SVANTEK

USER MANUAL

SV 973A

CLASS 2

SOUND LEVEL METER

& SOUND EXPOSURE METER

Warsaw, 2023-10-24

Rev. 0.09

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 ***1.08.x****.*

The succeeding software revisions (marked with the higher numbers) can change the view of some displays presented in the text of the manual.

WEEE Note: *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 **SV 973A** is an ultra-compact Class 2 IEC 61672-1:2013 Sound Level Meter (**SLM**) with real-time 1/1 & 1/3 octave analyser and Sound Exposure Meter (**SEM**) options that complies with international standards ISO 9612 and OSHA (IEC 61252; ANSI S1.25).

The unique feature of the SV 973A is the MEMS microphone with a lifetime warranty.

The instrument's user interface makes measurement configuration as easy as possible. All this makes the SV 973A an ideal choice for industrial hygiene noise measurements, audiometric testing, short-term environmental noise measurements, acoustic consultancy surveys, technical engineers dealing with noise issues and general acoustic noise measurements.

The instrument offers a huge time history logging capability, providing broadband results and spectra with adjustable dual (long and short) logging steps. Audio recording on user selectable trigger conditions completes the logging functionality. Data is stored on a built-in 8GB micro-SD chip and can be easily downloaded to a PC via the USB-C interface. An optional RS 232 interface can be used to connect the instrument to a device that provides this type of connection. A direct print function allows quick on-site printing using an optional portable printer.

The instrument can be easily calibrated in the field using a sound calibrator. The calibration process can be activated automatically if a sound calibrator with an auto-run function is installed on the microphone.

SV 973A is supplied with Svantek's own software packages – *Supervisor* for data download, visualisation, basic post-processing and export to popular office software applications and the full analysis package *SvanPC++* for advanced data processing and analysis, visualisation and automated reporting.

SV 973A is equipped with a Bluetooth®[1] module and can be remotely controlled via the *Assistant* smartphone applications.

With a rugged, pocket-sized housing and a low energy, long range Bluetooth® Smart wireless interface, this instrument is an excellent tool for anyone involved in acoustic measurement.

1.1 SV 973A AS SOUND LEVEL METER / SOUND EXPOSURE METER / ANALYSER

- SLM mode: **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, Leq statistics (**Ln**), expected Leq value (**EX**), standard Leq deviation (**SD**), measurement time and overload time % (**OVL**) and two rolling Leq (**LR1** and **LR2**) with Class 2 IEC 61672-1:2013 accuracy in the frequency range 20 Hz ÷ 10 kHz and linear measurement range **32 dBA LEQ ÷ 128 dBA PEAK**.

[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.

- SEM mode: **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **LEPd**, **Ltm3**, **Ltm5**, Leq statistics (**Ln**), expected Leq value (**EX**), standard Leq deviation (**SD**), **Lc-a**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, SEL8(**LAE8**), PSEL(**PLAE**), **E**, **E_8h**, peak counter (**PTC**), peak threshold (**PTP**), upper limit time (**ULT**), **TWA**, **PrTWA**, measurement time and overload time % (**OVL**) with Class 2 IEC 61672-1:2013 accuracy in the frequency range 20 Hz ÷ 10 kHz and linear measurement range **50 dBA LEQ ÷ 141 dBA PEAK**. Available exchange rates: 2, 3, 4, 5 and 6
- parallel **Impulse**, **Fast** and **Slow** detectors for the measurements with **A**, **B**, **C**, **Z** and **LF** (low frequency) frequency-weighting filters
- **1/1 Octave** real-time analysis. Nine 1/1 octave filters with centre frequencies from 31.5 Hz to 8 kHz (meeting Class 1 requirements of IEC 61260-1:2014) available simultaneously with three user definable profiles for broadband measurements (SLM and SEM), time history logging and audio recording
- **1/3 Octave** real-time analysis (option). Twenty-eight 1/3 octave filters with centre frequencies from 20 Hz to 10 kHz (meeting Class 1 requirements of IEC 61260-1:2014) available simultaneously with three user definable profiles for broadband measurements (SLM and SEM), time history logging and audio recording
- **Audio signal** recording (option), trigger and continuous mode, 12 kHz and 24 kHz sampling rate, WAV format
- Reverberation time **RT60** analysis function (option) for 1/1 octave bands or 1/3 octave bands and three total RMS levels (**A**, **C** and **Z** weighted) according to ISO 3382.
- **STIPA** (Speech Transmission Index for Public Address Systems) measurements of electro-acoustic and acoustic environmental effects that affect the speech intelligibility in room acoustics and/or public address systems.

Note: *SV 973A has two different dynamic ranges - one dedicated to the SLM functions (**Level Meter**, **1/1 Octave**, **1/3 Octave** and **RT60**) and another dedicated to the **Dosimeter** function. As a result, the instrument uses two different calibration factors, one for SLM and one for Dosimeter!*

1.2 GENERAL FEATURES OF SV 973A

- Sound Level Meter in extremely small pocket size body
- Noise measurements meeting Class 2 IEC 61672-1:2013 accuracy
- Dosimeter function for personal noise monitoring in the workplace
- 1/1 & 1/3 octave real-time frequency analysis (option)
- Audio signal recording (option)
- Reverberation time function (option)
- Speech transmission index function (option)
- Audio records on demand, created before or after measurement, added to a measurement file
- Statistical analysis with up to 10 percentile values
- Time-history with two logging step intervals
- Automated calibration start and save
- Integration measurement run time programmable up to 24 h
- Long operation time: 20 h ÷ 38 h (depending on configuration and environmental conditions)
- Wireless connectivity with low energy Long Range Bluetooth® Smart (4.2) interface
- Setup editor available with *Supervisor* or *SvanPC++* software
- Super contrast colour OLED display
- Bluetooth® for remote control by the *Assistant* smartphone applications
- Wide range of temperature operating conditions
- Very handy, light weight and robust pocket size case
- Easy and friendly user interface for quick start and stop

1.3 ACCESSORIES INCLUDED

- **ST 973A** MEMS microphone with **LIFETIME WARRANTY!**
- **SC 158** USB type C to USB type A cable
- **SA 22** foam windscreen
- **SA 80** pocket soft bag
- **batteries** four AAA type

1.4 ACCESSORIES AVAILABLE

- **SV 34B** Class 2 sound calibrator: 114 dB/1000 Hz
- **SP 75** RS232 interface option
- **SA 72** carrying case for SV 973A and accessories (waterproof)

1.5 FIRMWARE OPTIONS AVAILABLE

- **SF 973_PACK** Level Meter including 1/1 & 1/3 octave analysis, audio recording
- **SF 973_1** 1/1 octave analysis option
- **SF 973_2** 1/3 octave analysis option
- **SF 973_5** Reverberation time analysis (RT60) option
- **SF 973_15** Audio recording option
- **SF 973_20** STIPA option

Note: *The firmware and software options listed above can be purchased at any time as they require only the entry of a special unlocks code to activate them.*

2 GENERAL INFORMATION

2.1 MEASUREMENT CONFIGURATIONS

The normal mode of operation of the instrument as an SLM is with the microphone attached to the instrument and without the windscreen. Optionally the instrument can be operated with the windscreen attached to the microphone (see Appendix C for specification).

If there are significant differences between the temperature of the instrument and the ambient temperature at the measuring point, it is recommended that the instrument be acclimatised for a sufficient period of time to bring its temperature as close as possible to the ambient temperature.

When taking measurements in the presence of wind, it is necessary to use a windscreen. The windscreen should simply be placed over the microphone with the preamplifier without any significant force.

For measurements according to IEC 61672-1:2013 it is necessary to set the appropriate compensation in the **Compensation Filter** screen (see Chapter 4.7).

When measuring in a diffuse field (in small rooms), it is recommended to switch on the diffuse field filter.

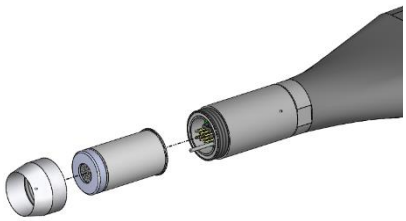
Note: *To make measurements in accordance with IEC 61672-1:2013, it is necessary to set the appropriate compensation in the* ***Compensation Filter*** *screen (see Chapter 4.7).*

Before starting measurements, the instrument should be calibrated using the recommended sound calibrator (see Chapter 3.2).

2.2 INPUT AND OUTPUT SOCKETS OF THE INSTRUMENT

Instrument top cover

The measurement **Input** is located in the centre of the top cover of the instrument. The microphone capsule has a special locking ring with a screw. The ring should only be tightened to a slight resistance. A full description of the microphone connector is given in Appendix C.



Instrument bottom cover

There is only one socket in the bottom cover – **USB** (type C).

The **USB-C Device** 2.0 interface is the serial interface that operates at 12 MHz clock in Full Speed mode and at 480 MHz in High Speed mode, which is a default mode of the instrument. The USB-C socket is described in detail in Appendix C.

Note: *Always switch off the instrument before connecting it to other equipment (e.g., a printer or a PC) or before fitting the microphone capsule.*

2.3 INSTRUMENT POWER

SV 973A can be powered from one of the following sources:

- Four AAA standard size batteries fitted internally. In the case of the alkaline type, a new fully charged set can operate for more than 20 hours (6.0 V / 0.8 Ah). Measurements taken with the display off extend the operating time to over 30 hours. Four AAA batteries can be used instead of the standard alkaline cells (a separate external charger is required to charge them).
- **USB-C** interface – 100 mA HUB.

When the instrument is powered from internal batteries, the **"battery"** icon is displayed on the top line of the display.

The battery status can be checked on the **Battery** screen. It is also continuously indicated on the top line of the display by the number of bars in the **"battery"** icon.

If the voltage of the batteries is too low for reliable measurements, the icon will be red and when you try to switch on the instrument, the message **Low Battery!** Will appear on the display for 2 seconds and the instrument will switch off automatically.

To power the instrument from the USB-C interface, connect its **USB** port to a PC or other USB power source using the SC 158 cable.

When the USB power is connected, the instrument automatically switches from the internal battery power to the USB power. When the USB power is disconnected, the instrument automatically switches to internal battery power.

Note: *When the instrument is powered via USB, the internal batteries will discharge slightly. Be aware of this effect and remove the battery if you do not want it to discharge.*

Note: *Only use high quality USB-C cables, such as SC 158. Many inferior cables do not ensure low resistance of the cable and thus prevent proper operation of the instrument.*

When powered from the USB-C source, the **"USB"** or "**plug**" icon is displayed at the top of the display and the **Battery** screen displays the source voltage.

Note: *If the **"battery"** icon is red, it is strongly recommended to use the USB-C power as soon as possible to ensure reliable operation. If no suitable external power source is available, the instrument will automatically switch off after a short time!*

Prolonging the internal power source of the instrument can be achieved by using the LCD screen **Dim Mode**. You can configure the power saving function (**Dim Mode**) in the **Screen Set.** screen (*path: <Menu> / Display / Screen Set.)*.

2.4 CONTROL KEYS

The instrument is controlled in a fully interactive manner using the control keys and the configuration menu.

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

- **<ESC>**
- **<Enter>**
- ▲, ◄, ►, ▼
- **<Shift>** ⇧
- **<Start/Stop>**

The name given in (...) brackets denotes the second function of the key, which is available when pressed it in conjunction (or in sequence) with the **<Shift>** key.

<Shift> The second function of a key can be used when the **<Shift>** key is pressed with **<ESC>** or the arrow keys. This key can be used in two different modes, configured in the **Keyboard** screen (*path: <Menu> / Instrument / Keyboard*):

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

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

<Start/Stop> This key starts or stops the measurement.

<Enter> This key opens the selected item in the menu and confirms the selected settings. In the Measurement mode, it switches between sub-views. Some additional functions of this key will be described in the following chapters of this manual.

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

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

◄ / ► These keys allow you in particular to:

- change viewed result in the measurement mode,
- select the column in a multi-column parameter list,
- select the parameter value in an active item (e.g., filter **Z**, **A**, **C** etc., **Start Delay** period: **1s**, **2s**, **3s**, … etc.). In the case of numerical values, it speeds up selecting by pressing and holding,

- control the cursor in Spectrum and Logger views,
- select position of a character in the text editor screen.

(◄ / ►) These ◄ / ► keys, used in conjunction with **<Shift>**, allow you in particular to:
- select parameter value in an active item (e.g., filter **Z**, **A**, **C**; integration period: **1s**, **2s**, **3s**, … etc.),
- move the cursor from the first to the last position on the graph and back again.

▲ / ▼ These keys allow you in particular to:
- select item in the list,
- select character in the text editor screen.

(▲ / ▼) These ▲ / ▼ keys, used in conjunction with **<Shift>**, allows you in particular to:
- change view in Measurement mode,
- change relationship between Y-axis and X-axis in the Logger and Spectrum views,
- set the Real Time Clock (**RTC**) and **Timer**.

<Shift>+<ESC> This key combination temporarily interrupts the measurement. When no measurement is in progress, this key opens the Setup Manager menu.

<REC> Pressing the ◄ and ► keys simultaneous starts the recording of a voice comment (see Chapter 8.3).

2.5 WORKING WITH THE INSTRUMENT

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

The instrument is equipped with a high contrast OLED colour display (96 x 96 pixels), which displays the measurement results and the configuration menu.

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

Switching on the instrument

To switch on the instrument, press the **<Shift>** and **<Start/Stop>** keys simultaneously. The instrument will perform the self-test routine on power-up (displaying the manufacturer's logo) and enter the Running SPL view, if it was enabled, otherwise enter the One Profile view.

2.5.1 *Measurement mode*

The measurement results can be displayed in several views, depending on the selected **Measurement Function**. You can activate/deactivate views and switch between them by pressing the **<ESC>** key or the ▲ / ▼ keys pressed together with **<Shift>**.

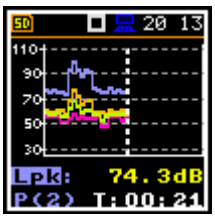
Measurement views

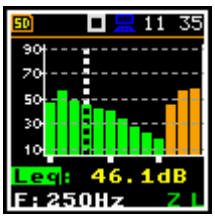
In the measurement views, the readings are displayed as well as additional information using icons relating to:

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

Some views are always available, others can be activated or deactivated in Configuration mode.

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





In some views you can switch between sub-views by pressing the **<Enter>** key.

<ENT>

All icons are described in Chapter 2.7, other fields and view control functions are described in Chapter 5.

Starting a measurement

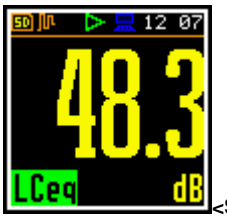
To start a measurement, press the **<Start>** key. The flashing icon will appear, and the measurement will be taken using the current settings, stored in the instrument's internal memory. During the measurement the shape of the icon will change from self to contoured.

