SVANTEK

USER MANUAL

SVAN 977W

SOUND & VIBRATION ANALYSER

Warsaw, July 2017

Note: *On account of continuous product improvement SVANTEK reserves the right to make changes to product specifications without notice. To download the most up to date user's manual please visit our web site at www.svantek.com.*
This user's manual presents the firmware revision named 1.26 and bootstrap revision named 1.06 (see the ***Unit Label*** *review to check version details).*
The succeeding software revisions (marked with the higher numbers) can change the view of some displays presented in the text of the manual.

WEEE Notice: *Do not throw the device away with the unsorted municipal waste at the end of its life. Instead, hand it in at an official collection point for recycling. By doing this you will help to preserve the environment.*

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1. INTRODUCTION

The **SVAN 977W** is an all-digital, Class 1 Sound & Vibration level meter (SLM and VLM) as well as a real time 1/1 or 1/3 octave analyser. The instrument is designed for general acoustic and vibration measurements, environmental monitoring, occupational health and safety monitoring.

Three acoustic or vibration user configurable profiles allow parallel measurements with independently defined frequency filters and RMS detector time constants. Each profile provides significant number of results (like **Spl**, **Leq, Sel**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **LN%**, **LR15**, **LR60**, **Ovl**, **Peak**, **Max** and **Min** in case of sound measurements or **RMS**, **Ovl**, **Peak**, **P-P** in case of vibration measurements). Advanced time history logging for each profile provides complete information about the measured signal using the external SD-card fitted in the bottom of the meter and can be easy downloaded to any PC using the USB interface and SvanPC++ software.

All required weighting filters: **A**, **B**, **C**, **Z** for sound measurements and **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10** and **Wh** for general vibration measurements (like acceleration, velocity and displacement); are available with this instrument.

Using the computational power of its digital signal processor the **SVAN 977W** instrument can, simultaneously to the meter mode, perform the real time **1/1 Octave** or **1/3 Octave** analysis including calculations of statistical levels.

The instrument conforms the WELMEC requirements for built-for-purpose measuring instrument (type P) for acoustic measurements.

Time domain waveform signal recording on the external SD-card is available as an option and advanced trigger and alarm functions are available in the standard version of this instrument.

A fast USB 1.1 interface (12 MHz) creates a real-time link for the PC "front-end" application of the **SVAN 977W** instrument. With the use of optional interfaces (RS 232) the instrument can be remotely controlled from the PC with the use of **SvanPC++** software.

SVAN 977W is equipped with **Bluetooth®**[1] v.2.0+EDR module and can be remotely control by the **SvanMOBILE** Android platform smartphone application.

Working as a part of SV 277PRO monitoring station, equipped with 3G modem, SVAN 977W can transfer measured data via Internet to the PC with the use of **SvanPC++_RC** option or via **SvanNET** Web service. The instrument can be fully remotely controlled via these interfaces. The instrument has **extended alarms** features, enables the user notification about exceeded threshold levels by SMS or mails.

The instrument is powered from four AA standard alkaline or rechargeable batteries (i.e. NiMH – a separate charger is required). Powering the instrument from the External DC power source or the USB interface is also possible.

Robust and lightweight design enhances the exceptional features of this new generation sound and vibration instrument.

[1] "The *Bluetooth*® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by SVANTEK is under license. Other trademarks and trade names are those of their respective owners.

1.1. SVAN 977W as Sound Level Meter & Analyser

- noise measurements (**Spl**, **Lmax**, **Lmin**, **Lpeak**, **Leq**, **Sel**, **Lden**, **LEPd**, **Ltm3**, **Ltm5** and 10 x **LN%** statistics) in accordance with Type 1 IEC 61672-1:2013 accuracy in the frequency range 20 Hz to 20 kHz with the SV 7052 microphone (3.15 Hz ÷ 20 kHz with GRAS 40AE microphone)
- parallel **Impulse**, **Fast** and **Slow** detectors for the measurements with **A**, **B**, **C** and **Z** frequency filters
- two measurement ranges 25 dB RMS(A) ÷ 123 dB Peak (**Low**) and 35 dB RMS(A) ÷ 140 dB Peak (**High**)
- **1/1 Octave** and **1/3 Octave** real time analysis - 10 filters with centre frequencies 31,5 Hz ÷ 16 kHz, and 31 filters with centre frequencies 20 Hz ÷ 20 kHz, in accordance with Type 1 IEC 61260-1: 2014.

1.2. SVAN 977W as Vibration Level Meter & Analyser

- General Vibration measurements (acceleration, velocity and displacement) and optionally HVM meeting ISO 8041:2005 and ISO 10816-1: 1995 standards in the frequency range depending on the parameters of the attached accelerometer, i.e. with SV 80 general purpose transducer is equal to 0.5 Hz ÷ 14 kHz.
- Parallel **RMS**, **MTVV** or **Max**, **Peak**, **Peak–Peak** measurements.
- **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10** and **Wh** weighting filters.
- **1/1 Octave** and **1/3 Octave** real time analysis - 15 filters with centre frequencies 1 Hz ÷16 kHz, and 45 filters with centre frequencies 0.8 Hz ÷ 20 kHz, Type 1 IEC 61260-1: 2014.

1.3. General features of SVAN 977W

- Conforms the WELMEC requirements for type P instrument for acoustic measurements
- Advanced **Data Logger** function
- 1/1 octave band analyser on board
- Time domain waveform signal recording (option)
- Advanced trigger and alarm functions
- **USB 1.1 Client interface** (real time PC "front end" application supported)
- **RS 232** interface
- **Bluetooth®** v.2.0+EDR module
- Integration time programmable up to **24 h**
- Power supply by **four AA** rechargeable or standard batteries
- Hand held, light weight and robust case
- Easy to use with menu driven user interface

1.4. Accessories included

- **SV 7052** prepolarised ½" microphone with nominal sensitivity 35 mV/Pa
- **SV 12L** microphone preamplifier with IEPE power supply
- **SA 22** foam windscreen
- **SC 16** USB 1.1 cable
- **four AA** alkaline batteries
- **SvanPC++** download and viewing software.
- **SC 77** output cable for I/O connector, Stereo Jack to 2 x BNC

1.5. Accessories available

- **SA 277** outdoor protection Unit
- **SA 17A** external battery pack using 6 x AA batteries
- **SA 143** carrying case for SVAN 95x and accessories (lightweight)
- **SA 79** carrying case for SVAN 9xx and accessories (waterproof)
- **SA 47** carrying bag for SVAN 95x and accessories (fabric material)
- **SV 55** RS 232 option for the SVAN 955
- **SV 80** general purpose vibration accelerometer 100 mV/g (10 mV/ms^{-2})
- **SC 27** coiled cable for accelerometer 2 m
- **SA 27/10-32** mounting magnetic base for accelerometer
- **SA 15** power supply
- **SA 31** external charger for four AA rechargeable batteries.

1.6. Software options available

- **SV 977_2** 1/3 octave analysis for the SVAN 977W
- **SV 977_4** FFT analysis option for the SVAN 977W
- **SV 977_5** RT60 option for the SVAN 977W
- **SV 977_8** RPM Rotation measurement option (excluding Laser Tachometer) for the SVAN 977W
- **SV 977_15** Time domain waveform signal recording (to the micro SD card: *.srt or *.wav format) for the SVAN 977W

Note: *The software options for the instrument can be purchased at any time as only the introduction of a special unlock code is required for their activation in a specific instrument. Contact your local Svantek distributor for further information and costs for these options.*

2. MANUAL CONTROL OF THE INSTRUMENT

Control of the instrument has been developed in a fully interactive manner. The user can operate the instrument by selecting the appropriate position from the selected **Menu** list. Thanks to that, the number of push-buttons for control of the instrument has been reduced to nine for ease of use and convenience.

2.1 Control push-buttons on the front panel

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

<Shift>

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

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

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

<Alt>

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

Note: *Simultaneously pressing the **<Alt>** and **<Start/Stop>** push-buttons switches the instrument on or off.*

<Start/Stop>

This push-button enables the user to start the measurement process when the instrument is not measuring or to stop it when the instrument is in course of the measurement. It is also possible to set the mode of this push-button such that in order to start or stop the measurements the user has to press it simultaneously with the **<Shift>** push-button. This can prevent accidentally starting or stopping a measurement at the wrong time by just brushing against the Start/Stop button on its own.

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

<ENTER> This push-button enables the user to enter the selected position shown on the screen Menu list or to confirm selected settings. Some additional functions of this push-button will be described in the following chapters of this manual.

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

<Save> This push-button (**<ENTER>** pressed together with **<Alt>**) enables the user to save the measurement results (see description in chapter 3.5).

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

<Cal.> This push-button (**<ESC>** pressed together with **<Shift>**) opens the **Calibration** sub-list.

<S/P> This push-button (**<ESC>** pressed together with **<Alt>**) enables the user to pause or break the measurement process temporarily during the measurement or to save the setup file if the instrument is not running the measurement.

◄, ► These push-buttons enable the user specifically to:

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

(◄, ►) The ◄ or ► push-buttons pressed together with **<Shift>** enable the user specifically to:

- change the parameters value with double step (e.g. **Start Delay** period: form **1s** to **11s**, **21s**, … etc.);
- to shift cursor from the first to the last position and back on the graphical view mode.

[◄, ►] The ◄ or ► push-buttons pressed together with **<Alt>** enable the user specifically to:

- select the parameters value in an active position in the matrix parameter list;
- select the parameters value in an active position (e.g. filter **Z**, **A**, **B** or **C**, **Start Delay** period: **1s**, **2s**, **3s** … etc.);
- insert or delete a character in the text edition screen.

▲, ▼ These push-buttons enable the user specifically to:

- select line in the list;
- select the active field on the result view screen;
- select the correct character from the list in the text edition screen;
- activate markers 1 and 4.

(▲,▼) The ▲ or ▼ push-buttons pressed together with **<Shift>** enable the user specifically to:

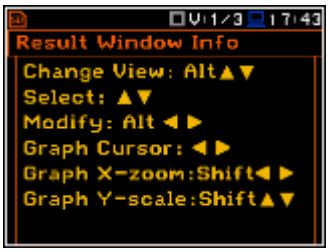
- shift the cursor from the first to the last position and back on the menu list;

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

[▲,▼] The ▲ or ▼ push-buttons pressed together with **<Alt>** enable the user specifically to:

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

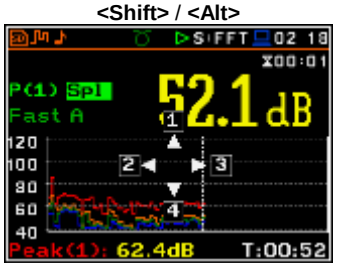
[Info] The **<Info>** push-button (simultaneous pressing the ◄ and ► push-buttons) opens the window with the help information in the measurement display modes. Press **<ESC>** or <**ENTER**> to exit the Info screen.



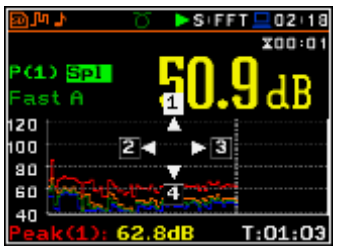
<Markers> The <**Markers>** push-button (**<Alt>** pressed together with **<Shift>**) enables the user to mark special events, which occurred during the performed measurements (i.e. the airplane flight, the dog barking, the train's drive etc.). To activate the markers, the logger should be switched on (*path: <Menu> / Measurement / Logging / Logger Setup*) and one or more logger results (**Peak**, **Max**, **Min**, **Leq** for sound measurements or **Peak**, **P–P**, **Max**, **RMS** for Vibration measurements) in profiles have to be activated (*path: <Menu> / Measurement / Logging / Logger Results).*

To enter the marker mode, the user must press **<Shift>** and **<Alt>** push-buttons simultaneously during the measurement. Then four available markers appear on the screen. To switch on marker number 1 the user must press ▲ push button (number 2 - ◄, number 3 - ► and number 4 - ▼). Active marker number will be highlighted. To switch off the marker the user should press the appropriate arrow-button second time.

<Shift> / <Alt>



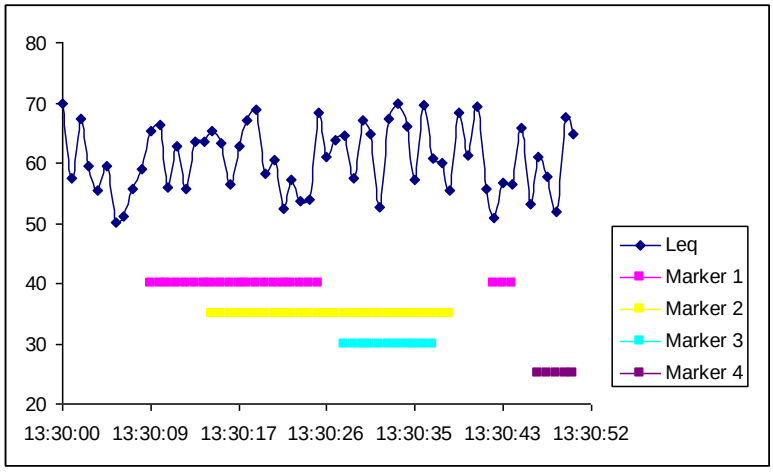
▲



The markers disappear from the screen after pressing **<Shift>** and **<Alt>**, but the status of markers doesn't change. To continue working with the markers, the user should press **<Shift>** and **<Alt>** again.

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

An example presentation of the markers on the time history plot is shown below (to view a plot with markers the user should transfer data to the appropriate software such as SvanPC++).



2.2 Input and output sockets of the instrument

Top cover of the instrument

The measurement input is placed in the centre of the instrument's top cover. It is the TNC compatible socket. The **SV 12L** microphone preamplifier has a specially designed matching TNC plug and a locking screw to secure the preamplifier to the meter body. The accelerometers must be connected to the instrument also using the TNC connector. After connecting the preamplifier or the accelerometer cable to the measurement input, the screw should be tightened to light resistance only. Do not over tighten this connector. It is not necessary to remove this preamplifier from the top of the instrument unless the meter is in a calibration laboratory as it is always used close coupled to the meter body. The full description of the signals connected to the socket is given in Appendix C.

Bottom cover of the instrument

In the bottom cover, there are four sockets, placed from the right to the left as follows: **7-16V**, **Serial**, **USB** and **I/O**.

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

The **USB** socket is the USB Device 1.1 interface – a serial interface working with 12 MHz clock. Thanks to its speed, it is widely used in all PCs. In the instrument, the standard 4-pin socket is used.

The **Serial** socket is Serial Port provides data transfer using RS232 data format but in TTL logic standard by means of the SV 55 interface. It conforms to the EIA Standard RS 232C and enables the user to programme remotely all instrument functions and the transmissions to and from the instrument with speed from 300 bit/s to 115200 bit/s.

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

The user can connect an external DC power 7-16V adapter to the **7-16V** socket located on the bottom cover of the instrument. The current consumption depends on the voltage of the power supplier.

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

All sockets are described in detail in the Attachment C for this manual.

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

3. INSTRUMENT SETTING

To perform measurements using the instrument the user only should connect the preamplifier with the microphone already screwed on or the proper vibration transducer and to switch the power on by pressing the **<Alt>** and **<Start/Stop>** push-buttons at the same time. Hold both buttons down for 1 or 2 seconds and release to switch on.

3.1. Basis of the instrument's control

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

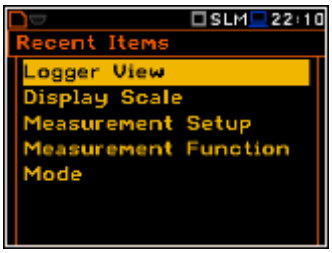
The instrument's menu consists of different type of windows, which include: main menu list, sub-menu list, option list, parameter list, text editor window, information window and file manager window with file command list.

Main menu

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

Recent Items list

Double pressing the **<Menu>** push-button opens the list of recently accessed menu items. This enables the user to access the most frequently used lists quickly, without the necessity of passing through the whole menu path.

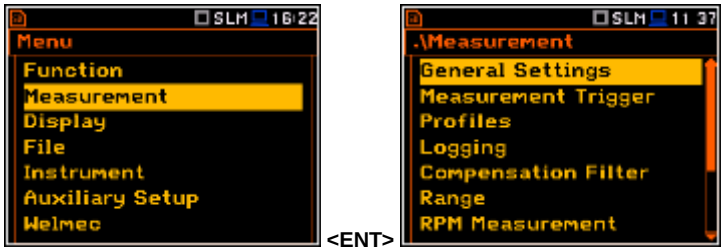


Position selection

The desired position in menu list is selecting using the ▲ or ▼ push-buttons.

Entering position

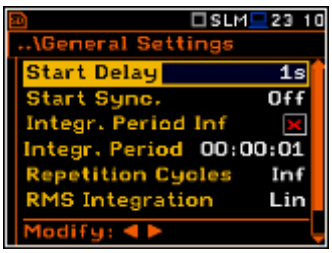
After selection of the desired position in the menu list, the user should press the **<ENTER>** push-button to enter it. After this operation, a new sub-menu, option list, parameter list or information window appears on the display.



List of parameters

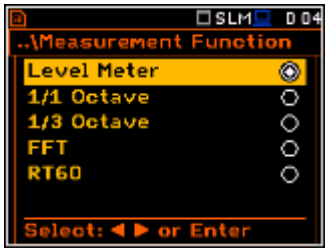
The parameter list contains parameters for which the user may select the value from the available range. Pressing the **<ENTER>** push-button enables the user to access the above mentioned sub-list.

- The desired position in a list is accessed after pressing the ▲ or ▼ push-button.



- Changing of the value in a selected position is performed by the ◄ or ► push-buttons (or pressed together with **<Shift>**).

Option list

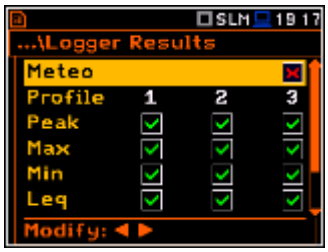


The option list consists of different choices, from which only one may be selected. The selection of the option is performed as follows. The user should highlight the desired option by means of the ▲ or ▼ push-buttons and then press **<ENTER>**. This option becomes active and the list is closed. When the user re-enters this list again, the last selected option will be marked.

If the parameter has a numerical value, the user may keep pressing the ◄ or ► push-buttons longer than 1 second to speed up the selection. In this case the parameter starts to change automatically until the user releases the pressed buttons.

The user may change the numerical parameter value with a larger step (usually 10) by means of the ◄ or ► push-buttons pressed together with **<Shift>**.

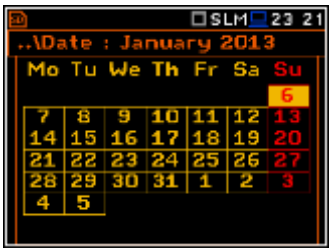
Matrix of parameters



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

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

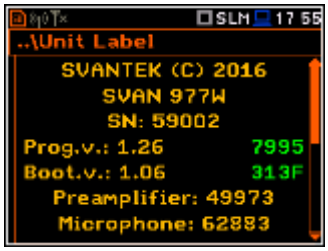
Complex parameters



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

In all cases the **<ENTER>** push-button is used for confirmation of the selection in a position and for closing the opened sub-list. The sub-list is closed ignoring any changes made in the list by pressing the **<ESC>** push-button and the user returns to the previous menu.

Information window



Some windows inform the user about the state of the instrument, available memory, none existing files or loggers, standards fulfilled by the unit, etc. In order to scroll through the list, the user has to use the ▲ or ▼ push-buttons. In order to close such a window, the user has to press **<ESC>**.

Text editor window

In the text editor windows the user may edit text lines (file names, directory name etc.) Such window contains the virtual keyboard to edit the text. The character which is displayed inversely may be edited.

- The user can select the position of the character in the virtual keyboard using the ◄ or ► **or** ▲ or ▼ push-buttons.

►

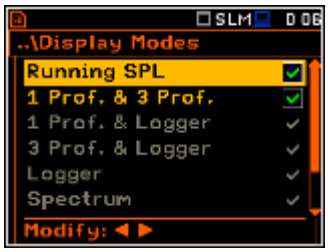
- To change the uppercase to lowercase letters or symbols the user has to select **ABC** button and press **<ENTER>**.
- The user can insert, delete or change the position in the edited text using the buttons of the keyboard: **Ins**, **Del**, ◄ and ►.
- To confirm the editted name the user has to select **Ok** button and press **<ENTER>**.

Help information

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

Inactive parameters

If some functions or parameters are not available, the positions in the menu or parameter lists linked with this function or parameter became inactive (their colour becomes grey). For example, if ***Logger*** (*path: <Menu> / Measurement / Logging / Logger Setup)* is switched off, the **Logger** view mode is **not** active!



3.2. Powering of the instrument

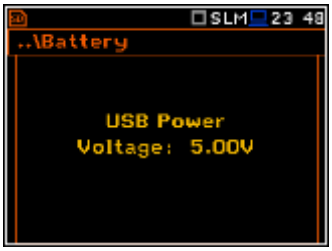
The **SVAN 977W** can be powered by one of the following sources:

- Four AA standard size internal batteries. In case of alkaline type, a new fully charged set can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary alkaline cells, four AA rechargeable batteries can be used (a separate external charger is required for charging them). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- External DC power source – 7 V DC÷16 V DC (1.5 W)
- SA 17A external battery pack – operation time > 24 h (option)
- **USB** interface – 500 mA HUB

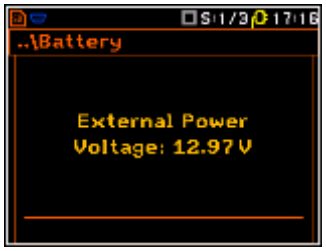
For each of possible power source there is a different view presented in the **Battery** window of the **Instrument** list.

When the instrument is powered from its internal batteries, the **"Battery"** icon is presented on the top line of the display. When the voltage of the batteries is too low for reliable measurements, the icon is red or during attempt to switch the instrument on the **Low Battery!** message occurs on the display for 2 seconds and the instrument switches off by itself. A fully charged set of 4 batteries ensures more than 12 hours of continuous operation of the instrument (with display **Dim** switched on). The battery condition can be checked by means of the **Battery** function. It is also presented continuously on the top line of the display by means of the **"Battery"** icon.

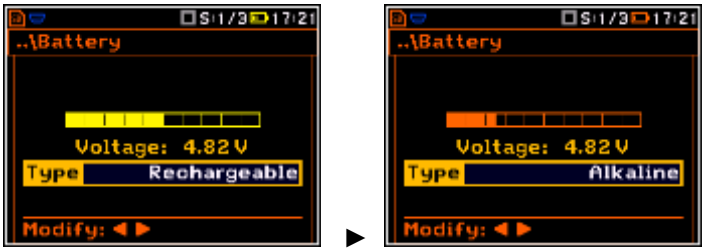
When there is a connection to the USB interface (**USB Device** socket is connected by means of the cable to a PC), the **"computer"** icon is presented on the top of the display and in the **Battery** window there is the **USB Power: Voltage: x.xxV** message.



When there is a connection to the **7–16V** socket the **"plug"** icon is presented on the top of the display and in the **Battery** window there is the **External Power: Voltage: yy.yyV** message.



When the instrument is powered from the internal batteries the **"battery"** icon is presented on the top of the display and the **Battery** window presents the battery status scale and battery voltage: **Voltage: x.xxV**. The colour of the battery and the scale reflects the battery capacity: green (>75%), yellow (>25%), red (<25%).



To have right indication of the battery status the user should select the battery type in the **Type** position: **Alkaline** or **Rechargeable**.

Note: *In case when* ***"Battery"*** *icon is red it is strongly recommended to use an external power adapter or USB interface as soon as possible to ensure reliable operation. If no suitable external power source is provided the instrument will be switched off automatically after a short time!*

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

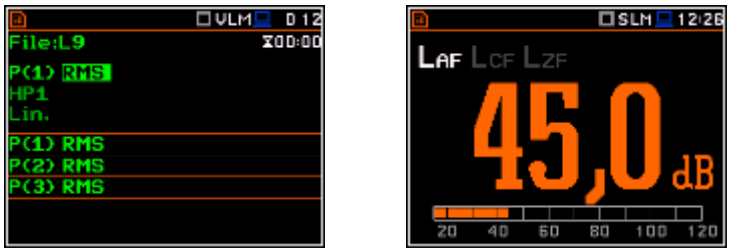
3.3. Turning the instrument on

Switching the instrument on

To switch the power on the user should press the **<Alt>** and **<Start/Stop>** push-buttons at the same time.

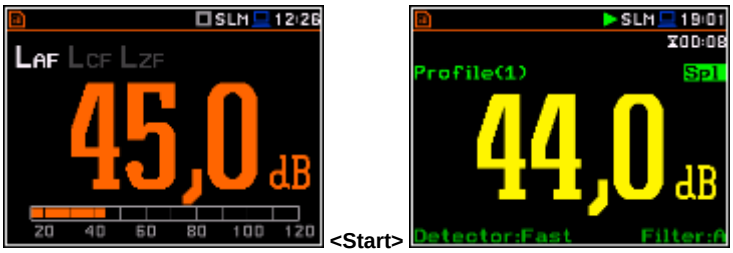
The instrument goes through the self-test routine after switching on, displaying during this time: manufacturer logo, name of the instrument, program and bootstrap versions, their CRC as well as preamplifier and microphone serial numbers; and then it enters:

- the last used just before the unit switch off view mode in case of Vibration measurements or
- the **Running SPL** view mode in case of Sound measurements.

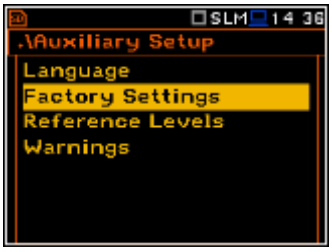


Starting measurement

To start the measurements the user should press the **<Start/Stop**> push-button. The measurement will be performed with the current instrument settings, which are preserved in the internal memory of the instrument.



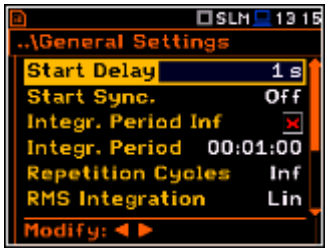
Setting the measurement parameters



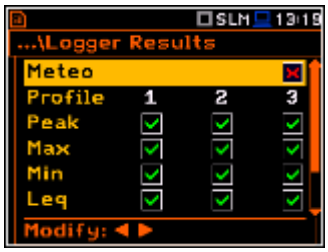
The instrument as sold has default settings which the user may change, but always return to them with the use of **Factory Settings** option in the **Auxiliary Setup** menu.

Next chapters of the manual will describe in details what each parameter means and how to change the instrument settings.

Main default settings



With default settings, the instrument will measure sound pressure level by virtual meters, so called profiles (Measurement **Mode: Sound**; **Measurement Function: Level Meter**) with 1 second delay from the **<Start>** push-button pressure (**Start Delay: 1 s**), 1 minute integration time (**Integration Period: 00:01:00**), infinitive repetition till press **<Stop>** push-button (**Repetition Cycle: Inf**), linear integration (**RMS Integration: Lin**), free field compensation (**Compensation Filter: Free Field**), active logging of the selected results with 1 second step (**Logger: On**; **Logger Step: 1 s**; **Logger Results: Peak**, **Max**, **Min** and **Leq** for all profiles) and summary results saving including **Statistics**. Other functions are switched off like:



- measurement trigger (**Measurement Trigger: Off**),
- logger trigger (**Logger Trigger: Off**),
- event recording (**Events: Off**)
- wave recording (**Wave Rec.: Off**),
- timer (Timer **Mode: Off**).

The logger and summary results will be automatically saved in the file with the name defined by the instrument and presented in the **Logger Setup** sub-list (**Logger Name: Lxxxx**).

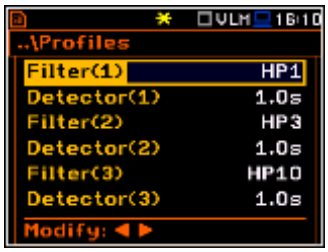
Default profile settings for Sound measurements:

Profile 1 - **A** weighting filter (**Filter(1)=A**), **Fast** RMS detector (**Detector(1)=Fast**);

Profile 2 - **C** weighting filter (**Filter(2)=C**), **Fast** RMS detector (**Detector(2)=Fast**);

Profile 3 - **Z** weighting filter (**Filter(3)=Z**), **Fast** RMS detector (**Detector(3)=Fast**).

Default profiles settings for Vibration measurements:



Profile 1 - **HP1** weighting filter (**Filter(1)=HP1**); **1.0s** RMS detector (**Detector(1)=1.0s**);

Profile 2 - **HP3** weighting filter (**Filter(2)=HP3**), **1.0s** RMS detector (**Detector(2)=1.0s**);

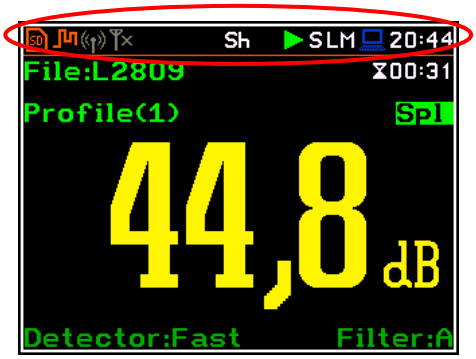
Profile 3 - **HP10** weighting filter (**Filter(3)=HP10**), **1.0s** RMS detector (**Detector(3)=1.0s**).

3.4. Description of icons

Description of the instrument state

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

The type of measurement function and the measurement mode (SLM, VLM, S:1/1 etc.) as well as real time clock (RTC) is also displayed in the same line together with icons.



The meanings of the icons are as follows:

	**"play"** icon is displayed when the measurement is running.		**"memory warning"** icon is displayed when there is no external SD memory card inserted.
	**"stop"** icon is displayed when the measurement is stopped.		"**SD Card**" icon is displayed when the external micro SD card memory is inserted.
	**"pause"** icon is displayed when the measurement is paused.		**"RS232"** icon is displayed when the RS232 port is activated.
	**"computer"** icon is displayed when there is a successful USB connection with the PC.		**"curve"** icon is presented when the current measurement results are logged into the instrument's logger file.
	**"note"** icon is displayed when the wave recording is active (wave files with extension WAV are saved automatically)		**"Trigger Level +"** icon is displayed when the "**Level+**" trigger is waiting for fulfilment condition. The icon appears alternately with the "play", "curve" or "note" icons.
	**"arrow up"** icon is displayed when overload appears.		**"Trigger Level –"** icon is displayed when the trigger condition is set up to "**Level-**" trigger is waiting for fulfilment condition. The icon appears alternately with the "play", "curve" or "note" icons.
	**"arrow down"** icon is displayed when under range appears.		**"Trigger Slope +"** icon is displayed when the "**Slope+**" trigger is waiting for fulfilment condition. The icon appears alternately with the "play", "curve" or "note" icons.
	**"Alt" icon** is displayed when the **<Alt>** push-button is pressed.		**"Trigger Slope –"** icon is displayed when the "**Slope-**" trigger is waiting for fulfilment condition. The icon appears alternately with the "play", "curve" or "note" icons.
	**"Shift"** icon is displayed when the **<Shift>** push-button is pressed.		**"trigger"** icon is displayed when other than Level or Slope trigger is waiting for fulfilment condition.
	**"lightning"** icon is displayed when polarisation voltage is 200V.		**"bell'** icon is displayed when any alarm appears

	**“clock”** icon is displayed when the timer is **On**. It is active when the instrument is waiting for the measurement start up to occur. When the measurement start up is close, the icon changes its colour to green and starts to blink.		**“battery”** icon is displayed when the instrument is powered from the internal batteries. Icon corresponds to the status of the batteries (three, two, one or none vertical bars inside the icon). When voltage of batteries is too low, the icon becomes red.
	**“satellite”** icon is displayed when GPS is active. Colours of the icon define the state of the GPS: green – active, blue – searching, grey – disconnected.		**“Bluetooth”** icon is displayed when the Bluetooth® is switched on. Colours of the icon define the state of the Bluetooth®: blue – connected, grey – disconnected.
	**“plug”** icon is displayed during external power is connected to the **7-16V** socket		icon is displayed if the current firmware is different from the original one (which was installed when the instrument has been purchased)

Icons connected with modem functionality:

 or	Icon is displayed when the **GPRS** function is swithed on and there is no cable connection with the modem	 or	Icon is displayed when the **GPRS** function is swithed on and there is no cable connection with the modem
 or	icon is displayed when the wireless transmission (**GPRS** modem) is active, but there is no connection with Host or SvanNET	 or	icon is displayed if there is no GPRS connection
 or	icon is displayed if there is connection with Host		icon is displayed if there is GPRS connection and shows the level of the GPRS signal. In additional GPRS connection yellow and red arrows appear
	icon is displayed if there is connection with SvanNET.		

3.5. Data storage

Memory type

All available measurement results and settings can be stored in the external memory (micro **SD Card**) as files in the predefined or assigned directories. The setup files are stored in the predefined directory SETUP. The predefined directories can be changed by the user or renamed.

The **SD Card** external memory is activated automatically after insertion of the card.

The “**SD Card**” icon is displayed when the external micro SD card memory is inserted in the memory slot.

If the SD card is removed from the memory slot the **“memory warning”** icon appears instead of “SD Card” icon.

The **SD Card** memory is organised as standard memory with directories and sub-directories (FAT32 file system). It is possible to create and delete the directories.

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

In the **File Manager** or **Setup Manager** windows data files are described by their file name with an extension (**SVL**, **SVT** or **WAV**) as well as additional icon and size (**2KB** etc.).

 Directory

 Logger file .SVL


New file or directory


Wave file .WAV


Setup file .SVT

Managing directories and files

The user can manage the files saved on SD card with the help of the **File Manager** or **Setup Manager** function of the **File** menu.

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The files are saved in the directory, which was set up as a working directory. The working directory is displayed in the bottom line of the **File Manager** window together with the memory icon.

Directories are created manually with the use of **<New Directory>** position.

In more details, **File** menu is described in chapter 7.

Automatic logger files saving

Files which contain the logger data are saved automatically in the **SD Card** memory with an extension .SVL. To enable automatic saving several conditions should be fulfilled:

1. SD card should be inserted and there should be enough space on it.
2. The **Logger** (*path: <Menu> / Measurement / Logging / Logger Setup*) should be switched on.

The logger file name is defined automatically using a pattern **LLdd**, where **LL** is the string of letters (so called **prefix**) and **dd** is a string of digits that forms a number (*path: <Menu> / Measurement / Logging / Logger Setup / Logger Name*). Up to 8 characters can be used to name a file.

The default prefix for the logger files is **L**.

The individual counter is assigned to every prefix of files the user has created and saved in the working directory and is equal to the maximum number of these files. So, the next saved file will always have a number higher than the counter.

The user can change the automatically generated file name in the special screen, which is opened after pressing the ◄ or ► push-buttons.

►

If the user changes number of the name, the instrument will accept only that names which number is higher than the counter, assigned to the file prefix.

After changing file name number and pressing **<Enter>** the counter will be adjusted to the new number.

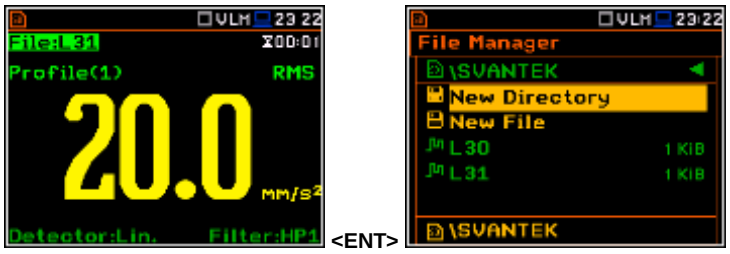
The user can change the prefix. In such case the instrument assigns the new counter to the new prefix.

The file number automatically increases after every saving operation.

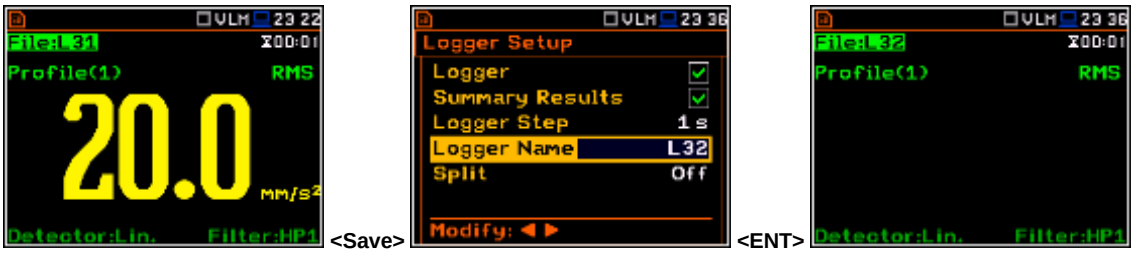
The screens below show the automatic file saving during two subsequent measurements. Before and during first measurement the file name **L30** is displayed. This file is saved automatically in the SD card memory after the measurement stop. After start of second measurement the instrument automatically changes the file name to **L31** and this file is saved after stop of the second measurement and so on.

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

The user can quickly jump to the directory where files were saved. To do this the user should make the field with file name active by means of ▲ or ▼ push-buttons and press **<Enter>**.



If the user presses **<Save>** (**<Alt>+<ENTER>**) after the measurement the instrument opens the **Logger Setup** window (*path: <Menu> / Measurement / Logging / Logger Setup*) with the selected **Logger Name** position and the file name with the increased number. Pressing **<Enter>** will return the instrument to the measurement screen with no results of the previous measurement and new file name in the file field.



Manual saving of Summary Results

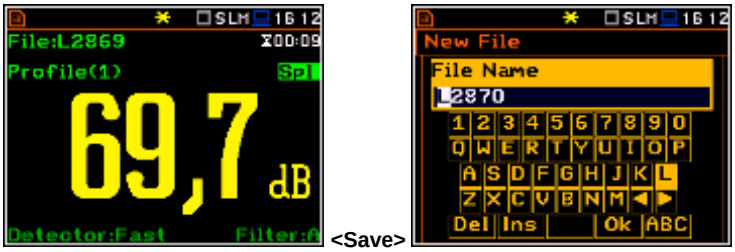
If **Logger** or the **Summary Results** option is switched off in the **Logger Setup** list (*path: <Menu> / Measurement / Logging / Logger Setup*) the automatic saving of result data (so called **Summary Results**) is switched off too. In such a case **Summary Results** can be saved only manually.

***Note:** If **Logger** is Off, the field with file name is empty!*

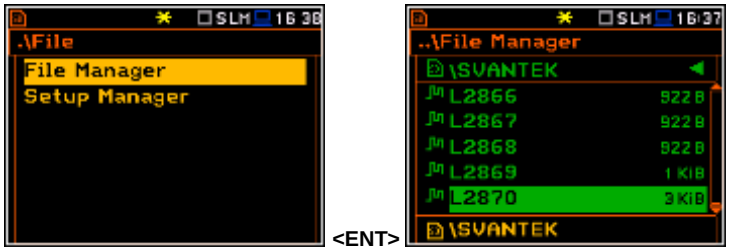
There are two options for saving manually **Summary Results** data. One option is to press **<Save>** push-button (**<Alt>+<ENTER>**) right after the measurement finishes. Another option is to create **<New File>** in the **File Manager**.

After pressing **<Save>** the **New File** window appears with the predefined name which has number increased by one to the latest saved. In the **New File** window the user can enter a new name for the file.

