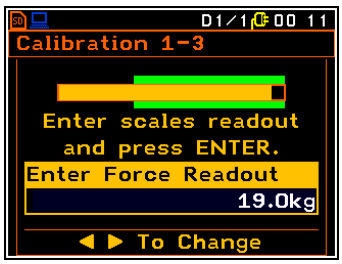
<ENT>



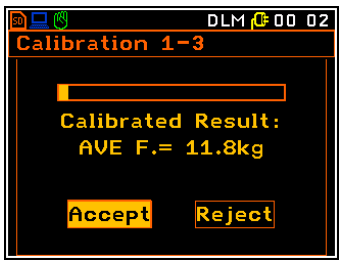
Press **<ENTER>** when the scale indicates a value within the range requested by the instrument. Next, enter the value indicated by the scale in the **Enter Force Readout** box. Press **<ENTER>** to continue.

In the next steps the instrument will ask you to apply 9-11 kg of pressure and no pressure (place the sensor on a flat surface). Follow instructions on the screen.

=>



At the end of the contact force sensor calibration procedure, the instrument will displaying the current force applied to the sensor, like in the **System Check** mode. Compare the displayed values with those indicated by the scale used for calibration and **Accept** or **Reject** the re-calibration of the contact force sensor.



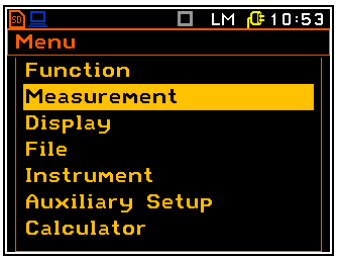
The purpose of the contact force sensor is to detect the occurrence of contact between the operator's hand and a tool, and for this purpose it does not need to follow the scale readings perfectly.

If the instrument is unable to continue with the contact force detection sensor, it will display the following message. It is possible that the sensor readings in the second step (9-11 kg) may indicate a higher pressure than that recorded in the first step (18-20 kg).

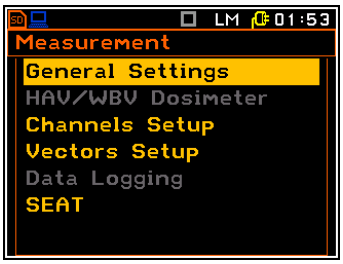
Select **Retry** to repeat the current step of the procedure or **Cancel** to exit.

4 CONFIGURING MEASUREMENT PARAMETERS – Measurement

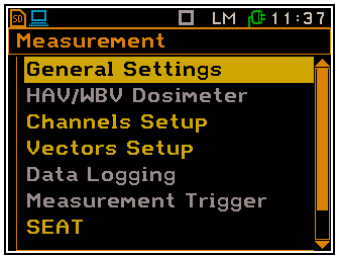
The **Measurement** section groups together the menu items related to the configuration of measurement parameters.



<ENT>



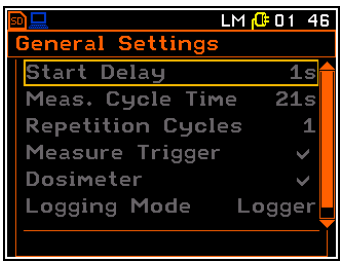
The contents of the **Measurement** and some of its items (**General Settings** and **Data Logging**) depend on the interface mode (*path: <Menu> / Auxiliary Setup / Instrument Mode*): **Simple Mode** or **Advanced Mode**. In **Advanced Mode** some additional functions are available such as triggering, markers, event and wave recording.



The **Measurement** section contains the following items, allowing you to:

General Settings	select general measurement parameters for all channels,
HAV/WBV Dosimeter	set parameters for vibration dose measurements,
Channels Setup	programme individual parameters for channels,
Vectors Setup	programme individual parameters for vectors calculations,
Data Logging	programme logger functions – measurement logging and signal recording,
Measurement Trigger	set parameters of the measurement trigger; this item appears only in the advanced instrument mode,
SEAT	programme measurements using the special SEAT accelerometer,
Alarm Trigger	programme the trigger that generates alarm pulses on the I/O socket,
Timer	programme the internal real-time clock to act as a delayed start timer.

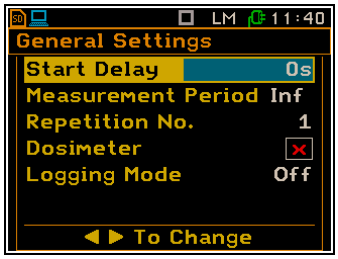
Note: *Each parameter in the* ***Measurement*** *list can only be modified when the instrument is not performing a measurement. The parameters are displayed in grey. The blinking "▶" icon in the top line indicates that the instrument is performing a measurement.*

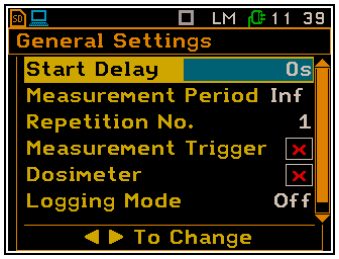


Note: *The parameters can be displayed in* ***Logarithm*** *(decibels) or* ***Linear*** *(m/s²) units. This depends on the value of the* ***Scale*** *parameter (path: Menu / Display / Results Scale), e.g., 10 m/s² can be displayed as 140 dB.*

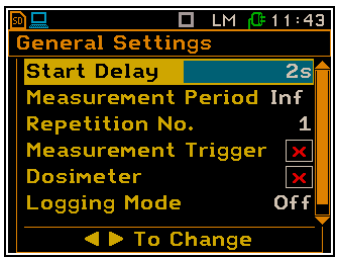
4.1 SETTING GENERAL MEASUREMENT PARAMETERS – GENERAL SETTINGS

The **General Settings** list allows you to set general measurement parameters: delay of the measurement start (**Start Delay**), measurement period (**Measurement Period**) and the number of measurement cycles (**Repetition No.**). In advanced interface mode there are three additional parameters: **Measurement Trigger**, **Logging Mode** and **Event Recording**.





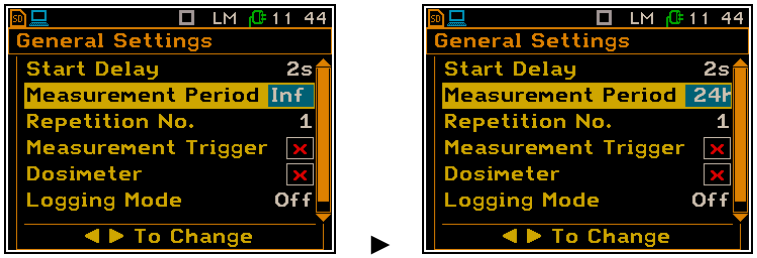
Delay of the measurement start



The **Start Delay** parameter defines the delay time between pressing the **<Start>** key and the actual start of the measurement (the instrument's digital filters constantly analyse the input signal even when the measurement is stopped). This delay can be set from **0 second** to **60 seconds**.

Note: *The minimum delay is 0 seconds. In the* ***Calibration*** *mode, the delay is always 5 seconds.*

Measurement period



The **Measurement Period** parameter (also called integration period) defines the period during which the signal is measured from the real start of the measurement. The definitions of the measurement results in which the integration period is used are given in Appendix D.

The value of this parameter can be set within the range of:

- from **1 s** to **59 s** (with 1-second or 10-seconds increments),
- from **1 m** to **59 m** (with 1-minute or 10-minutes increments),
- from **1 h** to **24 h** (with 1-hour or 10-hours increments).

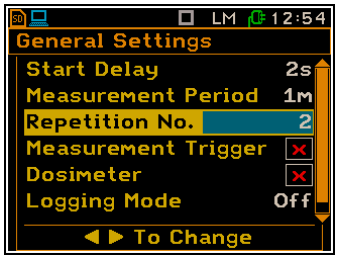
It is also possible to set **Inf**, which means infinite integration (from real start of the measurement until the **<Stopt>** key is pressed, or the STOP command is received remotely).

It is also possible to select some predefined periods (**24h**, **8h**, **1h**, **15m**, **5 m** and **1 m**), which are listed in the standards. These values are placed in order, as in brackets, when scrolling the values to the right of **Inf** up to **1s**.

Note: *If the* ***Auto Save*** *option is active, the integration period should be longer than 15 seconds.*

If the **Auto Save** option is enabled and you set an integration period of less than 16 seconds, the **Auto Save** option is automatically disabled and the message "**Integration Period Too Short / Autosave Not Available**" is displayed.

Number of measurement repetitions



The **Repetition No.** parameter defines the number of measurements (with the measurement period defined by **Measurement Period**) that the instrument will perform in succession. The **Repetition No.** values are in the range [Inf, 1÷1000].

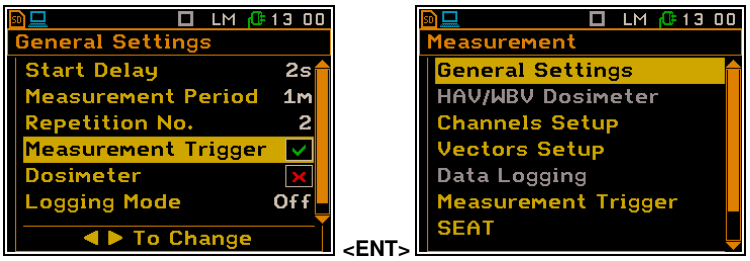
This makes it possible to carry out a series of measurements without pressing the **<Start>** key and to save this series in the file.

For example, if the **Measurement Period** is 1 hour and the **Repetition No.** is 8, the instrument will take the first measurement for the one-hour period from the time the **<Start>** key is pressed plus the **Start Delay**. After the first measurement, the instrument will take a further seven measurements in sequence for the one-hour period. If the **Auto Save** option is enabled, at the end of each cycle the one-hour RMS and other main results will be saved in the SVN file with the prefix @.

Note: *In the case of the infinite integration period or infinite repetition cycles, the measurement must be stopped manually.*

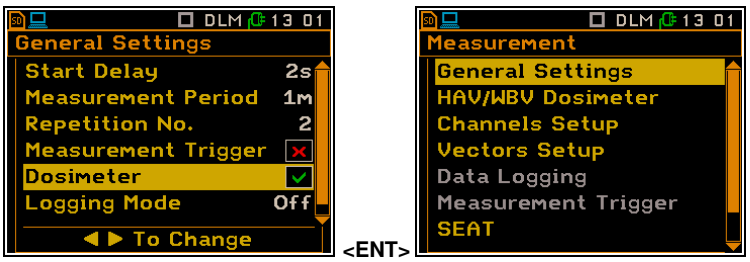
Activating measurement trigger

The **Measurement Trigger** item activates or deactivates the measurement trigger function. This item doesn't appear in Simple interface mode. If the **Measurement Trigger** function is switched off, the **Measurement Trigger** item in the **Measurement** list is not active.



Activating Dosimeter

The **Dosimeter** item enables / disables the dosimeter function. When **Dosimeter** is enabled, all channels are automatically assigned to whole-body (**WBV**) and/or hand-arm (**HAV**) dose measurement for ease of use by the user.

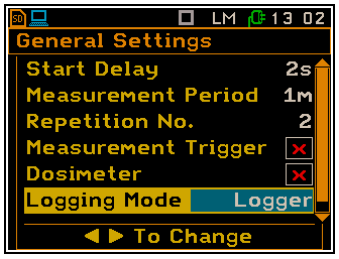


The dosimeter parameters can be set in the **HAV/WBV Dosimeter** screen, which is opened from the **Measurement** list. When **Dosimeter** is enabled, the **HAV/WBV Dosimeter** item in the **Measurement** list is active and the function abbreviation **DLM**, **D1/1** or **D1/3** appears in the icon line of the display.

Setting the Logging mode

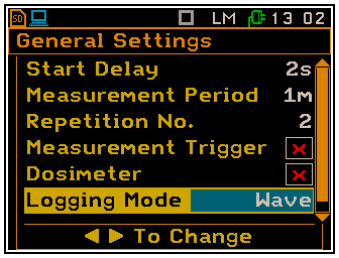
The **Logging Mode** item allows you to disable the logger function (**Off**) or to enable this function by selecting the mode: **Logger** or **Wave**. The **Wave** option doesn't appear in Simple interface mode.

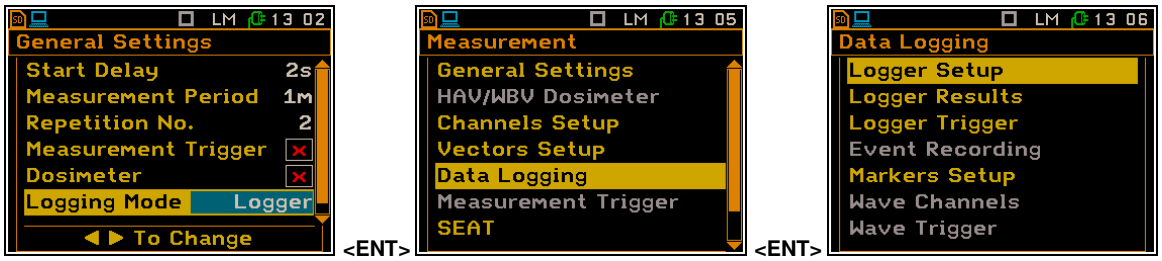
If **Logger** is selected, the time history of some selected results will be saved in the logger file (SVN type with prefix &).



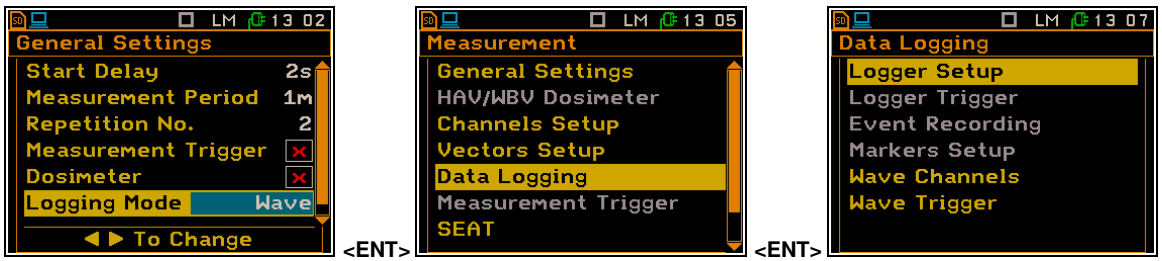
If the **Wave** option is selected, the time wave signals for the channels selected in the **Wave Channels** screen are recorded to the wave file (WAV type with prefix &).

The name of the logger file is defined in the **Logger Setup** screen. The predefined names are **&LOG#** for history results and **&REC#** for wave recording. The **Logging Mode** affects the structure of **Measurement** and **Data Logging** lists.





Data Logging screen view when Logger mode is switched on

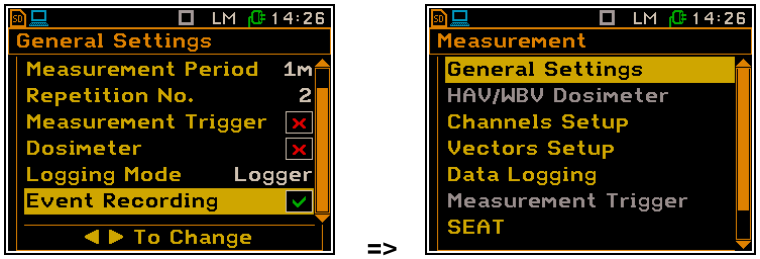


Data Logging screen view when Wave mode is switched on

Activating Event recording

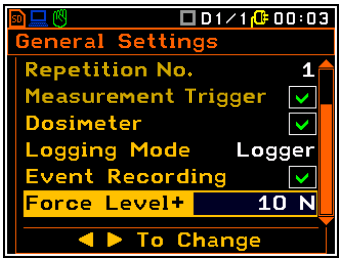
The **Event Recording** item allows you to enable the event recording function. This item doesn't appear in Simple interface mode.

When Event recording is off, the **Event Recording** item is not active in the **Data Logging** list.



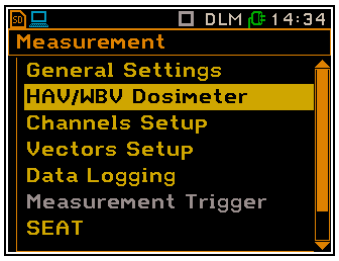
Note: *The event recording function is optional and should be unlocked by entering the activation code in the text editor screen that opens after the first attempt to select it. Once unlocked, this function is permanently available.*

If the SV 105F accelerometer with contact force sensor is used, the **Force Level+** parameter appears in the list. It allows you to set the threshold above which the instrument detects the contact force and evaluates the time of contact with the mechanical tool.



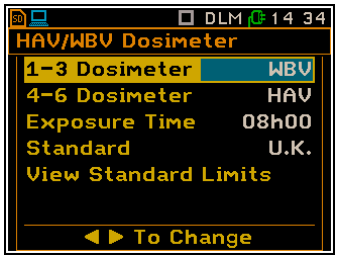
4.2 SETTING DOSE MEASUREMENT PARAMETERS – HAV/WBV DOSIMETER

The **HAV/WBV Dosimeter** list allows you to set vibration dose measurement parameters such as: exposure period, type of measurement (Whole-Body or Hand-Arm) performed on channels 1-3 and 4-6, vibration action limits used for some standards (**U.K.**, **Italy**, **Poland**, **France**, **Germany China**, **Brazil**), as well as specific limits defined by the user (**User**).



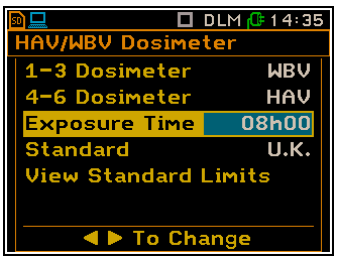
Measurement type for channels 1-3 and 4-6

The **1-3 Dosimeter** and **4-6 Dosimeter** items set the desired type of measurement to be performed using channels 1,2,3 and 4,5,6 – Hand-Arm Vibration (HAV) or Whole-Body Vibration (WBV).



Exposure time

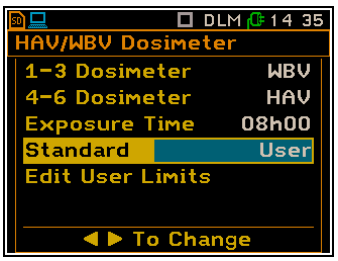
The **Exposure Time** item defines the exposure time used to calculate the dosimeter results. The **Exposure Time** values are in the range [**00h01**, **24h00**].



Standard for dose measurements

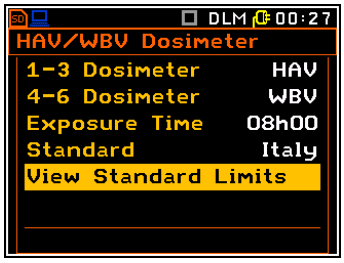
The **Standard** item sets the standard for dose measurements. The available standards: **U.K.**, **Italy**, **Poland**, **France**, **Germany** and **User**.

Depending on the standard selected, it is possible to view (**U.K.**, **Italy**, **Poland**, **France**, **Germany**, **China**, **Brasil** or **Spain**) or edit (**User**) the limits for the dose calculation.

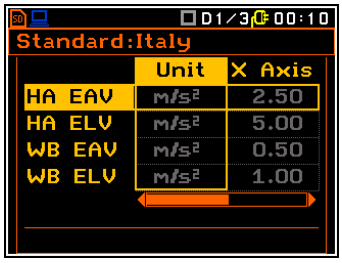


Viewing or editing dose limits

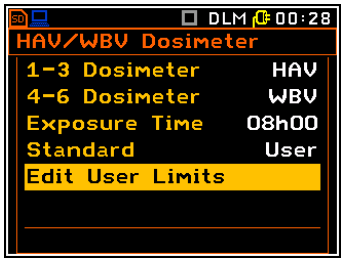
The **View Standard Limits** item opens the screen with the coefficients for the given axis of the 3-axis accelerometer used for the selected standard. Use the ◄ / ► keys to scroll through the displayed axes.



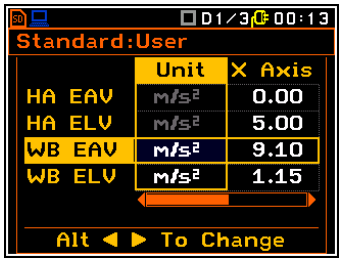
<ENT>



When the **User** standard is selected in the **Standard** item, the **Edit User Limits** item appears instead of **View Standard Limits** allowing you to define your own specific coefficients for each axis.

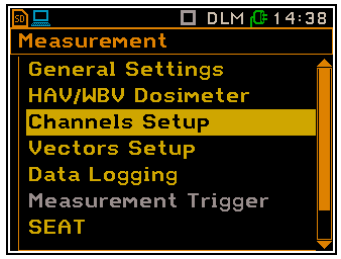


<ENT>



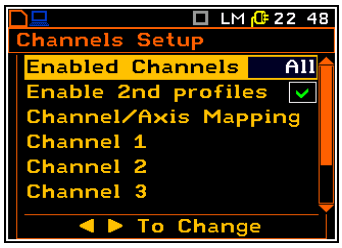
4.3 SETTING PARAMETERS FOR CHANNELS – CHANNELS SETUP

The **Channels Setup** item allows you to assign the axis of the triaxial accelerometer to the specific channel of the instrument, to enable/disable channels or second profiles and to programme the channel parameters: transducer type (**Type**) and weighting filter (**Filter**). The measurement range cannot be modified and is displayed for information only.

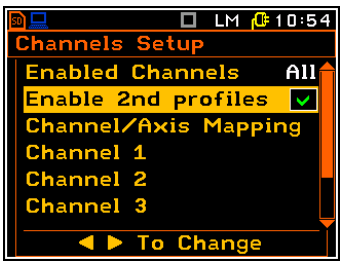


Enabling channels

The **Enabled Channels** item allows you to select the channels to be active during the measurement: **All**, **1-3** or **4-6**. Other channels are disabled and not displayed.



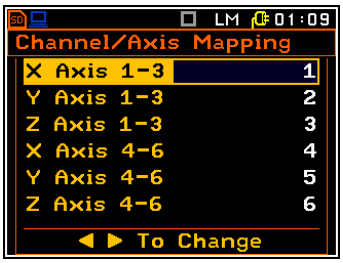
Enabling second profiles



The **Enabled 2nd profiles** item allows you to enable/disable second profiles.

If second profiles are disabled, calculations for second profiles will not be performed and displayed in different views, and all items with settings for second profiles will be inactive.

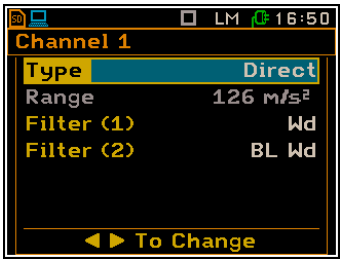
4.3.1 Allocation of channels to the transducer axes – Channel/Axis Mapping

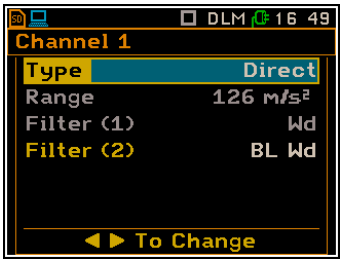


The **Channel/Axis Mapping** item allows you to allocate channels to the transducer axis. You can allocate channels **1**,**2**,**3** to the X, Y, Z axis of the first transducer, connected to the Lemo compatible socket type ENB.0B.304 for **Channels 1–3** and channels **4**,**5**,**6** to the X, Y, Z axis of the second transducer, connected to the Lemo compatible socket type ENB.0B.304 for **Channels 4-6**.

If the same channel is allocated to more than one axis, an error will be detected, and the user will be prompted to reallocate the channels.

4.3.2 Setting parameters for channels – Channel x

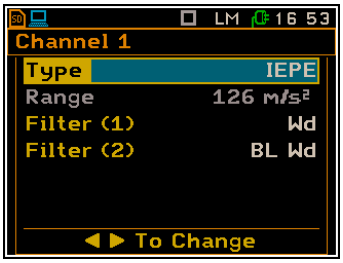




The **Channel x** items allow you to set or view parameters for the individual channel, such as: input type (**Type**), measurement range (**Range**) and filters for both profiles (**Filter**).

If the **Dosimeter** is active, the filter for the first profile is set by default and cannot be changed. If the second profile is disabled, the filter for the second profile doesn't appear as a parameter in the list.

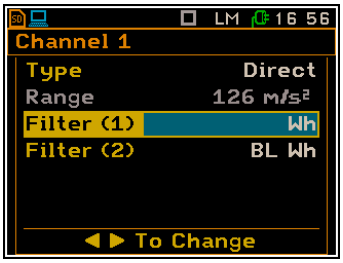
Input type and range



The following inputs are available: **Direct** and **IEPE**. The **Direct** input should be selected for MEMS accelerometers, such as: SV 38V, SV 105, SV 105F, SV 150 and SV 151. The IEPE input should be selected for IEPE accelerometers, such as: SV 39A/L or SV 50.

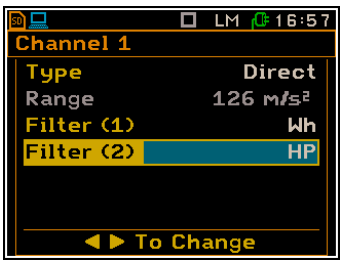
The **Range** value cannot be changed, it always depends on the filter type and the calibration factor. If the calibration factor is zero, the range is **126 m/s^2**.

Weighting filter



The following weighting filters are available for the first profile: **HP**, **KB**, **Wh**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wg**, **Wb**, **Wf**, **We** and **BL Wc**. The characteristics of the filters are given in Appendix C.

The set of filters for the second profile depends on the filter selected for the first profile. **HP** and **Vel3** filters are always available for the second profile with all combinations of filters for the first profile. The next available filter for profile 2 is one of the following: **BL Wh**, **BL Wk**, **BL Wd**, **BL Wc**, **BL Wj**, **BL Wm**, **BL Wg**, **BL Wb** and **BL Wf**; according to the rule – if the **Wh** filter is selected in the profile 1, then apart from **HP** and **Vel3**, only the **BL Wh** filter is available for the profile 2. If **Wk** filter is selected in the profile 1, then apart from **HP** and **Vel3**, only the **BL Wk** filter is available for profile 2. The same rule is applied to the other channels.



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

If the **WBV** measurements are performed on channels **1-3** or **4-6**, the filters defined for the channels are:

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

If the **HAV** measurements are performed on channels **1-3** or **4-6**, the filters defined for the channels are:

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

If the second profile is active during **Dosimeter** measurements, the filter can be **HP**, **Vel3** or one of the following: **BL Wd**, **BL Wk** or **BL Wh**, depending on which filter has been predefined for the first profile of the selected channel according to the rule described above.

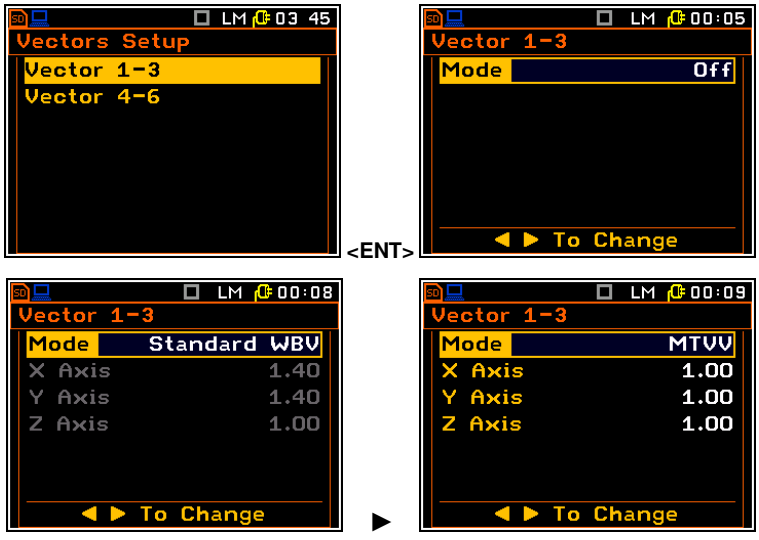
RMS detector

The instrument has only one **1.0s** RMS detector. This parameter is hidden.

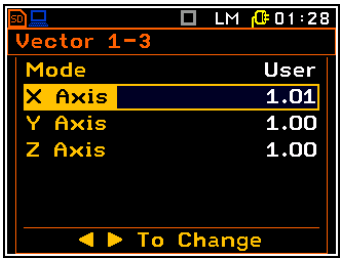
4.4 SETTING VECTOR PARAMETERS – VECTORS SETUP

The **Vectors Setup** item allows you to select the coefficients to calculate the vector for channels 1, 2, 3 and 4, 5, 6.

The Vector is calculated based on different set of coefficients for three axes (X, Y, Z) that can be selected in the **Mode** item: for hand-arm measurements (**Standard H-A**), for whole-body measurements (**Standard WBV**), for measurements with user defined coefficients (**User**) and for **MTVV** and **PPV** measurements. For the **Standard H-A** and **Standard WBV** modes, coefficients are predefined. For the **User**, **MTVV** and **PPV** modes, you can define coefficients for vector.



If you need to calculate a vector with non-standard coefficients, it is possible to select the coefficient within the range from **0.00** to **2.00**.



It is important that the user must select only those coefficients that correspond to the correct channels.

The above values are considered when calculating the measurement results. **VECTOR** is calculated according to the formulae:

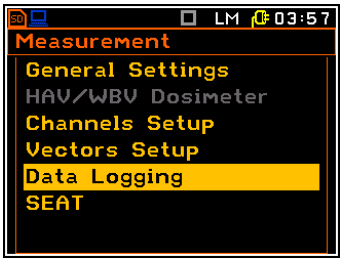
$$\mathbf{VECTOR} = \sqrt{k_1^2 x_1^2 + k_2^2 x_2^2 + k_3^2 x_3^2}$$

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.

4.5 PROGRAMMING DATA LOGGING – DATA LOGGING

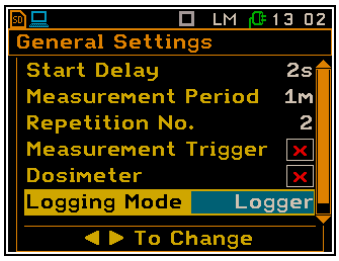
The **Data Logging** item allows you to set the logger functions: recording of the results history, event and signal (wave) recording for all six channels.



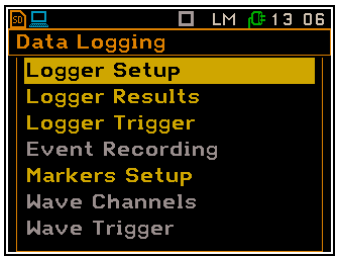
The contents of the **Data Logging** list depend on **Instrument Mode** (*path: <Menu> / Auxiliary Setup*): **Simple Mode** or **Advanced Mode**. Some additional functions such as triggering, markers, event and waveform recording only appear in the advanced instrument mode.

Depending on the **Logging Mode** selected in the **General Settings** list (**Logger** or **Wave**), the **Data Logging** screen will have different active items.

When **Logger** is selected, the **Data Logging** list consists of four active items: **Logger Setup**, **Logger Results**, **Logger Trigger** and **Marker Setup**.

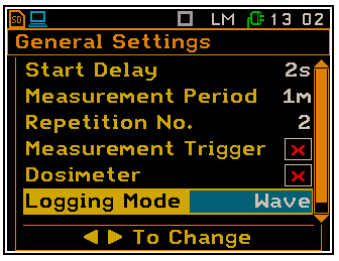


=>



Wave recording is only enabled in **Advanced Mode**.

When **Wave** is selected, the **Data Logging** list consists of three active items: **Logger Setup**, **Wave Channels** and **Wave Trigger**.

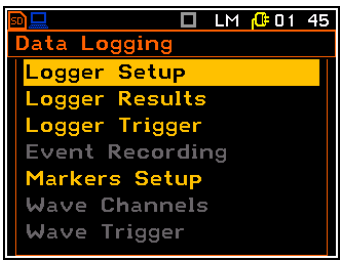


=>

***Note:** The **Logger** and **Wave** modes have mutually exclusive logging functions, and the instrument creates different files: in **Logger** mode - logger files, which contain histories of logger results and, if enabled, event records; in **Wave** mode – wave files, which contain analogue signals in the format used for digital recording.*

4.5.1 Logging time history results

The **Data Logging** list consists of two items in **Simple Mode**: **Logger Setup** and **Logger Results**; or four to five active items in the **Advanced Mode**: **Logger Setup**, **Logger Results**, **Logger Trigger**, **Event Recording** (which is active when the **Event Recording** item in the **General Settings** list is active) and **Marker Setup**.



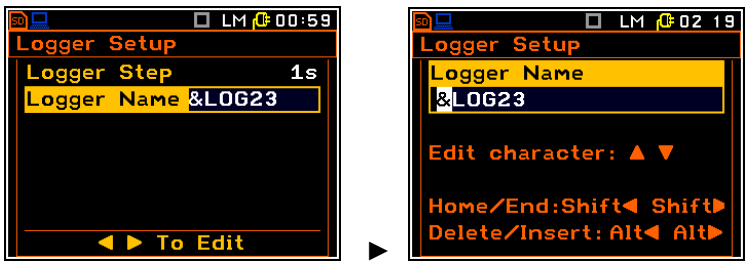
4.5.1.1 General logger parameters – Logger Setup

The **Logger Setup** list allows you to edit the name of the logger file (time history of results or waveforms) and set other general parameters.

When **Logger** mode is selected, you can also set the interval at which measurement results are logged to a file (**Logger Step**). The **Logger Step** can be set from 100 milliseconds to 1 hour.

The **Logger Name** item allows you to edit the name of the logger file. The default logger file name is **&LOGxx**. The name can be up to eight characters long. After pressing the ◄ / ► key, the special screen with text editor function is opened for editing.

The edited name is accepted and saved by pressing **<ENTER>**.

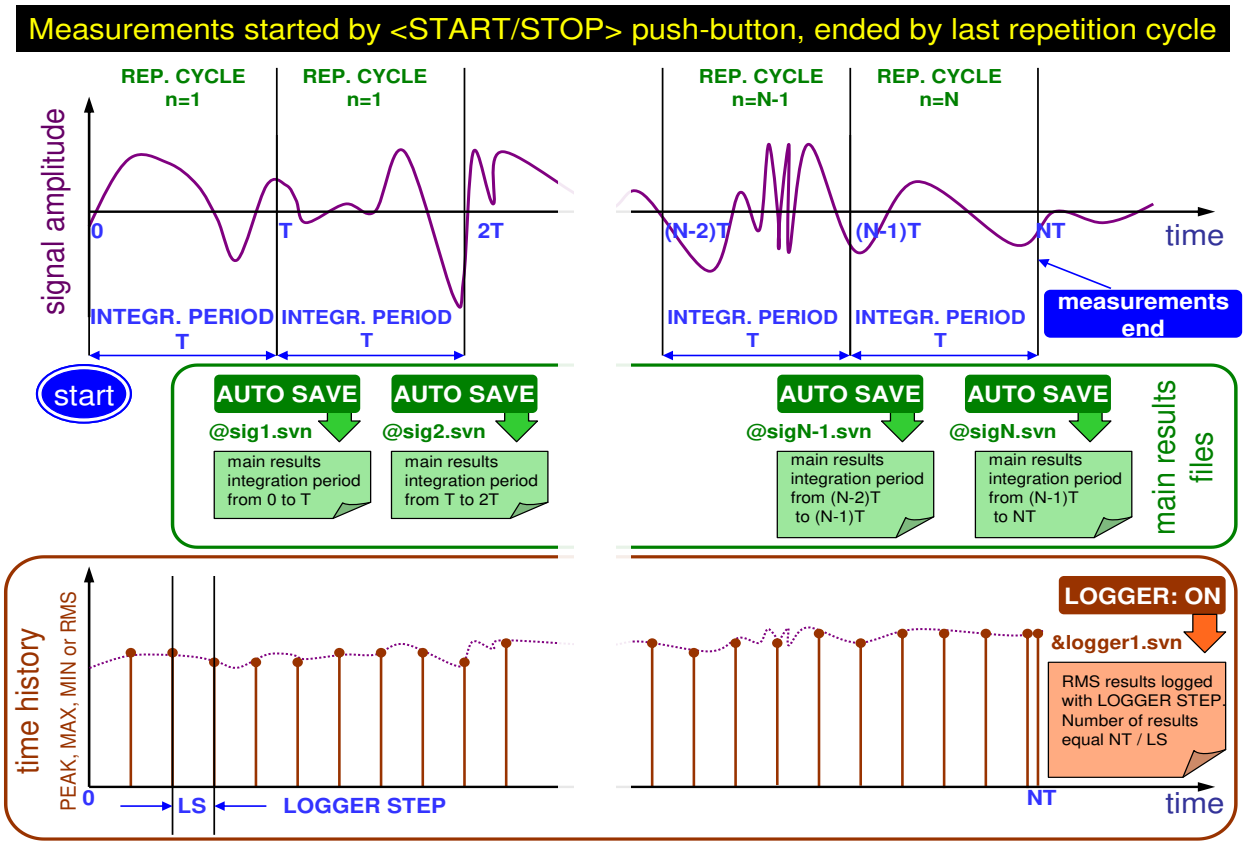


Note: *If you enter a name that already exists in the working directory, the instrument will automatically correct it by changing its number.*

The main measurement results are measured during the period set in the **Measurement Period** item. These results can be saved in the main result files. If **Measurement Period** is greater than 15 seconds, the results can also be saved using the **Auto Save** function. If **Repetition No.** is greater than one, the the main results file is automatically created for each measurement. The number in the name of the main results file (last digits) is automatically incremented by one after each time it is saved.

When **Logger** is selected in **Logging Mode**, logger results are measured in parallel with the main results at the time interval set in the **Logger Step** item. Up to 60 logger 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 a time step down to 100 ms. The logger results are saved in a logger file with the name defined in the **Logger Name** item. Logger recording is stopped after a measurement time (equal to the **Measurement Period** multiplied by the **Repetition No.**), or when the **<Stop>** key is pressed, or the measurement is stopped remotely.

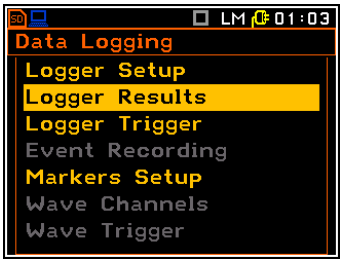
The figure below explains the mechanism of saving the main results (measured with the **Measurement Period** step and **Repetition No.** cycles) and the logger results (measured with the **Logger Step**).



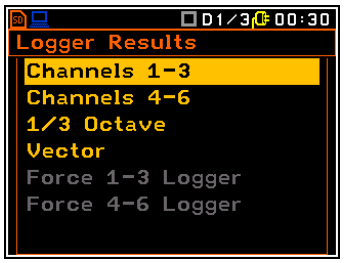
Relations between Measurement Cycle (Integration Period) and Logger Step

4.5.1.2 Selecting logger results – Logger Results

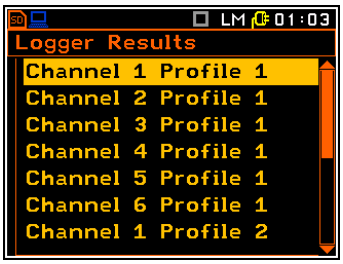
The **Logger Results** item allows you to activate the results for all channels and profiles (**Channel x Profile x**) and for vectors (**Vector**) to be logged in the logger file as a time history.



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

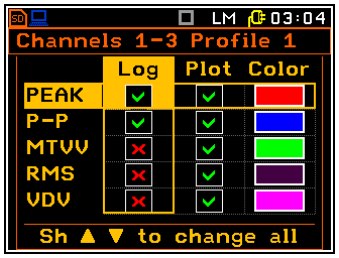


In **Advanced Mode** you can define logger results for each channel and profile individually, while in **Simple Mode** it is only possible to define results for the group of channels **1-3** and **4-6**.



Selecting results for channels and profiles

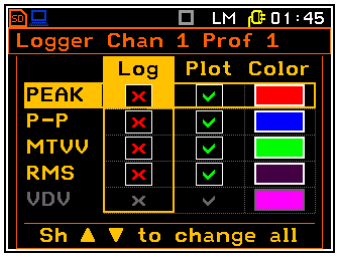
Depending on the **Instrument Mode** and the **Enable 2nd profiles** parameter, you can activate the results for channels and profiles (**PEAK**, **P-P**, **MAX**, **RMS** and **VDV**) to be recorded in the logger file (**Log** column), activate the plot to be displayed in the measurement mode (**Plot** column) and select its colour (**Color** column) in the screens with names: **Channels x-y**, **Channels x-y**, **Profile z**, **Channel x** or **Channel x Profile y**.



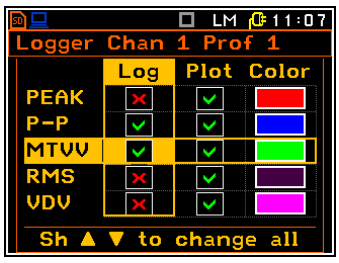
The **VDV** history will not be recorded if the **Wh** filer is selected for this profile.

Use the ◄ / ► keys together with **<Shift>** to activate/deactivate logger results.

Use the ◄ / ► or ▲ / ▼ keys to change the position.



A sample **Logger** screen with two selected results is attached.



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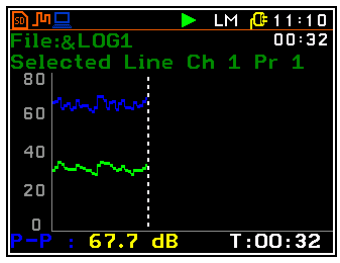
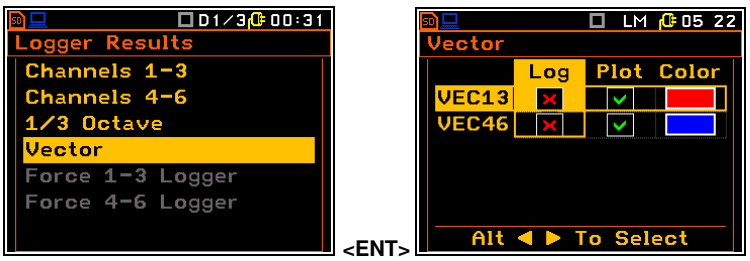


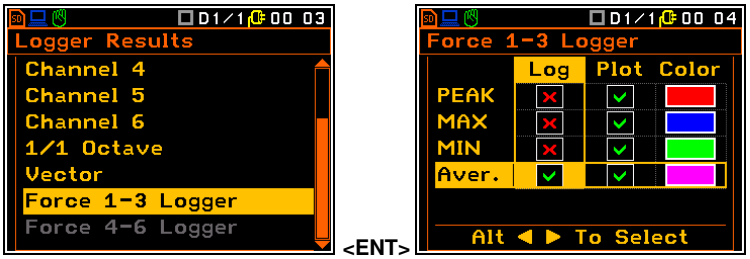
Selecting vectors

The **Vector** list allows you to activate the vectors (**VEC13** and **VEC46**) to be recorded in the logger file, to activate the plot to be displayed in the measurement mode (**Plot** column) and to select its colour (**Color** column).