<Start>

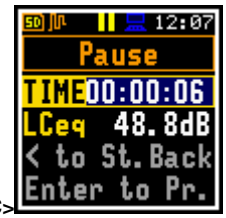
The time elapsed since the start of the measurement (elapsed time) is displayed in the lower right corner of the measurement screen in the format **mm:ss** in the range from 00:00 to 59:59, or in the format **hh:mm:ss** in the range from 01:00:00 to 99:59:59, or in the format **xxxh** from 100h to 999h,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

Pausing a measurement

To pause a measurement, press the **<Shift>** and **<ESC>** key together. The measurement will be paused and the icon will appear along with the **Pause** screen.



<Sh+ESC>



The Pause mode, the ◄ key can be used to erase up to 30 last seconds of the measurement. Each press deletes one second of the measurement, reducing the elapsed time.

This can be useful if, for example, the measurement is temporarily disturbed by an event that should not normally occur.

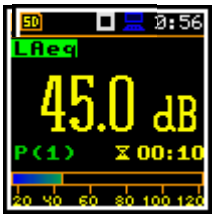
◄ ..◄

To continue the measurement, press **<Enter>**.

Stopping a measurement

To stop a measurement, press the **<Stop>** key. The icon will appear.

<Stop>



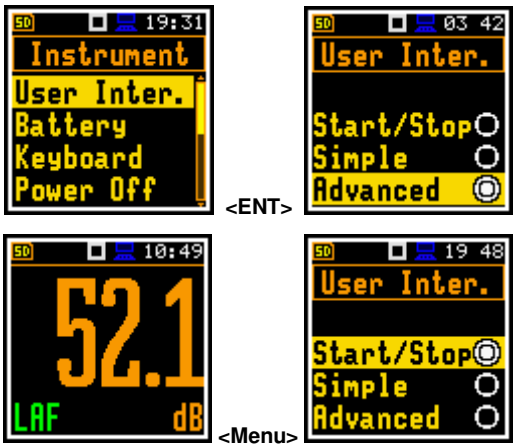
2.5.2 Configuration mode

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

User interface options

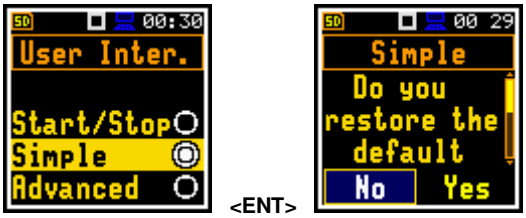
There are three user interface options that determine the level of functionality available: **Start/Stop**, **Simple** or **Advanced**. These options can be selected from the **User Inter.** screen of the **Instrument** section. The **Simple** option allows basic instrument settings to be made, while the **Advanced** option allows the full range of settings to be made. Many screens can therefore have a different appearance depending on the selected option.

The **Start/Stop** option limits the menu to only one **User Interface** item in the main menu and measurement screens.



Note: *For parameters that are hidden in the* ***Simple*** *interface, the instrument will use settings previously defined in the* ***Advanced*** *interface or default settings.*

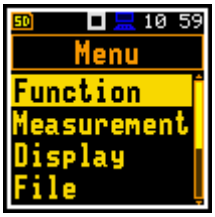
If the **Simple** interface is selected after **Advanced**, the instrument proposes to restore the default settings by asking the following question: **Do you restore the default value of the advanced settings?** If **No** is selected, all the parameters hidden in the **Simple** interface will have the settings defined in the **Advanced** interface. If **Yes** is selected, the instrument resets all the hidden parameters to their default values.



Note: *Most of the screens in this manual are shown in the* ***Advanced*** *interface.*

Main Menu

The main **Menu** contains six sections (submenu), grouping configuration settings: **Function**, **Measurement**, **Display**, **File**, **Instrument**, **Auxiliary Setup** and **Report**. The main **Menu** is accessed by pressing the **<Menu>** key (**<Shift>** + **<Enter>**).

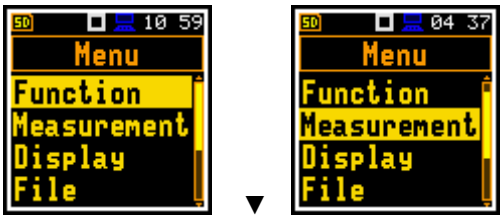


Recent Items list

A double press on the **<Menu>** key opens the list of recently used menu items. This provides quick access to the most frequently used lists of parameters and options, without having to scroll through the entire menu.

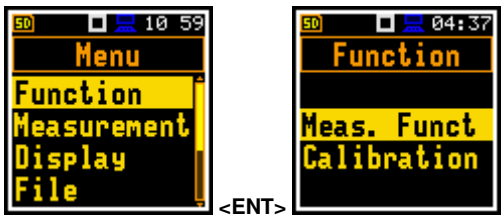
Selecting an item

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



Entering an item

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



List of parameters

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

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

If the parameter has a numerical value, you can speed up the selection by pressing the ◄ or ► key for more than 2 seconds. The parameter will change automatically until you release the keys.

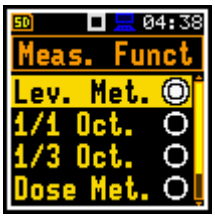
The numerical parameter value can be changed by a larger increment (10 or 20) by pressing the ◄ / ► key together with **<Shift>**.

Matrix of parameters

When a list of parameters consists of more than one column you may change:

- column with the ◄ / ► key
- line with the ▲ / ▼ key
- value in a selected position with the ◄ / ► key pressed with **<Shift>**
- all values in a line with the ▲ / ▼ key pressed with **<Shift>**
- all values in a column, if the cursor is on one of Profile positions, with the ◄ / ► key pressed with **<Shift>**
- all values in a matrix, if the cursor is on one of Profile positions, with the ▲ / ▼ key pressed with **<Shift>**.

Options list



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

Complex parameters

For complex parameters consisting of more than one value item, such as **RTC**, first select the item with the ◄ / ► / ▲ / ▼ key and then change the value with the ◄ / ► key pressed with **<Shift>**.

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

Text editor screen

The text editor screens allow you to edit lines of characters (file names, directory name, etc.) The text editor screen is opened with the ◄ / ► key when the item with the text parameter is selected. These screens provide help information on how to edit text.

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

Information screen

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

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

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

Help information

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

For example, **Delete: Shift <** means that you can delete the selected item by pressing the ◄ key with **<Shift>**.

Inactive parameters

If some functions or parameters are not available, the menu items associated with that function will be inactive (their colour changes to grey).

For example, if **Logger** (*path: <Menu> / Measurement / Logging / Logger Set.)* is switched off, some other **Logging** items will be inactive!

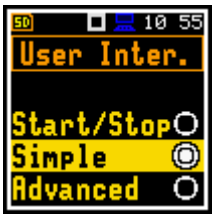
2.6 DEFAULT SETTINGS

Factory settings

The instrument is supplied with default settings, which you can change, but always return to them using the **Factory Settings** function in the **Auxiliary Setup** section.

The following chapters of the manual describe in detail what each parameter means and how to change the instrument's settings.

Main default settings



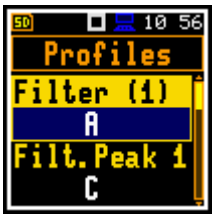
By default, the instrument has the **Simple** interface and is configured as a Sound Level Meter (**Measurement Function: Level Meter**) to measure sound pressure level using three virtual meters, called profiles, with a 1 second delay from the **<Start>** key press, infinite integration time (**Integration Period: Inf**), and linear Leq integration (**LEQ Integration: Linear**).

Sound pressure is measured with free field compensation for microphone noise and case effect (**Microphone: On**, **Field Comp.: Free Field**, **Windscreen: On**), active logging of the selected results (**Lpeak**, **Lmax**, **Lmin** and **Leq**) with 1 second step for all profiles and summary results saving.

Other functions such as measurement trigger, logger trigger, event recording and timer are disabled.

The logger and summary results are automatically saved to the file with the name specified in the **Logger Setup** screen (**Logger Name: Lxxxx**). The logger results are logged with 1 second step (**Logger Step: 1s**). Logger splitting is **Off**.

Default profile settings:



Profile 1 - **C** weighting filter for Peak results (**Filt.Peak(1)=C**), **A** weighting filter for other results (**Filter(1)=A**), **Fast** for the LEQ detector (**Detector(1)=Fast**);

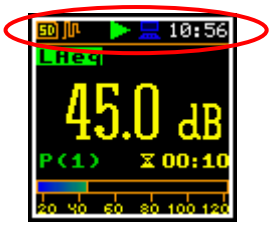
Profile 2 - **C** weighting filter for Peak results (**Filt.Peak(2)=C**), **C** weighting filter for other results (**Filter(2)=C**), **Fast** for the LEQ detector (**Detector(2)=Fast**);

Profile 3 - **Z** weighting filter for Peak results (**Filt.Peak(3)=Z**), **Z** weighting filter for other results (**Filter(3)=Z**), **Fast** for the LEQ detector (**Detector(3)=Fast**);

You can change all the above settings using the **Profiles** item in the **Measurement** section. The instrument remembers all changes until the next time it is used. You can return to the default settings (set by the manufacturer) using the use of the **Factory Set.** item in the **Aux. Setup** section.

2.7 DESCRIPTION OF ICONS

Instrument status Indicators



Additional information on the status of the instrument is provided by the row of icons on the top line of the display.

The real time clock (RTC) is also displayed on the same line together with icons.

Meanings of icons are as follows:

	The „**measurement**" icon is displayed when the measurement is in progress and the icon shape changes from self to contoured.		The "**SD card**" icon is displayed when the SD card memory is in use and there is free space. The grey colour of the icon indicates that the card memory is full.
	The "**waiting**" icon is displayed when the instrument is waiting for the measurement to start after the **<Start>** key has been pressed, due to a start delay or a delay caused by a trigger.		The "**no card**" icon is displayed when the SD memory card is malfunctioning.
	The **"stop"** icon is displayed when the measurement is stopped.		The **"pause"** icon is displayed when the measurement is paused.
	The "**overload**" icon is displayed if an overload was registered during the measurement.		The "**underrange**" icon is displayed if an underrange was registered during the measurement.

	The “**logger**” icon is displayed when the current measurement results are being logged to the logger file. The grey colour of the icon indicates that the instrument is waiting for logging to start after the **<Start>** key is pressed, due to a start delay or a delay caused by a trigger.		The “**signal**” icon is displayed during waveform recording. The grey colour of the icon indicates that the instrument is waiting for the waveform recording to start after the **<Start>** key is pressed, due to a start delay or a delay caused by a trigger.
	The **“battery”** icon is displayed when the instrument is powered from the internal batteries. The colour of the icon corresponds to the state of charge of the batteries (green - 30÷100%, yellow – 10÷30%, red – less than 10%).		The **“clock”** icon is displayed when the timer is **On**. It is active when the instrument is waiting for the start of the measurement. When it is about to start, the icon turns green and starts flashing.
	The **“level+”** icon is displayed when the “**Level+**” trigger is waiting for a condition to be met. The icon will alternate with the „wait”, “logger” or “wave” icons.		The **“level-”** icon is displayed when the “**Level-**” trigger is waiting for a condition to be met. The icon will alternate with the „play”, “logger” or “wave” icons.
	The **“slope-”** icon is displayed when the “**Slope-**” trigger is waiting for a condition to be met. The icon will alternate with the “wave” icons.		The **“slope+”** icon is displayed when the “**Slope+**” trigger is waiting for a condition to be met. The icon will alternate with the “wave” icons.
	The **“trigger”** icon is displayed when trigger other than Level or Slope is waiting for a condition to be met. The icon will alternate with the “play”, “logger” or “wave” icons.		The **“Bluetooth”** icon is displayed when *Bluetooth®* is switched on. The color of the icon indicates the status state of the connection: green – connected, grey – disconnected.
	The „**USB**” icon is displayed when there is USB connection with a PC.	Sh	The **“shift”** icon is displayed when the **<Shift>** key is pressed.
	The **“RS232”** icon is displayed when the RS232 port is active.		The “**plug**” icon is displayed when the instrument is powered from the USB-C port without using the USB interface.

2.8 OVERLOAD AND UNDERRANGE DETECTION

Overload detectors

The instrument has built-in overload detectors. Overload conditions of both the A/D converter and the input amplifier are detected. Overload in the measuring channel (in its analogue part) and overload of the analogue/digital converter are both detected. The "overload" indication appears when the input signal amplitude is 0.5 dB above the declared "Peak measurement range". This condition is checked once per second or with the logger step if it is less than 1 second.

An overload is indicated by the flashing ⇧ icon displayed from the time the overload is detected until the end of the integration period. If the overload disappears by the end of the integration period, the overload icon will not be displayed from the start of the next measurement cycle.

When an overload is detected, the special marker is recorded to the logger file with the data logging step.

The overload time is measured by the **OVL** result during the integration period and saved in the logger file as part of Summary Results.

Underrange detector

The instrument has a built-in underrange detector. The “underrange” indication appears when the RMS value for the elapsed time is below the lower linear operating range. This condition is checked once per second.

An underrange is indicated by the flashing icon displayed during the underrange detection period. If an underrange is detected up to the integration period, the special marker will be recorded to the logger file with the Integration Period step. If the signal level increases during the integration period and the total RMS is greater than the minimum, the icon will disappear and the underrange marker will not be recorded.

2.9 SAVING DATA

The instrument creates files of the next types:

- Logger files containing measurement results (extension **.SVL**)
- Wave files containing signal waveform (extension **.WAV**)
- Setup files containing measurement and instrument configuration (extension **.SVT**)

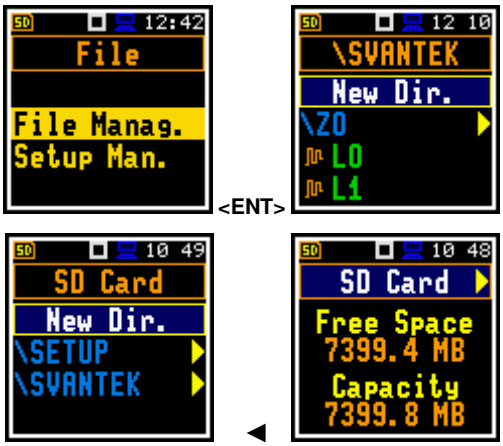
A detailed description of the structures of all file types is given in Appendix B.

Memory type

All files are stored in the instrument memory in the predefined or assigned directories. Setup files are stored in the predefined SETUP directory. The non predefined directories can be changed or renamed by the user.

File Manager

File Manager is used to check the contents of memory and perform operations on files and directories such as renaming, deleting, viewing information and creating new directories.



The instrument memory is organised as a standard memory with directories and subdirectories (FAT32 file system). It is possible to create or delete directories.

The contents of the memory can be checked using the **File Manager** item in the **File** section.