After edition of the automatically proposed name, the user should select the **Ok** button and press **<ENTER>**.



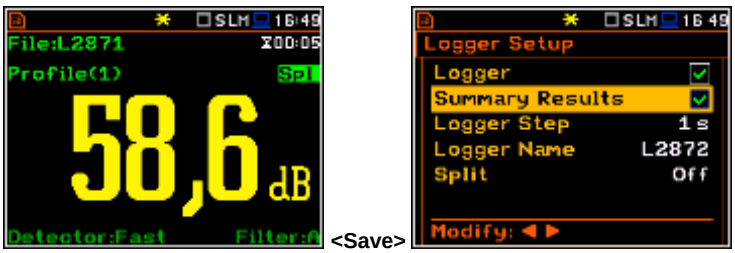
File with the proposed or created by the user name will be saved in the working directory on the SD card.



Another option is to open the **File Manager** window (*path: <Menu> / File / File Manger*), select **New File** and press **<ENTER>**.

There is exception from this rule. If **Logger** and **Summary Results** are switched on in the **Logger Setup** list (*path: <Menu> / Measurement / Logging / Logger Setup*) the manual saving of **Summary Results** is possible only through **File Manager**.

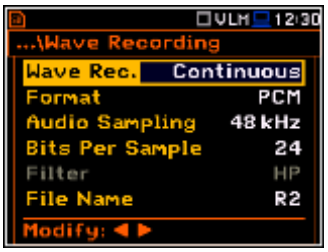
If the user press **<Save>** push-button after the measurement the instrument opens the **Logger Setup** window.



Note: *Saving is not possible when the instrument is measuring the signal. The message "**Measurement in progress!**" is displayed for about 3 seconds.*

Note: *When no measurements were performed and there are no results to be saved all save functions are disabled.*

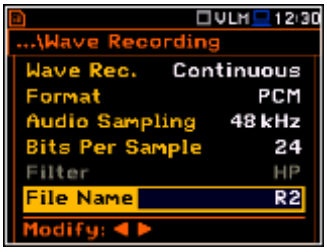
Automatic Wave files saving



Wave files contain signal recording data and are also saved automatically in the **SD Card** memory with an extension .WAV. To enable automatic saving several conditions should be fulfilled:

1. SD card should be inserted and there should be enough space on it.
2. The wave recording should be switched on (*path: <Menu> / Measurement / Logging / Wave Recording / Wave Rec.: Continuous or On Trigger*).

The wave file name is defined automatically using the same rules as for the logger files. The default prefix for the wave files is **R**.



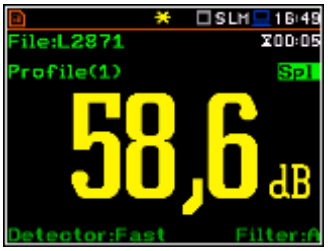
Note: *During the measurement run with wave recording to the wave file the "note" icon is displayed.*

Note: *The wave files usually are big and may use enormous memory space. Since the wave name is not displayed on the result view screen, the user should remember that wave recording function is active and switch it off always when wave recording is not required.*

Saving the setup files

The measurement configuration setup files can be stored in the **SD Card** memory with an extension .SVT either by means of **<S/P>** push-button or by creating the **<New File>** in the **Setup Manager** list.

There is no automatic option for the setup files saving, but the instrument always generates new setup name automatically with default prefix **SET**.



<S/P>

<ENT>

3.1. Files downloading and uploading

Downloading files

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

First way is to extract the micro SD Card and use it directly in the PC.

Second way is to use SvanPV++ software, which enables the user download and upload functions as well as data view and data processing options. In this case the instrument should be connected to the PC via SC 56 USB cable.

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

Uploading files

Same approach is used for uploading files (usually setup files).

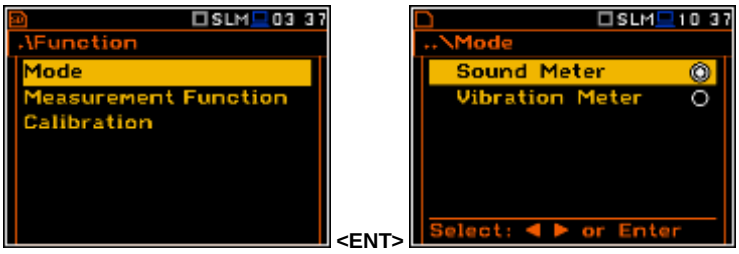
Files can be upload via micro SD Card or via SvanPC++ software.

4. FUNCTIONS OF THE INSTRUMENT – Function

To select the **Function** list, the user should press the **<Menu>** push-button, select the **Function** text and press **<ENTER>**. The **Function** list contains three elements: **Mode**, **Measurement Function** and **Calibration**.

4.1. Selection of the instrument mode – Mode

The device can work in two modes: **Sound Meter** and **Vibration Meter**.



Note: *In the manual text the Sound mode (or Sound measurements) refers to the* ***Sound Meter*** *modes and the appropriate functions dedicated for the measurement and analysis of the acoustic signal:* ***Level Meter***, ***1/1 Octave***, ***1/3 Octave***, ***FFT***; *the Vibration mode (or Vibration measurements) refers to the* ***Vibration Meter*** *modes and the appropriate functions dedicated for the measurement and analysis of the vibration signal:* ***Level Meter***, ***1/1 Octave***, ***1/3 Octave***, ***FFT***.

4.2. Measurement functions of the instrument - Measurement Function

The main function of the instrument is the measurement of Sound pressure or Vibration broad band level (**Level Meter**). The Sound Level Meter (SLM) function provides the user with functions meeting the standard IEC 61672:2013 for Type 1 accuracy and the Vibration Level Meter (VLM) meeting the standard ISO 8041:2005. The instrument can also be used for medium to the long-term acoustic monitoring using the huge capacity data logger in which all the measurement results are stored.

The user may also use 1/1 and 1/3 real time octave band frequency analysis functions. These functions extend the main Level Meter functionality of the instrument, because the selected 1/1 and 1/3 octave analysis is performed together with all calculations of Level Meter.

To select the required function, the user should enter the **Measurement Function** list. After entering the **Measurement Function** list, the set of the available functions appears on the display: **Level Meter**, **1/1 Octave**, **1/3 Octave** and **FFT** (in case of Sound modes). The currently active function is marked.

Note*: The type of measurement function and the measurement mode is displayed in the upper line of the screen.*

- ***SLM*** ***Sound Level Meter***,
- ***S:1/1*** ***Sound 1/1 Octave***,
- ***S:1/3*** ***Sound 1/3 Octave***,
- ***S:FFT*** ***Sound FFT***,
- ***S:RT60*** ***Sound RT60***.
- ***VLM*** ***Vibration Level Meter***,
- ***V:1/1*** ***Vibration 1/1 Octave***,
- ***V:1/3*** ***Vibration 1/3 Octave***,
- ***V:FFT*** ***Vibration FFT***.

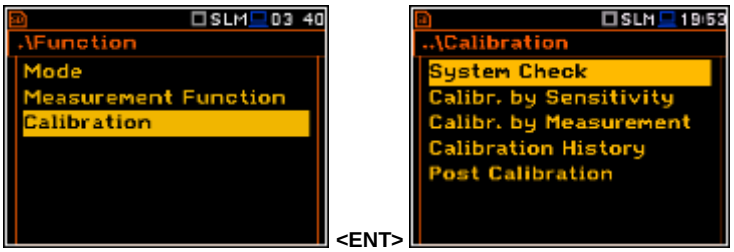
Optional measurement functions that broaden the application of the instrument can be easily installed. These options can be initially supplied by the manufacturer or purchased later and added by the user.

Note: *It is not possible to change the measurement function during a measurement run. In this case the instrument displays for about 3 seconds the message:* ***"Measurement in Progress"****. To change the mode of the instrument the current measurement in progress must be finished!*

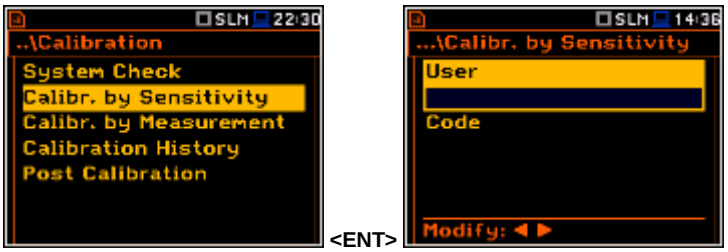
4.3. Instrument's calibration – Calibration

The instrument is factory calibrated with the supplied microphone for the standard environmental conditions. Because the microphone sensitivity is a function of the temperature, ambient pressure and humidity, when the absolute sound pressure level value is important, the absolute calibration of the measurement channel should be performed. To select the calibration function, the user should enter the **Calibration** sub-list.

The **Calibration** sub-list consists of positions which are used to perform the in-situ checks and calibration (**System Check**, **Calibr. by Sensitivity**, **Calibr. by Measurement**), check the calibration records (**Calibration History**) as well as perform additional calibration after the measurement session and add the results to the file (**Post Calibration**).

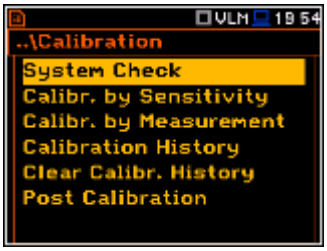


To have access to the instrument's calibration (positions **Calibr. by Sensitivity** or **Calibr. by Measurement**) in the **Sound Meter** mode the user should have a special right and know the **Code** to unlock these positions.



Note: *The new calibration factor for* ***Sound Meter*** *mode can be saved if it differs less than ±1.1 dB from the factory one, or the last one defined by the authorised user and recorded in the Calibration position (path: <Menu> / Welmec / Service / Calibration).*

In the **Vibration Meter** mode, all calibration positions don't require special unlocking code. In addition to the **Sound Meter** mode there is one additional position enabled the user to clear calibration records (**Clear Calibr. History**).



Note: *The calibration factor is always added to the results and measurement range limits in the* ***Level Meter****,* ***1/1 Octave****,* ***1/3 Octave*** *modes.*

Note: *It is advised to perform the system check of the instrument each time before the measurements begin. If system check shows negative result, then it is necessary to perform calibration.*

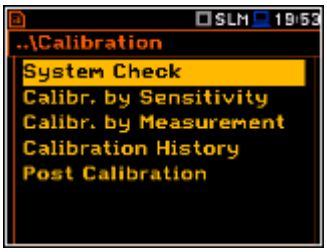
Note: *The calibration level and the calibration result are expressed in different units depending on the settings of the instrument. The metric or non-metric Vibration units are set in the* ***Vibration Units*** *window (path: <Menu> / Auxiliary Setup / Vibration Units). Additionally, the linear or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

Note: *It is not possible to check and calibrate the instrument during the execution of live measurements. It is possible to open different lists and sub-lists but the positions in these lists are displayed greyed out inversely and so - not accessible. The flashing "►" icon on the top line indicates*

that the instrument is in the measurement process. To change the sensitivity, the current measurement in progress must be finished!

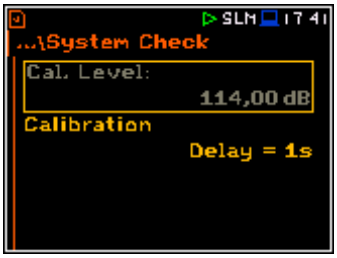
4.3.1. System Check

ISO 8041 standard advises users to perform in-situ checks of measurement instrumentation. Checking should be carried out immediately before and after measurements are made.



1. Select **System Check** in the **Calibration** sub-list and press the **<ENTER>** push-button.
2. Select the calibrator signal level.
3. Attach the vibration calibrator to the instrument's accelerometer.
4. Switch on the calibrator and wait approximately 30 seconds before starting the system check measurement.
5. Start the calibration measurement by pressing the **<Start/Stop>** push-button.

The measurement starts after 5 second delay. The system check measurement time is also predefined to 5 seconds. During the calibration period the **<ESC>** and **<Pause>** push-buttons do not operate but it is possible to stop the measurement using the **<Start/Stop>** push-button. Waiting for the calibration measurement to begin, a **Delay** is counted down.



Measurement results in relationship with calibrator level will be compared against current calibration factor and the instrument will assess whether the system check was successful or failed, displaying relevant message together with current calibration factor and measured calibration.

System check is considered successful in case its result is not more than 2 dB different than the current calibration factor.

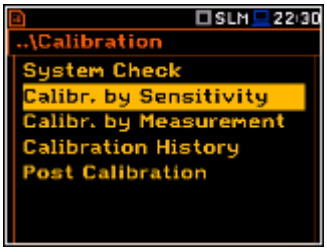
Press **<ENTER>** to exit **System Check**.

If system check measurement shows bigger difference than 2 dB the user should manually stop the measurement with the **<Start/Stop>** push-button.

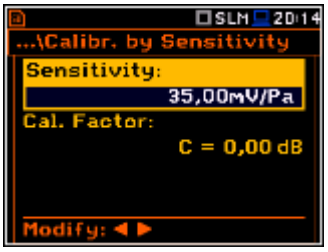
4.3.2. Calibration by Sensitivity in case of Acoustic signal

Calibration by using the microphone's published sensitivity information can be performed in the following way:

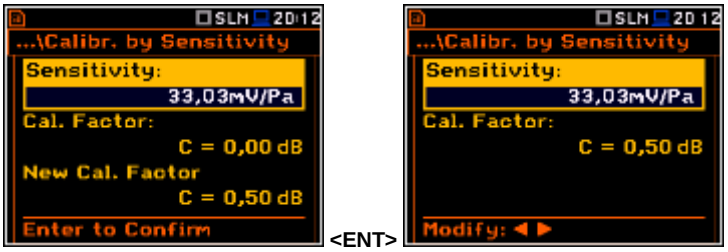
1. Select the **Calibr. by Sensitivity** position in the **Calibration** sub-list and press the **<ENTER>** push-button.



<ENT>



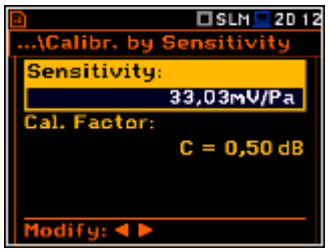
2. Set the sensitivity of the microphone taken from its calibration certificate using the **<Shift>** with ◄ or ► push-buttons and then press **<ENTER>.**



After pressing the **<ENTER>** push-button and confirmation by selecting **Yes** in the screen with answer “Are you sure?” the calibration factor is calculated, in relation to the nominal value of 35.0 mV / Pa.

To avoid the calculation, the user should select **No** in the screen with answer “Are you sure?”.

For a microphone with sensitivity higher than 35.0 mV / Pa the calibration factor will always be negative.

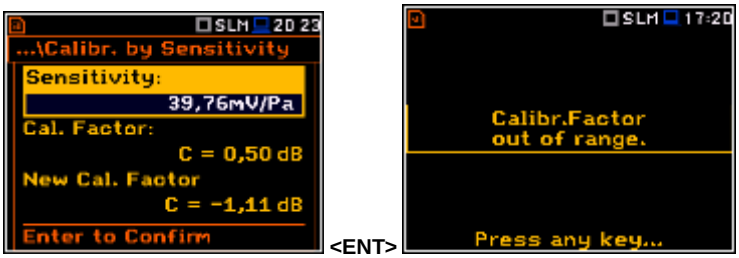


For a microphone with sensitivity lower than 35.0 mV / Pa the calibration factor will always be positive.

The lowest available value of the sensitivity that can be introduced is equal to 35.0 µV / Pa (it conforms to the calibration factor equal to 60.0 dB) and the highest value is equal to 35.0 V / Pa (calibration factor is equal to -60.0 dB).

If the new calibration factor differs more than ±1.1 dB from the factory one, or the last changed by the authorised service, the instrument will not save it.

A special warning will appear on the screen.

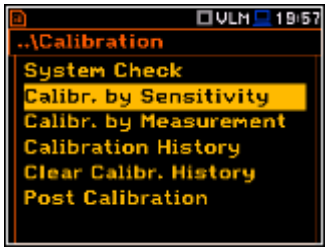


To return to the **Calibration** sub-list, the user should press the **<ESC>** push-button.

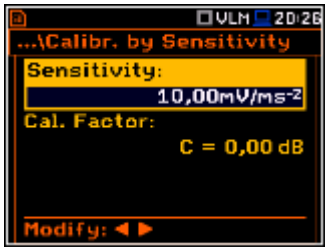
4.3.3. Calibration by Sensitivity in case of Vibration signal

The calibration by using the accelerometer’s published sensitivity information can be performed in the following way:

1. Select the **Calibr. by Sensitivity** position in the **Calibration** sub-list and press the **<ENTER>** push-button.



2. Set the sensitivity of the accelerometer taken from its calibration certificate using the **<Shift>** with ◄ or ► push-buttons and then press **<ENTER>**.



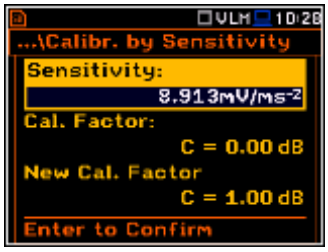
After pressing the **<ENTER>** push-button and confirmation by selecting **Yes** in the screen with answer “Are you sure?” the calibration factor is calculated in relation to the nominal value of 10.0 mV / ms^{-2}.

To avoid the calculation, the user should select **No** in the screen with answer “Are you sure?”.

For an accelerometer with sensitivity higher than 10.0 mV / ms^{-2} the calibration factor will always be negative.

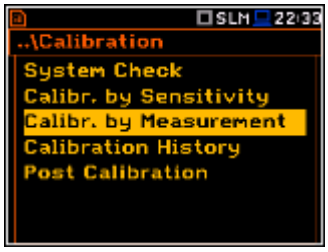
For an accelerometer with sensitivity lower than 10.0 mV / ms^{-2} the calibration factor will always be positive.

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



4.3.4. Calibration By Measurement in case of Acoustic signal

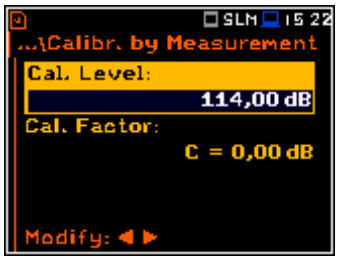
Calibration by measurement for the sound measurements can be done in the following way:



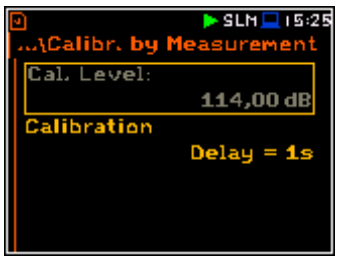
1. Select the calibration by measurement (highlight the **Calibr. by Measurement** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.
2. Set the calibration level appropriate to the used calibrator.
3. Attach the acoustic calibrator SV 30A (or equivalent **114 dB / 1000 Hz**) carefully over the microphone of the instrument.

Note: *It is also possible to use an electro-mechanical pistonphone, which generates a signal (ca 124 dB) or different type of acoustic calibrator dedicated for ½" microphones. In any case, before starting the calibration measurement, the user has to set the level of the signal generated by the given calibrator (**Cal. Level** position of **Calibr. by Measurement** sub-list), which is stated in the calibration certificate of the unit (the value of the **Cal. Level** set by the manufacturer of SVAN 977W is equal to 114 dB). It is also necessary to switch the instrument **Range** to the **High** level setting.*

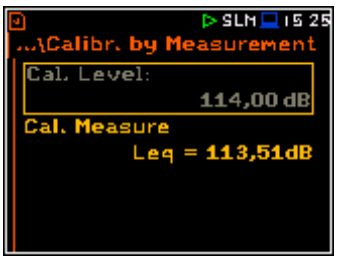
4. Switch on the calibrator and wait approximately 30 seconds for the tone to stabilise before starting the calibration measurement.
5. Start the calibration measurement by pressing the **<Start/Stop>** push-button.



The calibration delay time is set to 3 seconds Waiting for the start of the measurement the **Delay** is counted down on the display. After the end of the measurement, the result is displayed in the bottom line. The measurement is running until the user presses the **<Start/Stop>** push-button.

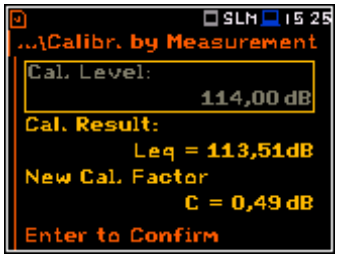


....

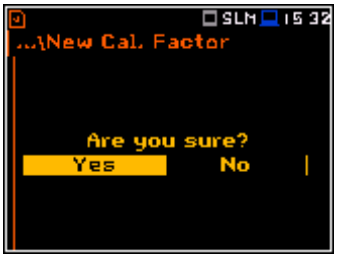


6. Press the **<ENTER>** push-button to accept the calibration measurement result, or **<Esc>** to exit without saving.

The calibration factor is calculated, stored and displayed (cf. next Figure) after pressing the **<ENTER>** push-button and confirmation (**Are you sure? Yes**).



<ENT>



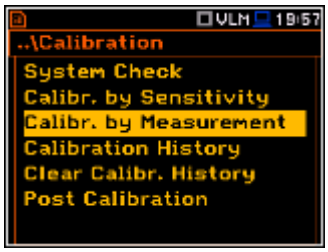
It is recommended to repeat the calibration measurement a few times to ensure the integrity of the calibration. The obtained results should be almost identical (with ±0.1 dB difference). Some possible reasons for unstable results are as follows:

- the calibrator is not properly attached to the instrument,
- there are external acoustic disturbances such as high noise levels close by,
- the calibrator or the measurement channel (the microphone, the preamplifier or the instrument itself) are damaged.

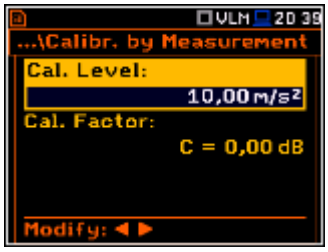
Note: *During the calibration measurement, any external disturbances (acoustic noise or vibrations) should not exceed a value of 100 dB (when using a calibrator that generates a level of 114 dB).*

4.3.5. Calibration By Measurement in case of Vibration signal

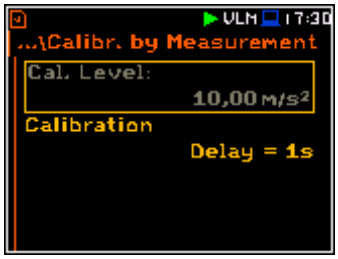
Calibration by measurement for the vibration measurements can be done in the following way:



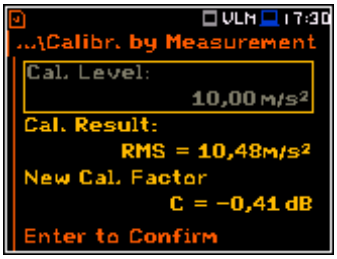
1. Select the calibration by measurement (highlight the **Calibr. by Measurement** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.
2. Set the calibration level appropriate to the used calibrator. The default level for calibration in the vibration mode is 10 m/s^2 at 159.2 Hz. Remember to change this level if using an alternative vibration calibration signal source.
3. Attach the instrument's accelerometer to the vibration calibrator using an appropriate or recommended fixing method.
4. Switch on the calibrator and wait approximately 30 seconds before starting the calibration measurement.
5. Start the calibration measurement by pressing the **<Start/Stop>** push-button.



The calibration measurement starts after 3 second delay. Waiting for the calibration measurement the **Delay** is counted down on the display. The measurement lasts 5 second. After the end of the measurement, its result is displayed in the bottom line.

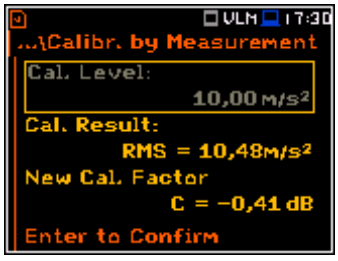


....

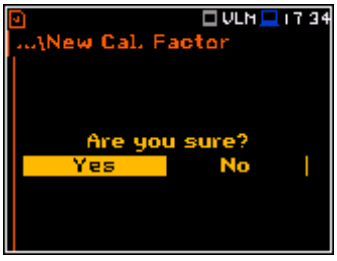


6. Press **<ENTER>** to accept the measurement result, or **<Esc>** to exit without saving.

The calibration factor is calculated, stored and displayed after pressing the **<ENTER>** push-button and confirmation (**Are you sure? Yes**).



<ENT>



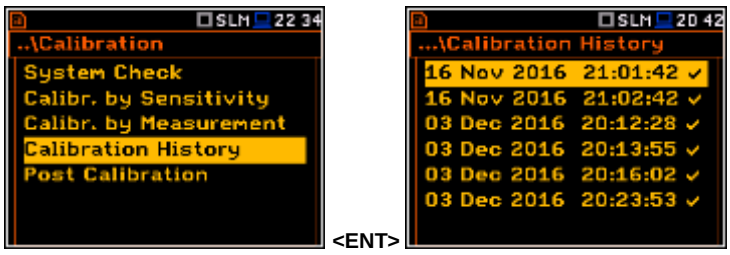
It is recommended to repeat the calibration measurement a few times to ensure the integrity of the calibration. The obtained results should be almost identical (with ±0.1 dB difference). Some possible reasons for unstable results are as follows:

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

Note: *During the calibration measurement, the external disturbances (vibrations or acoustic noise) should not exceed a value of 1/10 of the level of the calibration level signal being used.*

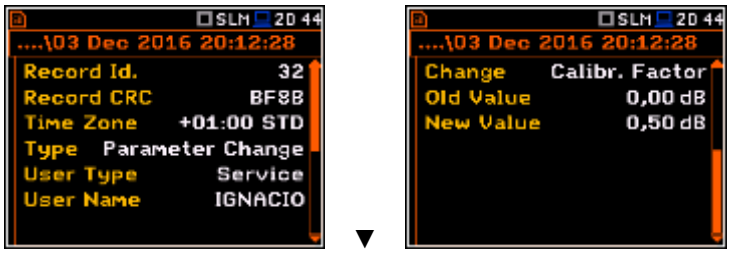
4.3.6. History of calibrations – Calibration History

The **Calibration History** window displays records of performed calibrations. To review the calibration records, the user should select the required line in the **Calibration History** window and press **<ENTER>**.

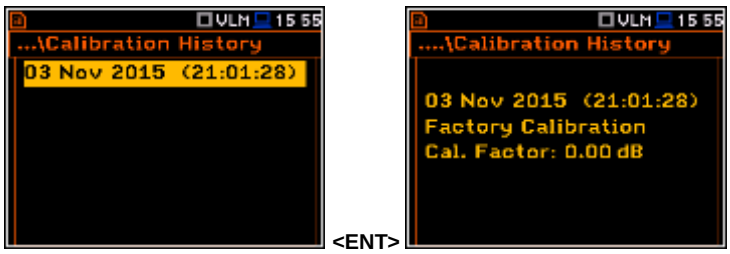


The window contains the required information regarding the performed calibration.

Calibration records are a part of the event records in the **Welmec** menu (*path: <Menu> / Welmec / Event Logger / All Records*) and are a part of the **Parameter Change** group of records.



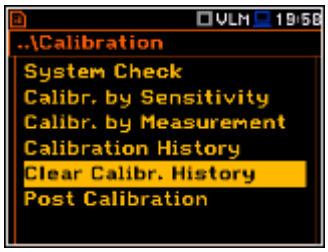
In case of **Vibration Mode**, the **Calibration History** window has different content, because no WELMEC requirements is applied to the **Vibration Meter** mode.



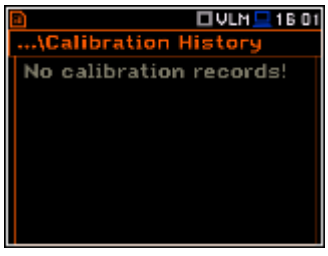
4.3.7. Clear calibration records - Clear Calibr. History

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

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



After this operation, the **Calibration History** window will not contain any previous calibration records. The content of this window is also cleared after the **Factory Settings** operation.



Note: *The acoustic calibration history can be cleared only by authorised person, which possess the special rights and unlocking code to enter the **Service** menu (path: <Menu> / Welmec / Service).*

4.3.8. Post measurement calibration – Post Calibration

Sometimes it is required to perform so called post-calibration of the instrument. Position **Post Calibration** enables the user to perform additional calibration after a measurement session and add the results to the file saved in the memory. The **Post Calibration** list includes three options for saving post-calibration results: not to save (**Off**), save in the last file (**Last file**) or save in the files which will be created after the last calibration (**Files after last calibr**).

5. MEASUREMENT PARAMETERS SETTING – Measurement

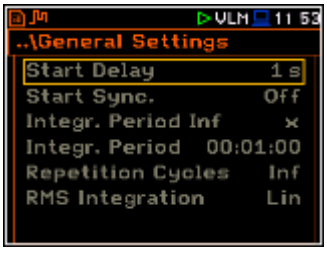
The **Measurement** list contains the elements that enable the user to set the measurement parameters. To open the **Measurement** list, the user should press the **<Menu>** push-button, select the **Measurement** text and press **<ENTER>**.

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

General Settings	enables the user to set various general measurement parameters;
Measurement Trigger	enables the user to set up the measurement trigger;
Profiles	enables the user to program the profile parameters;
Logging	enables the user to program the logging function;
Spectrum	enables the user to set spectrum parameters;
Compensation Filter	enables the user to switch on required microphone compensation filter;
Range	enables the user to set the correct measurement range;
RPM Measurement	enables the user to set the RPM measurements parameters;
Exposure Time	enables the user to set the daily exposure time for dose results;
Statistical Levels	enables the user to define 10 statistical levels;
Timer	enables the user to program the internal timer;
Alarms	enables the user to check the enable ability of alarm function.

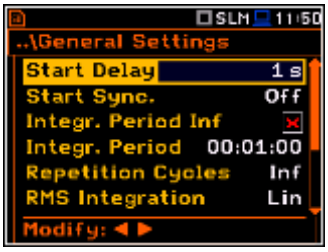
The content of the **Measurement** list is different for different **Mode** and **Measurement Function** and other settings. Some examples for different modes and measurement functions are presented.

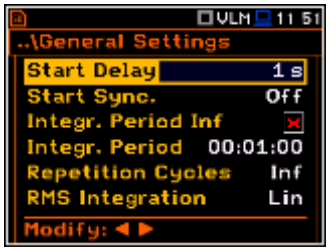
Any parameter in the **Measurement** list can be changed only when the instrument is not currently executing a measurement. The parameters are displayed with grey colour. The blinking "▶" icon on the top row indicates that the instrument is performing a measurement.



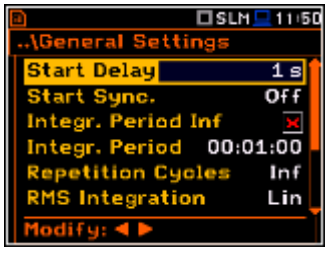
5.1 Setting the measurement parameters - General Settings

The **General Settings** list consists of the following parameters: the delay of the start of measurements (**Start Delay**), the maximum delay period for the synchronization with RTC (**Start Sync.**), the integration period / measurement run time (**Integration Period**), the repetition of the measurement cycles (**Repetition Cycles**), the RMS detector type (**RMS Integration**) and the intervals for day time period (**Day Time Limits**) in case of Sound modes.





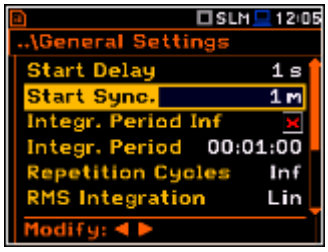
Time delay before the measurement start



The **Start Delay** position defines the delay period from the moment the **<Start/Stop>** push-button is pressed to the start of the actual measurements (the digital filters of the instrument constantly analyse the input signal even when the measurement is stopped). This delay period can be set from **0 second** to **60 seconds** (with 1 second step by means of the ◄ or ► push-buttons and with 10 second step by means of the ◄ or ► push-buttons pressed together with **<Shift>**).

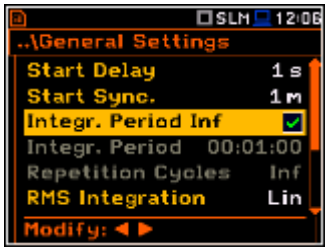
Note: *The minimum delay period is equal to 0 second. In the* ***Calibration*** *mode, the delay period is always equal to 3 seconds.*

Synchronisation of the measurement start



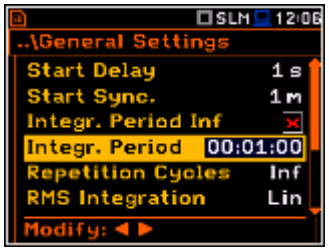
The **Start Sync.** position defines maximum delay period from pressing the **<Start/Stop>** push-button to the start of the measurements to allow synchronisation with the instrument's RTC. The **Start Sync.** parameter can be set as: **Off**, **1m**, **15m**, **30m** and **1h**. For example, if **1h** was selected, then each measurement starts from the first second of next real time hour after pressing **<Start/Stop>** push-button, and then each hour after **Integr. Period**, if **Rep. Cycles** is greater than one. The default value is set to **Off**.

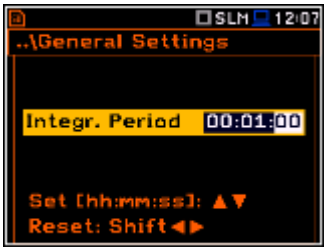
Switching on/off the measurement period settings



The integration period can be set as infinite or can be defined together with the **Repetition Cycles** number. The **Integr. Period Inf** position defines if the period during which the signal is being measured is infinite or not. If the **Integr. Period Inf** parameter is switched on then the signal will be averaged all the time until the **<Stop>** push-button is pressed and the measurement is stopped. If integration period is infinite, then two next positions become inactive.

Measurement period

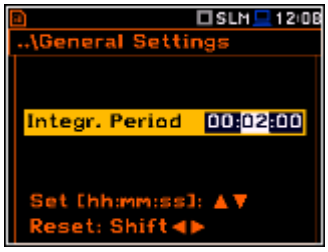




The **Integr. Period** position (integration period) defines the period during which the signal is being measured (integrated) and stored as the set of Summary Results (**SR**). The integration period can be set in the special window, which is opened by pressing the ◄ or ► push- buttons.

The measurement will stop automatically after this period, or the measurement will start again when the selected **Repetition Cycle** is greater than one. The definitions of the measurement results in which the integration period is used is given in App. D.

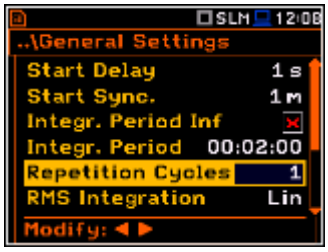
Note: *It is not possible to set the integration period less than 1 minute if* ***Repetition Cycle*** *is set to* ***Inf****. This is specific of Welmec series of the instruments.*



To set the integration period the user should define the required hours, minutes and seconds fields.

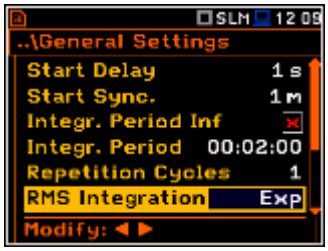
- The appropriate field may be selected by pressing the ◄ or ► push-buttons.
- Value of hour, minute and second is changing by means of the ▲ or ▼ push- buttons.

Number of measurement repetitions



The **Repetition Cycles** position defines the number of cycles (with the measurement period defined by **Integration Period**) to be performed by the instrument. The **Repetition Cycles** number values are within the limits [1, 1000].

Detector type

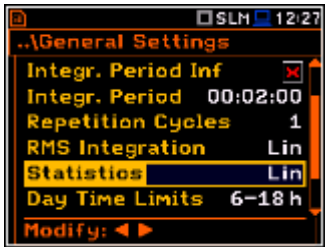


The **RMS Integration** position defines the detector type for the calculations of the **Leq**, **LEPd**, **LN%** and **Sel** functions. Two options are available: linear (**Lin**) and exponential (**Exp**). The formulae used for the **Leq** calculation are given in Appendix D.

Selecting **Lin** is required to obtain the true RMS value of the measured signal. When this option is selected the value of the **Leq**, **LEPd**, **LN%** and **Sel** functions do not depend on the detector time constant: **Fast**, **Slow** or **Impulse** (the results are displayed without the indicator of the detectors selected in the profiles). In this case, the indicator **Lin.** (or **L**) is displayed in the different modes of the result presentation.

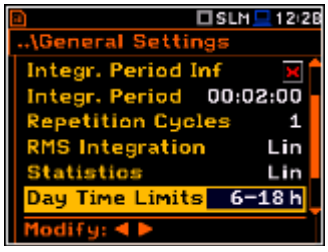
Selecting **Exp** enables the user to fulfil the requirements of other standards for the time averaged **Leq** measurements. When this option is selected the value of the **Leq, LEPd, LN%** and **Sel** function depends on the detector time constant (**Slow**, **Fast**, **Impulse**). The results are displayed with the indicator of the detectors selected in the profiles (*path: <Menu> / Measurement / Profiles*).

Statistic calculation



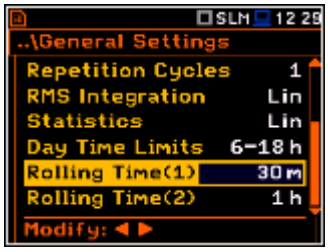
The **Statistics** position defines the method for calculation of the statistical results. The statistics for profiles will be calculated based on RMS results with linear detector (**Lin**) or exponential detector (**Exp**), e.g. Impulse, Fast or Slow, defined in the **Profiles** list.

Day time limits

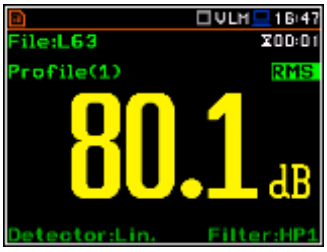


The **Day Time Limits** position appears only in Sound modes and enables the user to select the definition of the day and night periods required by the local standards. These limits are used for the calculation of the **Lden** function (cf. App. D for the definition). Two options are available: **6–18 h** and **7–19 h**.

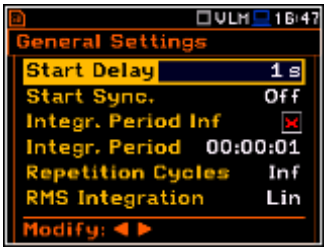
The **Rolling Time(1 & 2)** parameters define „time frame" for "Rolling Leq" calculation. The Rolling Leq are presented as LR+<time frame>. For example, if the **Rolling Time** is equal to 30 minutes, the appropriate result will be named as **LR30** and will be calculated each second as Leq of last 30 minutes. If the **Rolling Time** is in seconds, for example is equal to 50s, the result name will have letter "s" in the end (**LR50s**), to make it different from 50 minutes LR result (**LR50**).



The user can easily get into the **General Settings** screen during the measurement performance from the result view. It is necessary to enter some result field (for example, **RMS**) with the use of ▲ / ▼ or ◄ / ► push-buttons and press **<ENTER>**.