Selecting the contact force

When using the SV 105F transducer it is possible to log and display force values. The **Force 1-3/4-6 Logger** list allows you to select which force parameters are recorded in the logger file (**PEAK**, **MAX**, **MIN** and **Aver.**), activate the plot to be displayed in measurement mode (**Plot** column) and select its colour (**Color** column).

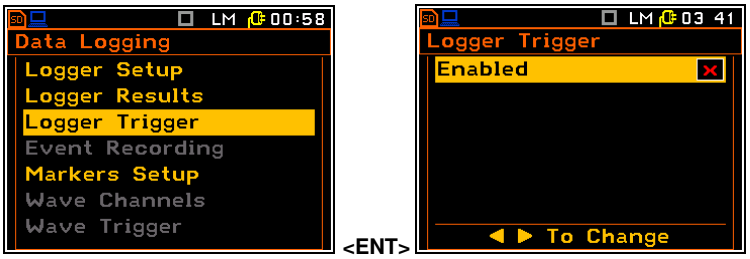


The force results in Newtons are visible in the **Logger** and **Dosimeter** view modes.

4.5.1.3 Logger trigger settings – Logger Trigger

The **Logger Trigger** item only appears in Advanced instrument mode.

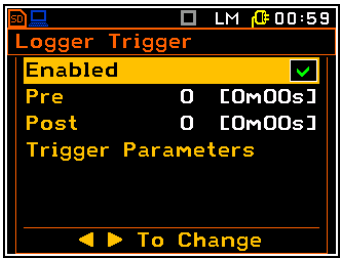
The **Logger Trigger** item allows you to switch and configure the logger trigger.



To enable/disable the logger trigger, tick **Enabled**.

You can select the number of the results saved in the logger before the the trigger condition is met (**Pre**) and the number of the results saved in the logger after the trigger condition is met (**Post**).

To set the logger trigger parameters, select the **Trigger Parameters** item.

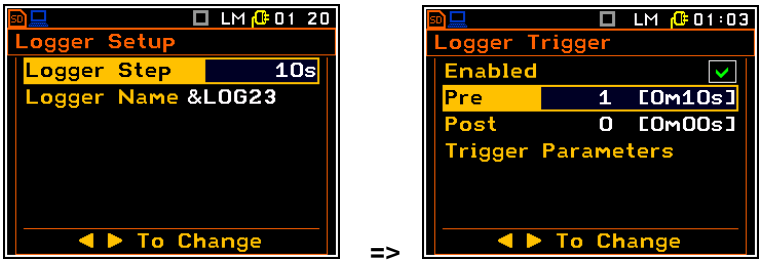


When the trigger condition is met, the logger will contain:

- the measurement results recorded immediately before the trigger condition was met. The time of this recording can be calculated by multiplying the value set in the **Pre** item by the time period set in the **Logger Step** item (*path: Menu / Measurement / Data Logging / Logger Setup*),
- all measurement results up to the moment when the triggering condition disappears,
- the results recorded immediately after the disappearance of the triggering condition. The time of this recording can be calculated by multiplying the value set in the **Post** item by the time period set inthe **Logger Step** item (*path: Menu / Measurement / Data Logging / Logger Setup*).

Pre and Post trigger recording

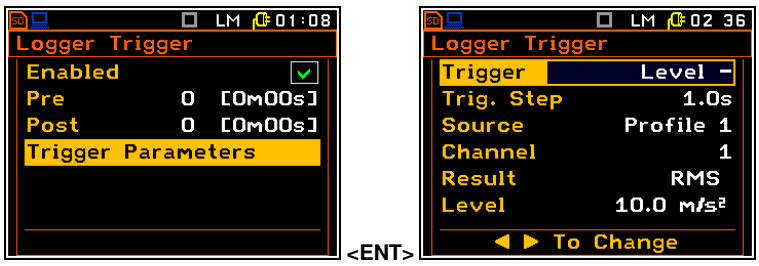
The **Pre**/**Post** item allows you to set the number of results to be recorded in the logger's file before/after the trigger condition is met/disappear. This number is within the limits of 0..20 for **Pre** trigger and 0..200 for **Post** trigger.



Setting the trigger parameters

The **Trigger Parameters** item allows you to set the parameters of the trigger signal in the **Logger Trigger** screen.

The **Trigger** item allows you to select the trigger type: **Level -**, **Level +**, **Slope -**, **Slope +**, **Gradient -** or **Gradient +**.



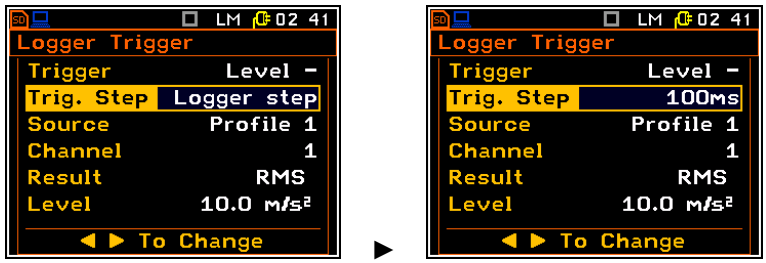
Logger Trigger operation

At each interval defined by the **Trig. Step**, the trigger condition is checked and if it is met, the set of logger results is recorded to the logger file, otherwise the recording is skipped. Trigger types define the trigger conditions and:

- if **Level +** is selected, the trigger condition is only met if **Result** is greater than **Level**,
- if **Level –** is selected, the trigger condition is only met if **Result** is lower than **Level**,
- if **Slope +** is selected, the trigger condition is only met if the rising value of **Result** exceeds the value of **Level**,
- if **Slope –** is selected, the trigger condition is only met if the falling value of **Result** passes the value of **Level**,
- if **Gradient +** is selected, the trigger condition is only met if **Result** is greater than **Level** and the rate of change of **Result** is greater than **Gradient**,
- if **Gradient -** is selected, the trigger condition is only met if **Result** `has a value less that than **Level** and the rate of change of **Result** is less than **Gradient**.

Trigger condition checking

The **Trig. Step** item allows you to select the interval (integration period) for checking the trigger condition: equal to **Logger step** (*path: <Menu> / Measurement / Data Logging / Logger Setup*), **100ms**, **1.0s**, equal to **Meas. Time** and equal to **Meas. Period** (*path: <Menu> / Measurements / General Settings*).

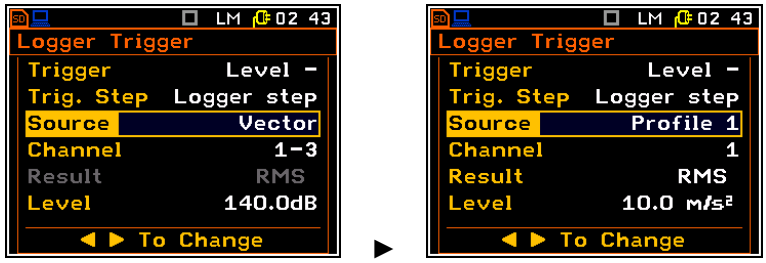


If **Meas. Time** is selected, the trigger condition is checked every second and the RMS value is averaged from the start of the measurement (**Meas. Time** is displayed in the upper right corner of the display, just below the Real Time Clock).

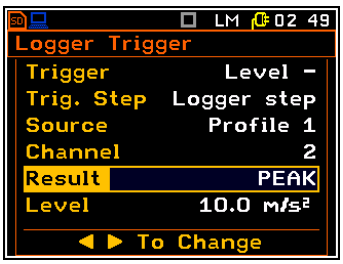
Source of trigger result

The **Source** item allows you to select the type of source for the trigger result: **Vector**, **Profile 1** or **Spectrum** (available for **1/1 Octave** and **1/3 Octave** functions).

The **Channel** item allows you to select the channel or channels (for the Vector source) of the triggering result.



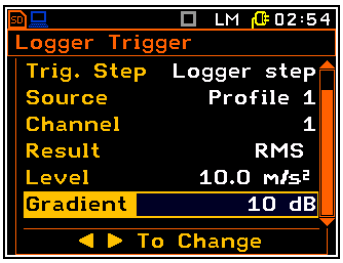
Trigger result and threshold



The **Result** item allows you to select the result to be compared with the threshold (**Level**) for evaluating the trigger condition: **PEAK**, **P-P**, **MAX**, **MIN**, **RMS** or **VDV**. If **Vector** is selected as the source, only one result is available – **RMS**. If **Spectrum** is selected as the source, you can select 1/1 octave or 1/3 octave band frequency, depending on the active **Measurement Function**, and **Total Level** results.

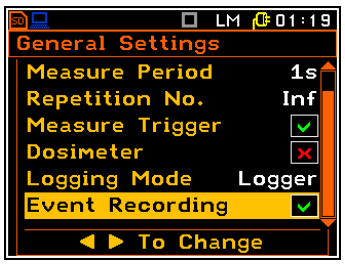
The **Level** item allows you to select the threshold for evaluating the trigger condition. The threshold level can be set in the range of **60 dB** to **200 dB** or from **1.00 mm/s²** to **10.0 km/s²** depending on the type of scale selected in the **Scal**e item (*path: <Menu> / Display / Results Scale*).

Trigger signal change rate



This item appears when the **Gradient -** or **Gradient +** trigger is selected. The rate of change of the trigger result (**Gradient**) can be set in the range of **1 dB** to **100 dB**.

4.5.1.4 Event recording settings – Event Recording



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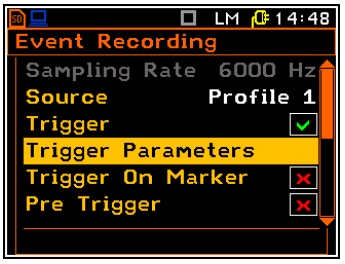
The **Event Recording** item appears in the **Data Logging** menu only in Advanced instrument mode and becomes active when the **Event Recording** parameter is enabled in the **General Settings** list.

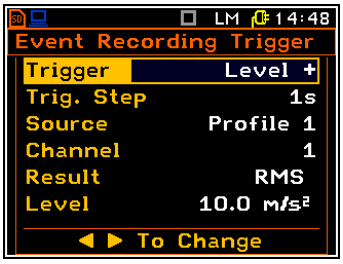
The **Event Recording** item allows you to enable the recording of the event waveform in the logger file and to set the recording parameters.

The **Sampling Rate** item displays the sampling frequency of the event recording – **6000 Hz**. It cannot be changed.

If the second profiles have been enabled in the **Channels Setup** list (*path: <Menu> / Measurements / Channels Setup / Enable 2nd profiles:* ☑), the **Source** item will be active, allowing you to select the profile of the channel for the trigger result: **Profile 1** or **Profile 2**.



<ENT>



If the **Trigger** item is checked, event recording is started by the trigger.

The trigger condition is set on the screen when the **Trigger Parameters** item is opened. This item appears in the list after the **Trigger** is activated. The settings in the **Event Recording Trigger** screen are the same as in the **Logger Trigger** screen.

Event Trigger operation

At each interval set by **Trig. Step**, the trigger condition is checked and if it is met, the instrument starts recording the event waveform to the logger file for the time set in **Rec. Time**, otherwise the recording is skipped. If the trigger condition is checked and met during recording, the recording is continued for another **Rec. Time** and so on. Trigger types are defined in a similar way to the Logger triggers.

When **Trigger On Marker** condition is on, event recording will start when one of the markers is triggered. Trigger markers are defined in the **Markers Setup** screen.

If **Trigger** and **Trigger On Marker** are selected, event recording will start when one of these trigger conditions is met.

When **Trigger** or **Trigger On Marker** is selected, additional items appear in the list.

When **Pre Trigger** is on, the signal recording starts before the trigger condition is met. The length of this additional record is 1 s for 1 or 2 channel recording, 0.5 s for 3 or 4 channel recording and 0.25 s in other cases.

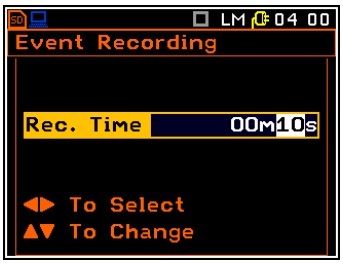
The **Rec. Limit** item allows you to limit the duration of the event recording. You can select: **Max Length**, **Fixed Length** or **Off**.

If **Off** is selected, the signal will be recorded until the memory is full, assuming the trigger condition is met.

If **Max Length** is selected, the signal will be recorded for the time set by **Rec. Time** but the recording can be stopped if the trigger condition is no longer met.

If **Fixed Length** is selected, the signal will be recorded for the time set by **Rec. Time**, even if the trigger condition is no longer met.

The **Rec. Time** item allows you to select the duration of the signal recording after triggering. If the next trigger condition is met during this period, the signal recording period is extended for another **Rec. Time** period.

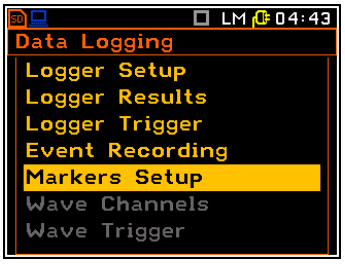


The **Channel x** items allow you to enable / disable the channels to be used for the event recording.

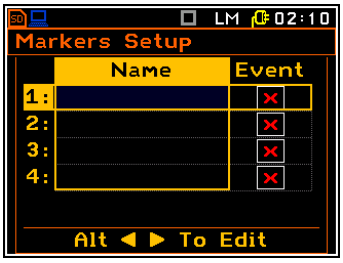
4.5.1.5 Marker settings – Marker Setup

Markers are used to mark special events during the measurement that are not typical vibration and are nothing more than an indication of the start and end of the block of logger results in which the event occurred. In the case of point markers, there is no start and end of the marker, only a record in the logger file. Markers are activated by pressing the arrow keys when the instrument is in the result presentation mode.

The **Marker Setup** item only appears in Advanced instrument mode and allows you to assign a specific name to each marker and define markers for event recording.



<ENT>

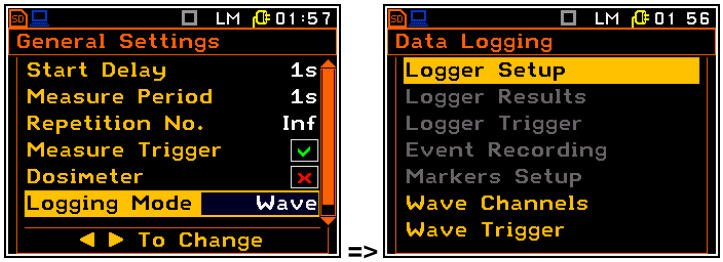


The specific name can be edited in the screen opened by the ◄ / ► key pressed together with **<Shift>** or **<Alt>**.

4.5.2 Waveform recording

All items related with wave recording in the **Data Logging** menu only appear in Advanced instrument mode.

When the **Wave** option is selected in the **Logging Mode** item, the **Data Logging** list consists of three active items: **Logger Setup**, **Wave Channels** and **Wave Trigger**.



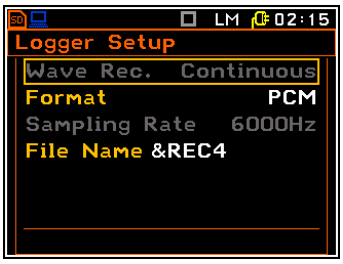
4.5.2.1 General Wave recording settings – Logger Setup

The **Logger Setup** item allows you to edit the name of the wave file (**File Name**) and set other general parameters for Wave recording when **Wave** is selected in **Logging Mode**.

The **Wave Rec.** item is inactive. It indicates the fixed type of Wave recording - **Continuous**.

You can select the format of the Wave file header (**Format**): **PCM** or **Extensible**.

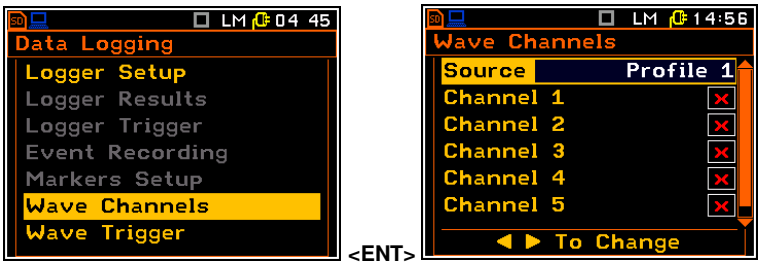
The **Sampling Rate** item is inactive. It indicates the fixed sampling rate - **6000Hz**.



4.5.2.2 Selecting channels for Wave recording – Wave Channels

The **Channel x** items allow you to select channels the signal of which will be recorded.

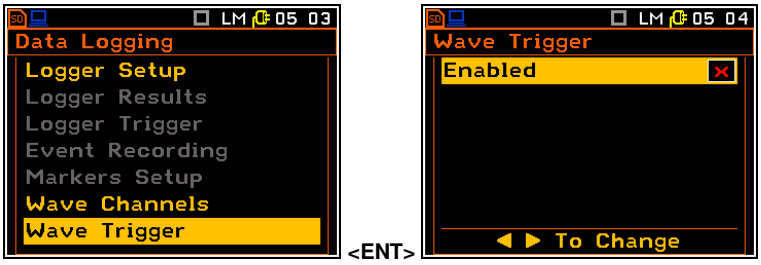
The **Source** item, which appears when **Enable 2nd profiles** is activated (*path: <Menu> / Measurement / Channels Setup*), allows you to select the profile with the selected weighting filter for all channels to be used for Wave recording.



4.5.2.3 Wave recording trigger settings – Wave Trigger

The **Wave Trigger** item allows you to activate/deactivate (**Enabled**) and, if enabled, to programme the Wave recording trigger.

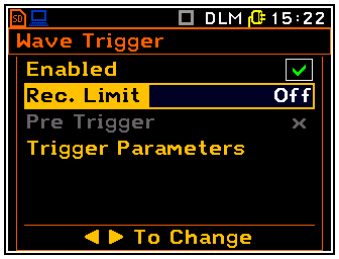
The **Rec. Limit** item allows you to set the limit of the Wave recording duration: **Max Length**, **Fixed Length** or **Off**.



If **Off** is selected, the signal will be recorded until the memory is full, assuming the trigger condition is met.

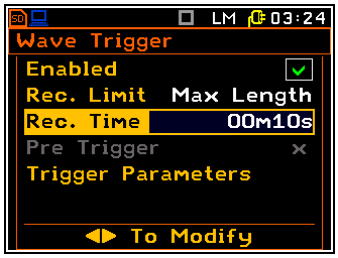
If **Max Length** is selected, the signal will be recorded for the time set by **Rec. Time** but the recording can be stopped if the trigger condition is no longer met.

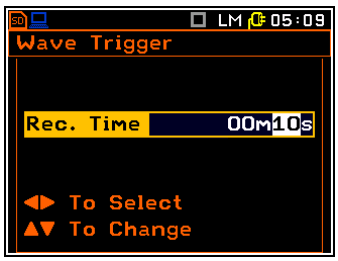
If **Fixed Length** is selected, the signal will be recorded for the time set by **Rec. Time**, even if the trigger condition is no longer met.



The **Rec. Time** item allows you to select the duration of the signal recording after triggering. If the next trigger condition is met during this period, the signal recording period is extended for another **Rec. Time** period.

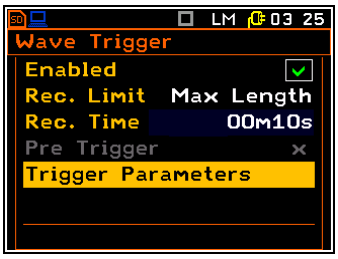
Pre Trigger is not available for the Wave recording.



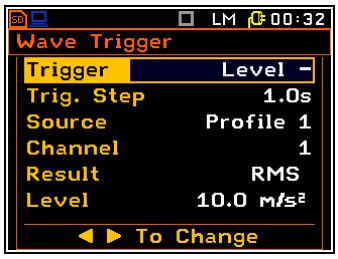


The **Trigger Parameters** item allows you to set the parameters of the trigger signal.

The **Trigger Parameters** item opens a **Wave Trigger** screen with identical items as for the **Logger Trigger** case described above.



<ENT>

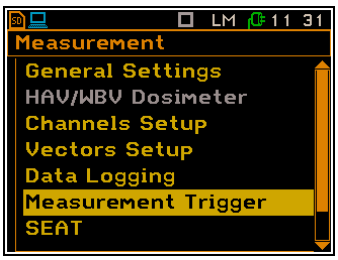


Wave Trigger operation

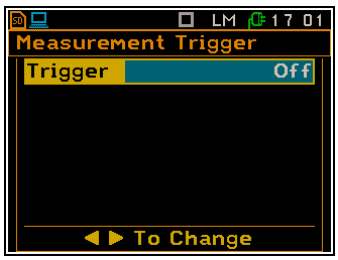
The trigger condition is checked at the interval set by **Trig. Step**, and if it is met, the instrument starts Wave recording to the WAV file for **Rec. Time**, otherwise the recording is skipped. If the trigger condition is checked during recording and it is met, the recording is continued for another **Rec. Time** and so on. Wave trigger definitions are similar to Logger triggers.

4.6 MEASUREMENT TRIGGER SETTINGS – MEASUREMENT TRIGGER

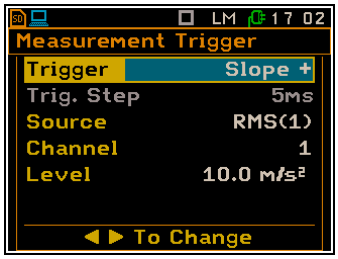
The **Measurement Trigger** item only appears in Advanced instrument mode and when the measurement trigger is enabled in the **General Settings** screen.



<ENT>

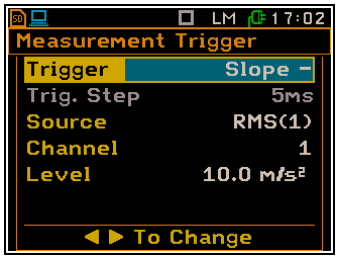


In the **Measurement Trigger** screen, you can disable the **Trigger** (**Off**) or enable it by selecting an option other than **Off**. When the **Trigger** is on, it is possible to specify the source of the trigger signal (**Source**), the channel of the source signal (**Channel**), the threshold (**Level**) and also the rate of change of the source value (**Gradient**). If **RTC** is selected as the trigger type, the start time (**RTC Start**) and the number of times (**Repeat Every**) the trigger is to be repeated can be set.



The trigger is enabled when any of the trigger types are selected in the **Trigger** item: **Slope +**, **Slope –**, **Level +**, **Level –**, **Gradient +** or **RTC**. If the instrument is operating with the trigger on, the corresponding icon appears on the display when the instrument is waiting for a trigger (while the trigger condition is not met). The trigger condition is checked every 5 milliseconds.

Slope trigger



The **Slope +** trigger starts the measurement with the duration of the **Measurement Period** (*path: <Menu> / Measurement / General Settings*) under the condition: the rising value of the RMS result (**Source**) averaged over 5 milliseconds passes above the threshold (**Level**).

The **Slope -** trigger starts the measurement with the duration of the **Measurement Period** (*path: <Menu> / Measurement / General Settings*) under the condition: the falling value of the RMS result (**Source**) averaged over 5 milliseconds passes below the threshold (**Level**).

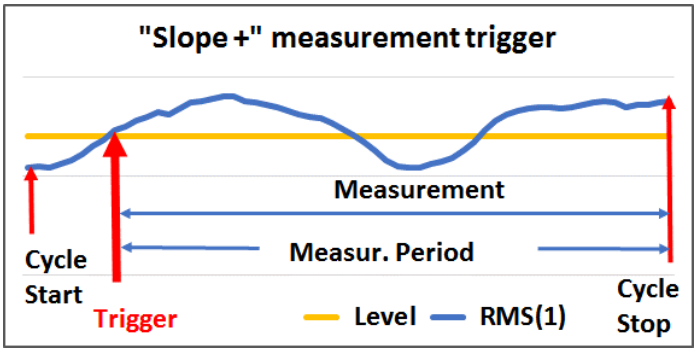
The following trigger sources are available for the Slope trigger: **RMS(1)**, **VEC46**, **VEC13** or **External**.

At the new start of the new measurement cycle (manually after pressing the **<Start>** key or automatically after stopping the previous measurement cycle) the instrument checks the trigger condition every 5 ms and if the condition is met the instrument starts the continuous series of 1-second measurements, the number of which is equal to the number of seconds in the **Measurement Period**.

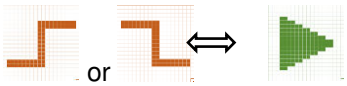
Once the **Measurement Period** has elapsed, the new measurement cycle can begin using the logic described above.

Measurement can be stopped manually at any time using the **<Stop>** key.

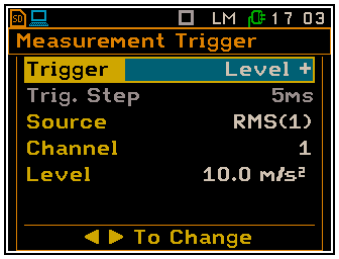
The main results are calculated on the basis of series of 1-second results measured during each measurement cycle and saved in the main results file.



***Note:** If a measurement is waiting for the slope trigger, the "trigger slope" icon will alternate with the „measurement" icon.*



Level trigger



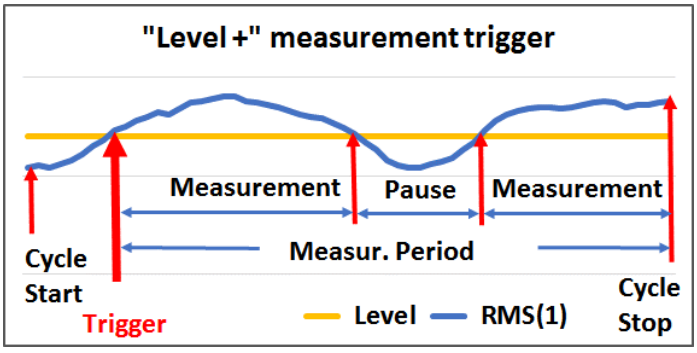
The **Level +** trigger starts the 1-second measurement under the condition: the RMS result (**Source**) integrated by 5 milliseconds is greater than the threshold (**Level**). Otherwise, the instrument continues to check the trigger condition every 5 milliseconds.

The **Level -** trigger starts the 1-second measurement under the condition: f the RMS result (**Source**) integrated by 5 milliseconds is lower than the threshold (**Level**). Otherwise, the instrument continues to check the trigger condition every 5 milliseconds.

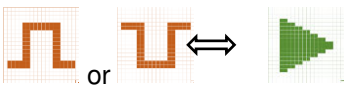
The following trigger sources are available for the Level trigger: **RMS(1)**, **VEC46** or **VEC13**.

At the start of a new measurement cycle (manually after pressing **<Start>** key or automatically after stopping the previous measurement cycle) the instrument checks the trigger condition every 5 milliseconds and starts a 1-second measurement if the condition is met.

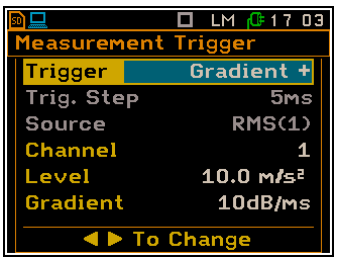
After a 1-second integration, the instrument repeats the trigger condition check every 5 milliseconds and starts the next 1-second measurement if the condition is met. The instrument does this as many times as there are seconds in the **Measurement Period** and stops the measurement cycle. Therefore, the series of 1-second measurements may not be continuous as with for the Slope trigger, and the duration of the measurement cycle may be longer than the **Measurement Period**.



***Note:** When a measurement is waiting for a level trigger, the "trigger level" icon will alternate with the „measurement" icon.*



Gradient trigger

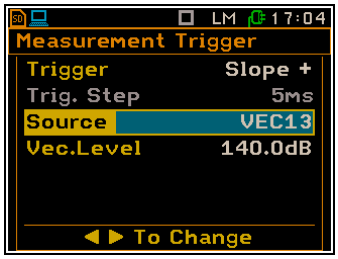


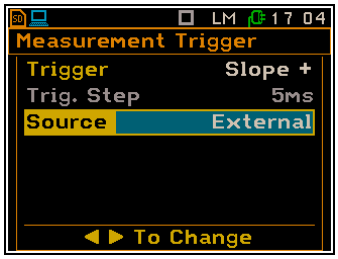
The **Gradient +** trigger starts the 1-second measurement under the condition: the RMS result (**Source**) integrated during 5 milliseconds is greater than the threshold (**Level**) and the rate of change of the Source is greater than the gradient threshold (**Gradient**). Otherwise, the instrument continues to check the trigger condition every 5 milliseconds.

This type of trigger has the same logic as **Level +** trigger, but the trigger condition also requires the gradient threshold level to be exceeded.

There is only one trigger source available for the Gradient trigger: **RMS(1)**.

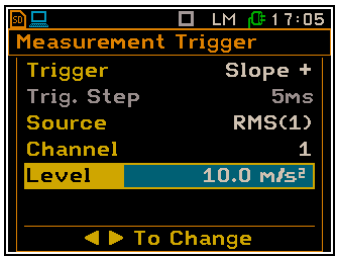
Source result





Depending on the selected trigger type, you can select several results (**Source**) for the trigger: vectors (**VEC13** and **VEC46**), RMS of the first profile (**RMS(1)**) and external signal of the I/O socket (**External**). **External** source means that the trigger is initiated by the positive or negative slope of the signal on the I/O socket. The **External** option is available when the **Slope** trigger is selected.

Source channel

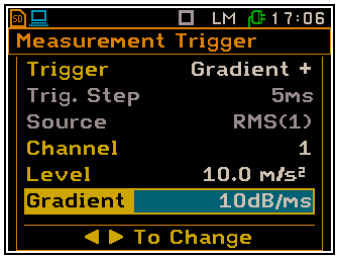


The **Channel** item indicates the channel of the source result.

Threshold level

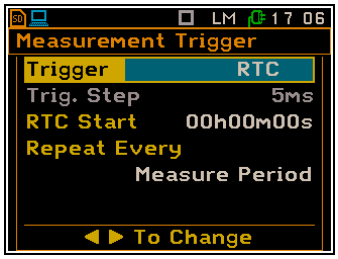
The **Level** item allows you to select the threshold level for trigger condition. The threshold level can be set in a range from **60 dB** to **200 dB** or from **1.00 mm/s²** to **10.0 km/s²**, depending on the scale type selected in the **Scal**e item (*path: <Menu> / Display / Results Scale*).

Rate of change of Source

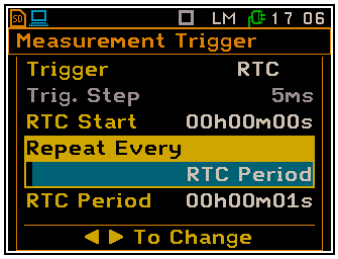


This item appears when the **Gradient -** or **Gradient +** trigger is selected. The rate of change of the source (**Gradient**) can be set within a range of **1 dB** to **100 dB**.

RTC trigger



If **RTC** (Real Time Clock) is selected, the trigger will start at the time set by **RTC Start**. You should press the **<Start>** key and the measurement will be triggered at the time set by **RTC Start**.

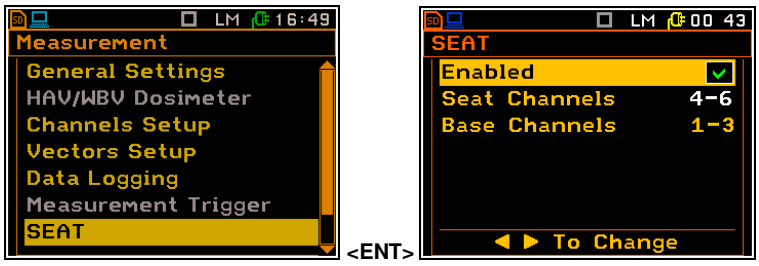


The measurement is repeated with the step selected in the **Repeat Every** item. The **Repeat Every** parameter can be selected as: **Measurement Period** or **RTC Period**. If **RTC Period** is selected, the additional item **RTC Period** appears.

Note: *Each time the trigger conditions are met, a measurement is started which lasts for the duration of the* ***Measurement Period*** *(path: <Menu> / Measurement / General Settings). The* ***Repetition No.*** *item defines the maximum number of measurement repetitions in this period. A separate main result file is created for each triggered measurement, but the logger file contains entire measurements.*

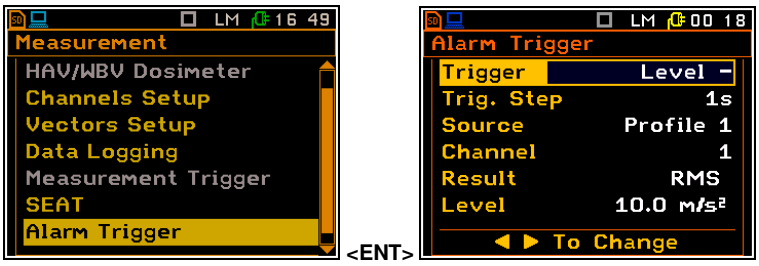
4.7 CONFIGURING WHOLE BODY MEASUREMENTS – SEAT

The **SEAT** item allows you to enable the SEAT (Seat Effective Amplitude Transmissibility) measurements and assign channels 1-3/4-6 to the triaxial seat accelerometer (**Seat channels**) or the accelerometer for base measurements (**Base channels**).



4.8 CONFIGURING ALARMS – ALARM TRIGGER

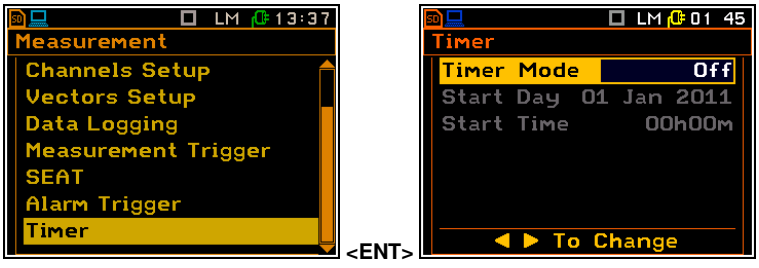
The **Alarm Trigger** item only appears in the Advanced instrument mode (*path: <Menu> / Auxiliary Setup / Instrument Mode*) and allows you to program the trigger that generates alarm pulses on the I/O socket. You should set the **Mode** parameter to **Digital Out** in the **Multifunction I/O** screen (*path: <Menu> / Instrument / Multifunction I/O*).



The **Alarm Trigger** screen and the meaning of all items are identical to the **Logger Trigger**.

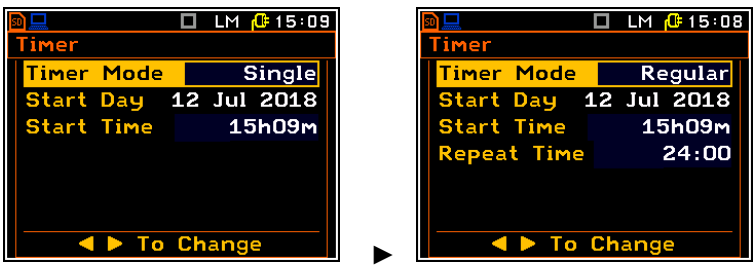
4.9 PROGRAMMING THE INSTRUMENT'S TIMER – TIMER

The **Timer** function is used to switch on the instrument at the desired time and perform measurements using the settings made before the instrument was switched off. The **Timer** item only appears in the Advance instrument mode.



Timer mode

The timer can be switched **Off** or programmed to start the measurement one (**Single**) or several times (**Regular**) with the time between consecutive measurements (**Repeat Time**). For example, if **Repeat Time** is 24 hours, this means that the instrument will switch on at the same time once a day until the user deactivates the timer function.

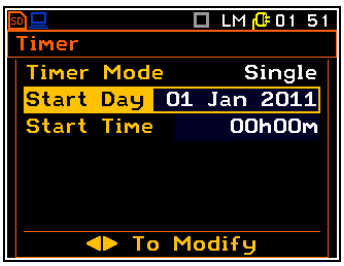


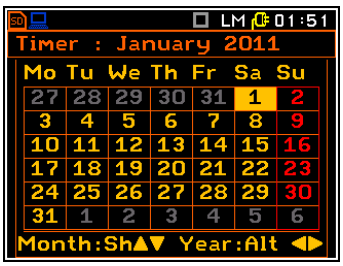
When the Timer function is on, the "**clock**" icon appears on the screen.

Start day

The **Start Day** item allows you to set the date on which the measurement is to be start.

The timer can be programmed up to one month in advance. The desired date can be selected in the special screen opened with the ◄ / ► keys.

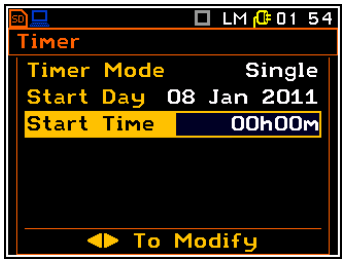


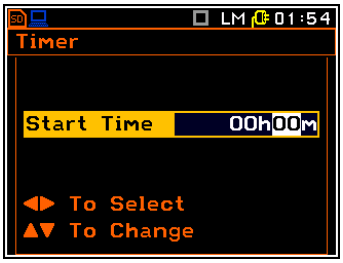


Start time

The **Start Time** item allows you to set the time at which the measurement is to be start.

The desired hour and minute can be set in a special screen opened with the ◄ / ► keys.





4.9.1 Example of timer execution

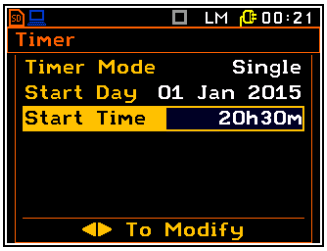
The **Timer** function is used to program the instrument to switch on at the desired time and perform the measurements with the parameters set in the **Measurement** section.

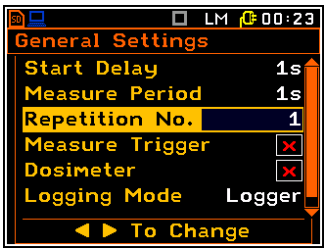
Suppose you want to switch on the instrument at 20:30 on the 1 January, measure the vibration for 10 seconds without using the logger and save the results in a file named @R1.

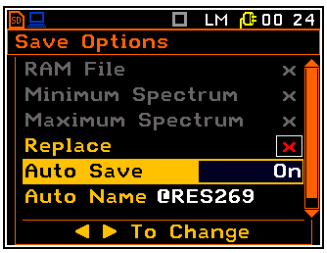
To do this, set the parameters of the **Timer** function (*path: Menu / Measurement / Timer*), the measurement parameters (*path: Menu / Measurement / General Settings*), activate the **Auto Save** function (*path: Menu / File / Save Options*), name the file (the **File Name** screen is opened when the **Auto Save** function is activated) and finally – switch off the instrument.

The instrument will be switched on at 20:30 on 1 January. I will warm up for 60 seconds, decreasing the counter on the display by one every second.

After the warm-up period and the pre-set **Start Delay**, the measurements will be carried out for a period of ten seconds. The results will be saved in the, and finally the instrument will switch off automatically.

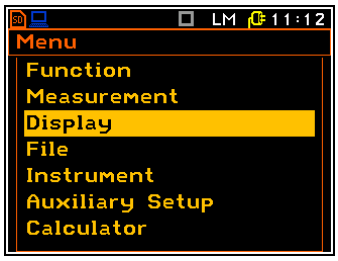




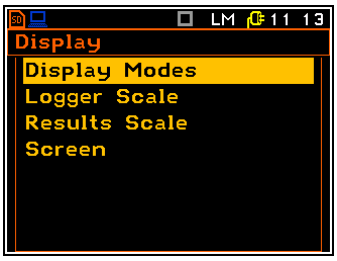


5 DATA DISPLAY CONFIGURATION – Display

The **Display** section contains items for programming the display of the measurement result.



<ENT>



The **Display** section contains the following items, allowing you to:

Display Modes enable active views of the measurement results,

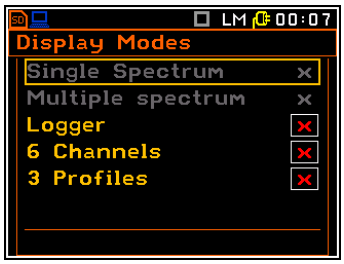
Logger Scale adjust the scale of the result presentation plots,

Results Scale change the scale of results display,

Screen set the brightness and switch on/off the energy saving function.

5.1 ENABLING VIEWS OF THE MEASUREMENT RESULTS – DISPLAY MODES

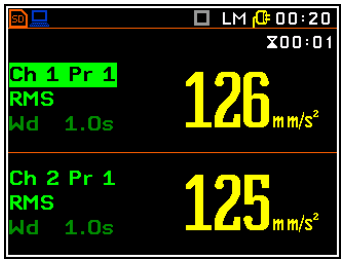
The **Display Modes** list allows you to enable/disable the currently available modes of displaying the measurement results - views. The set of available views depends on to the instrument function (**LM**, **1/1 Octave** or **1/3 Octave**).



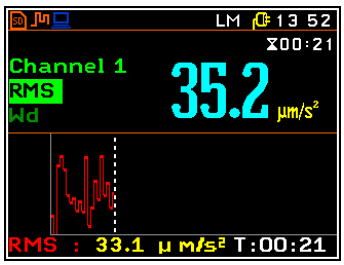
Note: ***Single Spectrum*** *and* ***Multiple spectrum*** *views become active for the 1/1 Octave or 1/3 Octave function.*

The view with two results and with one result and a history plot is always enabled.

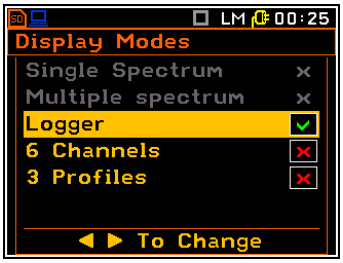
If all the views in the **Display Modes** list are disabled, only the main view with two results and with one result and a history plot will be available.



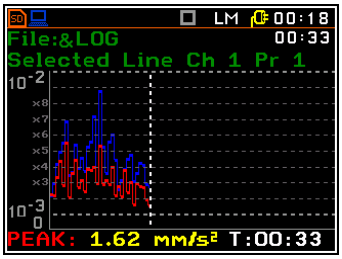
or



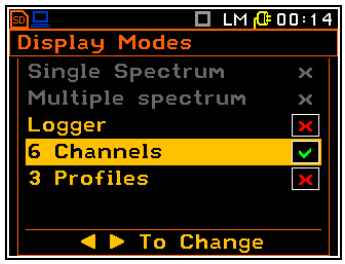
The **Logger** view displays a plot of histories of selected results.