Automatic saving of logger and wave files

Logger and wave files are created and saved automatically. To enable automatic saving, several conditions should be met:

1. There should be enough free space in the memory.
2. The **Logger** (*path: <Menu> / Measurement / Logging / Logger Set.*) and/or **Recording** (*path: <Menu> / Measurement / Logging / Wave Rec.*) should be enabled.
3. The new file should be given with a unique name (*path: <Menu> / Measurement / Logging / Logger Set. / Logger Name* and *path: <Menu> / Measurement / Logging / Wave Rec. / File Name*).

Files are saved in the directory set as the working directory. The default working directory (after using the **Factory Settings** function) is called **SVANTEK**.

Note: *The "logger" icon is displayed during the measurement run with data logging to the logger file. If the signal is recorded to the wave file, the "signal" icon is displayed.*

The file name (Logger or Wave) is automatically generated using a pattern **LLdd**, where **LL** is the string of letters (called the prefix) and **dd** is a string of digits forming a number. Up to 8 characters can be used to name a file.

The default prefix is **L** for the logger files and **R** for the wave files.

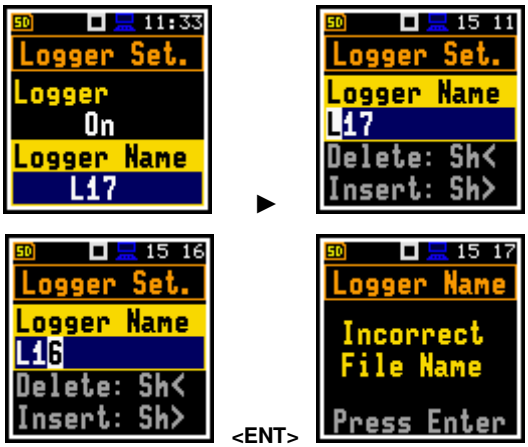
The instrument assigns an individual counter to each prefix of files created by the user and saved in the working directory. The counter value is equal to the maximum number in the set of files with the same prefix. For example, if there are files named **L0**, **L15** and **L16**, the counter will be 16.

The number of the new automatically created file will increase the value of the counter by one. So, in the example above, the new file name will be **L17**.

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

If you change the number in the file name without changing the prefix and press **<Enter>**, the counter will be automatically adjusted.

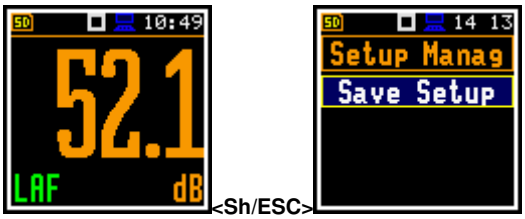
The instrument will only accept the name whose number is greater than the prefix counter.



Saving Setup files

Setup files can be created using the **Setup Manager** or from the measurement screen by pressing **<ESC>** with **<Shift>** when a measurement is not in progress.

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



2.10 DOWNLOADING AND UPLOADING FILES

All measurement and setup files stored in the instrument's memory can be downloaded to a PC using the *SvanPC++* or *Supervisor* software, which provides the user with download and upload functions as well as the data viewing and data processing options. In this case, the instrument should be connected to a PC via the SC 158 USB-C cable.

SvanPC++ and *Supervisor* also provide upload functions (usually for setup files).

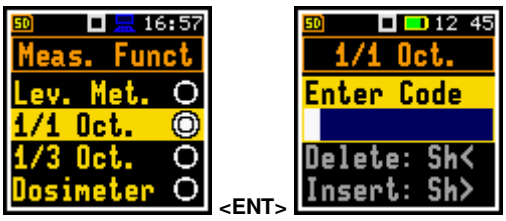
Note*: Working with SvanPC++ and Supervisor software is described in detail in "SvanPC++ User Manual" and "Supervisor User Manual".*

2.11 ACTIVATING OPTIONAL FUNCTIONS

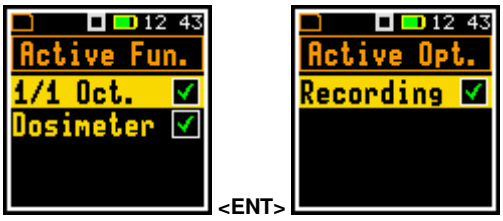
The standard instrument firmware contains all the basic functions to perform measurements according to most international standards and methods. For more complex tasks, additional functions can be added to the instrument. These functions include 1/1 and 1/3 octave analyser, waveform recording, reverberation time and STIPA measurement.

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

The optional function is activated the first time you try to use it. For example, if **1/1 Octave** was locked, but is later purchased, the first time you try to switch it on, the instrument will require you to enter the special code that unlocks this option. Once unlocked, the option is permanently available.

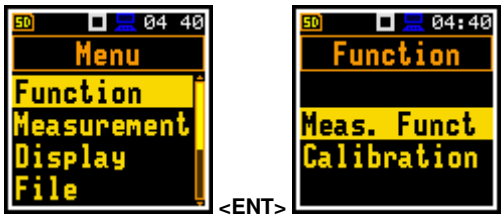


You can check and lock options that were previously unlocked in the special **Active Functions** and **Active Options** screen that opens when you press the **<Shift>** and ◄ keys immediately after switching on the instrument. You should hold keys down for the first half of the system initialisation until the **Active Fun.** screen opens. To access the **Active Opt.** screen, press the **<Enter>** key.



3 MEASUREMENT FUNCTIONS AND CALIBRATION – Function

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



3.1 ACTIVATING MEASUREMENT FUNCTIONS – MEASUREMENT FUNCTION

The main function of the instrument is to measure the broadband sound pressure level (**Lev. Met.**). The Sound Level Meter (SLM) function meets the IEC 61672-1:2013 standard for Class 1 accuracy. The instrument can also be used for medium to long term acoustic monitoring using the high capacity data logger which can store all measurement results.

You can also use the 1/1 and 1/3 octave band real-time analysis (**1/1 Oct.**, **1/3 Oct.**) and dosimeter (**Dosimeter**) options. These options extend the main Level Meter functionality of the instrument, by performing the 1/1 or 1/3 octave analysis and dose meter measurements are performed along with all calculations of the broadband Level Meter results (**1/1.&Dose** and **1/3.&Dose** functions provide 1/1 and 1/3 octave analysis along with dose calculations).

To activate a function, open the **Meas. Funct** list and select the required function: **Lev. Met.**, **1/1 Oct.**, **1/3 Oct.**, **Dosimeter**, **1/1.&Dose**, **1/3.&Dose**, **RT60** or **STIPA**.

Note: *The type of measurement function is not displayed on the screen, so the user should remember the currently selected function!*

Note: *The **1/3 Octave**, **RT60** and **STIPA** functions are optional and should be unlocked by entering an activation code in the text editor screen that opens after the first attempt to select them. Once unlocked, these functions are permanently available.*

The optional functions can be included with the instrument as supplied or purchased at a later date if required.

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

3.2 CALIBRATION OF THE INSTRUMENT – CALIBRATION

The instrument is factory calibrated with the supplied microphone for the reference environmental conditions (see Appendix C). The sensitivity of the microphone is a function of the temperature, ambient pressure and humidity, and if the absolute value of the sound pressure is required, the absolute calibration of the measurement channel should be performed. To select the calibration function, open the **Calibration** menu.

The automatic calibration option allows the instrument to perform the sound calibration automatically when the calibrator is placed over the microphone (switched on or with the auto run function). The calibration signal is automatically detected, and the calibration measurement is automatically started. Simply press <Enter> to accept the calibration results. No measurement can be made while automatic calibration is in progress.

Note: *SV 973A has two different dynamic ranges - one dedicated to the SLM functions (**Level Meter**, **1/1 Octave**, **1/3 Octave**, **RT60** and **STIPA**) and another dedicated to the SEM functions (**Dosimeter**, **1/1.&Dose**, **1/3.&Dose**) – see Chapter 4.6 and 11.4. The instrument therefore uses two different calibration factors, both calculated during calibration.*

In the **Simple** user interface, the **Calibration** list includes items that allow you to calibrate the instrument using the sound calibrator (**By Measurement**), review and clear previous calibration records (**Last Calibration**, **Calibration History**, **Clear History**), add current calibration results to the logger file (**Post Calibration**).

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In the **Advanced** user interface, there is an additional item in the **Calibration** list (**Auto Calibration**), which allows you to enable the auto calibration function.

Note: *It is recommended to calibrate the instrument each time before starting measurements. A single calibration at the beginning of each day is usually sufficient for most regulations.*

Note: *The calibration factor is always added to the measurement results and range limits of all measurement functions.*

Note: *The recommended factory calibration interval is 12 months to ensure continued accuracy and compliance with international regulations. Please contact your local Svantek representative for further details.*

Note: *It is possible to perform a "By Sensitivity" calibration by setting the calibration factor using a special command, see Appendix A.*

3.2.1 Calibration – By Measurement

To calibrate the instrument:

1. Set the calibration level (**Cal. Level**), see Appendix C, Chapter C.1, par. Calibration.
2. Carefully place the sound calibrator (SV 34B or equivalent 94/114 dB @ 1000 Hz) over the microphone of the instrument.

Note: *It is also possible to use an electromechanical pistonphone, which generates a signal (ca 124 dB), or another type of sound calibrator designed for ½" microphones.*

3. Switch on the calibrator (if the used calibrator you are using doesn't have an auto run function) and wait about 30 seconds for the tone to stabilise before starting the calibration measurement.
4. Start the calibration measurement by pressing the **<Enter>** or **<Start>** key.

The calibration delay time is set to 3 seconds. While waiting for the measurement to start, the **Delay** will count down on the display.

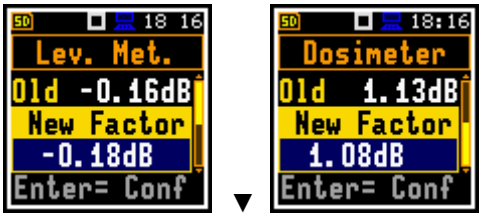
The calibration process is divided into Level Meter calibration and Dosimeter calibration. The progress bar shows the overall progress of the calibration.

During the first calibration, the level of the calibration signal measured by the Level Meter is displayed until the measurement result stabilises (the maximum difference between three consecutive 1-second LCeq results should be less than **0.05 dB**). The calibration result is then displayed.

During the second calibration, the level of the calibration signal measured by the Dosimeter is displayed until the measured result stabilizes (the maximum difference between three consecutive 1-second LCeq results should be less than **0.05 dB**).

After the second calibration stop, the calibration factor for the Level Meter is displayed first.

Use the ▼ key to scroll to the Dosimeter part.



It is recommended to repeat the calibration measurements several times. The results obtained should be almost the same (with a difference of ±0.1 dB). The 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 nearby,
- damage to the calibrator or measurement channel (microphone, preamplifier or instrument itself).

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

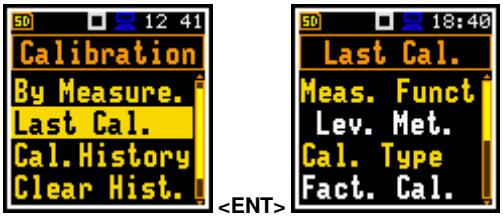
5. Press **<Enter>** to accept and save the new calibration factors.
6. Detach the calibrator from the microphone.

Note: If the calculated calibration factor is outside the ±3 dB range, the warning "*Microphone outside the tolerance. Accept?*" will appear on the screen. If the calibration drift is outside the ±20 dB range, the header of the screen turns red: **Calibration**.

Note: *To exit the calibration procedure without saving the calibration factor, press* ***<ESC>****.*

3.2.2 Last calibration record – Last Calibration

The **Last Cal.** screen displays the information about the last calibration record for the current measurement function: the measurement function for which calibration was performed (*Level Meter* or *Dosimeter*), the type of calibration (*Factory Calibration*, *By Sensitivity* or *By Measurement*), the date of calibration and the calibration factor.



3.2.3 History of calibrations – Calibration History

The **Cal. History** screen displays a list of calibration records.

Note: *After calibration, the instrument creates two calibration records with the same date –for the Level Meter and for the Dosimeter.*

The calibration record contains information about the measurement function for which the calibration was performed (*Level Meter* or *Dosimeter*), the type of calibration (*Factory Calibration*, *By Sensitivity* or *By Measurement*), the date of calibration and the calibration factor.

Note: *Each time you return to the factory settings without keeping the last calibration (see Chapter 8.2), the new record appears in the list that indicates the Factory calibration of the instrument.*

3.2.4 Erasing calibration records – Clear History

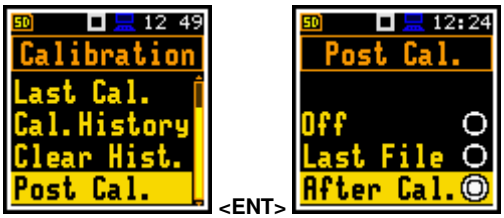
To delete all records in the calibration history list, select the **Clear Hist.** item and press **<Enter>**.

The instrument requests will ask you to confirm the deletion.

3.2.5 Post measurement calibration – Post Calibration

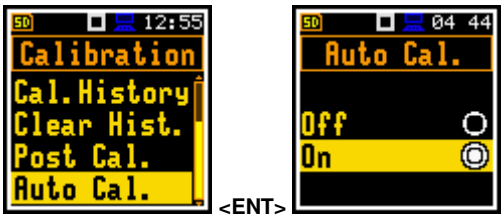
Some regulations require that post-measurement calibration information be added to measurement files created prior to such calibration. The last calibration factor is for informational only, as it was not taken into consideration during the measurement.

The **Post Cal.** screen offers three options: no saving (**Off**), save in the last file created (**Last File**) or save in the files created after the last calibration (**After Cal.**).



3.2.6 Automatic calibration – Auto Calibration

The **Auto Cal.** item allows you to perform automatic calibration when the sound calibrator is attached. In this case, the "Calibration by measurement" screen will appear automatically. If **Auto Cal.** is off, the user should access this screen from the menu.



The automatic calibration function has been implemented to make calibration as easy as possible and to allow the user to calibrate the instrument with a minimum of steps.

When Auto Calibration is enabled, the unit periodically compares the measured signal level (Running SPL for 1 second) with the reference calibration level when it's not performing a measurement and starts the calibration measurement if the stable SPL result is within ±5dB of the calibration level.

To perform the automatic microphone calibration, follow the steps below:

1. Switch on the instrument.
2. Attach the SV 34B (or equivalent 94/114 dB @ 1000 Hz) calibrator to the microphone and switch it on (if the calibrator you are using doesn't have an automatic switch-on function).

Generated by the calibrator sound pressure level triggers the Automatic Calibration process if the difference between the **Calibration Level** value set up in the **Calibration** screen and the measured SPL level generated by the calibrator is in the range **±5 dB**. The calibration process is similar as in case of calibration **By Measurement**.