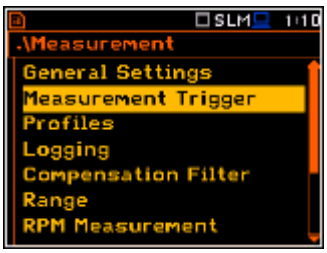


<ENT>

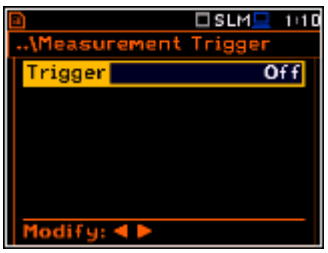


5.2 Setting the measurement trigger – Measurement Trigger

The **Measurement Trigger** sub-list enables the user to set the parameters for the measure trigger. The **Measurement Trigger** is a context sub-list in which the triggering can be switched off or on (**Trigger**), when on the source of the triggering signal (**Source**) can be determined, its level (**Level**) and sometimes also the speed of changes (**Gradient**). Triggering of the measurement (**Trigger**) can be switched off using the ◄ push-buttons.



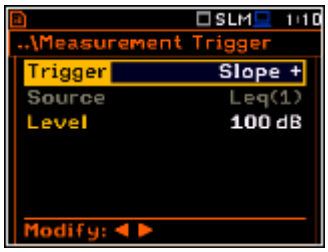
<ENT>



Triggering is switched on if one of its six available modes is selected: **Slope +**, **Slope –**, **Level +**, **Level –**, **Grad +** or **External**. If the instrument works with the triggering switched on, the appropriate icon appears on the display when the triggering condition is not fulfilled.

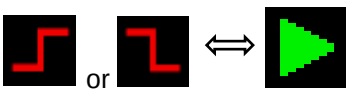
The triggering condition is checked every 0.5 millisecond.

Slope type trigger



In case when **Slope +** is selected, the measurement starts when the rising result value (**Source**) passes above the level determined by the selected **Level** value. When **Slope –** is selected, the measurement starts when the falling result value (**Source**) passes below the level determined by the selected **Level** value. The measurement is stopped when the conditions set in the **General Settings** sub-list are fulfilled or after pressing the **<Start/Stop>** push-button or after receiving the proper control code remotely.

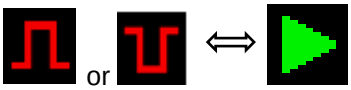
Note: *When measurement is waiting for the slope trigger the "trigger slope" icon appears alternatively with the „play" icon.*



Level type trigger

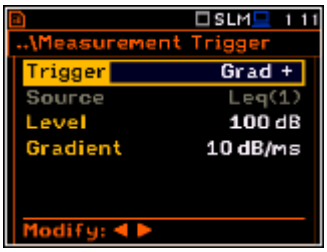
When **Level +** or **Level –** is selected for the measurement the triggering condition is checked every 0.5 millisecond. The measurement is recorded only when the result value (**Source**) has the greater / lower level than that determined in the **Level** position otherwise the measurement result is skipped.

Note: *When measurement is waiting for the level trigger the "trigger level" icon appears alternatively with the „play" icon.*



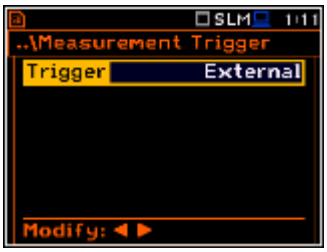
Gradient type trigger

When **Grad +** is selected, the triggering condition is checked every 0.5 millisecond of the measurement. The measurement is recorded only when the result value (**Source**) has a level greater than that determined by the selected decibel **Level** and the gradient of the signal is greater than determined in the **Gradient** position. Otherwise the measurement result is skipped.

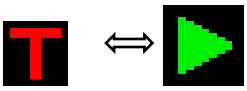


External type trigger

When **External** is selected, the triggering is done by the signal on the **I/O** socket. In this case, it is necessary to set up the **I/O Mode** parameter as **Digital In** (*path: <Menu> / Instrument / Multifunction I/O*). In the other case the measurement result is skipped.



Note: *When measurement is waiting for the gradient or external trigger the "trigger" icon appears alternatively with the „play" icon.*

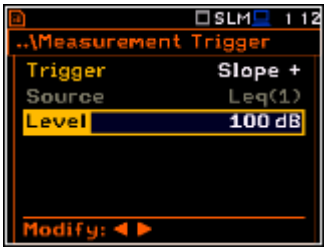


Source of the triggering signal

It is assumed that only one measured result can be used as a source of the triggering signal in the **Level Meter** mode, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)**. This position does not become active (it is not displayed inversely) and the text stated here remains unchanged.

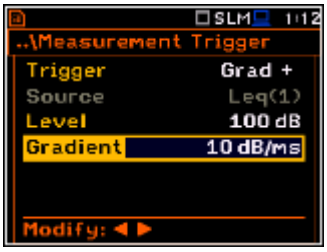
Level of the triggering signal

The level of the triggering signal (**Level**) can be set with 1 dB step steps in the range from 24 dB to 136 dB in sound modes and from 64dB (1.585mm/s2) to 176dB (631 m/s2) in vibration modes. The **Level** value of the triggering signal refers to the instantaneous value of the RMS result from the first profile calculated during the period depending on selected **Detector** (path: <Menu> / Measurement / Profiles).



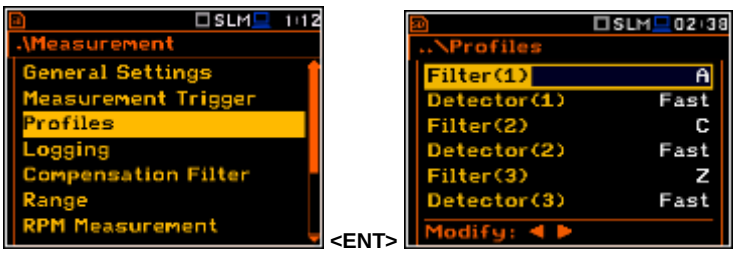
Speed of the triggering signal changes

This position appears when the **Grad+** trigger is chosen. The speed of change of the triggering signal (**Gradient**) can be set within the range from **1 dB/ms** to **100 dB/ms**.



5.3 Setting parameters for profiles – Profiles

In the **Profiles** sub-list, the following parameters can be programmed independently for each user defined profile: weighting filter (**Filter**) and RMS detector type (**Detector**).

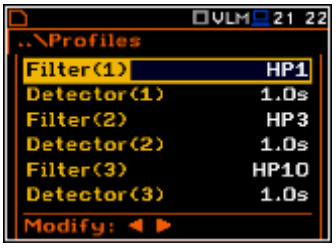


Weighting filter selection

Sound measurements

- **Z** type 1 according to IEC 61672-1 standard,
- **A** type 1 according to IEC 651 and IEC 61672-1 standards,
- **C** type 1 according to IEC 651 and IEC 61672-1 standards,
- **B** type 1 according to IEC 651 standard,

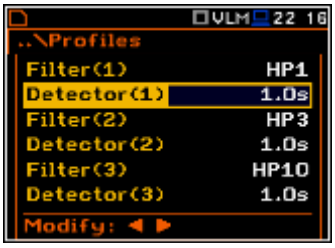
Vibration measurements



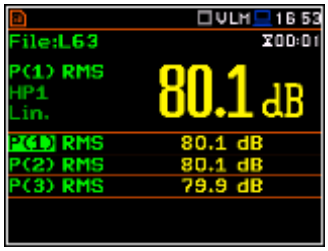
- acceleration measurements: **HP**, **HP1**, **HP3**, **HP10**,
- velocity measurements: **Vel1**, **Vel3**, **Vel10** and **VelMF**,
- displacement measurements: **Dil1**, **Dil3** and **Dil10**.

RMS detector selection

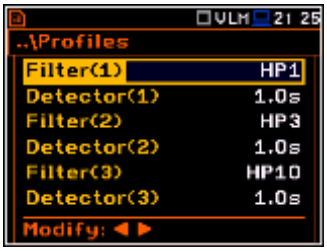
The following RMS detectors are available in the instrument: **Impulse**, **Fast** and **Slow** (in case of Sound measurements) and **100ms**, **125ms**, **200ms**, **500ms**, **1.0s**, **2.0s**, **5.0s**, **10.0s** (in case of Vibration measurements).



The user can easily get into the **Profiles** screen during the measurement performance from the result view. It is necessary to enter some profile field (for example, **P(1)**) with the use of ▲ / ▼ or ◄ / ► push-buttons and press **<ENTER>**.



<ENT>



5.4 Setting of the data logging – Logging

Main measurement results or summary results (**Spl**, **Leq**, **Sel**, **LEPd**, **Ltm3**, **Ltm5**, **LN%**, **Ovl**, **Peak**, **Max**, **Min** in case of Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P**, **MTVV** in case of Vibration measurements) are measured and saved in the file with the step defined by **Integration Period** parameter as many times as defined by the **Repetition Cycles** parameter.

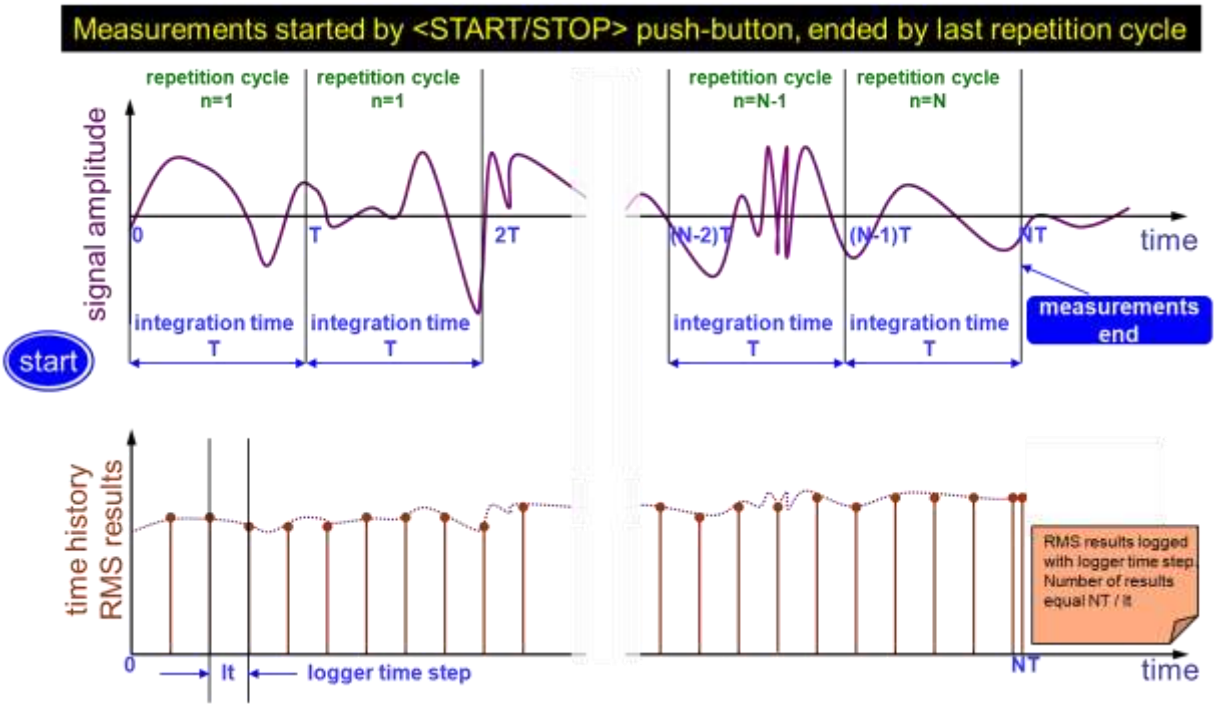
The **Logger** function proposes additional registration of some parameters with different step defined by the **Logger Step** parameter. Therefore in fact it can be possible to save to sequences of measured results – one for summary results and another for logger results.

When the **Logger** is switched on up to 18 logger results can be saved simultaneously from three independent profiles of the instrument (**Peak** / **Max** / **Min** / **Leq** / **LRxxx** and **LRyyy** for acoustic measurements or **Peak** / **P-P** / **Max** / **RMS** for vibration measurements) with time step down to **2ms**. The recording of logger results to the file is stopped after the period, which is equal to **Integration Period** multiplied by **Repetition Cycles** or after pressing the **<Start/Stop>** push-button or after stopping the measurements remotely.

The summary results are saved in the same file that the logger results. The whole block of the summary results is added to the file in the end of every measurement cycle.

The figure below illustrates described principles of saving results of the measurement.

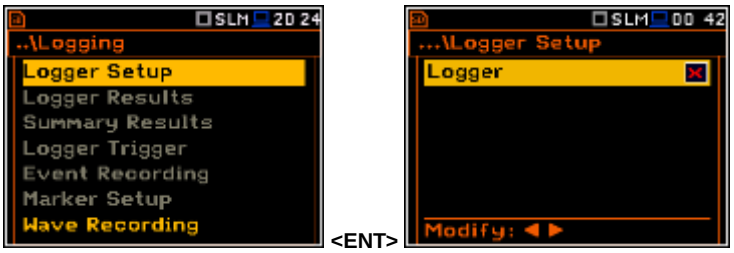
Relations between Integration Period and Logger Step



The **Logging** list enables the user to program the logger functionality - recording of the measurement time history results; and program markers and parameters of the signal recording (event or wave). The **Logging** list consists of seven positions: **Logger Setup**, **Logger Results**, **Summary Results**, **Logger Trigger**, **Event Recording**, **Marker Setup** and **Wave Recording**.

5.4.1 Setting the logger general parameters – Logger Setup

The **Logger Setup** list enables the user to activate logger functionality. If **Logger** position is switched off only **Wave Recording** function is accessible in the **Logging** list.



***Note:** If **Logger** is **Off**, logger files are not created automatically and measurement results of the time history changes are not saved!*

The **Logger** position switches on the functionality, which enables the user to save selected results from the three profiles, spectra as well as meteo results, taken from special Meteo module, with the defined interval selected in the **Logger Step** position.

▶


The **Summary Results** position allows the user to select or deselect the saving of the full set of profile results that the instrument generates during total measurement time and which are not belonged to the time history data. These results are: **Spl**, **Leq, Sel**, **Lden**, **LEPd**, **Ltm3**, **Ltm5, LN%, LR15, LR60, Ovl, Peak, Max, Min,** in case of sound measurements or **RMS**, **Ovl, Peak**, **P-P**, **MTVV** in case of vibration measurements as well as spectra in the analyzer function. In addition to above mentioned results it is possible to add summary meteo results, Statistics and Min and Max Spectra, listed the **Summary Results** window.

The **Logger Step** defines the period of the data logging in a file. It can be set from 2 milliseconds to 1 second or the values from 1 second to 59 seconds or the values from 1 minute to 59 minute and up to 1 hour.

The **Logger Name** position enables the user to define the logger file name. The default name is **L**. The name can be up to eight characters long. After pressing the ◄ or ► push-buttons, the special window with text editing function is opened.

▶


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

<ENT>


The **Split** position enables the user to split the logger registration data into separate files. If **Split** parameter is **Off** the registration of time history data will be continuously performed in one logger file with the name defined in the **Logger Name** position.

In other cases, the registration is performed in separate files and the registration in the new file will start: after integration period time (**Integr. Period**), or every quarter of the RTC (**Sync. to 15m**), or every half an hour of the RTC (**Sync. to 30m**), or every hour of the RTC (**Sync. to 1h**), or at specified by the user times (**Spec. Time**). Every time when the split time is achieved the logger file is closed and new file with the increased by

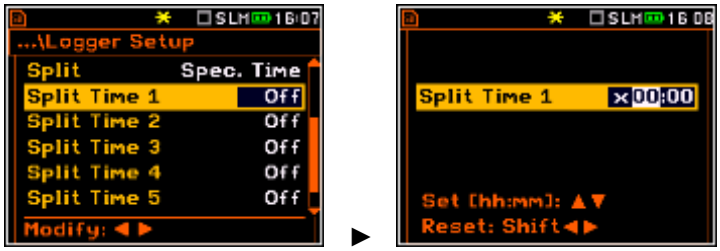
▶


one number is opened for subsequent measurement data.

If **Spec. Time** is selected 6 additional lines appear in the end of the **Logger Setup** list.

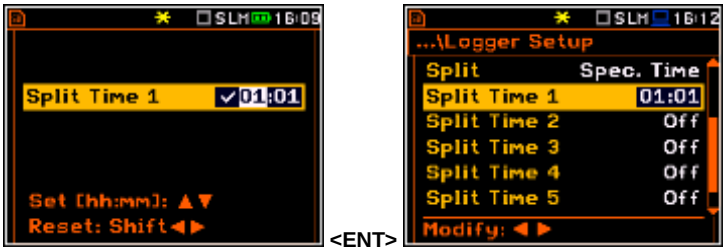
Opening each line the user can define the time of the day when the split will take place.

The special screen with time edition is opened after pressing the ► push-button.



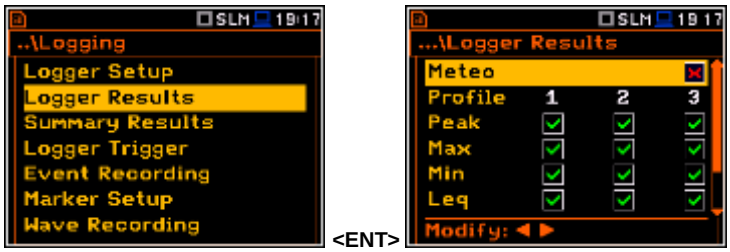
In the time edition line the user may define hour and minute of the split operation and switch on (☑) or off (☒) the current split.

After pressing **<ENTER>** the **Split Time** list will show the active times of the day when the logger will be split.



5.4.2 Selection of results for logging – Logger Results

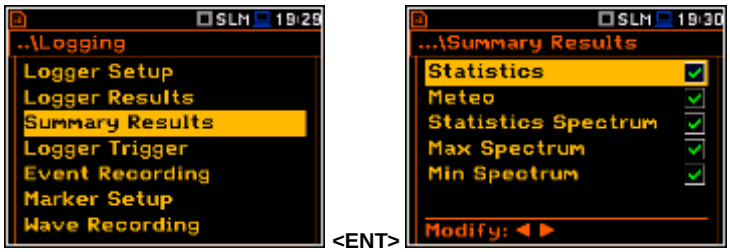
The **Logger Results** list enables the user to activate the results for three independent user defined profiles (**Peak**, **Max**, **Min**, **Leq**, **LRxxx** and **LRyyy** for acoustic measurements and **Peak**, **P-P**, **Max** and **RMS** for vibration measurements) and results taken from the meteo module (**Meteo**) which will be recorded to the logger file during the measurement period with the logger step. Activation / deactivation can be done by means of the ◄ or ► push-buttons pressed together with **<Alt>**. The position is changed by means of the ◄ or ► and ▲ or ▼ push-buttons.



***Note:** When **Logger** is switched off or there are no results for logging, the logger plot cannot be activated in **Display Modes** and accordingly doesn't appear on the display.*

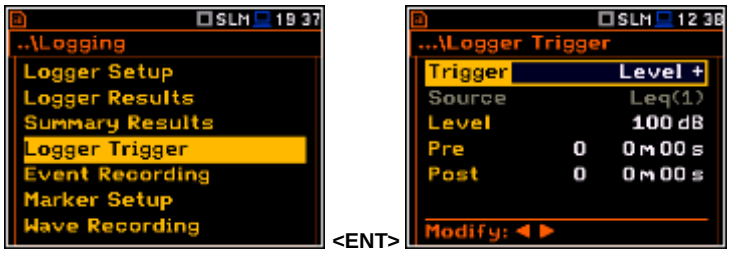
5.4.3 Selection of summary results to be saved in the file – Summary Results

The **Summary Results** list became active if **Summary Results** position in the **Logger Setup** list is switched on and enables the user to activate additional to the main results saving in the logger file: **Statistics**, **Meteo**, **Statistics Spectrum**, **Max Spectrum** and **Min Spectrum** for the acoustic measurements and **Meteo**, **Max Spectrum** and **Min Spectrum** for the vibration measurements.



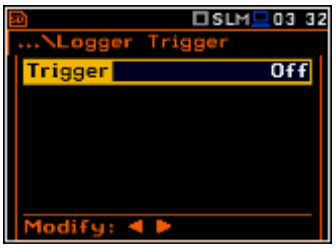
5.4.4 Setting the logger trigger parameters – Logger Trigger

The **Logger Trigger** parameters influence the way the measurement results are saved in the logger. It is a context sub-list in which: the trigger can be switched off or its type selected (**Trigger**), the source of the triggering signal can be determined (**Source**), it's level can be selected (**Level**), as well as the number of the results saved in the logger before the fulfilment of the triggering condition (**Pre**) and the number of the results saved in the logger after the fulfilment of the triggering condition (**Post**) defined.



Trigger disabling

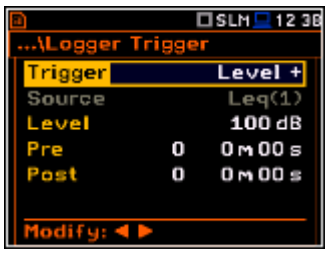
The logger triggering of the measurements (**Trigger**) can be switched off using the ◄ or ► push-button. The triggering is switched on if the **Level +** or **Level –** mode is selected.



Level type trigger

If the triggering signal is greater than the selected in **Level +** or less than **Level -** , the logger contains:

- the measurement results recorded directly before the fulfilment of the triggering condition; time of the recording can be calculated by multiplying the value set in the **Pre** position by the time period taken from the **Logger Step** (*path: <Menu> / Measurement / Logging / Logger Setup*);
- all measurement results up to the moment the triggering signal falls below the **Level**;
- the results recorded directly after the fulfilment of the triggering condition; time of the recording can be calculated by multiplying the value set in the **Post** by the period taken from the **Logger Step** (*path: <Menu> / Measurement / Logging / Logger Setup*).



Note: *When logger is waiting for the level trigger the "trigger level" icon appears alternatively with the „curve" icon.*

Source of the triggering signal

When the **Level Meter** mode is chosen only one measured result can be used as a source of the triggering signal in the logger, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)** for the SLM Mode or **RMS(1)** for the VLM Mode. This position does not become active (it is shown greyed out) and the text stated here remains unchanged. After pressing the ▼ push-button, the **Source** line is skipped.

Level of the triggering signal

The level of the triggering signal for logging (**Level**) can be set with 1 dB steps in the range from 24 dB to 136 dB in sound modes and from 1mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in vibration modes. The **Level** value of the triggering signal for the logger refers to the instantaneous value of

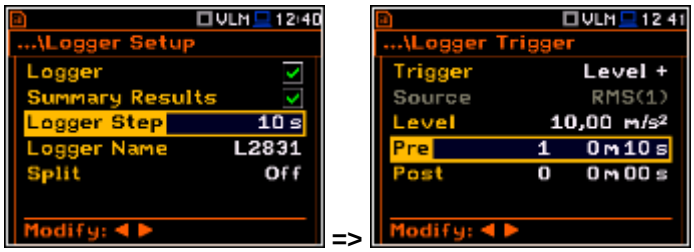
the RMS result from the first profile calculated during the period depending on selected **Detector (1)** (*path: <Menu> / Measurement / Profiles*).

Pre and Post trigger registration

In the **Pre** position, the number of the results registered in the logger's file before the fulfilment of the triggering condition can be set. This number is within the limits 0..50.

In the **Post** position, the number of the results registered in the logger's file after the fulfilment of the triggering condition can be set. This number is within the limits 0..200.

The period of the measurements that are saved in the logger before or after the fulfilment of the triggering condition can be calculated by multiplying the value set in the **Pre** or **Post** positions by the value set in the **Logger Step** position (*path: <Menu> / Measurement / Logging / Logger Setup*). The result of the calculation is presented in the same line, at the right side of the display



5.4.5 Setting the event recording – Event Recording

The **Event Recording** position enables the user to activate and set the parameters of event waveform signal recording in the logger file.

The **Events** position, if it is not **Off**, defines the type of events recording: **Continuous** or **On Trigger**.

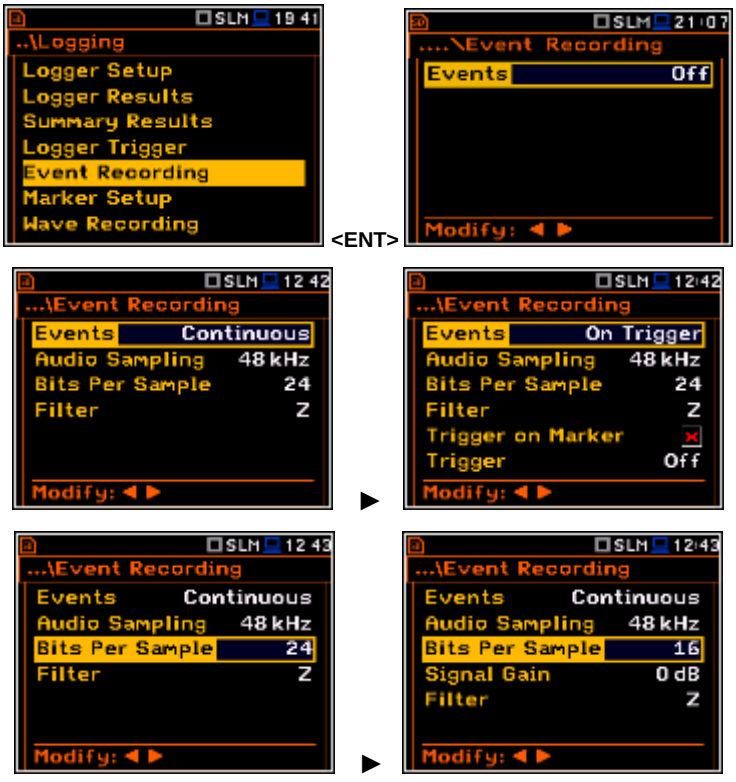
When **On Trigger** event recording is chosen then additional positions appear which enable the user to programme the trigger conditions for the event recording.

The **Audio Sampling** position enables the user to select the sampling frequency of the event recording: **12KHz**, **24kHz** and **48kHz**.

The **Bits Per Sample** position enables the user to select the number of recorded bits per sample: **16** or **24**.

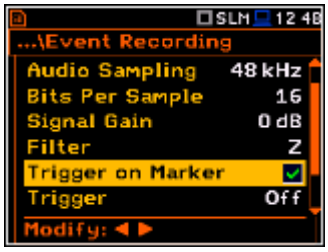
The **Signal Gain** position enables the user to select the gain of the recorded signal, when 16 bits per sample was selected: **0dB** … **40dB**.

The **Filter** position enables the user to select the weighting filter: **A**, **B**, **C** or **Z** for sound and **HP** during event signal recording.



The **Trigger on Marker** position switches on or off the triggering by marker.

When **Trigger on Marker** is switched on then event recording will start by initiation of one of the user controlled markers. Markers for triggering are defined in the **Markers Setup** window.

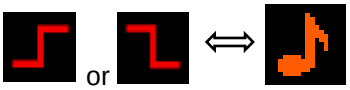


In the **Trigger** position the following options are available: **Off**, **Slope +**, **Slope –**, **Level +**, **Level –**, **External** and **Integr. Period**.

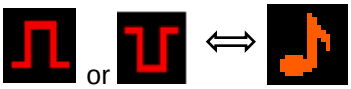
All triggers except **Integr. Period** were described in the chapter 5.2.

►...

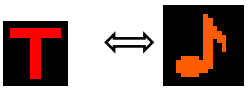
Note: *When event recording is waiting for the slope trigger the "trigger slope" icon appears alternatively with the „note" icon.*



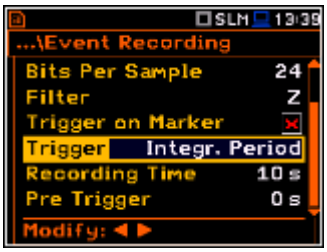
Note: *When event recording is waiting for the level trigger the "trigger level" icon appears alternatively with the „note" icon.*



Note: *When event recording is waiting for the external or integration period trigger the "trigger" icon appears alternatively with the „note" icon.*

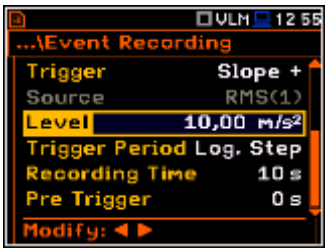


If the **Integr. Period** trigger was defined, the signal is recorded every time the measurement starts and ended after the **Integration Period** time, defined in the **General Settings** window (*path: <Menu> / Measurement / General Settings*).



The **Source** position indicates the triggering signal source. Only one measured result can be used as a source of the triggering signal in all modes, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)** for sound and **RMS(1)** for vibration measurements. This position does not become active.

The level of triggering signal for the event recording (**Level**) can be set with 1 dB steps in the range from 24 dB to 136 dB in sound modes and from 1mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in vibration modes. In case of Vibration measurements, the level can be expressed not only in decibels but also in linear units. The vibration unit scale can be set in the **Display Scale** window (*path: Menu / Display / Display Scale / Scale*).



In the **Trigger Period** position, it is possible to select the time interval of checking the triggering conditions. This parameter can be set on: **Log. Step** (same as **Logger Step** value), **0.5ms**, **100.0ms** and **1s**.

In the **Rec. Time** position, it is possible to select the time of signal recording after triggering. If another triggering condition that satisfies the selected conditions appears then the signal will be recorded for an additional **Rec. Time**. The available values can be selected from **1s** to **8h**.

When **Pre Trigger** is higher than 0 then the wave signal start to be recorded before the triggering condition moment. The period of such recording depends on the sample frequency and bits per sample. The maximum pre trigger period is:

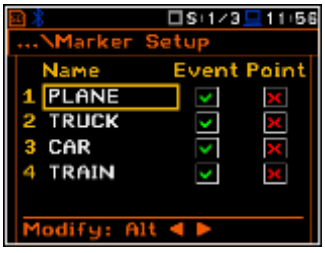
- for 24 bits per sample: **2s** for 48 kHz, **4s** for 24 kHz and **8s** for 12 kHz.
- for 16 bits per sample: **4s** for 48 kHz, **8s** for 24 kHz and **16s** for 12 kHz.

5.4.6 Setting the markers – Marker Setup

Marker is used to mark (or highlight) special events during the measurement such as "airplane flight" and is nothing but an indication of the beginning and end of the block of logger results in which the event occurred. In case of point markers there is no start and end of the marker, but only one record in the logger file. Markers are activated in the result presentation window by pressing the arrow keys.

The **Marker Setup** enables the user to assign a specific name for each marker, select its type (normal or **Point**) and define markers for event recording.

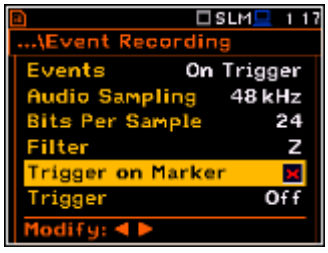
<ENT>



Name edition is performed in a special text edition window after pressing the ► push-button together with **<Shift>**.

<Sh/►>

The **Event** column is active only when **Trigger on Marker** (*path: <Menu> / Measurement / Logging / Event Recording*) is switched on.



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5.4.7 Setting the wave recording – Wave Recording

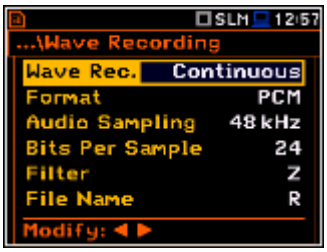
The **Wave Recording** position enables the user to activate and to set the parameters of the raw time waveform recording in the special file with the extension **WAV**. The WAV files are saved automatically in the working directory on the external memory (**SD Card**).

<ENT>

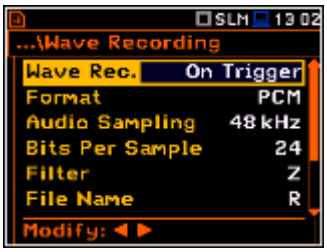
The **Wave Rec.** parameter, if it is not **Off**, defines the type of the wave recording: **Continuous** or **On Trigger**.

The **Format** position enables the user to select the format of the wave file header: **PCM** or **Extensible**.

The **Audio Sampling** position enables the user to select the sampling frequency of the wave recording: **12 kHz**, **24 kHz** and **48 kHz**.

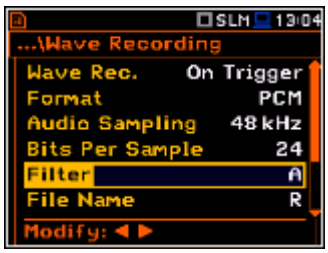


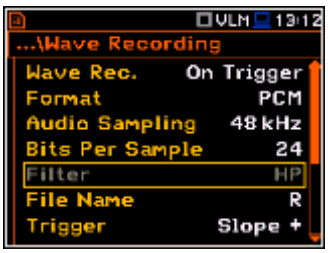
▶



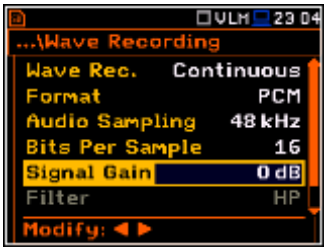
The **Bits Per Sample** position enables the user to select the number of recorded bits per sample: **16** or **24**.

The **Filter** position enables the user to select the weighting filter: **A**, **B**, **C** or **Z** for sound and **HP** during wave signal recording.

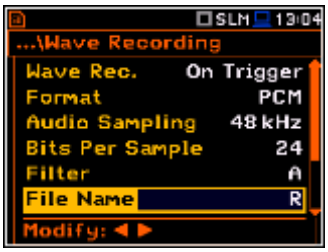




The **Signal Gain** position enables the user to select the gain of the recorded signal, when 16 bits per sample was selected: **0dB** … **40dB**.



The **File Name** position enables the user to edit the name of the wave file.



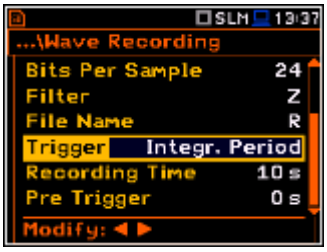
▶

The **Wave Recording** enables the user to activate and programme the wave recorder trigger. This option became active only when the value of the **Wave Rec.** parameter was set as **On Trigger**.

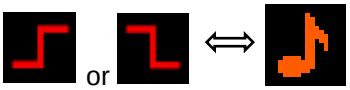
In the **Trigger** position the following options are available: **Slope +**, **Slope –**, **Level +**, **Level –**, **External** and **Integr. Period**.

All triggers except **Integr. Period** were described in the chapter 5.2.

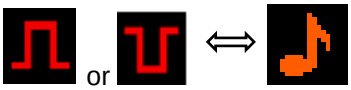
If the **Integr. Period** trigger defined the signal is recorded every time the measurement starts and ended after the Integration Period time, defined in the **General Settings** window (*path: <Menu> / Measurement / General Settings*).



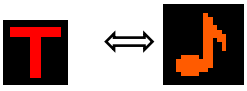
***Note:** When wave recording is waiting for the slope trigger the "trigger slope" icon appears alternatively with the „ note" icon.*



***Note:** When wave recording is waiting for the level trigger the "trigger level" icon appears alternatively with the „note" icon.*



***Note:** When wave recording is waiting for the external or integration period trigger the "trigger" icon appears alternatively with the „note" icon.*



The **Source** position indicates the triggering signal source. Only one measured result can be used as a source of the triggering signal in all modes, namely the output signal from the RMS detector coming from the first profile which is denoted here as **Leq(1)**. This position does not become active (it is not displayed inversely) and the text shown here remains unchanged.

The level of triggering signal for the wave recording (**Level**) can be set with 1 dB steps in the range from 24 dB to 136 dB in sound modes and from 1mm/s^2 (60 dB) to 10 km/s^2 (200 dB) in vibration modes. In case of Vibration measurements, the level can be expressed not only in decibels but also in linear units. The vibration unit scale can be set in the **Display Scale** window (*path: <Menu> / Display / Display Scale / Scale*).

In the **Trigger Period** position, it is possible to select the time interval of checking the triggering conditions. This parameter can be set on: **Log. Step** (same as **Logger Step** value), **0.5ms**, **100.0ms** and **1s**.

In the **Recording Time** position, it is possible to select the time of signal recording after triggering starts. If another triggering condition that satisfies the selected conditions appears then the signal will be recorded for an additional **Recording Time**. The available values can be selected from **1s** to **8h** or **Inf**.

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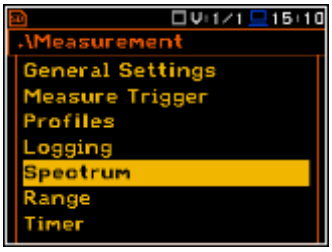
When **Pre Trigger** is higher than 0 then the wave signal start to be recorded before the triggering condition moment. The period of such recording depends on the sample frequency and bits per sample. The maximum pre trigger period is:

- for 24 bits per sample: **2s** for 48 kHz, **4s** for 24 kHz and **8s** for 12 kHz.
- for 16 bits per sample: **4s** for 48 kHz, **8s** for 24 kHz and **16s** for 12 kHz.

5.5 Setting the 1/1 Octave and 1/3 Octave spectra – Spectrum

The **Spectrum** position appears in the **Measurement** list when the **1/1 Octave** or **1/3 Octave** function is selected in the **Measurement Function** list (*path: <Menu> / Function / Measurement Function / 1/1 Octave or 1/3 Octave*). See section 10 for more details.



5.6 Selection of the microphone compensation filters – Compensation Filter

The **Compensation Filter** position is available only in case of the **Sound Meter** modes. It enables the user to select the appropriate frequency response compensation filter and the additional windscreen filter.

The **Compensation Filter** window consists of a list with 6 positions: **Off**, **Free Field**, **Diffuse Field**, **Outdoor Environment**, **Outdoor Airport** and **Windscreen**. The position in the sub-list is changed after pressing the ▲ or ▼ push-buttons. To switch the filter on the user should mark it, by means of the ◄ or ► push-buttons and to confirm the selection with the **<ENTER>** push-button. Pressing **<ENTER>** push-button closes the sub-list. After pressing the **<ESC>** push-button the sub-list is also closed but any changes will be ignored.

The **Free Field** and **Diffuse Field** filters enable the user to set compensation for sound measurements in the free field conditions or in the diffuse field conditions. The microphone supplied with the **SVAN 977W** instrument (SV 7052) is designed for sound measurements in free field conditions. The **Free Field** option means that the correction filter for the diffuse field conditions is switched off. In case of sound measurements performed with the use of specific diffuse field microphone types the option **Diffuse Field** should never be used and the compensation filter should be turned off.

Outdoor Environment and **Outdoor Airport** filters are dedicated for the permanent outdoor monitoring application. The characteristics of the outdoor filters depend on the application: environmental (the acoustic signal is parallel to the microphone's grid) or airport (the acoustic signal is perpendicular to the microphone's grid). The frequency characteristic of the designed filters is given in App. D.

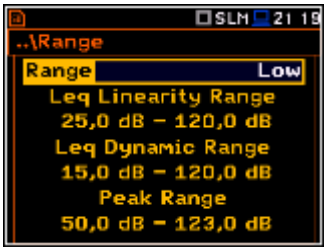
Windscreen filter can be switch **Off**, **On** or set to automatic detection – **Auto**.

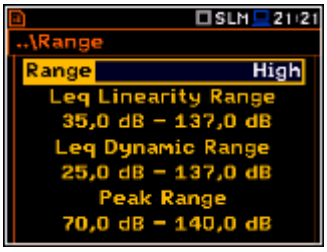
5.7 Setting the measurement range – Range

The **Range** position is used to set one of the available measurement ranges in the instrument.

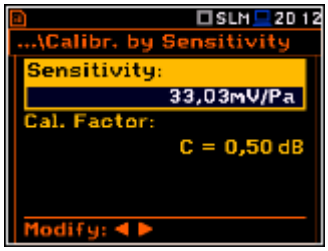
The absolute range value changes due to the calibration factor and are shown on the screen.