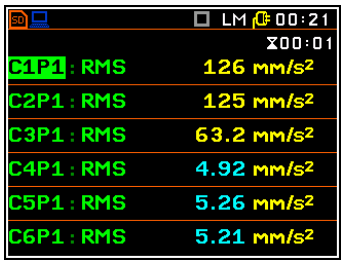
=>



The **6 Channels** view simultaneously displays 6 results for selected channels and profiles.

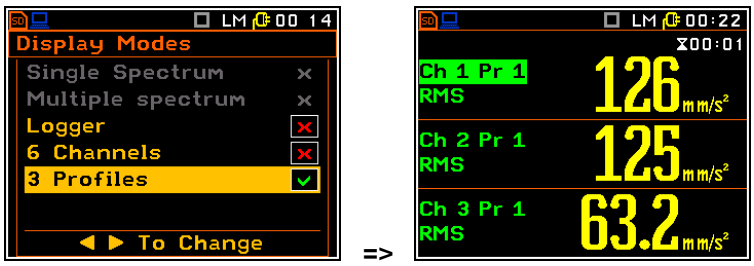


=>



The **3 Profiles** view simultaneously displays 3 results for selected channels and profiles.

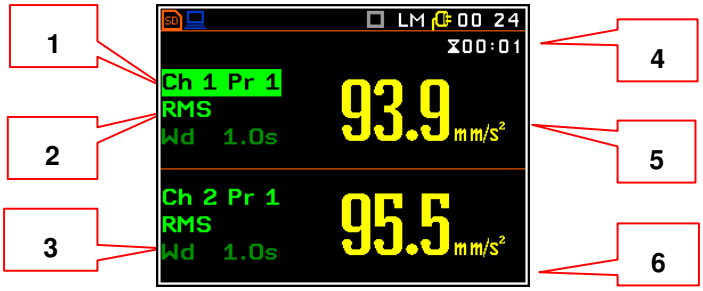
If some views are enabled in the **Display Modes** list, they will all be available and can be selected with the **<Alt>** and ▲ / ▼ keys pressed together.



5.1.1 Main view

The main view is always active and cannot be deactivated.

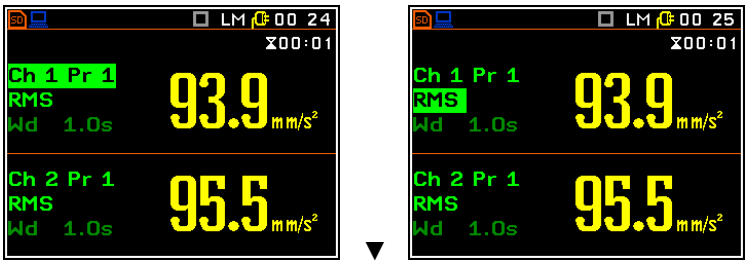
Main view fields



1. Channel and Profile number.
2. Measurement result name: **RMS**, **VDV**, **CRF**, **OVL**, **PEAK**, **P–P** or **MTVV**.
3. Name of the filter used: **KB**, **Wh**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wg**, **Wb**, **Wf** (for the first profiles) and **HP**, **BL Wh**, **BL Wk**, **BL Wd**, **BL Wc**, **BL Wj**, **BL Wm**, **BL Wg**, **BL Wb**, **BL Wf** (for the second profiles); and detector time constant: **1.0 s**.
4. Elapsed time, showing the current second of the measurement in the range [**1**, **Measurement Period**].
5. Value of the measurement result.
6. Units of the measurement result.

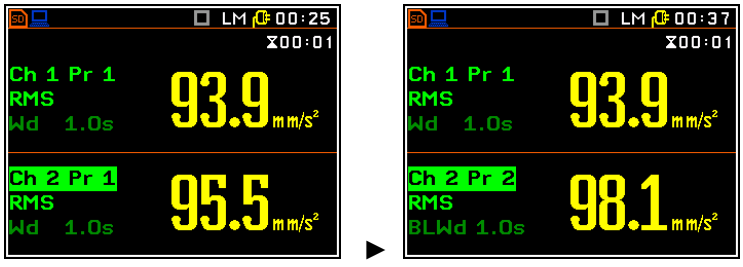
Changing the active field

Use the ▲/▼ keys to change the active field.

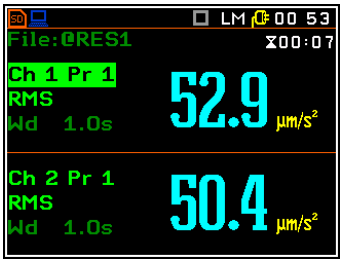


Changing field contents

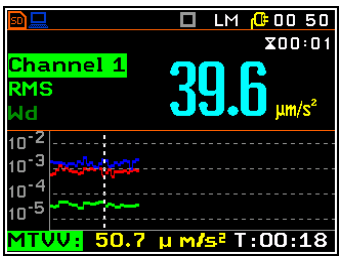
When the profile or result field is selected, the profile number or result name can be changed with the ◄ / ► key.



When **Auto Save** is active, the file name is displayed in the upper field of the view.



Note: *When Logger is enabled (path: <Menu> / Measurement / General Settings / Logging Mode: Logger) and the* ***Logger*** *view is switched on, a combined view of the logger plot with one result is displayed instead of two results as the main view.*

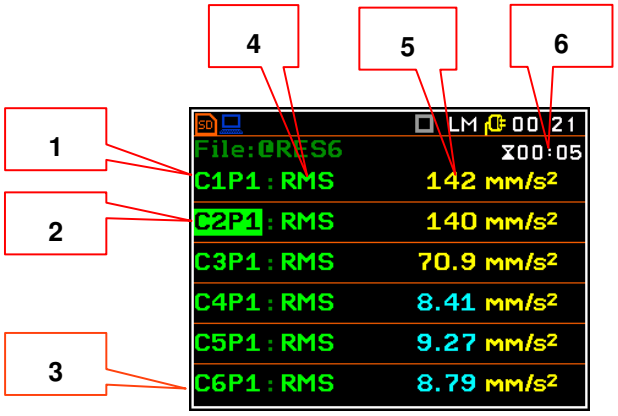


5.1.2 Six channels view – 6 Channels

The six channels view (**6 Channels**) displays results for six channels simultaneously. If the **All** option is not selected in the **Channel Activation** screen (*path: <Menu> / Measurement / Channels Setup*), the **6 Channels** view is not active.

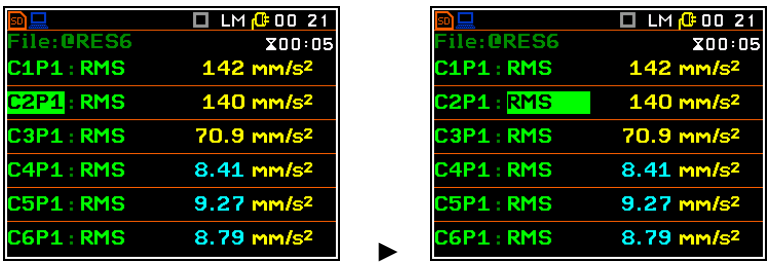
6 Channels view fields

1. Result for Channel 1.
2. Result for Channel 2.
3. Result for Channel 6.
4. Measurement result name: **RMS**, **VDV**, **CRF**, **OVL**, **TIME**, **PEAK**, **P–P** or **MTVV**.
5. Value and units of the measurement result. See Appendix D for definitions.
6. Elapsed time, showing the current second of the measurement in the range [**1**, **Measurement Period**].



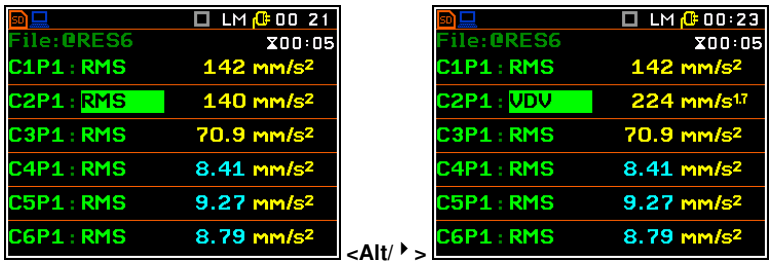
Changing the active fields

Use the ▲/▼ or ◄ / ►keys to change the active field.



Changing field contents

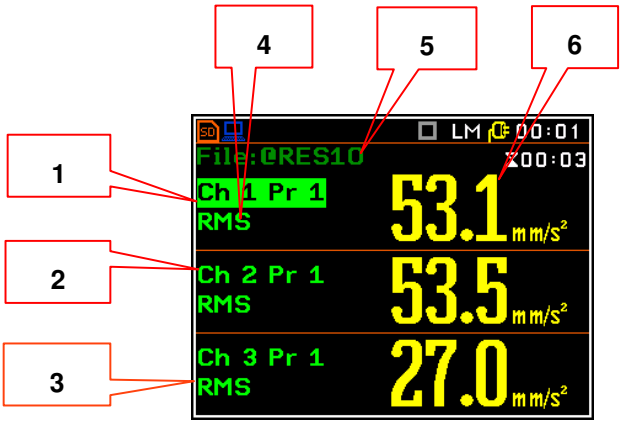
When the profile or result field is selected, the profile number or result name can be changed with the ◄ / ► key pressed together with **<Alt>**.



5.1.3 Three profiles view – 3 Profiles

The three profiles view (**3 Profiles**) displays results for three profiles simultaneously.

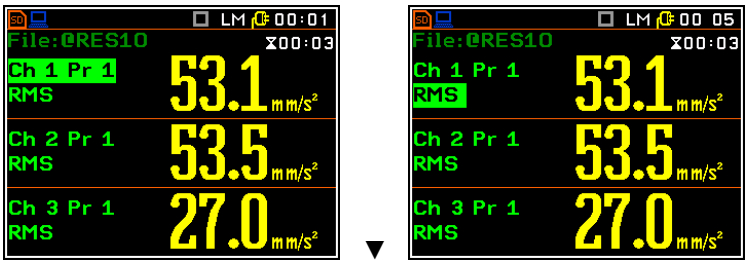
3 Profiles view fields



1. First result.
2. Second result.
3. Third result.
4. Measurement result name: **RMS**, **VDV**, **CRF**, **OVL**, **TIME**, **PEAK**, **P–P** or **MTVV**.
5. File name if the **Auto Save** function is active (*path: <Menu> / File / Save Options)*
6. Value and units of the measurement result.
7. Elapsed time, showing the current second of the measurement in the range [**1**, **Measurement Period**].

Changing the active field

Use the ▲/▼ keys to change the active field.



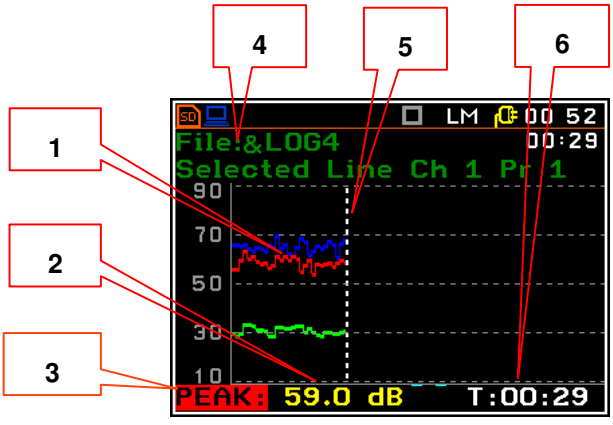
Changing field contents

When the profile or result field is selected, the profile number or result name can be changed with the ◄ / ► key.

5.1.4 Logger view – Logger

The **Logger** view shows the time history of measurement results stored in the logger file.

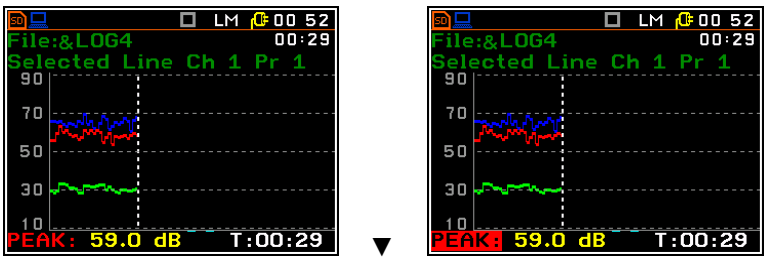
Logger view fields



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

Changing the active field

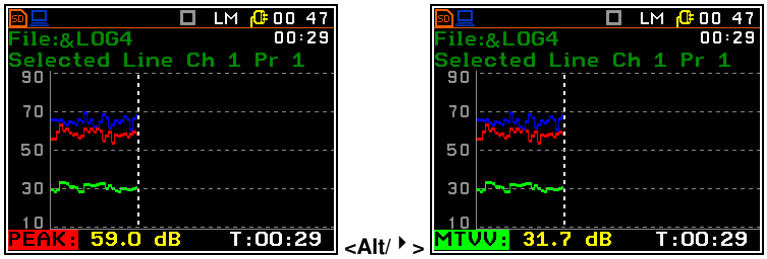
Use the ▲/▼ keys to change the active field.



Changing field contents

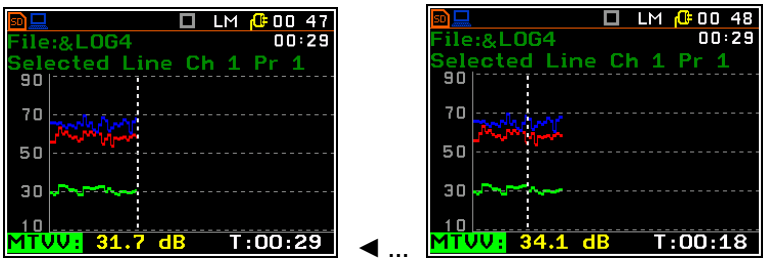
When the result field is selected, the result type can be changed with the ◄ / ► key pressed together with **<Alt>**.

The values of the cursor will then refer to the plot of the selected result.



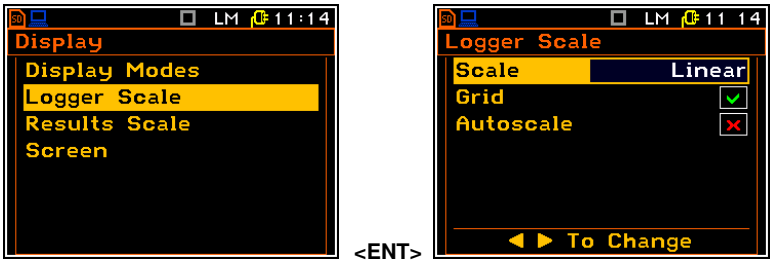
Changing the cursor position

When the measurement is stopped, you can change the position of the cursor with the ◄ / ► keys. The new value is displayed in the bottom line of the screen.



5.2 CUSTOMISING THE LOGGER VIEW– LOGGER SCALE

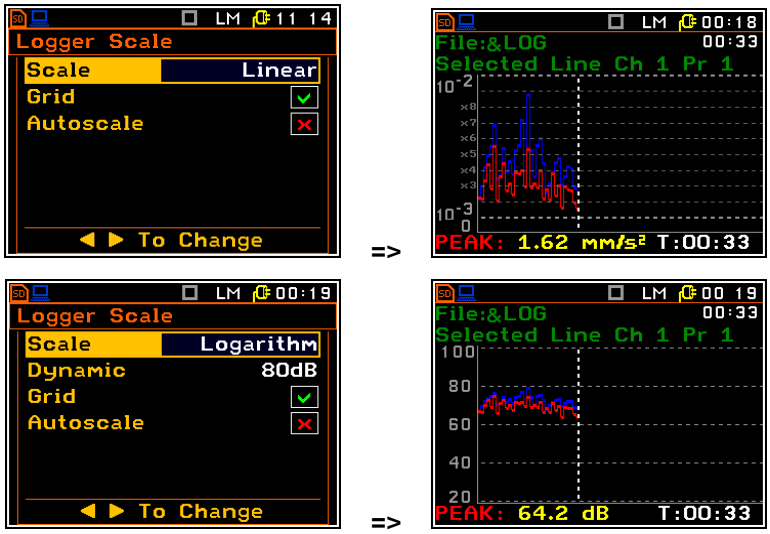
The **Logger Scale** item allows you to change the scale of the Y-axis of the result history plot and to enable/disable the grid and automatic scale adjustment.



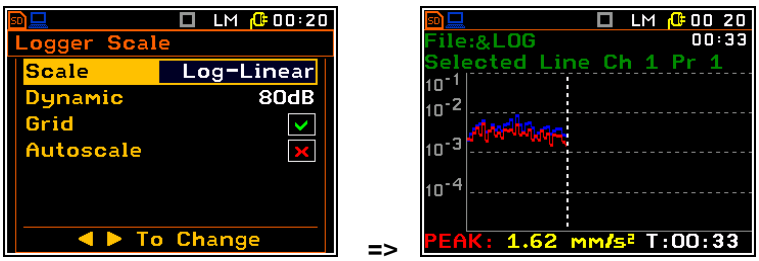
Logger plot scale

There are three options for the **Scale** item: **Linear**, **Logarithm** and **Log-Linear**. **Linear** means that both the plot scale and the units are linear. **Logarithm** means that the plot scale is logarithmic, and the measurement results are expressed in decibels (the results are related to the values set up in the **Reference Levels** screen (*path: Menu / Auxiliary Setup / Reference Levels*).

The example on the right shows the same logger plot with the other scale.



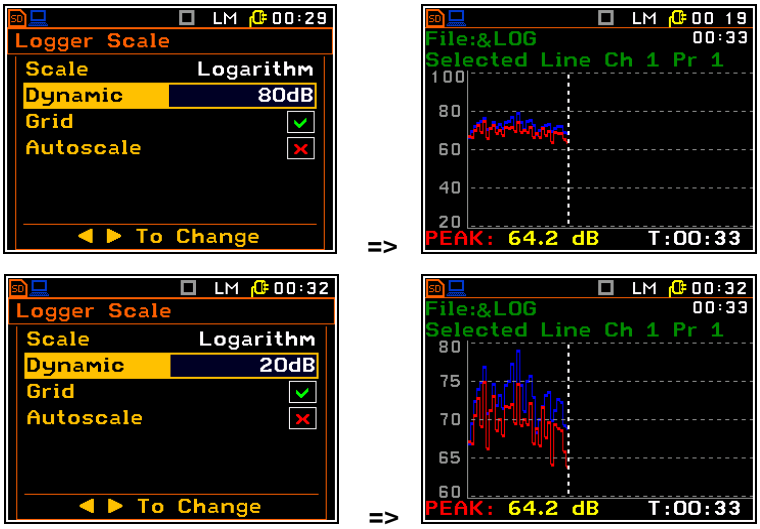
Log-Linear means that the Y-scale is logarithmic, but the units are linear.



Logarithmic scale range

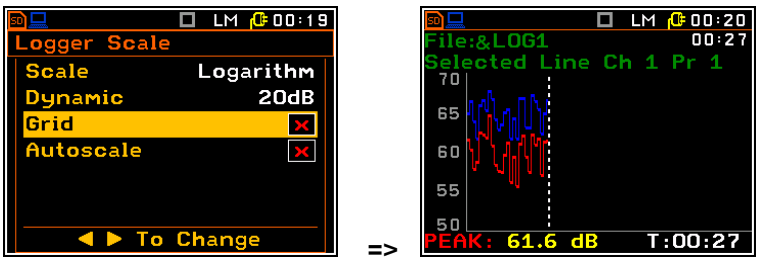
If **Scale** is set to **Logarithmic** or **Log-Linear**, the **Dynamic** item allows you to select the desired dynamic range for the **Logger** view. You can choose between twofold, fourfold, and eightfold expansion of the vertical axis (the default vertical axis corresponds to **80 dB**, and after expansion it corresponds to **40 dB**, **20 dB** and **10 dB** respectively).

The example on the right shows the same logger plot with the different dynamic ranges (80 and 20 dB).



Toggle grid lines on/off

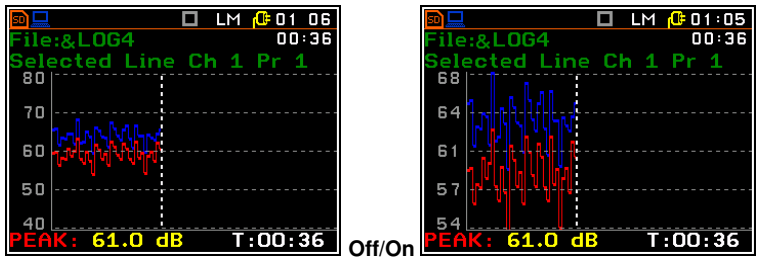
The **Grid** item allows you to toggle the horizontal grid lines on or off in all graphical views.



Automatic Y scale adjustment

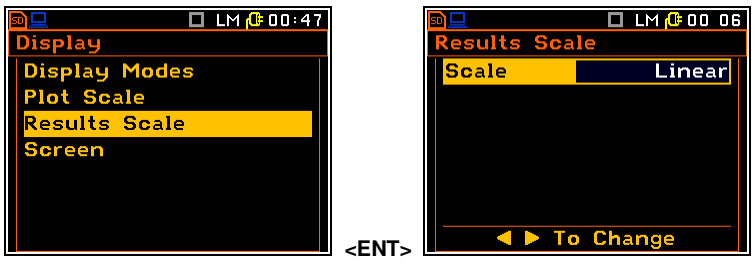
The **Autoscale** item enables or disables the automatic adjustment of the Y-axis scale to display the plot on the full screen. The adjustment is made automatically each time the plot is refreshed.

The example on the right shows a graph with autoscaling off and on.

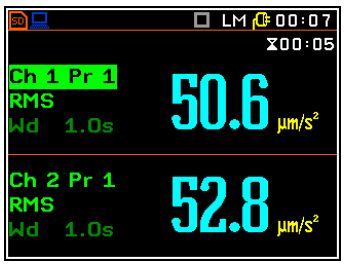


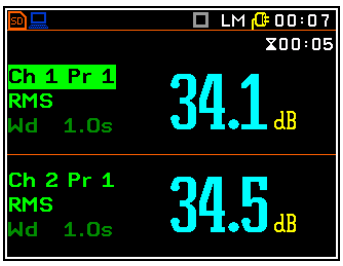
5.3 SETTING THE RESULT DISPLAY – RESULTS SCALE

The **Results Scale** item allows you to change the scale in the non-graphic views of the measurement result.



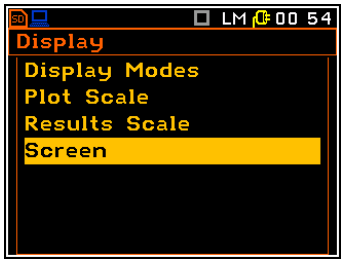
The **Scale** can be **Linear** or **Logarithm**. In the case of **Linear**, all measurement results are expressed in absolute units, whereas in the case of **Logarithm**, the measurement results are expressed in decibels (the results are related to the values set in the **Reference Levels** screen (*path: <Menu> / Auxiliary Setup / Reference Levels*).





5.4 CONFIGURING DISPLAY PARAMETERS – SCREEN

The **Screen** item allows you to change the colour theme of the display, adjust the brightness and turn the screen saver on or off.



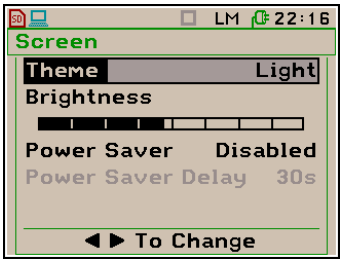
<ENT>

Note: *The new brightness is confirmed each time the ◄ or ► key is pressed (the new value is selected without confirmation by pressing the* ***<ENTER>*** *key).*

Colour Theme

The **Theme** item allows you to set the colour theme of the display.

You can choose between **Dark** and **Light** themes. The **Dark** theme is presented in this manual.



Adjusting the display brightness

The **Brightness** item allows you to set the desired brightness of the display with the ◄ / ► keys.

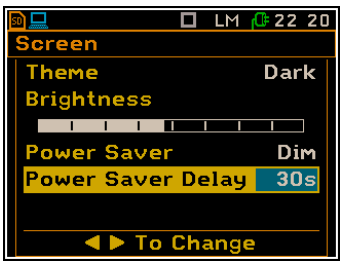
Power saver function

The internal power source of the instrument can be conserved by reducing the brightness of the screen whenever possible.

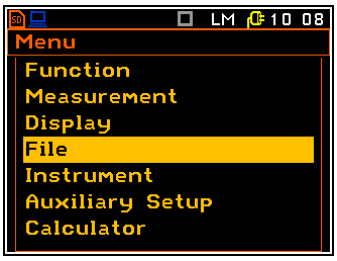
The **Power Saver** function can be **Disabled** or you can choose between two options: the screen can be turned off (**Screen Off**) or dimmed (**Dim**). If one of these options is selected, the screen will be turned off or dimmed after the number of seconds (defined in the **Power Saver Delay** item) elapsed from the moment any key is pressed. Once this has happened, the first press of any key will restore the screen brightness.

Power saver delay

The **Power Saver Delay** item defines the delay between the last use of any key and the entry into Power saver mode. This delay period can be set from **5 s** to **60 s**.



6 SAVING AND MANAGING FILES – File



The **File** section contains the elements for managing the data and setup files saved in the instrument memory.

Recording measurement results is an essential task for the efficient use of the instrument. Temporary data and current settings are stored in the internal memory. Measurement result and setup files are saved on the micro-SD card.

Instrument's files contain following data:

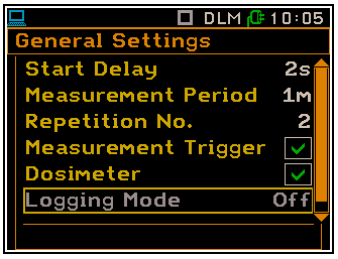
- **Level Meter** measurement results,
- **1/1 Octave** analysis measurement results,
- **1/3 Octave** analysis measurement results,
- time-history (logger) results,
- waveform records,
- settings.

Note: *Setup files can only be saved manually, files with main result can be saved manually or automatically, Logger and Wave files can only be saved automatically (see Chapter 2.6).*

The **File** list contains the following items, allowing you to:

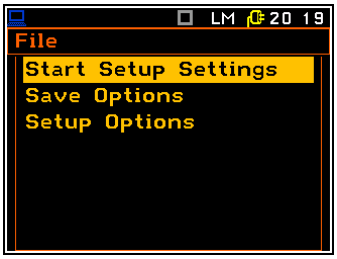
File Manager	manage files saved on the instrument's memory card,
Setup Manager	manage the Setup files,
Start Setup Settings	select Setup files to be displayed in the **Select Setup** list that appears when the instrument is started,
Save Options	set the options for saving the measurement results,
Setup Options	set the options for saving the setup.

Note: *Due to the limited internal memory capacity of the instrument, all files can only be saved on the SD card. Therefore, if there is no SD card in the instrument, no file can be created.*



In this case:

- *the **Logger Mode** is Off and the **Data Logging** item in the **Measurement** menu is not active,*

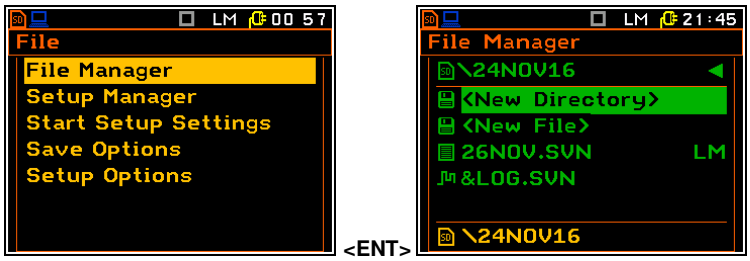


- *the **File Manager** and **Setup Manger** items are not displayed in the **File** list, and*

- *all items in the **Save Options** and **Setup Options** lists are unavailable.*

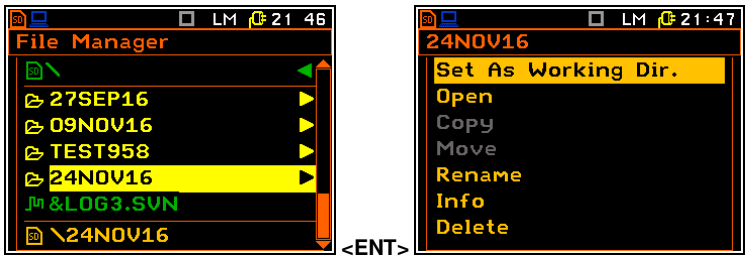
6.1 MANAGING FILES – FILE MANAGER

The **File Manager** is used to check the contents of the memory and perform commands on the main results, logger and wave files such as: open, delete, rename, create new files or directories and view file and directory information.



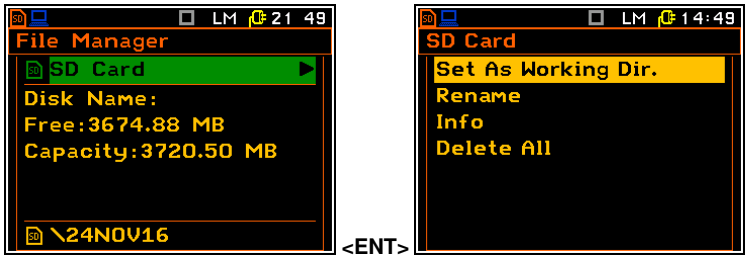
The **File Manager** screen is closed and the instrument returns to the **File** list when **<ESC>** is pressed.

The **File Manager** screen displays a list of files and directories. Files are stored in directories, which are organised hierarchically. Directory names do not have extensions. Pressing **<ENTER>** on the selected item will open a screen with a list of commands that are available for that item.

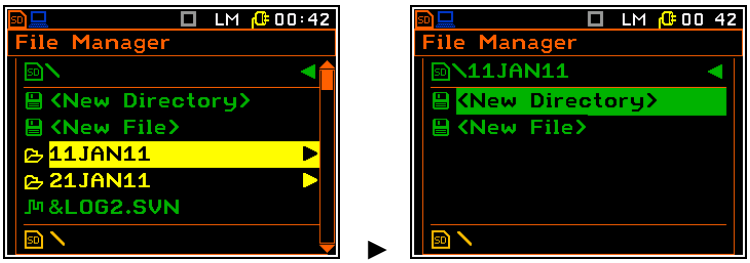


The contents of the command list depend on the item for which it has been opened.

The example on the right shows the command list for the SD disc.

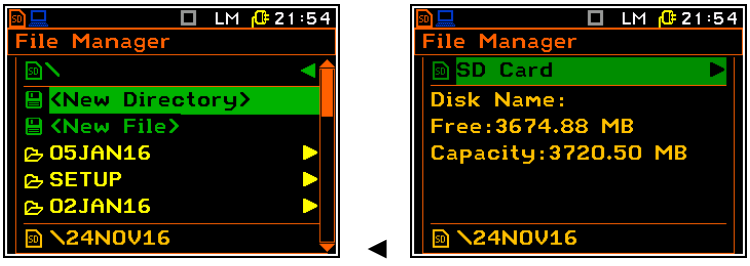


The selected directory can be opened in two ways: by pressing the ► key or by opening the command list with the **<ENTER>** key, then selecting the **Open** item and pressing **<ENTER>** again.



To return to the top directory in the hierarchy, press the ◄ key.

The highest directory contains the name and icon of the **SD Card** and the description of the memory: **Disk Name**, **Free** memory and **Capacity** (total memory space).



In the **File Manager** screen, files are described by their file name with an extension (SVN or WAV) and an additional icon and measurement function abbreviation for SVN files (**LM**, **S:1/1** etc.). Names where the first character is @ are from the **Auto Save** function.


Directory


Logger file &XXX.SVN


New file or directory

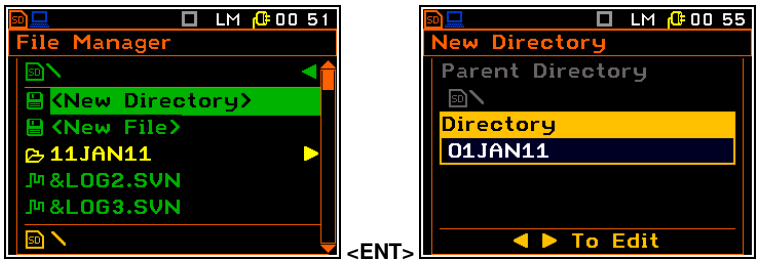

Wave file &XXX.WAV


Main results file XXX.SVN or @XXX.SVN


Setup file XXX.SVN

6.1.1 Creating a new directory

You can create a new directory on the SD card. To do this, enter the directory in which the new directory is to be created and press **<ENTER>** on the **<New Directory>** item. The proposed new directory name will be displayed. If a directory with the same name already exists, a warning will be displayed.



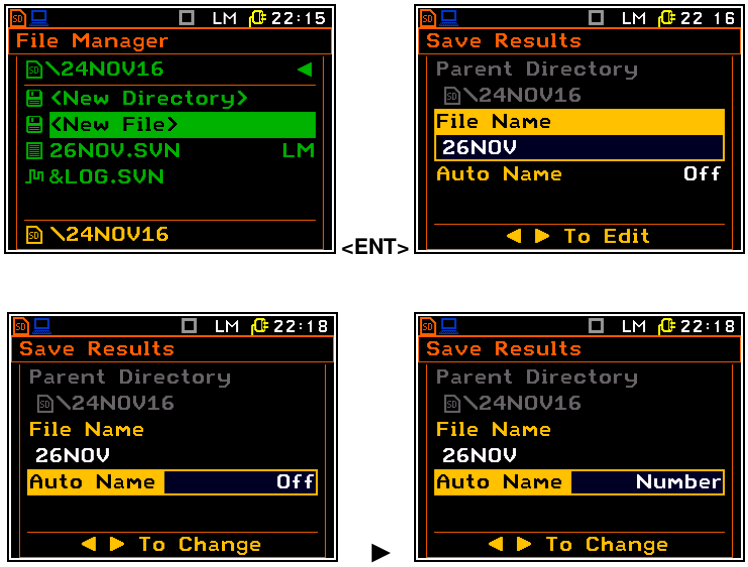
6.1.2 Creating a new file containing the main results

To create a file containing the main results obtained of the last measurement, enter the directory in which the new file is to be created, select **<New File>** and press **<ENTER>**.

The **Save Results** screen will open. The instrument will propose the automatic file name associated with the current date as set in the instrument.

There are two ways to name the new file:

- to edit the name manually (**Auto Name: Off**) or
- to edit the name automatically by changing only the number at the end of the file name (**Auto Name: Number**).



If **Auto Name** is **Off**, the new file will be created with the name given in the **File Name** item. This file name can be edited in the special screen opened with the ► key.

If **Auto Name** is **Number**, the new file will be created with the name given in the **File Name** item, but with the number 0 added at the end. If a sequence of digits already exists at the end of the file name, the number formed by these digits is increased by one.

The number can be between 0 and N. The only limit on the N value is the length of the file name, which cannot exceed eight characters. When this limit is reached, the instrument will inform you and you should create a new file name.

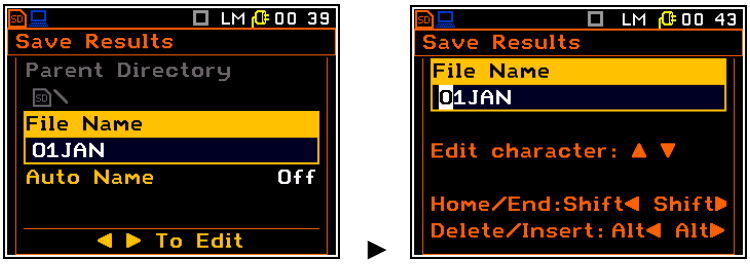
The default name for a file is displayed if there are no measurement files in the working directory. The default name will consist of the day number and the month abbreviation.

You can skip editing the file name and save the file by pressing **<ENTER>** or return to the **File** list or the measurement view by pressing **<ESC>**.

File name editing

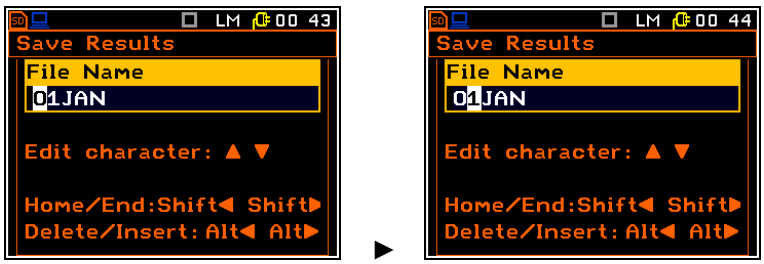
To start file editing, select the **File Name** item and press the ◄ / ► key. The editor screen will open. The editing procedure is shown below.

The editor screen includes help information.



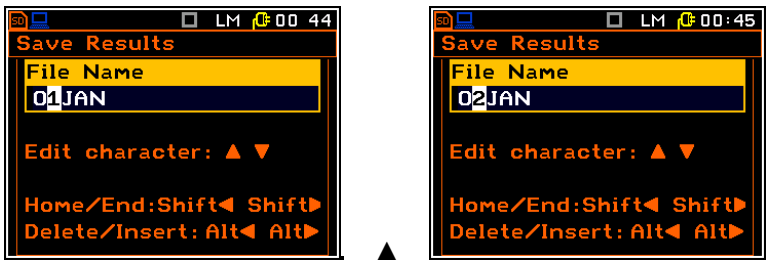
Selecting the character position

Use the ◄ / ► keys to select the position of the character in the edited text. You can change the character for the current position, delete the current character or insert a new blank character before the selected position.



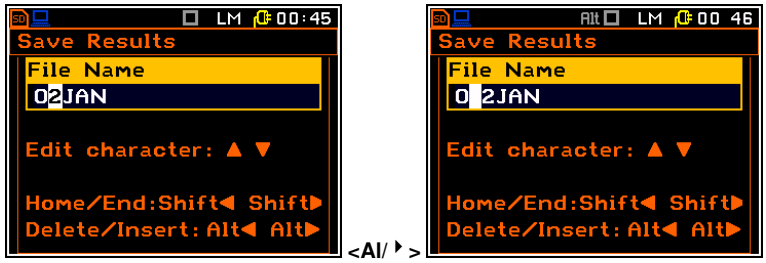
Changing characters

Use the ▲/▼ keys to select the ASCII characters. Each time you press the key, the digits, letters and other characters appear in reverse.



Inserting, deleting a position

Use the ◄ / ► keys together with **<Alt>** to delete or insert the position in the edited text.



<Alt/ ▸ >

The edited name is accepted and the instrument returns to the **Save Results** screen when **<ENTER>** is pressed. Pressing **<ENTER>** will save the file in the working directory.

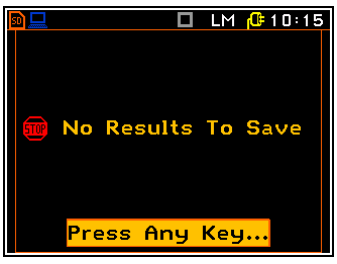
The instrument will inform you of the successful saving and wait for your reaction (any key except **<Shift>** or **<Alt>** should be pressed) and if you press a key it will return to the **File Manager** screen.

The special warning is displayed if the file with the same edited name already exists in the working directory. The instrument then waits for the user to decide whether to **Skip** saving or to **Replace** the existing file.

Note: *Files can be overwritten (with the same filename) without any confirmation if the* ***Replace*** *option is enabled (path: <Menu> / File / Save Options).*

Saving is not possible while the instrument is taking measurements. If you try to save the file, will follow the message “Measurement in progress!” will be displayed for about 3 seconds.

The message “No Results To Save” is displayed after the attempt to execute the Save command if no measurements have been performed and there are no results to sav. The instrument then waits for your respond (any key except **<Shift>** or **<Alt>** should be pressed) and returns to the measurement view.

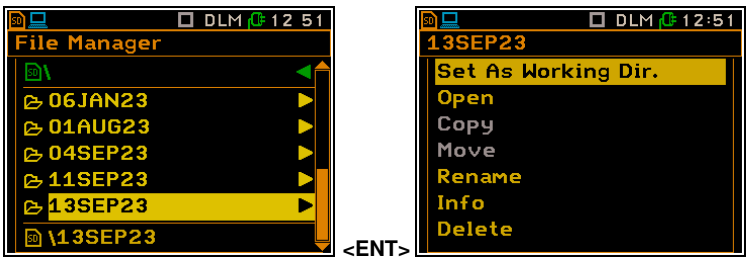


Note: *Direct access to the* ***Save Results*** *screen is possible after pressing the <Save> key (****<ENTER>*** *+* ***<Alt>****) if the* ***Auto Save*** *option is disabled (path: Menu / File / Save Options). Otherwise (****Auto Save*** *option is on), the results are automatically saved to the file with the incremented name number after pressing these keys.*

6.1.3 Setting a working directory – Set As Working Dir.

You can set the directory for automatic saving of data files. To do this, select the required directory and press **<ENTER>**. From the list of commands, select **Set As Working Dir.** and press **<ENTER>**.

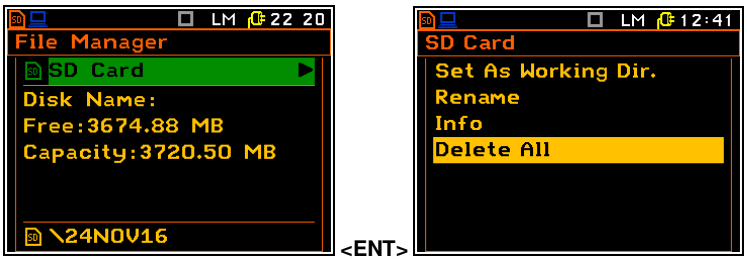
From this point on, all automatically saved files will be stored in this directory.



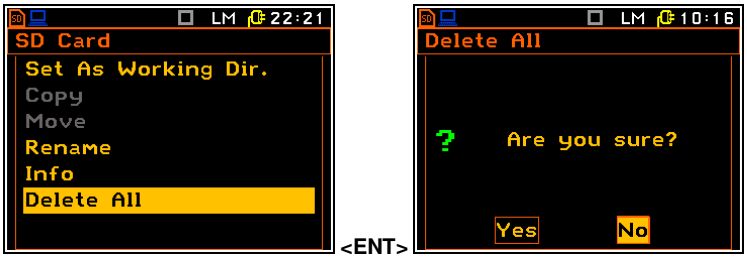
Note: *The working directory name is displayed on the bottom line of the screen.*

6.1.4 Erasing the SD card memory – Delete All

You can erase all files on the SD card. To do this, select **SD Card** and press **<ENTER>**. From the list of commands, select the **Delete All** item and press **<ENTER>**.