The sound pressure level generated by the calibrator will trigger the automatic calibration process if the difference between the **Calibration Level** value set in the **Calibration** screen and the measured SPL level generated by the calibrator is within ±5 dB. The calibration procedure is similar to the calibration **By Measurement** procedure.

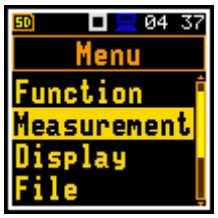
Note: *Automatic calibration is performed in relation to the calibration level set in the* ***By Measurement*** *screen.*

3. Press **<Enter>** to accept and save the new calibration factors.
4. Detach the calibrator from the microphone.

Note: If the calculated calibration factor is outside the ±3 dB range, the warning "*Microphone outside the tolerance. Accept?*" will appear on the screen. If the calibration drift is outside the ±20 dB range, the header of the screen turns red: **Calibration**.

4 CONFIGURING MEASUREMENT PARAMETERS – Measurement

The **Measurement** section combines elements related to the configuration of measurement parameters.



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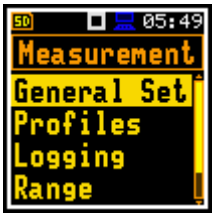
The contents of the **Measurement** list depend on the user interface (**Simple** or **Advanced**) and the measurement function selected. Two example **Measurement** screens are shown for the **Advanced** and **Simple** interfaces.



The **Measurement** section contains the following items which allow you to:

General Set	set general measurement parameters,
Meas. Trig.	set the measurement trigger; this item only appears in the **Advanced** interface,
Profiles	set profile specific parameters in the **Level Meter** function,
Profile 1 (2,3)	set profile specific parameters in the **Dosimeter** function;
Alarm	set alarms; this item only appears in the **Dosimeter** function and in the **Advanced** interface,
Logging	set the logger,
Spectrum	set the spectrum parameters; this item only appears in the 1/1 and 1/3 octave analysis functions,
Range	check the current measurement range,
Comp. Filter	switch on the required compensation filter,
Stat. Lev.	set 10 statistical levels,
Exp. Time	set the exposure time for dose measurements; this item only appears in the **Dosimeter** function and in the **Advanced** interface,
Timer	set the internal timer; this item only appears in the **Advanced** interface.

4.1 SETTING GENERAL MEASUREMENT PARAMETERS – GENERAL SETTINGS

The **General Set** screen allows you to set the general measurement parameters: delay of the start of the measurement (**Start Delay**), synchronisation with the instrument's RTC (**Start Sync.**), period of integration of the measurement results (**Integr. Per**), repetition of the measurement cycles (**Rep. Cycles**), type of the LEQ detector (**LEQ Integr.**) and duration of the day period (**Day Time L.**).

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Start delay

The **Start Delay** item defines the delay time between pressing the **<Start>** key and to the actual start of the measurement (the instrument's digital filters of continue to analyse the input signal even when the measurement is stopped). This delay can be set between 0 seconds to 60 minutes. The default value is **1s**.

Note: *In the **Simple** interface, the **Start Delay** item is hidden, but the instrument uses the settings previously defined in the **Advanced** interface or the default settings (**1s**).*

Note: *During calibration, the start delay is always 3 seconds.*

Note: *When the instrument is switched on, it takes 30 seconds to warm up. The instrument will not start a measurement until 30 seconds have elapsed if you press the <Start> key earlier.*

Synchronisation of measurements

The **Start Sync.** item defines the points of synchronisation measurements with the instrument's RTC. The **Start Sync.** item can be set to **Off**, **1m**, **15m**, **30m** and **1h**. For example, if **1h** is selected, the measurement will start from the beginning of the first second of the next hour after the **<Start>** key is pressed and will be repeated from the first second of the next hour after the integration period has elapsed if the number of cycles is greater than one. The default value is **Off**.

Integration period

The **Integr. Per** item defines the period over which the signal is measured (and for some results averaged/integrated) and the measurement results are logged to the logger file as **Summary Results** (see **Logger Setup** description). The integration period can be infinite (**Inf**) or selected from the set: **24h**, **8h**, **1h**, **15m**, **5m**, **1m**, from **1s** to **59s** with 1s increments, from **1m** to **59m** with 1m increments, from **1h** to **24h** with 1h increments.

During the integration period, the instrument takes a series of 1-second measurements and averages them with the results averaged over the n-1 seconds. The averaged results are displayed and updated every second for the elapsed measurement time (n seconds). At the end of the integration period, the averaged results are stored in the logger file, if such storage is enabled.

At the end of the integration period, the measurement is automatically stopped and restarted if the number of measurement repetitions (**Rep. Cycles**) is greater than one.

The definitions of the measurement results are given in Appendix D.

Number of measurement cycles

The **Rep. Cycles** item defines the number of measurements (made with the measurement period defined in the **Integr. Per** item) that the instrument will perform after the **<Start>** key is pressed. The values of **Rep. Cycles** are within the limits [Inf, 1÷1000]. The default value is **1**.

For example, if **Integr. Period** equals 8 hours and **Rep. Cycles** equals 2, the instrument will make a first measurement for the 8-hour period and a second measurement for the 8-hour period from the end of the first measurement. At the end of each cycle the 8-hour LEQ is stored in the logger file.

Note: *In the **Simple** interface, the **Rep. Cycles** item is hidden, but the instrument uses the settings previously defined in the **Advanced** interface or the default settings (**1**).*

Note: *In the case of the infinite integration period or the infinite repetition cycles, the measurement should be stopped manually with the **<Stop>** key.*

Day time limits

The **Day Time Limits** item defines the day and night time limits required by the local standards. These limits are used to calculate the **Lden** result (see Appendix D for definition). Two options are available: **6H-18H** and **7H-19H**. The default value is **6H-18H**.

Note: *In the* ***Simple*** *interface, the* ***Day Time Limits*** *item is hidden, but the instrument uses the settings previously defined in the* ***Advanced*** *interface or default settings (****6H-18H****).*

Detector type

The **LEQ Integration** item defines the detector type for calculating RMS based results: **Leq**, **Lden**, **LEPd**, **Ln** and **Sel**. Two options are available: **Exponential** and **Linear**. Default value is **Linear**.

▶

Linear is required to obtain the true RMS value of the measured signal according to IEC 61672-1:2013. When this option is selected, the RMS based results do not depend on the detector time constant defined in the **Profiles** screen (*path: <Menu> / Measurement / Profiles*) (results are displayed without indication of the detectors selected in the profiles). In this case, the **Lin.** (or **L**) is displayed during the presentation of the results.

Exponential allows to meet the requirements of another standard for averaging **Leq**. When this option is selected, the RMS based results depend on the detector time constant defined in the **Profiles** screen (*path: <Menu> / Measurement / Profiles*): **Slow**, **Fast**, **Impulse**. The results are displayed with the detector type indicator selected for the profiles.

Note: *In the* ***Simple*** *interface, the* ***LEQ Integration*** *item is hidden, but the instrument will use settings previously defined in the* ***Advanced*** *interface or default settings (****Linear****).*

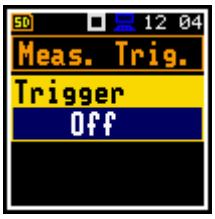
Rolling Leq

In the two items **LRx Time** you can define integration periods for the calculation of **LR1** and **LR2** results (see Appendix D). The default values are **30 m** and **60 m** respectively.

4.2 SETTING THE MEASUREMENT TRIGGER – MEASUREMENT TRIGGER

The **Meas. Trig.** item only appears in the **Advanced** interface and allows the measurement trigger parameters to be set. The **Meas. Trig.** is a contextual list of parameters in which the trigger (**Trigger**) can be switched **Off** or On by selecting the trigger type (**Slope+**, **Slope–**, **Level+**, **Level–** or **Gradient+**). If the trigger is on, additional parameters can be defined: the measurement result to be checked for a trigger condition (**Source**), the threshold level (**Level**) and the rate at which the source value changes (**Gradient**).

<ENT>

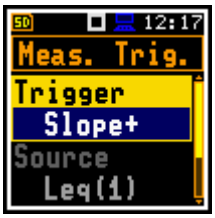


Note: *In the* ***Simple*** *interface, the* ***Measurement Trigger*** *item is hidden, but the instrument uses the settings previously defined in the* ***Advanced*** *interface or the default settings (****Trigger: Off****).*

The trigger condition is checked every 0.5 milliseconds.

Slope trigger

The **Slope +** / **Slope–** trigger starts the measurement with the duration of the **Integration Period** under the condition that the rising/falling value of the measured result (**Source**) integrated during 0.5 ms passes above/below the threshold value (**Level**).

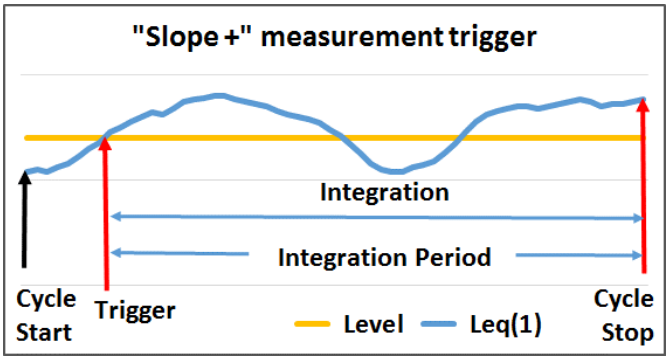


At the start of a new measurement cycle (after pressing the **<Start>** key or automatically after stopping the previous measurement cycle) the instrument checks a trigger condition every 0.5 ms and if the

condition is met, the instrument starts a continuous series of 1-second integrations, the number of which is equal to the number of seconds in the **Integration Period**.

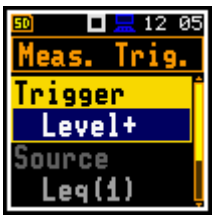
After ending the **Integration Period**, the new measurement cycle can start with above logic.

The measurement can be stopped manually at any moment with the **<Stop>** key.



Note: *When a measurement is waiting for the slope trigger, the flashing "slope" icon will overlay the „waiting" icon.*

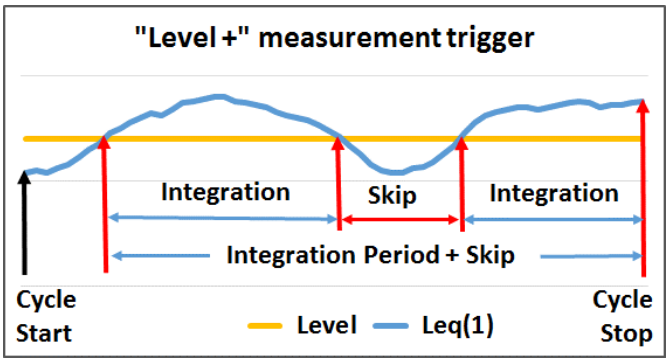
Level trigger



The **Level+** / **Level–** trigger starts the 1-second measurement under the condition: value of the RMS result (**Source**) integrated by 0.5 milliseconds is greater/lower than the threshold value (**Level**). In other cases, the instrument continues checking the trigger condition every 0.5 milliseconds.

At the start of the new cycle (after pressing the **<Start>** key or automatically after stopping the previous cycle) the instrument checks the trigger condition every 0.5 ms and starts 1-second integration if the condition is met.

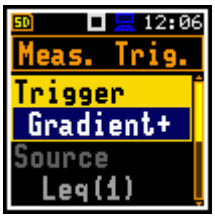
After each 1-second integration, the instrument repeats the trigger condition check every 0.5 ms and starts the next 1 second integration if the condition is met. The instrument repeats this as often as there are seconds in the integration period and stops the measurement cycle. Therefore, the series of 1-second measurements may not be continuous, and the duration of the measurement cycle may be longer than the integration period.



The measurement can be stopped manually at any time using the **<Stop>** key. Summary Results are calculated from a series of 1-second results measured during each measurement cycle and stored in a logger file.

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

Gradient trigger

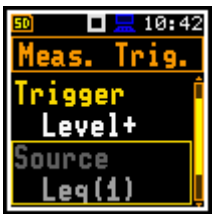


The **Gradient +** trigger starts the 1-second measurement under the condition: the value of the RMS result (**Source**) integrated during 0,5 milliseconds is greater than the threshold (**Level**) and the gradient of the Source value is greater than the gradient threshold (**Gradient**). In other cases, the instrument continues to check the trigger condition every 0.5 milliseconds.

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

Note: *When a measurement is waiting for a gradient trigger, the flashing "trigger" icon will overlay the „waiting" icon.*

Source

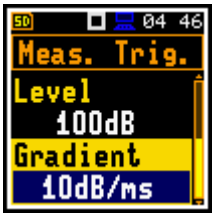


Only one measurement result (**Source**) can be used to check the trigger condition in the **Level Meter** mode, namely the instantaneous LEQ from the first profile (with appropriate filter and detector), which is denoted here as **Leq(1)**. This item cannot be changed.

Threshold

The threshold (**Level**) can be set in the range of **24 dB** to **136 dB**. The **Source** value is compared with the **Level** value every 0.5 milliseconds.

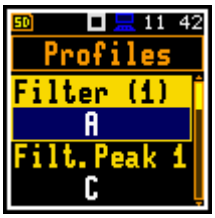
Rate of change of Source value



This item appears when the **Gradient+** trigger is selected. The rate of change of the **Source** value (**Gradient**) can be set in the range of **1 dB/ms** to **100 dB/ms**.

4.3 SETTING PARAMETERS FOR PROFILES – PROFILES

<ENT>



Parameters for three profiles can be set in the **Profiles** screen for the **Lev. Met.** function or in the **Profile x** screens for the **Dosimeter** function.

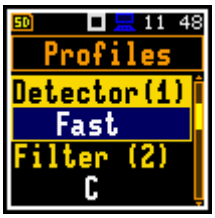
The following parameters can be set independently for each profile: the weighting filter for results other than peak (**Filter**), the weighting filter for peak results (**Filter Peak**) and the type LEQ detectors (**Detector**).

Weighting filter

Next weighting filters can be selected for the **Filter** and **Filter Peak** positions:

- **Z** Class 2 according to IEC 61672-1:201,
- **A** Class 2 according to IEC 651 and IEC 61672-1:2013,
- **C** Class 2 according to IEC 651 and IEC 61672-1:2013,
- **B** Class 2 according to IEC 651,
- **LF** low frequency filter according to China requirements.

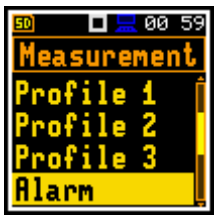
LEQ detector



The following LEQ detectors (time constants) are available: **Impulse**, **Fast** and **Slow**.

Time constants are always applied to the **Lmax**, **Lmin**, **L**(SPL), **Ltm3** and **LTeq** results and to the **Leq**, **LE**(SEL), **LEPd** and **Lden** results if the **Exponential** LEQ detector is selected in the **General Settings** list (see Appendix D).