There are two ranges available: **High** and **Low**. The detailed description of the measurement ranges parameters is given in App. C. After pressing the **<ENTER>** push-button the change is confirmed and the window closes. Press the **<ESC>** push-button to return to the **Measurement** list ignoring any changes made in the sub-list.





The above screens were made with calibration factor equal to zero. The calibration factor is always added to the upper range level – see example.



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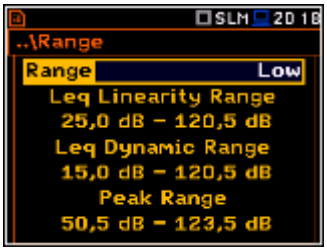
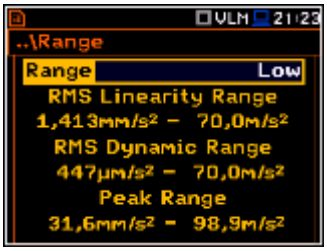
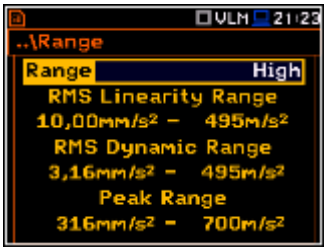
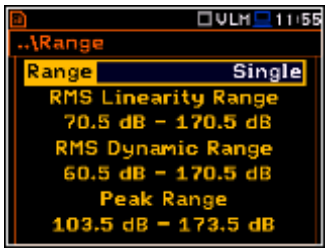


Right-side screens present the **Range** for VLM mode and zero calibration factor.





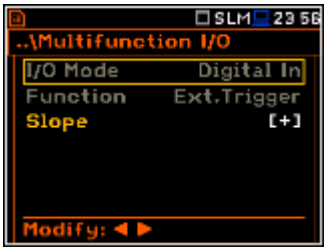
Note: *The calibration factor is always added to the range limits. For example, if calibration factor is equal to 0.5 dB, the range will be changed automatically (lower and upper limits will be increased by 0.5).*



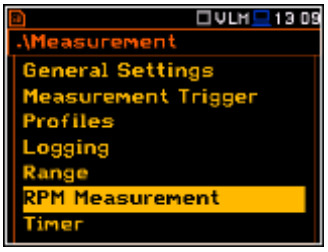
5.8 Setting the RPM measurements – RPM

To perform the RPM measurement the RPM probe should be connected to the **I/O** socket. The instrument automatically detects such connection and switches the **I/O Mode** to **Digital In** (*path: <Menu> / Instrument / Multifunction I/O / I/O Mode*).

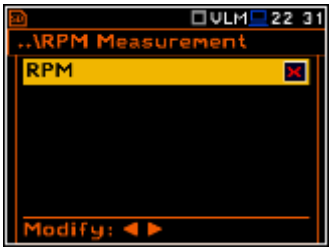
While the tacho is connected the **I/O Mode** position is inactive.



The **RPM Measurement** position enables the user to programme the measurements of rotational speed, measured by tacho probe. The RPM function usually is an optional function and should be activated during first attempt to switch it on.

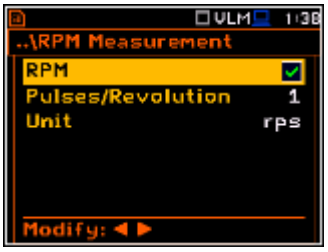


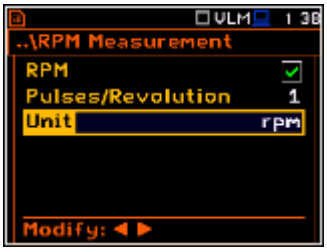
<ENT>



The **Pulse/Rot.** position enables the user to select the number of pulses per one rotation. Available values are in the range: **1**..**360**.

The **Unit** position enables the user to select the unit of the measurement. Two option are available: revolutions per minute (**rpm**) and revolutions per second **(rps**).

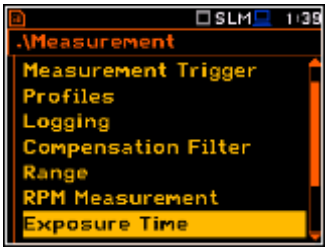




Note: *The RPM results are always registered in the logger file as a logger results (with the logger step) and as a summary results (with the integration period step).*

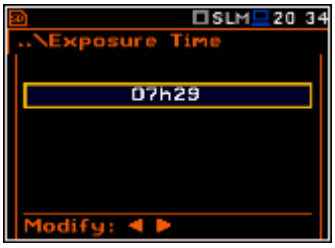
5.9 Setting the exposure time - Exposure Time

The **Exposure Time** enables the user to set the desired value of the workday exposure time that is used for the calculation of **LEPd** (cf. App. D for the definitions of the functions). This sub-list is available only in the sound mode.



<ENT>

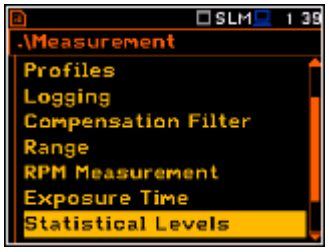
The **Exposure Time** values are within the range [00h01, 08h00]. The required value can be set using the ◄ or ► push-buttons – after each button press the exposure time is decremented / incremented by one minute. The step can be decremented / incremented in 30 minute steps by pressing the ◄ or ► push-buttons together with **<Shift>**.



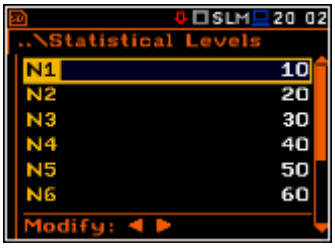
5.10 Setting ten statistical levels - Statistical Levels

The **Statistical Levels** position is available only in case of the **Sound Meter** modes.

In the **Statistical Levels** window, it is possible to define ten statistical levels, named from **N1** to **N10**, to be calculated, displayed and saved in the files together with the main results.



<ENT>



The default statistical levels have the following settings: **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80**, **90** and **95**. All values should be within the integer range [1, 99]. Each individual value can be set independently from the others. The selection of the **Nx** in the list is made by means of the ▲ or ▼ push-buttons.

The upper **Nx** is visible on the display and becomes active for editing after pressing the ▲ push-button together with **<Shift>**. The lower **Nx** is visible on the display and becomes active for editing after pressing the ▼ push-button together with **<Shift>**.

The **Nx** current value is decreased / increased in 1 % steps by means of the ◄ or ► push-buttons. The step can be decreased / increased up to ten % by simultaneously pressing the ◄ or ► push-buttons with **<Shift>**.

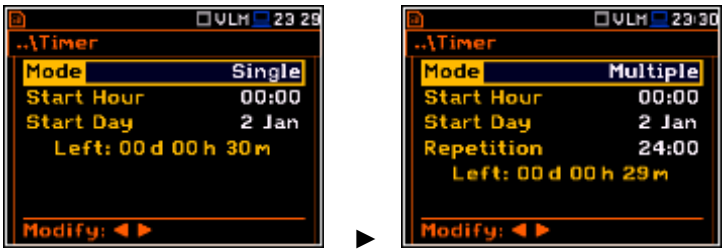
The sub-list is closed and the instrument returns to the **Measurement** list after pressing the **<ENTER>** (with the confirmation of all changes made in this list) or **<ESC>** push-button (ignoring all changes).

5.11 Programming the instrument's internal timer – Timer

The **Timer** position enables the user to programme the internal real time clock to act as a delayed start and stop timer. The instrument can be switched on automatically at the pre-selected programmed time and perform the measurement with the same settings used before the instrument was switched off.

Modes of the timer function

The timer can be switched off (**Off**), switched on only once (**Single**), or switched on many times regularly (**Multiple**) with the period between two consecutive measurements set in the **Repetition** line.



In case the timer function is active (**Single** or **Multiple**) and the instrument is switched on the "**clock**" icon appears until finishing the programmed measurements.

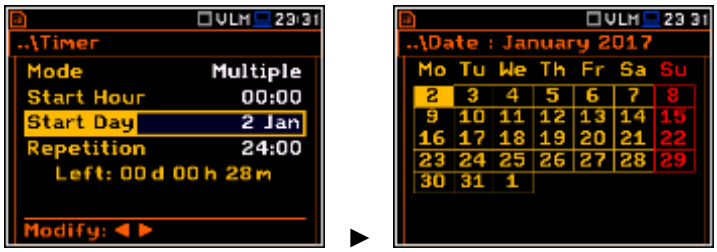
Time to start measurement

The **Start Hour** position determines the time for the measurement to start. The required hour and minute can be selected in a special window, which is opened by means of the ◄ or ► push-buttons.

To set hours or minutes the user should enter the left or right field by pressing the ◄ or ► push button and then select the proper value by means of the ▲ or ▼ push-buttons and finally to press **<ENTER>**.

Day to start measurement

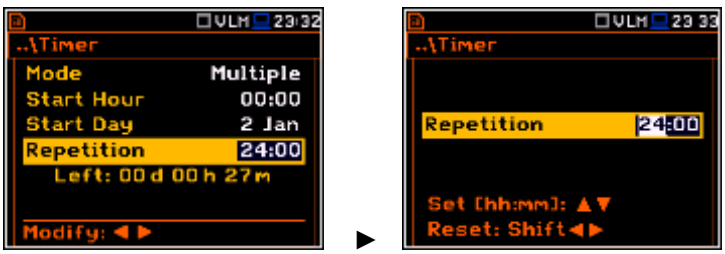
The **Start Day** position determines the date for the measurement to start. The timer can be programmed up to one month ahead and during the date setting the current state of the **R**eal-Time **C**lock (**RTC**) is considered. The required date can be selected in a special window, which is opened by means of the ◄ or ► push-buttons.



To set date, the user should select its position by means of the ◄ or ► and ▲ or ▼ push button and then press **<ENTER>**.

Period between two consecutive measurements starts

The **Repetition** position is displayed when the **Multiple** mode is selected. This parameter can be programmed in the range from **00:00** up to **96:00**. The required date can be selected in a special window, which is opened by means of the ◄ or ► push-



buttons analogously to the **Start Hour** position.

Note: *The instrument's Timer function can be used for multiple measurements (at the programmed day and time with the selected repetition number). The first switch on of the instrument must be within one month ahead. Make sure that the RTC is set correctly before trying to set a value for a delayed Start/Stop Timer.*

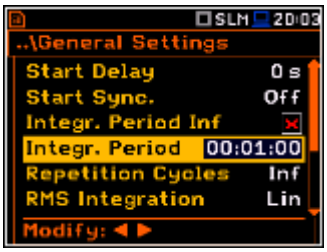
Note: *Make sure that there is sufficient power available for the instrument to carry out the required measurement when it wakes up and starts the recording.*

5.11.1 Example timer execution

The **Timer** function is used to programme the instrument to switch on at the desired time and perform the measurements with the parameters set in the **Measurement** sub-list.

Let us assume that the user wants to switch on the instrument on the 3rd of December, at 20:00, measure the sound for 1 minute and save the results in a file named **L2831**.

To do this the user should set the parameters of the **Timer** function, the measurement parameters (*path: <Menu> / Measurement / General Settings*), name the file (*path: <Menu> / Measurement / Logger / Logger Setup*) and finally – switch off the instrument.



The instrument will be switched on the 3rd of December at 20:00 and will be warmed up for the period of 60 seconds decrementing the counter visible on the display by one after each second.

After warming up the instrument and the pre-set **Start Delay** time, the measurements will be performed for a period of one minute. Then, the results will be saved in the previously named file and finally – the instrument will switch itself off.

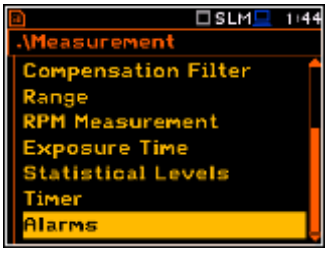
In this example the delayed start time on the meter can be configured any time during the previous month. It is recommended that for simplicity the **Start Delay** time is set to 0 seconds for use with the **Timer** function.

5.12 Advanced alarm function - Alarms

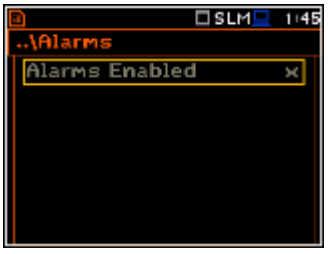
The **Alarm** position opens the window with information about advanced alarm function enabling.

The advanced alarm function is configured via SvanPC++.

For more details see Appendix L "SVAN 977 Advanced Alarms".



<ENT>

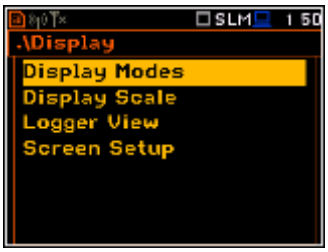


6. SETTING THE DATA VIEW – Display

The **Display** list contains the elements that enable the user to independently programme the display parameters.

The content of the **Display** list is different for the spectrum analyser functions (**1|1 Octave**, **1/3 Octave** and **FFT**) in regards to the **Level Meter** function.

<ENT>



The **Display** list is used for setting the various parameters, which are dedicated to the control of the LCD screen display, and contains the following items:

Display Modes enables the user to select the mode of the measurement results presentation;

Display Scale enables the user to change the scale in the graphical modes of result's presentation;

Logger View enables the user to select and present the results stored in the logger's files;

Spectrum View enables the user to change the type of the spectrum and to activate the **Max** and **Min** spectrum. This position appears only in spectrum analyser functions;

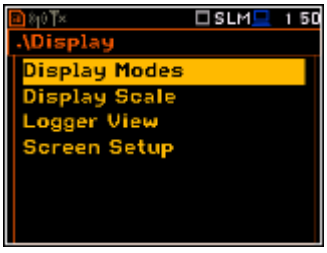
Spectrum Type enables the user to change the spectrum type presented on the display: **Acceleration**, **Velocity** and **Displacement**. This position appears only in spectrum analyser functions when the **Vibration Meter** mode is selected;

Screen Setup enables the user to set the brightness and the switch on/off the energy saver function.

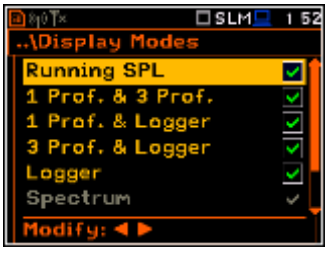
6.1 Selection of the view modes - Display Modes

The One Result view is always available in all measurement modes. Other view modes can be switched on or off in the **Display Modes** sub-list.

The mode of results presentation is related to the selection of the instrument's function (**SLM** or **VLM**, **1/1 Octave**, **1/3 Octave**, etc.).

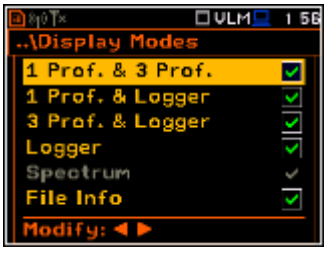


<ENT>



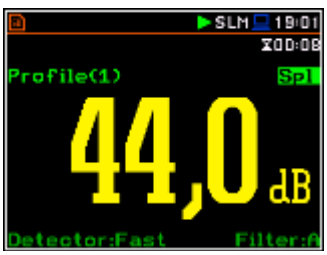
In case of **Sound Level Meter**, following optional views are available: **Running SPL**, **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & Logger**, **Logger**, **Statistics** and **File Info**.

In case of **Vibration Level Meter**, following optional views are available: **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & LoggerB, Logger** and **File Info**.

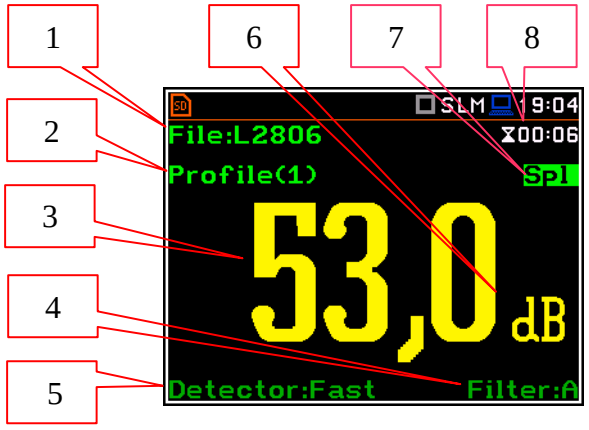


One Result view

The One Result view is always available in all measurement modes. In this view, only one measured value is displayed in large letters.



Field description of the One Result view



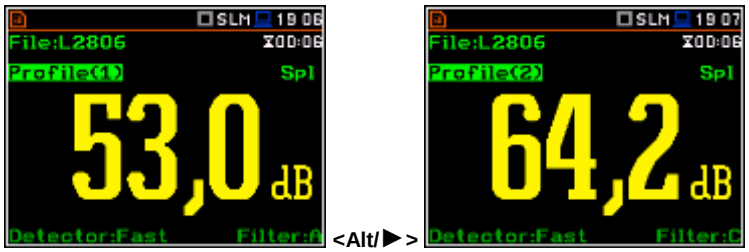
1. Logger file name.
2. Profile number.
3. The value of the measured function.
4. The name of the implemented filter: **Z**, **A**, **C**, **B**, **G** in case of Sound measurements or **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10**, **Wh** in case of Vibration measurements.
5. Detector type: **Lin** when **RMS Integration** is **Lin** *(path: <Menu> / Measurement / General Settings)* or: **Imp.**, **Fast**, **Slow** in case of Sound measurements or **100 ms**, **125 ms**, **.. 10.0 s**, in case of Vibration measurements, when **RMS Integration** is **Log**.
6. Units of the measured value.
7. Function name: **Spl**, **Leq**, **Sel**, **LEPd**, **Ltm3**, **Ltm5**, **LN%**, **Ovl**, **Peak**, **Max**, **Min** in case of Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P**, **MTVV** in case of Vibration measurements.
8. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Integration Period**].

Note: *In case the **RMS Integration** is linear (path: <Menu> / Measurement / General Settings / RMS Integration: Lin) for the **Leq**, **Sel**, **Le**, **LEPd** and **LN%** results **Lin.** text appears on the display instead of **Imp.**, **Fast** or **Slow** detector time constant.*

Note: *There is no displayed indication of the detector in case of **Peak** and **Ovl** results.*

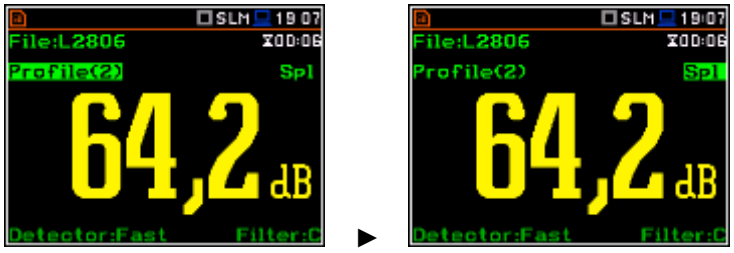
Changing the field content

The content of some fields can be changed after pressing the ◄ and ► push-buttons together with **<Alt>**.



Changing the active fields

The change of the active field is made by pressing the ◄ or ► push-buttons.

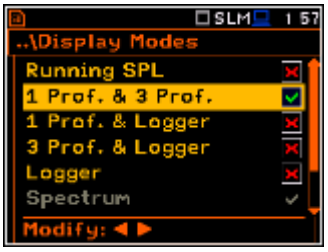


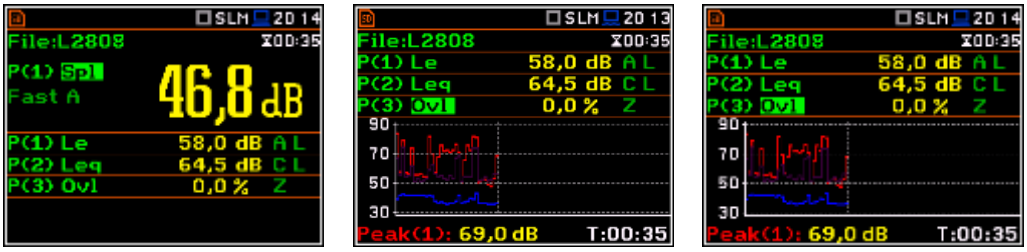
Changing the view mode

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

Combined views

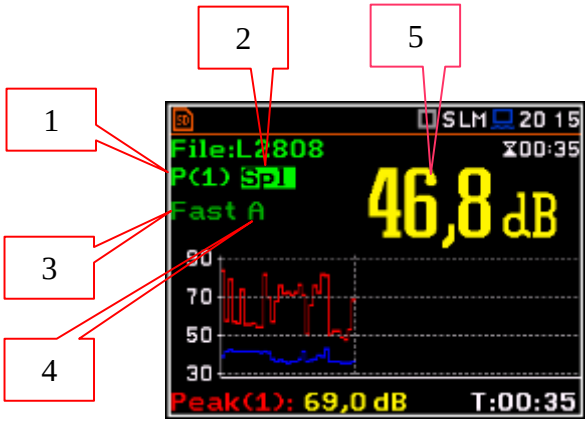
There are three display modes, that combine two views and can be activated or not: **1 Prof. & 3 Prof.**, **1 Prof. & Logger**, **3 Prof. & Logger**. These combined views allow the user to compare results for profiles and to follow the history of measured results, saved in the logger file.

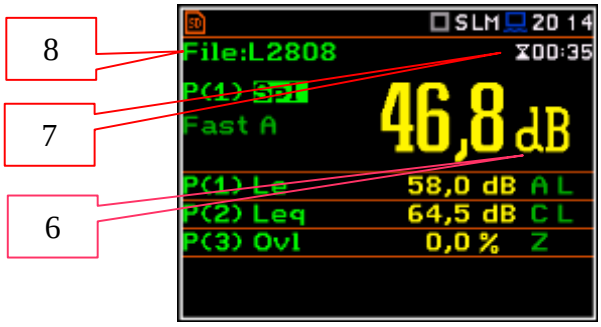




Fields description of the One Result view

1. Profile number.
2. Function name: **Spl**, **Leq**, **Sel**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **LN%**, **Ovl**, **Peak**, **Max**, **Min** in case of Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P**, **MTVV** in case of Vibration measurements.
3. Detector type: **Lin** when **RMS Integration** is **Lin** *(path: <Menu> / Measurement / General Settings)* or: **Imp.**, **Fast**, **Slow** in case of Sound measurements or **100 ms**, **125 ms**, **.. 10.0 s**, in case of Vibration measurements, when **RMS Integration** is **Log**.
4. The name of the implemented filter: **Z**, **A**, **C**, **B**, **G** in case of Sound measurements or **HP**, **HP1**, **HP3**, **HP10**, **Vel1**, **Vel3**, **Vel10**, **VelMF**, **Dil1**, **Dil3**, **Dil10**, **Wh** in case of Vibration measurements.
5. The value of the measured function.
6. Units of the measured value.
7. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Integration Period**].
8. File name when Auto Save Function is activated (*path: <Menu> / File / Save Options / Auto Save:*☑)



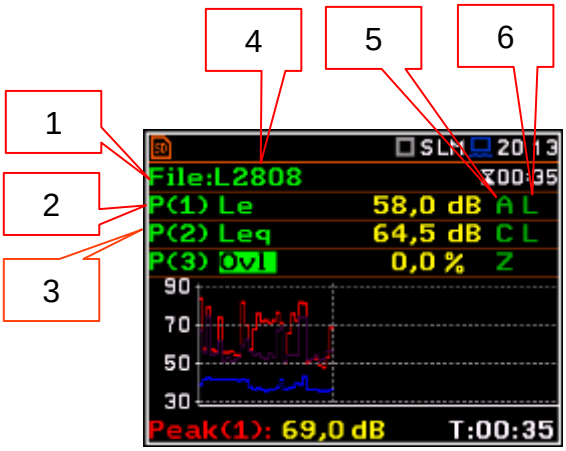


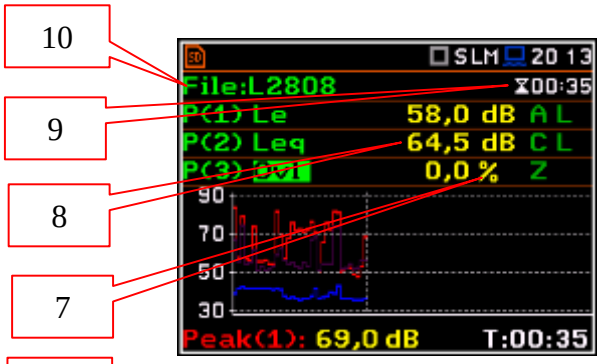
Note: *In case the **RMS Integration** is linear (path: <Menu> / Measurement / General Settings / RMS Integration: Lin) for the **Leq**, **Sel**, **Lden**, **LEPd** and **LN%** results **Lin.** text appears on the display instead of **Imp.**, **Fast** or **Slow** detector time constant.*

Note: *There is no displayed indication of the detector in case of **Peak** and **Ovl** results.*

Fields description of the 3 Profiles view

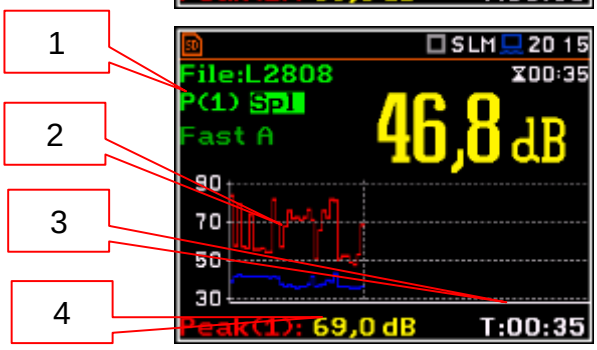
1. Result line for Profile 1.
2. Result line for Profile 2.
3. Result line for Profile 3.
4. Function name: **Spl**, **Leq**, **Sel**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **LN%**, **Ovl**, **Peak**, **Max**, **Min** in case of Sound measurements or **RMS**, **Ovl**, **Peak**, **P–P**, **MTVV** in case of Vibration measurements.
5. The name of the implemented filter: **A**, **C**, **Z** in case of Sound measurements. In case of Vibration measurements this field is skipped.
6. Detector type: **L** (Lin) when **RMS Integration** is **Lin** *(path: <Menu> / Measurement / General Settings)* or: **I** (Imp.), **F** (Fast), **S** (Slow) in case of Sound. In case of Vibration measurements this field is skipped.
7. Units of the measured value.
8. The value of the measured function.
9. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Integration Period**].
10. File name.





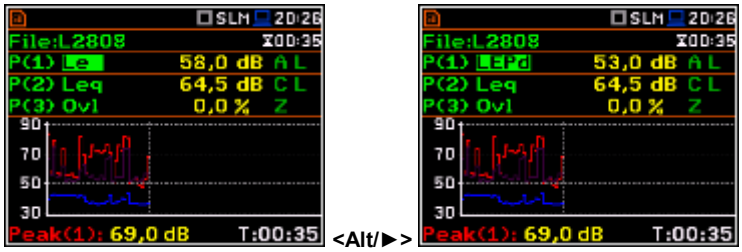
Fields description of the Logger view

1. Profile number and Function name
2. Logger Plot
3. Cursor time position
4. Function value for cursor position



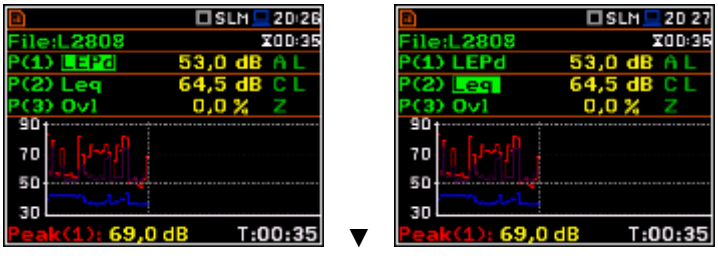
Changing the field content

The content of some fields can be changed after pressing the ◄ and ► push-buttons together with **<Alt>**.



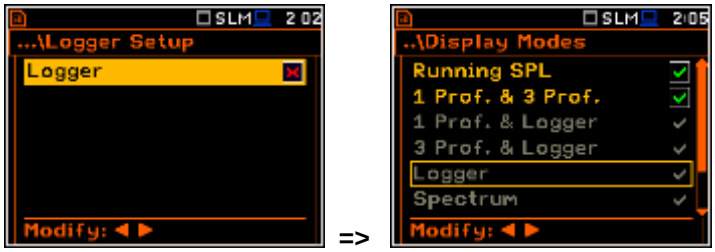
Changing the active fields

Changing the active field is made by pressing the ▲ / ▼ (vertically) or ◄ or ► (horizontally) push-buttons.

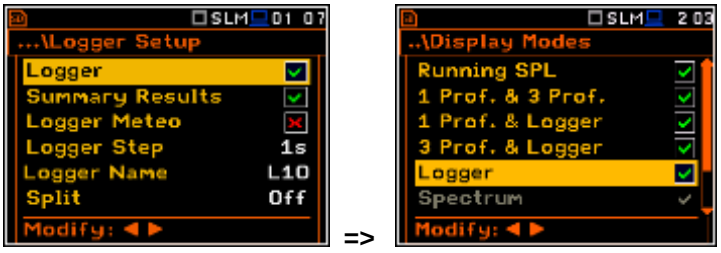


Logger view

The **Logger** view mode depends on the settings made in the **Logging** list (*path: <Menu> / Measurement / Logging). If* ***Logger*** (*path: <Menu> / Measurement / Logging / Logger Setup)* is switched off the **Logger** view mode is **not** active!



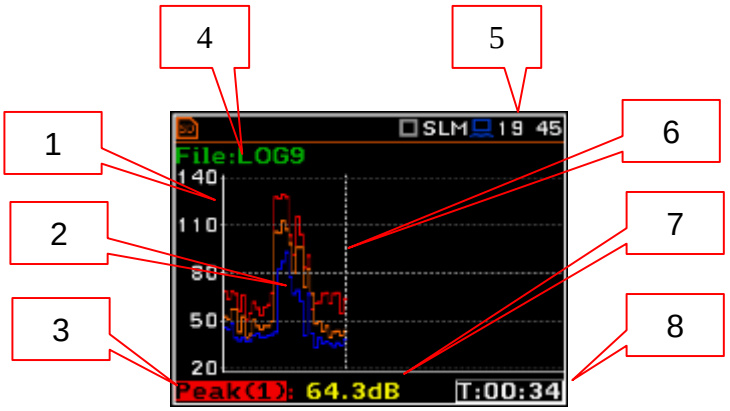
So, to have this view mode active, the user should switch the **Logger** on!



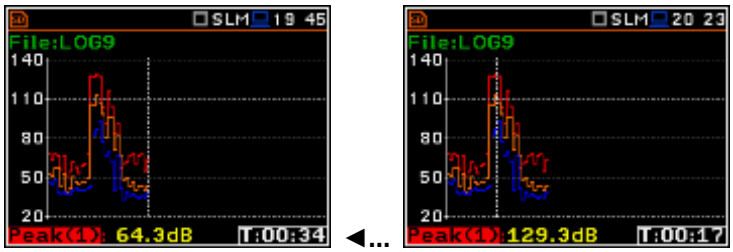
When **Logger** is On and some results have been selected for logging the logger plot can be viewed.

Fields description of the Logger view

1. Y-scale
2. Logger plot
3. Name of the logged result and profile number
4. Name of the file
5. Real Time Clock
6. Cursor position
7. Result value for the cursor position
8. Cursor time position



The user may change the cursor position by means of the ◄ or ► push-buttons.

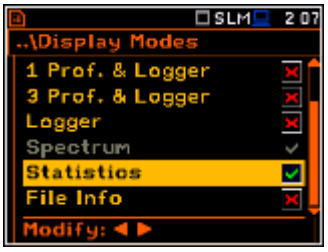


Spectrum view

The **Spectrum** position is accessible only for active **1/1 Octave**, **1/3 Octave** or **FFT** functions (*path: <Menu> / Function / Measurement Function*).

The spectra views are described in chapters dedicated to the analyzer functions.

Statistics view

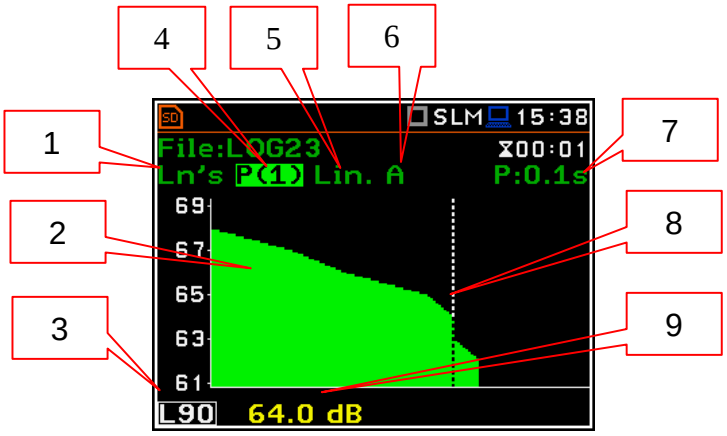


The **Statistics** position is accessible only for **Sound** measurements.

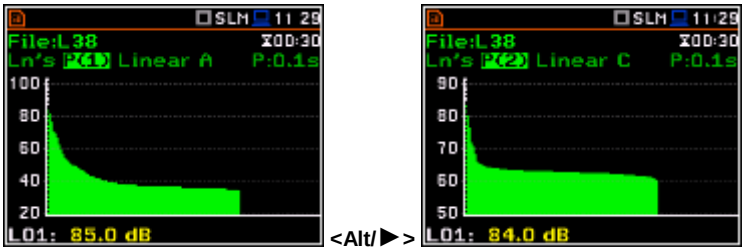
Statistics is the cumulative probability density function of exceeding the noise level during the measurement period. The X axis defines the probability of exceeding the noise level, statistical level **LN%**, and the axis Y defines the calculated noise level in dB.

Fields description of the Statistics view

1. Function name
2. Statistics plot
3. Statistical level (LN% percentile value) for the active cursor position
4. Active profile (P1, P2 or P3)
5. RMS detector (**Lin.**, or **Exp.**: **Fast**, **Slow** or **Imp**.)
6. Averaging filter used (**A**, **B**, **C** or **Z**)
7. The sampling interval for the LN% values calculated by the meter (0.1 s)
8. Cursor position
9. Value of the selected statistical level **LN%** and units (dB)

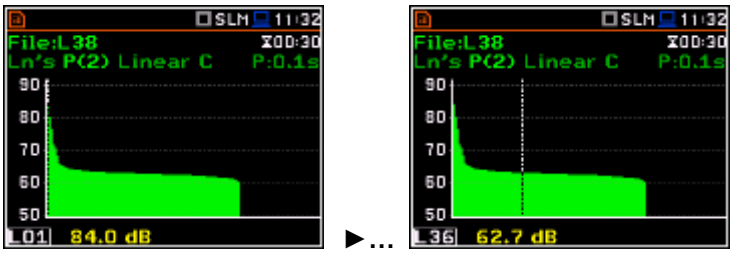


The profile is changed after pressing the ◄ and ► push-buttons with **<Alt>**.



The cursor position is changed by means of the ◄ or ► push-buttons if field **Lxx** is selected. The statistical level and appropriate value are presented in the line below the plot.

Press the ◄ or ► push-buttons with <**Shift**> to go straight to the first or last LN% position on the screen.



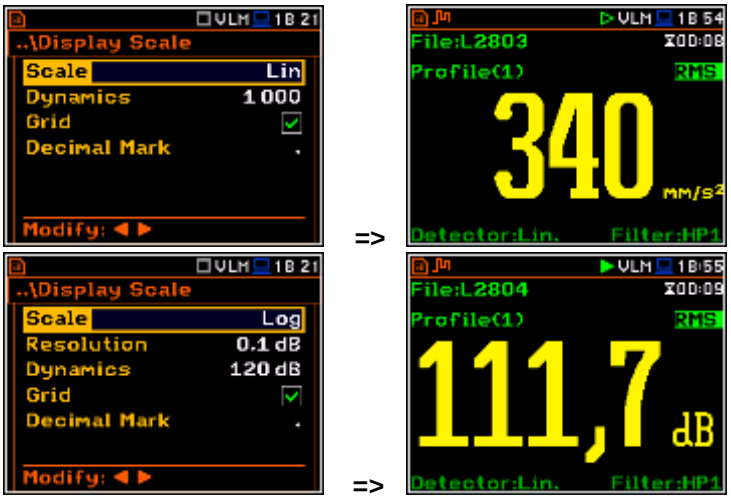
6.2 Setting the units and scale of result presentation - Display Scale

The **Display Scale** sub-list enables the user to define the result units (absolute or logarithmic), adjust scale of plots and switch the grid on/off.

Scale of results presentation

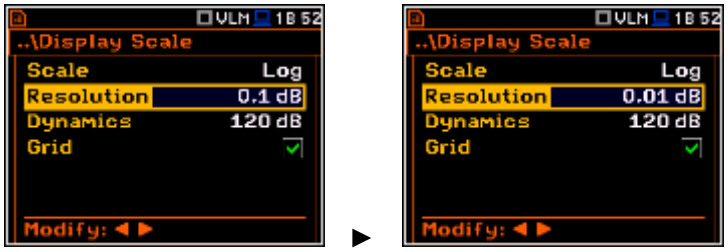
The **Scale** position defines the units of results: **Lin** (linear) and **Log** (logarithmic). In case of **Log** the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** window (*path: <Menu> / Auxiliary Setup / Reference Levels*).

In case of the sound measurements the **Scale** position is not active. All results are presented in dB.



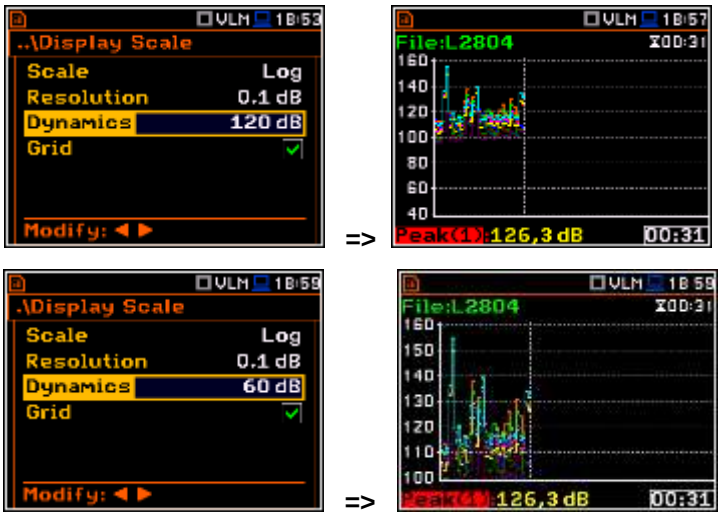
Note: *In the Vibration modes, the parameters can be presented in* ***Logarithmic*** *(dB) or* ***Linear*** *(for example, m/s²) units. It depends on the* ***Scale*** *parameter value. For example, 10 m/s² can be presented as 140 dB.*

The **Resolution** position defines the number of digits after the decimal point in the presented results: one digit after the decimal point (**0.1 dB**) or two digits after the decimal point (**0.01 dB**).