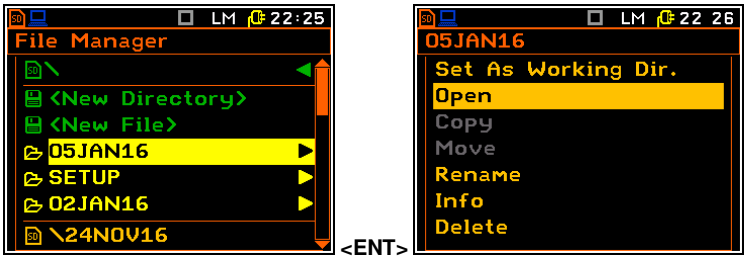


Before deleting files, you will be asked to confirm the operation. Select your choice and press **<ENTER>** or simply press **<ESC>** to continue without deleting.

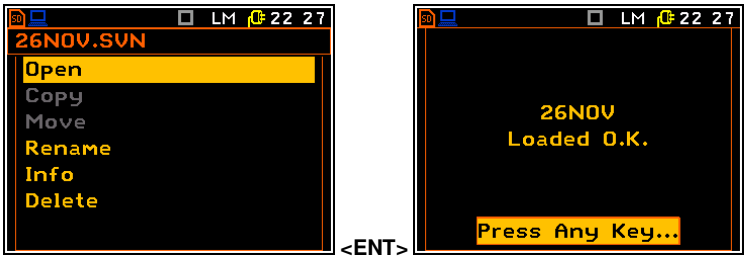


6.1.5 Opening files/directories – Open

To open a file or directory, select the file/directory and press **<ENTER>**. From the list of commands, select the **Open** item and press **<ENTER>**. The effect of such a command on the directory is the same as opening the directory with the ► key.



Opening the result file means that the measurement results stored in this file are loaded to the instrument's flash memory and can be viewed on the display.

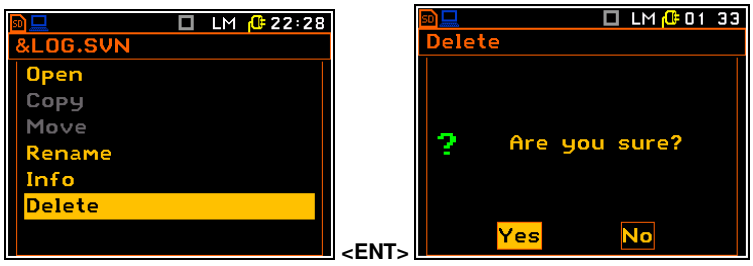


Note: *The Copy and Move commands are blocked because the SV 106D doesn't use the flash-memory (**Internal**) to store data files. It is also not possible to copy or move files/directories between different directories on the SD Card.*

6.1.6 Deleting files/directories – Delete

To delete a file/directory, select the file/directory to be deleted and press **<ENTER>**. From the list of commands, select the **Delete** item and press **<ENTER>** again.

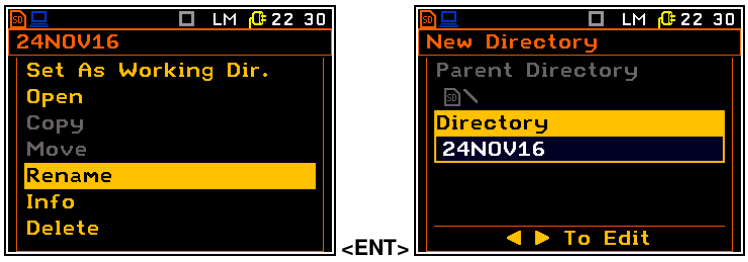
Before deleting files/directories, you will be asked to confirm the operation. Select your choice and press **<ENTER>** or simply press **<ESC>** to continue without deleting.



6.1.7 Renaming file/directory – Rename

To rename a file/directory, select the file/directory to be renamed and press **<ENTER>**. From the list of commands, select the **Move** item and press **<ENTER>**.

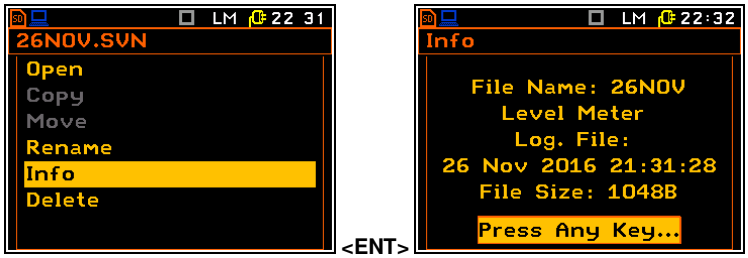
The text editor screen will appear allowing you to rename the file/directory.



6.1.8 Viewing about file/directory information – Info

To obtain information about a file or directory, select the file/directory and press **<ENTER>**. From the list of commands, select the **Info** item and press **<ENTER>**.

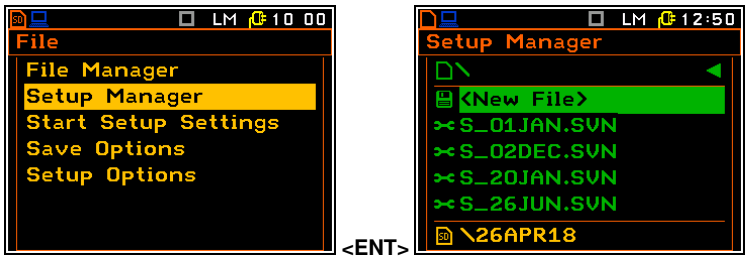
The instrument will display the information about the selected file/ directory.



6.2 MANAGING SETUP FILES – SETUP MANAGER

The **Setup Manager** allows you to save, delete, rename or load the settings in the setup files.

Only setup files are displayed in the **Setup Manager** screen. Setup files have the **SVN** extension and the  icon.



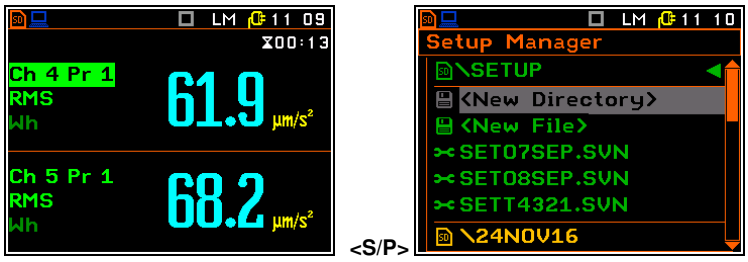
Note: *The setup files are stored in the default SETUP directory. The* ***Setup Manger*** *always opens this directory after pressing* ***<ENTER>*** *and it is not possible to change this directory from the* ***Setup Manager*** *screen.*

6.2.1 Saving setup files

There are two ways to open the **Setup Manager** screen.

One way is to press the **<S/P>** key when no measurement is being performed.

The other option is to select the **Setup Manager** item from the **File** menu.



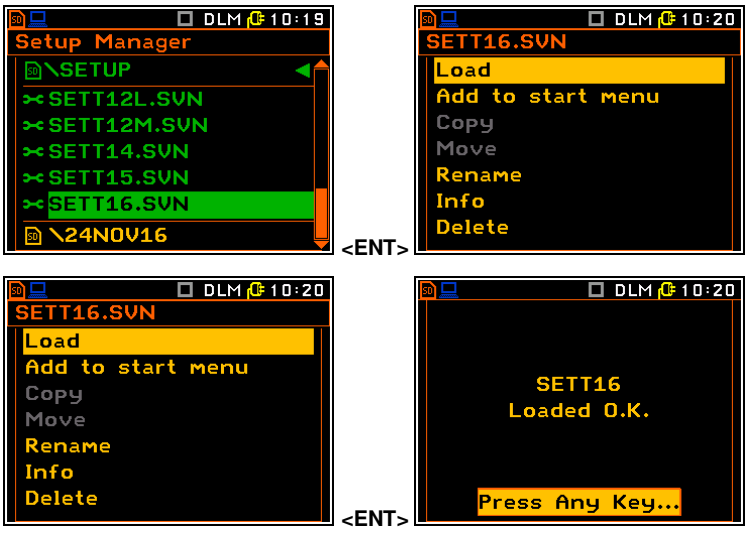
To save the setup file, enter the directory where the new file will be created, select the **<New File>** item and press **<ENTER>**. The **Save Setup** screen will then appear.

The instrument will automatically propose the file name associated with the current date set in the instrument.

There are two available ways for naming files: manually editing the name (**Auto Name: Off**) or automatically changing only the number at the end of the file name (**Auto Name: Number**).

6.2.2 Setup files commands

The **Setup Manager** allows you to apply commands to setup files in the same way as described above for the **File Manager**. To execute the command, select the file to which the command is to be applied and press **<ENTER>**. Then select the command from the command list and press **<ENTER>**.



Loading setup files

Loading a setup file means that the settings stored in that file are loaded to the instrument's flash memory. When the **<Start>** key is pressed, the instrument will start the measurement with the newly loaded settings.

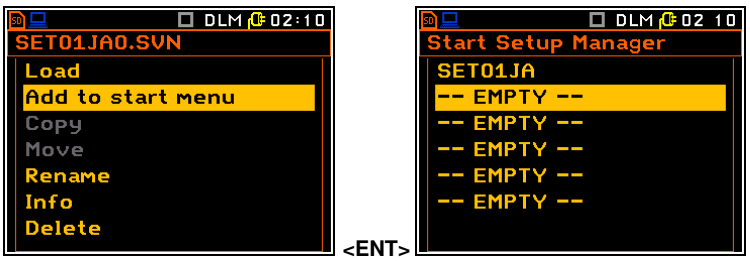
After loading the setup file, the instrument is reconfigured.

Selecting Setup configuration

When the instrument is switched on, the **Select Setup** screen appears, allowing you to select and activate measurement and instrument settings that have been previously configured and saved as a setup file, or predefined settings such as: **Current Setup**, **Hand-Arm 1**, **Whole-Body 1**, **Factory Settings**.

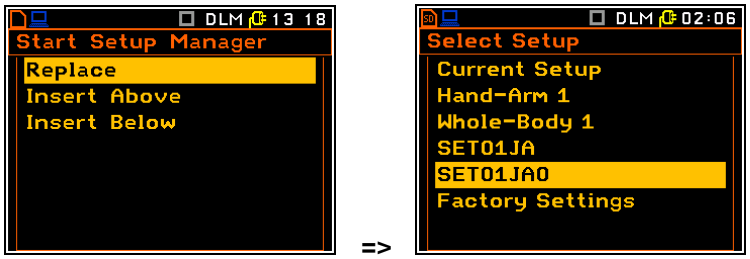
The **Add to start menu** command adds the current setup file to the list of setups you can select from the **Select Setup** screen (see Chapter 6.3).

From the **Start Setup Manager** screen, select the item used by the setup file or **– EMPTY--** and press **<ENTER>**.

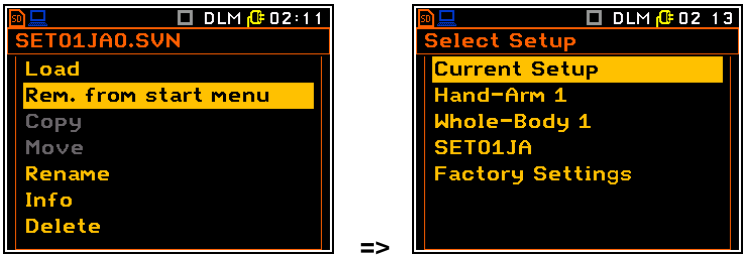


In the next screen, select the option: to replace the existing setup file (**Replace**), or to insert the new file above (**Insert Above**) or below (**Insert Below**) the item selected in the previous screen.

After pressing **<ENTER>** the new setup file will be placed in the **Select Setup** list.

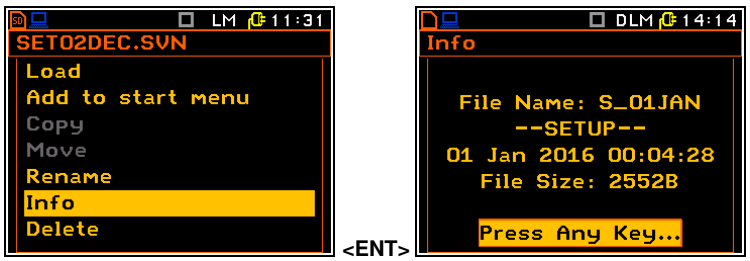


The **Rem. from start menu** command removes the current setup file from the **Select Setup** list.



Setup file info

To view information about the setup file, select the required file and press **<ENTER>**. From the command list, select **Info** and press **<ENTER>**.



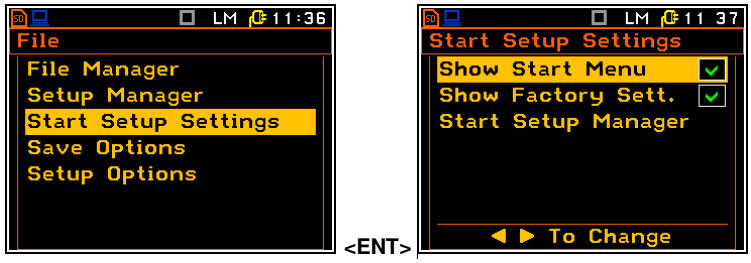
Deleting setup files

Deleting setup files is done in the same way as deleting files in **File Manager**.

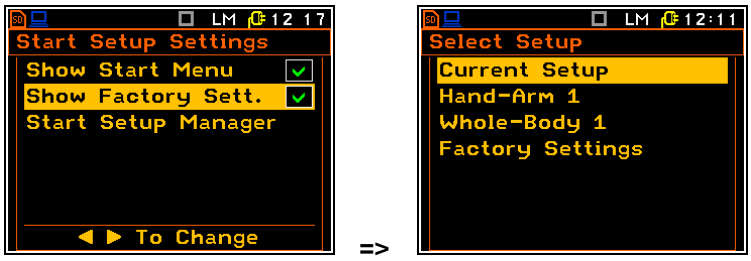
6.3 SELECTING SETUP AT STARTUP – START SETUP SETTINGS

The **Start Setup Settings** item allows you to customise the **Select Setup** menu that appears when the instrument is switched on.

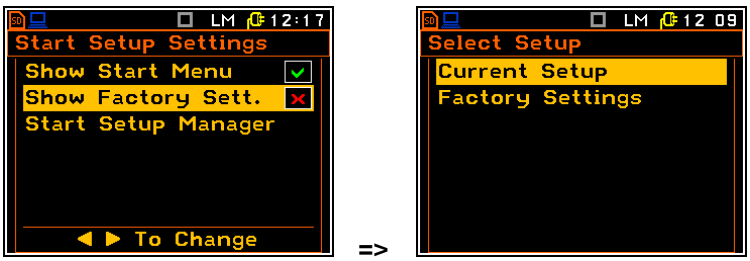
Setups from this list can be selected and loaded during the instrument startup.



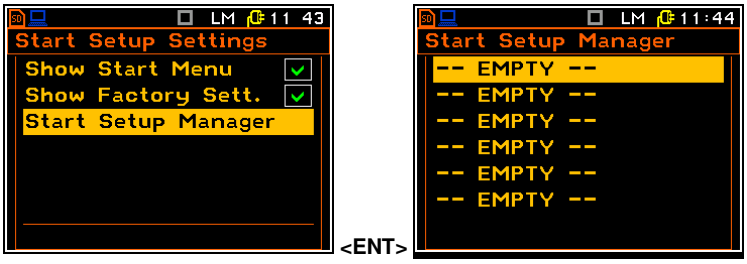
The **Show Start Menu** item switches the display of the **Select Setup** menu on/off.



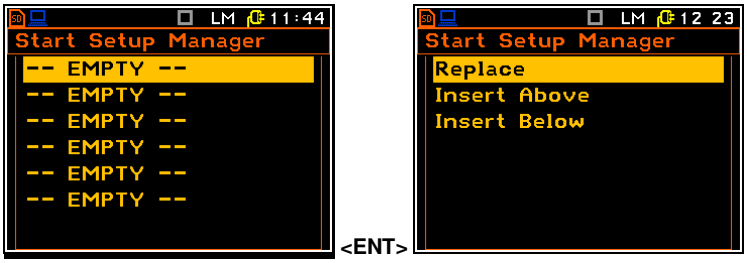
The **Show Factory Sett.** item switches on/off the display of the factory defined setups for hand-arm and whole-body (**Hand-Arm 1**, **Whole-Body 1**) measurements in the **Select Setup** menu.



The **Start Setup Manager** item allows you to select the user defined setups to be included in the **Select Setup** list.

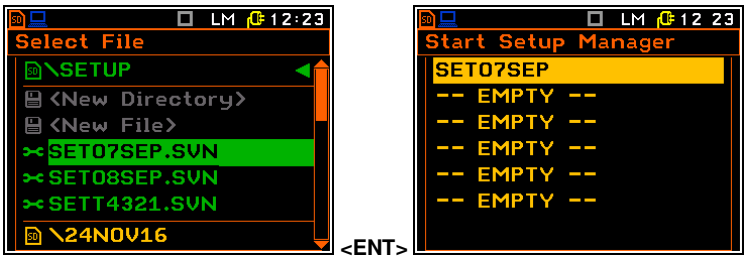


To add the setup to the **Select Setup** list, select the items in the list that is initially marked as **--EMPTY--** and press **<ENTER>**. Select the **Replace**, **Insert Above** or **Insert Below** option to add the new setup to the desired position in the list.



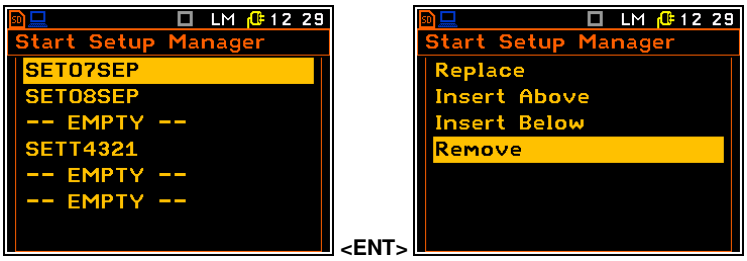
Select the setup file from the instrument's memory and press **<ENTER>** to assign its settings to the desired item in the **Select Setup** menu.

Repeat this procedure to assign further setups to other items in this list, if required.



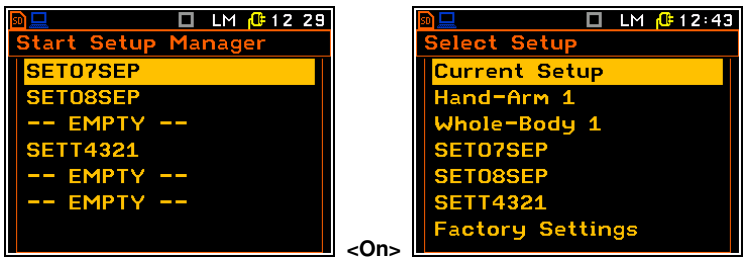
The **Inset Above** and **Insert Below** commands allow you to move the setup above or below the selected line.

For existing setups, the **Remove** option is also available. This command removes the setup from the list but does not remove the setup file.



When the instrument is restarted, the user edited setups will be displayed between the **Whole-Body 1** and **Factory Settings** setups.

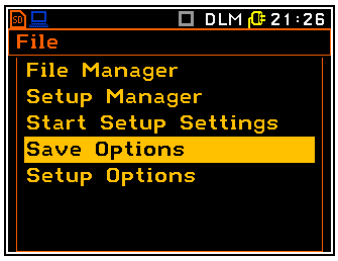
Pressing the **<ENTER>** key will load the selected setup.



6.4 DATA SAVING OPTIONS – SAVE OPTIONS

The **Save Options** item allows you to configure data saving.

When saving, you can replace an existing file in the memory by a new file with a new file with the same name (**Replace**), automatically save the main results for each measurement cycle (**Auto Save**), manually save the main results with the **<Save>** key using the automatic incrementing of the number of the file name without opening the **Save Setup** screen (**Direct Save**).

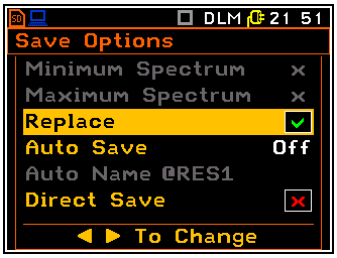


<ENT>

The **Minimum Spectrum** and **Maximum Spectrum** options allow the minimum and/or maximum spectra to be stored along with the RMS spectra. These items are active for the **1/1 Octave** and **1/3 Octave** functions.

Replacement of existing files by the new ones

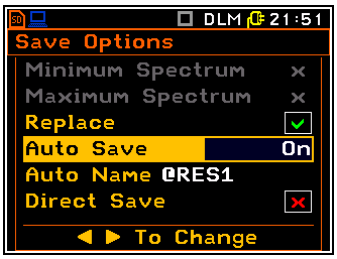
If **Replace** is enabled, the instrument will replace the existing file with the new one without confirmation. This option is useful in remote mode and for files created using the **Auto Save** function.



If the **Replace** option is disabled, you will be informed that the file with the same name already exists and you will be asked to choose whether to **Skip** saving or **Replace** the existing file.

Automatic file saving

The **Auto Save** item allows you to set the automatic saving of the main results with an automatically incremented number. If enabled, the **Auto Name** item will appear allowing you to set the "start name" of the file series.



Note: *The* ***Auto Save*** *function can only be performed if the value of the* ***Measurement Period*** *(path: Menu / Measurement / General Settings) is not less than 16 seconds. If it is less than 16 seconds, the results will not be saved, and a message will be displayed. There is only one exception - if* ***Repetition No.*** *(path: Menu / Measurement / General Settings) is equal to one, the* ***Auto Save*** *function is performed regardless of the value of the integration period.*

If the **Measurement Period** is too short for the **Auto Save** function or the **Repetition No.** is not one, the following message appears on the display.

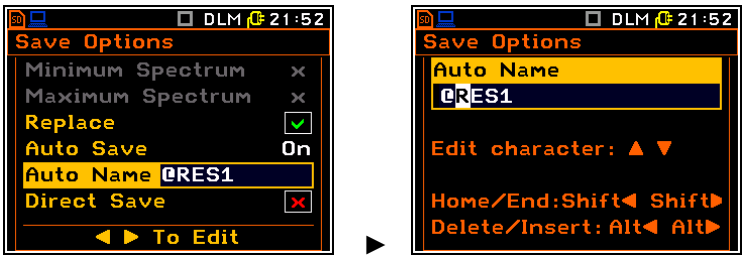
When the **Auto Save** function is active, after the measurements have been started by pressing the **<Start>** key, the results of the first **Measurement Period** are automatically saved in the SVN file with the “start name”. This file is saved in the Working directory.

If the **Repetition No.** is greater than one, the next set of results will be saved in the file with the “start name” increased by one, and so on.

If another series of measurements is started with the **<Start>** key, the results are automatically saved in SVN files with the same names but with numbers increased by one from the number of the last file in the previous series.

Auto Save “start name”

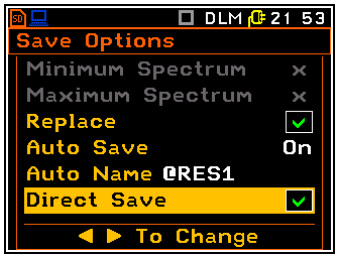
The **Auto Name** item, which becomes active when **Auto Save** is **On**, allows you to edit the name of the “start file”. To edit the file name, press the ► key to open the text editor screen.



Direct Save function

The **Direct Save** function allows you to quickly save the main result files after pressing the **<Alt>** and **<ENTER>** keys after stopping the measurement. The file names are saved with the automatically incremented name number.

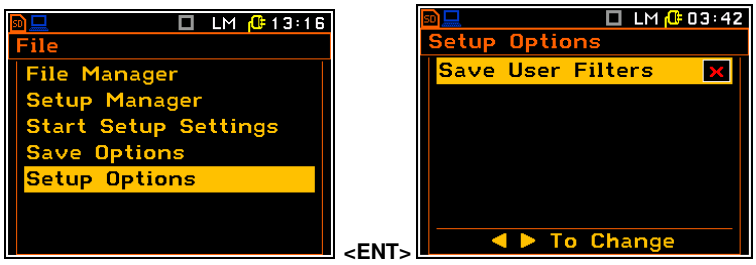
If this option is not active, pressing these keys will take you to the **Save** screen.



6.5 OPTIONS FOR SETUP FILES – SETUP OPTIONS

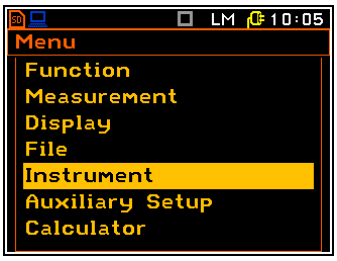
The **Setup Options** item allows you to select options for saving the setup files.

If you enable the **Save User Filters** option, the user filter coefficients will be saved in the setup files.



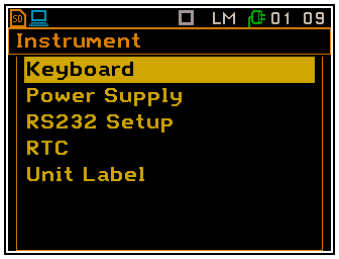
7 CONFIGURING INSTRUMENT PARAMETERS – Instrument

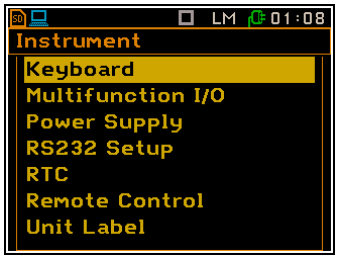
The **Instrument** section is used to set various parameters, mainly related to the configuration of the instrument's hardware components.



The contents of the **Instrument** item depend on **Instrument Mode** - Simple or Advanced.

Advanced Mode allows more parameters to be configured.



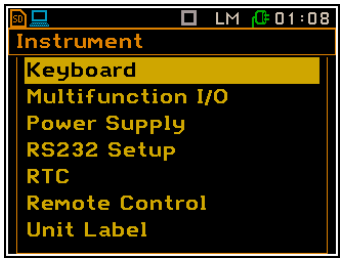


The **Instrument** section in Advanced mode contains the following items, allowing you to:

Keyboard	set the mode of the **<Shift>**, **<Alt>** and **<Start/Stop>** keys.
Multifunction I/O	configure functionality of the I/O port.
Power Supply	check the power source of the instrument.
RS232 Setup	set the RS232 port.
RTC	set the Real-Time Clock.
Remote Control	enable or disable the fault acknowledgement.
Unit Label	display instrument properties.

7.1 KEYBOARD PROGRAMMING – KEYBOARD

The **Keyboard** item allows you to set the mode of operation of the **<Shift>**, **<Alt>** and **<Start/Stop>** keys, and to enable the option of waking up when the key is pressed if it is working in the screen saver mode.



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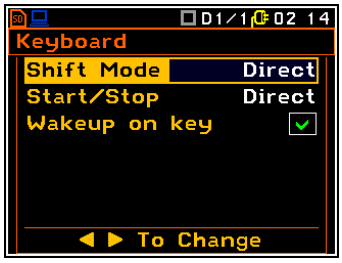
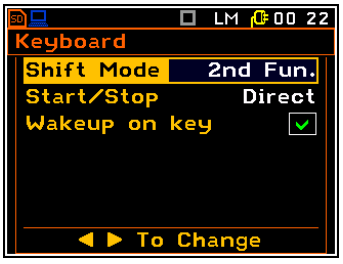


<Shift> / <Alt> key mode

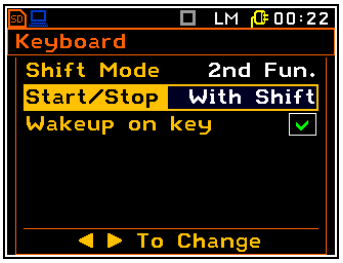
The **Shift Mode** item allows you to choose between the **2nd Fun.** and **Direct** options. When the **Direct** option is selected, the **<Shift>** and **<Alt>** keys work like a computer keyboard – to achieve the desired result, the second key should be pressed simultaneously with **<Shift>**/**<Alt>**. When the **2nd Fun.** option is selected, the **<Shift>**/**<Alt>** keys work in sequence with the other one – just like on smartphones. This allows you to operate the instrument with one hand.



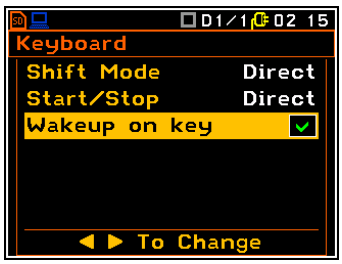
<Start/Stop> key mode

The **Start/Stop** item allows you to choose between the **Direct** and **With Shift** option. When the **Direct** option is selected, the instrument will respond to each press of the **<Start/Stop>** key, starting or stopping the measurement.

When the **With Shift** option is selected, the **<Start/Stop>** key will operate when the **<Shift>** key is pressed simultaneously or in sequence. The measurements are started or stopped when both keys are pressed.



Instrument wake-up function



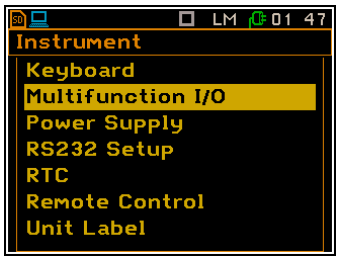
The **Wakeup on key** item allows you to program the behaviour of the instrument when a key is pressed while it is in screen save mode.

If it is **On**, any key press will wake up the instrument without any further action.

If it is **Off**, the instrument will wake up and the key action will be performed.

7.2 SETTING PARAMETERS OF THE I/O PORT – MULTIFUNCTION I/O

The **Multifunction I/O** item allows you to program the functionality of the **I/O** port (3.5 mm jack socket).



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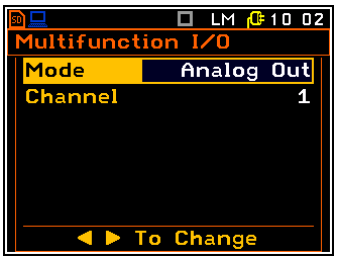
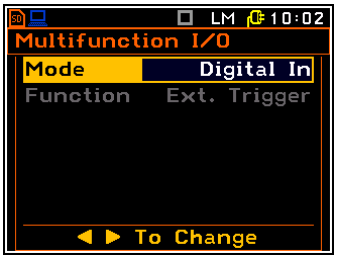


I/O port modes

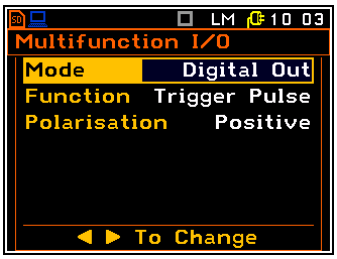
The **I/O** socket can be used as (**Mode**):

- output of the analogue signal (**Analog Out**), which is transmitted from the input of the instrument to its output without any digital processing (i.e., frequency filtering);
- input of the digital signal used as an external trigger to start the measurements (**Digital In**). In this case, the instrument acts as a "slave instrument",
- digital output (**Digital Out**) used to trigger other "slave" instruments (in this case, the instrument acts as a "master" instrument) or as a source of an alarm signal in the event of certain circumstances occurring during the measurements (i.e., the level of the input signal is higher than the trigger alarm threshold selected by the user).

A more detailed description of the **I/O** port is given in Appendix C.

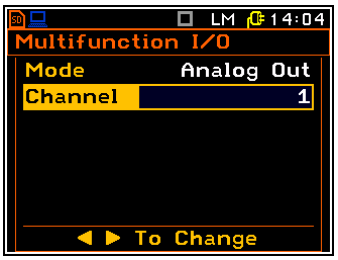


▶



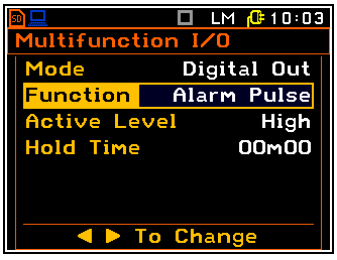
Assigning a channel to an analogue out

The **Channel** item allows you to select a channel connected to the analogue output.



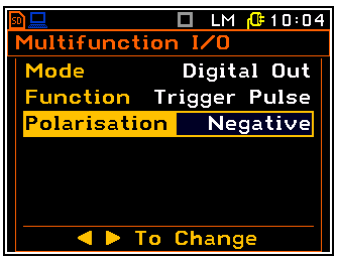
Digital output mode

The **Function** item allows you to set the function of the digital output of the **I/O** instrument's socket. The socket can be used as a source of a trigger pulse (**Trigger Pulse**) that starts the measurement in another "slave" instrument connected to the "master" instrument, or as an alarm signal that appears there when certain measurement conditions are met (**Alarm Pulse**).



Digital output signal polarisation

The **Polarisation** parameter defines which signal polarisation (**Negative** or **Positive**) is applied to the output trigger pulse.

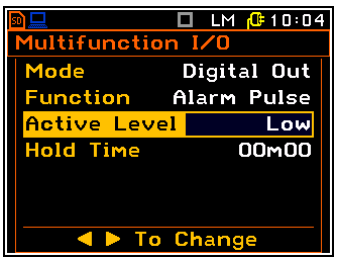


Active level for the alarm pulse generation

The **Active Level** parameter defines which level of the signal is to be treated as valid: **Low** or **High** ("negative" or "positive" logic).

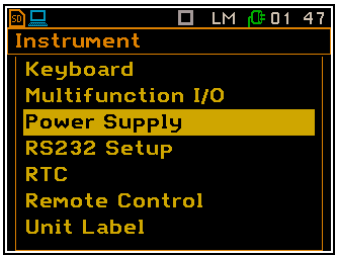
Alarm duration

The **Hold Time** item allows you to select the minimum duration of the alarm signal.



7.3 CHECKING POWER – POWER SUPPLY

The **Power Supply** item allows you to check the instrument's power source: internal battery status, external power source and voltage.



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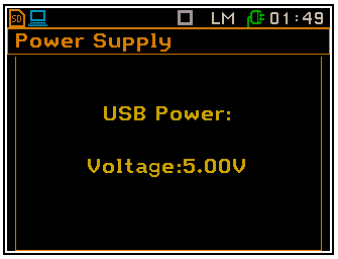
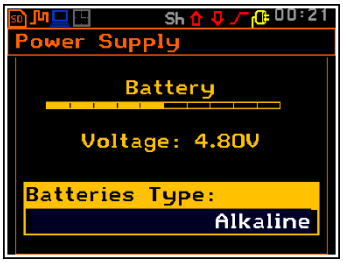


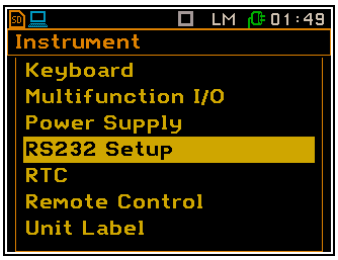
The instrument can be powered by four AA rechargeable or standard alkaline batteries or by the USB interface when its USB Device socket is connected by cable to a PC or USB power supply such as the SA 54.

If the instrument is powered by internal batteries, it is recommended to set the type of batteries (**Alkaline** or **Rechargeable**) in the **Batteries Type** item for better discharge estimation.

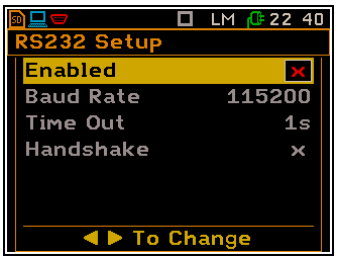


7.4 PROGRAMMING INSTRUMENTS SERIAL PORT – RS232 SETUP

The **RS232 Setup** item allows you to program the RS232 serial port.

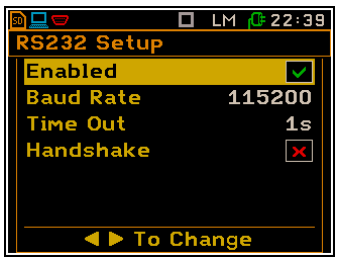


<ENT>



There are three parameters to set:

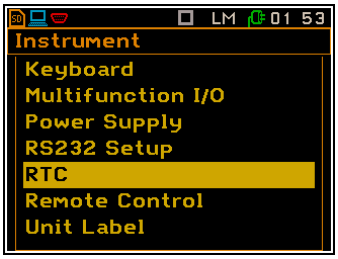
- **Baud Rate: 1200** .. **115200** bits/s),
- **Time Out**, time limit during which the data transfer should be performed,
- **Handshake**: on/off.



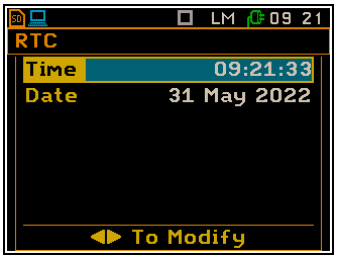
The other RS 232 transmission parameters are fixed at **8 bits for data**, **No parity** & **1 Stop bit**.

7.5 PROGRAMMING THE INSTRUMENT'S INTERNAL REAL TIME CLOCK – RTC

The **RTC** item allows you to program the internal **Real Time Clock**. This clock is displayed in the top right corner of the display.



<ENT>

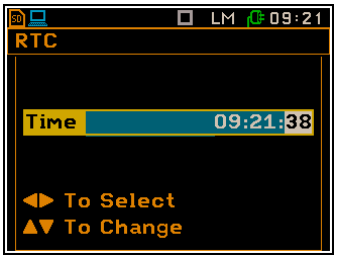


The desired time (hour, minute and second) is set in a special window that opens with the ◄ / ► key when the **Time** item is selected.

To set the hour, minute or second, use the ◄ / ► keys to select the appropriate field and the ▲ / ▼ keys together with <Alt> to select the value.

Press **<ENTER>** to confirm the selection.

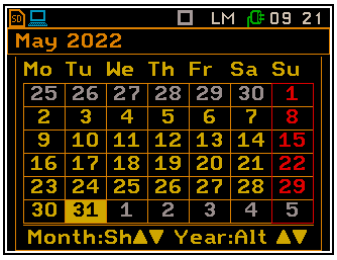
If you exit this window with **<ESC>** the new time will be also saved.



The required date can be selected in a special window, which is opened with the ◄ / ► key when the **Date** item is selected.

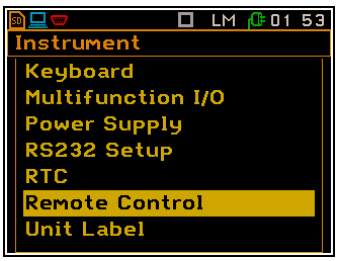
To set the date, select its position in the calendar with the ◄ / ► or ▲ / ▼ key and press **<ENTER>** to confirm the selection.

Exiting this window with **<ESC>** will also save the new time.

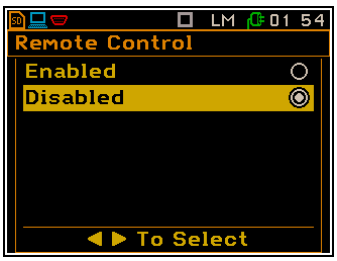


7.6 ACTIVATING FAULT ACKNOWLEDGEMENT – REMOTE CONTROL

The **Remote Control** item allows you to enable/disable fault acknowledgement. If automatic acknowledgement is **Enabled**, the instrument automatically acknowledges warnings after 5 seconds and no user action is required. This function is useful when the instrument is remotely controlled. If automatic acknowledgement is **Disabled**, the instrument waits for the user to react. The **Disabled** option is used during the normal operation of the instrument.



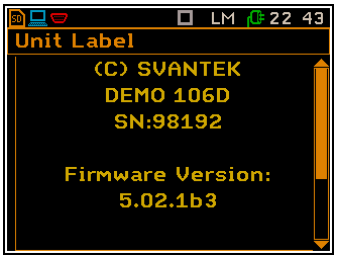
<ENT>



7.7 CHECKING INSTRUMENT PROPERTIES – UNIT LABEL

The **Unit Label** item allows you to check information about the instrument type, its serial number, the current software version installed and the relevant standards that the instrument complies with.

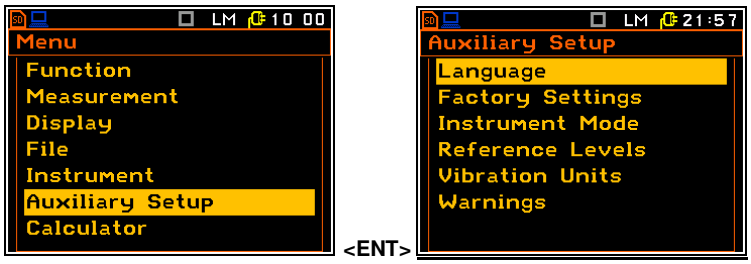
The displayed text is scrolled on the display after pressing the ▲ / ▼ key.



Note: *The contents of the* ***Unit Label*** *screen should always be sent to Svantek's local service department or official representative in the event of any problems encountered by the user during the normal operation of the instrument.*

8 AUXILIARY SETTINGS – Auxiliary Setup

The **Auxiliary Setup** section provides settings for additional functions, such as customising the instrument's interface to meet specific user requirements, that are not directly related to the instrument's hardware.



In the **Auxiliary Setup** section contains the following items, allowing you to:

Language	select the language of the user interface.
Factory Settings	return to the default, factory settings.
Instrument Mode	select the set of instrument functions available.
Reference Levels	set the reference levels for logarithmic units.
User Filters	define customized frequency filters for 1/1 and 1/3 octaves; this item is only available for **1/1 Octave** and **1/3 Octave** functions.
Vibration Units	select the Vibration units for displaying measurement results.
Warnings	configure warnings to be displayed during normal operation of the instrument.

8.1 SELECTING THE INTERFACE LANGUAGE – LANGUAGE

The **Language** item allows you to select the language of the user interface.

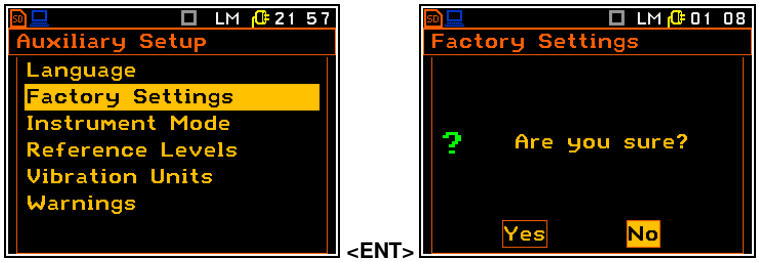
If, after switching on the instrument, the display shows an interface in an unknown language, you can reset the instrument with four **<Shift/Enter/Alt/Start>** keys pressed together. This will return the unit to the default setup with the English interface.

Note: *Some user interface languages should be unlocked by a special code.*

8.2 RESTORING FACTORY SETTINGS – FACTORY SETTINGS

The **Factory Settings** item allows you to restore the default settings of the instrument.