4.4 SETTING ALARM THRESHOLDS FOR DOSE METER – ALARM



<ENT>

The **Alarm** item is only active in the **Dosimeter** function and is described in detail in in Chapter 11.6.

4.5 CONFIGURING DATA LOGGING – LOGGING

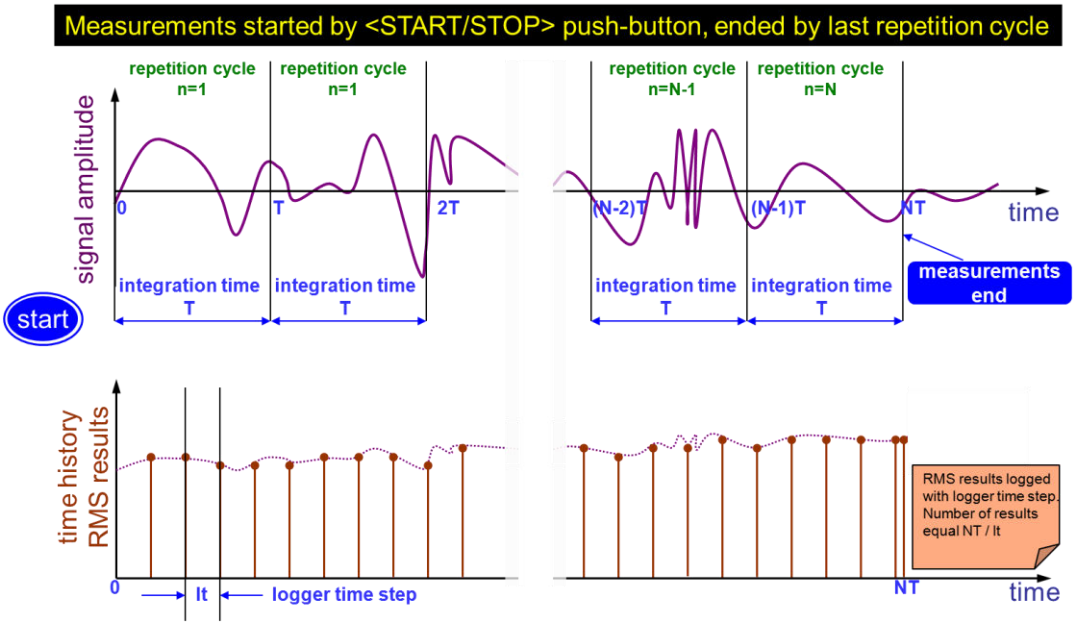
Summary results (**L**(SPL), **Leq**, **LE**(SEL), **Lden**, **LEPd**, **Ltm3**, **Ltm5**, 10 x **Ln**, **OVL**, **Lpeak**, **Lmax**, **Lmin**, **EX**, **SD** and spectra) are measured and stored in the file with the step defined by the **Integration Period** utem as many times as defined by the **Repetition Cycles** item (*path: <Menu> / Measurement / General Settings*).

The instrument also allows the additional recording of some results with a different step defined by the **Logger Step** item (*path: <Menu> / Measurement / Logging / Logger Setup*). It is therefore possible to store two sequences of measurement results in parallel – one for Summary results (SR) and another for Logger results or time history results (TH).

When **Logger** is switched on, selected logger results taken from three independent profiles are stored simultaneously with a time step down to **100 ms**. Recording of logger results to a file is stopped after a period equal to the **Integration Period** multiplied by the number of **Repetition Cycles**, or when the measurement is stopped manually.

The Summary Results are stored in the same file as the Logger Results. Blocks of summary results are written to the file at the end of each measurement cycle.

The figure below illustrates the principles for saving measurement results.



Summary Results and Logger Results logging

The **Logging** list allows you to program the logging functions: recording of Summary and Logger results in a logger file and recording of audio signal in a WAV file.

In the **Simple** interface, the **Logging** list includes only of one item - **Logger Set.**

4.5.1 Setting general logging parameters – Logger Setup

In the **Logger Set.** list you can enable logging (**Logger**) and set the general logger parameters: split the logger file (**Log. Split**), set the logging step (**Logger Step**), edit the file name (**Logger Name**) and enable logging of Summary results (**Summary Results**).

The **Logger** item switches logging **On** or **Off**.

Switching the logger on activates other items in the **Logging** list.

Note: *If **Logger** is **Off**, logger files will not be created, logger results will not be measured, and summary results will not be stored!*

Note: *The **Wave Recording** function doesn't depend on the **Logger** status. Wave files have a different format and are created when **Wave Recording** is enabled – see Chapter 4.5.4.*

Logger file split

The **Log. Split** item allows the logging data to be split into separate files. If **Log. Split** is **Off**, the data will be logged in one logger file with the name defined in the **Logger Name** item. The default value is **Off**.

In other cases, the logging is done in separate files and the logging in the new file starts at the end of the integration period (**Integr. Per**), or at every quarter of the RTC (**Sync. to 15m**), or at every half an hour of the RTC (**Sync. to 30m**), or at every hour of the RTC (**Sync. to 1h**), or at user defined times (**Spec. Time**). Whenever the split time is reached, the logger file is closed, and a new file is opened with the number incremented by one for subsequent measurement data.

Note: *In the **Simple** interface, the **Logger Split** item is hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (**Off**).*

If **Spec. Time** is selected in the **Log. Split** item, you can set six split times (**Split Time1**, **Split Time2**, **Split Time3**, **Split Time4**, **Split Time5** and **Split Time6**) changing **Off** to the desired time of the day when splitting should occur.

The **Logger Step** item defines the step for recording logger results to a file. It can be set in a range from **100ms** to **1h**. The default value is **1s**.

Note: *For logger steps smaller than 1s, the running Leq results will be calculated with a step of 1s but stored to the logger file with the logger step. In such cases the logger curve for the running Leq results will be a stepped curve.*

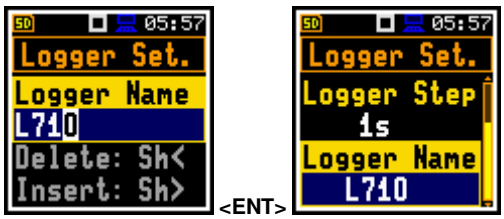
Note: *In the **Simple** interface mode, the **Logger Step** parameter is hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (**1s**).*

Logger file name

The **Logger Name** item allows you to define the logger file name. The default logger file name is **Lnn**, where **nn** is a number. The name can be up to eight characters long. Pressing the ◄ / ► key opens the special screen with the text editor.

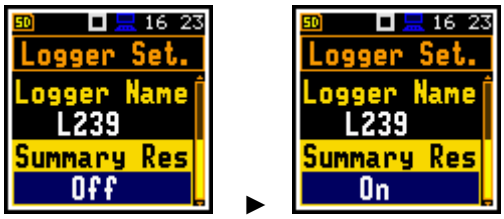
The edited name is accepted and saved when the **<Enter>** key is pressed. The special warning is displayed if the file with the same name already exists in the working directory. The instrument displays the message “Incorrect File Name” and waits for the **<Enter>** key to be pressed.

If the new name is correct, the instrument will display it in the **Logger Name** item.



Logging Summary results

The **Summary Results** item switches on or off the storage of the full set of Summary results measured by the instrument with the **Integration Period** step: main results (**L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **OVL**, **Lpeak**, **Lmax**, **Lmin**, **EX**, **SD**), statistics and spectra.



Note: *In the **Simple** interface, the **Summary Results** item is hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (**On**).*

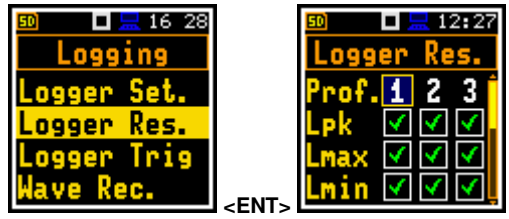
4.5.2 Selecting results for logging – Logger Results

The **Logger Results** item allows you to select results for three independent profiles to be logged in the logger file during a measurement with the **Logger Step**.

The list of logger results depends on the measurement function. For the **Level Meter** function, the following results can be logged: Lpeak (**Lpk**), **Lmax**, **Lmin**, **Leq**, **LR1** and **LR2**.

Use the ◄ / ► or ▲ / ▼ keys to select the item.

To select results to be logged, press the ◄ / ► key with **<Shift>**.

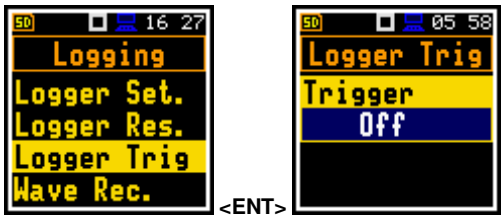


Note: *When the Logger is Off or no results have been selected for logging, the logger plot cannot be activated in **Display Modes** and will not appear on the display.*

Note: *In the **Simple** interface, the **Logger Results** item is hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (all results are selected).*

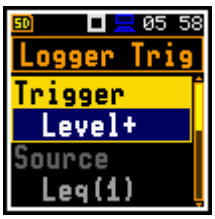
4.5.3 Logger trigger settings – Logger Trigger

The **Logger Trigger** item allows you to define how the logger results are to be recorded in the logger file. The trigger can be disabled (**Off**) or enabled if you select the trigger type in the **Trigger** item. If the trigger is enabled, other parameters can be defined: the measurement result to be checked for a trigger condition (**Source**), the threshold (**Level**) and the number of readings to be stored in the logger before the trigger condition is met (**Pre Trigger**) and the number of readings to be stored in the logger after the last trigger during logging (**Post Trigger**).



Note: *In the **Simple** interface, the **Logger Trigger** item is hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (**Trigger: Off**).*

Level trigger

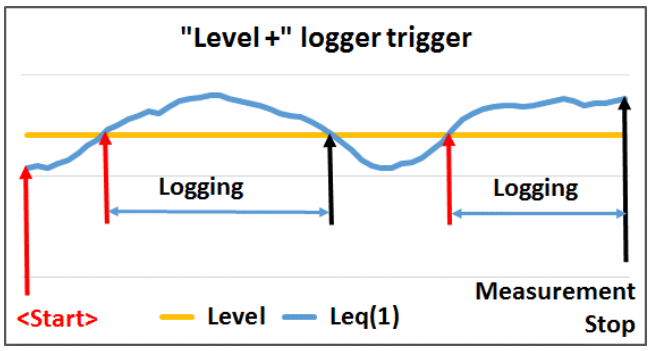


The **Level +/Level -** trigger enables the logging of logger results with the **Logger Step** under the condition: the value of the LEQ result (**Source**) measured by the **Logger Step** period is greater/less than the threshold (**Level**). In other cases, the logging is skipped.

This type of trigger makes it possible to separate the results related to the low/high noise level.

Logging can only be performed when the Summary results are being measured, i.e., from the start of the measurement to the end of the measurement.

This means, for example, that if the measurement is waiting for a trigger condition, logging will be skipped, even if the logger trigger condition is met.



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

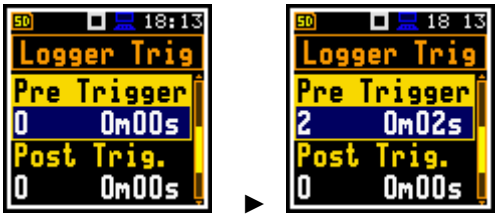
Source

Only the one measurement result (**Source**) can be used to check the trigger condition in the **Level Meter** mode, namely the instantaneous LEQ from the first profile (with appropriate filter and detector), denoted here as **Leq(1)**. This item cannot be changed.

Threshold

The threshold (**Level**) can be set in the range of **24 dB** to **136 dB**. The **Source** value is compared with the **Level** value every 0.5 milliseconds.

Pre and post trigger logging



The **Pre Trigger** item allows you to define the number of reedings to be recorded in the logger file before the trigger condition is met. This number is limited to 0..10.

The **Post Trigger** item allows you to define the number of reedings to be recorded in the logger file after the last trigger condition is met. This number is limited to 0..200.

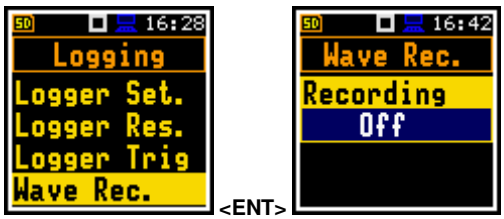
These parameters can serve a dual purpose. Firstly, if you want to collect data immediately after or before the event that triggered the logger. Secondly, when it is necessary to have continuous logging, but the source oscillates close to the threshold. Extending the logging window allows you to avoid the effects of pulsation.

Periods of logging before or after the trigger condition are shown to the right of the number in minutes and seconds (in the format **0 m 00 s**) as a result of multiplying the number of results by the **Logger Step**.

4.5.4 Configuring signal recording – Wave Recording

The **Wave Rec.** item allows you to enable and configure a recording of the signal waveform to a WAV file.

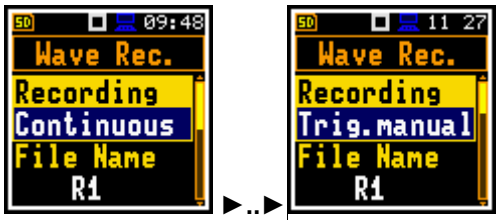
WAV files are saved automatically in the working directory of the instrument's memory.



Note: *In the **Simple** interface, the **Wave Recording** item is hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (**Recording: Off**).*

Note: *The **Wave Recording** function is optional and should be unlocked by entering the activation code in the text editor screen, opened with the ► key. Once unlocked, this function is always available.*

The **Recording** item, if it is not disabled (**Off**), defines the type of trigger for a signal recording: from the start and throughout the measurement period (**Continuous**), manual start (**Trig.manual**), from a slope, level or gradient trigger or from the start of a measurement with a given recording interval (**Integr. Per.**).



The **File Name** item allows you to edit the name of the WAV file.

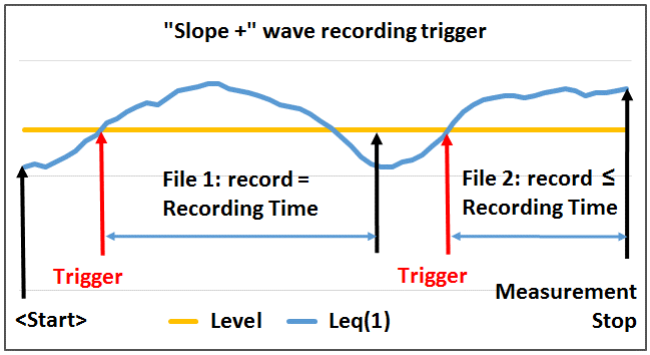
The **Format** item defines a type of the VAW file format: **PCM** or **Extensible**.