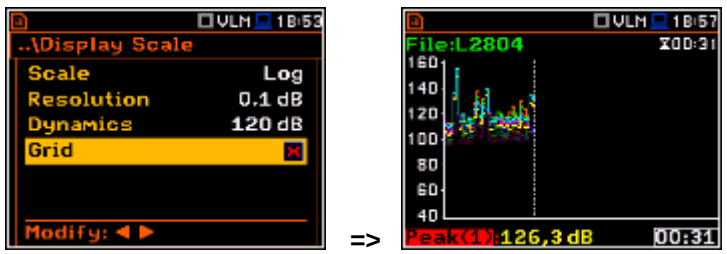
Scaling the vertical axis of the plot

The **Dynamic** position enables the user to select the required dynamic range scaling of the plot. It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.



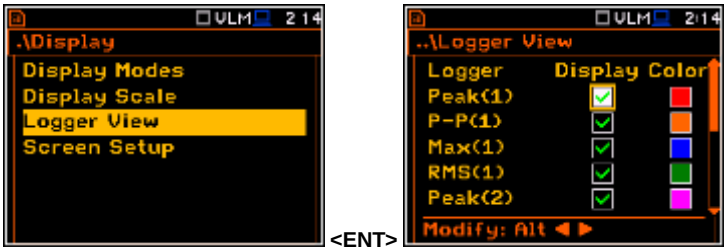
Switching the grid on/off

The **Grid** position enables the user to switch on or off the horizontal grid lines in any graphical presentation – history plot or spectrum.

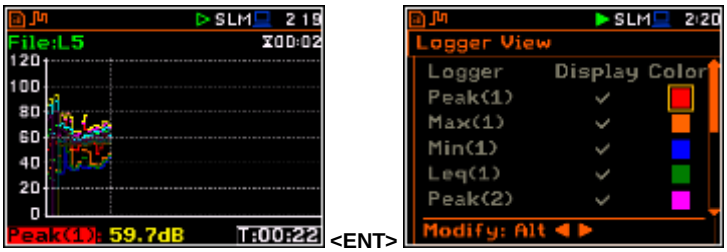


6.3 Setting view of the logger plot - Logger View

The **Logger View** position enables the user to change the colour of the logger curves. Every logger curve shows the history of one result measured in a profile, like **Peak(1)**. It is possible to include or exclude the curve from the logger plot, and define the colour of this curve.

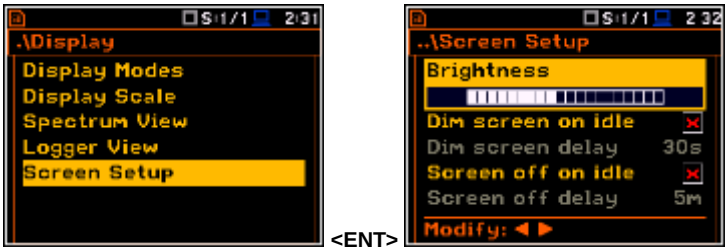


The view of the logger screen can be adjusted quickly without stopping the measurement. Highlight the function label in the bottom left hand corner then press the **<ENTER>** push-button and the **Logger View** list is displayed. The user can make necessary adjustments and return to the **Logger** view after confirmation of the performed changes by means of the **<ENTER>** push-button.



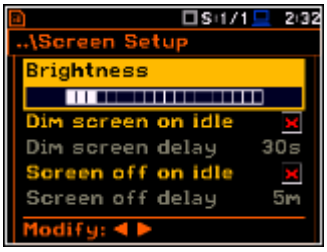
6.4 Setting the display brightness and power saver - Screen Setup

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



Brightness of the display

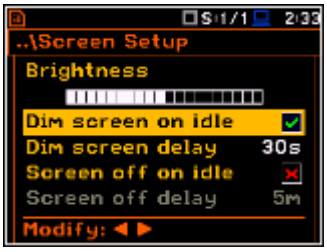
The **Brightness** position enables the user to set the proper brightness of the display by means of the ◄ or ► push-buttons. The user can select 20 different values of this parameter. The new value of the brightness level is confirmed after each press of the ◄ or ► push-buttons.



Power saver function

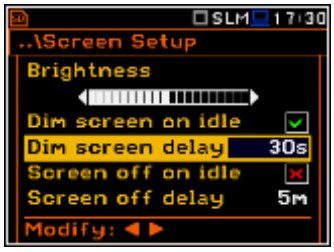
The saving of the internal source of the instrument's power can be achieved by reducing the brightness of the screen when possible.

There are two options for the power saver function. The screen may be switched off (**Screen off on idle**) and/or dimmed (**Dim screen on idle**). When either of these options is set, after a delay, set by the parameters **Dim screen delay** or **Screen off delay**, from pressing any push-button the screen is dimmed or switched off. If it has happened, the first press of any push-button will cause the screen to switch back on again.



Power saver delay

The power saver delay defines the delay period from last use of any push-button to the power saver mode. This delay period can be set for **Dim screen on idle** from **5 s** to **60 s** and for **Screen off on idle** from **1 m** to **60 m**. The **<ENTER>** push-button must be pressed for confirmation of the selection, which then also closes the **Screen Setup** window.



7. MANAGING THE FILES – File

The **File** list enable the user to manage the data and setup files saved in the external memory (micro **SD Card**).

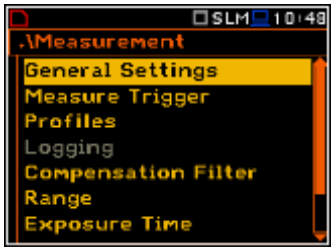
<ENT>

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

File Manager enables the user to manage the files saved on SD card;

Setup Manager enables the user to manage the Setup files saved on SD card.

Note: *Because of limited internal memory capacity of the instrument data files can be saved on the external memory only. So, if there is no* ***SD Card*** *in the instrument there is no any possibility to create any data files. In such cases the* ***Logging*** *position in the* ***Measurement*** *list is not available.*



Note: *Positions in the* ***File*** *list are active only when an* ***SD Card*** *is inserted into the card slot under the bottom cover of the instrument. If there is no SD card, after user's attempt to enter any position in the* ***File*** *list, the instrument will generate warning.*

There are three types of files that the instrument generates:

- Logger files with measured data (extension **.SVL**),
- WAV files with time waveform recordings (extension **.WAV**);
- Setup files with measurement configuration setups (extension **.SVT**).

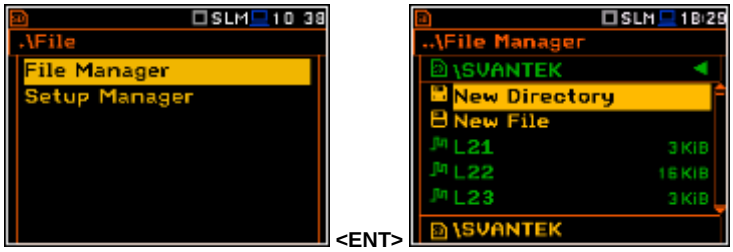
The detailed description of all types of file structures is given in the Appendix B.

The logger file (.SVL) structure depends on the selected function (**Level Meter**, **1/1 Octave**, **1/3 Octave**, etc.) and logging settings. These elements are as follows:

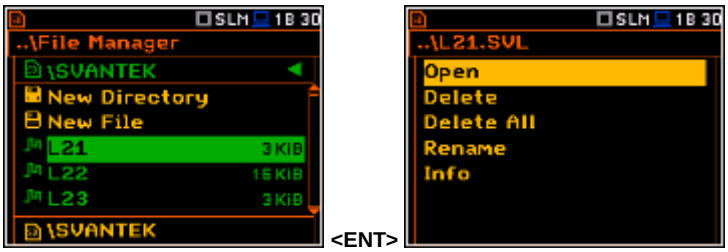
- main results,
- results of statistical analysis,
- time histories of measured results,
- audio time waveform recording for events,
- marker recording,
- results of **1/1 Octave** analysis,
- results of **1/3 Octave** analysis,
- results of **FFT** analysis.

7.1 Managing files saved in the external memory – File Manager

The **File Manager** is used for checking the memory content, create new directories and files, select directory for saving files, delete files and directories.



The list of files and directories is presented in the **File Manager** window. Files are stored in directories, which are organised hierarchically. By pressing the **<ENTER>** push-button the window with the list of available operations is opening for the marked (highlighted) position.



Creating new directory or file

The first position of the File **Manager** list is **New Directory**, which enables the user to create the new directory.

To do this, the user should enter the directory in which the new one will be created and press the **<ENTER>** push-button at the **New Directory** position.

The marked directory can be opened by means of the ► push-button.

To return to the upper directory the user should press the ◄ push-button.

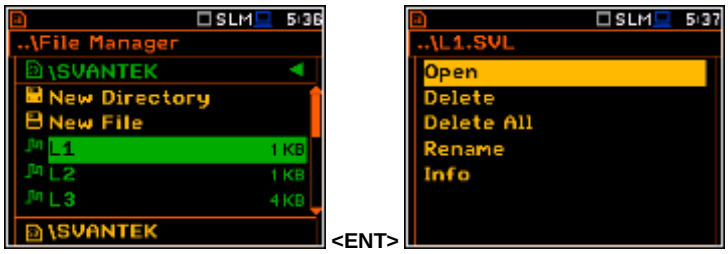
7.1.1 Assigning the directory for saved files – Set as Working Dir.

The user can assign the directory for automatically saving logger files. To do this the user should choose the required directory and press the **<ENTER>** push-button. After opening the command list, the user should select **Set as Working Dir.** and press the **<ENTER>** push-button.

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

7.1.2 Opening file – Open

The user can open logger file from the file list. To do this the user should select the file and press the **<ENTER>** push-button. After opening the command list select the **Open** position and press **<ENTER>** again.

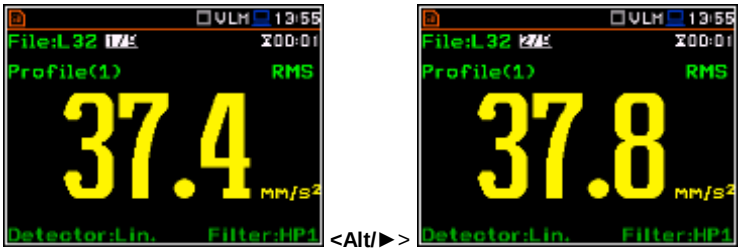


Opening the measurement file means that the measurement results saved in this file will be loaded to the instrument's operation memory and may be reviewed on the screen. The results are loaded together with **Mode** and **Measurement Function** settings, but other measurement settings are as before opening the measurement file.

After loading the file, only summary results saved in the logger file as records can be viewed at the display. Each record contains measurement data for one cycle (measured with integration time step).

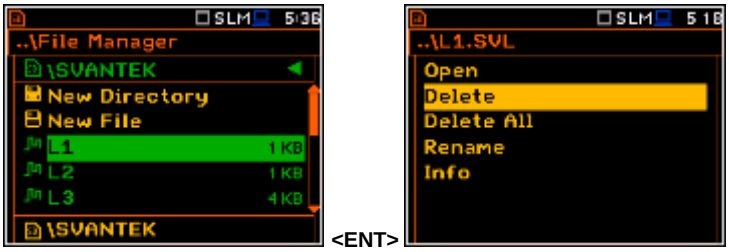
The record counter is displayed in the same line with the file name.

To see next cycle data the user should select the record counter position by means of ▲ or ▼ push-button and then change the record number by means of the ◄ or ► push-button pressed together with **<Alt>**.



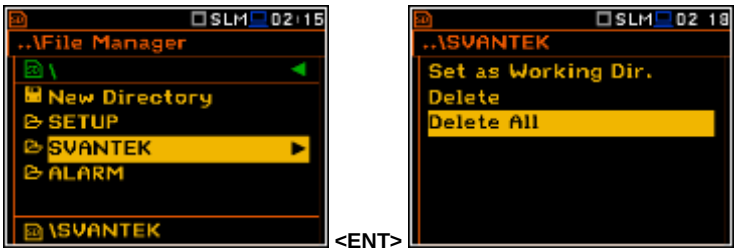
7.1.3 Deleting file/directory – Delete

The user can delete a file or directory from the file/directory list. To do this the user should select the file/directory and press the **<ENTER>** push-button. After opening the command list, select the **Delete** position and press **<ENTER>**. The instrument will ask for confirmation of this action since it cannot be undone once a file/directory has been deleted.



7.1.4 Erasing all files in a directory – Delete All

The user can delete all elements from the directory. To do this the user should select the desired directory and open it by means of the ► push-button. Then select any file or subdirectory and press **<ENTER>**. In the command list select the **Delete All** command and press **<ENTER>**. The instrument will ask for confirmation of this action since it cannot be undone once files have been erased.



If the **Delete All** command is performed in a root directory, then all files and directories will be erased except three directories: **ALARM**, **SETUP** and **SVANTEK**. These directories are always presented on a SD-disc.

7.1.5 Renaming files – Rename

The user can rename files or directories. To do this the user should select the desired file and press the **<ENTER>** push-button. In the command list select the **Rename** command and press **<ENTER>**. The special window with editor function will be opened.

If file with the new name is already in the directory, the warning will be generated and rename command will not be performed. After pressing any key the instrument will return to the editor window.

7.1.6 Viewing information about files – Info

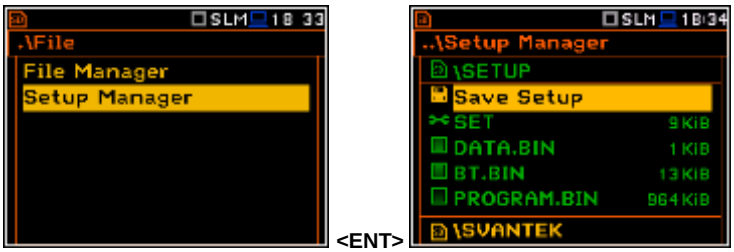
The user can view information about file. To do this the user should select the desired file and press the **<ENTER>** push-button. In the command list select the **Info** command and press **<ENTER>**. The information window will be opened.

The file Info window contains information about: date and time of file creation, file size, number of records with summary results and results saved with the logger step for three profiles.

7.2 Managing the setup files – Setup Manager

The **Setup Manager** position enables the user to save a new setup file or to load saved setup.

All Setup files are stored in the default **SETUP** directory on the SD disk.



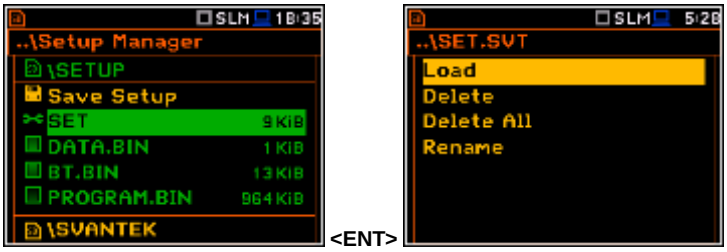
Saving the setup files

It is possible to save only current instrument's settings. To save current settings in the setup file the user should press **<ENTER>** on the **Save Setup** position and to edit the setup file name in the special window. Up to 8 characters can be used to name a setup.

Loading the setup files

To load settings saved in the setup directory the user should press **<ENTER>** on the selected file. Then the user should confirm the loading in the opened window by pressing the **<ENTER>** push-button.

After loading the setup file the instrument will be reconfigured.



Deleting the setup files

Deleting the setup files is performing the same way as deleting of files from the **File Manager** list.

8. SETTING THE HARDWARE PARAMETERS – Instrument

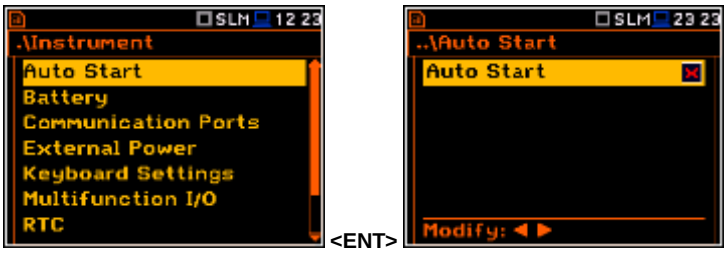
The **Instrument** list is directly related to the settings of the hardware components of the instrument. To open the **Instrument** list, the user should press the **<Menu>** push-button, select the **Instrument** position and press **<ENTER>**.

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

Auto Start	enables the user to start the measurement just after switching the instrument on;
Battery	enables the user to get information about current power source;
Communication Ports	enables the user to select the active port of the instrument;
External Power	enables the user to select the minimum voltage of the external source, when the instrument should be switched off automatically;
IEPE Current	enables the user to choose the correct IEPE current supply for vibration transducers. This position is active in the **Vibration Meter** mode;
Keyboard Settings	enables the user to set the operating mode of the **<Shift>** and the **<Start/Stop>** push-buttons;
Multifunction I/O	enables the user to select the available functionality of the I/O port;
RTC	enables the user to set the Real-Time Clock;
Wireless Transfer	enables the user to select the network type and set the parameters of the data transmission;
Unit Label	enables the user to check information about the type of the instrument, its serial number, the current software versions installed and the standards, the instrument fulfils.

8.1. Measurement auto start - Auto Start

The **Auto Start** position enables the user to start the measurement just after the switching the instrument on without pressing the **<Start>** push-button.

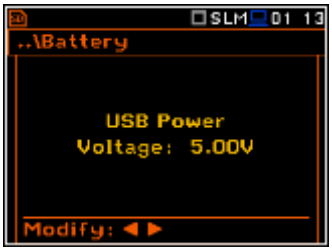


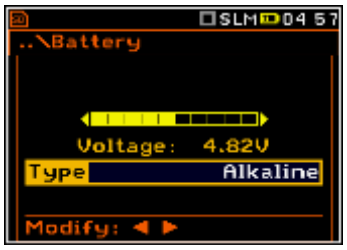
8.2. Checking the instrument powering – Battery

The **Battery** position enables the user to check the power source of the instrument: internal battery condition, source and voltage of the external power supply; and, to set the battery type for checking their condition. The instrument can be powered from an external DC power supply, from the external battery pack, from internal four AA rechargeable or standard alkaline batteries or from the USB interface when its USB Device socket is connected via the SC 16 cable to a PC or other USB power.

The view presented on the display for each of three kinds of possible power sources is different. The current battery voltage is displayed together with its approximate state (in graphical format).

When the instrument is powered from a set of internal batteries the user should select the correct battery type (**Alkaline** and **Rechargeable**). It is essential for the right detection of the capacity of the battery pack.





8.3. Setting the interface parameters - Communication Ports

The **Communication Ports** position enables the user to select active communication ports (**GPS** and/or **Serial Port**) and programme them.

As a serial port the user may select **RS232** or **Bluetooth**.

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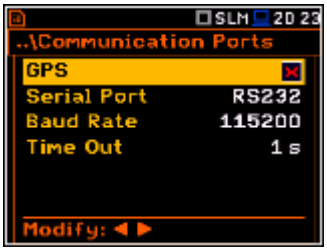
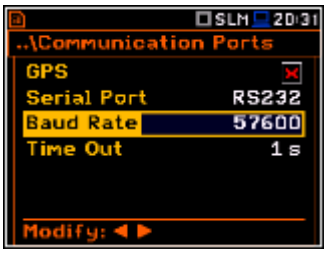


For the **RS232** serial port, two parameters should be defined: transmission speed (**Baud Rate**) and the time limit during which the communication operation should be performed (**Time Out**).



Setting the transmission speed of the serial interface

The RS 232 interface transmission (**Baud Rate**) speed can be selected from the following available values: **1200** (bits/second), **2400** (bits/s), **4800** (bits/s), **9600** (bits/s), **19200** (bits/s), **38000** (bits/s), **57600** (bits/s) or **115200** (bits/s). The selection is made by means of the ◄ or ► push-buttons. The setting here should be the same as the connected instrument or computer to ensure successful data transfer.

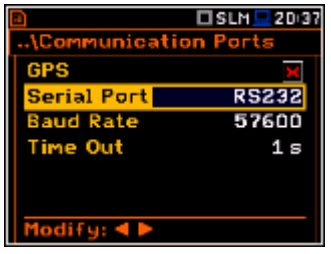
The other RS 232 transmission parameters are fixed to **8 bits for data**, **No parity** & **1 Stop bit**.

Setting time limit for the performance of serial interface operation

The default value of the parameter **Time Out** is equal to one second but this may be too short for the printers, which may not be fast enough. In such cases, the **Time Out** parameter may have to be increased to a higher value.

For the Bluetooth interface the user should key in the **Authorisation code** to pair a PC (or suitable tablet or smartphone) and the instrument.

If the **Visible** parameter is switched on, then during the searching of the Bluetooth unit by the PC, the instrument will be visible and it will be possible to pair the instrument and the PC. The instrument can communicate with the PC also with inactive **Visible** parameter.



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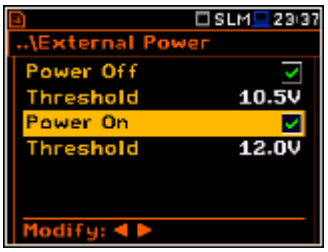
8.4. Setting the external power parameters - External Power

The **External Power** position enables the user to select the minimum voltage of the external DC power source, when the instrument should be switched off automatically (**Power Off**) or the voltage threshold to switch it on (**Power On**) when the voltage of the external DC power source exceeds this level.

<ENT>

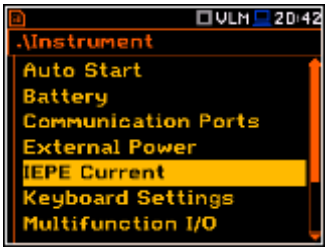
The **Threshold** parameters appear in the window as soon as **Power Off** and/or **Power On** parameters are On.

This window appears automatically after switching on the instrument when the instrument is connected to the external DC power source.

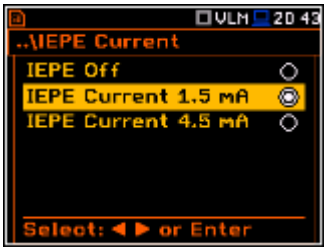


8.5. Selection of the IEPE current supply - IEPE Current

The **IEPE Current** position enables the user to choose the correct IEPE current supply: **IEPE Off** or **IEPE Current 1.5 mA** and **IEPE Current 4.5 mA**



<ENT>



8.6. Programming the keyboard – Keyboard Settings

The **Keyboard Settings** position enables the user to programme the functionality of the **<Shift>**, **<Alt>** and **<Start/Stop>** push-buttons. The default settings are **Direct** for both items shown on the display screen.

<ENT>

<Shift> / <Alt> push-button mode

In the **Shift/Alt** position the user can choose between **2nd Fun.** and **Direct**. When the **Direct** option is selected, the **<Shift>** and **<Alt>** push-buttons operate as in the keyboard of a computer – to achieve the desired result, the second push-button should be pressed at the same time with **<Shift>/<Alt>**. When the **2nd Fun.** option is selected the **<Shift>/<Alt>** push-buttons operate in sequence with the other one. This enables the user to use only one hand to operate the instrument.

<Start/Stop> push-button working mode selection

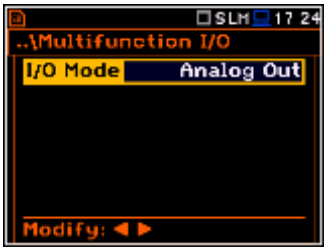
In the **Start/Stop** position the user can choose between **Direct** and **With Shift**. When the **Direct** option is selected, the instrument reacts on each of the **<Start/Stop>** push-button press, starting or stopping the measurements.

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

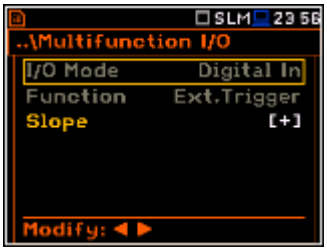
8.7. Setting parameters of the I/O port - Multifunction I/O

The **Multifunction I/O** enables the user to select the available functionality of the **I/O** port (3.5 mm jack socket).

<ENT>



Note: *If the **RPM** function is switched on (path: <Menu> / Measurement / RPM Measurement) the **Multifunction I/O** is set automatically on **Digital In** mode and with **Ext.Trigger** function.*

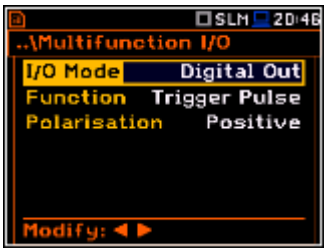


The **I/O** jack socket can be used as:

- the output of the analogue signal (**Analog Out**) transmitted from the input of the instrument to its output without any digital processing (i.e. frequency filtering),
- the input of the digital signal used as an external trigger to start the measurements (**Digital In**). The instrument is acting in this case as so called “slave instrument”,
- the digital output (**Digital Out**) used for triggering other “slave instrument(s)” (the instrument is acting in this case as a “master instrument”), or as a source of any alarm signal in case of certain circumstances occurred during the measurements (i.e. the level of the input signal was higher than a user selected trigger alarm setting).

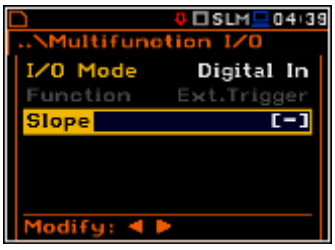
The more detailed description of the **I/O** socket is given in App. C.

►

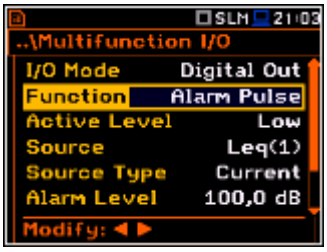


Slope parameter for the Digital In mode (Ext.Trigger function)

In case of **Digital In** the signal appeared on the **I/O** socket will be be treated as the external trigger if **External** is chosen as a trigger (*path: <Menu> / Measurement / Measurement Trigger / Trigger: External*). For the **Digital In** mode only the **Ext.Trigger** value is available for the parameter **Function**. It is possible to set up **Slope** as positive **[+]** or negative **[-]** by means of the ◄ or ► push-buttons.

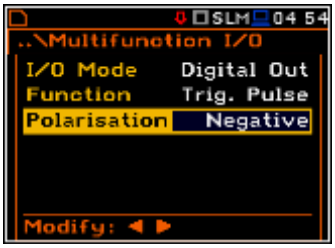


Digital output function of the I/O socket



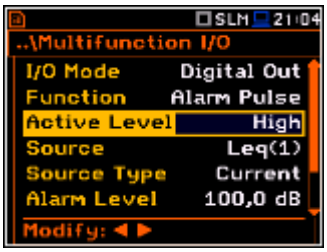
The **Function** position enables the user to set the function of the digital output of the **I/O** instrument's socket. The socket can be used as the source of the trigger pulse (**Trigger Pulse**) which starts the measurement in another "slave instrument" linked to the "master instrument" or the alarm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

Polarisation of the digital output signal



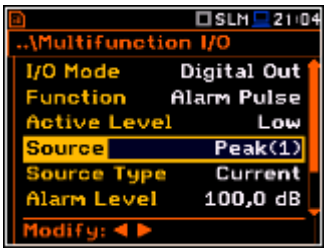
The **Polarisation** position enables the user to select which polarisation of the signal (negative or positive) will be applied to the output trigger pulse.

Active level for the alarm pulse generation



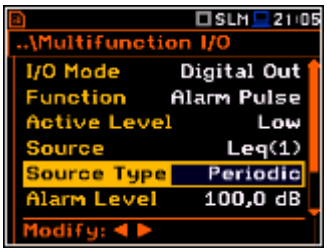
The **Active Level** position enables the user to select which level of the signal should be treated as a valid one ("negative" or "positive" logic): **Low** or **High**.

Source signal for the alarm pulse generation



The **Source** position enables the user to select the level of which measurement result should be checked. If the measured result level is greater than selected alarm level (**Alarm Level**), the instrument will generate alarm signal on the **I/O** socket. The measurement results from the first profile: **Peak(1)**, **Spl(1)**, **Max(1)** or **Leq(1)** can be used for the purpose described above.

Alarm source type

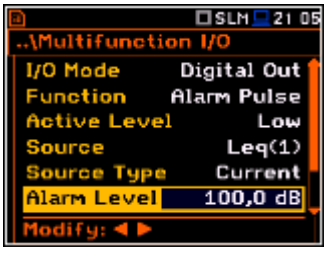


The **Source Type** position enables the user to select the type of alarm source). Available types are: **Current** and **Periodic**.

In case of **Current**, the alarm pulse will be generated all time when the instantaneous result of the function selected in the **Source** position (measured with 1 second step) is over the **Alarm Level** value.

In case of **Periodic**, the alarm pulse will be generated all time when the result of the function selected in the **Source** position and measured with the integration period step, is over the **Alarm Level** value.

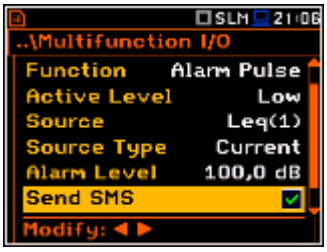
Alarm level



The **Alarm Level** position enables the user to set the level of the result to be monitored during the measurements. If the result is greater than the alarm level, the instrument will generate the alarm signal in the selected logic. The available levels are within the range [30.0 dB, 140 dB] in Sound mode and [60.0 dB, 180 dB] in Vibration mode.

SMS message in case of alarm

When the alarm is generated during the measurement it is possible to send an SMS message to the phone number, defined in the **SMS Option** window (*path: <Menu> / Instrument / Wireless Transfer / SMS Options).*



E-mail message in case of alarm

When the alarm is generated during the measurement it is possible to send an E-mail message to the address, defined in the **E-mail Settings** window (*path: <Menu> / Instrument / Wireless Transfer / E-mail Settings).*

Note: *SMS and e-mails can be send in case the instrument is working with the modem (for example, as a part of SVANTEK monitoring stations)*

8.8. Setting the instrument's internal Real Time Clock – RTC

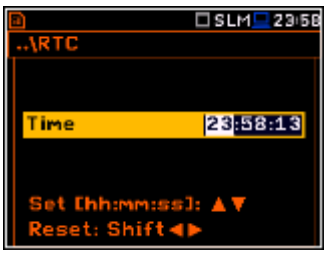
The **RTC** position enables the user to programme the internal **Real Time Clock**. This clock is displayed in the different places of the display depending on the selected view mode.

<ENT>

Note: *In this window the user may change time zone and time in the limited range. This range increases by six seconds each day from the date of the RTC correction by service. For example, after 7 days, the user can adjust the clock by +/- 42 seconds, and after a year by +/- 36.5 minutes. Date and time changes without limitation can be perforemed only by authorised user in the* ***Welmec*** *menu (path: <Menu> / Welmec / Service / RTC). In other case the instrument informs the user about acceptable time range.*

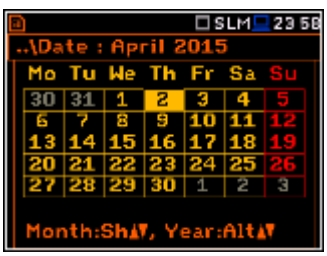
The required **Time** (hour, minute and second) can be selected in a special window, which is opened by means of the ◄ or ► push-buttons.

To set hours, minutes or seconds the user should enter the correct field position by pressing the ◄ or ► push button and then select the correct value by means of the ▲ or ▼ push-buttons. To set the chosen value the user should press the **<ENTER>** push-button.



The required **Date** can be selected in a special window, which is opened after pressing the ◄ or ► push-buttons when the **Date** text is displayed inversely in the **Timer** sub-list.

To set the correct date, the user should select its position by means of the ◄ or ► and ▲ or ▼ push button and then press **<ENTER>** to set the chosen value.

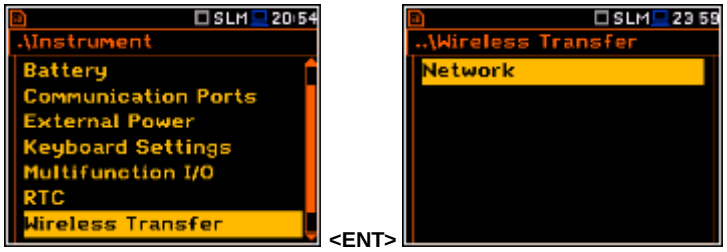


Time Zone can be selected in a special window, which is opened by means of the ◄ or ► push-buttons.

8.9. Setting the remote communication - Wireless Transfer

SVAN 977W instrument is not equipped with the modem and itself cannot assure data transfer via GPRS network. However, it can control data transfer via external modem that supports GPRS connection with the help of **Wireless Transfer** functionality. The connection with the external modem is carried out via USB port.

The **Wireless Transfer** position enables the user to select the network type and set the parameters of the data transmission.



8.9.1. Selection of the network type – Network

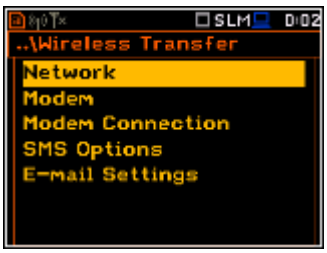
It is possible to select one of two options: **Off** and **GPRS**.

Depending on the settings in the **Network** list the **Wireless Transfer** screen has different sets of positions.

If the **Off** parameter was selected the **Network** window has only one position - **Network**.

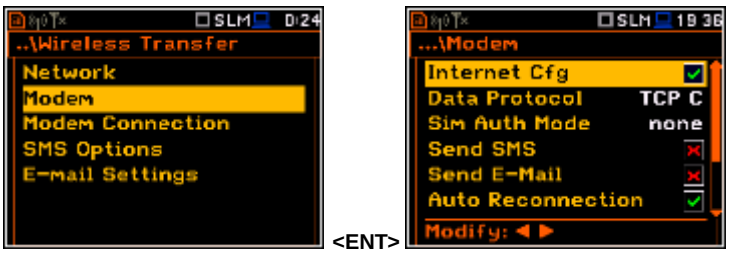
If the **GPRS** network was selected the **Wireless Transfer** window will have six positions: **Network**, **Modem**, **Modem Connection**, **SMS Options** and **E-mail Settings**.

Communication between modem and SVAN instruments is described in Appendix J.

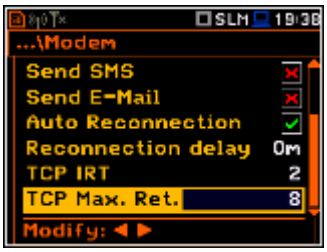


8.9.2. Configuration of modem basic settings – Modem

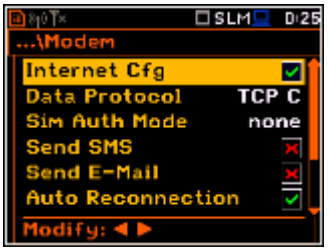
The **Modem** position enables the user to configure modem basic settings, such as modem type and connection types.



Note: *For connection with* ***SvanNET*** *server the positions in the* ***Modem*** *list should be set on default values as is shown on the screen-shots abowe and right-side.*

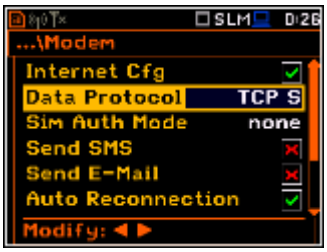


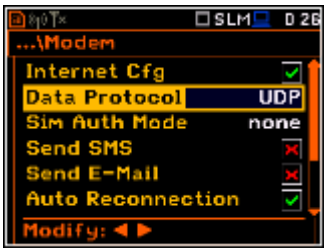
The **Modem** window contains the following options:



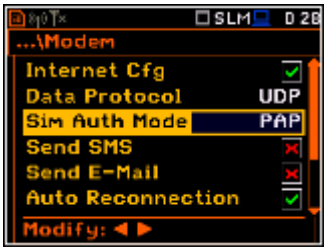
- **Internet Cfg** – selecting this option ensures that the device is set to automatically configure the modem. When the device is turned off with this option set, it will attempt to configure the modem after the next turn on. More about this option is written in Appendix J (Configuration and Registration).

- **Data Protocol** – defines connection type for data exchange. Available types are **TCP S** (server mode), **TCP C** (client mode) and **UDP**.

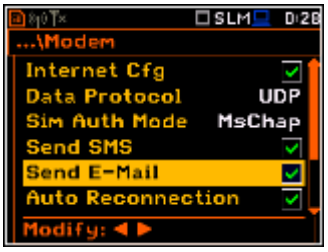




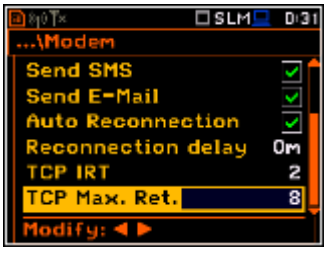
- **Sim Auth Mode** – defines the method of user verification by the SIM card. Depending on the SIM card, several options are possible, some of them are recognized by the modem:
  - **none** – no verification required.
  - **PAP**
  - **CHAP**
  - **MsChap** – denotes MsChap in version 1.



- **Send SMS** – selecting this option will configure SMS service by the modem.
- **Send E-Mail** – selecting this option will configure e-mail service by the modem.

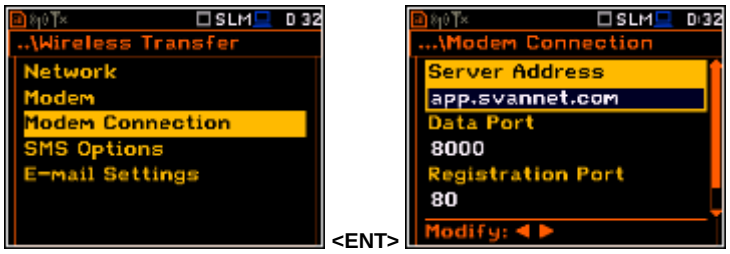


- **Auto Reconnection** – selecting this option will make the device attempt to reconnect the modem in case of errors or sudden disconnection. More about this option is written in Appendix J (Error handling).
- **Reconnection Delay** – time between each reconnection attempt.
- **TCP IRT** - initial timeout for TCP connections. In some cases, extending this timeout may be helpful in case of slow connections, but the default setting is recommended.
- **TCP Max. Ret.** - maximum reconnection attempts performed within a simple connection cycle. In some cases, setting higher value may be helpful in case of slow connections, but the default setting is recommended.



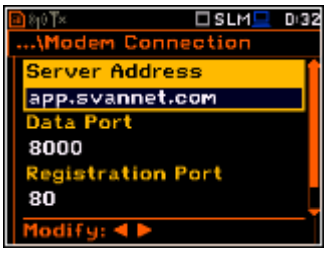
8.9.3. Setting of support modem options - Modem Connection

The **Modem Connection** position enables the user to configure several supporting options required by 3G modem to establish internet connection. More about this option is written in Appendix J (Configuration and Registration).

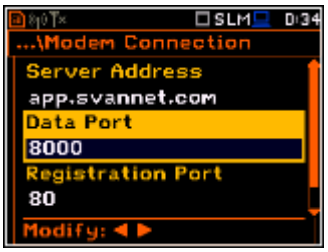


Note: *For connection with* ***SvanNET*** *server the positions in the* ***Modem*** *list should be set on default values as is shown on the screen-shots abowe and below.*

The **Modem Connection** window contains the following positions:

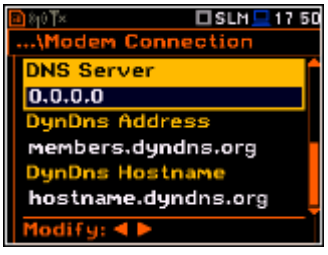


- **Server Address** – allows the user to enter up to 32 characters of either IP or domain address, where the registration data will be sent during the registration process (**Data Protocol: TCP S** or **UDP**) or to which the modem will connect to (**Data Protocol: TCP C)**. By default, the server address is **app.svannet.com** and all other settings, presented in this chapter, are default settings, which enabled the connection with the SvanNET server.