While on the **Factory Settings** item, press **<ENTER>**, select **Yes** in the **Factory Settings** window that opens and press **<ENTER>** to execute the operation.



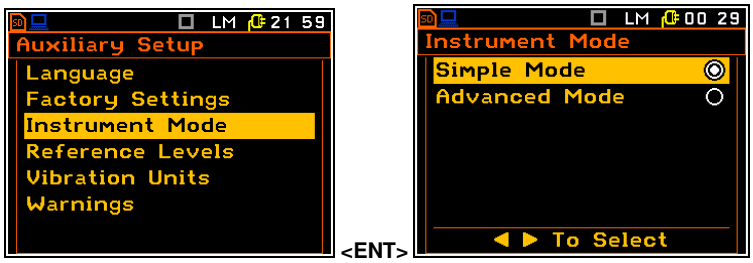
Note: *The factory setup can also be installed with the four* ***<Shift/Enter>*** *and* ***<Alt/Start>*** *keys pressed together.*

The message WAIT... is displayed during the clearing process. After returning to the default settings, the following message is displayed and the instrument waits for the user's reaction to press any key to continue.

Note: *The Factory Settings command also restores the English language interface.*

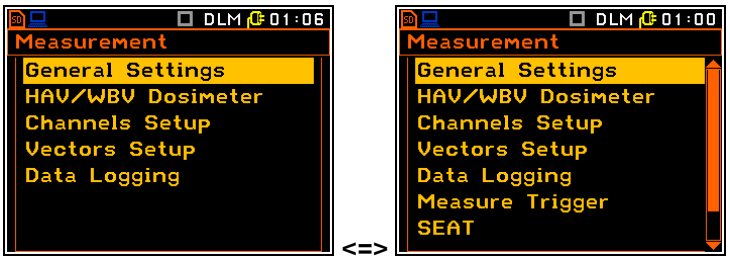
8.3 SELECTING THE INSTRUMENT MODE – INSTRUMENT MODE

The **Instrument Mode** item allows you to select the instrument mode, which defines the set of functions available: **Simple Mode** and **Advanced Mode**. **Advanced Mode** provides all available functions.

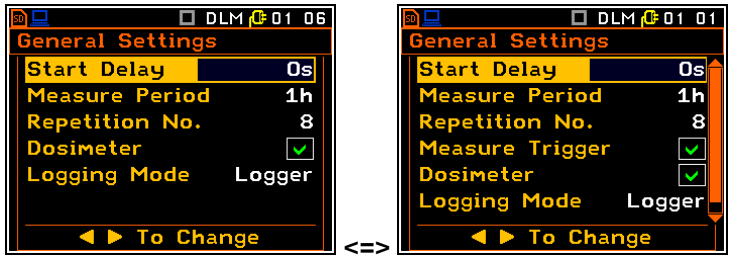


Simple Mode limits the set of functions available, excluding functions that are less frequently used, such as trigger, waveform and event recording, user filters, etc. Therefore, some menu lists will have different content for different instrument modes. Below are some screenshots showing the differences between Simple and Advanced modes.

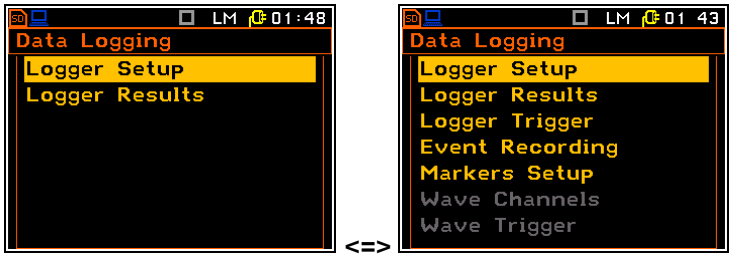
The **Measurement** screen in **Simple Mode** and **Advanced Mode**.



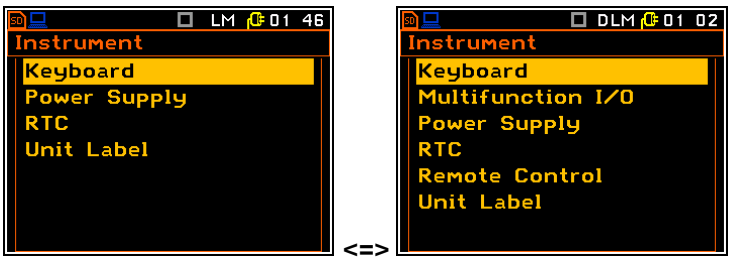
The **General Settings** screen in **Simple Mode** and **Advanced Mode**.



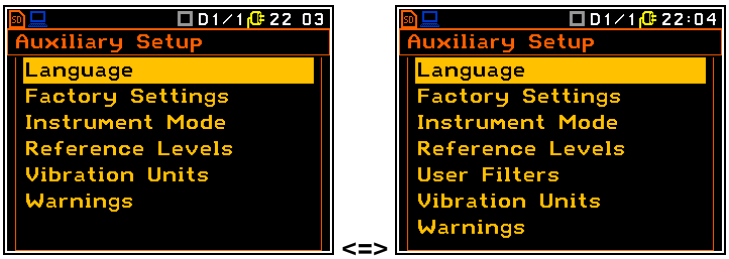
The **Data Logging** screen in **Simple Mode** and **Advanced Mode**.



The **Instrument** screen in **Simple Mode** and **Advanced Mode**.

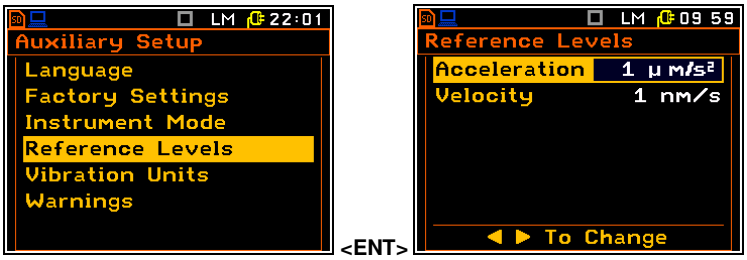


The **Auxiliary Setup** screen in **Simple Mode** and **Advanced Mode**.



8.4 SETTING REFERENCE LEVELS – REFERENCE LEVELS

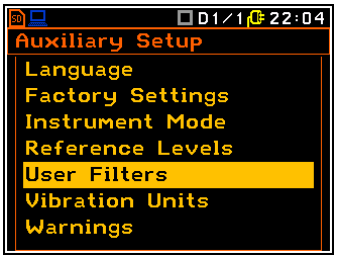
The **Reference Levels** item allows you to set the reference levels of the vibration signal. The values set here are taken into account when calculating the measurement results, which are expressed on a **Logarithmic** scale (in **dB**).



The **Acceleration** item allows you to set the reference level of the acceleration signal from **1 µms^{-2}** to **100 µms^{-2}**. The **Velocity** item allows you to set the reference level of the velocity signal from **1 nms^{-1}** to **100 nms^{-1}**.

8.5 SETTING USER FILTERS – USER FILTERS

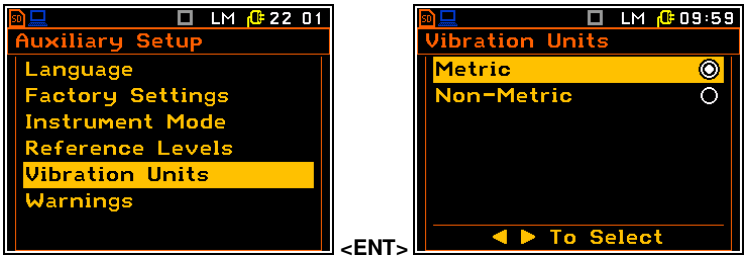
The **User Filters** item allows you to enter the coefficients of the user-defined frequency filters. This item is only active for the **1/1 Octave** and **1/3 Octave** functions (see Chapter 9).



8.6 SELECTING UNITS FOR VIBRATION RESULTS – VIBRATION UNITS

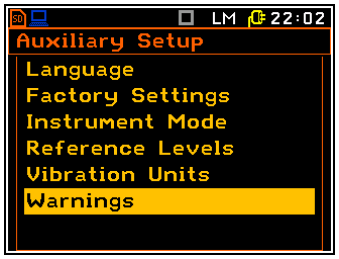
The **Vibration Units** item allows you to select the units for vibration measurements.

You can select **Non-Metric** units (e.g. g, ips, mil, etc.) or **Metric** units (e.g. m/s^2, m/s, m, etc.).

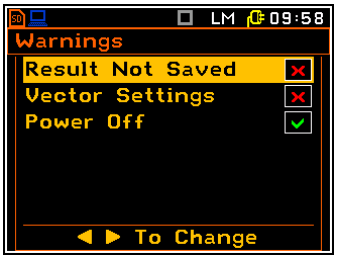


8.7 ACTIVATING WARNINGS – WARNINGS

The **Warnings** item allows you to enable messages to be displayed during normal operation of the instrument.

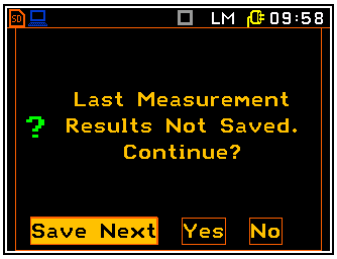


<ENT>



Warning when saving measurement results

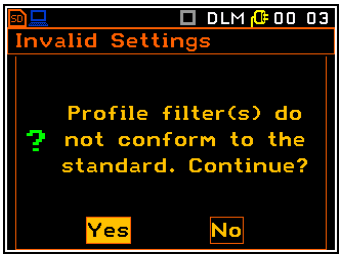
If the **Results Not Saved** parameter is on, the special warning will be displayed after pressing the **<Start>** key if the results of the previous measurement have not been saved.



The **Continue?** question appears with the warning message. There are three options: **Save Next**, **Yes** or **No** or. If **Yes** is selected, the instrument starts the new measurement without saving the results of the previous measurement. If **No** is selected, the instrument returns to the display of the measurement result without starting the new measurement. If **Save Next** is selected, the measurement results are saved in the file with the name number incremented by one and the instrument starts the new measurement.

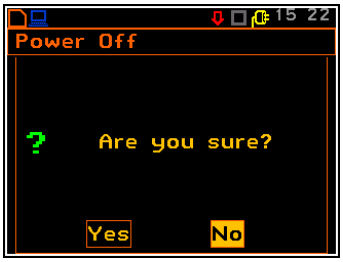
Vector settings warning

When the **Vector Settings** item is enabled, the special warning is displayed if the **Mode** parameter selected in the **Vector 1-3** or **Vector 4-6** screens does not comply with the standard.



Confirmation of instrument shutdown

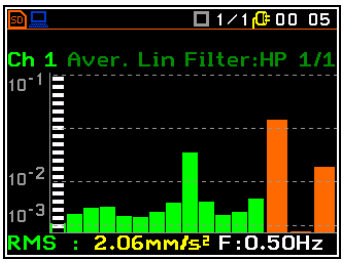
If the **Power Off** parameter is enabled, the instrument displays the warning message before switching off.



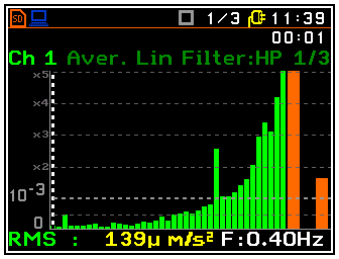
9 1/1 AND 1/3 OCTAVE ANALYSER

The instrument operates as the 1/1 octave or 1/3 octave analyser in a very similar way to the level meter. In addition, the 1/1 octave or 1/3 octave analysis is performed in parallel with the level meter measurements. All digital bandpass filters (thirteen 1/1 octave filters with centre frequencies from 2 kHz down to 0.8 Hz and thirty-nine 1/3 octave filters with centre frequencies from 40 kHz down to 0.8 Hz; in the "base two" system) work in real time with the **HP** weighting filter (Class 1 according to the IEC 61672-1 standard) and the linear RMS detector.

The results of a 1/1 octave or 1/3 octave analysis (also called spectrum analysis) can be viewed on a display in the **Spectrum** view. The availability of this view can be controlled by the user (*path: <Menu> / Display / Display Modes*).

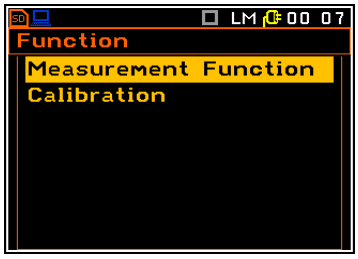


..

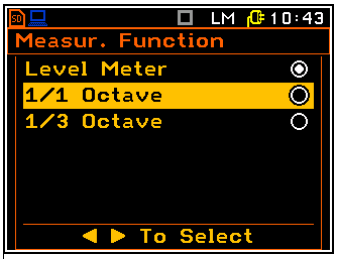


9.1 ACTIVATING THE 1/1 OCTAVE OR 1/3 OCTAVE FUNCTION

To activate the 1/1 octave or 1/3 octave analysis function, open the **Measurement Function** screen, select **1/1 Octave** or **1/3 Octave** and press **<ENTER>**.



<ENT>



Note: *The **1/1 Octave** and **1/3 Octave** functions are optional and should be unlocked by entering the activation code in the text editor screen that opens after the first attempt to select them. Once unlocked, these options are permanently available.*

Note: *It is not possible to change the current function during a measurement. In this case, the instrument will display the message: **"Measurement in Progress"**. To change the current function, the measurement must be stopped!*

9.2 CONFIGURING THE 1/1 OCTAVE OR 1/3 OCTAVE ANALYSER

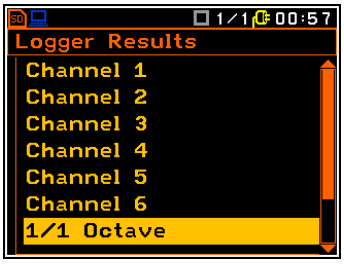
The execution of 1/1 octave and 1/3 octave analysis depends on the settings of **Measurement Period** and **Repetition No.** in the **General Settings** screen. Other parameters are set up by default: weighing filter (**HP**), frequency range (from 0.5 Hz up to 2 kHz for 1/1 octave analysis and from 0.40 Hz up to 2.50 kHz for 1/3 octave analysis) and measurement range (**126 m/s²**). The RMS result is measured in each 1/1 octave or 1/3 octave pass band.

In addition to the passband RMS results, three Total results are measured during 1/1 and 1/3 octave analysis. Parameters for Total results (weighting filter, type of integration filer for acceleration, velocity or displacement results and additional calibration factor) are set in the **Total Values** screen (*path: <Menu> / Display / Spectrum Display Setup*).

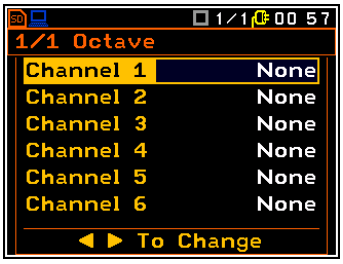
The output of a selected 1/1 octave or 1/3 octave filter can also be used as a trigger signal for various trigger applications: logger trigger, event trigger, waveform trigger and alarms.

9.3 LOGGING 1/1 OR 1/3 OCTAVE SPECTRA – LOGGER RESULTS

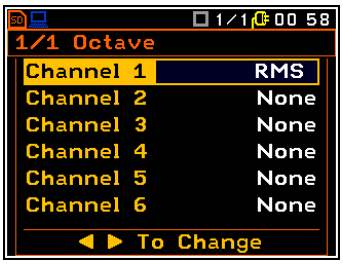
The 1/1 octave or 1/3 octave spectra can be saved in the logger file. Logging of spectra can be enabled for each channel (*path: <Menu> / Measurement / Data logging / Logger Results / 1/1 Octave or 1/3 Octave*).



<ENT>



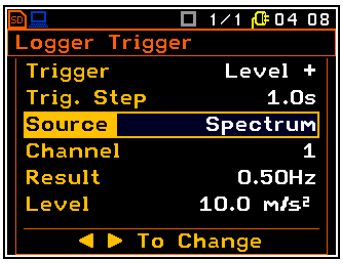
If **None** is selected in the **Channel x** item, the spectrum data will not be logged. If **RMS** value is selected, the RMS spectra for that channel will be logged.



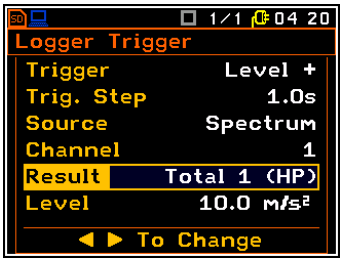
9.4 1/1 AND 1/3 OCTAVE BANDPASS RESULTS AS TRIGGER SOURCE

For the **1/1 Octave** or **1/3 Octave** functions, it is possible to define trigger conditions for logger, event, waveform and alarm triggers, based on the RMS levels for the selected spectrum band.

The trigger conditions for the above applications can be programmed in the **Logger Trigger**, **Event Recording Trigger**, **Wave Trigger** and **Alarm Trigger** screens. In these screens, select **Spectrum** in the **Source** item and the required centre frequency of the bandpass in the **Result** item.



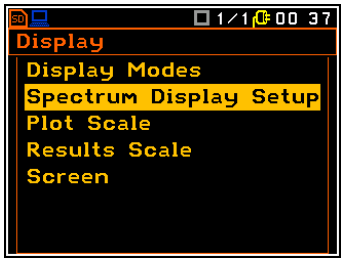
The trigger condition can be defined for the selected RMS result in the **Result** item calculated for 1/1 octave filters (**0.50 Hz**, **1.00 Hz**, **2.00 Hz**, **4.00 Hz**, **8.00 Hz**, **16.0 Hz**, **31.5 Hz**, **63.0 Hz**, **125 Hz**, **250 Hz**, **500 Hz**, **1.00 kHz** and **2.00 kHz**), or 1/3 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**), as well as **Total Level** results with appropriate filters: **Total 1 (HP)**, **Total 2 (**filter defined for the profile 1 of the channel**)**, **Total 3** (filter defined for the profile 2 of the channel).



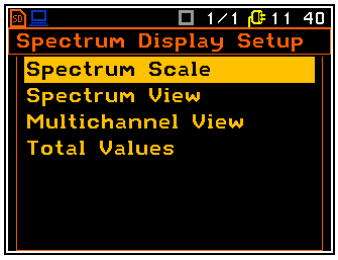
9.5 CONFIGURING 1/1 OCTAVE AND 1/3 OCTAVE SPECTRAL VIEWS

The **Display** section contains items for setting the views of the result display.

The following items are used to set views of 1/1 octave or 1/3 octave results:



<ENT>



Display Modes allowing you to enable the **Spectrum** view.

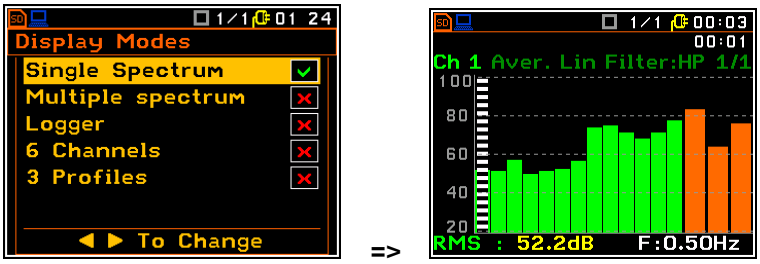
Spectrum Display Setup allowing you to select options for the spectrum view, such as:

- **Spectrum Scale** to change the scale of the vertical axis of the graph, toggle the grid, toggle the automatic scaling.
- **Spectrum View** to select the type of the spectrum to be displayed.
- **Multichannel View** to select how many channels to display simultaneously.
- **Total Values** to select parameters for Total results.

9.6 DISPLAYING 1/1 OCTAVE AND 1/3 OCTAVE SPECTRA

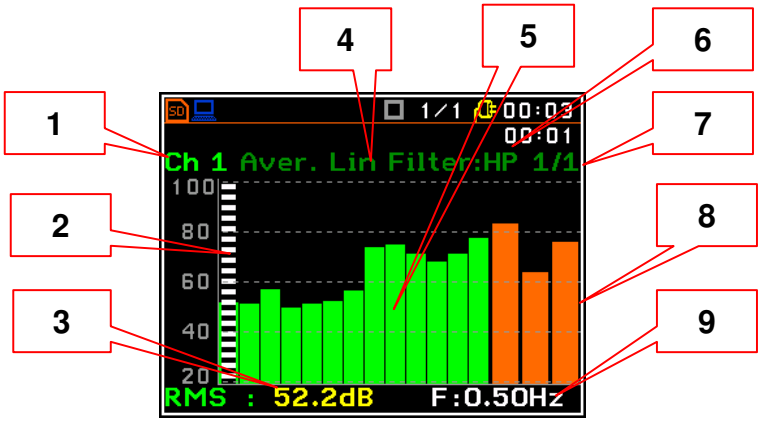
The **Single Spectrum** and **Multiple spectrum** items in the **Display Modes** list are only accessible in **1/1 Octave** and **1/3 Octave** functions.

When **Single Spectrum** is enabled, the measurement screen in the **Spectrum** view is as shown on the right.

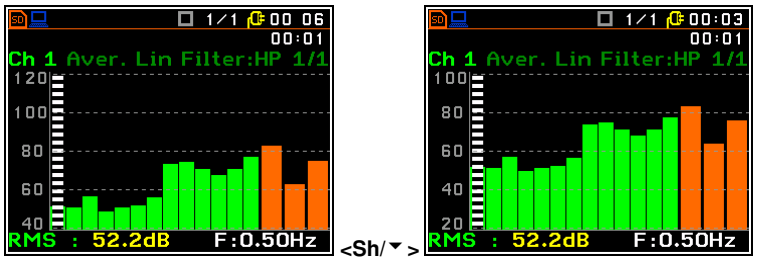


Spectrum view fields

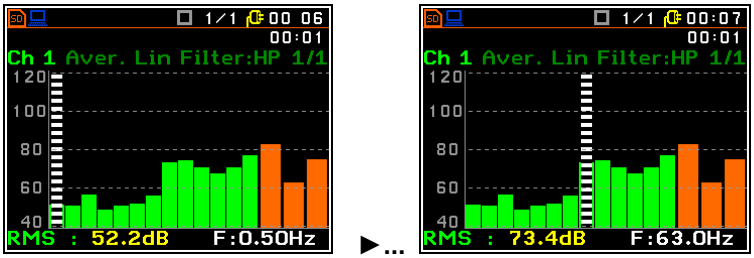
1. Channel number
2. Cursor position
3. Value for the cursor position
4. Used averaging
5. Spectrum plot
6. Used weighting filter
7. Type of spectrum
8. Total values
9. Central frequency for the cursor position



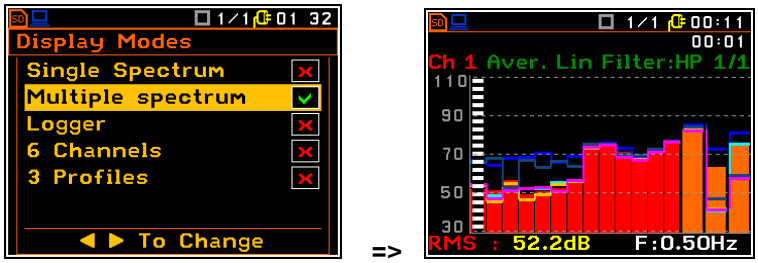
Use the **<Shift>** and ▲/▼ keys to shift the Y-axis.



Use the ◄ / ► key to change the cursor position. The frequency and corresponding value are displayed in the line below the graph.

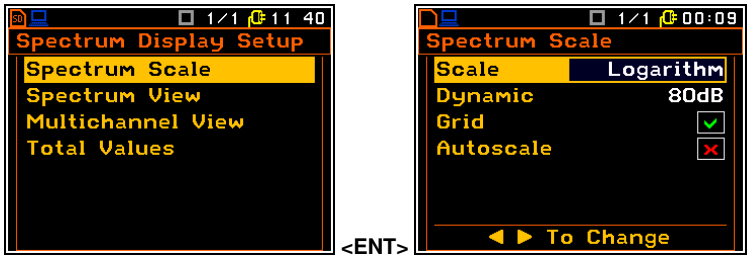


When **Multiple spectrum** is enabled, the measurement screen in the **Spectrum** view is as shown on the right.



9.7 ADJUSTING THE SPECTRUM PLOT SCALE – SPECTRUM SCALE

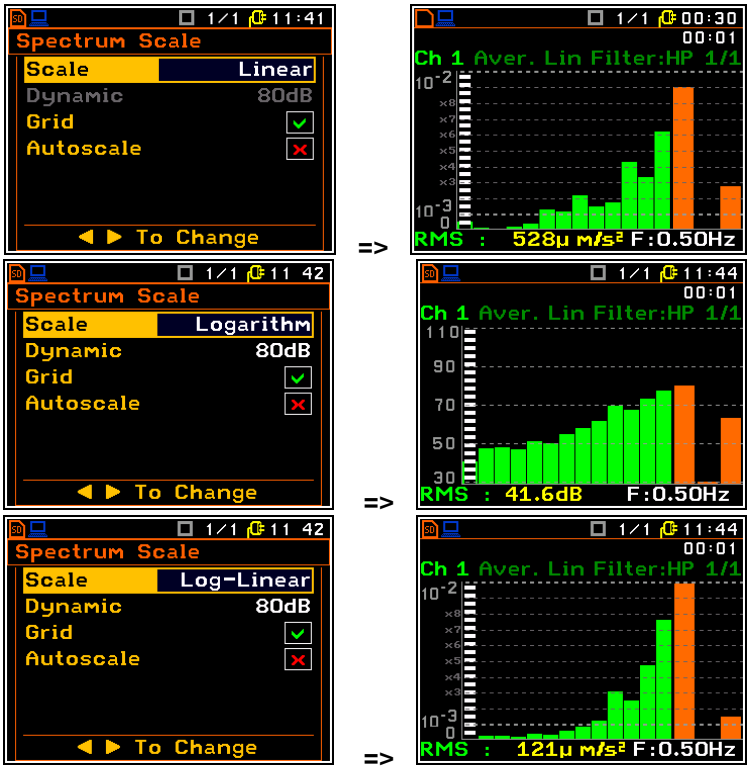
The **Spectrum Scale** item allows you to change the scale of the Y-axis in the spectrum view, toggle on/off the grid and automatic scaling.



Scale of results presentation

There are three options for the **Scale** item: **Linear**, **Logarithm** and **Log-Linear**. **Linear** means that both the plot scale and the units are linear. **Logarithm** means that the plot scale is logarithmic, and the measurement results are expressed in decibels (the results are related to the values set up in the **Reference Levels** screen (*path: Menu / Auxiliary Setup / Reference Levels*).

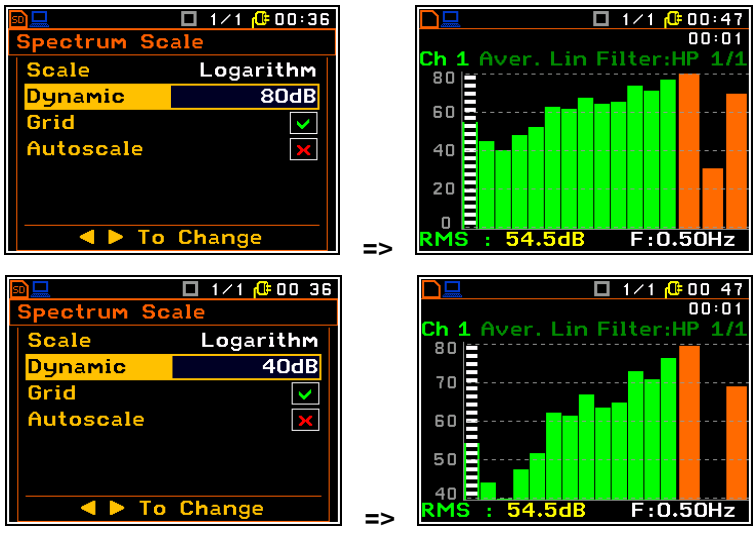
The example on the right shows the same spectrum plot with a different scale.



Logarithmic scale range

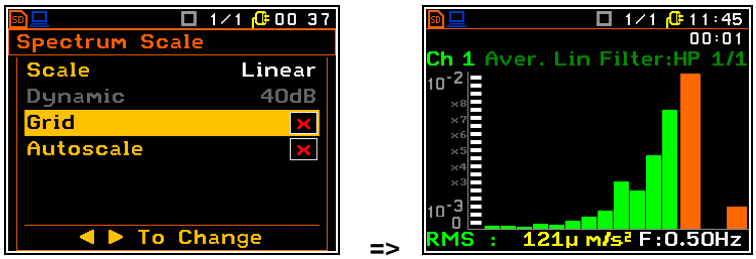
If **Scale** is set to **Logarithmic** or **Log-Linear**, the **Dynamic** item allows you to select the desired dynamic range for the **Logger** view. You can choose between twofold, fourfold, and eightfold expansion of the vertical axis (the default vertical axis corresponds to **80 dB**, and after expansion it corresponds to **40 dB**, **20 dB** and **10 dB** respectively).

The example on the right shows the same spectrum plot with the different dynamic ranges (80 and 40 dB).



Toggle grid lines on/off

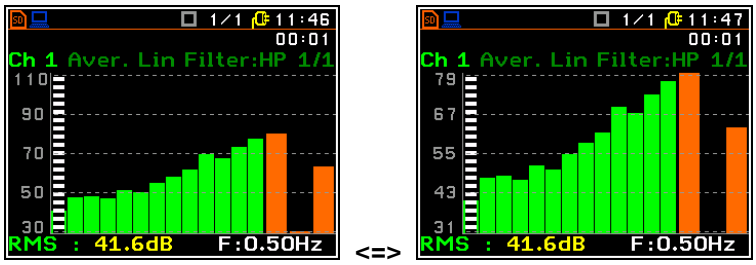
The **Grid** item allows you to toggle the horizontal grid lines on or off in all graphical views.



Automatic Y scale adjustment

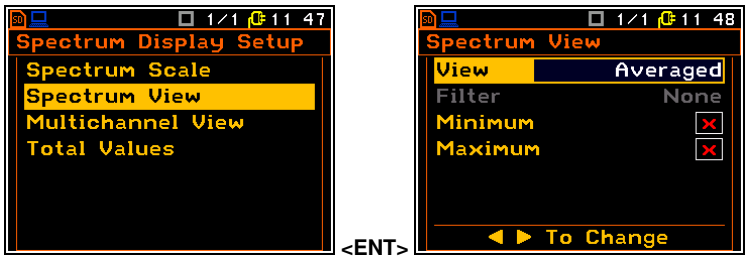
The **Autoscale** item enables or disables the automatic adjustment of the Y-axis scale to display the plot on the full screen. The adjustment is made automatically each time the plot is refreshed.

The example on the right shows a graph with autoscaling off and on.

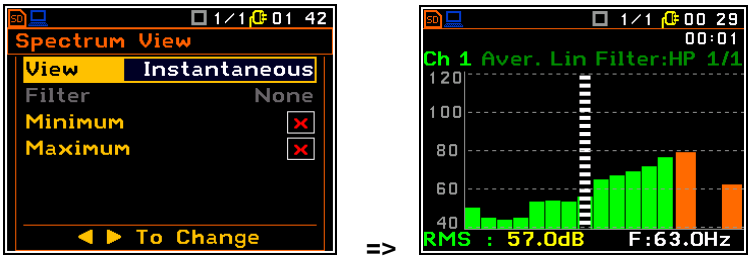


9.8 Selecting spectra to view – Spectrum View

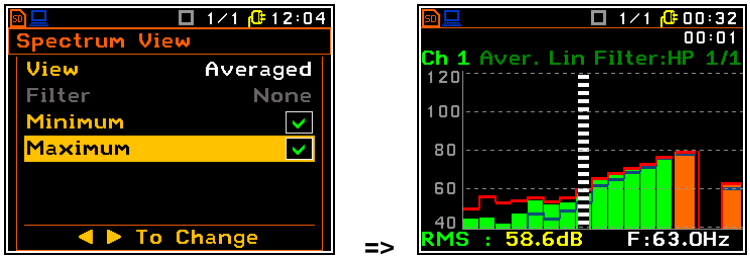
The **Spectrum View** item allows you to select the different spectra to be displayed in the **Single spectrum** and **Multi spectrum** views.



The **View** item allows you to select the type of spectrum to be displayed as a bar graph: **Averaged**, **Instantaneous**, **Max** or **Min**.

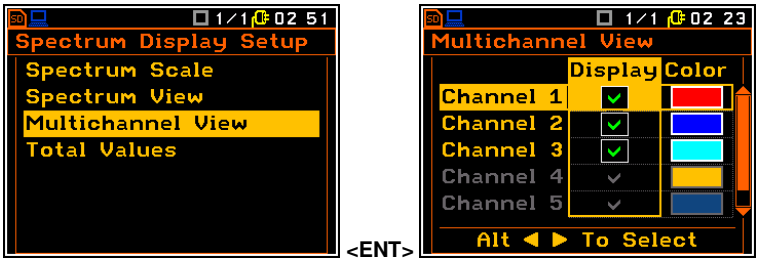


When the **Averaged** or **Instantaneous** spectrum is selected, you can also choose to display the **Max** and/or **Min** spectrum.



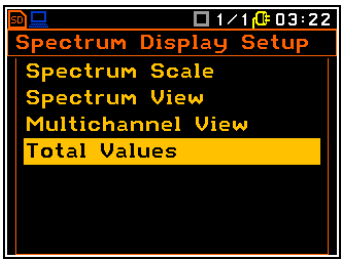
9.9 Selecting channels for presentation – Multichannel View

The **Multichannel View** item allows you to select the channels for which spectra are displayed in **Multi spectrum** views and to assign a specific colour to the spectrum bar graph.

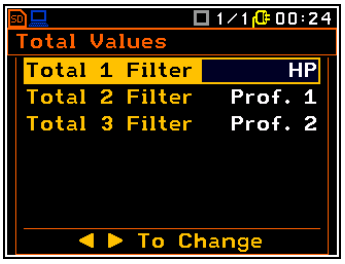


9.10 SETTING PARAMETERS FOR TOTALS – TOTAL VALUES

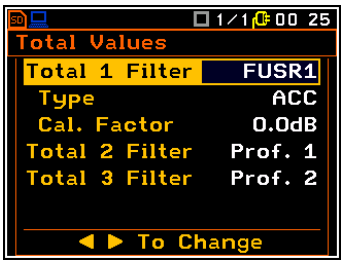
The **Total Values** item allows you to set parameters for the calculation of the Totals results. Three Totals are calculated for each channel. For each Total you can define the weighting filter, the type of signal measurement (acceleration, velocity or displacement) and the calibration factor.



<ENT>

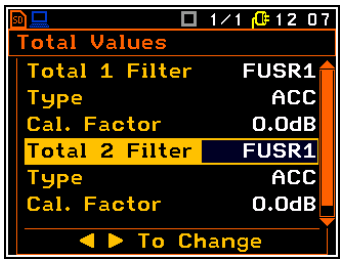


By default, the **HP** filter is shown for the first Total. The second and third Totals have the same filters as those set for the profiles (**Prof. 1** and **Prof. 2**) in the **Channels** screen (*path: <Menu> / Measurement / Channels*).



It is also possible to select three user filters for Totals: **FUSR1**, **FUSR2** and **FUSR3**. When the user filter is selected, two additional items appear: **Type** and **Cal. Factor**.

The **Type** item allows you to define the type of integration to display the measured signal as acceleration (**ACC**), velocity (**VEL**) or displacement (**DIL**).

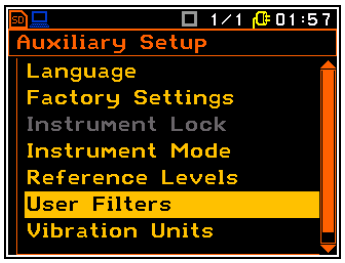


The **Cal. Factor** item allows you to define additional calibration factor to be used in the calculation of the Total result.

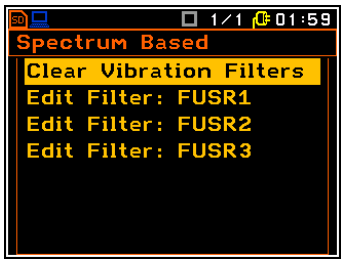
The same settings can be made for **Total 2** and **Total 3**.

9.11 SETTING USER FILTERS FOR 1/1 AND 1/3 OCTAVE ANALYSIS – USER FILTERS

The **User Filters** item (*path: <Menu> / Auxiliary Setup / User Filters*) allows you to set the values of the user filter coefficients. This item is only active for the **1/1 Octave** and **1/3 Octave** functions. The **User Filters** item opens the screen where you can clear (**Clear Vibration Filters**) or edit (**Edit Filter**) the filter coefficients for the user filter: **FUSR1**, **FUSR2** and **FUSR3**.

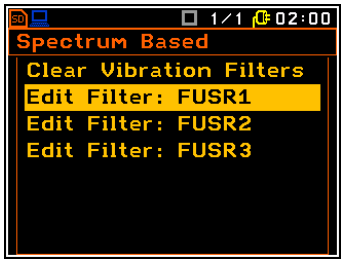


The **Clear Vibration Filters** item opens the screen with a warning before deleting the user filter coefficients. If the answer is **Yes**, all the coefficients of the selected filter are set to zero.

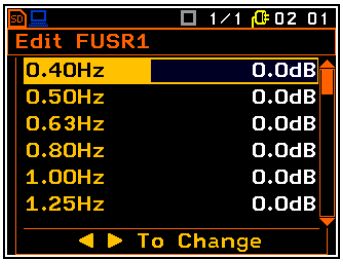


<ENT>

The **Edit Filter** item opens the screen with the table of filter coefficients for frequencies from 0.40 Hz to 2.5 kHz. The coefficient can be set in the range from -100.0 dB to 100.0 dB.



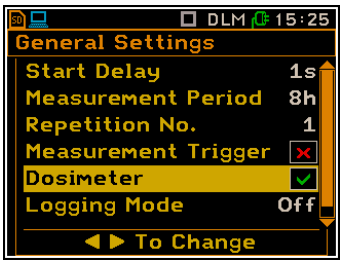
<ENT>



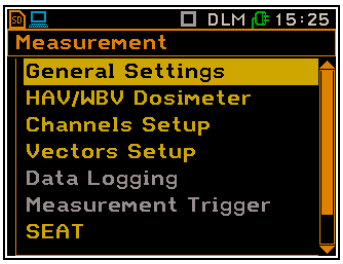
10 DOSIMETER FUNCTION

Dose meter activation

The **Dosimeter** item in the **General Settings** screen activates the dose meter function. When the **Dosimeter** function is enabled, all channels are assigned to whole-body (**WBV**) or hand-arm (**HAV**) dose measurements.



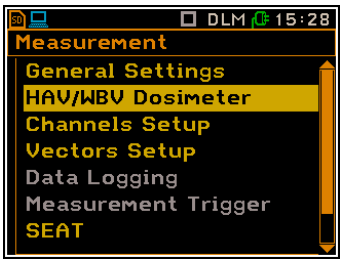
<ENT>



The Dosimeter parameters can be configured in the **HAV/WBV Dosimeter** screen, which is accessed from the **Measurement** menu. When the **Dosimeter** function is enabled, the **HAV/WBV Dosimeter** item in the **Measurement** list becomes active and the function abbreviations **DLM**, **D1/1** or **D1/3** appear in the top line.

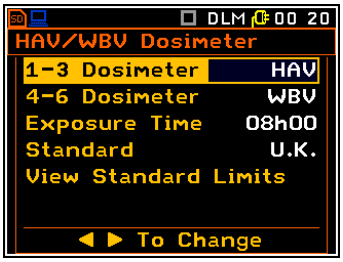
10.1 SETTING PARAMETERS FOR DOSE MEASUREMENTS – HAV/WBV DOSIMETER

The **HAV/WBV Dosimeter** item allows you to set parameters for human vibration dose measurements, such as: exposure duration, type of measurement (whole-body or hand-arm), performed on channels 1-3 and 4-6, action limits used in some standards, as well as user defined limits (**User**).



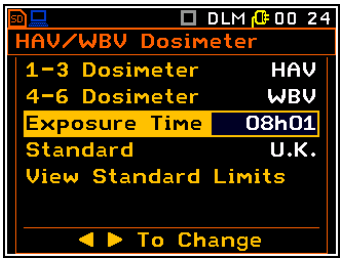
Type of measurement in channels

Items **1-3 Dosimeter** and **4-6 Dosimeter** allow you to set the desired type of measurement to be performed using channels 1,2,3 and 4,5,6 – hand-arm (**HAV**) or whole-body (**WBV**) vibration.



Exposure time

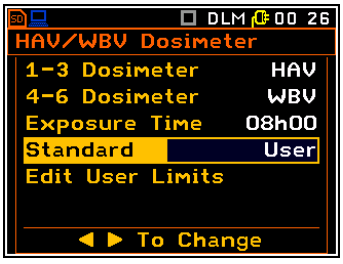
The **Exposure Time** item allows you to set the desired value for the exposure time used to calculate the **HAV/WBV Dose** results. **Exposure Time** values are in the range [**00h01**, **24h00**].



Standard for dose measurements

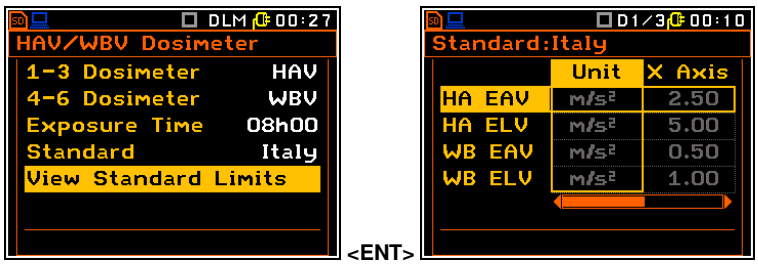
The **Standard** item allows you to select the standard for the **HAV/WBV Dosimeter** measurements: **U.K.**, **Italy**, **Poland**, **France**, **Germany**, **China**, **Brazil**, **Spain** and **User**.

Depending on the setting of the **Standard** item, you can view the dose calculation limits for the predefined standards or to edit them for the **User** standard.

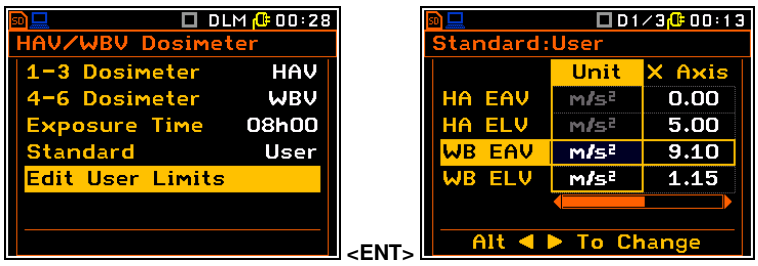


View / Edit standard limits

The **View Standard Limits** item opens the screen with the coefficients for the given axis of the selected standard. Use the ◄ / ► key to scroll through the displayed axes.