Slope trigger

The **Slope+** / **Slope–** trigger starts a signal recording on the condition: the rising value of the Leq result (**Source**), integrated by 0.5 ms, passes above/below the threshold level (**Level**).

When the **<Start>** key is pressed, the instrument checks the trigger condition with the steps defined by the **Trigger Period** parameter, and, if the condition is met, starts a signal recording. The recording lasts for the minimum **Recording Time**, and during this time the instrument continues to check the trigger condition with the **Trigger period** step. Provided that the **Trigger Period** is shorter than the **Recording Time,** if the next trigger condition is met during the **Recording Time**, the instrument triggers the recording again, so that from this moment it continues with the additional **Recording Time** and so on. If there are no triggers during the next recording time, recording will stop after the last trigger plus **Recording Time**. Assuming that trigger conditions continue to be checked after the first recording, a new signal recording can start during the same measurement time.

The attached example shows that two records have been created between the start and stop of the measurement. The first record is equal to **Recording Time** because no second trigger condition was met during this period. During the second record, the measurement was stopped, and the record is shorter than **Recording Time**.

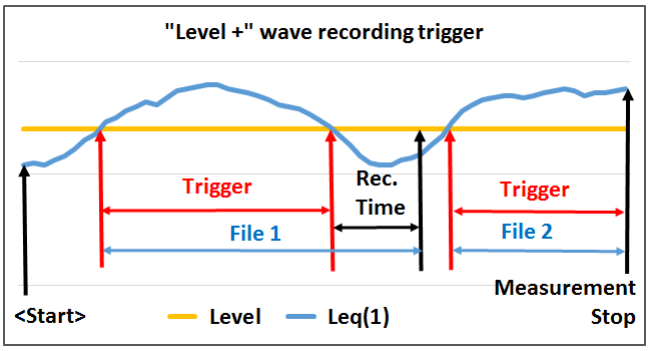


Note: *When a wave recording is waiting for the slope trigger, the "slope" icon will overlay on the grey „wave" icon.*

Level trigger

The **Level +**/**Level -** trigger starts a signal recording that will last for the **Recording Time** under the condition: the value of the Leq result (**Source**) integrated by 0.5 ms is greater/less than the threshold (**Level**). In other cases, the recording doesn't start, but if it has been already started, it can be continued until the **Recording Time** has elapsed.

If a trigger condition occurs during the **Recording Time**, the recording will be extended for another **Recording Time** from the moment of the trigger condition, and so on.



Note: *When the wave recording is waiting for the level trigger, the "trigger" icon will overlay on the grey „wave" icon.*

Gradient trigger

The **Gradient +** trigger starts a signal recording for the **Recording Time** under the condition: the value of the Leq result (**Source**) averaged by 0.5 ms is greater than the threshold (**Level**) and the rate of change of this Source result (gradient) is greater than the gradient threshold (**Gradient**). In other cases, the recording doesn't start, but if it has been already started, it can be continued until the **Recording Time** has elapsed. The instrument also checks the trigger condition during recording and if the condition is met, the recording is continued for another **Recording Time**.

Integration period trigger

If the **Integr. Period** trigger is selected, the signal recording is triggered at the start of each measurement and the recording lasts for the minimum **Recording Time**. If the trigger condition occurs during recording (when the **Integration Period** is shorter than the **Recording Time**), the recording will continue from that moment for the next **Recording Time** and so on.

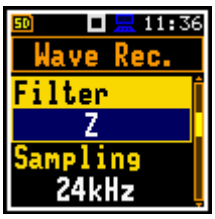
Manual trigger

If the **Trig.manual** trigger is selected, the signal recording starts and stops when the ◄ and ► keys are pressed simultaneously during the measurement. When these keys are pressed, the screen with the corresponding message appears. Recording always stops after the time set by the **Rec. Time** parameter.

Note: *When a wave recording is waiting for the gradient trigger manual trigger or "integration period" trigger, the flashing "trigger" icon will overlay on the grey „wave" icon.*

The **Filter** item allows the user to select the broadband frequency filter during a waveform recording: **Z**, **A**, **C**, **B** or **LF**.

The **Sampling** parameter defines the sampling frequency of the waveform recording: **24 kHz** or **12 kHz**.



The **Signal Gain** item allows the user the user to select the gain of the recorded signal: **0 dB** … **40 dB**.

Source result

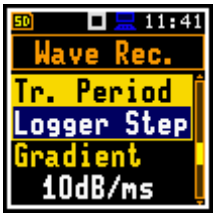
Only one measured result (**Source**) can be used to check the trigger condition in the **Level Meter** mode, namely the LEQ from the first profile averaged for the **Trigger Period** with appropriate filter and detector here denoted as **Leq(1)**. This item cannot be changed.

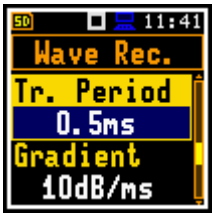
Threshold level

The threshold (**Level**) can be set in the range of 24 dB to 136 dB.

Checking the trigger condition

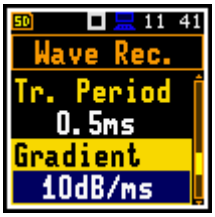
The **Source** value is compared with the **Level** value at the step defined by the **Tr. Period** parameter, which can be set as follows: **Logger Step**, **0.5ms**, **100ms** and **1s**.





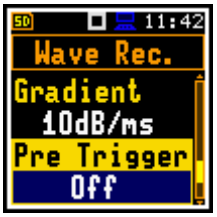
Gradient

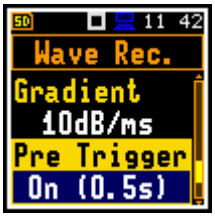
Rate of triggering signal change (**Gradient**) can be set in the range of **1 dB/ms** to **100 dB/ms**.



Recording before trigger

If the **Pre Trigger** item is set to a value other than **Off**, the instrument will start recording the waveform before the first trigger. The interval of this recording is equal to the **Trigger period** (0.5 s in the example attached).





Signal ecording time

The **Rec. Time** item allows you to set the time of signal recording after triggering. If the trigger condition appears during the recording time, the signal is recorded for an additional **Rec. Time**. The available values are from **1s** to **8h** or infinitive (**Inf**).

Wave file size control

The **LengthLimit** item allows you to define the maximum time during which recording to a file is allowed. After this time, the current file is closed, but the signal recording continues in the new file. You can disable the limitation selecting **Off**. This option allows you to control the size of the waveform files.

Note: *When a measurement is paused, either manually or automatically (in the case of programmed pauses in Dosimeter mode), the Wave file is closed at the start of the pause and a new Wave file is opened when the pause is released.*

4.6 MEASUREMENT RANGE – RANGE

The **Range** item is used to check the current measurement range.

The absolute values of the range depend on the calibration factor and are shown in the **Range** screen.

In the attached screens it is assumed that the calibration factor is equal to zero.

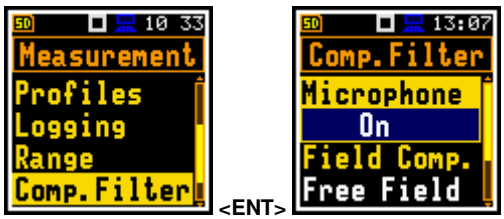
The instrument uses two measurement ranges: for the **Level Meter** function, including RT60 and STIPA, (32.0 LEQ(A) – 128.0 PEAK) and for the **Dosimeter** function (50.0 LEQ(A) – 141.0 PEAK). The detailed description of the measurement range parameters is given in Appendix C.

Note: *The calibration factor is always added to the lower and upper range limits.*

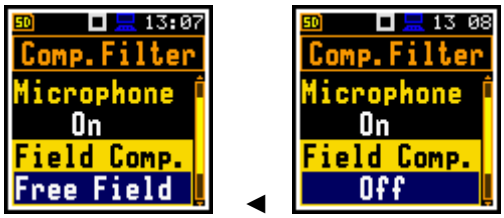
4.7 SELECTING MICROPHONE COMPENSATION – COMPENSATION FILTER

The **Comp. Filter** item allows you to switch on/off the compensation filters used in the instrument.

The **Microphone** compensation filter (microphone inner noise compensation) is switched on by default but can be switched off for electrical measurements (e.g., for laboratory calibration).



The **Field Compensation** item allows you to set the compensation filter for sound measurements in the free field (**Free Field**) or diffuse field (**Dif. Field**) conditions, or to disable it for laboratory tests. The default setting is **Free Field**.



The **Windscreen** item is active when the field compensation is On. It switches on the compensation when the windscreen is applied. The default setting is **On**.

Note: *For laboratory instrument's tests, the compensation filters should be set according to Appendix C.*

4.8 SETTING STATISTICAL LEVELS – STATISTICAL LEVELS

In the **Stat. Levels** list, you can define ten statistical levels, named from **N1** to **N10**, to be calculated, displayed, and stored in the files together with Summary Results (see Appendix D).

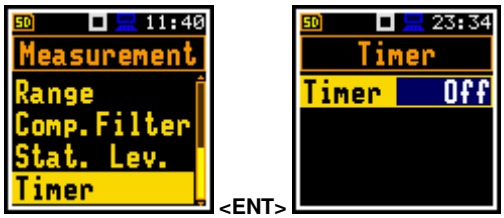
The default statistical levels have the following settings: **1**, **10**, **20**, **30**, **40**, **50**, **60**, **70**, **80** and **90**. All values should be within the integer range [1, 99]. Each value can be set independently from others.

4.9 PROGRAMMING THE INSTRUMENT'S INTERNAL TIMER – TIMER

The **Timer** function is used to program the automatic start of the measurement (and switch on the instrument if it is switched off) at a given time and day of the week, and the automatic stop of the measurement and switch off the instrument.

Note: *In the **Simple** interface, the **Timer** item is hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (**Timer: Off**).*

The measurement is performed with the parameters set in the **Measurement** section with one exception (see Note below).



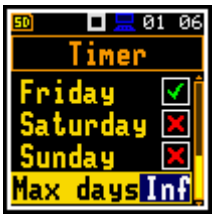
Note: *When the **Timer** is **On**, the measurements are performed from the defined **Start** to **Stop** times because the **Repetition Cycles** parameter is automatically set to **Inf** (path: <Menu> / Measurement / General Set.). The last integration can be truncated.*

Setting the start and stop of the measurement

The **Start (hh:mm)** and **Stop (hh:mm)** items define the start and stop times of measurement.

In the items: **Monday**, **Tuesday**, …, **Sunday**; you can select the days of the week on which the measurements are to start.

The timer can be programmed for a maximum number of days ahead (**Max days**) (up to 100) or without limit (**Inf**). During these days, the instrument refers to the time of the **R**eal **T**ime **C**lock (**RTC**). The measurements stop when the number of days in the day counter reaches **Max days**. If the **Inf** value is selected, the measurement series can only be stopped manually (if power is available). If more than one day per week is selected, the day counter increases with each measurement day.



Once the timer has been programmed, you can switch off the instrument. However, if you try to switch off the instrument when the time remaining to the first timer start point is less than 10 minutes, the instrument will ask you if you really want to switch off the instrument, as this will also disable the timer.

Note: *Before using the timer, check that the real time clock settings are correct.*

Note: *Ensure that there is sufficient internal battery power and memory for the instrument to perform the required measurements when it wakes up.*

4.9.1 Example of timer performance

Let us assume that you want to switch on the measurement on Monday at 8:00, measure the noise level for 20 minutes and save the results in the file named L4.

To do this you should configure the **Timer** function as shown in the attached screen and to set the measurement parameters (*path: <Menu> / Measurement / General Settings*) and define the file name (*path: <Menu> / Measurement / Logging / Logger Setup*). Then turn off the instrument.

The instrument turns on and starts to warm up during the 30 seconds before the measurement start time at 8:00 on the nearest Monday.

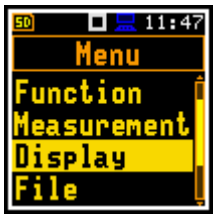
The measurement is carried out over a period of 20 minutes. The results are then automatically stored in a file named L4. The instrument will turn off at 8:20 and wait for the next Monday to start the next measurement at 8.00. The next file is automatically named L5, and so on.

Such cycle will be repeated as many times as is defined by **Max days** parameter. If more than one day in a week is selected, the day counter is increased with each measurement performed. The measurement cycle will stop when the day counter reaches the **Max days** value. If **Inf** value is selected, the measurement cycles can only be stopped by the user (if the power supply is guaranteed, of course).

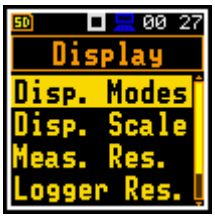
5 CONFIGURING DATA VIEWING – Display

The **Display** section contains the elements for setting the views of the measurement result and the display parameters.

The content of the **Display** list depends on the selected measurement function.



<ENT>



The **Display** section contains the items that allow you to:

Disp. Modes enable views in the measurement mode,

Disp. Scale adjust the **Logger** and **Spectrum** views,

Spect. View select the spectra to be viewed; this item becomes available only in the 1/1 and 1/3 octave analysis functions,

Meas. Res. select the measurement results to be displayed,

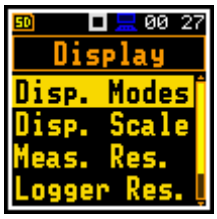
Logger Res. select time history results to be plotted,

Screen Set. enable/disable screen rotation and set the power save function.

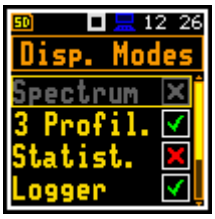
5.1 ENABLING VIEWS – DISPLAY MODES

The One Result view is always enabled. Other views can be enabled or disabled in the **Disp. Modes** list.

You can switch between the views enabled in the **Display Modes** screen.

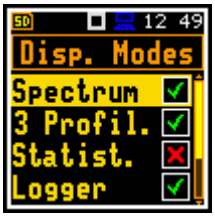


<ENT>



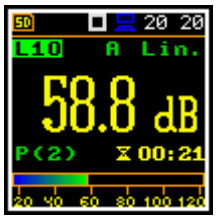
In the **Level Meter** function, the following views are available: **3 Profiles**, **Statistics**, **Logger**, **Running SPL** and **File Info**.

An additional view (**Spectrum**) is available in the **1/1 Octave** and **1/3 Octave** functions.

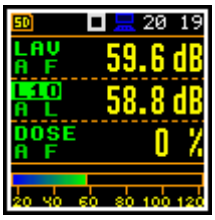


Changing views

The view is changed with the **<ESC>** key or with the ▲ / ▼ key pressed with **<Shift>**.