- **Data Port** – allows the user to enter up to 5 characters for the port number. This number denotes a port on which a communication socket will be configured for data exchange between remote host and the station.
- **Registration Port** – allows the user to enter up to 5 characters for the port number. This number denotes a port on which a communication socket will be configured to transmit registration packet (Register Mode: On) or exchange Http data (Register Register Mode: AS or SMT. AS).

- **APN** – allows the user to enter up to 20 characters of APN name of the SIM card used with the modem.
- **APN User** – allows the user to enter up to 20 characters of user name used for verification by the SIM card used with the modem. **APN Password** – allows entering up to 20 characters of password used for verification by the SIM card used with the modem.



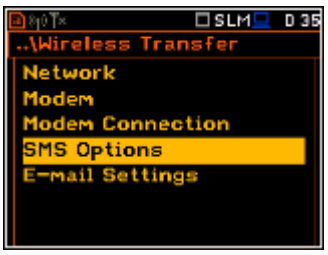
- **DNS Server** – allows the user to enter up to 15 characters of IP address of DNS server used for establishing connection with the internet. In most cases, leaving the default value of “0.0.0.0” will be sufficient, but some SIM cards may require a specific address to be entered.

- **DynDns Address**, **DynDns Hostname**, **DynDns Login** and **DynDns Password** - allow the user to define the server and login information when using DynDNS service in case of dynamic IP address.

Editing each position is performed in the special window with the text editor function, which is opened after pressing the ◄ or ► push-buttons.

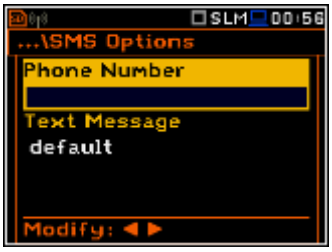
8.9.4. Configuration of SMS service - SMS Option

The **SMS Options** position allows the user to configure SMS service used for alarm notification. For more information about alarm notification see Appendix J (Alarm notification).



The **SMS Options** window contains the following positions:

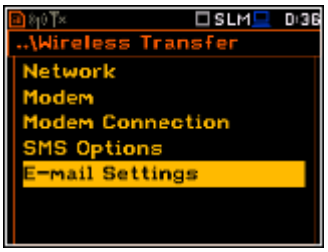
- **Phone Number** – allows the user to enter up to 20 characters of the phone number where the text messages will be sent.
- **Text Message** – allows the user to enter up to 20 characters of additional text, which will be appended into a standard alarm message template.



Editing each position is performing in the special window with the text editor function, which is opened after pressing the ◄ or ► push-buttons.

8.9.5. Configuration of e-mail service - E-mail Settings

The **E-mail Settings** position allows the user to configure the e-mail service used for alarm notification. For more information about alarm notification see Appendix J (Alarm notification).

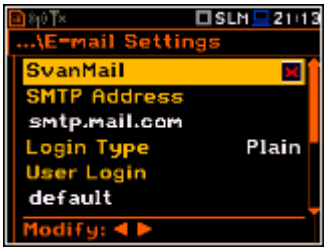


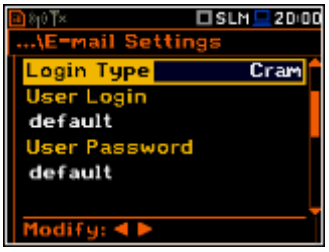
The **E-mail Settings** window contains the following positions:

If **SvanMail** position is switched on the user should define only positions: **Recipient e-mail**, **E-mail Subject** and **E-mail Message**. The **SvanMail** option allows SvanNET compatible instruments to send e-mails without additional parameters, simplifying the process of configuring alarm notifications.

If **SvanMail** position is switched off the user should define additional up to five positions:

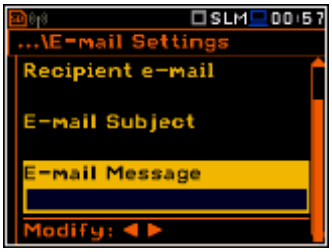
- **SMTP Address** – allows the user to enter up to 32 characters of SMTP server address which will be used to send e-mail messages.
- **Login Type** – **None**, **Login**, **Plain** and **Cram**. These options define authentication method, which is dependent on SMTP server used for sending e-mails. In most cases, **Plain** value is used.
- **User Login** – allows the user to enter up to 20 characters of user login text used to establish verified connection with SMTP server.
- **User Password** – allows the user to enter up to 20 characters of user password text used to establish verified connection with SMPT server.



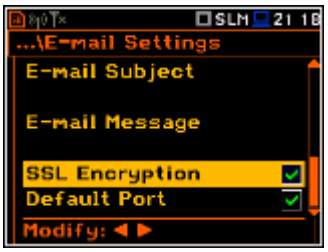


If **Login Type** is **None** no **User Login** and **User Password** positions appear. It should be used when SMTP server requires no authentication.

- **Sender e-mail** – allows the user to enter up to 48 characters of e-mail address from which the e-mail message will be sent.



- **Recipient e-mail** – allows the user to enter up to 48 characters of e-mail address to which the e-mail message will be sent.
- **E-mail Subject** – allows the user to enter up to 20 characters of the message's subject.
- **E-mail Message** – allows the user to enter up to 20 characters of additional text which will be appended to standard e-mail message template used for alarm notification.



- **SSL Encryption** – when switched on means that the device will attempt to configure the modem to connecting to the mail server used the encryption protocol SSL.
- **Default Port** - when switched on means that the device will try to communicate with the mail server on the default port (25 for normal calls, 465 with SSL).

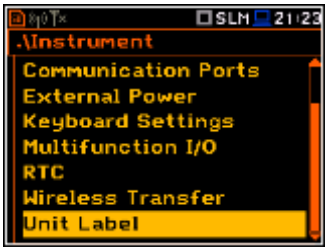
Disabling of **Default Port** will initiate the **Port** position, where the user will be able to set its own port.

Editing each position is performing in the special window with the text editor function, which is opened after pressing the ◄ or ► push-buttons.

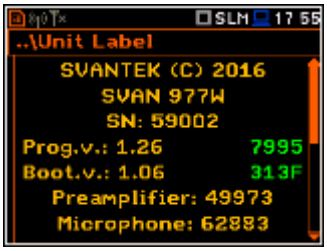
8.10. Checking of the instrument specification - Unit Label

The **Unit Label** position enables the user to check information about the instrument type, its serial number, the current software version installed and the relevant standards, which the instrument fulfils.

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



<ENT>



According to the Welmec requirements the **Sound Meter** should have approved by the notified body firmware with specific serial number and CRC as well as serial numbers of preamplifier and microphone.

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

9. SETTING THE AUXILIARY PARAMETRS – Auxiliary Setup

The **Auxiliary Setup** list provides the user with additional features that allow, for instance, customize the interface device to a specific user and are not directly related to the hardware components of the instrument. To open the **Auxiliary Setup** list, the user should press the **<Menu>** push-button, select the **Auxiliary Setup** text and press **<ENTER>**.

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

Language enables the user to select the language of the user interface.

Factory Settings enables the user to return to the default, factory settings.

Reference Levels enables the user to select the reference level for the Vibration measurements and it informs the user about the reference level in the Sound measurements.

Vibration Units enables the user to select the Vibration units in which the results of the measurements are to be viewed. This position appears only in Vibration modes.

Warnings enables the user to switch the warnings on or off that can be displayed during the normal operation of the instrument.

9.1. Setting language of the user interface – Language

The **Language** sub-list enables the user to select the language of the user interface.

If after turn on the instrument an unknown language interface appears on the display the user can reset the instrument by means of the four <**Shift/Enter/Alt/Start>** push-buttons pressed together. After this, the instrument will come back to the default setup with the English interface.

9.2. Restoring the factory settings – Factory Settings

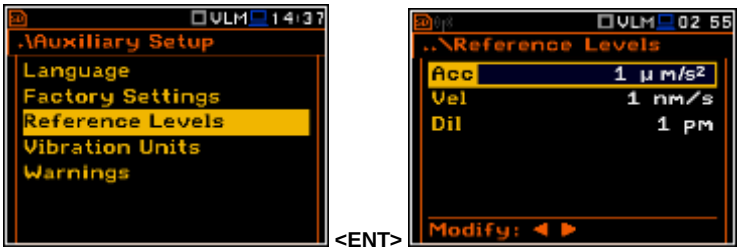
The **Factory Settings** sub-list enables the user to restore the default settings of the instrument.

Select **Yes** in the **Factory Settings** window and press **<ENTER>**. After restoration process the instrument will inform the user that "**Settings restored**".

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

9.3. Setting the reference levels - Reference Levels

The **Reference Levels** sub-list enables the user to set the reference levels of the vibration signal for acceleration (**Acc**), velocity (**Vel**) and displacement (**Dil**). In case of sound measurements - to inform the user about the used reference level. The selected values will be considered during the calculations of the measurement results expressed in the Logarithmic scale (dB).



Reference levels for vibration measurements

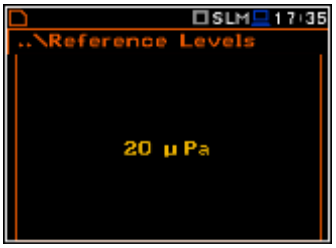
In the **Acc** position the user can set the reference level of the acceleration signal in the range from 1 μms^{-2} to 100 μms^{-2}.

In the **Vel** position the user can set the reference level of the velocity signal in the range from 1 nms^{-1} to 100 nms^{-1}.

In the **Dil** position the user can set the reference level of the displacement signal in the range from 1 pm to 100 pm.

Reference level for sound measurements

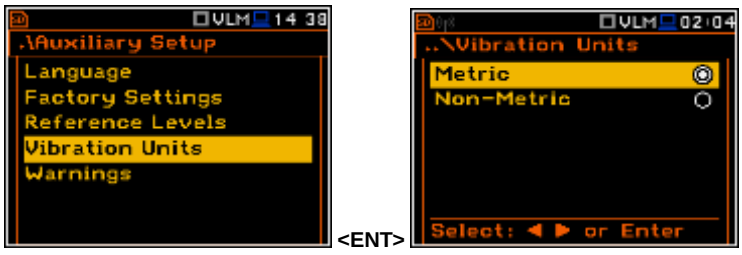
In case of sound measurements, the **Reference Levels** sub-lists is used to inform only the user that the reference level of the acoustic signal is equal to **20 µPa**. After pressing the **<ESC>** or **<ENTER>** push-buttons the sub-list is closed.



9.4. Selection of the units for vibration results - Vibration Units

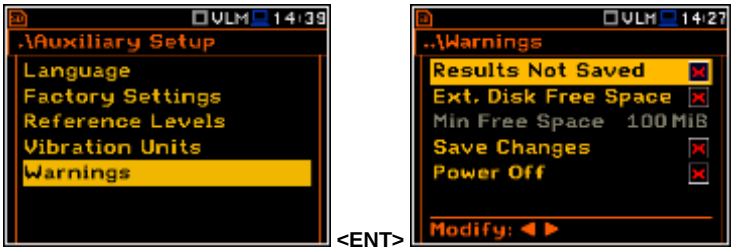
The **Vibration Units** sub-list enables the user to select the units for the Vibration measurements (this position is available only in Vibration modes).

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

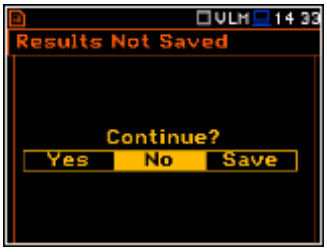


9.5. Warnings setup – Warnings

The **Warnings** sub-list enables the user to activate the messages, which will be displayed during the normal operation of the instrument.



Saving the measurement results in a file



When the **Results Not Saved** position is On, a special warning will be displayed after pressing the **<Start/Stop>** push-button in a case when the results of the previous measurement were not saved.

The should select one of three answers to the question **Continue?**: **Yes**, **No** or **Save**. If **Yes** is chosen, the instrument returns to the active mode of result presentation and starts the new measurement process. If **No** is chosen, the instrument returns to the active mode of measurement result's presentation without starting the new measurement process. If **Save** option is chosen, then the measurement results are saved.

Checking free space on the external disk

The **Ext. Disk Free Space** position switches on or off the verification of free space on the external memory and generates the warning when the space is lower than **Min Free Space**.

The selected limit should be within the range [1 MB, 1024 MB].

Confirmation of parameters changes

If the **Save Changes** position is On, the instrument displays the warning message in case some parameters were changed, but the window with parameter list was exit by means of the **<ESC>** push-button.

Confirmation of the instrument turn off

If the **Power Off** position is On, the instrument displays the warning message in case the user is switching the instrument off.

10. WELMEC SETTINGS – Welmec

The **Welmec** list contains positions directly related with the WELMEC requirements for built-for-purpose measuring instrument (type P) for acoustic measurements. This position is active in the **Sound Meter** mode. To open the **Welmec** list the user should press the **<Menu>** push-button, select the **Welmec** text and press **<ENTER>**.

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

Data Logger enables the user to view information, registered in the Welmec internal unit memory, about performed measurements.

Event Logger enables the user to view information about the event records, connected with the instrument calibration, programme update and service works and registered in the Welmec internal unit memory.

Data Dump enables the user to perform the dump of memory allocated to the measurement records (**Data Logger**). The memory dump is saved as a file on the SD-card.

Program Dump enables the user to perform the dump of internal unit memory allocated to the firmware. The memory dump is saved in two files on the SD-card.

Status enables the user to view information about the registered in the Welmec memory status.

Service enables the authorised user to modify Welmec related parameters.

Note: *The WELMEC memory consists of two independent parts: for data storage with a capacity of 1024000 records and for event storage with a capacity of 32768 records. Each memory has its own record format, which is described in the Appendix W.*

10.1. Viewing data records – Data Logger

The **Data Logger** sub-list enables the user to view the measurement data records saved in the Welmec allocated memory.

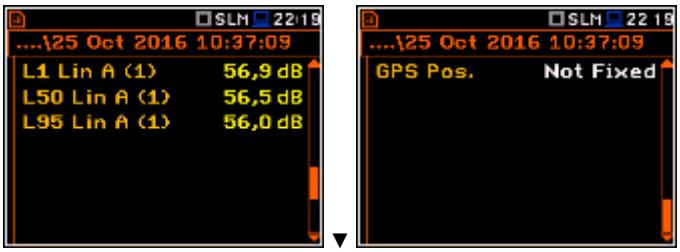
The **Data Logger** list contains positions which enable the user to view all data records (**All Records**), to find the required record by its specific number (**Find Record By ID**), to find required record by the date of its creation (**Find Record By Date**) or to clear all records older than 2 years (**Clear Records**).

10.1.1. Viewing all data records – All Records

The **All Records** position opens the list of all records made for all registered sound measurements.

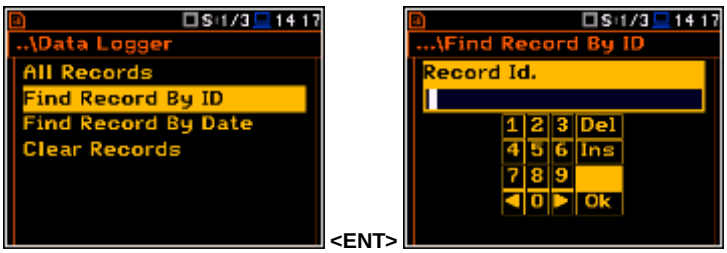
The record includes: record Id number, record CRC, time zone, preamplifier and microphone serial numbers, measurement function, compensation filter, range, measurement and pause times, main results. The main results structure depends on the settings in the **Profiles** list.

three statistic results for 1st profile (L1 Lin A, L50 Lin A and L95 Lin A), spectrum (if measured) and GPS position,



10.1.2. Selecting data records by ID – Find Records by ID

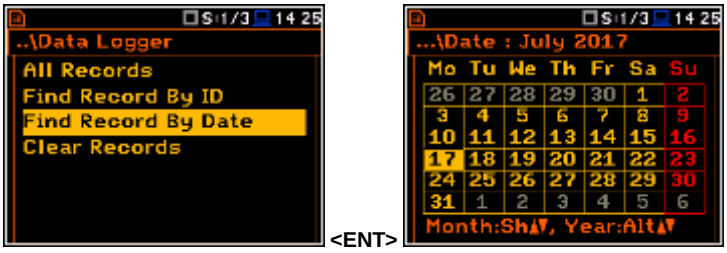
The **Find Record By ID** position opens the window where the user can select with the use of ◄ or ► and ▲ or ▼ push-buttons the required record ID number.



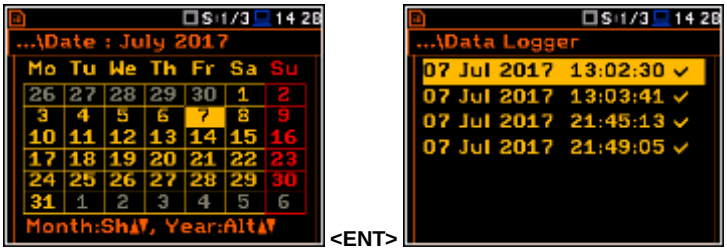
After selection of the ID number and pressing **<Ok>**, the appropriate record is displayed.

10.1.3. Selecting data records by date – Find Records by Date

The **Find Record By Date** position opens the window where the user can select with the use of ◄ or ► and ▲ or ▼ push-buttons the required record creation date.

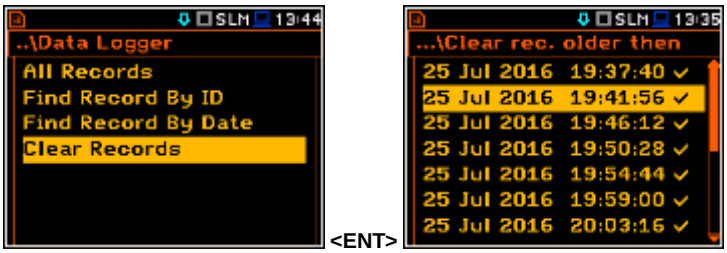


After selection of the date and pressing **<ENTER>**, the list of all records made on this date is displayed.

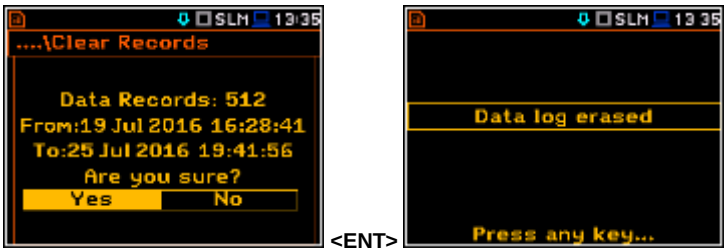


10.1.4. Clearing all data records older than 2 years – Clear Records

The **Clear Records** position enables the user to delete all records with the creation date older than 2 years from the date of the selected record.



Once date selected, a dialogue box appears asking the user to confirm the operation at the same time informing how many records will be deleted and with what range of time. When records are erased the message about successful deleting appears.



10.2. Viewing event records – Event Logger

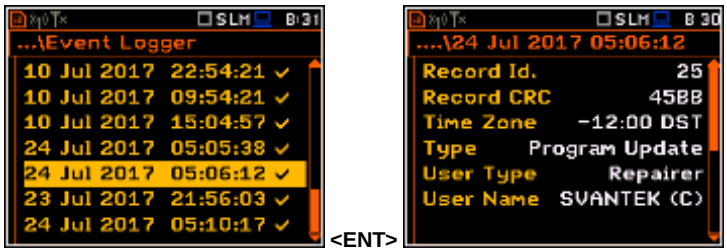
The **Event Logger** sub-list enables the user to view the records of events connected with the instrument calibration, programme update and service works and saved in the Welmec allocated memory.

The **Event Logger** list contains positions enable the user to view all records (**All Records**), to filter records (Filter Records), to find the required record by its identificatory number (**Find Record By ID**) or to find required record by the date of its creation (**Find Record By Date**).

10.2.1. Viewing all event records – All Records

The **All Records** position opens the list of all event records.

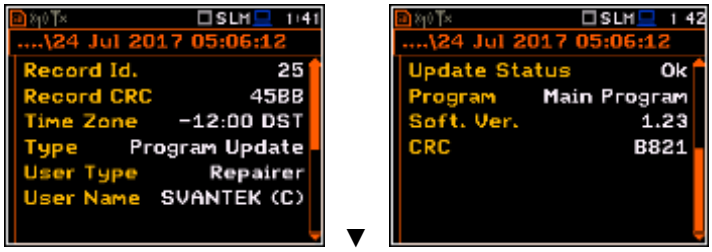
The record includes: record Id number, record CRC, time zone, event type, user type and name that created that event and depending of the event type the description of what has been changed.



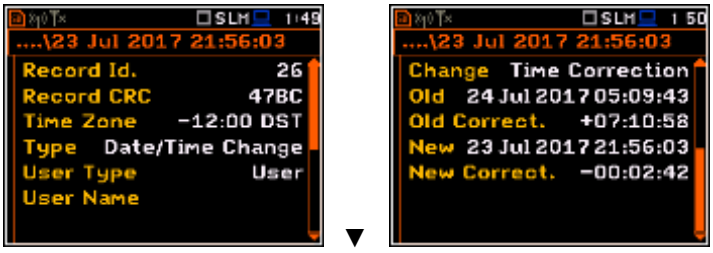
The first page of the record consists of six positions: number of the record (**Record Id.**), it's CRC (**Record CRC**), used time zone (**Time Zone**), type of the event (**Type**: **Program Update**, **Date/Time Change**, **Parameter Change**, **Software Dump**, **State of Seal**, **Hardware Error** and **Repair**), type of the user (**User Type**: **User**, **Verificator** or **Repair**) and name of the user (**User Name**).

The second page content depends of the event type. There is one exception, for **Software Dump** there is no second page.

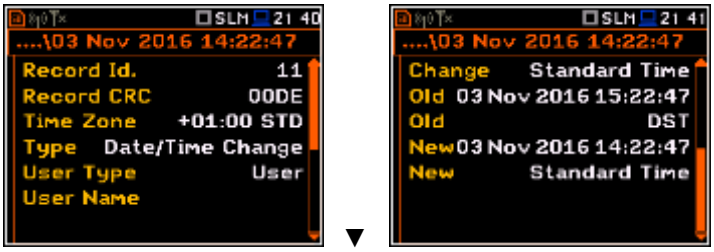
In case of **Program Update** the second page consists of four positions, which describe the status of program update, the program to be updated (main or bootstrap), version of the software and CRC.



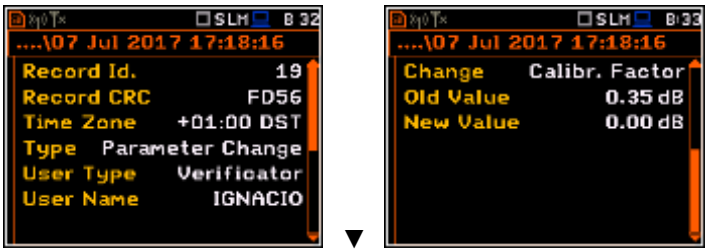
In case of **Date/Time Change** the second page consists of five positions, which describe the type of change (in this case **Time Correction**), previous time of the instrument display (**Old**), previous correction of the instrument RTC (**Old Correct.**), new time of the instrument display (**New**), new correction of the instrument RTC (**New Correct.**).



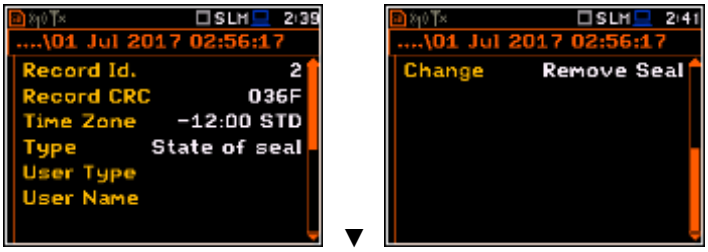
If time correction was due to change from Daylight Saving Time (**DST**) to a **Standard Time** (**STD**) the second page consists of five positions, which describe the type of change (in this case **Standard Time**), previous time of the instrument display (**Old**), previous type of time (**Old**), new time of the instrument display (**New**), new type of time (**New**).



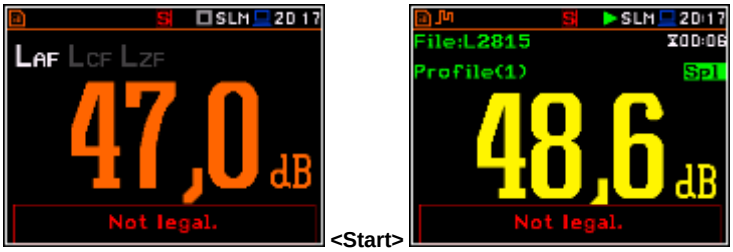
In case of **Parameter Change** the second page consists of three positions, which describe the type of change, old and new value of the parameter



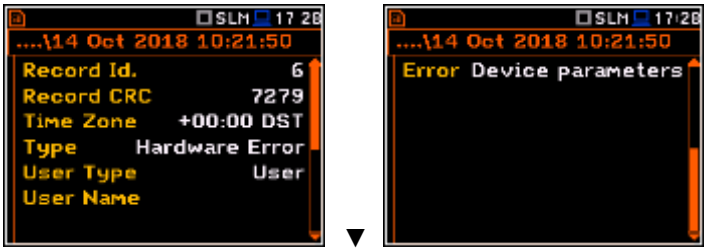
In case of **State of Seal** the second page informs what change was done: **Remove Seal** or **Install Seal**.



If seal and jumper are removed from the bottom panel of the instrument the instrument react on this with the text on every screen „**Not legal**”, meaning that measured results are not legal and measurement results will not be saved in the Welmec memory.



In case of **Hardware Error** the second page consists of one positions, which describe the type of error, for example – **Device parameters**.

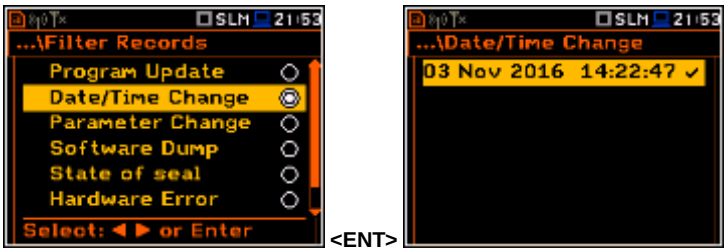


In case of **Repair** the second page consists of one positions, which describe the ID of specific repair that was performed by the service team. This ID is given according to the rules used by the service team and is not defined in the Appendix W.

10.2.2. Filtering event records – Filter Records

The **Filter Records** position enables the user to choose the filter for event records selection by types of events.

After choosing **Date/Time Change** position and pressing **<ENTER>** the list of all events of this type is displayed.



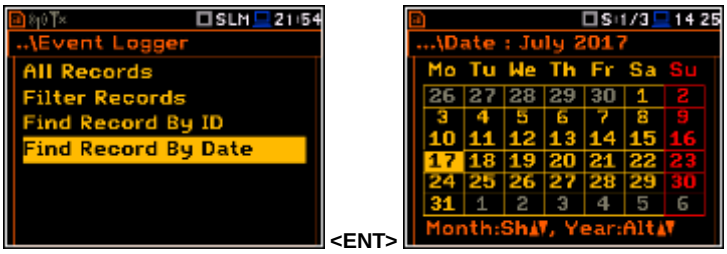
10.2.3. Selecting event records by ID – Find Records by ID

The **Find Record By ID** position opens the window where the user can select with the use of ◄ or ► and ▲ or ▼ push-buttons the required record ID number.

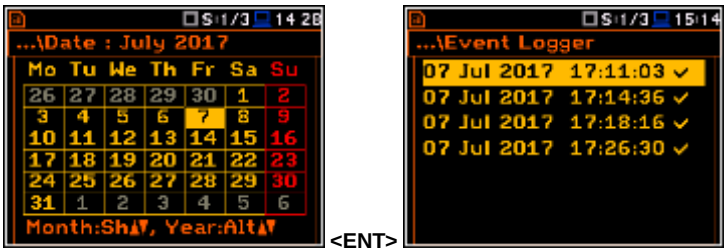
After selection of the ID number and pressing **<Ok>**, the appropriate record is displayed.

10.2.4. Selecting event records by date – Find Records by Date

The **Find Record By Date** position opens the window where the user can select with the use of ◄ or ► and ▲ or ▼ push-buttons the required record creation date.



After selecting the date and pressing **<ENTER>**, the list of all records made on this date is displayed.



10.3. Data Logger dumping – Data Dump

The **Data Dump** sub-list enables the user to perform the dump of memory allocated to the measurement records (**Data Logger**). The memory dump is saved as a file on the SD-card.

After pressing **<ENTER>** the display shows the directory tree and the user may select the directory where the file with the data records dump will be created.

During data memory dump performance, the unit informs in which file the data dump is saved.

The user may find the file with the data dump in the selected directory among other files.

10.4. Firmware memory dumping – Program Dump

The **Program Dump** sub-list enables the user to perform the dump of internal unit memory allocated to the firmware. The memory dump is saved in two files on the SD-card.

After pressing **<ENTER>** the display shows the directory tree and the user may select the directory where the file with the memory dump will be created.

After the program dump the Bootstrap and Program files names are presented on subsequent screens.

<Key>

The user may find the files with the memory dump in the selected directory among other files.

Note: *The **PROGRAM.BIN** file stored on the SD-card is not executable code and cannot be loaded back to the instrument. This coded with md5 algorithm version is used by the authorised verifiers to check the authenticity of the program installed on the device.*

10.5. Status of "welmec memory" – Status

The **Status** sub-list enables the user to view the status of the memory dedicated for the "welmec records" – data and event records number recorded and available.

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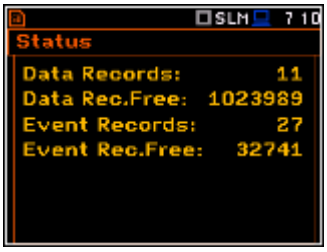
<ENT>

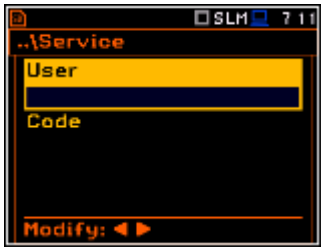


10.6. Modification of Welmec related parameters – Service

The **Service** sub-list enables the authorized users (authorised service centres) to modify Welmec related parameters and create event records.

The **Service** sub-list consists of four positions, enables the user to set the real time (**RTC**) and perform calibration (**Calibration**) without limitation, as well as input preamplifier and microphone serial numbers (**Preamplifier** and **Microphone**).

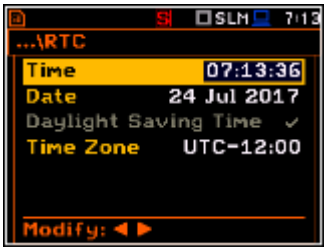
<ENT>



10.6.1. Setting the real-time clock – RTC

The **RTC** window is a copy of the one located in the menu **Instrument**. The difference is that in this place the user may change time, date and time zone without any limitations.

<ENT>



10.6.2. Instrument calibration – Calibration

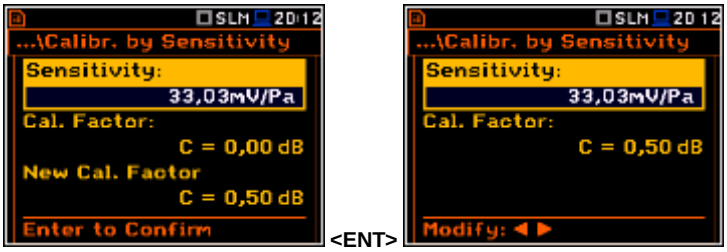
The **Calibration** sub-list enables the user to calibrate the sound measurement path. The user can calibrate with the use of information of the microphone sensitivity (**Calibr. by Sensitivity**) or by performing calibration measurement with the use of dedicated sound calibrator (**Calibr. by Measurement**).

Calibration by Sensitivity

Calibration by using the microphone's published sensitivity information can be performed in the following way:

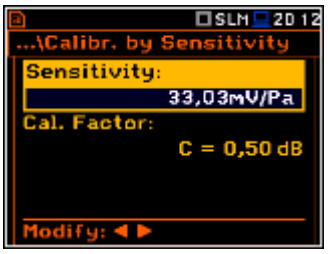
1. Select this type of calibration (highlight the **Calibr. by Sensitivity** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.

2. Set the sensitivity of the microphone taken from its calibration certificate using the **<Shift>** with ◄ or ► push-buttons and then press **<ENTER>.**



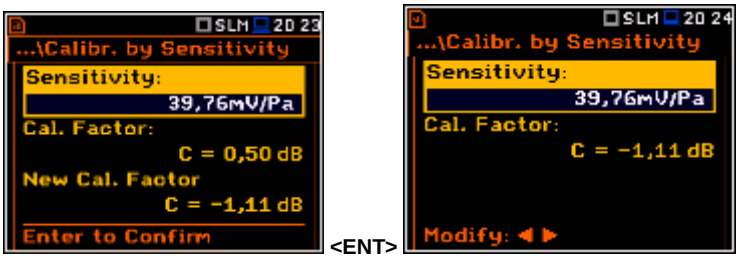
The calibration factor is calculated, after pressing the **<ENTER>** push-button, in relation to the nominal value of 35.0 mV / Pa. To avoid calculation, the user should leave the **Calibration** sub-list by pressing **<ESC>**.

For a microphone sensitivity, higher than 35.0 mV / Pa, the calibration factor will always be negative. For a microphone sensitivity, lower than 35.0 mV / Pa, the calibration factor will always be positive.



The lowest available value of the sensitivity that can be introduced is equal to 35.0 µV / Pa (it conforms to the calibration factor equal to 60.0 dB) and the highest value is equal to 35.0 V / Pa (calibration factor is equal to -60.0 dB).

Unlike the **Calibration** list in the **Function** menu where the new calibration factor differs more than ±1.1 dB from the factory one or the last changed by the authorised service will be rejected, in the **Service** part every change will be accepted.



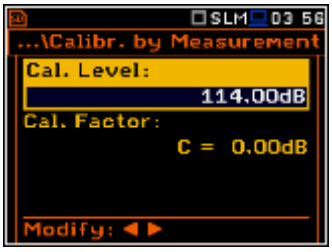
To return to the **Calibration** sub-list, the user should press the **<ESC>** push-button.

Calibration By Measurement

Calibration by measurement for the sound measurements can be done in the following way:

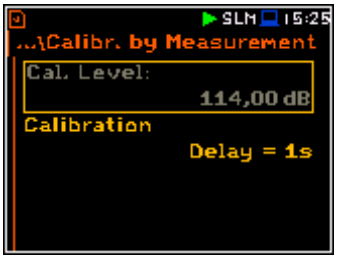
1. Select the calibration by measurement (highlight the **Calibr. by Measurement** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.
2. Attach the acoustic calibrator SV 30A (or equivalent **114 dB / 1000 Hz**) carefully over the microphone of the instrument.

Note: *It is also possible to use an electro-mechanical pistonphone, which generates a signal (ca 124 dB) or different type of acoustic calibrator dedicated for ½" microphones. In any case, before starting the calibration measurement, the user has to set the level of the signal generated by the given calibrator (**Cal. Level** position of **Calibr. by Measurement** sub-list), which is stated in the calibration certificate of the unit (the value of the **Cal. Level** set by the manufacturer of SVAN 977W is equal to 114 dB). It is also necessary to switch the instrument **Range** to the **High** level setting.*

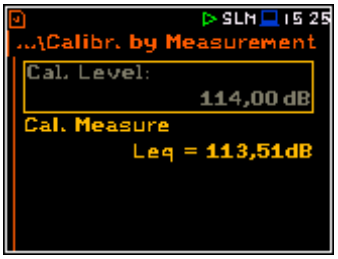


3. Switch on the calibrator and wait approximately 30 seconds for the tone to stabilise before starting the calibration measurement.
4. Start the calibration measurement by pressing the **<Start/Stop>** push-button.
5. Stop the calibration measurement by pressing the **<Start/Stop>** push-button after stabilisation of the calibration measurement result.

The calibration delay time is set to 3 seconds Waiting for the start of the measurement the **Delay** is counted down on the display. After the end of the measurement, the result is displayed in the bottom line. The measurement is running until the user presses the **<Start/Stop>** push-button.



....



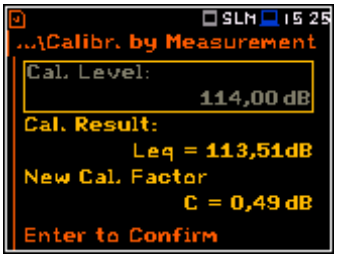
It is recommended to repeat the calibration measurement a few times to ensure the integrity of the calibration. The obtained results should be almost identical (with ±0.1 dB difference). Some possible reasons for unstable results are as follows:

- the calibrator is not properly attached to the instrument,
- there are external acoustic disturbances such as high noise levels close by,
- the calibrator or the measurement channel (the microphone, the preamplifier or the instrument itself) are damaged.

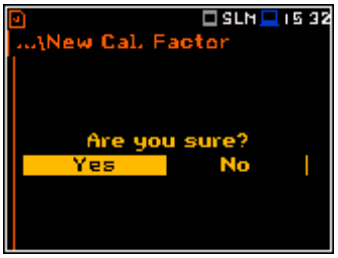
Note: *During the calibration measurement, any external disturbances (acoustic noise or vibrations) should not exceed a value of 100 dB (when using a calibrator that generates a level of 114 dB).*

6. Press the **<ENTER>** push-button to accept the calibration measurement result.

The calibration factor is calculated, stored and displayed (cf. next Figure) after pressing the **<ENTER>** push-button and confirmation (**Are you sure? Yes**).



<ENT>



Note: *The user should press the **<ESC>** push-button to quit the calibration procedure without saving the calibration factor.*

10.6.3. Setting the preamplifier serial number – Preamplifier

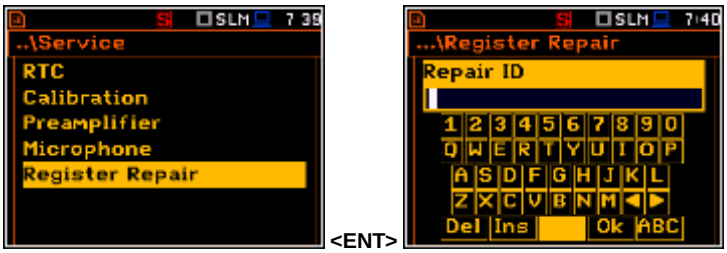
The **Preamplifier** position enables the authorised user to input the preamplifier serial number.

10.6.4. Setting the microphone serial number – Microphone

The **Microphone** position enables the authorised user to input the microphone serial number.

10.6.5. Repair registration – Register Repair

The **Register Repair** position enables the authorized service to enter special code or text identifying repairs. Text will be visible in the WELMEC event memory.