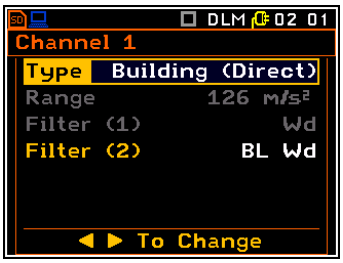
If **User** is selected as a **Standard**, the **Edit User Limits** item appears instead of **View Standard Limits**. The **Edit User Limits** item opens the screen where you can set your own specific coefficients for each axis.



10.2 Setting parameters for channels – Channel x

The **Channel x** items allow you to set or view parameters for the individual channel (input type) and for profiles (filters).

If the **Dosimeter** function is active, the filters for the first profiles are set by default and cannot be changed. If the second profile is disabled, the filter for the second profile doesn't appear as a parameter in the list.



The filters for the first profiles of the dosimeter depend on the 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 these channels are:

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 these channels are:

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

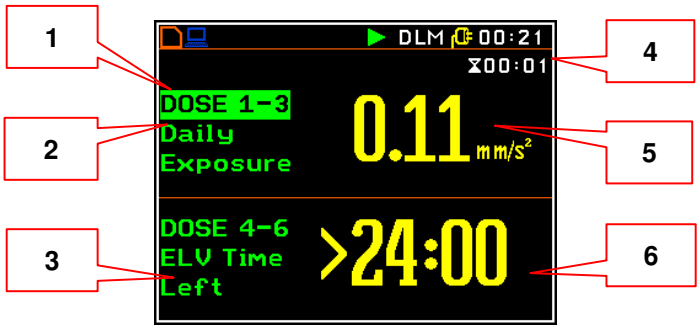
If second profiles are active during dose measurements, the filter can be **HP** or one of **BL Wd**, **BL Wk** or **BL Wh**, depending on which filter was defined for the first profile of the selected channel, according to the rule described above.

10.3 Dosimeter view

The dosimeter view is always active when the **Dosimeter** is switched on.

Dosimeter view fields

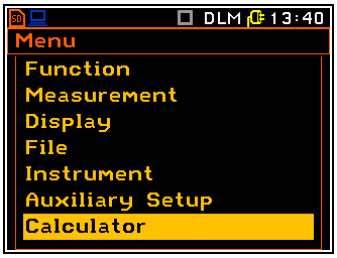
1. Channels used for dose calculation. If SV 105F is used, **FORCE 1-3/4-6** may also be available here.
2. Result name: **Daily Exposure**, **Vector**, **MAX(VDV)**, **Current Exposure**, **AEQ**, **MAX(RMS)**, **EAV Total Time**, **EAV Time Left**, **ELV Total Time**, **ELV Time Left, FORCE** results (**AVE, MAX, MIN, PEAK, LEVEL+** time).



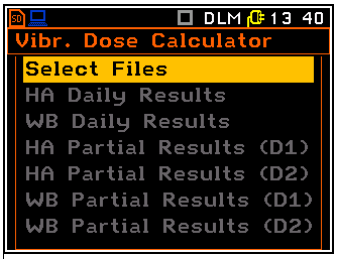
3. Second field for measurement of dose results.
4. Elapsed time shows the current second of the measurement. The value displayed there is in the range [**1**, **Meas. Period**].
5. Value of the measurement result.
6. Value of the measurement result.

10.4 CALCULATION OF HAND-ARM AND WHOLE-BODY DAILY RESULTS – CALCULATOR

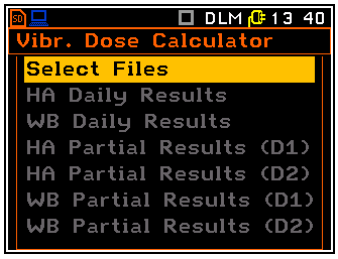
The **Calculator** item is used to calculate the various parameters associated with the dosimeter measurements. This item opens the **Vibr. Dose Calculator** screen allowing you to calculate **HA** and **WB** daily results based on files with partial dosimeter results.



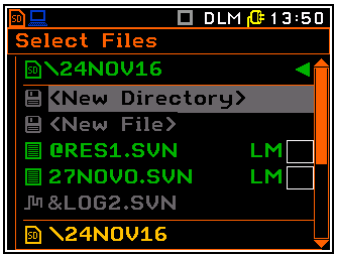
<ENT>



The **Selected Files** item is used to retrieve data from the files containing dosimeter results. Up to 10 files can be selected for calculations.

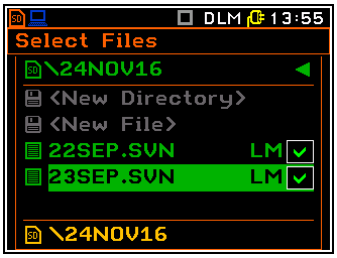


<ENT>

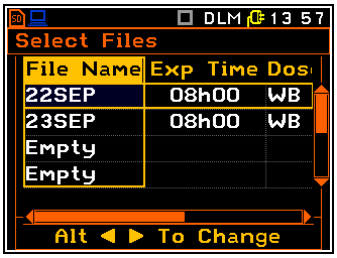


Files are selected and loaded after pressing **<ENTER>**.

If the selected file does not contain dosimeter data, the “Invalid File Content” message will be displayed.

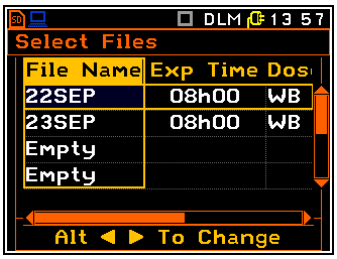


<ENT>

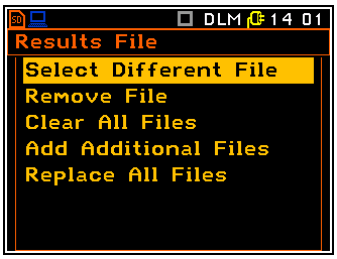


Selecting files

Pressing the ◄ / ► key together with **<Alt>** opens the list of **Results File**, allowing you to perform some commands on the files.

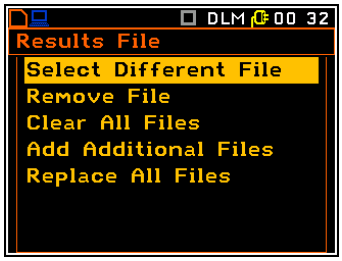


<Alt/ ▸ >

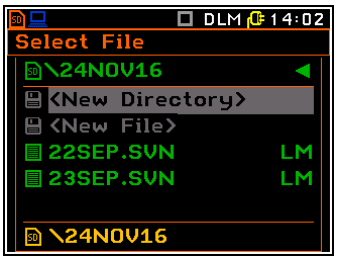


Select Different File

To select another file, press **<ENTER>** on this item, select a new file and press **<ENTER>** again.



<ENT>

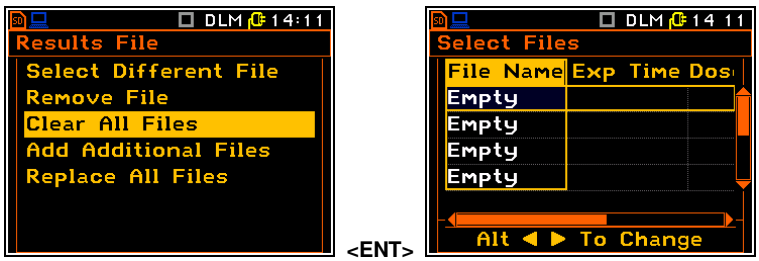


Remove Files

To remove a file, press **<ENTER>** on that item.

Clear All Files

To remove all files, press **<ENTER>** on that item. The selected file and all files in the table will be deleted.



Add Additional Files

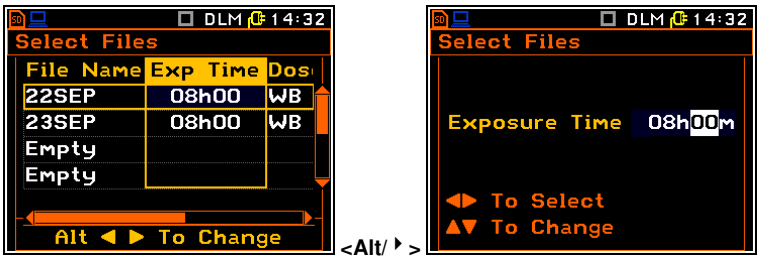
To add additional files, press **<ENTER>**, select new files from the **Select Files** screen and press **<ENTER>**.

Replace All Files

To replace all files, press **<ENTER>**, select new files from the **Select Files** screen and press **<ENTER>**.

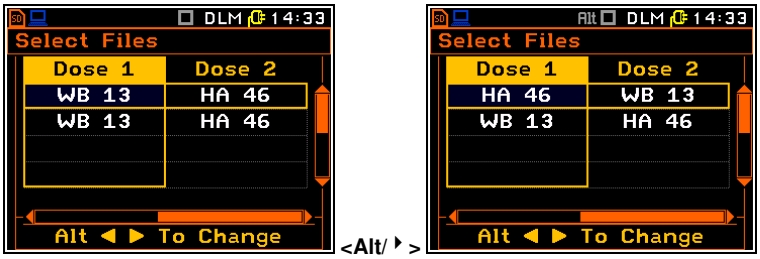
Exposure Time

Exposure Time (**Exp Time**) defines the period during which the measurement results are extrapolated. The desired value can be set in the special screen opened with the ◄ / ► key pressed together with **<Alt>**. Exposure Time can be set from **00h00m** to **24h00m**. You can set the Exposure Time for each file separately.



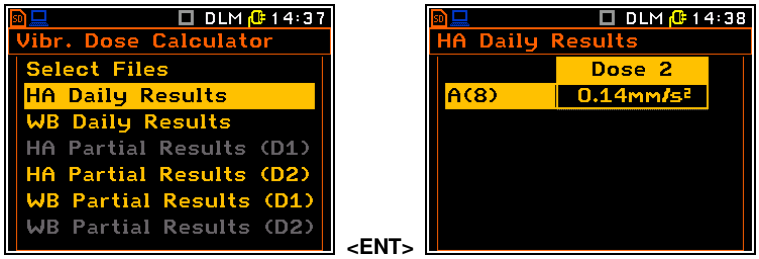
Assigning dose results

Dose results calculated for channels 1,2,3 or 4,5,6 can be assigned to calculate **Dose 1** or **Dose 2** results. **Dose 1** or **Dose 2** results are calculated for HA and WB measurements based on a set of appropriate files.



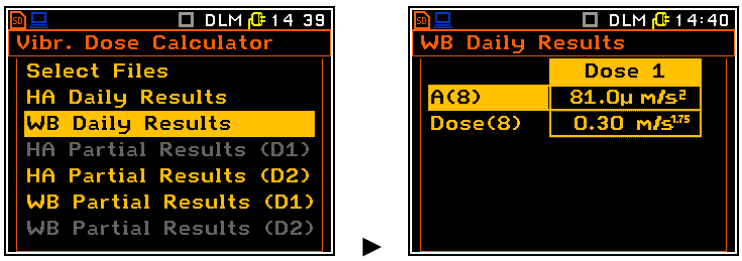
Hand-Arm daily dose results

The **HA Daily Results** item is used to display daily HA dose calculations for all selected files.



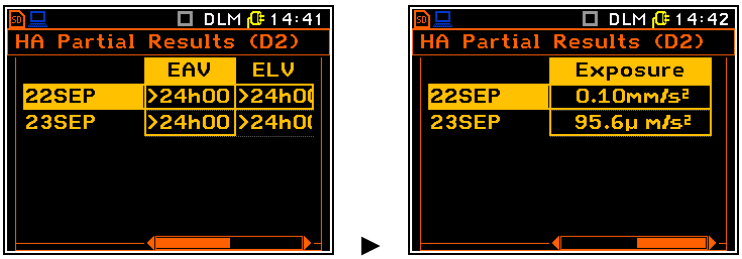
Whole-Body daily dose results

The **HA WB Daily Results** item is used to display daily WB dose calculations for all selected files.



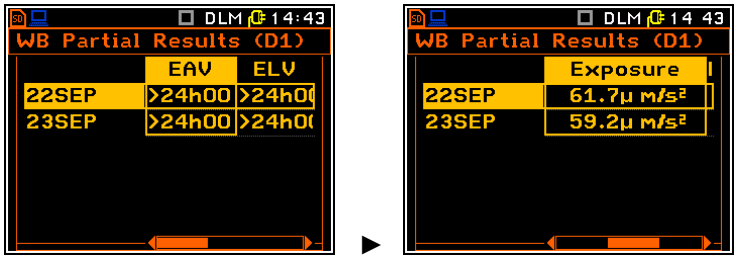
Hand-Arm partial results

The **HA Partial Results** item is used to display partial HA dose results for all selected files.

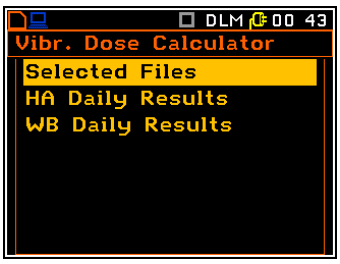


Whole-body partial results

The **WB Partial Results** item is used to display partial WB dose results for all selected files.



If **Simple Mode** is selected from the **Instrument Mode** screen, partial dose results are not displayed in the **Vibr. Dose Calculator** menu.



11 MAINTENANCE

11.1 POWERING

The instrument does not have an internal charger; so, the rechargeable batteries can only be charged by removing them from the instrument and using the optional charger (**SA 31**).

To change or recharge the batteries, switch off the instrument, unscrew the coin-operated screw, remove the black bottom cover from the instrument and slide out the battery tubes.

Note: *When replacing the batteries, ensure that the polarity is correct.*

The instrument is powered from the USB port is performed by connecting its **USB** socket to a PC or other USB power source using the **SC 158** cable.

When the instrument is powered from the USB port, the internal batteries are automatically disconnected. When disconnected from the USB port, the instrument automatically switches to internal battery power.

Note: *Only use high-quality USB-C cables such as **SC 158**. Many low quality cables do not ensure the low resistance of the cable will therefore prevent the correct operation of the instrument.*

Note: *To improve the accuracy of remaining battery life indicator when using rechargeable batteries, run the instrument until it is completely discharged and then fully charge the batteries. This procedure is recommended before first use. Repeat this procedure after every few months of use to maintain more accurate life indication.*

11.2 MEMORY CARD

The SV 106D comes with the Kingston MicroSD HC Class 4 micro-SD card.

Note: *The original Kingston MicroSD HC Class 4 memory card supplied has been tested by SVANTEK and is strongly recommended as a replacement.*

To replace the memory card, switch off the instrument, unscrew the screw and remove the bottom plastic cover of the SV 106D to access the micro-SD card slot.

To remove the card from the slot, press the card and then pull it out of the slot.

When you insert the SD card, you will hear a clicking sound to indicate that the card is properly inserted. If necessary, use a tool (e.g., a pen) to push the card all the way in.

Replace the bottom cover and tighten the screw.

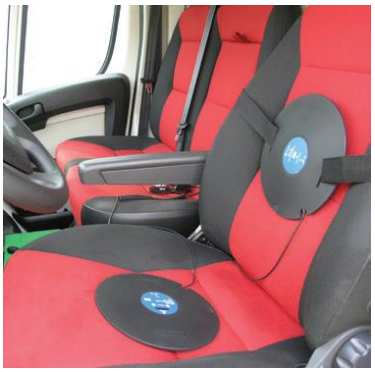
11.3 TRANSDUCERS

SV 106D can work with various accelerometers supported by SVANTEK:

- integrated triaxial Hand-Arm accelerometer (MEMS type) - **SV 105**
- integrated triaxial H-A accelerometer (MEMS type) with the grip force sensor - **SV 105F**

- triaxial accelerometer, Hand-Arm, direct fixing to the tool – **SV 150**

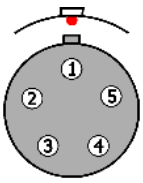
- triaxial accelerometer for Whole-Body measurements (MEMS type) - **SV 38V** or **SV 39A/L**



- triaxial accelerometer for measurements on vehicle floor **- SV 151**

  The SV 151 accelerometer can be a part of the **SV 207B** kit that includes also metal mounting base.

All supported accelerometers have LEMO 5-pin connectors: six channels of IEPE or Direct type and two channels for force transducers, which can be connected to one of the instrument's input connectors.



Note: *The TEDS data (accelerometer serial number and calibration factor) for the accelerometer is automatically be downloaded to the instrument's internal memory.*

11.4 RESETTING THE INSTRUMENT

- **SYSTEM RESET:** An internal software reset clears any setup configuration and restores the default factory settings (*path: <Menu> / Auxiliary Setup / Factory Settings*).

- **HARDWARE RESET:** An internal hardware reset doesn't change any user data. Make sure that the battery is not exhausted, and that the unit is switched off. Press and hold the **<Alt>** and **<Start/Stop>** keys for more than 15 seconds, then release them. Switch on the instrument in the normal way.

Note: *The hardware reset should only be used in extreme situations, such as when the instrument is hanging up.*

Note that a hardware reset:
- will stop any pre-programmed auto-run modes,
- will stop the measurement run!

11.5 FIRMWARE UPGRADE

SVANTEK is committed to continuous innovation and development, and therefore reserves the right to provide firmware improvements based on user feedback.

To update the instrument firmware, follow next steps:

- Unpack the provided firmware package. (provided as a suitable compressed file).
- Make sure that the instrument is switched off.
- Connect the instrument to a PC using the SC 158 cable (USB interface)..
- Press and hold the **<ENTER>** and ▲ keys when switching on the instrument - the following message should appear on the unit's screen: BOOTSTRAP v3.02 (version 3.02 or greater).
- Wait for the message **<USB>** on the instrument screen and run **go-usb.bat**.from the PC.
- The changing number and final message: "**..... o.k.**" should appear on the computer screen.
- A successful firmware update is indicated by the message: ***Program loaded!***
- Switch off the instrument.

Note: *Using the Supervisor software, it is very easy to check if new firmware releases are available for download.*

11.6 TRANSPORTATION AND STORAGE

Always use the packaging provided by the manufacturer for transport or storage. In a potentially dirty industrial environment, it is advisable to use the transport case provided by the manufacturer, such as the fabric case (SA 47) or the lightweight case (SA 143), which offer excellent mechanical and environmental protection and long-term storage conditions.

To prolong the life of the internal batteries, switch off the instrument when storing it. It is recommended to remove the batteries from the instrument.

11.7 CLEANING

Clean the surface of the instrument with a damp, soft cloth.

The instrument sockets should be cleaned with the use of compressed air.

Note: *In case of major contamination, such as oil or grease, contact your local authorised distributor or Svantek Service Office.*

11.8 TROUBLESHOOTING

- If the unit cannot be switched on, connect it to the power supply via USB. Then perform a hardware reset.
- If the unit is switched on but does not respond to any key, perform a hardware reset.
- If the reset does not help, contact your local authorised distributor or Svantek Service.

Should your SVANTEK professional measurement equipment need to be returned for repair or for calibration, please contact the service office at the following number or contact via the SVANTEK website.

Service Office: +48 (22) 51-88-320 or +48 (22) 51-88-322.

Office hours are 9:00 a.m. to 5:00 p.m. Central European Time.

E-mail: office@svantek.com.pl
support@svantek.com.pl

Internet: www.svantek.com

Address: SVANTEK Sp. z o.o.
Strzygłowska 81
04-872 Warszawa,
Poland

APPENDIX 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

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,

#D read/write the data file from/to instrument memory.

A.2 FUNCTION #1 - INPUT/OUTPUT OF THE CONTROL SETTING CODES

Function #1 enables 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 106D** 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.

Note: *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

15,16 - for reading force measurement results for channels 1-3 and 4-6

1,2,3,..,12 – for reading profile results

0 - all available results sets

(calculated from the formulae: *ChannelNumber + 6 * (ProfileNumber - 1)*

Note: *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).

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

v time of the measurement above threshold (ccc – value in seconds);
P the **PEAK** value (ccc – the value in N);
M the **MAX** value (ccc – the value in N);
N the **MIN** value (ccc – the value in N);
R the **AVERAGE** value (ccc – the value in N);
r the 1 second **AVERAGE** value (ccc – the value in N).

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

A.4 FUNCTION #3 - READ-OUT OF 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 = 1denotes "overload indicator",
D6 = 1denotes "averaged spectrum",
D5 = 0the instantaneous current result (RUN State),
= 1the 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 to read-out the data file from the internal Flash-disc memory. The data file formats are given in Appendix B.

Note: Function is deprecated, use of #D commands instead is recommended

#4 function formats are defined as follows:

#4,0,\; the file containing the catalogue,

#4,0,?; the count of files

#4,0,index,count; the part of the file containing the catalogue

where:

index - first catalogue record

count - numbers of catalogue records

The catalogue of the files is a set of the records containing 16 words (16 bits each). Each record describes one saved file. 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 the RAMfile the **logical address** is always set to 0.

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.

For files containing saved setup measurement or logger data the start date and time are always set to file creation date and time.

#4,1,FILE NAME; the saved file,
#4,1,FILE NAME,?; file size
#4,1,FILE NAME,offs,len; part of the saved file,
#4,1,<addr,len; part of the saved file,

where:

FILE NAME not longer than eight-character file name,
addr absolute internal address,
offs offset from the beginning of the file
len number of bytes to read.

#4,2,Bnnn; the file in internal memory containing logger, where **nnn** is the number of the logger file (one or more digits - depends on requirements).

#4,3; the special file contained in the RAM memory (**RAMfile**),
#4,3,?; size of the RAM file
#4,3,offs,len; the part of RAM file

where:

offs offset from the beginning of the file
len number of bytes to read.

#4,5,'\'; the file containing the catalogue of USB DISK,
#4,5,?; the count of files on USB DISK
#4,5,idx,count; the part of the file containing the catalogue of USB DISK

where:

idx first record
count number of records to read.

The catalogue of the files on SD-card is a set of the records containing 32 bytes. Each record describes one file saved in the current working directory SD-card. The record structure is as follows:

bytes 0-10 - file name with extension
byte 11 - reserved
bytes 12-15 - file length in bytes
bytes 16-19 - number of file in catalogue
bytes 20-21 - file creation date
bytes 22-23 - file creation time
bytes 24-31 - reserved

#4,6,fname,?; file size,

#4,6,fname,offs,len; the part of the file

where:

fname - name and extension containing not more than 11 characters

offs - offset from the beginning of the file (an even number)

len - number of bytes to read (an even number)

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

The device will respond sending the specified file/directory 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:

- for the file containing the directory,
- for the file containing the measurement results or saved setup,
- 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 structure of the files containing the measurement results, saved setups and/or logger files is described in detail in Appendix B.

A.6. 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.

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

A.7. FUNCTION #7 – SPECIAL CONTROL FUNCTIONS

Function **#7** enables 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,CB,1;

This function deletes all logger files in current directory on SD card and starts the measurement. The function returns **#7,CB,1;** 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,rh,rm;** where e=0 if AutoStart function is switched OFF, 1 if it's set to single repeat or 2 if it is set to repeating mode, **hh:mm:ss** gives the time and **DD** gives the day for the current date, **rh:rm** gives hours and minutes between consecutive repeats.

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

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,DS;

This function deletes all files containing instrument's settings from the current directory. 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,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: 2 - SD card.

#7,UH,XX;

This function sets the device selected for file storing, where XX can be one of: 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 the 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;**.

#7,ME;

This function returns internal flash memory size in the format **#7,ME,nn;** where nn is a size in MB.

#7,NF;

This function returns number of free sectors on SD card in the format **#7,NF,nn;** If card isn't installed or initialized, function returns following sequence of characters: **#7,NF,?;**

#7,NS;

This function returns number of sectors on SD card in the format **#7,NS,nn;** If card isn't installed or initialized, function returns following sequence of characters: **#7,NS,?;**

#7,FT;

This function returns FAT format type on SD card in the format **#7,FT,X;** where X can be one of: 1 - FAT16, 2 - FAT32, 3 - FAT12. If card isn't installed or initialized, function returns following sequence of characters: **#7,FT,?;**

#7,PI;

This function returns PIC firmware versions

#7,CF,ch,?;

This function returns force calibration factors in the form #7,CF,ch,U0,U2,U4,F2,F4,st; In the case of SV105AF and SV 105BF transducers and #7,CF,ch,U0,U1,U2,U3,U4,F1,F2,F3,F4,st; otherwise,

where:

ch - channel 0 or 1
U - voltage in mV
F - force value in N*100 corresponding to Ui value
st - strap type:
0 - flat
1 - slightly curved
2 - curved

#7,CF,ch,U0,U2,U4,F2,F4,st;

Function sets force calibration parameters for SV105AF and 105BF transducers,

where:

ch - channel 0 or 1
Ui - voltage in mV
Fi - force value in N*100 corresponding to Ui value
st - strap type:
0 - flat
1 - slightly curved
2 - curved

#7,CF,ch,U0,U1,U2,U3,U4,F1,F2,F3,F4,st;

Function sets force calibration parameters for SV105CF and newer transducers,

where:

ch - channel 0 or 1
Ui - voltage in mV
Fi - force value in N*100 corresponding to Ui value
st - strap type:
0 - flat

1 - slightly curved
2 - curved

#7,TS,ch,?;

Function returns selected strap type of the SV105 transducer in the form #7,TS,ch,st;

where:

ch - channel 0 or 1
st - strap type:
0 - flat
1 - slightly curved
2 - curved

#7,TS,ch,st;

Function selects strap type of the SV105 transducer,

where:

ch - channel 0 or 1
st - strap type:
0 - flat
1 - slightly curved
2 - curved

#7,FS,ch;

Function returns status of force measurement in channel ch in the form #7,FS,ch,flags, calValid;

where:

ch - channel 0 or 1
flags - sum of:
1 - force measurement active
2 - invalid calibration data
4 - potentially loose screw detected
8 - reserved
16 - measured force is below 0N
calValid - 0: calibration data is invalid

#7,BV;

Function returns current battery voltage in V;

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

A.8. 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.9. FUNCTION #D – OPERATIONS ON INSTRUMENT'S FILE STORAGE

<disk>	logical disk number: 0 –SD card, 255 - invalid device
<address>	directory address (cluster number)
<offsetB>	offset the first byte to read/write (an even number).
<nB>	number of bytes to read/write (an even number)
<data>	binary data.
<countW>	directory size in words
<name>	name and extension of the file or directory

Failure of the command is indicated by the one of the replies:

#D,<commandCode>,?;

#D,!; - command not allowed while measurement is running

If the command doesn't return data, success is confirmed by the following reply:

#D,<commandCode>;

#D,c,?;

This function returns the list of available disks in format:

#D,c,<disk1>[,<disk2>[,<disk3>]];

#D,d,?;

This function returns the parameters of the working directory in format:

#D,d,<disk>,<address>,<countW>;

#D,d,<disk>,<address>;

This function enables to change the working directory

#D,e;

This function deletes all files in working directory.

#D,e,<name>;

This function deletes the file specified by the name from working directory.

#D,e,<name>,<address>;

This function deletes the file specified by the name from directory specified by address.

#D,f, <disk>,0;

This function erases active disk.

Response:

#D,f;

#D,f, <disk >,<address>;

This function deletes the directory specified by the cluster number.

Response:

#D,f;

#D,r,<disk>,<address>,<offsetB>,<nB>;

This function enables the user to read the file.

Response:

#D,r,<disk>,<address>,<offsetB>,<nB>; [<data>]

#D,m,<address>,<name>;

This function creates subdirectory "name" in directory specified by address

#D,w,<name>,<nB>; [<data>]

This function enables the user to write the file (in the working directory)

nB must be even

A.10. CONTROL SETTING CODES

The control setting codes used in the **SV 106D** instrument (starting from the internal software version 5.02.1) 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	**W**	Wx.xx.x Analyzer version number (read only)
Channel mode	**Z**	Z0:n - Vibration LM / Analyzer for channel n
Calibration factor	**Q**	Qnn.nn:c nn.nn - real number with the value of the calibration factor for channel c in dB ∈[-101.00 ÷ 101.00]
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 I15:m - **KB** filter for profile m (first profile only) I16:m - **Wk** filter for profile m (first profile only) I17:m - **Wd** filter for profile m (first profile only) I18:m - **Wc** filter for profile m (first profile only) I19:m - **Wj** filter for profile m (first profile only) I20:m - **Wm** filter for profile m (first profile only) I21:m - **Wh** filter for profile m (first profile only) I22:m - **Wg** filter for profile m (first profile only) I23:m - **Wb** filter for profile m (first profile only) I24:m - **Wf** filter for profile m (first profile only) I27:m - **Wp** filter for profile m (second profile only) I118:m - **BL Wc** filter for profile m I119:m - **BL Wj** filter for profile m (second profile only) I120:m - **BL Wm** filter for profile m (second profile only) I121:m - **BL Wh** filter for profile m (second profile only) I122:m - **BL Wg** filter for profile m (second profile only) I123:m - **BL Wb** filter for profile m(second profile only) I124:m - **BL Wf** filter for profile m (second profile only) I152:m - **DIN80** filter for profile m (first profile only) I153:m - **DIN315** filter for profile m (first profile only) m = ChannelNo + 6 * (ProfileNo - 1)
Detector type in profile for **VLM**	**E**	E1:m - **125ms** detector in profile m E4:m - **1s** 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 **RMS** function	**L**	L1 - **EXPONENTIAL**
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 function M1 (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 M2	**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} $\in$(1 ÷ 100)
Reference level for velocity (RefLev_v)	**Xv**	Xvnnn - nnn reference level for velocity given in nms^{-1} $\in$(1 ÷ 100)
Reference level for displacement (RefLev_d)	**Xd**	Xdnnn - nnn reference level for displacement given in pm $\in$(1 ÷ 100)
AutoSave option	**XA**	XA0 - switched OFF XA1 - switched ON, file names are numbered
Using the RAMfile instead of the disk while storing results with the AutoSave option switched on	**XR**	XR0 - switched OFF
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/PROCEED** S2 - **PAUSE**
Menu lock mode	**Xb**	Xb0 - menu unlocked Xb1 - menu partially locked Xb2 - menu fully locked
Vector calculation mode	**XB**	XB0:2 - same as for channels 1-3 XB1:n - switched OFF XB2:n - HAV XB3:n - WBV XB4:n - user defined XB5:n – MTVV XB6: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 ÷ 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 ÷ 1440)

Vibration dose standard	**XG**	XG0 - Great Britain XG1 - Italy XG2 - Poland XG3 - French XG4 - user defined XG5 - German XG6 - China XG7 - Brazil XG8 - Spain
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 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 - 1/1 Octave XXXm3:K - 1/3 Octave 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 XXXy6 - spanish XXXy7 - german XXXy8 - portugese XXXy9 - chinese XXXy10 - czech
visible logger profile results	**XXXA**	XXXA0:m - **No** visible results from profile m XXXAxx: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)
visible logger force results	**XXXB**	XXXB0:m - **No** visible results XXXBxx:m - xx - sum of values for profile m: 1 – logger with **PEAK** values 2 – logger with **MAX** values 4 – logger with **MIN** values 8 – logger with **RMS** values m: 1 - Transducer #1 (1-3) 2 - Transducer #2 (4-6)
visible logger vector results	**XXXC**	XXXCxx:P xx = 0 - no visible results xx = 8 - vector result visible P = 1 - results from vector from channels 1-3 P = 2 - results from vector from channels 4-6
Simple trigger gradient level	**XXXo**	XXXoN:K - N – level in dB K: simple trigger identifier. One of: 0 - alarm trigger 1 - logger trigger 2 - wave trigger 5 - event trigger
logged force results	**XXXD**	XXXD0:m - No results XXXDxx:m - xx - sum of values for profile m: 1 – logger with PEAK values 2 – logger with MAX values 4 – logger with MIN values 8 – logger with RMS values m: 1 - Transducer #1 (1-3) 2 - Transducer #2 (4-6)
UART baud rate	**XXXE**	XXXEn - interface speed equal to n*1200, n∈[1 ÷ 96]
UART timeout	**XXXF**	XXXFn - n- timeout in seconds, n∈[1 ÷ 60]
UART handshake	**XXXG**	XXXG0 - handshake disabled XXXG1 - handshake enabled
UART enabled	**XXXH**	XXXH0 - UART interface disabled XXXH1 - UART interface enabled

APPENDIX B. DATA FILE STRUCTURES (v5.01)

B.1 STRUCTURE OF THE SV 106D FILE

Each file containing data from the SVAN instrument consists of several groups of words. In the case of the **SV 106D** 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. Table B.1);
- the unit and internal software specification (cf. Table B.2);
- the marker for the end of the file (cf. Table B.14).

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:

- parameters and global settings, common for all channels (cf. Table B.3),
- hardware settings for channels (cf. Table B.4),
- software settings for channels (cf. Table B.5 and Table B.6),
- **VECTOR** measurement settings (cf. 0),
- hand-arm and whole-body vibration dose measurement settings (cf. 0),
- main results (cf. Table B.9, Table B.10, Table B.11),
- logger header (cf. Table B.12),
- data stored during the measurements in the logger (cf. Table B.13),
- setup data of the instrument (cf. Table B.15),
- trigger settings (cf. Table B.16**Error! Reference source not found.**),
- event recording settings (cf. Table B.17),
- **1/1 OCTAVE** or **1/3 OCTAVE** analysis header (cf. 0, 0),
- results coming from **1/1 OCTAVE** analysis (cf. 0),
- results coming from **1/3 OCTAVE** analysis (cf. Table B.21),
- totals description in **1/1 OCTAVE** or **1/3 OCTAVE** analysis (cf. Table B.22, 0),
- user-defined filter description (cf. Table B.24),
- **1/1 OCTAVE** or **1/3 OCTAVE** logger header (cf. Table B.25),
- Max results coming from **1/1 OCTAVE** analysis (cf. Table B.26),
- Min results coming from **1/1 OCTAVE** analysis (cf. Table B.27),
- Max results coming from **1/3 OCTAVE** analysis (cf. Table B.28),
- Min results coming from **1/3 OCTAVE** analysis (cf. Table B.29),
- **SEAT** measurements settings (cf. Table B.30).

Below, all file structure groups are described separately in tables. 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 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.2 Unit and software specification

Word number	Name / Value	Comment
0	0xnn02	[02, nn=specification_length]
1	UnitNumber	unit number. If 0 use UnitNumber32
2	UnitType	unit type: 106
3	SoftwareVersion	software version * 100
4	SoftwareIssueDate	software issue date
5	UnitSubtype	unit subtype: 3 (SV 106D)
6	FilesystemVersion	file system version * 100
7	reserved	Reserved
8	0xmmcc	[mm=software minor version, cc=software subversion]
9..10	UnitNumber32	unit number
…	…	…

Table B.3 Parameters and global settings

Word number	Name / Value	Comment
0	0xnn04	[04, nn=block_length]
1	CycleStartDate	measurement 1st cycle start date
2	CycleStartTime	measurement 1st cycle start time
3	DeviceFunction	1 - **LEVEL METER**, 2 - **1/1 OCTAVE** analyser, 3 - **1/3 OCTAVE** analyser

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: reserved 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 in dB*10:
13	MeasureVecTriggerLev	level of triggering for **VEC** result in dB*10
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 μms^{-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	LowestOct	lowest 1/3 octave frequency in Hz*100
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	gradient level for gradient trigger mode in dB*10

29	reserved	Reserved
30	reserved	Reserved
31	reserved	Reserved
32	reserved	Reserved
33	reserved	Reserved
34	reserved	Reserved
35	reserved	Reserved
36	CycleMeasurementStartDate	measurement cycle start date
37..38	CycleMeasurementStartTime	measurement cycle start time
39	enabledChannels	Channels used for measurement as bitfield: b0 - channel 1 enabled b1 - channel 2 enabled .. b5 - channel 6 enabled
40	forceLPThresold	Threshold value for force Level+ result measurement (*100 N)
…	…	…

Table B.4 Hardware settings for channels

Word number	Name / Value	Comment
0	0xnn05	[05, nn=block_length]
1	0x0906	[06, 09=sub-block_length]
2	ChannelMode[1]	mode of the 1st channel 0 - Vibration Level Meter / Analyser
3	CalibrFactor[1]	calibration factor (*100 dB) in the 1st channel
4	Range[1]	nominal range in the 1st channel in the case of **VLM**: 1 - **316 ms^{-2}**
5	Reserved	Reserved
6	Reserved	Reserved
7	Reserved	Reserved
8	Reserved	Reserved
9	RangeDB[1]	Range in the 1 st channel as dB*100
…	…	…
9*Channel Count+2	0x0906	[06, 09=sub-block_length]
9*Channel Count+3	ChannelMode[Channel Count]	mode of the last channel: 0 - Vibration Level Meter / Analyser
7*Channel Count+4	CalibrFactor[ChannelCount]	calibration factor (*100 dB) in the last channel
7*Channel Count+5	Range[ChannelCount]	nominal range in the last channel: in the case of **VLM**: 1 - **316 ms^{-2}**
7*Channel Count+6	Reserved	Reserved
7*Channel Count+7	Reserved	Reserved
7*Channel Count+8	Reserved	Reserved
7*Channel Count+9	Reserved	Reserved
7*Channel Count+10	RangeDB[ChannelCount]	Range in the last channel as dB*100

7*Channel Count+11	force_flags1	flags word (16 bits): b15 ... b3 b2 b1 b0 b0 - if set to 1: 1st force channel results have been calculated b1 - if set to 1: 1st force channel has invalid calibration data b4 - if set to 1: 1st force channel needs to be recalibrated or sensor checked b2,b3,b5... b15 - reserved
7*Channel Count+12	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,
7*Channel Count+13	force_flags2	flags word (16 bits): b15 ... b3 b2 b1 b0 b0 - if set to 1: 2nd force channel results have been calculated b1 - if set to 1: 2nd force channel has invalid calibration data b4 - if set to 1: 2nd force channel needs to be recalibrated or sensor checked b2,b3,b5... b15 - reserved
7*Channel Count+14	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,
7*Channel Count+15 ÷ 7*Channel Count+34	reserved	
…	…	…

Table B.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.6 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**, 15 - **KB** 16 - **Wk**, 17 - **Wd**, 18 - **Wc**, 19 - **Wj**, 20 - **Wm**, 21 - **Wh**, 22 - **Wg**, 23 - **Wb**, 24 - **Wf**, 27 - **Wp**, 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: 1 - **125 ms**, 4 - **1 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.7 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, 1 - MTVV, 2 - PPV
…	…	…

Table B.8 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**, 6 - **China**, 7 - **Brasil**, 8 - **Spain**
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.9 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	value of vector **VEC 1-3** (*100 dB)
171	Vec46	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.10 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.11 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)
5	Result[5]	time of measured force above forceLPThresold value
…	…	…

Table B.12 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
12..13	Reserved	
…	…	…

Note: *The current logger time step in seconds can be obtained from the formulae:*

T = BuffTSec + BuffTMilisec / 1000*.*

Table B.13 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.14 File end marker

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

Table B.15 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.16 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
…	AlarmCond	alarm trigger (Table B.31)
…	LoggerCond	logger trigger (Table B.31)
…	WaveCond	wave recording trigger (Table B.31)
…	SMSCond	SMS alert trigger (Table B.31)
…	MailCond	E-mail alert trigger (Table B.31)
…	EventCond	event recording trigger (Table B.31)
…	…	…

Table B.17 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
7	signal source	0 - 1st profile filter 1 - 2nd profile filter
…	…	…

Table B.18 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 0
…	…	…
2+4*used_spectrum..5+4*used_spectrum	OctaveHead[used_spectrum]	header of the last enabled octave analysis, defined in 0
…	…	…

Table B.19 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.20 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.21 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[l]	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.22 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 (0)
…	…	…
	OneChnlTotDesc[k]	one-channel totals description block for the last channel with **TOTALS** in user filters (0)
…	…	…

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.23 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]	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.24 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 (0)
2..4	FilterName	filter name (up to 5 letters, zero-ending string)
5..5+NTer-1	FilterVal[i]	filter value (*10 dB) corresponding to the 1/3 octave[i] position; i=1..NTer
…	…	…

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.25 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.26 Maximum results of 1/1 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.27 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.28 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.29 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.30 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.31 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 - **RMS**, 5 - **VDV**
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 the 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.32 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 (0)
...	...	
...	TEDSBlockN	last TEDS data block (0))
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	

Table B.33 TEDS data block

Word number	Name / Value	Comment
0	0xnn4B	[4B, nn=block length]
1	MfgId	Manufacturer ID
2	Model	Model
3	versionNo	Model version
4	versionLetter	Model subversion
5..6	serialNo	Serial number
…	…	…

Table B.34 Data block of instrument's text setup

Word number	Name / Value	Comment
0	0x004D	[4D, 00=block length in the next word]
1	BlockLength	block length
2..BlockLength-1	SetupData	saved setup string values
…	…	…

Table B.35 Data block of instrument's user filters

Word number	Name / Value	Comment
0	0x0027	[27, 00=block length in the next word]
1	BlockLength	block length
2..BlockLength-1	SetupData	saved values
…	…	…

B.3 STRUCTURE OF THE RESULT FILES

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

File header - cf. Table B.1.
Unit and software specification - cf. Table B.2.
Parameters and global settings - cf. Table B.3.
Hardware settings for channels - cf. Table B.4.
Software settings for channels - cf. Table B.5.
Trigger settings (cf. Table B.16).
Vector measurement settings - cf. 0.
Settings for vibration dose measurement (the presence depends on the **MEASURE DOSE** and channel filter settings) - cf. 0.
Main results - cf. Table B.9.

File end marker - cf. Table B.14.

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

File header - cf. Table B.1.
Unit and software specification - cf. Table B.2.
Parameters and global settings - cf. Table B.3.
Hardware settings for channels - cf. Table B.4.
Software settings for channels - cf. Table B.5.

Trigger settings - cf. Tab. Table B.16.
Vector measurement settings - cf. Table B.7.
Event Recording settings - cf. Table B.17.

Header of the file from the logger - cf. Table B.12.
Contents of the file from the logger - cf. Table B.13.

File end marker - cf. Table B.14.

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

File header - cf. Table B.1.
Unit and software specification - cf. Table B.2.
Data block of instrument's setup - cf. Table B.15.

File end marker - cf. Table B.14.