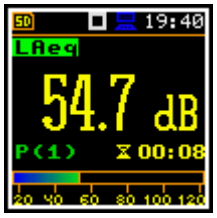
<ESC>



5.1.1 One Result view

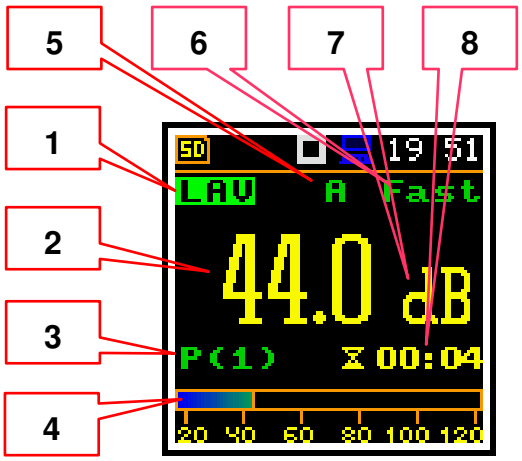
In the One Result view, any measurement result selected in the **Disp. Res** list, can be viewed.

The One Result view can have different sub-views. You can change the sub-view of the One Result view by pressing **<Enter>**.



<ENT>

<ENT>



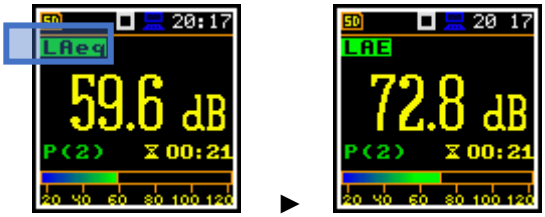
One Result view fields

1. Result name for:
   - **Level Meter**, **1/1 Oct.** and **1/3 Oct.** functions: **OVL**, **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **EX**, **SD**, **LR1**, **LR2**
   - **Dosimeter** function: **OVL**, **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **Ln**, **PTC**, **PTP**, **ULT**, **TWA**, **PrTWA**, **Lc-a**, **EX**, **SD**, **LR1**, **LR2**
2. Value of the measured result
3. Current profile number
4. Quasi analogue value indicator
5. Implemented weighting filter: **Z**, **A**, **C** or **B**
6. Detector time constant: **Imp.**, **Fast**, **Slow** for the exponential detector or **Lin.** for the linear detector
7. Units of measured value
8. Elapsed time showing the current second of measurement in the range [**0**, **Integration Period**]

Note: *For some results, the weighting filter and detector type are shown in the result name. For example, the **Lmax** result with **A** filter and **Fast** detector will be presented as **LAFmax**. For such results, there is no indication in the filter and detector fields.*

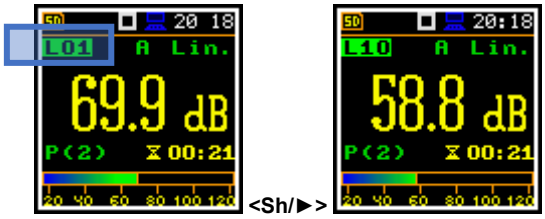
Changing the result for the current profile

Use the ◄ / ► key to change the measurement result for the current profile.



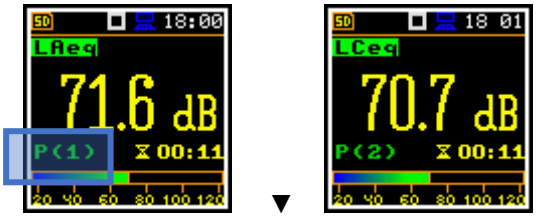
Changing statistical levels (Ln)

The statistical levels, which are set in the **Stat. Lev.** list (*path: <Menu> / Measurement / Stat. Lev.*), can be changed with the ◄ / ► key pressed with **<Shift>**.



Changing current profile

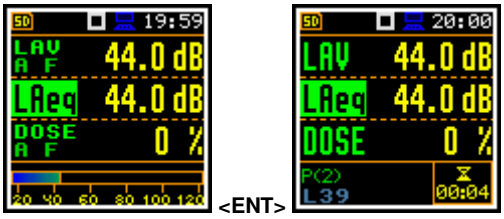
Use the ▲ / ▼ key to change a current profile.



5.1.2 Three profiles view

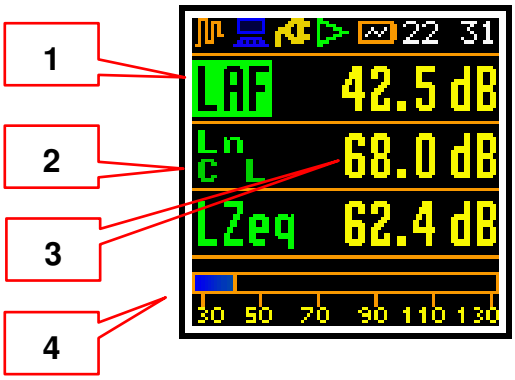
In the **3 Profiles** view, any three measurement results from the Summary results can be displayed.

You may change the **3 Profiles** sub-view with the **<Enter>** key.



3 Profiles mode fields

1. Result name for the first profile
2. Weighting filter and detector time constant
3. Value of the measured result
4. Quasi analogue value indicator for the selected result



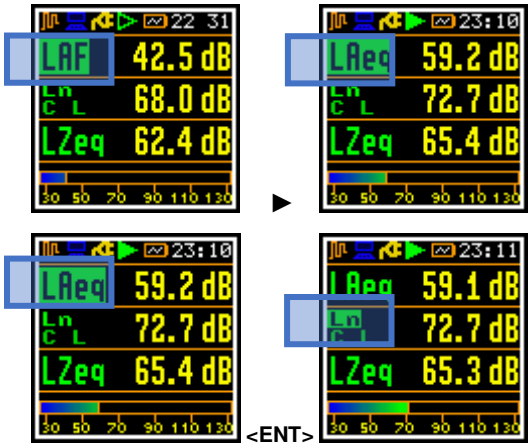
Changing the result for the current profile

Use the ◄ / ► key to change the measurement result for the current profile.

The statistical levels can be changed with the ◄ / ► key pressed with **<Shift>**.

Changing current profile

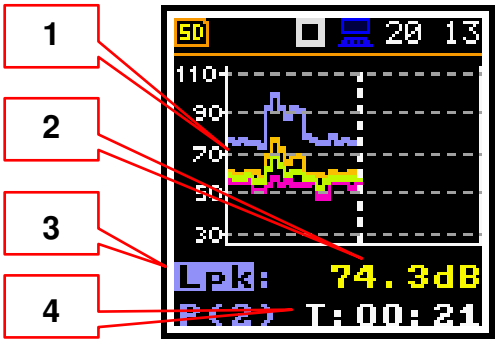
Use the ▲ / ▼ key pressed with **<Shift>** to change the current profile.



5.1.3 Logger view

Logger view fields

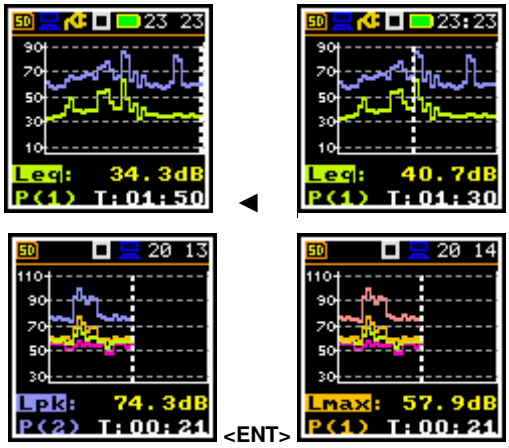
1. Logger Plot
2. Result value for cursor position
3. Result name (Profile number)
4. Cursor time position



In the **Logger** view, the time history results, selected in the **Logger View** list, are displayed as a plot.

Use the ◄ / ► key to change the cursor position.

Press **<Enter>** to change the active plot for reading cursor values.



Note: *If* ***Logger*** *(path: <Menu> / Measurement / Logging /Logger Set.) is switched off the* ***Logger*** *presentation mode is disabled! Therefore, to have this presentation mode active, switch the* ***Logger*** *on!*

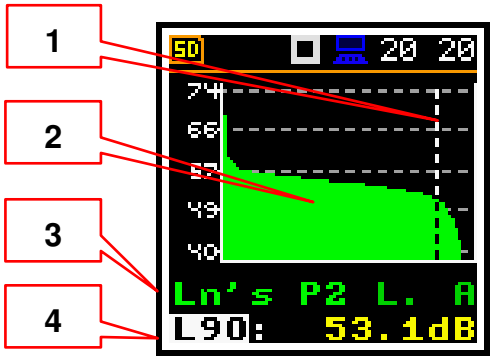
Note: *When* ***Logger*** *is switched on, but results were not selected for logging the* ***Logger*** *presentation mode is disabled!*

5.1.4 Statistics view

"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, the statistical level **Ln**, and the Y-axis defines the calculated noise level in dB.

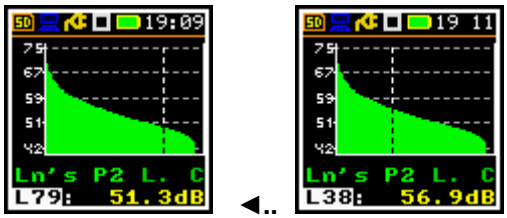
Statistics view fields

1. Cursor position
2. Statistics plot
3. Type of the plot (**Ln's**), active profile, LEQ detector (**L**inear, Fast, **S**low or **I**mpulse), used weighting filter name (**A**, **C**, **Z** or **B**)
4. Value (in dB) of the selected statistical level **Ln** for the cursor position



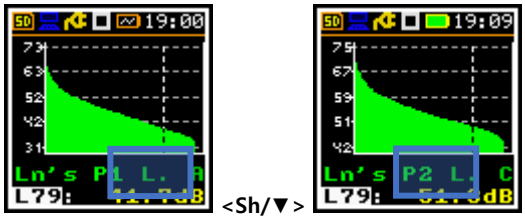
Changing the cursor position

Use the ◄ / ► key to change the cursor position.



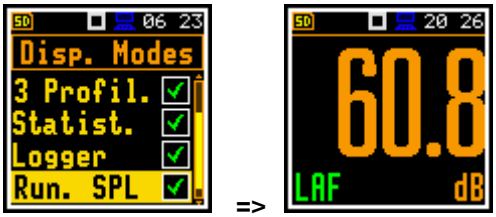
Changing current profile

Use the ▲ / ▼ key pressed with **<Shift>** to change the active profile.



5.1.5 Running SPL view

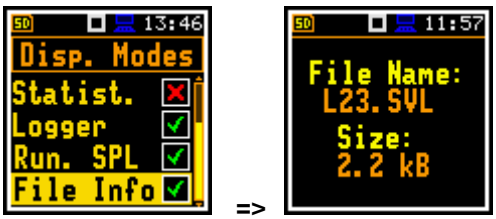
The **Running SPL** view shows the SPL result when the measurement is not currently running. In this view, the SPL result is calculated and displayed, but not stored in the instrument's memory. The purpose of this mode is to give the user an initial indication of the signal being measured.



5.1.6 File information view

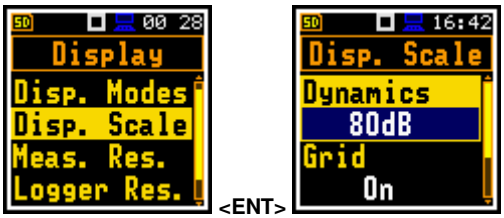
The **File Info** item provides the information about the last logger file saved.

The **File Info** view shows file name and size. When **Logger** is **Off** (*path: <Menu> / Measurement /Logging / Logger Setup*) the **File Info** item is disabled.



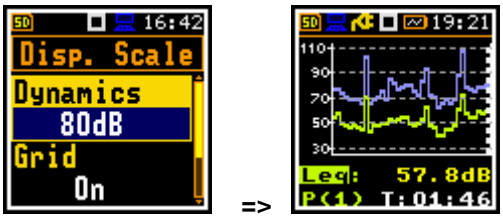
5.2 ADJUSTING PLOT SCALE – DISPLAY SCALE

The **Display Scale** list of parameters allows you to adjust the scale of the plot and switch a grid on/off in the **Logger**, **Statistics** or **Spectrum** display modes.

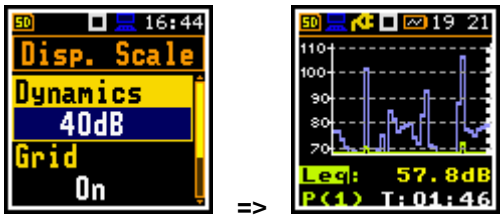


Scaling the vertical axis

The **Dynamics** item allows you to select the desired dynamic range scaling of the plot (Y-axis).

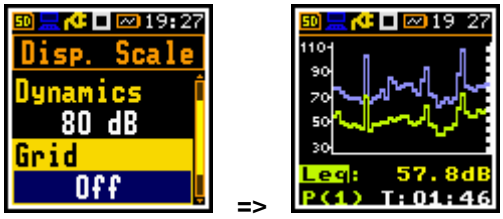


You can select the range from the set: **10 dB**, **20 dB**, **40 dB**, **80 dB** and **120 dB**.



Switching grid on/off

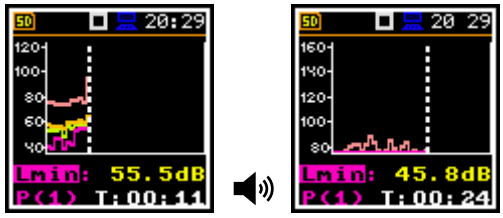
The **Grid** item allows you to switch on/off the horizontal grid lines of the plot.



Automatic Y-scale adjustment

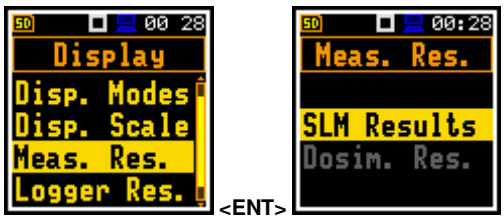
The **Autoscale** item allows you to switch on/off the automatic scale adjustment of the dynamic range of the Y-axis to the initial level of the input signal from the microphone as soon as the measurement is started.

The example shows the changes in the scale after a sudden increase in sound pressure level.



5.3 SELECTING SUMMARY RESULTS FOR PRESENTATION – MEASUREMENT RESULTS

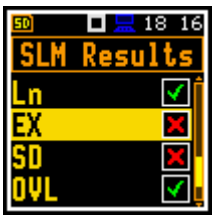
The **Meas. Res.** item allows you to select the Sound Level Meter (**SLM Results**) or Dose Meter (**Dosim. Res**) measurement results to be displayed in different views.



The result can be selected from:

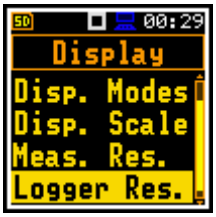
- **SLM Results** list: **TIME**, **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **LR1**, **LR2**, **EX**, **SD**, **OVL**;
- **Dosim. Res.** list: **TIME**, **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **Ln**, **PTC**, **PTP**, **ULT**, **TWA**, **PrTWA**, **Lc-a**, **EX**, **SD**, **OVL**.