11. 1/1 AND 1/3 OCTAVE ANALYSER

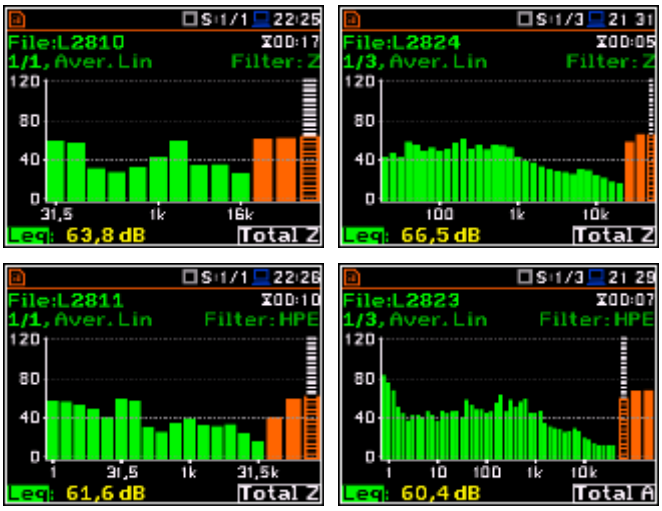
The instrument operates as a real time **1/1 Octave** or **1/3 Octave** analyser (RTA) in a very similar way to the **Level Meter**. Moreover, **1/1 Octave** or **1/3 Octave** analysis is performed in parallel with the **SLM**/ **VLM** operations. All 1/1-octave (with 10/15 centre frequencies from 16kHz down to 31.5Hz/1.0Hz; in base two system for Sound/Vibration measurements) and 1/3-octave (with 31/45 centre frequencies from 20kHz down to 20Hz/0,8Hz; in base two system for Sound/Vibration measurements) digital pass-band filters are working in real-time with the weighting filters (**Z**, **A**, **B** or **C** - in case of sound analysis; **HP** or **HPE**- in case of vibration analysis), selected in the **Spectrum** window (*path: Menu / Measurement / Spectrum / Filter*), and the linear RMS (Leq) detector. This enables the user to pre-weight a spectrum with one of the selected broadband frequency curves if required for an application such as the provision of hearing protectors in the control of high workplace noise levels.

Note: *The TOTAL RMS results are measured with the weighting filters (**A**, **C** and **Z** - in case of sound measurements; **HP**, **HP3** and **HP10** – in case of vibration measurements) regardless of what settings were selected in the profiles for Level Meter calculations**.** The spectra are always linearly averaged. Thus, the **Total** values for **1/1 Octave** or **1/3 Octave** analysis can be different from those obtained for the profiles (if the **RMS Integration** was set as **Exp**).*

The **SVAN 977W** instrument operates in two ranges, called **Low** and **High**, which can be selected in the **Range** window *(path: <Menu> / Measurement / Range)*.

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

The **1/1 Octave** and **1/3 Octave** spectra are presented for all centre frequencies of pass-band filters together with the **Total** overall values measured with preselected frequency weighting filters. The read-out of the spectrum value can be done using a vertical cursor.



11.1. Selection of the 1/1 Octave or 1/3 Octave functions

To select the **1/1 Octave** or **1/3 Octave** analysis function the user should enter the **Function** list by pressing the **<Menu>** push-button, then select the **Function** text and press **<ENTER>**. In the **Measurement Function** window select required (**1/1 Octave** or **1/3 Octave**) position and press **<ENTER>**.

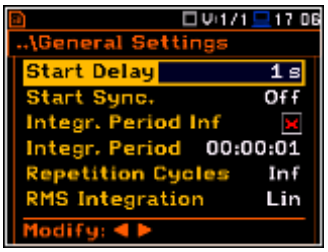
Note: *It is not possible to change the current function during a measurement. In this case the instrument displays for about 2 seconds the text: **"Measurement in Progress"**. To change the current function, the measurement must be stopped!*

11.2. Setting the 1/1 Octave or 1/3 Octave analyser

Execution of **1/1 Octave** or **1/3 Octave** analysis depends on a certain number of parameters, which can be set in the different windows of the **Measurement** list.

The **1/1 Octave** or **1/3 Octave** analysis is performed based on the parameters selected in the **General Settings** list of **Measurement** menu: **Integration Period** and **Repetition Cycles**.

The spectra are stored as main results in a results file with the same step (**Integr. Period**) as the other main results, measured by the **Level Meter** function.



The user can switch on or off the history of spectra recording in the logger file (*path: <Menu> / Measurement / Logging / Logger Results / Spectrum: ☑*). If spectra history is switched on, the spectra will be logged also with the step, defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup / Logger Step*).

For each octave or one-third octave band the RMS result is calculated and presented as a bar on the spectrum plot.

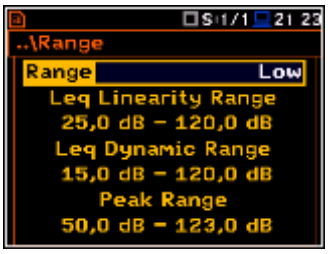
Besides the RMS results for the bands three **Total** values are measured and displayed as an additional three bars. Parameters for Total (filters) are set by default and can not be changed.

The output of the selected octave or third-octave band result can also be used to trigger an alarm, saving logger results, recording time history signal and the event.

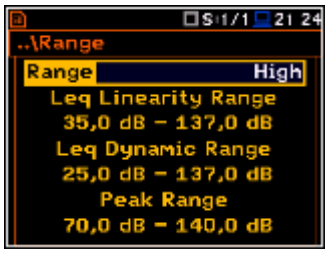
11.2.1. Setting the measurement range for 1/1 Octave and 1/3 Octave - Range

For the **1/1 Octave** or **1/3 Octave** functions the user can select the input ranges specified in Appendix C, named as **Low** and **High**.

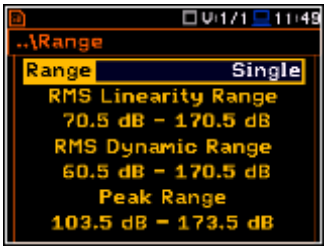
The selection of the input range is doing in the **Range** window of the **Measurement** list.



▶

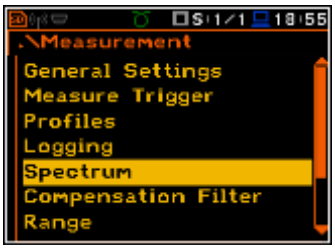


Note: *The calibration factor is always added to the range limits. For example, if calibration factor is equal to 0.5 dB, the range will be changed automatically (lower and upper limits will be increased by 0.5).*



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

For active **1/1 Octave** or **1/3 Octave** functions a context element (**Spectrum**) appears on the **Measurement** list (*path: <Menu> / Measurement / Spectrum)*. In the **Spectrum** window the user can select the band and the pre-weighting broadband frequency filter (only in case of sound measurements).



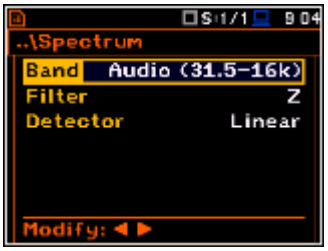
<ENT>

Selection of the band

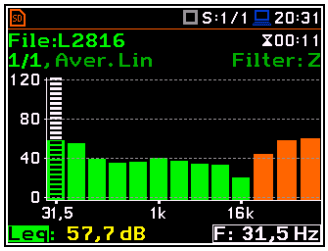
The **Band** position defines the applied band of **1/1 Octave** or **1/3 Octave** analysis.

Available bands of the sound analysis are as follows:

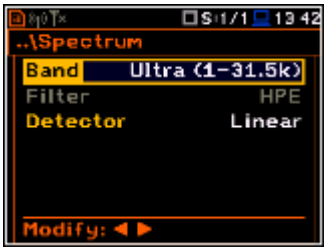
- **1/1 Octave**:
  - **Audio (31.5-16k)** - 10 filters with centre frequencies 31.5 Hz ÷16 kHz,



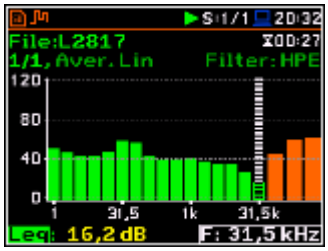
=>



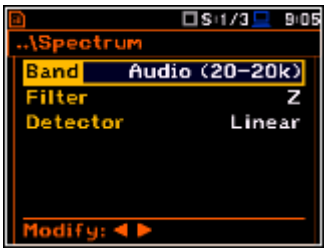
  - **Ultra (1-31.5k)** - 16 filters with centre frequencies 1 Hz ÷31.5 kHz;



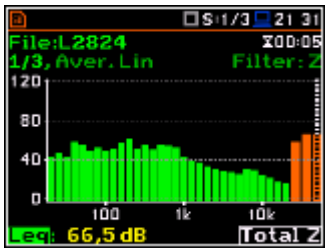
=>



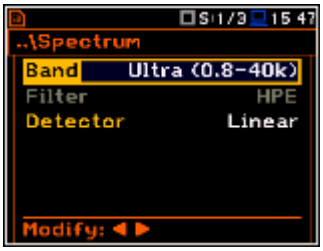
- **1/3 Octave**:
  - **Audio (20-20k)** - 31 filters with centre frequencies 20 Hz ÷20 kHz,



=>



  - **Ultra (0.8-40k)** - 48 filters with centre frequencies 0.8 Hz ÷40 kHz.



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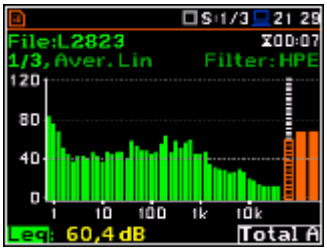
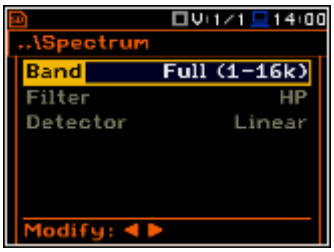
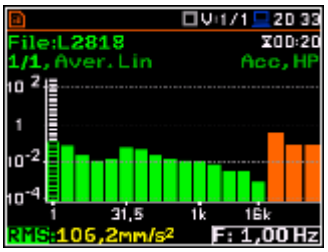


Available bands of the vibration analysis are as follows:

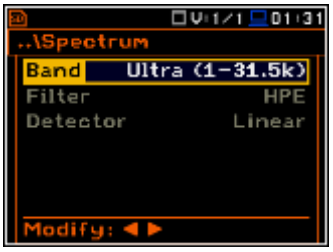
- **1/1 Octave**:
  - **Full (1-16k)** - 15 filters with centre frequencies 1 Hz ÷16 kHz,

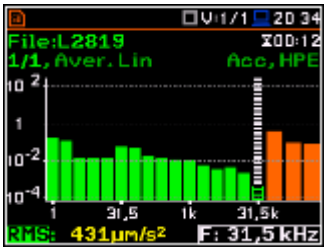


=>

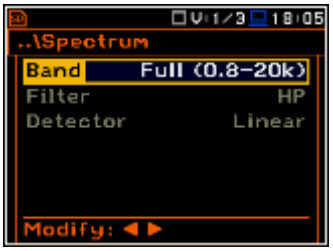


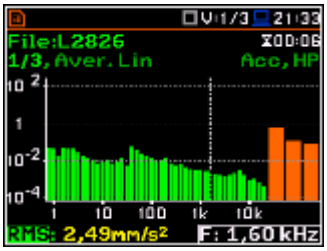
- **Ultra (1-31.5k)** - 16 filters with centre frequencies 1 Hz ÷31.5 kHz;



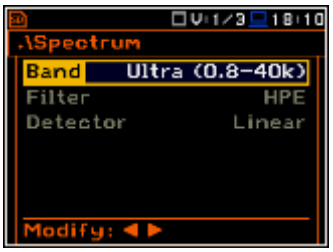
=>


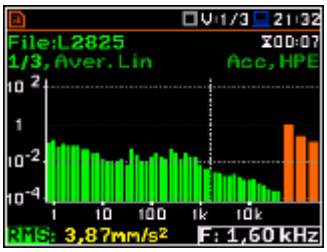
- **1/3 Octave**:
  - **Full (0.8-20k) -** 45 filters with centre frequencies 0.8 Hz ÷20 kHz,



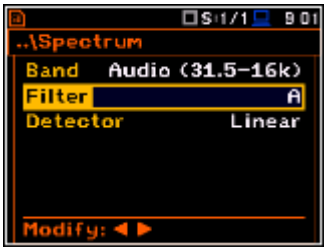
=>


  - **Ultra (0.8-40k) -** 48 filters with centre frequencies 0.8 Hz ÷20 kHz.



=>


Weighting filter selection



The following pre-weighting filters are available in **1/1 Octave** and **1/3 Octave** analysis.

For sound analysis with **Audio** band:

- **A** type 1 according to the IEC 651 and IEC 61672-1 standards,
- **C** type 1 according to the IEC 651 and IEC 61672-1 standards,
- **B** type 1 according to the IEC 651 standard,
- **Z** type 1 according to the IEC 61672-1 standard.

For vibration analysis with **Full** band:

- **HP** type 1 according to the IEC 61672-1 standard.

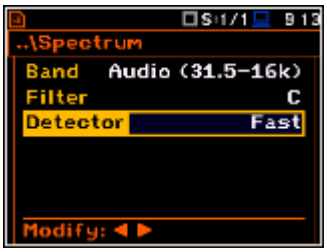
For sound and vibration analysis with **Ultra** band:

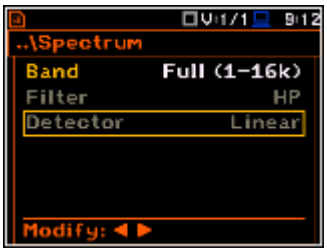
- **HPE**.

The characteristics of the filters are given in Appendix D.

Selection of the detector

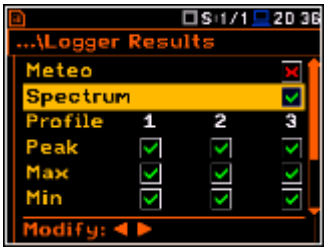
The **Detector** position enables the user to select the detector for the **1/1 Octave** - **1/12 Octave** analysis. In case of Sound measurements, it is possible to select the detector: **Linear**, **Fast** and **Slow**. For all Vibration measurements, only one **Linear** detector is available.





11.3. Saving the 1/1 or 1/3 Octave spectra as a time history – Logger Results

The **RMS** results from **1/1 Octave** or **1/1 Octave** analysis can be saved in the logger file together with the logger results and with the step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). The spectrum saving in the logger file is defined by activation the **Spectrum** position by means of the ◄ or ► push-buttons.

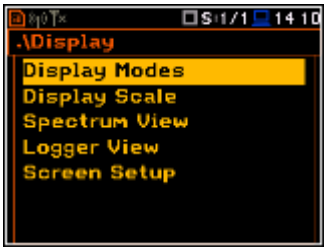


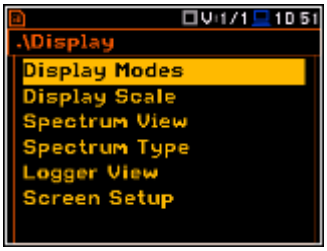
Note: *The spectra are always saved together with the summary results with integration period step.*

11.4. Setting the 1/1 Octave and 1/3 Octave spectra view

The **Display** list is used for setting the various parameters, which are mainly dedicated for the control of the spectrum view.

The following positions are used for setting the presentation of the **/1 Octave** and **1/3 Octave** results:





Display Modes enables the user to select the **Spectrum** view;

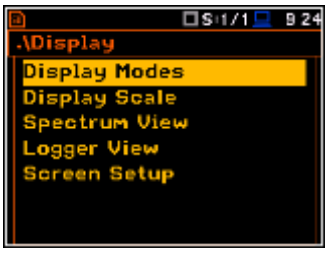
Display Scale enables the user to change the scale of the vertical and horizontal axis of the spectrum plot, switch on or off the grid and auto scale;

Spectrum View enables the user to choose the spectrum (**Average**, **Instantaneous**, **Min**, **Max**) to be viewed;

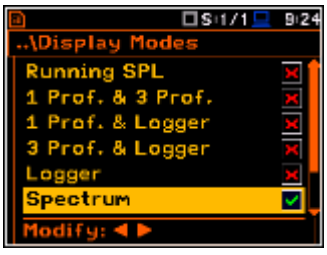
Spectrum Type enables the user to change the viewed spectrum: **Acceleration**, **Velocity** or **Displacement**.

11.3.1. Presentation of 1/1 Octave and 1/3 Octave spectra

The **Spectrum** position of the **Display Modes** list becomes available for the **1/1 Octave** and **1/3 Octave** functions and enables the user to switch on or off the spectrum view.

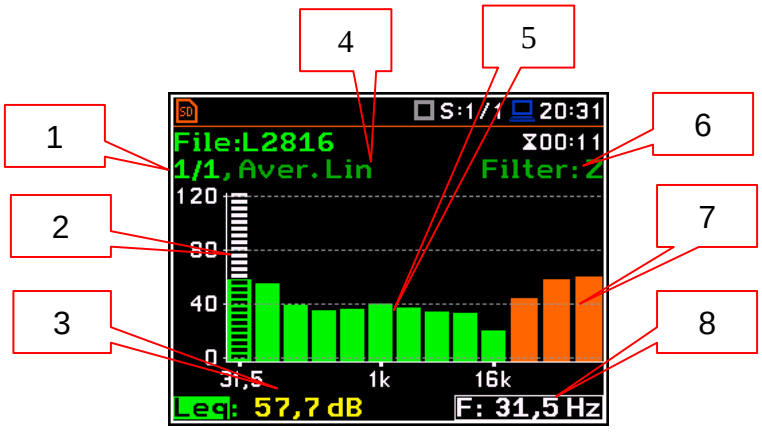


<ENT>

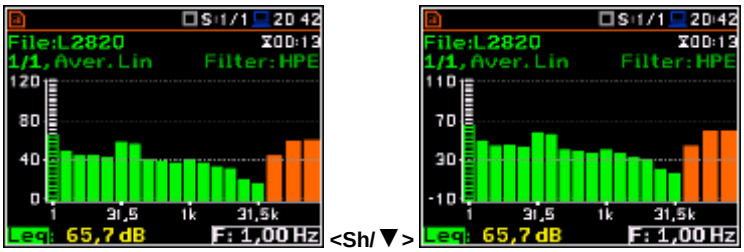


Fields description of the Spectrum view

1. Type of spectrum
2. Cursor position
3. Value for the cursor position
4. Averaging used
5. Spectrum plot
6. Frequency weighting filter used
7. Total values
8. Central frequency for the cursor position

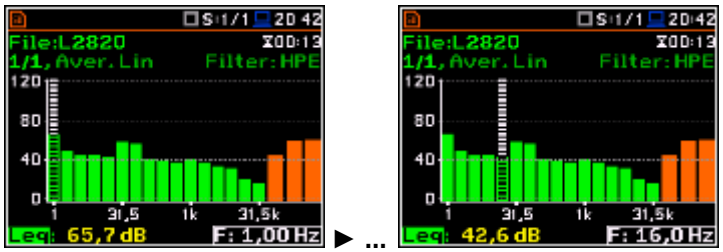


The user can shift the Y-axis during the spectrum view after pressing the **<Shift>** and ▲ (or **<Shift>** and ▼) push-buttons.



The user can change the cursor position by means of the ◄ or ► push-buttons. The user can change quickly to the first or last spectrum line by simultaneously pressing the ◄ or ► buttons with <**Shift**>.

The band central frequency and the appropriate value are presented in the line below the plot.



11.3.2. Setting scale of the spectrum plot - Scale

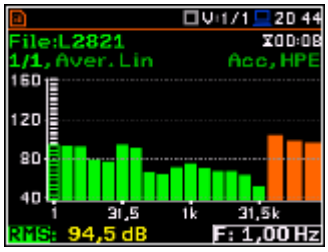
The **Display Scale** sub-list enables the user to change the scale of the spectrum plot, switch the grid on or off.

Scale of results presentation

The **Scale** position defines the units of results: **Lin** (linear) and **Log** (logarithmic). In case of **Log** the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** window (*path: <Menu> / Auxiliary Setup / Reference Levels*).

In case of the sound measurements the **Scale** position is not active. All results are presented in dB.

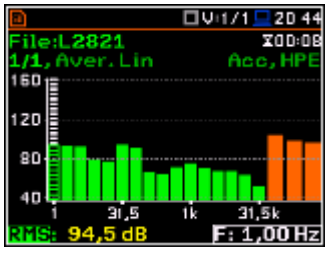
=>



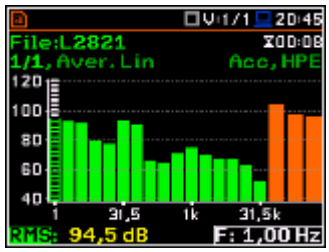
Scaling the plot vertical axis

The **Dynamic** position enables the user to select the required dynamic range scaling of the spectrum plot. It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.

=>



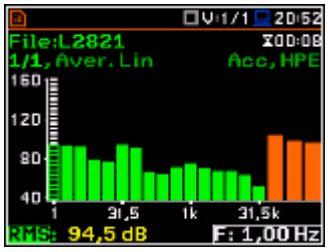
=>



Switching the grid on/off

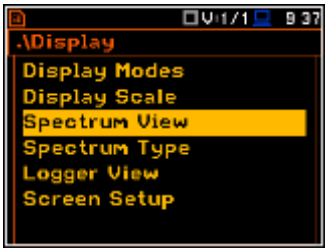
The **Grid** enables the user to switch on or off the horizontal grid lines in the spectrum view.

=>

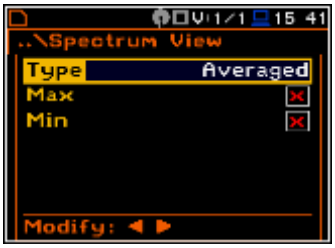


11.3.3. Selection of the spectra to be viewed - Spectrum View

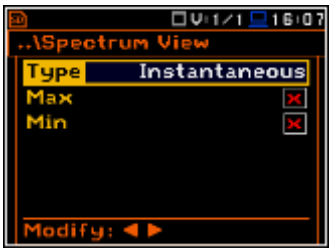
In the **Spectrum View** window, the user can select the different spectra to be visible on the display. In the **Spectrum View** window the following spectrum types may be selected: **Averaged**, **Instantaneous**, **Max** or **Min**.



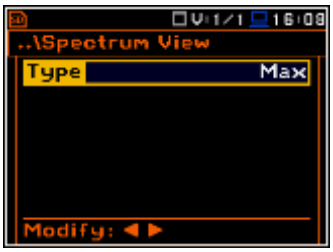
<ENT>



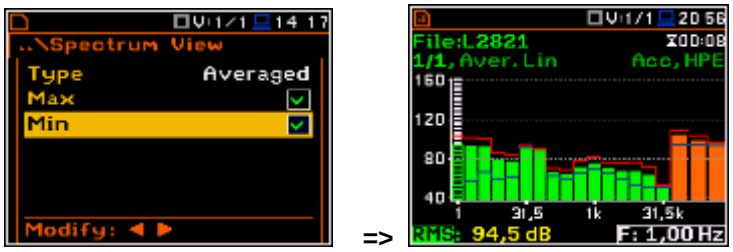
In the **Type** position the user may choose the following different spectrum type to be presented on the display in the graphical view modes: **Averaged**, **Instantaneous**, **Max** and **Min**.



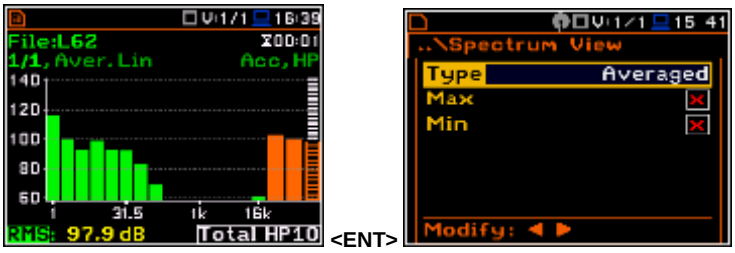
▶



When the **Averaged** or **Instantaneous** spectrum is selected, the user can additionally switch on or off the presentation of the **Max** and/or **Min** values for every displayed spectrum band by switching the **Max** or **Min** parameters on.

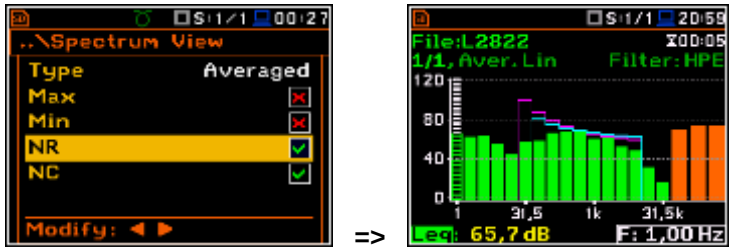


The user can easily get into the **Spectrum View** screen from the spectrum view. It is necessary to enter the result field (**RMS**) with the use of ▲ or ▼ push-buttons and press **<ENTER>**.

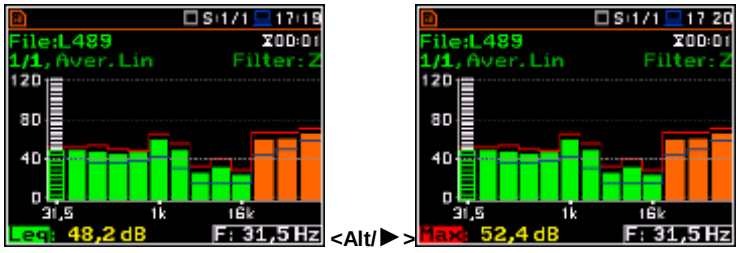


NR and NC results view

In case of 1/1 octave Sound measurements (**S:1/1**) noise rating (**NR**) and noise criterion (**NC**) values can be additionally presented on the same plot as main spectrum when the **NR** or **NC** parameter is switched on. A violet line shows the **NR** results for the octave bands with central frequencies: **31.5Hz**, **63.0Hz**, **125Hz**, **250Hz**, **500Hz**, **1.00kHz**, **2.00kHz**, **4.00kHz** and **8.00kHz**. A blue line shows the **NC** results for the octave bands with central frequencies: **63.0Hz**, **125Hz**, **250Hz**, **500Hz**, **1.00kHz**, **2.00kHz**, **4.00kHz** and **8.00kHz**.



To enable the cursor to read the **Max**, **Min**, **NR** or **NC** values the user should select the field in the lower left hand corner of the display by means of the ▲ or ▼ push-buttons. Then select the appropriate value by means of the ◄ or ► push-buttons pressed together with **<Alt>**.



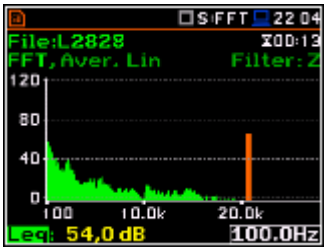
11.3.4. Selection of the spectrum type in Vibration mode - Spectrum Type

In the **Spectrum Type** window, which is available only in Vibration modes, the user can select the different types of vibration spectra to be presented on the display: **Acceleration**, **Velocity** or **Displacement**.

12. FFT ANALYSER

The instrument operates as **FFT** analyser in a very similar way to the **Level Meter**. Moreover, **FFT** analysis is performed in parallel with the **SLM** or **VLM** operations.

The results of **FFT** analysis (spectra) can be examined by the user on a display in the **Spectrum** view. The availability of this mode can be switched on or off by the user (*path: <Menu> / Display / Display Modes)*.

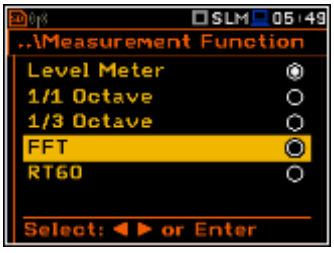


FFT spectra with the single **Total** overall value, measured with preselected frequency weighting filters and windows, are presented in the **Spectrum** view. The read-out of the spectrum values can be done using a vertical cursor on the screen.

12.1. Selection of the FFT function

To select the **FFT** analysis function the user should enter the **Function** list by pressing the **<Menu>** push-button, then select the **Function** text and press **<ENTER>**. In the **Measurement Function** window select the **FFT** position and press **<ENTER>**.

<ENT>



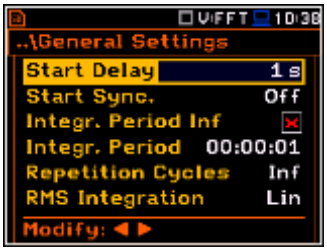
***Note:** It is not possible to change the current function during a measurement. In this case the instrument displays for about 2 seconds the text: **"Measurement in Progress"**. To change the current function, the measurement must be stopped!*

12.2. Setting the FFT analyser

Execution of **FFT** analysis depends on a certain number of the parameters, which can be set in the different windows of the **Measurement** list.

The **FFT** analysis is performed based on the parameters selected in the **General Settings** list of **Measurement** menu: **Integration Period** and **Repetition Cycles**.

The spectra are stored as main results in a results file with the same step (**Integr. Period**) as the other main results, measured by the **Level Meter** function.



The user can switch on or off the history of spectra recording in the logger file (*path: <Menu> / Measurement / Logging / Logger Results / Spectrum: ☑*). If spectra history is switched on, the spectra will be logged also with the step, defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup / Logger Step*).

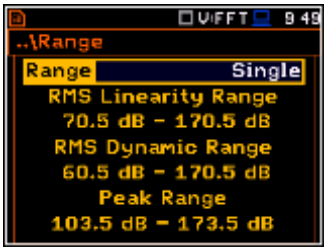
12.2.1. Setting the measurement range for FFT - Range

For the **FFT** function the user can select the input ranges specified in Appendix C, named as **Low** and **High**.

The selection of the input range is doing in the **Range** window of the **Measurement** list.

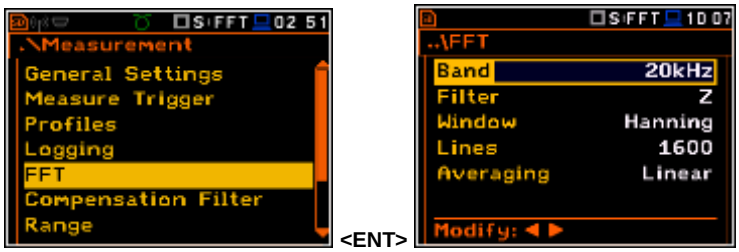
Depending on the settings of the **Scale** parameter (*path: <Menu> / Display / Display Scale*) the range for vibration signal can be presented in absolute or logarithmic units (dB).

Note: *The calibration factor is always added to the range limits. For example, if calibration factor is equal to 0.5 dB, the range will be changed automatically (lower and upper limits will be increased by 0.5).*



12.2.2. Setting the parameters of FFT analysis - FFT

The **FFT** position, which appears in **FFT** analysis, opens the window in which the user can select the parameters of the FFT analysis: averaging type (**Averaging**), pre-weighting filter (**Filter**), frequency band (**Band**), weighting window (**Window**) and the number of lines (**Lines**) for the FFT analysis.



In the **Band** position the user can select the band in which the **FFT** analysis should be performed. The user can select: **20 kHz**, **10 kHz**, **5 kHz**, **2.5 kHz**, **1.25 kHz**, **625 Hz**, **312 Hz**, **156 Hz** and **78 Hz**.

The following pre-weighting filters are available for the **FFT** analysis of sound:

- **A** - type 1 according to the IEC 651 and IEC 61672-1 standards,
- **C** - type 1 according to the IEC 651 and IEC 61672-1 standards,
- **B** - type 1 according to the IEC 651 standard,
- **Z** - type 1 according to the IEC 61672-1 standard
- **HP** - type 1 according to the IEC 61672-1 standard

Only one **HP** weighting filter is available for the **FFT** analysis of vibration.

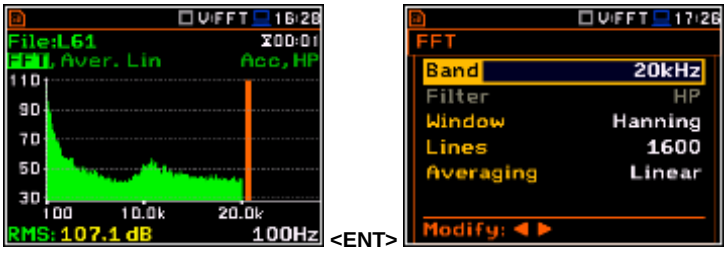
The characteristics of the filters are given in Appendix D.

In the **Window** position the user can select the weighting window for the **FFT** analysis of the signal. The user can select **Hanning**, **Rectangle**, **Flat Top** and **Kaiser-Bessel** weighting windows.

In the **Lines** position the user can select the number of lines for the **FFT** analysis of the signal. The user can select **1600**, **800** and **400** lines.

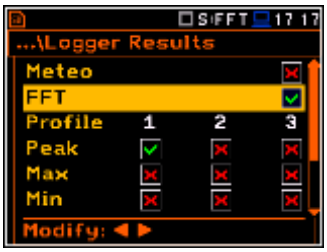
There are two averaging options: **Linear** and **Exponential**. In case of **Exponential** averaging an additional position appears in this window: **Time Constant**. The **Time Constant** parameter can be selected from the values: **100ms**, **125ms**, **200ms**, **500ms**, **1.0s**, **2.0s**, **5.0s** and **10.0s**.

The user can easily get into the **FFT** screen from the spectrum view. It is necessary to enter the function field (**FFT**) with the use of ▲ or ▼ push-buttons and press **<ENTER>**.



12.3. Saving the FFT spectra as a time history - Logger Results

The **FFT** analysis results can be saved in the logger file together with the logger results and with the step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). The spectrum saving in the logger file is defined by activation the **FFT** position in the **Logger Results** window by means of the ◄ or ► push-buttons.

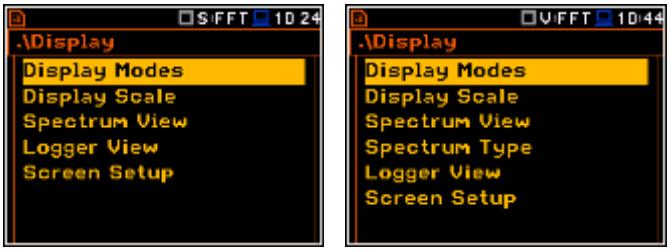


Note: *The spectra are always saved together with the summary results with integration period step.*

12.4. Setting the FFT spectra view

The **Display** list is used for setting the various parameters, which are mainly dedicated for the control of the spectrum view.

The following positions are used for setting the presentation of the **FFT** results:



Display Modes enables the user to select the **Spectrum** view;

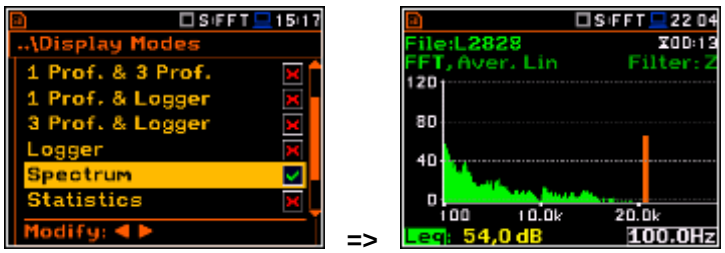
Display Scale enables the user to change the scale of the vertical and horizontal axis of the spectrum plot, switch on or off the grid and auto scale;

Spectrum View enables the user to choose the spectrum (**Average**, **Instantaneous**, **Min**, **Max**) to be viewed;

Spectrum Type enables the user to change the viewed spectrum: **Acceleration**, **Velocity** or **Displacement**.

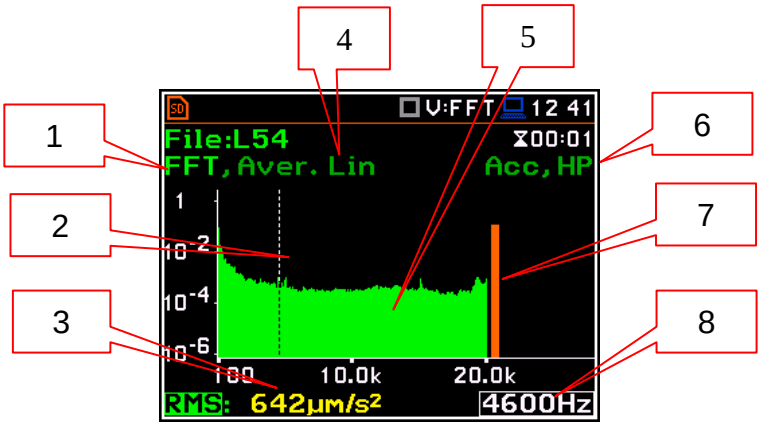
12.2.3. Presentation of FFT spectra

The **Spectrum** position of the **Display Modes** list becomes available in the **FFT** function and enables the user to switch on or off the spectrum view.

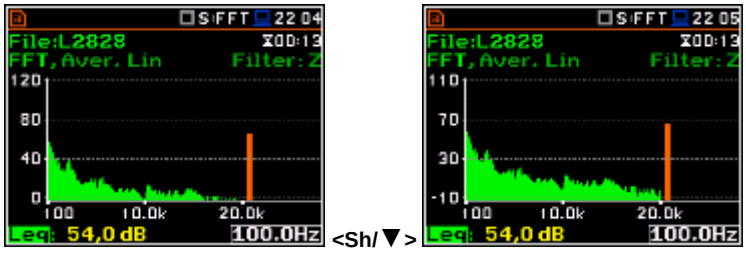


Fields description of the Spectrum view

1. Type of spectrum
2. Cursor position
3. Value for the cursor position
4. Averaging used
5. Spectrum plot
6. Frequency weighting filter used
7. Total value
8. Central frequency for the cursor position

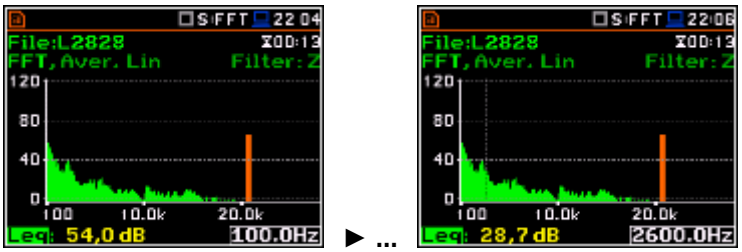


The user can shift the Y-axis during the spectrum presentation after pressing the **<Shift>** and ▲ (or the **<Shift>** and ▼) push-buttons.

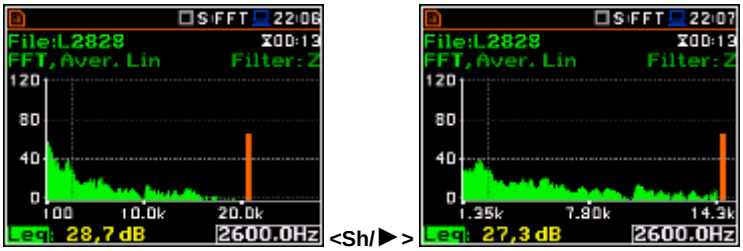


The user can change the cursor position by means of the ◄ or ► push-buttons.

The frequency and appropriate value are presented in the line below the plot.

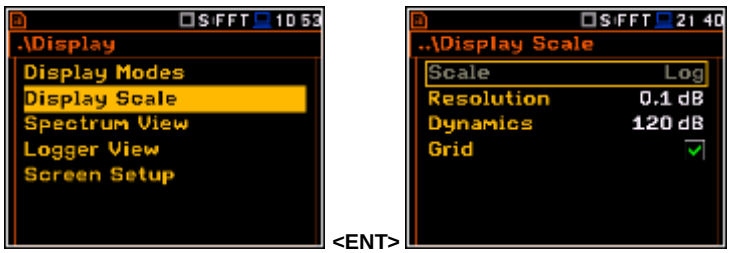


The user can zoom in/out the frequency scale at the cursor position by means of the ◄ or ► push-buttons, pressed with **<Shift>**.