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

File header - cf. Table B.1.
Unit and software specification - cf. Table B.2.
Parameters and global settings - cf. Table B.3.
Hardware settings for channels - cf. Table B.4.
Software settings for channels - cf. Table B.5.
Trigger settings (cf. Table B.16).
Vector measurement settings - cf. Table B.7.
Octave analysis header - cf. 0.
The hand-arm and whole-body vibration dose measurement settings - cf. 0.
Main results - cf. Table B.9.
One-channel 1/1 Octave analysis results (one for each channel with spectrum analysis enabled) - cf. 0.
TOTALS description (if needed) - cf. Table B.22.
Description of user-defined filter (if needed) - cf. Table B.24.
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. Table B.26.
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. Table B.27.

File end marker - cf. Table B.14.

B.3.5 Structure of the file with 1/3 OCTAVE analysis results

File header - cf. Table B.1.
Unit and software specification - cf. Table B.2.
Parameters and global settings - cf. Table B.3.
Hardware settings for channels - cf. Table B.4.
Software settings for channels - cf. Table B.5.
Trigger settings (cf. Table B.16).
Vector measurement settings - cf. Table B.7.
Octave analysis header - cf. 0.
The hand-arm and whole-body vibration dose measurement settings - cf. 0.
Main results - cf. Table B.9.
One-channel 1/3 OCTAVE analysis results (one for each channel with spectrum analysis enabled) - cf. Table B.21.
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. Table B.28.
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. Table B.29.
TOTALS description (if needed) - cf. Table B.22.

Description of user-defined filter (if needed) - cf. Table B.24.

File end marker - cf. Table B.14.

B.3.6 Structure of the file containing 1/1 or 1/3 OCTAVE analysis results from logger's file

File header - cf. Table B.1.
Unit and software specification - cf. Table B.2.
Parameters and global settings - cf. Table B.3.
Hardware settings for channels - cf. Table B.4.
Software settings for channels - cf. Table B.5.
Trigger settings (cf. Table B.16).
Vector measurement settings - cf. Table B.7.

Header of the file from the logger - cf. Table B.12.
Octave analysis header - cf. 0.
Spectrum analysis header of the file from the logger - cf. Table B.25.
Contents of the file from the logger - cf. Table B.13.

File end marker - cf. Table B.14.

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 `with the calibration adapter`
  <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

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 */
}
```

APPENDIX C. TECHNICAL SPECIFICATIONS

C.1 SPECIFICATION OF SV 106D AS VIBRATION LEVEL METER (VLM)

The SV 106D vibration meter makes measurements simultaneous in six channels with independent set of filters and detector constants. SV106D meets requirements of **ISO 8041-1:2017**, **ISO 5349** and **ISO 2631-1,2&5**

VLM function is provided by the two 5-pin Lemo compatible input sockets type ENB.0B.304 for **Channels 1-3** and **Channels 4-6**.

Configuration of the complete instrument for the Whole-Body measurements

- **SV 106D** vibration meter
- **SV 38V** triaxial SEAT accelerometer (MEMS type) with dedicated cable
- **SV 39A/L** triaxial SEAT accelerometer (IEPE type) with dedicated cable
- **SV 151** triaxial accelerometer (MEMS type) for measurements on vehicle floor

Configuration of the complete instrument for the Hand-Arm measurements

- **SV 106D** vibration meter,
- **SV 105** triaxial Hand-Arm accelerometer (MEMS type) with adapter
- **SV 105F** triaxial Hand-Arm accelerometer (MEMS type) with adapter & grip force sensor
- **SV 150** triaxial Hand-Arm triaxial accelerometer (MEMS type), direct fixing to the tool
- **SV 50** triaxial accelerometer set, including Dytran 3023M2 (IEPE type) and adapters

Recommended calibrator:

- **SV 111** vibration calibrator for HVM or equivalent (not included in the standard set)

Accessories included

- **SC 158** USB cable,

Measured quantities

The measured quantities in the vibration meter mode: **RMS**, **VDV**, **CRF, OVL, PEAK**, **P–P**, **MTVV, MAX, VECTOR, A(8), ELV, EAV.** Definitions for mentioned parameters are given in Appendix D.

Mounting for vibration tests

The accelerometer should be connected with SV 106D using proper cable provided by the manufacturer.

The accelerometer should be mounted on the shaker using proper adapter provided by the manufacturer.

Note: *Maximum length of the extension cable between the accelerometer and the instrument is 10 m. Recommended length of the cable is less than 3 meters.*

Linear operating ranges (for acceleration)

The linear operating ranges with the margin from noise > 10 dB

Table C.1. Linear operating ranges with the **SV 38V** accelerometer (RMS values for sinusoidal signals)

Filter	Accelerometer SV 38V nominal sensitivity 50 mV/ms^{-2} (calibration factor = -14 dB)	
	from	**to**
HP	94 dB (50 mm/s^2)	151 dB (35.5 m/s^2) 154 dBpeak (49 m/s^2 peak)
Wf	70 dB (3.16 mm/s^2)	
Wc, Wk, Wh, Wb Wd, Wm, Wg BL – Wf	80 dB (10.0 mm/s^2)	
Wj	85 dB (17.8 mm/s2)	
BL- Wb, BL- Wc, BL- Wm, BL- Wj, BL- Wd, BL- Wg, BL- Wk	90 dB (31.6 mm/s^2)	

Table C.2. Linear operating ranges with the **SV 39A/L** accelerometer (RMS values for sinusoidal signals)

Filter	Accelerometer SV 39A/L nominal sensitivity 10 mV/ms^{-2} (calibration factor = 0 dB)	
	from	**to**
HP	94 dB (50 mm/s^2)	161 dB (112 m/s^2) 164 dBpeak (159 m/s^2 peak)
Wc, Wk, Wh, Wb Wd, Wm, Wg	80 dB (10.0 mm/s^2)	
BL- Wb, BL- Wc, BL- Wm, BL- Wj Wj, BL- Wd, BL- Wg, BL- Wk	90 dB (31.6 mm/s^2)	

Table C.3. Linear operating ranges with the **SV 151** accelerometer (RMS values for sinusoidal signals)

Filter	Accelerometer SV 151 nominal sensitivity 5.81 mV/ms^{-2} (calibration factor = +4.71 dB)	
	from	**to**
HP	100 dB (100 mm/s^2)	163 dB (141.0 m/s^2) 167 dBpeak (223.5 m/s^2 peak)
Wd, Wk	80 dB (10 mm/s^2)	
Wm	83 dB (14 mm/s^2)	
BL- Wd, BL- Wk, BL- Wm	96 dB (63 mm/s^2)	

Table C.4. Linear operating ranges with **3023M2** accelerometer (RMS values for sinusoidal signals)

Filter	Accelerometer 3023M2 nominal sensitivity 1 mV/ms^{-2} (calibration factor = +20.0 dB)	
	from	**to**
Wh	110.0 dB (320 mm/s^2)	181.0 dB (1120.0 m/s^2) 184.0 dBpeak (1585.0 m/s^2 peak)
BL-Wh	116.0 dB (631 mm/s^2)	

Table C.5. Linear operating ranges with **SV 105/BF** accelerometer (RMS values for sinusoidal signals)

Filter	Accelerometer SV 105/105F / SV 150 nominal sensitivity 0.661 mV/ms^{-2} (calibration factor = +23.6 dB)	
	from	**to**
Wh	106.0 dB (0.2 m/s^2)	183.0 dB (1413.0 m/s^2) 186.0 dBpeak (1995.0 m/s^2 peak)
BL-Wh	120.0 dB (1.0 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 the accelerometer

In order to obtain an electrical input, an accelerometer with IEPE input must be replaced by the electrical impedance **SV48/106**.

Calibration

Direct: by measurement of the standard signal generated by the external vibration calibrator.

Indirect: by declaration of the transducer's sensitivity (according to the calibration chart).

Note: *Calibration procedure is given in Chapter 3.2.*

Accelerometer input

Connector 2 x LEMO 5-pins: six channels IEPE type or Direct and two channels for the force transducers

Impedance (each channel) 130 kΩ / 20 pF (typical)

Vibration transducers supply IEPE type: max 28 V / 1.5 mA current source

Direct type: 5.15 V DC / max 150 mA voltage source

Range of the measured voltage 5 V_{Peak} (indication 174 dB_{Peak} for the calibration factor 0.0)

Maximum input voltage SV 106D is the instrument with the 2nd security class according to the international standard IEC 348. The input voltage should be within 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. Both A/D converter and input amplifier overload conditions are detected. The overload in the measurement channel (in its analogue part) and the overload of the analogue / digital converter are both detected. The "overload" indication appears 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 as per ISO 8041-1:2017

- **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.

Note: *When the instrument is moved from a warm environment with high humidity, to a colder environment, care should be taken not to produce condensation inside the instrument. In this case, much longer stabilization periods may be necessary.*

Digital filters

- **High-pass** filter
- **HP** filter

See Chapter C.2 for filter characteristics.

Frequency weighting filters

All filters include Band Limiting filters.

Band Limited filters are listed and available separately.

- **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

See Chapter C.2 for filter characteristics.

Filters noise level

Typical noise levels of SV 106D with the vibration transducer for the frequency-weighted response:

Table C.6. Typical noise level of SV 106D with the accelerometers (for each axis)

Filter	SV 38V nominal sensitivity 50 mV/ms^{-2} (calibration factor: -14 dB)		SV 39A\L nominal sensitivity 10 mV/ms^{-2} (calibration factor: 0.0 dB)		SV 151 nominal sensitivity 5.8 mV/ms^{-2} (calibration factor: +4.7 dB)		SV 3023M2 nominal sensitivity 1 mV/ms^{-2} (calibration factor: +20.0 dB)		SV 105/BF SV 150 nominal sensitivity 0.66 mV/ms^{-2} (calibration factor: +23.6 dB)	
HP	<15.8 mm/s^2	<84 dB	<15.8 mm/s^2	<84 dB	<31.6 mm/s^2	<90 dB	<63 mm/s^2	<96 dB	<200 mm/s^2	<106 dB
Wk	<3.16 mm/s^2	<70 dB	<3.16 mm/s^2	<70 dB	<2.3 mm/s^2	<67 dB	-	-	-	-
BL-Wk	<10.0 mm/s^2	<80 dB	<10.0 mm/s^2	<80 dB	<11.4 mm/s^2	<81 dB	-	-	-	-
Wd	<3.16 mm/s^2	<70 dB	<3.16 mm/s^2	<70 dB	<2,3 mm/s^2	<67 dB	-	-	-	-
BL-Wd	<10.0 mm/s^2	<80 dB	<10.0 mm/s^2	<80 dB	<17.6 mm/s^2	<85 dB	-	-	-	-
Wm	-	-	<3.16 mm/s^2	<70 dB	<4.5 mm/s^2	<73 dB	-	-	-	-
BL-Wm	-	-	<10.0 mm/s^2	<80 dB	<17.6 mm/s^2	<85 dB	-	-	-	-
Wh	-	-	-	-	-	-	<31.6 mm/s^2	<90 dB	<141 mm/s^2	<103 dB
BL-Wh	-	-	-	-	-	-	<63 mm/s^2	<96 dB	<200 mm/s^2	<106 dB

Environmental, electrostatic and radio frequency criteria

Note: *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 magnetic field < 25 dB (for 80 A/m and 50 Hz)

Effect of radio frequency fields (meets requirements of ISO 8041-1:2017)

The greatest susceptibility (the least immunity) is achieved for RMS measurements with the **HP** weighting filter.

The greatest susceptibility is achieved when SV 106D and accelerometer with cable is placed along field and the cable is coil as solenoid.

Effect of electrostatic discharge (meets requirements of ISO 8041-1:2017)

During electrostatic discharge, the influence of the displayed results could be observed.

No changes in the instrument operation state, configuration or stored data corruption were found out.

Effect of temperature < 0.5 dB (from -10°C to + 50°C)

Effect of vibration < 0.1 dB (measured at the instrument vibration 1 m/s^2 in the 2 kHz band)

Temperature range

Operating	from -10°C to + 50°C
Storage and transportation	from -20°C to + 60°C

Effect of acoustic signal

Typical response of SV 106D with the vibration transducer and for the “Human Vibration” frequency-weighted (Wb, Wd, Wk and Wh), exposed to the acoustic sinusoidal signal of 100 dB.

The effect for the SV 38V transducer is marginal and can be neglected!

Table C.7. Typical effect of the acoustic signal perpendicular to the z axis of the 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.8. Typical effect of the acoustic signal perpendicular to the z axis of the SV 105/BF accelerometer

filter	Wh		
	channel 1	channel 2	channel 3
Typical effect of acoustic signal [mm/s^{-2}]	1.28	1.18	0.65

Table C.9. Typical effect of the acoustic signal perpendicular to the z axis of the SV 39A/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

C.2 SPECIFICATION OF SV 106D AS 1/1 AND 1/3 OCTAVE ANALYSER

SV 106D performs the 1/1 and 1/3 octave analysis in the configuration and with the parameters presented in Chapter C.1.

Note: *Simultaneously to the frequency analysis, SV 106D operates as a Vibration Level Meter - see Chapter C. for specification.*

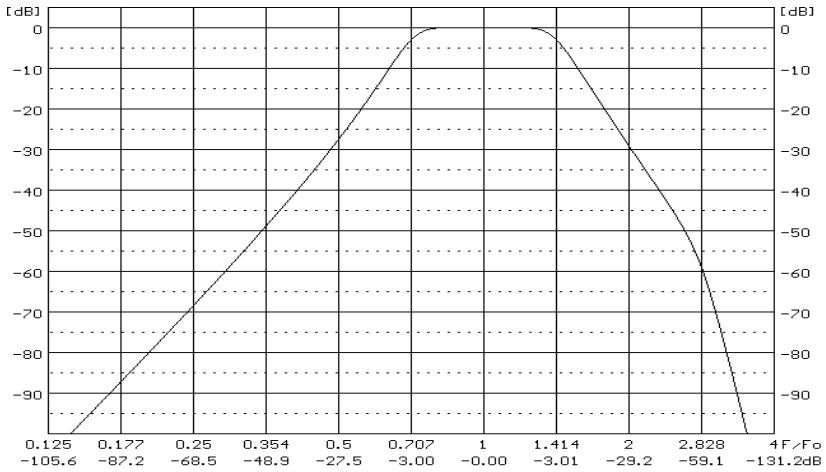
Antialiasing filter

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),
Crosstalk between channels	< -80 dB @ 16 Hz.

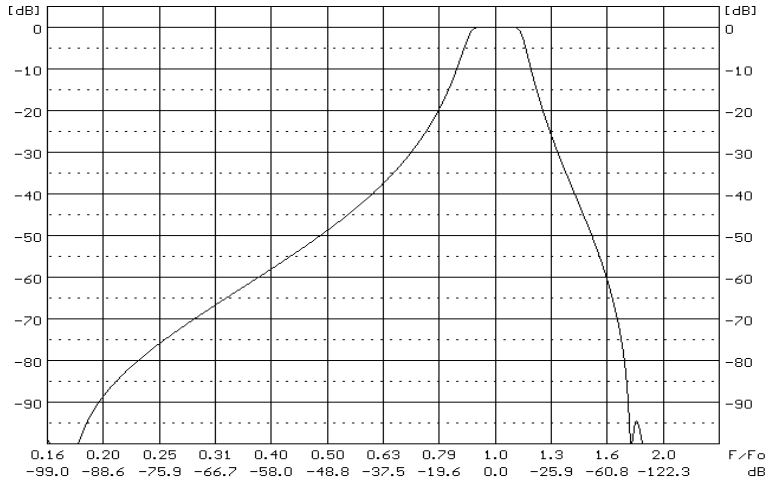
1/1 and 1/3 octave filters

1/1 Octave — 13 filters with centre frequencies from 0.5 Hz to 2 kHz (base 2), meeting DIN 45651, IEC 61260:1995 and ANSI S1.11-1986 for Class 1

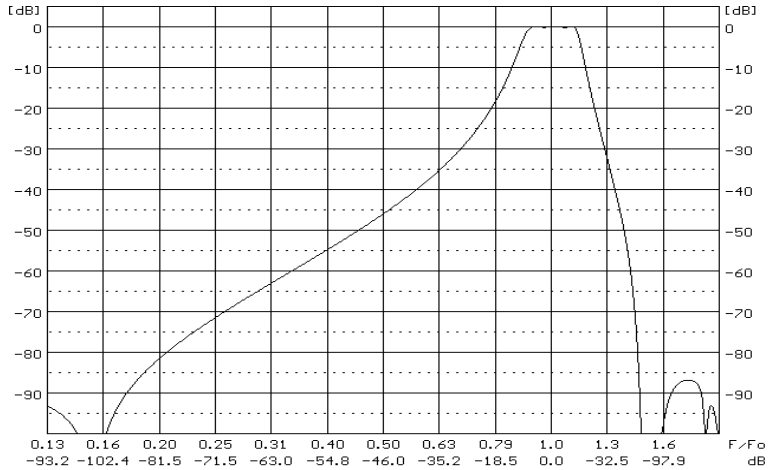


1/1 octave filter characteristics for each octave band

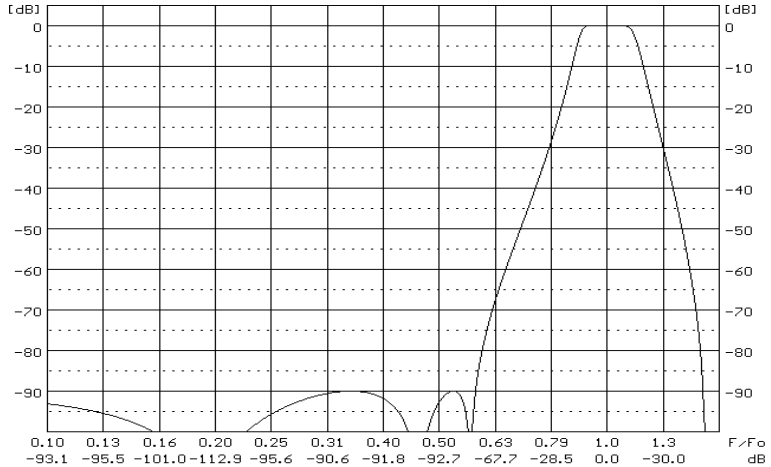
1/3 octave filters — 39 filters with centre frequencies from 0.4 Hz to 2.5 kHz (base 2), meeting DIN 45651, IEC 61260:1995 and ANSI S1.11-1986 for Class 1



1/3 octave filter characteristics for each octave band – "lower" filter



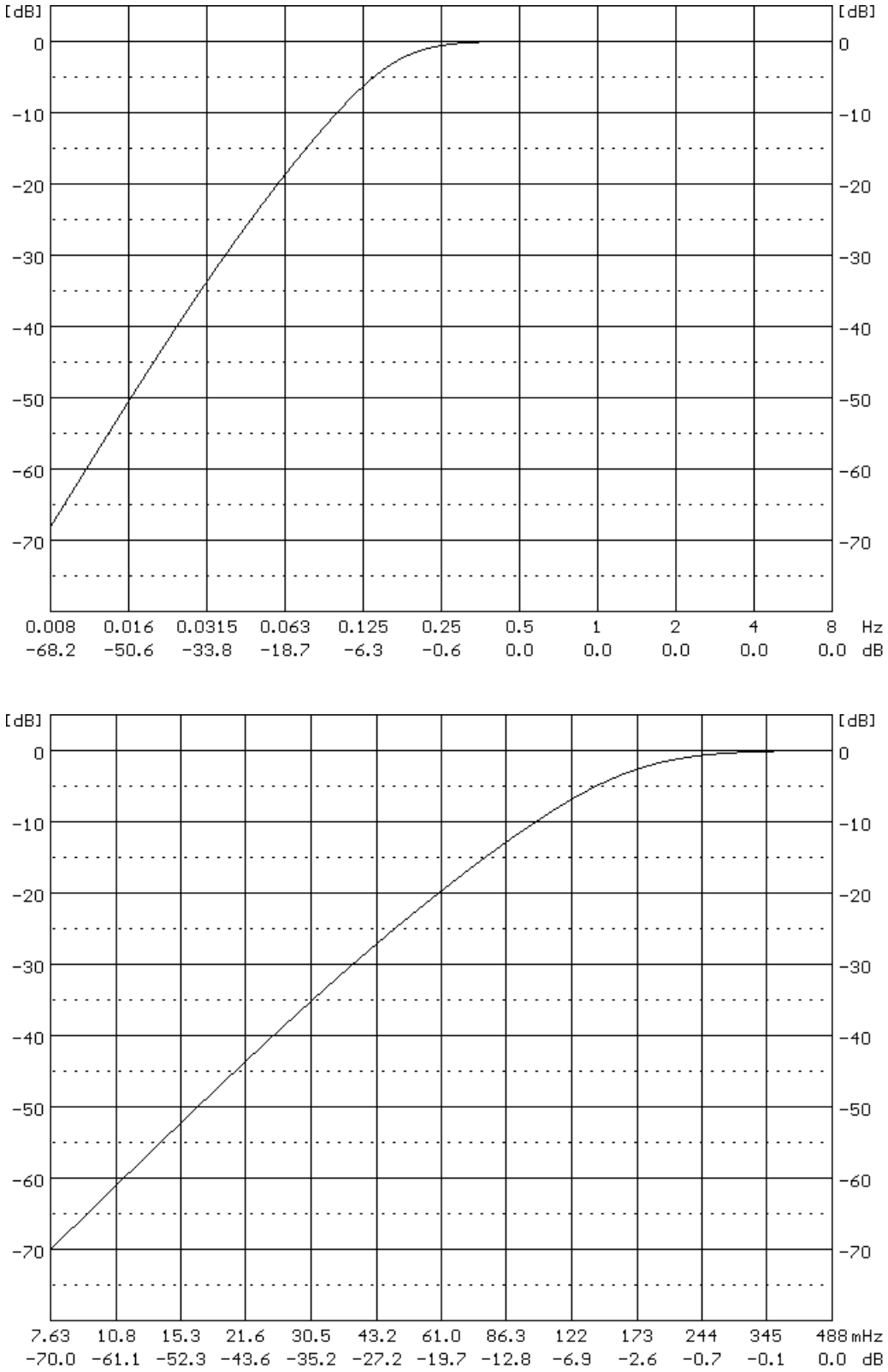
1/3 octave filter characteristics for each octave band – "middle" filter



1/3 octave filter characteristics for each octave band – "upper" filter

C.3 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED DIGITAL WEIGHTING FILTERS

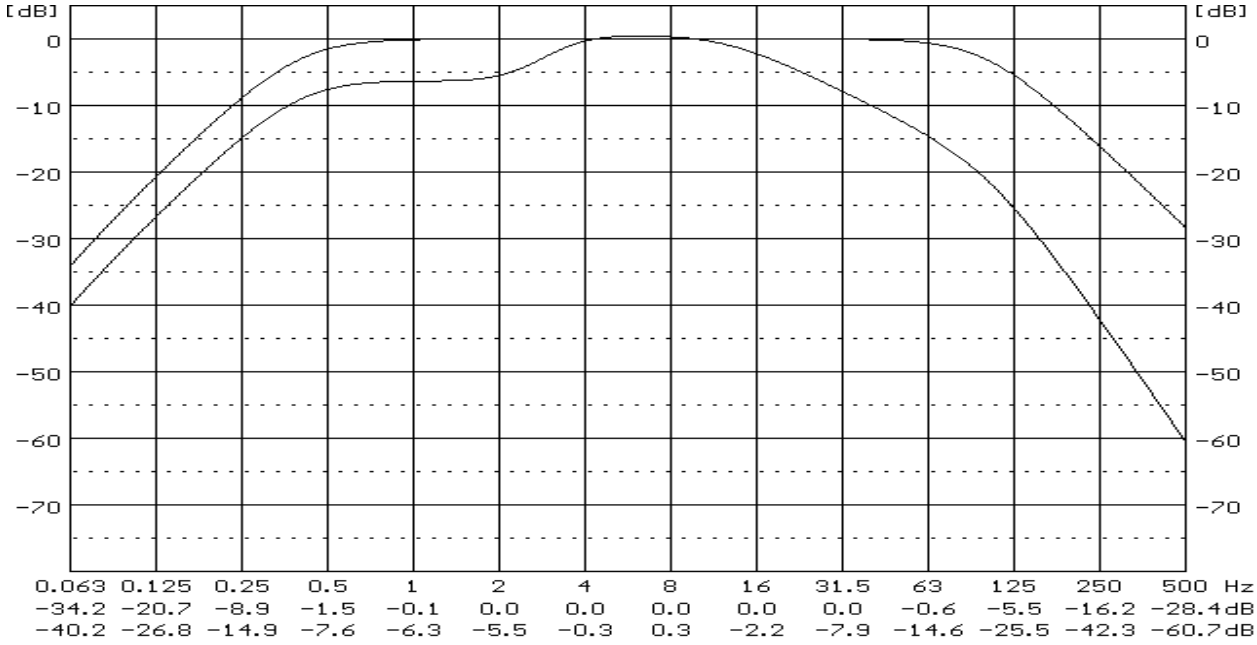
The **HP** filter is used for the acceleration measurements (the vibration signal) in the frequency range from 0.2 Hz to 2 kHz.



Characteristics of the HP digital filter implemented in the instrument

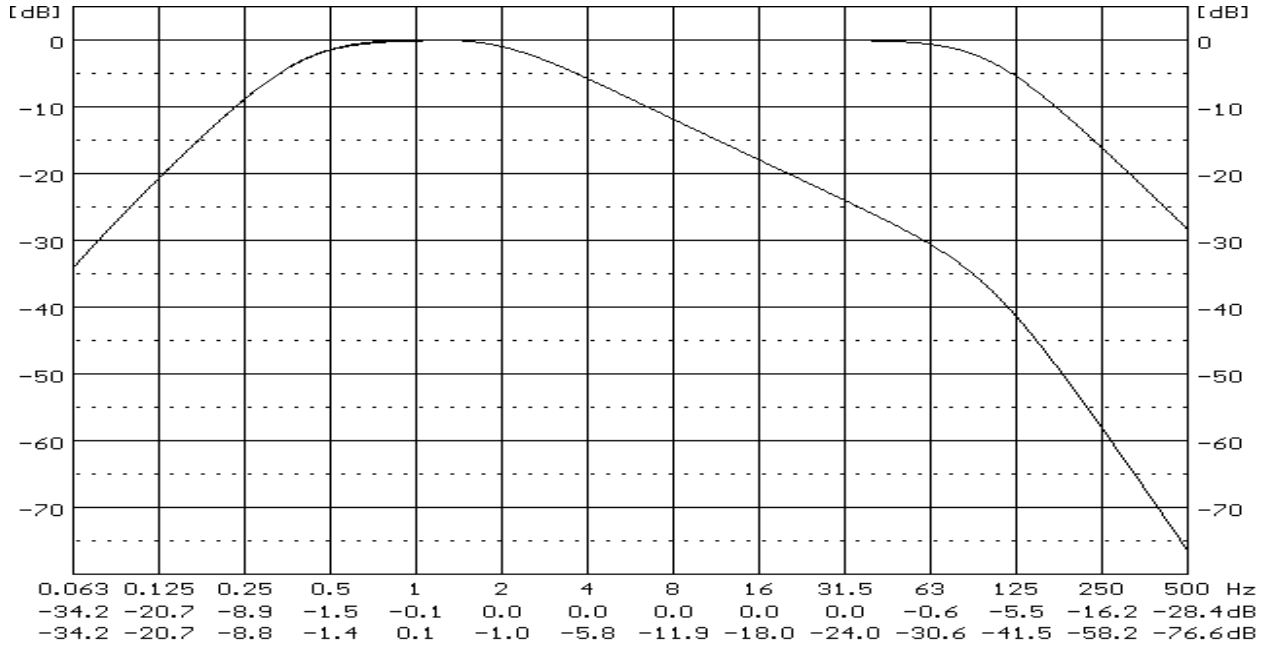
SV 106D has various filters conforming to ISO 8041-1:2017 standards (**Wk**. **BL-Wk**. **Wd**. **BL-Wd. Wc**. **BL-Wc. Wj**. **BL-Wj. Wm**. **BL-Wm. Wh**. **BL-Wh. Wg. BL-Wg. Wb. BL-Wb. Wf.** and **BL-Wf**).

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 the vertical recumbent direction. It conforms to ISO 2631-1-97 and ISO 8041-1:2017.



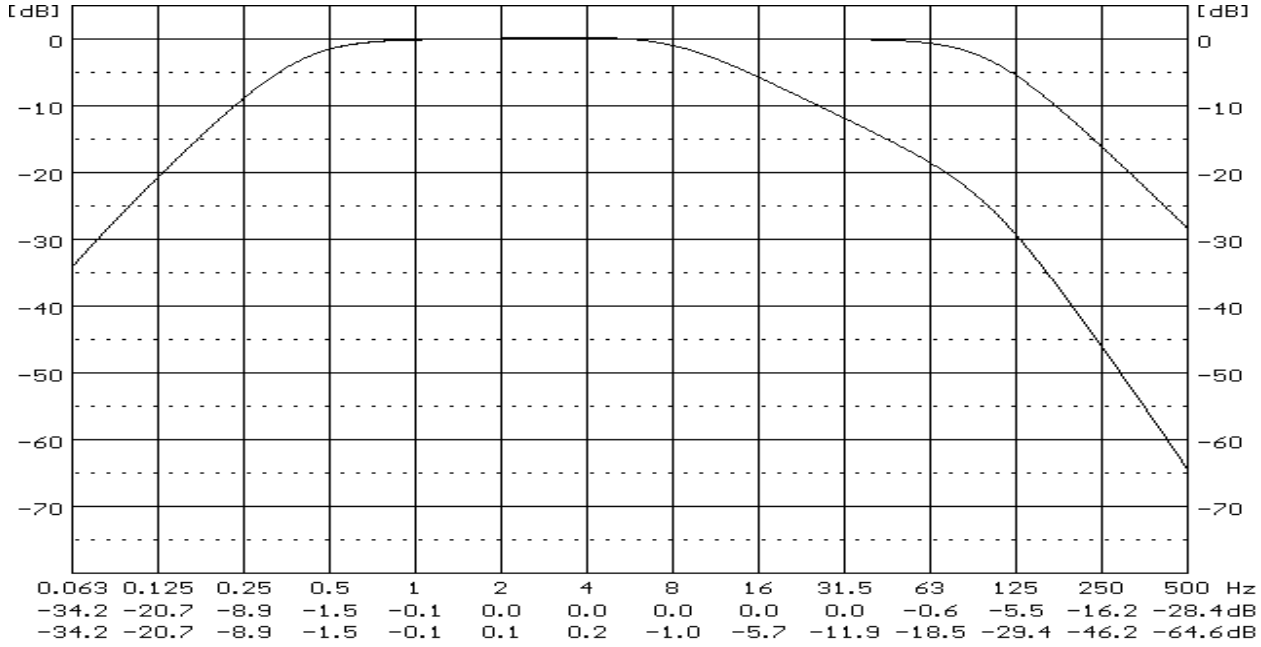
Characteristics of the BL-Wk and Wk digital filters implemented in the instrument

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 the horizontal recumbent direction. It conforms to ISO 2631-1-97 and ISO 8041-1:2017.



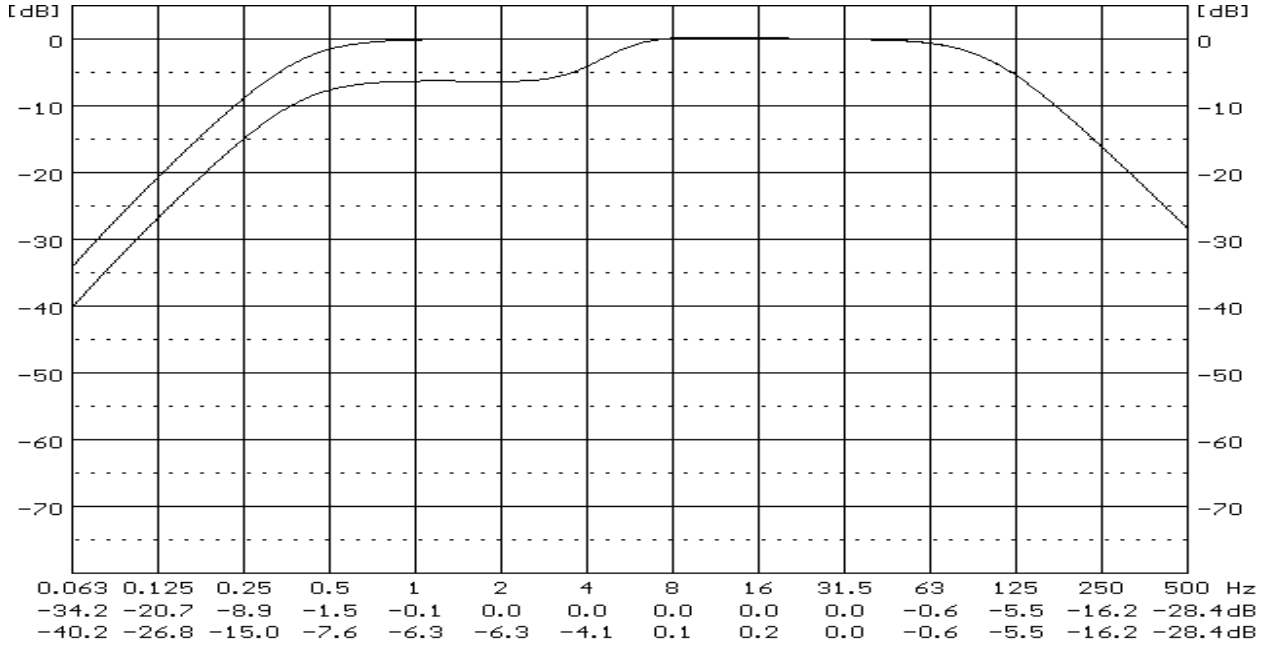
Characteristics of the BL-Wd and Wd digital filters implemented in the instrument

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 ISO 2631-1-97 and ISO 8041-1:2017.



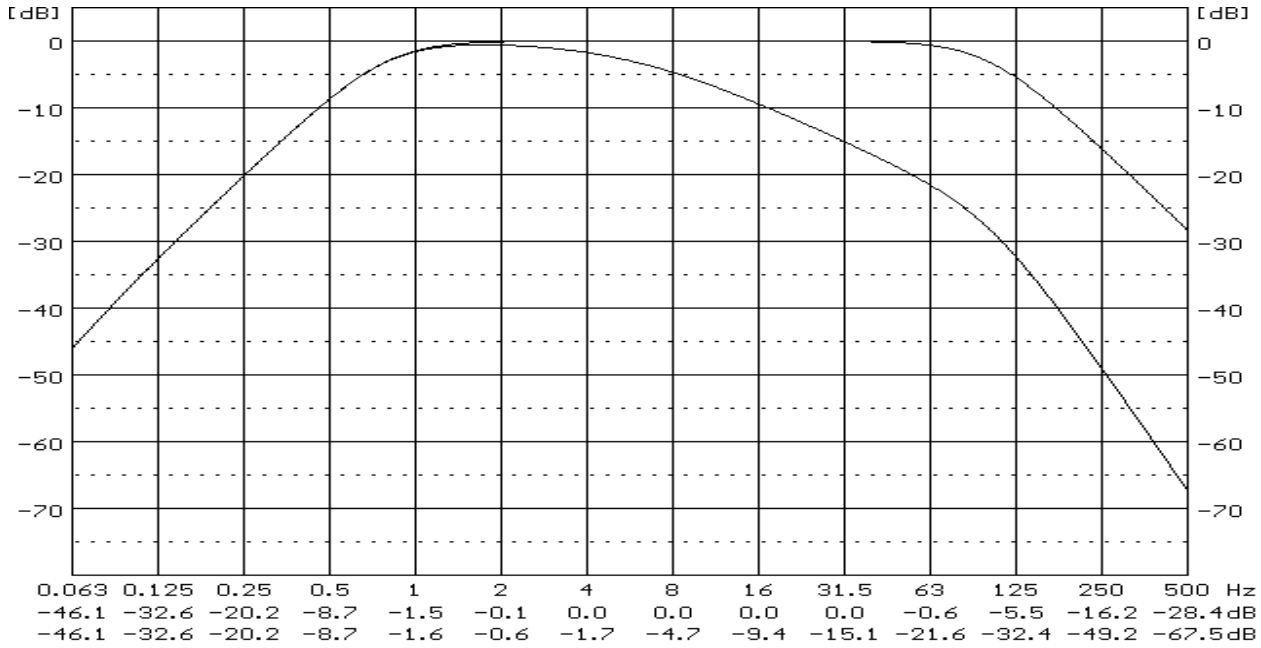
Characteristics of the BL-Wc and Wc digital filter implemented in the instrument

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 ISO 2631-1-97 and ISO 8041-1:2017.



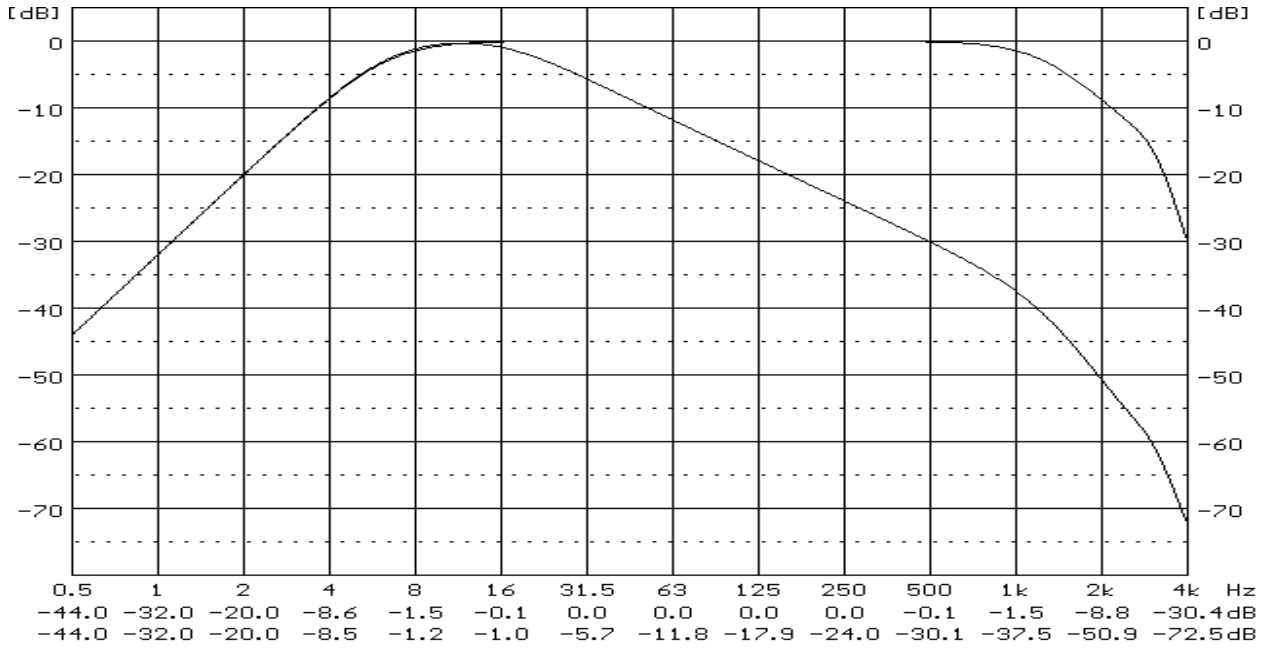
Characteristics of the BL-Wj and Wj digital filter implemented in the instrument

The **Wm** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to ISO 2631-1-97 and ISO 8041-1:2017.



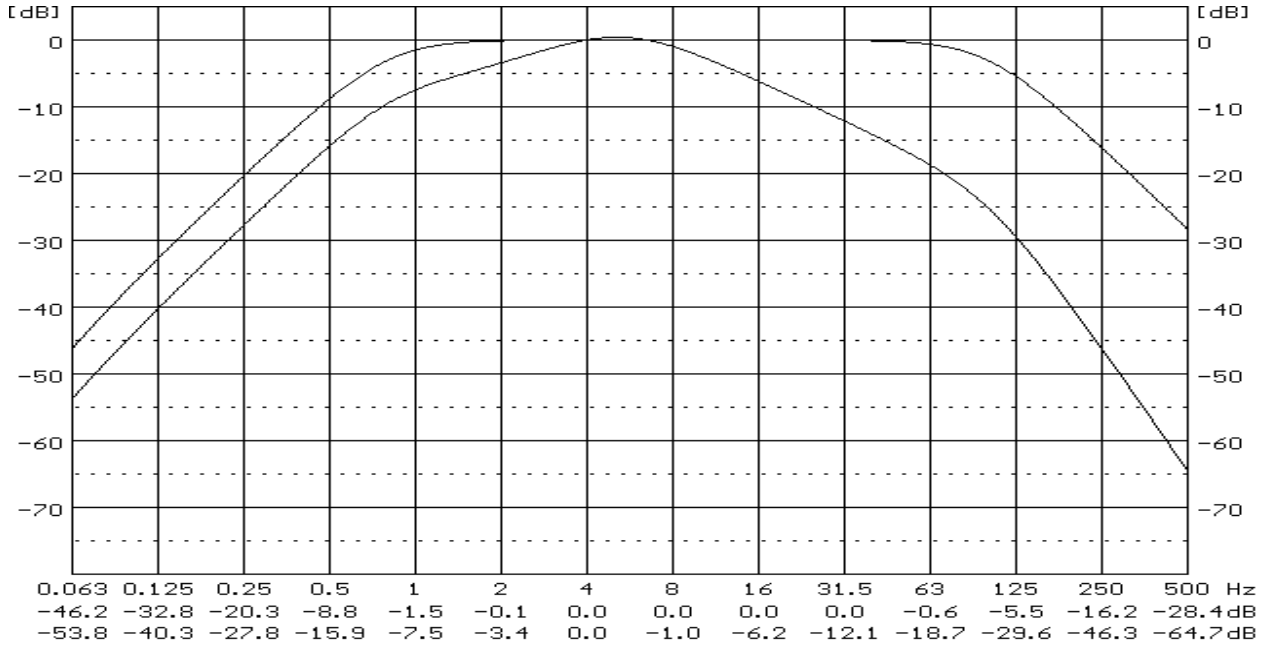
Characteristics of the BL-Wm and Wm digital filter implemented in the instrument

The **Wh** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to ISO 2631-1-97 and ISO 8041-1:2017.



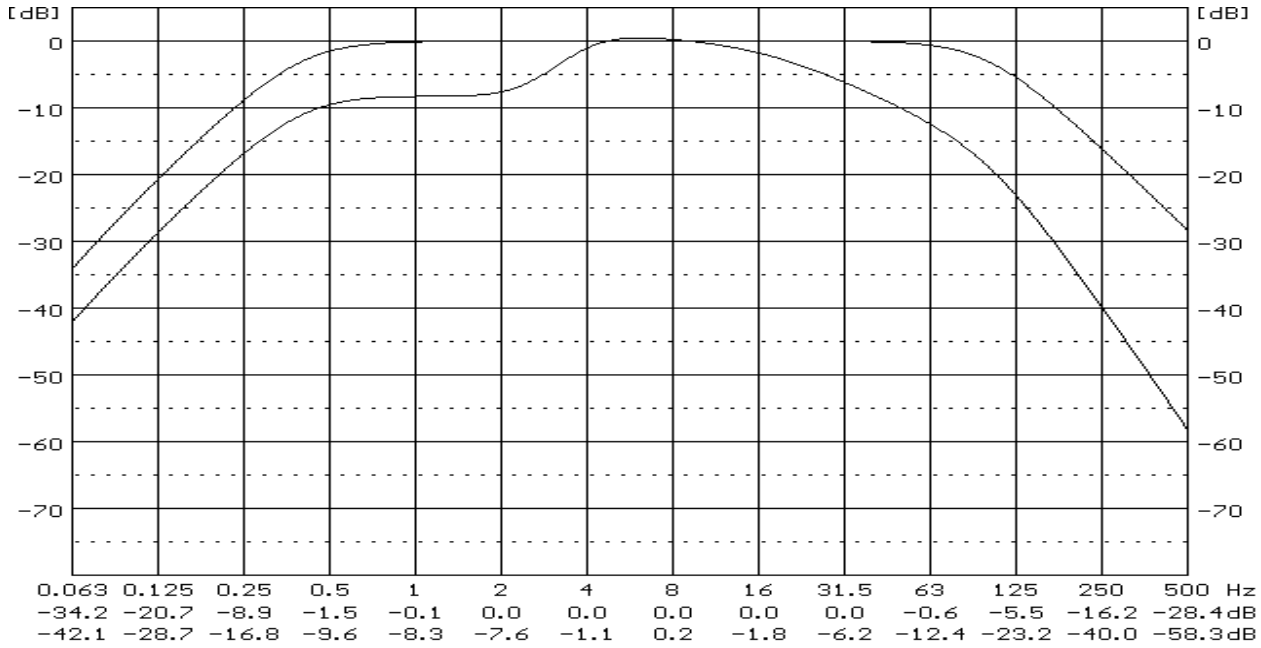
Characteristics of the BL-Wh and Wh digital filter implemented in the instrument

The **Wg** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to BS 6841:1987.



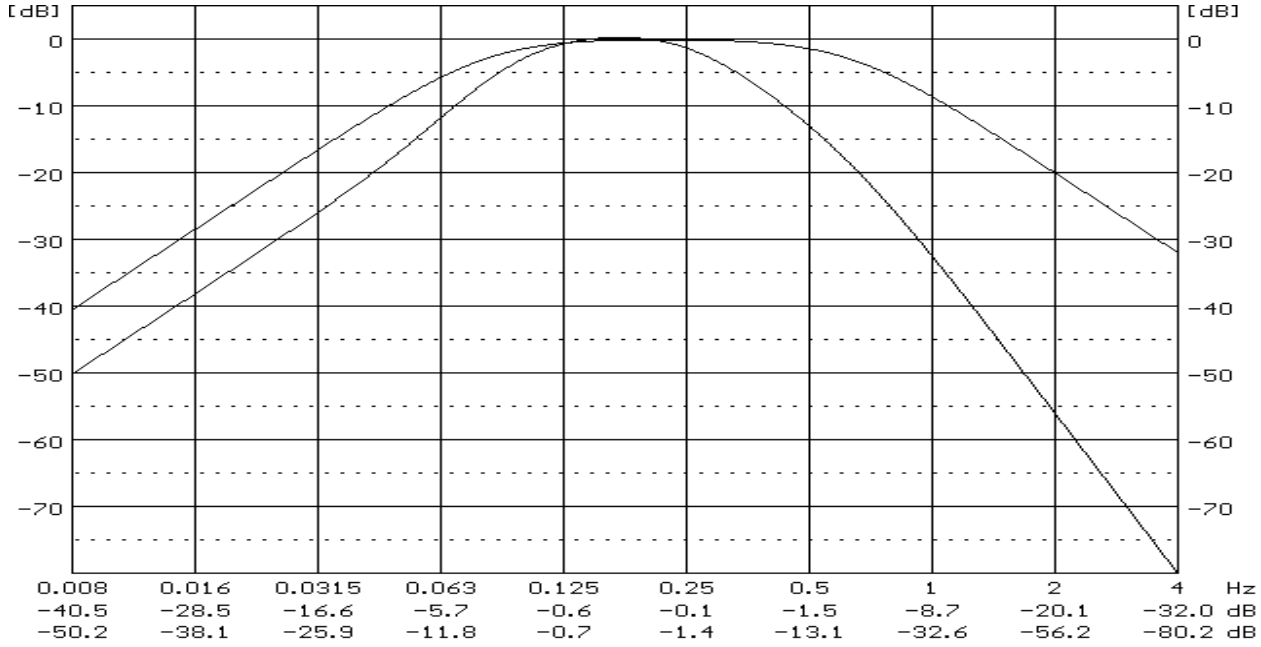
Characteristics of the BL-Wg and Wg digital filter implemented in the instrument

The **Wb** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to ISO 8041-1:2017.



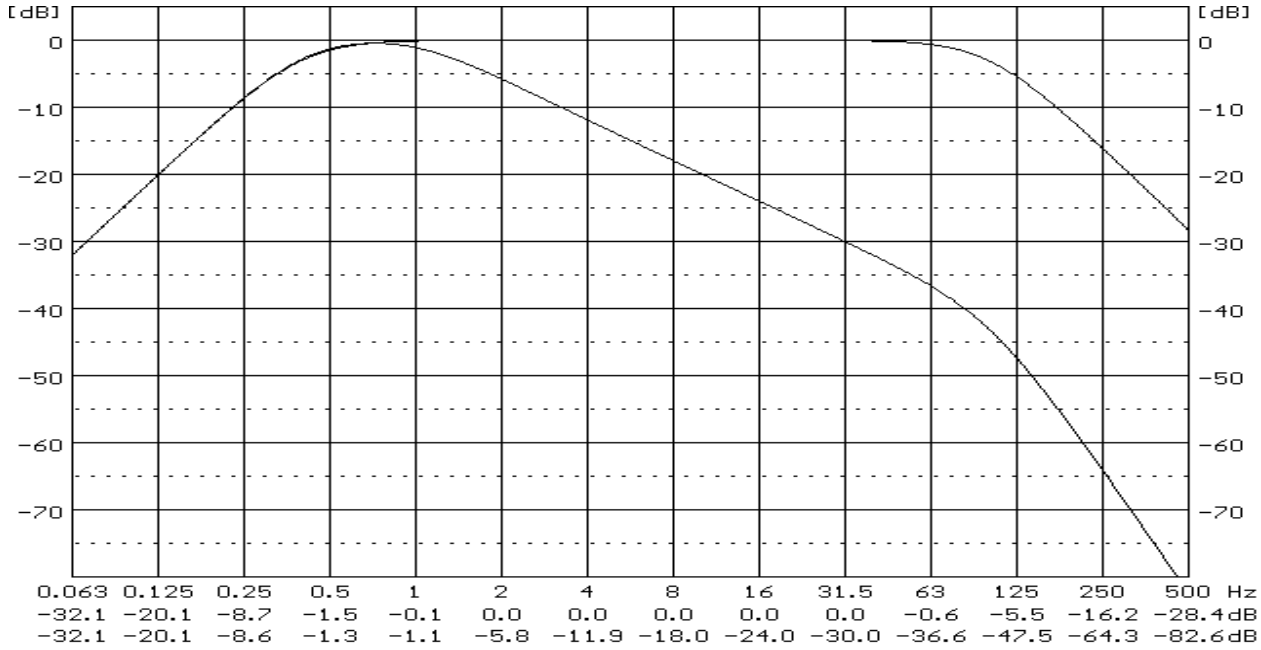
Characteristics of the BL-Wb and Wb digital filter implemented in the instrument

The **Wf** filter is used for the assessment of the influence of the vibration signal on the human body. It conforms to ISO 8041-1:2017.



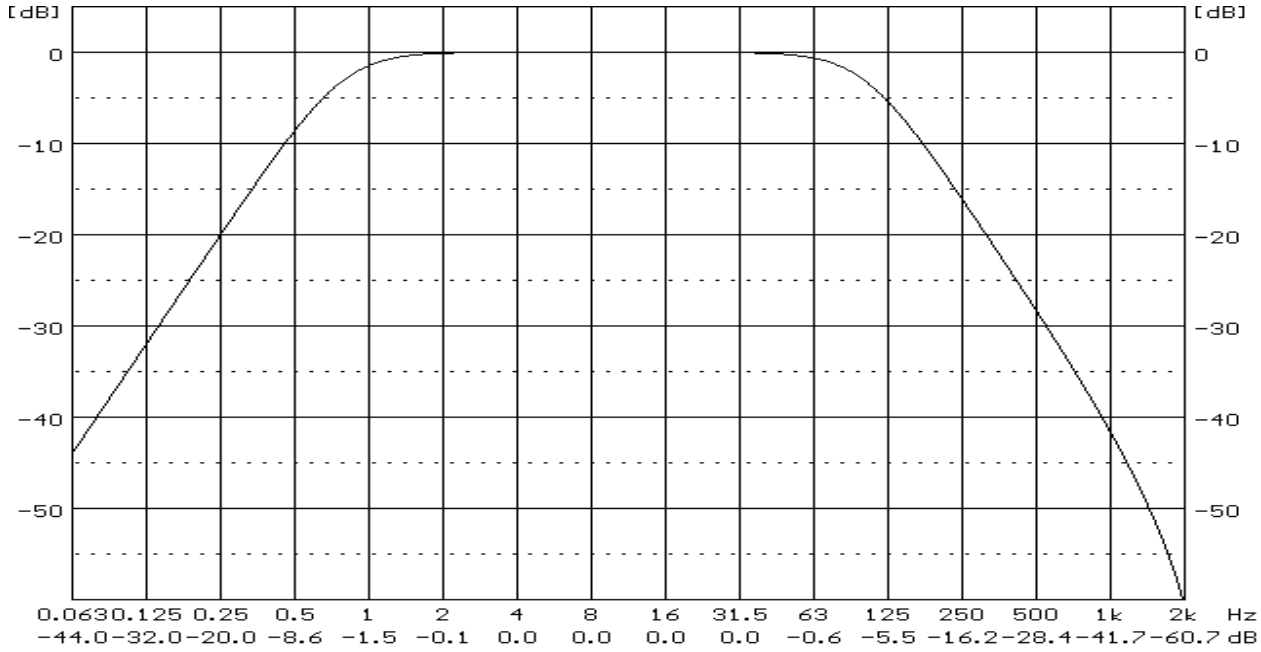
Characteristics of the BL-Wf and Wf digital filter implemented in the instrument

The **We** filter is used for the whole-body vibration measurements on a seat-back in accordance with ISO 2631-1. It conforms to ISO 8041-1:2017.



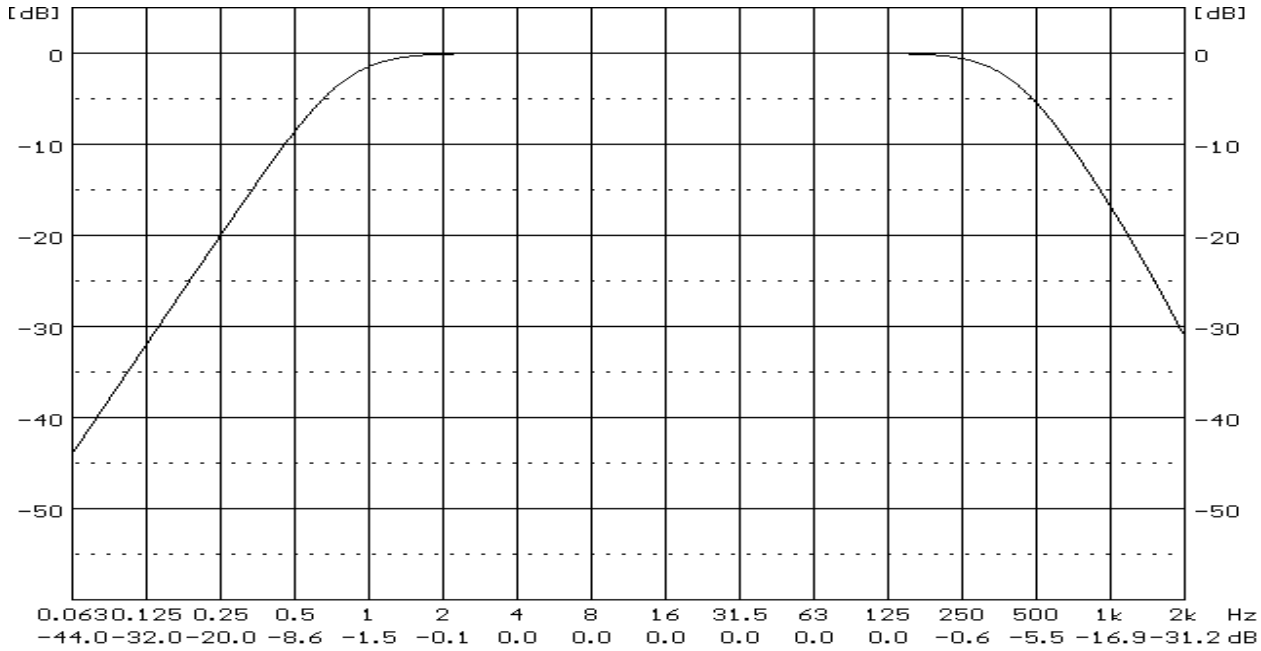
Characteristics of the BL-We and We digital filter implemented in the instrument

The **DIN80** filter is used for the building vibration applications in accordance with DIN 4150-3. It conforms to DIN 45669-1.



Characteristics of the DIN80 digital filter implemented in the instrument

The **DIN315** filter is used for the building and ground vibration measurements in accordance with DIN4150-3 at in the vicinity of railway traffic routes, blasts, or shocks. It conforms to DIN 45669-1.



Characteristics of the DIN315 digital filter implemented in the instrument

C.4 MISCELLANEOUS SPECIFICATION OF SV 106D

Display

Blanview TFT-LCD 2.4” colour display (320 x 240 pixels).

Memory

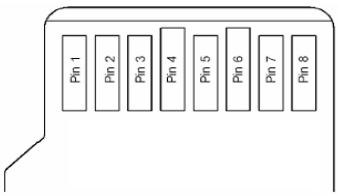
2 MB RAM memory.

128 MBit flash memory allocated to the program.

Memory card

Typical Micro SD or Micro SDHC cards can be used. Supported for up to 128 GB (provided that card was formatted as FAT32).

Note: *The originally supplied Kingston Industrial memory card has been tested by SVANTEK and cards of this type are strongly recommended for use when the original card is going to be replaced.*



MicroSD contact pad assignment - outer view

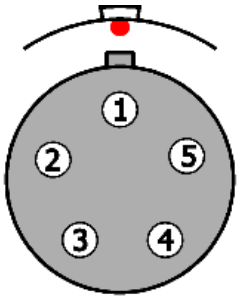
Table C.10. Pin out of the MicroSD contact

Pin No.	Name	Description
1	DAT2	Data Line [Bit 2]
2	CD/DAT3	Card Detect / Data Line [Bit 3]
3	CMD	Command / Response
4	V_{DD}	Supply voltage
5	CLK	Clock
6	V_{SS}	Supply voltage ground
7	DAT0	Data Line [Bit 0]
8	DAT1	Data Line [Bit 1]

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.11. 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

Power supply

Instrument is dedicated for the operation from the internal exchangeable batteries.

SV 106D 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.

Note: *For the temperatures below 0°C operating time can decree (depending on the batteries)!*

Instrument can be also powered from the external USB source with the DC Voltage from 4.5 V to 5 V.

Voltage ripple should not exceed ± 5%.

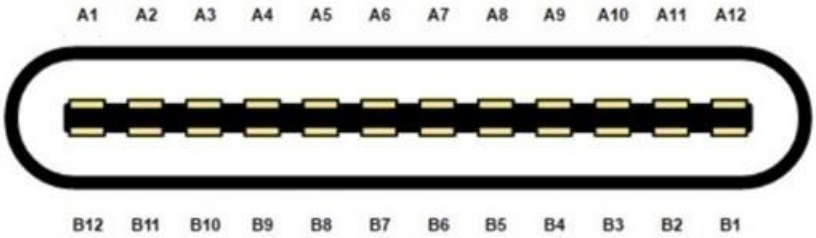
External Power requirement for 5 V:

- 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 Type C

The SV 106D USB-C 2.0 interface enables remote control of the instrument and data transfer with the speed up to that attainable with 12 MHz clock.

The USB-C interface can work as an external power source of the instrument.

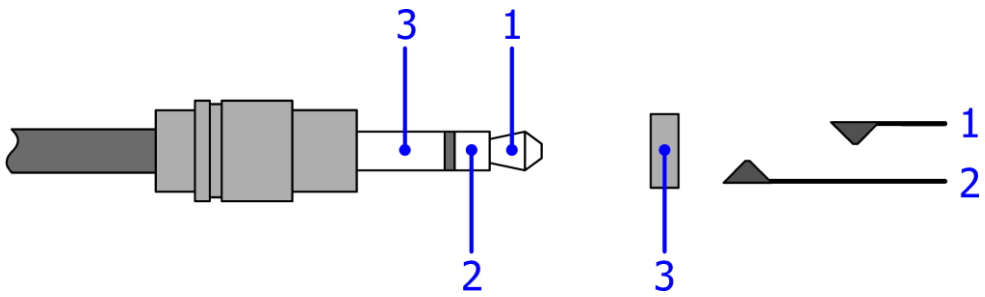


USB-C socket (external view)

Table C.12. Pin-out of the USB-C device connector

Contact no.		Signal name	Description
A1	B1	GND	Ground return
A2	B2	SSTXp1	not used
A3	B3	SSTXn1	not used
A4	B4	V_{BUS}	Bus power (5VDC ±0.5V)
A5	B5	CC1	Configuration channel (5.1kΩ to ground as UFP receiver)
A6	B6	Dp1	USB 2.0 differential pair, position 1, positive
A7	B7	Dn1	USB 2.0 differential pair, position 1, negative
A8	B8	SBU1	not used
A9	B9	V_{BUS}	Bus power (5VDC ±0.5V)
A10	B10	SSRXn2	not used
A11	B11	SSRXp2	not used
A12	B12	GND	Ground return

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.13. Pin out of the 3.5 mm Mini Stereo Jack

Pin Number	Function
1	Analog Output; Digital Input / Output *
2	Future functions: Analog Output (secondary). Supply Volt. +4.5V (auxiliary)
Chassis (3)	Ground

*depending on instrument set-up

You may set in the **Multifunction I/O** screen (path: *<Menu> / Instrument / Multifunction I/O*) one of Modes available in the instrument: **Analog Out**, **Digital In** or **Digital Out**.

1. **Analog Out**. In this mode analogue signal from the instrument is fed to its **IO** connector with following parameters:

   1.1. Output Voltage: 1.0 VRMS (± 5 %) at 170 dB indication with calibration factor 0.0 dB.

   1.2. Frequency Band (-3 dB): 0.02 Hz ÷ 4 kHz.

   1.3. Output Impedance: 51 Ω / 5%

2. **Digital In**. In this mode the **External** source should be selected (*path: <Menu> / Measurement / Measurement Trigger / Source: External*). The external signal for triggering is specified as follows:

   2.1. Trigger voltage threshold level is set to +1 V

   2.2. Minimal duration of the trigger impulse: 10 µsec.

   2.3. 100 µsec. release time after previous measurement is necessary before next trigger

   2.4. Recommended trigger voltage should not exceed ± 5 V

   2.5. Input impedance - ca. 10 kΩ / 100 pF. ESD type safety

   2.6. 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 with uprising voltage slope is necessary.

3. **Digital Out** - two different functions are available in this mode:

   3.1. **Trigger Pulse**. When this function is selected the terminal [1] is set as output which enables triggering 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. **Alarm Pulse**. When this function is selected the terminal [1] is set as an output which changes its output level when current measurement result exceeds the threshold level. In this case the terminal [1] output operates as an output of analogue comparator with user-programmable threshold. This feature enables controlling an external device as alarm-indicator or similar. Output alarm signal meets specification given below:

      a) electrical specification: 0 V to 3 V voltage range, 51 Ω output impedance

      b) output produces a voltage level (not impulse)

      c) **Active Level** setting (*path: <Menu> / Instrument / Multifunction I/O*) may be selected 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**, **Channel**, **Result** settings (*path: <Menu> / Measurement / Alarm Trigger*) define source of measurement result to be compared with the threshold level – its profile, channel and measured: **RMS**, **VEC13** or **VEC46**

e) **Level** setting (*path: <Menu> / Measurement / Alarm Trigger*) defines the threshold level.

Real Time Clock

Built-in real time. Accuracy better than 1 minute/month. Additional built-in CR1220 battery provides power to the RTC for a minimum of 2 years (typically 10 years).

Weight with the battery	390 g (without accelerometer).
Dimensions	140x83x33 mm (without accelerometer).

Compliance with EU Directives

CE mark indicates compliance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU.

Electromagnetic Compatibility (EMC)

The product described above is compliant with the following EMC standards:

1. For the EMC emissions specification:

   according to EN ISO 8041-1:2017; Human response to vibration - Measuring instrumentation - Part 1: General purpose vibration metres (Chapters 7.5. 12.20.7), applying test methods in accordance with EN 55011:2016/AMD1:2017 (CISPR 11:2015/A1:2016).

2. For the EMC immunity specification:

   according to EN ISO 8041-1: 2017 (Chapters 7.4. 7.6. 12.20.6. 12.20.8), applying test methods in accordance with IEC 61000-6-2:2016 and IEC 61326-1:2012.

Note: *EMC compatibility is guaranteed only with the original accessories supplied by SVANTEK!*

Safety

The product described above is compliant with following standards:

EN 61010-1:2010 and IEC 61010-1:2010; Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

Environmental parameters

- **Working temperature range** -10°C ÷ +50°C
- **Storing temperature range** -20°C ÷ +50°C
- **Humidity** up to 90% RH (non-condensed)

C.4 TRANSDUCERS SPECIFICATION

Whole-Body "Seat" Accelerometer SV 38V specification:

Physical

Sensing element	MEMS
Cable	integrated 1.4 meters long
Connector	LEMO 4-pin plug
Dimensions	236 mm diameter; thickness from 3.6 mm to 12 mm
Weight	550 grams (including cable and rubber cushion)

Performance

Number of axis	3
Sensitivity (± 5 %)	50 mV/(m/s2) at 15.915 Hz,
Measurement range	0.01 ms-2 RMS ÷ 50 ms-2 PEAK
Frequency response	0.1 Hz ÷ 100 Hz
Resonant frequency	5 kHz (MEMS transducer)
Electrical noise	< 50 µV RMS, Wb weighting
	< 316 µV RMS, HP weighting

Electrical

Supply current	1 mA ÷ per channel
Supply voltage	5 V
Bias voltage	1.5 V ± 0.2 V
Output impedance	51 Ohms
Charge / discharge time constant	
(start-up time)	30 sec. typ.
TEDS memory	Channel 1 (as standard)

Environmental

Maximum vibration	100 000 m/s^2 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

Accessories

SA 38 (option)	Calibration adapter

Whole Body “Seat” Accelerometer SV 39A/L specification:

Physical

Accelerometer type	Dytran 3023
Weight	16 Grams
Size, L X W X H	0.82 x 0.82 x 0.34 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	0.012 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	0.03 %/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 3023M2 (part of the SV 50 set) specification:

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%	1 mV / 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

Hand-Arm triaxial Accelerometer SV 105/105F specification:

Physical

Sensing Element	MEMS
Cable	integrated 1.4 meters
Connector	LEMO 5-pin plug (SV 106D compatible)
Dimensions	69.6 mm x 31.4 mm, thickness from 8.3 mm to 15 mm
Weight	50-60 grams (including cable and one of the vibration contact adapters)

Performance

Number of Axes	3
Sensitivity (± 5 %)	0.661 mV/ms^{-2} at 79.58 Hz
Measurement Range	2000 ms^{-2} PEAK
Frequency Response	0 Hz ÷ 1500 Hz (by design guideline, ± 3 dB)
Resonant Frequency	16.5 kHz (MEMS transducer)
Electrical Noise	< 0,14 ms^{-2} RMS, Wh weighting
Force range (SV 105F)	200 N

Environmental

Maximum Vibration	100 000 ms^{-2} shock survival for MEMS sensor
Temperature Coefficient	<+/-0.02%/°C
Temperature from	-10°C to +50°C
Humidity	up to 90% RH, non-condensed

Electrical

Supply Current	< 5.0 mA
Supply Voltage	3.3 V ÷ 5.5 V
Bias Voltage	1.5 V ± 0.05 V
Output Impedance	51 Ohms
Charge/Discharge Time Constant	30 sec. typ. (start-up time)
TEDS Memory	installed (power supply pin)

Accessories

SA 105D (optional)	calibration adapter

Hand-Arm triaxial Accelerometer SV 150 specification:

Physical

Sensing Element	MEMS
Cable	integrated 1.4 meters
Connector	LEMO 5-pin plug (SV 106D compatible)
Dimensions	15.5mm x 15.5 mm x 15.5mm
Weight	20 grams (without cable)

Performance

Number of Axes	3
Sensitivity (± 5 %)	0.661 mV/ms^{-2} at 79.58 Hz
Measurement Range	2000 ms^{-2} PEAK
Frequency Response	0 Hz ÷ 1500 Hz
Resonant Frequency	16.5 kHz (MEMS transducer)
Electrical Noise	< 0,14 ms^{-2} RMS, Wh weighting

Environmental

Maximum Vibration	100 000 ms^{-2} shock survival for MEMS sensor
Temperature Coefficient	<+/-0.02%/°C
Temperature from	-10°C to +50°C
Humidity	up to 90% RH, non-condensed

Electrical

Supply Current	< 5.0 mA
Supply Voltage	3.3 V ÷ 5.5 V
Bias Voltage	1.5 V ± 0.05 V
Output Impedance	51 Ohms
Charge/Discharge Time Constant	30 sec. typ. (start-up time)
TEDS Memory	installed (power supply pin)

Accessories

SA 105D (optional)	calibration adapter

SEAT Vibration Accelerometer SV 151 specification:

Physical

Sensing Element	MEMS
Cable	integrated 1.4 meters
Connector	LEMO 5-pin plug (SV 106D compatible)
Dimensions	15.5mm x 15.5 mm x 15.5mm
Weight	20 grams (without cable)

Performance

Number of Axes	3
Sensitivity (± 5 %)	5.81 mV/ms^{-2} at 15.915 Hz
Measurement Range	160 ms^{-2} PEAK
Frequency Response	0 Hz ÷ 500 Hz
Resonant Frequency	5.5 kHz (MEMS transducer)
Electrical Noise	< 0,066 ms^{-2} RMS, BL Wb weighting

Environmental

Maximum Vibration	100 000 ms^{-2} shock survival for MEMS sensor
Temperature Coefficient	<+/-0.01%/°C
Temperature from	-10°C to +50°C
Humidity	up to 90% RH, non-condensed

Electrical

Supply Current	< 5.0 mA
Supply Voltage	3.3 V ÷ 5.5 V
Bias Voltage	1.5 V ± 0.05 V
Output Impedance	51 Ohms
Charge/Discharge Time Constant	30 sec. typ. (start-up time)
TEDS Memory	installed (power supply pin)

Accessories

SA 155 (optional)	calibration adapter

APPENDIX D. DEFINITIONS AND FORMULAS OF MEASURED VALUES

D.1 BASIC TERMS AND DEFINITIONS

T	Current time period of the measurement in seconds.
τ	Detector time constant (τ =1s).
T_E	Exposure time in seconds (period during which a person is exposed to the action of vibration)
T_0	Reference duration of 8 hours (28 800 seconds)
EAV	**E**xposure **A**ction **V**alue – constant value defined by local standards
ELV	**E**xposure **L**imit **V**alue – constant value defined by local standards
EAV_A	**E**xposure **A**ction **V**alue expressed in $\frac{m}{s^2}$
ELV_A	**E**xposure **L**imit **V**alue expressed in $\frac{m}{s^2}$
EAV_V	**E**xposure **A**ction **V**alue expressed in $\frac{m}{s^{1.75}}$
ELV_V	**E**xposure **L**imit **V**alue expressed in $\frac{m}{s^{1.75}}$
W	Frequency-weighting filter. Filters in Profile (1): **Wd**, **Wk**, **Wm**, **Wb**, **Wc**, **Wj**, **Wg**, **Wf** (ISO 2631), **Wh** (ISO 5349), **We**. Filters in Profile (2): **HP**, **KB**, **Vel3** (for PPV measurement) and Band Limiting according to ISO 8041-1:2017.
$a_W(t)$	Temporary value of the measured vibration with the weighting filter **W** (e.g. **Wd**) on the input of the RMS detector
$p_W(t)$	Temporary value of the measured vibration with the weighting filter **W** (e.g. **Wd**) on the output of the RMS detector $p_W(t) = \left(\frac{1}{\tau} \int_{-\infty}^{t} a_W^2(t_x) \exp\left(\frac{t_x - t}{\tau} \right) dt_x \right)^{1/2}$ t_x - time (variable of the integration)
MAX (RMS)	Highest **RMS** value taken from three axis $MAX(RMS) = \max\left\{ k_X RMS_X, k_Y RMS_Y, k_Z RMS_Z \right\}$

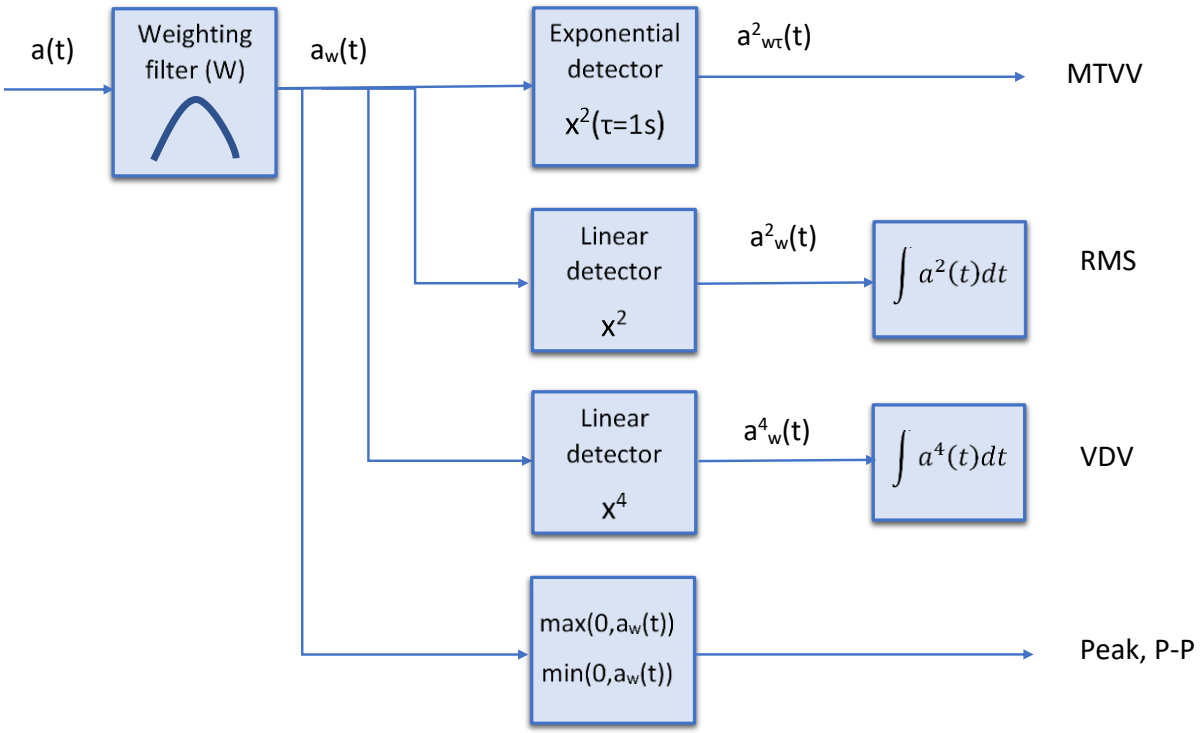
MAX (VDV) Highest weighted **VDV** value taken from three axis

$$\mathbf{MAX(VDV) = max\left\{k_X VDV_X, k_Y VDV_Y, k_Z VDV_Z\right\}}$$

Notice: *In all formulas the multipliers* k_x, k_y *and* k_z *mean the coefficients which are defined in the applicable software in the „Multiplying Factor" screen. By default:* ***k = 1.4*** *for x- and y-axis and* ***k = 1.0*** *for z-axis.*

D.2 DEFINITIONS AND FORMULAS OF THE VLM MODE RESULT

The instrument calculates the vibration measurement results for two profiles of six channels. The calculation flow diagram for one profile is presented below:



RMS **RMS** (root mean square) result for current time period of the measurement (**T**)

$$\mathbf{RMS} = \left(\frac{1}{T}\int_0^T a_w^2(t)\,dt\right)^{1/2}$$

VDV **V**ibration **D**ose **V**alue result expressed in $m/s^{1.75}$

$$\mathbf{VDV} = \left(\int_0^T a_w^4(t)\,dt\right)^{1/4}$$

CRF **CRF** value (**Cr**est **F**actor) is obtained from the proportion **PEAK**/**RMS**

OVL	Overload result presents the percentage of the overloaded input signal, which occurred during the current time period of the measurement (**T**)	
PEAK	Peak value is calculated for the given **T**	$\mathbf{PEAK} = \mathbf{max}_T \lvert \mathbf{a}_W(t) \rvert$
P–P	Peak-to-peak (**P-P**) result is the difference between highest and lowest value of the signal. It is calculated for the given **T**	$\mathbf{P-P} = \mathbf{max}_T(0, \mathbf{a}_W(t)) - \mathbf{min}_T(0, \mathbf{a}_W(t))$
MTVV	**M**aximum Transient **V**ibration **V**alue - **MTVV**, saved as the main result, is defined according to the ISO 8041-1:2017 standard for T=1 second	$\mathbf{MTVV} = \mathbf{max}_T(\mathbf{p}_W(t))$

D.3 DEFINITIONS AND FORMULAS OF THE HAND-ARM VIBRATION RESULTS

MAX (RMS)	Highest **RMS** value taken from three axis	$\mathbf{MAX(RMS)} = \mathbf{max}\{ \mathbf{RMS}_x, \mathbf{RMS}_y, \mathbf{RMS}_z \}$
EAV Total **T**ime	Time to reach Exposure Action Value from beginning of measurement	$\mathbf{EAV}_{TT} = \mathbf{T}_0 \left(\frac{\mathbf{EAV}}{\mathbf{AEQ}} \right)^2$
EAV Time **L**eft	Current time to reach Exposure Action Value during the measurement	$\mathbf{EAV}_{TL} = \mathbf{EAV}_{TT} - \mathbf{T}$
ELV Total **T**ime	Time to reach Exposure Limit Value from beginning of measurement	$\mathbf{ELV}_{TT} = \mathbf{T}_0 \left(\frac{\mathbf{ELV}}{\mathbf{AEQ}} \right)^2$
ELV Time **L**eft	Current time to reach Exposure Limit Value during the measurement	$\mathbf{ELV}_{TL} = \mathbf{ELV}_{TT} - \mathbf{T}$
MNDN Total **T**ime	Time to reach NDN limit value for hand-arm vibration (Polish standard)	$\mathbf{MNDN}_{TT} = \mathbf{T}_0 \left(\frac{\mathbf{MNDN8h}}{\mathbf{AEQ}} \right)^2$

MNDN Time Left — Current time left to reach NDN limit value during hand-arm vibration measurement (Polish standard)

$$MNDN_{TL} = MNDN_{TT} - T$$

AEQ — Vector of **RMS** values taken from three axis (equivalent to a_{hv} when **Wh** filter is applied)

$$AEQ = \sqrt{RMS_x^2 + RMS_y^2 + RMS_z^2}$$

CExp — Current Exposure to vibration measured from the measurement start

$$CExp = AEQ\sqrt{\frac{T}{T_0}}$$

A(8) — Daily Exposure to vibration measured based on the T_E exposure time

$$A(8) = AEQ\sqrt{\frac{T_E}{T_0}}$$

D.4 Definitions and formulas of the Whole-Body vibration results

EAV Total Time — Time to reach Exposure Action Value from beginning of measurement

$$EAV_{TT} = \begin{cases} EAV_{TTA} \text{ if EAV limit is in } \frac{m}{s^2} \\ EAV_{TTV} \text{ if EAV limit is in } \frac{m}{s^{1.75}} \end{cases}$$

where:

$$EAV_{TTA} = \min\left\{ EAV_{TTAx}, EAV_{TTAy}, EAV_{TTAz} \right\}$$

$$EAV_{TTAx} = T_0\left(\frac{EAV_{Ax}}{1.4RMS_x}\right)^2 \quad EAV_{TTAy} = T_0\left(\frac{EAV_{Ay}}{1.4RMS_y}\right)^2 \quad EAV_{TTAz} = T_0\left(\frac{EAV_{Az}}{RMS_z}\right)^2$$

$$EAV_{TTV} = \min\left\{ EAV_{TTVx}, EAV_{TTVy}, EAV_{TTVz} \right\}$$

$$EAV_{TTVx} = T\left(\frac{EAV_{Vx}}{1.4VDV_x}\right)^4 \quad EAV_{TTVy} = T\left(\frac{EAV_{Vy}}{1.4VDV_y}\right)^4 \quad EAV_{TTVz} = T\left(\frac{EAV_{Vz}}{VDV_z}\right)^4$$

EAV Time Left — Current time to reach Exposure Action Value during the measurement

$$EAV_{TL} = EAV_{TT} - T$$

ELV Total Time — Current time to reach Exposure Limit Value during the measurement

$$ELV_{TT} = \begin{cases} ELV_{TTA} \text{ if ELV limit is in } \frac{m}{s^2} \\ ELV_{TTV} \text{ if ELV limit is in } \frac{m}{s^{1.75}} \end{cases}$$

where:

$$ELV_{TTA} = \min\left\{ ELV_{TTAx}, ELV_{TTAy}, ELV_{TTAz} \right\}$$

$$ELV_{TTAx} = T_0\left(\frac{ELV_{Ax}}{1.4RMS_x}\right)^2 \quad ELV_{TTAy} = T_0\left(\frac{ELV_{Ay}}{1.4RMS_y}\right)^2 \quad ELV_{TTAz} = T_0\left(\frac{ELV_{Az}}{RMS_z}\right)^2$$

$$ELV_{TTV} = \min\left\{ ELV_{TTVx}, ELV_{TTVy}, ELV_{TTVz} \right\}$$

$$ELV_{TTVx} = T\left(\frac{ELV_{Vx}}{1.4VDV_x}\right)^4 \quad ELV_{TTVy} = T\left(\frac{ELV_{Vy}}{1.4VDV_y}\right)^4 \quad ELV_{TTVz} = T\left(\frac{ELV_{Vz}}{VDV_z}\right)^4$$

ELV Time Left — Current time to reach Exposure Limit Value during the measurement

$$ELV_{TL} = ELV_{TT} - T$$

ONDN Total Time — Time to reach NDN limit value for whole-body vibration (Polish standard)

$$ONDN_{TT} = T_0\left(\frac{ONDN8h}{Vector}\right)^2$$

ONDN Time Left — Current time left to reach NDN limit value during whole-body vibration measurement (Polish standard)

$$ONDN_{TL} = ONDN_{TT} - T$$

CDose — Current Dose - VDV exposure to vibration measured from the measurement start

$$CDose = MAX(VDV)$$

DDose — Daily Dose - VDV exposure to vibration measured based on the T_E exposure time

$$DDose = MAX(VDV)\sqrt[4]{\frac{T_E}{T}}$$

CExp	Current Exposure to vibration measured from the measurement start	$\mathbf{CExp} = \mathbf{MAX(RMS)}\sqrt{\frac{T}{T_0}}$
A(8)	Daily Exposure to vibration measured based on the T_E exposure time	$\mathbf{A8} = \mathbf{MAX(RMS)}\sqrt{\frac{T_E}{T_0}}$
Vector	Vibration total value of weighted rms determined from vibration in orthogonal coordinates	$\mathbf{Vector} = \sqrt{(k_x RMS_x)^2 + (k_y RMS_y)^2 + k_z RMS_z^2}$
	Default **Vector** calculation	$\mathbf{Vector} = \sqrt{(1.4 RMS_x)^2 + (1.4 RMS_y)^2 + RMS_z^2}$

D.5 Additional Whole Body results for Brazilian Standard

Vector VDV	Vibration total value of weighted VDV determined from vibration in orthogonal coordinates	$\mathbf{VectorVDV} = \sqrt[4]{(1.4 VDV_x)^4 + (1.4 VDV_y)^4 + VDV_z^4}$
Daily Dose (vec)	VDV exposure to vibration measured based on the T_E exposure time	$\mathbf{DDose(vec)} = \mathbf{VectorVDV}\sqrt[4]{\frac{T_E}{T}}$
Daily Exposure (vec)	A(8) exposure to vibration measured based on the T_E exposure time	$\mathbf{DailyExp(vec)} = \mathbf{Vector}\sqrt{\frac{T_E}{T_0}}$
VAE (RMS)	Exposure Action Value (RMS)	$\mathbf{VAE(RMS)} = T_0\left(\frac{0.5}{\mathbf{Vector}}\right)^2$
VAE(RMS) Time Left	Exposure Action Value (RMS) time left	$\mathbf{VAE(RMS)_{TL}} = \mathbf{VAE(RMS)} - T$
VLE (RMS)	Exposure Limit Value (RMS)	$\mathbf{VLE(RMS)} = T_0\left(\frac{1.15}{\mathbf{Vector}}\right)^2$
VLE(RMS) Time Left	Exposure Limit Value (RMS) time left	$\mathbf{VLE(RMS)_{TL}} = \mathbf{VLE(RMS)} - T$

VAE (VDV)	Exposure Action Value (VDV)	$$\mathbf{VAE(VDV) = T\left(\frac{9.1}{VectorVDV}\right)^4}$$
VAE(VDV) Time Left	Exposure Action Value (VDV) time left	$$\mathbf{VAE(VDV)_{TL} = VAE(VDV) - T}$$
VLE (VDV)	Exposure Limit Value (VDV)	$$\mathbf{VLE(VDV) = T\left(\frac{21}{VectorVDV}\right)^4}$$
VLE(VDV) Time Left	Exposure Limit Value (VDV) time left	$$\mathbf{VLE(VDV)_{TL} = VLE(VDV) - T}$$