12.2.4. Setting scale of spectrum plot - Scale

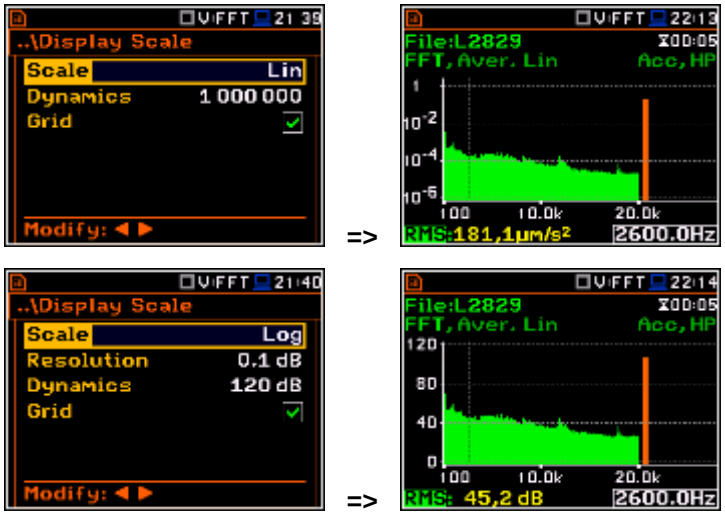
The **Display Scale** sub-list enables the user to change the scale of the spectrum plot, switch the grid on or off.



Scale of results presentation

The **Scale** position defines the units of results: **Lin** (linear) and **Log** (logarithmic). In case of **Log** the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** window (*path: <Menu> / Auxiliary Setup / Reference Levels*).

In case of the sound measurements the **Scale** position is not active. All results are presented in dB.



Scaling the plot vertical axis

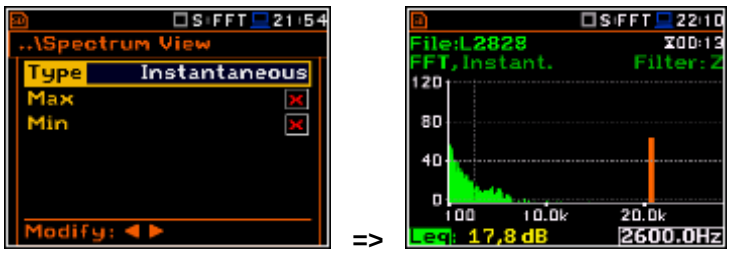
The **Dynamic** position enables the user to select the required dynamic range scaling of the spectrum plot. It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB**, **100dB** and **120dB**.

Switching the grid on/off

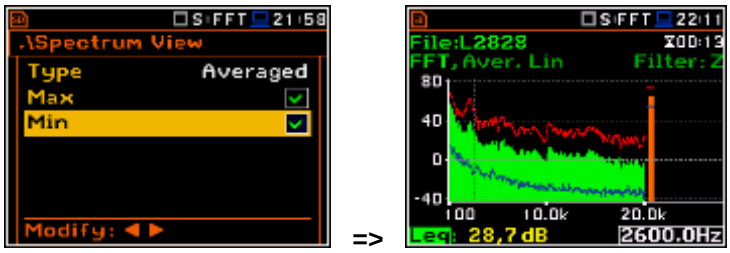
The **Grid** enables the user to switch on or off the horizontal grid lines in the spectrum view.

12.2.5. Selecting the spectrum types to be viewed - Spectrum View

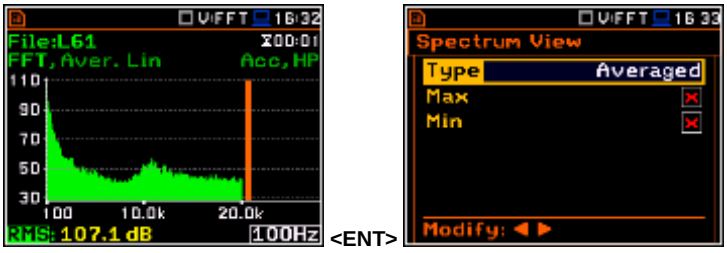
In the **Spectrum View** window (*path: <Menu> / Display / Spectrum View*), the user can select the different spectra to be visible on the display. In the **Spectrum View** window the following spectrum types may be selected: **Averaged**, **Instantaneous**, **Max** or **Min**.



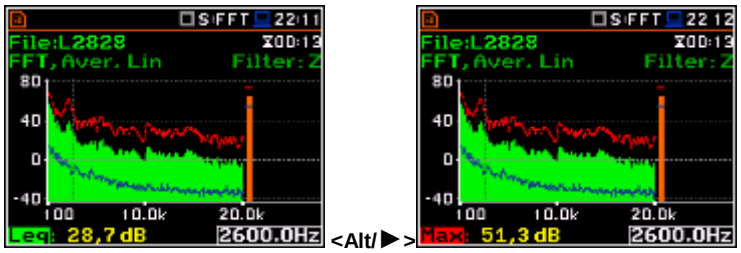
When the **Averaged** or **Instantaneous** spectrum is selected, the user can additionally switch on or off the presentation of the **Max** and/or **Min** values for every displayed spectrum band by switching the **Max** or **Min** parameters on.



The user can easily get into the **Spectrum View** screen from the spectrum view. It is necessary to enter the result field (**RMS**) with the use of ▲ or ▼ push-buttons and press **<ENTER>**.

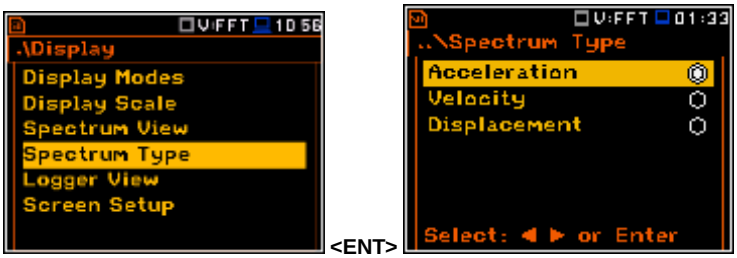


To enable the cursor to read the **Max** or **Min** values the user should select the field in the lower left hand corner of the display by means of the ▲ or ▼ push-buttons. Then select the appropriate value by means of the ◄ or ► push-buttons pressed together with **<Alt>**.

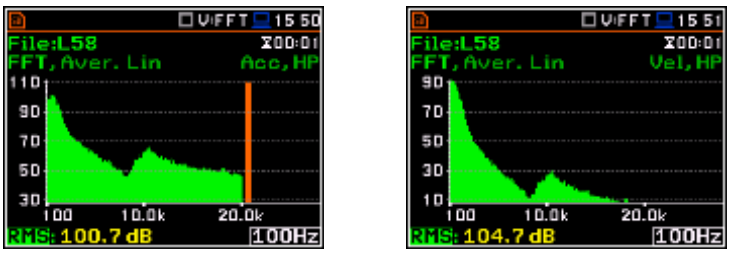


12.2.6. Selection of the spectrum type in Vibration mode - Spectrum Type

In the **Spectrum Type** window (*path: <Menu> / Display / Spectrum Type*), which is available only in Vibration modes, the user can select the different types of vibration spectra to be presented on the display: **Acceleration**, **Velocity** or **Displacement**.



As an example, same spectrum is presented - **Acceleration** and **Velocity**.



13. REVERBERATION TIME MEASUREMENT - RT60

The **RT60** analysis is an optional function of the SVAN 977W instrument, which provides reverberation time calculation for 1/1 octave bands (from 63Hz to 16kHz) or 1/3 octave bands (from 50 Hz to 20 kHz) and three total RMS levels (**A**, **C** and **Z** weighted). Whole measurement process and calculations implemented in the SVAN 977W instrument fulfil the ISO 3382 standard.

The reverberation time of the room can be obtained with the use of the SVAN 977W instrument by two measurement methods: Impulse Response Method (**Impulse**) and Interrupted Noise Method (**Decay**). The selection of the method depends on the type of the sound source used by the user. The **Impulse** method is designed for measurement using the impulse sound source (like pistol shot, petard explosion), whereas the **Decay** method is intended for measurements when room is excited by broad or narrow band sound noise source (usually pink noise). For more details about the measurement and calculation process see Appendix H.

The reverberation time analysis applied in the instrument consists of two parts:

1. The measurement part during which the acoustic response of the room is registered.
2. The calculation part during which the reverberation time (**EDT**, **RT20**, **RT30** and **RTUser**) is calculated for the measured room response.

Note: *It is recommended to familiarize with the Appendix H before proceeding. This chapter describes only the navigation of the instruments, whereas Appendix H depicts the definitions and description of the reverberation time measurement.*

13.1. Selection of RT 60 function

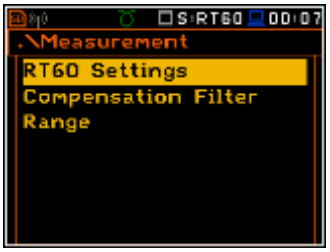
To select the **RT60** analysis function the user should enter the **Function** list by pressing the **<Menu>** push-button, then select the **Function** text and press **<ENTER>**. In the **Measurement Function** window the user should highlight the **RT60** line and press **<ENTER>**.

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

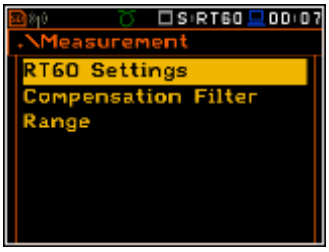
13.2. Setting the RT60 analysis

Execution of **RT60** analysis depends on a certain number of the parameters, which can be set in the different windows of the **Measurement** list: **RT60 Settings**, **Compensation Filter** and **Range**.

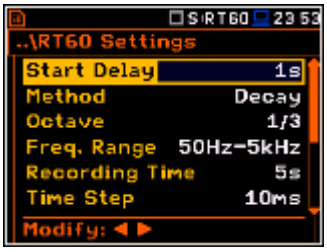
Positions **Compensation Filter** and **Range** are the same as for other instrument's functions (see. Sections 5.6 and 5.7 of this manual).



The **RT60 Settings** list enables the user to select the method for **RT60** calculation, select the name of the file, where the registered data will be collected, and other parameters for **RT60** calculation.

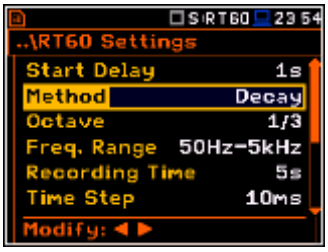


<ENT>

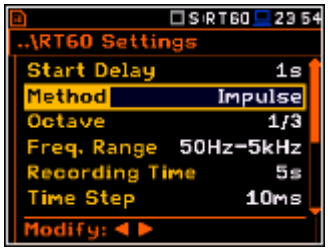


The **Start Delay** position defines the delay period from the moment the **<Start/Stop>** push-button is pressed to the start of the actual measurement.

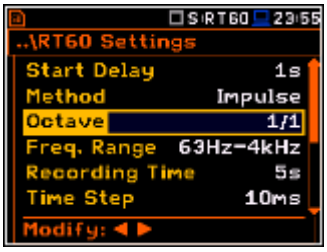
The **Method** position enables the user to choose the method for **RT60** calculation: **Decay** or **Impulse**. Both methods are described in the Appendix H.



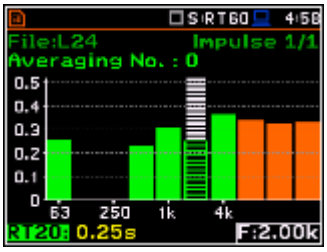
▶



The **Octave** position enables the user to choose for which bands (**1/1** or **1/3**) the **RT60** analysis will be performed.

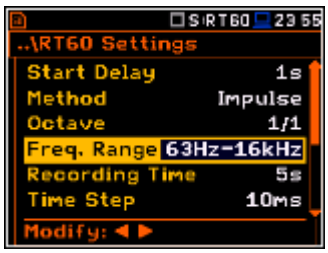


=>

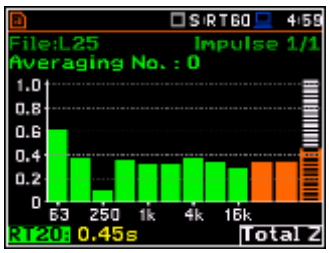


The **Freq. Range** position enables the user to select the frequency range for 1/1 or 1/3 octave calculations:

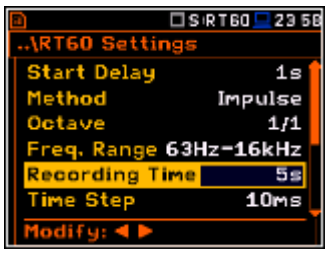
- for **1/1** octave**: 63Hz-4kHz** (7 bands) and 63**Hz-16kHz** (9 bands).
- for **1/3** octave: **50Hz-5kHz** (21 bands) and **50Hz-20kHz** (27 bands).



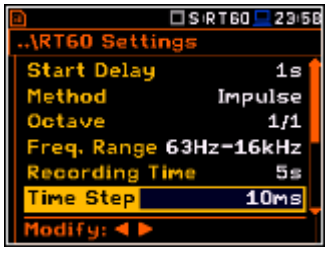
=>



The **Recording Time** position defines the recording time of the measurement data (sound pressure level decay curve). Data acquiring starts in the moment of the trigger condition appearance. Recording time can be set in the range **1 ÷ 30 s**.



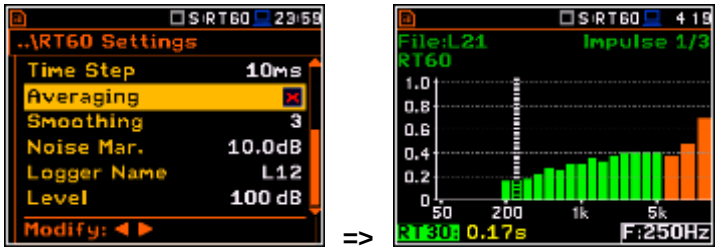
The **Time Step** position defines the time-step of data registration (sound pressure level) in the file. The parameter value can be selected from the set: **2**, **5**, **10**, **20**, **50**, **100 ms**.



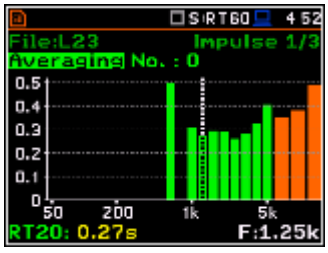
The **Averaging** position enables the user to activate the averaging of the reverberation time results from several measurements.

When this option is switched on the **Averaging** position appears on the **RT60** bar plot.

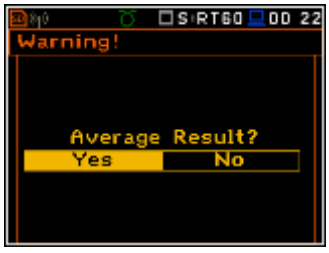
To make averaging of the new results with the results calculated earlier the user should select the field **Averaging** and press the **<ENTER>** push-button, select in the confirmation window **Yes** and press **<ENTER>** again. In the field **No.: x**, the value **x** will be increased by one and the symbol √ will inform that the results have been averaged.



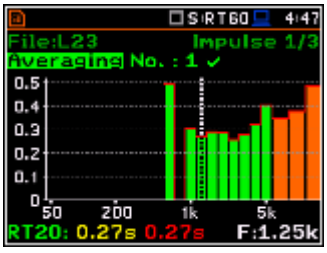
<Start>



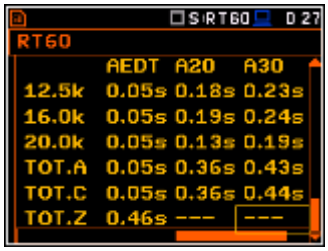
<ENT>



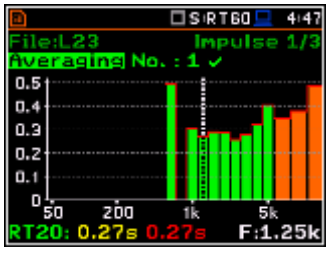
<ENT>



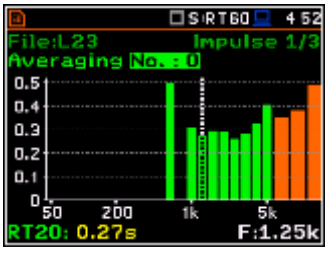
When the averaging is **On** the additional columns appear in the RT60 result table, named: **AEDT**, **A20**, **A30** and **A.User**.



To clear averaging the user should select the field **No.: x** and press the **<ENTER>** push-button, select in the confirmation window **Yes** and press **<ENTER>** again.



<ENT> .. <ENT>



The **Smoothing** position enables the user to set the number of samples, which are taken to averaging process of the sound pressure level decay curve.

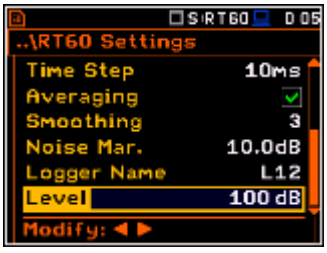
Note: this parameter influences the reverberation time results. The parameter can be set in the range **0** ÷ **15** with **1** sample step (default value is **3** samples).

The **Noise Mar.** position enables the user to set the margin value to the calculated noise level (for more detail see **Appendix H**). This parameter can be set in the range **0 ÷ 20 dB** with **0.1 dB** step (default value is **10 dB**).

***Note:** If the measurement must fulfill the **ISO 3382** standard requirements the noise margin is required to be set to 10 dB (or greater value).*

The **Logger Name** position enables the user to define the name of the logger file in which the data of the **RT60** analysis will be recorded. The name can be up to eight characters long. After pressing the ◄ or ► push-buttons, the special window with text editor is opened.

The **Level** position defines the level for triggering the measurement.



In the **Impulse** method, the trigger condition appears when the **TOTAL** sound pressure level exceeds the defined by the user threshold **Level** value. The parameter can be set in the range **24 ÷ 136 dB** with **1 dB** step (**100 dB** default value).

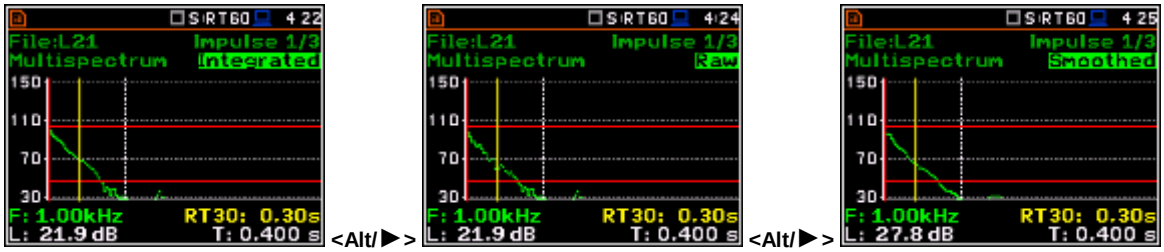
In the **Decay** method, the **Leq** level defined by the **Level** parameter must be reached to start time history recording. The **RT60** measurement starts when the 1 second **Leq** (**A** weighted) level value decreases by **10 dB**. The RT60 Decay algorithm uses 50 samples pre-trigger, defined by "10 dB drop point" (see Appendix H).

13.3. Setting the RT60 view

The **Display Modes** list of the **Display** menu enables the user to select the type of data displayed during the **RT60** calculation.

Time data can be viewed as a **Raw Data**, **Smoothed Data** (or **Integrated Data** in case of **Impulse** method).

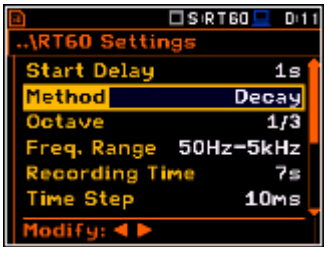
The user may also switch between different data view modes during measurement in the presentation display mode. For this purpose, it is necessary to set the cursor on the field with **Raw**, **Smoothed** or **Integrated** text (at the right upper corner of the display) and change its content with the **<Alt>** and ◄ or ► push-buttons.



13.4. Start RT60 measurements

Measurements with the use of Decay method

1. Set parameters for **Decay** RT60 measurements. Most used setup is presented below.
   - **Method:** **Decay**
   - **Recording Time:** **7s**
   - **Time Step:** **10ms**
   - **Averaging:** **On**
   - **Smoothing:** **3**

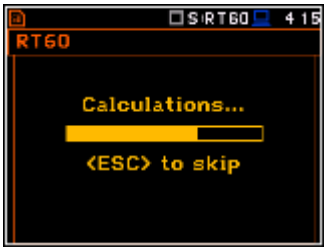


- **Noise Mar.:** **10.0dB**
- **Level:** **100dB**

2. Place the sound power source in the measured room (for the sound power source location - see the reverberation time measurement ISO standard).
3. Place the microphone in one of the selected measurement points (for the measurement points location see the reverberation time measurement ISO standard).

***Note*:** *The default measurement time of the decay curve registering (**Recording Time**) is 7 seconds. It can be insufficient in some applications. It is recommended to set this value to be at least two times longer than expected reverberation time. For details see Appendix H.*

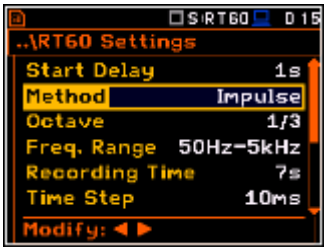
4. Switch on the sound power source.
5. Start the measurement process by pressing the **<Start/Stop>** push-button. While the instrument is waiting for the trigger condition fulfilment the **Spl** result is displayed.
6. Switch off the sound power source (the source should work enough long to obtain the acoustic field stabilisation). After the trigger condition fulfilment, the instrument starts to collect data.
7. After the data recording process ends, the instrument starts the calculation of the reverberation time results. During this process the message „Calculations…" and "Reading Logger…" appear.
8. To save results press the **<Save>** push-button or use the **File** menu option.



***Note*:** *It is necessary to switch on the sound source before starting the measurement because of the trigger requirements (for more details see Appendix H). If there it is necessary to start the instrument before switching on the sound source it is recommended to use the higher **Start Delay** value.*

Measurements with the use of Impulse method

1. Set parameters for **Impulse** RT60 measurements. Most used setup is presented below.
   - **Method:** **Impulse**
   - **Recording Time:** **7s**
   - **Time Step:** **10ms**
   - **Averaging:** **On**
   - **Smoothing:** **3**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100dB**

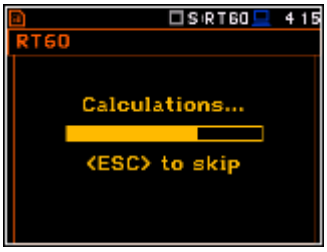


***Note*:** *The default measurement time of the decay curve registering (**Recording Time**) is 7 seconds. It can be insufficient in some applications. It is recommended to set this value to be at least two times longer than expected reverberation time. For details see Appendix H.*

***Note*:** *The proper value of the sound level trigger threshold should be set well above the background noise and significantly below the maximum sound level emitted by the impulse source.*

2. Place the microphone in one of the selected measurement points (for the measurement points location see the reverberation time measurement ISO standard).
3. Start the measurement process by pressing the **<Start/Stop>** push-button. The display indicates that the instrument is waiting for the trigger condition fulfilment.
4. Fire the impulse sound power source. If the trigger condition is fulfilled the instrument starts to collect data.

9. After the data recording process ends, the instrument starts the calculation of the reverberation time results. During this process the message „Calculations…" and "Reading Logger…" appear.
5. To save results press the **<Save>** push-button or use the **File** menu option.



***Note*:** *During the data collections in the investigated room all other sources of sound should be suppressed to not affect the measurements.*

13.5. Viewing of the RT60 results

The **RT60** measurement results for all 1/3 octave bands and three Total values can be viewed in three different view modes:

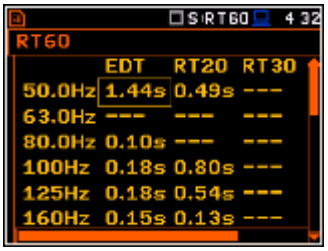
1. Table of **EDT**, **RT20**, **RT30** and **User** results;
2. Bar plot of **EDT**, **RT20**, **RT30** and **User** results;
3. Plot of sound pressure level decay curves.

The user may switch between the view modes by means of the **<Alt>** and ◄ or ► push-buttons.

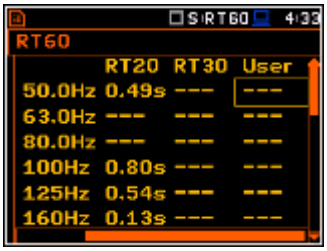
Table of RT60 results

The table presents the results of reverberation time for different **RT60** results:

- **EDT** - early decay time;
- **RT20** - reverberation time calculated with 20 dB dynamics;
- **RT30** - reverberation time calculated with 30 dB dynamics;
- **User** - reverberation time, calculated with the user defined dynamics.



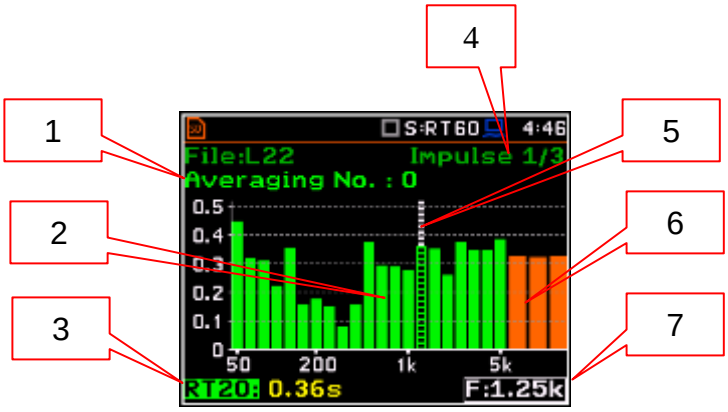
►



Note: *If "- - -*" text appears in the RT indicator field, it means that for this 1/3 octave band with the selected parameters (**Noise Mar.**) the required measurement conditions were not fulfilled to obtain the results (for more details see Appendix H).*

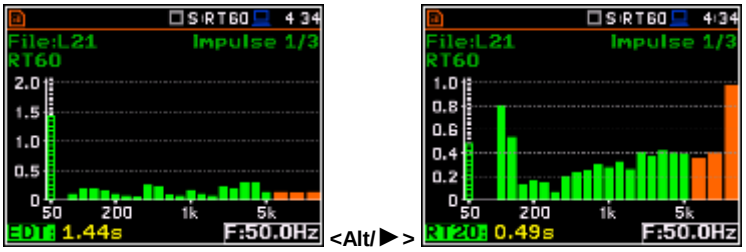
Bar plot of RT60 results

1. Number of averaged results
2. RT 1/3 octave plot
3. Name of the RT result and its value
4. Used **RT60** calculation method
5. Cursor position
6. RT results for Total values
7. Cursor position value (central 1/3 octave band frequency)



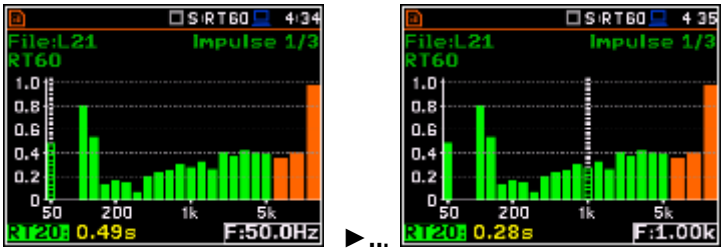
Changing the RT result

When the field 3 is active the **RT60** analysis result can be changed after pressing the ◄ and ► push-buttons together with **<Alt>**.



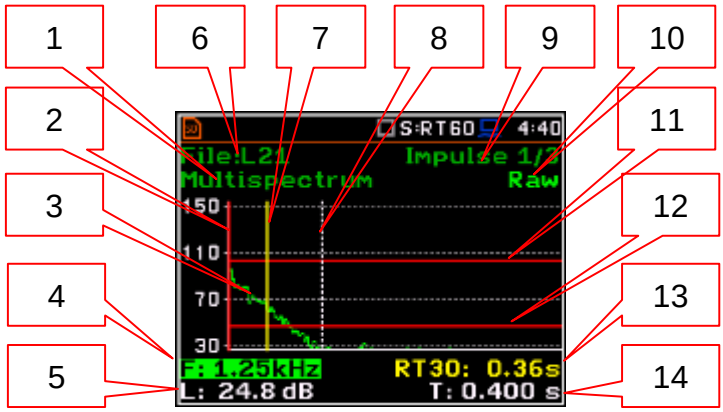
Changing the cursor position

The user may change the cursor position by means of the ◄ or ► push-buttons.



Sound pressure decay curve plot

1. Logger file content
2. T0 marker position
3. Decay curve plot
4. Central frequency of selected by cursor 1/3 octave band
5. Result value (SPL) for the cursor position
6. Name of the logger file
7. T1 marker position
8. Cursor position
9. RT60 method
10. Type of data displayed: **Raw**, **Smoothed** or **Integrated**
11. Calculated steady upper sound level value
12. Calculated steady lower sound level value
13. RT result (**RT30**, **RT20**, **EDT** and **RT User**) with calculated reverberation time
14. Cursor measurement time position

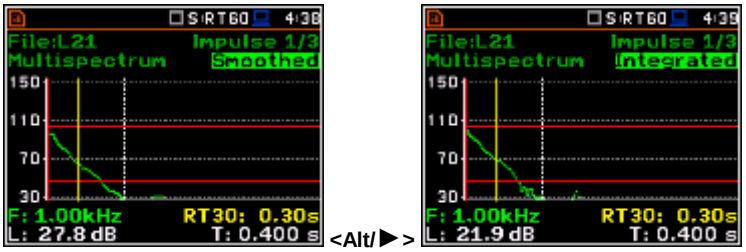


T0 marker position is used as a starting point to all three (and the **RT User** also) reverberation time calculations.

On the display T1 marker position is labelled (indicator **A7**) as **EDT**, **RT20** or **RT30** according to which the most restricted definition of the RT condition is fulfilled.

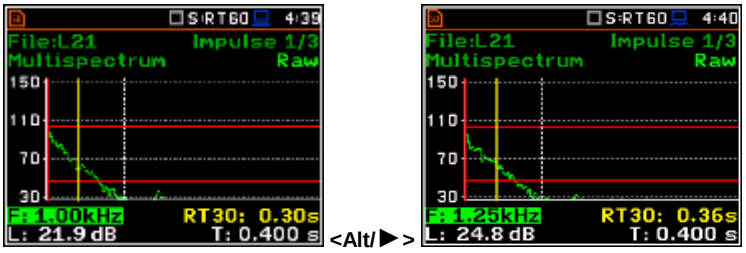
Changing the data type

When the field 9 is active the type of data displayed (**Raw**, **Smoothed** or **Integrated**) can be changed after pressing the ◄ and ► push-buttons together with **<Alt>**.



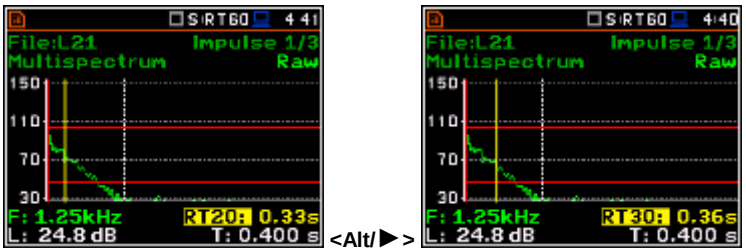
Changing the 1/3 octave band

When the field 3 is active the central frequency of 1/3 octave band can be changed after pressing the ◄ and ► push-buttons together with **<Alt>**.



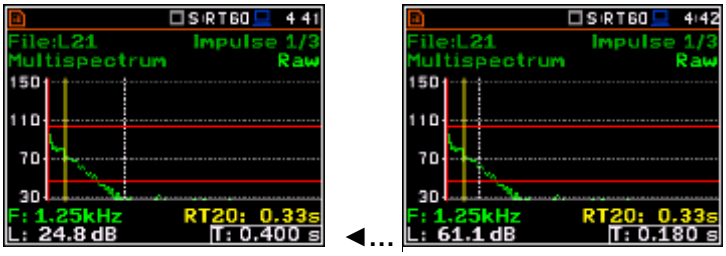
Changing the RT function

When the field 12 is active the **RT60** analysis function can be changed after pressing the ◄ and ► push-buttons together with **<Alt>**.



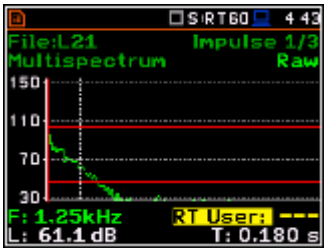
Changing the cursor position

When the field 13 is active the user may change the cursor position by means of the ◄ or ► push-buttons.



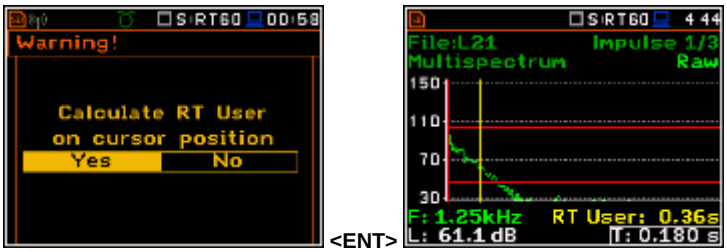
RT User reverberation time calculation

1. Select the 1/3 octave band or one of the total levels for user reverberation time calculation process.
2. Set the position of the marker T1.



Note: *The marker should be located on the right side of the T0 marker but not in the noise background region (for more details see Appendix H).*

3. When the marker position is located press **<ENTER>**, then select **Yes** field and press **<ENTER>** again.
4. The **RT User** result will be calculated and presented in the field 13, as well in the Table and 1/3 octave bar plot.



14. MAINTENANCE

14.1. Powering the instrument

The **SVAN 977W** can be powered by one of the following sources:

- Four AA standard size internal batteries. In case of alkaline type, a new fully charged set can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary alkaline cells, four AA rechargeable batteries can be used (a separate external charger is required for charging them). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- External DC power source – 7 V DC÷16 V DC (1.5 W)
- SA 17A external battery pack – operation time > 24 h (option)
- **USB** interface – 500 mA HUB

SVAN 977W is delivered with four AA alkaline batteries, but the user may also use AA rechargeable batteries.

The "**battery**" icon shows the condition of the internal batteries.

The instrument is not equipped with an internal charger; therefore, the rechargeable batteries can be charged only after removal them out of the instrument with the use of optionally provided charger (**SA 31**).

To change or charge the batteries the user should switch off the instrument, unscrew the bolt, take off the black bottom cover of the instrument and slide the battery tubes out.

Note*: *While changing the batteries, observe the correct polarity.

Powering the instrument from the USB interface is performed by connecting its **USB** socket to the PC or other USB power source via the **SC 16** cable.

Powering the instrument from the external 6 x AA battery pack (**SA 17A**) or DC power source 7 V DC÷16 V DC, 1.5 W (**SA 15**) is performed via **7–16 V** socket.

When the instrument is powered from the external power source the internal batteries are automatically disconnected. Once disconnected from the external power source, the instrument will automatically switch powering to the internal batteries.

Note*: *Use only high quality USB cables, such as **SC 16**. Many poor-quality cables do not ensure low resistance of the cable, thus disabling proper operating of the instrument.

14.2. Memory card extraction and insertion

SVAN 977W is delivered with 4GB micro SD-card.

The user may exchange it with the high capacity card (up to 32GB), but before insertion the card must be formatted as FAT32.

Note: *If the user would like to use card with higher capacity, he must call to the local distributer.*

To extract the memory card from the card-slot, the user should switch off the instrument, unscrew the bolt and take off the black bottom cover of the instrument.

The card is installed in the slot. To extract the card the user should push on the card and then pull it out of the slot.

While insertion the SD-card, a click sound indicates that the card is inserted properly. If necessary, use a tool (e.g. pen) to push the card right in.

14.3. Transsducers

SVAN 977W is equipped with the TNC connector as an input of the measured signal taken from the microphone preamplifier or the vibration transducer.

Microphone

SVAN 977W set includes prepolarised ½" microphone with nominal sensitivity 35 mV/Pa (**SV 7052**) and microphone preamplifier with IEPE power supply (**SV 12L**).

To connect the preamplifier with the microphone to the instrument the user should first insert the tip of the preamplifier into the socket and tighten the ring to the first screw thread.

Then slide the upper sleeve of the preamplifier to the instrument and tighten it on the thicker screw thread.

Note: *Do not disconnect the preamplifier by turning the preamplifier body (turn only rings/collars) because it may damage the preamplifier!*

Accelerometer

Optionally general purpose vibration accelerometer 100 mV/g (10 mV/ms^{-2}) (**SV 80**) with a coiled cable for accelerometer 2 m (**SC 27**) can be used.

The SV 80 is an industry standard IEPE accelerometer offered to SVAN 977W. It is an ideal choice for walk-around vibrations measurement in the rugged environments of industrial machinery monitoring, such as pumps, motors or fans. The accelerometer is mounted on a vibrating surface with the mounting magnet.

The design of SV 80 features the low electronic noise and wide temperature operating range.

The connection of the accelerometer to the instrument is like the microphone preamplifier, but there is only one ring to be tighten to the first screw thread.

14.4. Resetting the instrument

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

- **HARDWARE RESET:** internal hardware reset, no user data is changed. Make sure the battery is not exhausted, and the unit is turned off. Hold down the **<Alt>** and **<Start/Stop>** push-buttons for more than 15 seconds, and then release it. Turn on the instrument as usually.

Note: *Hardware reset is only to be used in extreme situations such as an instrument hang-up.*

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

14.5. Firmware upgrade

SVANTEK is committed to continuous innovation path of development, and as such reserves the right to provide firmware enhancements based on user's feedback.

To update the instrument firmware:

- Unpack the provided firmware package. (provided as a suitable compressed file).
- Make sure the unit is turned off.
- Connect SC 16 cable to the computer and SV 977W instrument (USB interface).
- Keeping pressed the **<ENTER>** and **<▲>** push-buttons switch on the instrument - the following message should appear on the unit's screen: BOOTSTRAP v1.06 (or higher).
- Wait for the message **<USB>** on the unit's screen and start from the PC: **go-usb.bat**.
- The changing number and final message: "..... o.k." should appear on the computer screen.
- Successful firmware update will be indicated by the message: *Program loaded!*
- Switch off the instrument.

Note: *With the use of **Supervisor** or **SvanPC++** software it is very easy to check if there are any new firmware releases available for download.*

14.6. Storing the instrument

- To preserve the life of the internal batteries, it is recommended that the instrument is turned off when it is stored. In case of alkaline batteries, it is recommended to extract them out of the instrument.
- Do not store the instrument permanently connected to the USB port. It shortens battery lifecycle.
- When the instrument is turned off, it still draws a small amount of battery power. Therefore, it is recommended to charge the cell every few months if it is not going to be used regularly.

14.7. Transportation and carrying

For transportation or storage purpose, we recommend to use the packaging provided by the manufacturer. In a potentially dirty industrial environment it is advisable to use the carrying case provided by the manufacturer such as the fabric material case (**SA 47**), lightweight case (**SA 143**) or waterproof case (**SA 79**), which ensures excellent mechanical and environmental protection and long term storage conditions.

14.8. Cleaning

Clean the surface of the instrument with damp soft cloth.

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

Note: *In cases of larger dirt, such as oil or grease, contact your Local Authorized Distributor or Svantek Service Office.*

14.9. Troubleshooting

- In case your instrument does not respond proceed with hardware reset of the instrument (see chapter 14.414.4).
- In case the reset does not help call your Local Authorized Distributor or Svantek Service Office.

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's website.

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

Office hours are 8:00 a.m. to 4:00 p.m. Central European Time.

- E-mail at office@svantek.com
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