Note: *The **EX** and **SD** results are optional and should be unlocked by entering the activation code in the text editor screen that opens after the first attempt to select them. Once unlocked, these results are permanently available!*



5.4 SELECTING LOGGER RESULTS FOR PRESENTATION – LOGGER RESULTS

The **Logger Results** item allows you to select the Logger results (time history results) to be displayed in the **Logger** view.



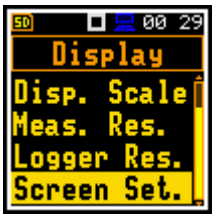
<ENT>

You can select Logger results for the:

- **Level Meter**, **1/1 Oct.** and **1/3 Oct.** functions: **Lpk**(Lpeak), **Lmax**, **Lmin**, **Leq**, **LR1**, **LR2**
- **Dosimeter** function: **Lpk**(Lpeak), **Lmax**, **Lmin**, **Leq**, **LAV**

5.5 CONFIGURING POWER SAVER – SCREEN SETUP

The **Screen Set.** item allows you to configure the power saver function (**Dim Mode**) and switching on the screen auto rotation.



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Power saver function

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

There are two options for **Dim Mode**. The screen can be switch off (**Screen Off**) or dimmed with different levels (**Level 1**, **2** or **3**). If one of these options is set, the screen will be dimmed or switched off after a delay set by the **Dim Delay** parameter when any key is pressed. Once this has happened, pressing any key will switch the screen back on.

If **Dim Mode** is **Off**, the screen always remains bright.

By default, **Dim Mode** is set to **Level 2** (medium dim).

The power saver delay defines the delay time between the last use of any key and the start of the power saver mode. This delay period can be set from **5s** to **60m** with **Dim Mode** active.

Changing the colour scheme

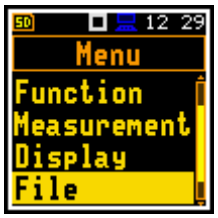
The **Col. Scheme** item allows you to change the colour scheme of the screen from **Colorful** to **Black/white**.

6 MANAGING FILES – File

The **File** section allows you to manage the data and setup files stored in the instrument's memory.

The memory structure and files saving methods are described in Chapter 2.9.

To open the **File** section, press the **<Menu>** key, select the **File** item and press **<Enter>**.



<ENT>

The **File** section contains the following items that allow you to:

File Manager manage measurement results files,

Setup Manager manage only setup files located in the predefined SETUP directory.

There are three types of files generated by the instrument:

- Logger files containing measurement results (extension **.SVL**, icon)
- Wave files containing signal recording (extension **.WAV**, icon)
- Setup files containing measurement and instrument configuration (extension **.SVT**, icon)

Logger and Wave files are automatically created and saved with default names. You can define a specific logger file names in the **Logger Name** item (*path: <Menu> / Measurement / Logging / Logger Set.*) and a specific wave file name in the **File Name** item (*path: <Menu> / Measurement / Logging / Wave Rec.*).

The elements of the logger file structure depend on the selected function (**Lev. Met.**, **1/1 Oct.**, **1/3 Oct.**, **RT60**, **Dosimeter**, **STIPA**) and logging settings. These elements are as follows:

- main results, including results of statistical analysis,
- time histories of the measurement results,
- marker recordings,
- 1/1 or 1/3 octave analysis results,
- dosimeter results,
- RT60 analysis results,
- STIPA analysis results.

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

6.1 MANAGING MEASUREMENT FILES – FILE MANAGER

The **File Manager** is used to check the contents of memory and to perform operations on the measurement files and directories such as: renaming, deleting, viewing information, creating a new directory/file, and clearing memory.

<ENT>

In the **File Manager**, all file and directory names are in upper case. Directory names are blue and file names are green. Measurement files have icons and no extensions, other files have no icons but extensions.

The list of files and directories is displayed in the **File Manager** screen. Files are stored in hierarchically organised directories.

Pressing **<Enter>** on the highlighted directory/file will open the screen with the list of operations available for that directory/file.

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Changing directories

To open a directory, select it and press the ► key.

To return to the upper directory, press the ◄ key.

Creating a new directory

The first item in the **File Manager** list is **New Dir.**, which allows you to create a new directory.

To create a new directory, enter the directory in which the new one is to be created, select the **New Dir.** item and press **<Enter>**. The text editor screen with appear for entering the new directory name.

Memory properties

The last screen displayed after pressing the ◄ key shows information about the instrument's memory (**SD Card**): the free space (**Free Space**) and the total memory (**Capacity**).

6.1.1 Assigning the directory for saving data files – Working Directory

You can specify a directory for automatic saving of the measurement files. To do this, select the required directory and press **<Enter>**. Select the **Work. Dir.** item in the command list and press **<Enter>**.

All logger and wave files are then stored in this directory.

Note: *The working directory name is not displayed on the screen, so you should remember the selected working directory!*

6.1.2 Opening file/directory – Open

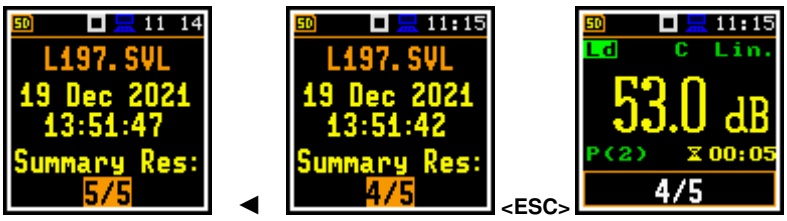
To open a file or directory, select the file/directory you wish to open and press **<Enter>**. Select **Open** from the command list and press **<Enter>**.

The **Open** command for a directory acts as the ► key (see Chapter 6.1).

The **Open** command for a file displays Summary results records.

You can change views and change displayed results as shown.

You can change the record to be displayed in the **File Info** view by selecting the record with the ◄ / ► key and switching to the desired view.



The preview of the summary results saved in a file will stop when you start the new measurement or when you open the **File** section, select the **Close File** item and press **<Enter>**.

6.1.3 Renaming file/directory – Rename

To rename a file or directory, select the file/directory to be renamed and press **<Enter>**. Select the **Rename** item from the command list and press **<Enter>**. The text editor screen will appear for you may to enter the new file/directory name.

6.1.4 Viewing information about file/directory – Info

To obtain information about a file/directory, select the file/directory and press **<Enter>**. Select the **Info** item from the command list and press **<Enter>**. The instrument will display the information about the selected file/directory.

6.1.5 Deleting file/directory – Delete

To delete a file/directory from the file/directory list, select the file/directory to be deleted and press **<Enter>**. Select the **Delete** item from the command list and press **<Enter>**. The instrument will ask you to confirm this action as it cannot be undone.

6.1.6 Erasing memory – Erase Disk

To erase all files and directories from memory, select any file and press the **<Enter>** key. Select the **Erase Disk** item from the command list and press **<Enter>**. You should confirm this action as it cannot be undone.

Once the disc has been erased, the default directories will be restored.

6.2 MANAGING SETUP FILES – SETUP MANAGER

The **Setup Manager** allows you to save new setup files, load and delete them, view file information, and select the setup files that will be displayed in the setup screen when the instrument starts up.

All setup files are stored in the default **SETUP** directory on the SD card.

The screen with the list of available operations on the setup files opens when the **<Enter>** key is pressed on the highlighted setup file.

Loading the setup file means that the settings stored in the loaded file become the active settings of the instrument.

If the right box of the setup file is checked, this setup will be in the list of setups when the instrument starts up, so that you can select a predefined setup at the beginning of the measurement session.

7 CONFIGURING INSTRUMENT – Instrument

The **Instrument** section is mainly related to the configuration of the hardware components of the instrument.

To open the **Instrument** section, press the **<Menu>** key, select the **Instrument** item and press **<Enter>**.

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The **Instrument** section contains the following items that allow you to:

User Inter.	select the user interface option,
Battery	display information about current power source,
Keyboard	program keyboard functions,
Power Off	switch off the power to the unit when inactive,
USB	configure the USB interface; this item is available only in the **Advanced** interface,
Comm. Ports	configure the serial interface,
RTC	set the Real Time Clock,
Unit Label	display instrument properties.

7.1 CHOOSING USER INTERFACE MODE – USER INTERFACE

The **User Inter.** Item allows you to select the user interface option: **Start/Stop**, **Simple** or **Advanced**.

The **Simple** interface allows basic instrument settings, while the **Advanced** interface allows the full range of settings. Many screens therefore have different views in different interface options. The default value is **Simple**.

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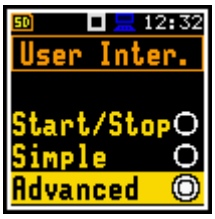
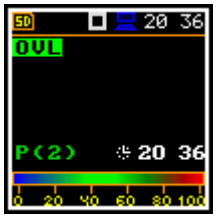


The **Start/Stop** option limits the user interface to only one **User Interface** item in the main **Menu** and measurement screens.



<Menu>

Note: *If you change the interface from* ***Advanced*** *to another, you will always be asked "Do you restore the default value of the advanced settings?" If the answer is* ***No****, all settings of parameters that are not active in the* ***Simple*** *interface will remain unchanged. If the answer is* ***Yes****, these parameters will be reset to their default values.*

7.2 CHECKING POWER – BATTERY

The **Battery** item allows you to check the status of the power source. The instrument can be powered by four rechargeable or standard alkaline AAA batteries or the USB-C interface.

The view on the display depends on the current power source.

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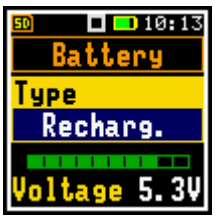
If the instrument is powered by internal batteries, the current battery voltage is displayed along with an approximate charge level.

Select the correct battery type for the correct detection of the battery state of charge: **Alkaline** or **Rechargeable**.



Note: *Rechargeable batteries must be removed and charged using an external charger. They cannot be charged inside the instrument.*

7.3 PROGRAMMING KEYBOARD FUNCTIONS – KEYBOARD

The **Keyboard** item allows you to program the operation of the **<Shift>** key and enable the keyboard to be locked and unlocked using four keys.

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<Shift> key mode

In the **Shift** item you can choose between **Direct** and **2nd Function**. If the **Direct** option is selected, the **<Shift>** key works like a computer keyboard – to achieve the desired result, the second key should be pressed at the same time as **<Shift>**. If the **2nd Function** option is selected, the **<Shift>** key works like the virtual keyboard on a smartphone – the **<Shift>** key should be pressed first and then the second key. This allows you to operate the instrument with one hand. The default value is **Direct**.

Keyboard lock

The **Key Lock** item allows you to enable the keyboard lock. When **On** is selected, the **Fast Unlock** function becomes available. This function allows you to program the keyboard unlock code. The default value is **Off**.

Keyboard unlock

The unlock code can be programmed the following four items: **First Key**, **Second Key**, **Third Key** and **Fourth Key**. In each item, the user can select one of four arrow keys: **Left Key**, **Right Key**, **Up Key** or **Down Key**, the sequence of which generates the unlock code.

7.4 AUTOMATIC POWER OFF – POWER OFF

The **Power Off** item allows you to select the time after which the instrument automatically switches off if no key has been pressed during this time.

If **Inf** (infinitive) value is selected, the instrument will not switch off automatically, but only manually.

The default value is **5 m**.

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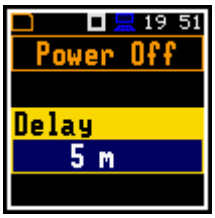
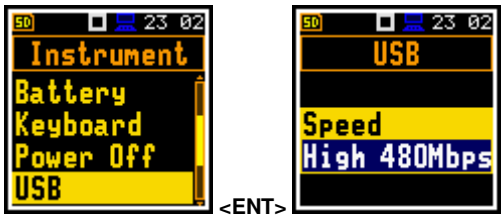


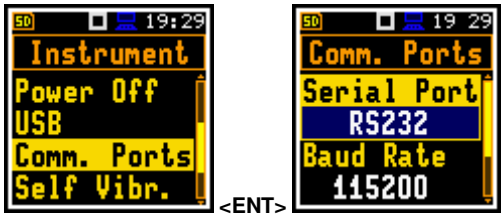
7.5 CONFIGURING THE USB INTERFACE – USB

The **USB** item allows you to select the transfer rate of the USB interface: **Full 12 Mbps** and **High 480 Mbps**. The default value is **High 480 Mbps**.

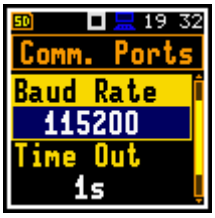


7.1 SETTING INTERFACE PARAMETERS – COMMUNICATION PORTS

The **Communication Ports** item allows you to select the type of the **Serial Port** (**RS232** or **Bluetooth**) and set its parameters. The default value is **RS232**.

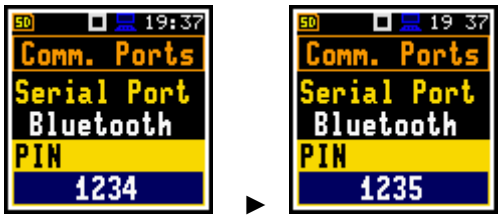


In the case of the **RS232** serial port, two parameters should be defined: the transmission speed (**Baud Rate: 1200**, **2400**, **4800**, **9600**, **19200**, **38000**, **57600** or **115200** bits/s) and the time limit for data transmission (**Time Out**). The default value of the **Time Out** parameter is 1 second, but this may be too short for printers that are not fast enough. In such cases the **Time Out** parameter should be increased.



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

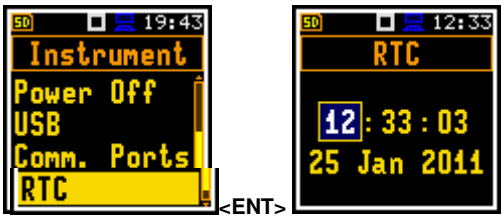
In the case of **Bluetooth**, you can set the PIN with the ◄ / ► keys. The default value is **1234**.



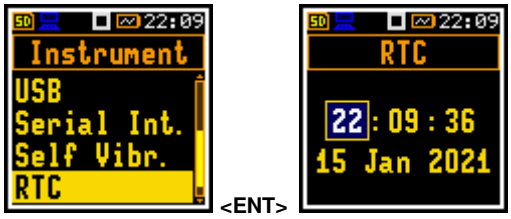
7.2 PROGRAMMING THE INTERNAL REAL TIME CLOCK – RTC

The **RTC** item enables programming the internal Real Time Clock of the instrument. This clock is displayed in the top right corner of the display.

To set year, month, day, hour, minute or second, select the appropriate field with the ◄ / ► or ▲ / ▼ key, select value with the ▲ / ▼ key pressed with **<Shift>** and press **<Enter>** or **<ESC>** to exit this screen.



The **RTC** item allows you to set the instrument's internal Real Time Clock. This clock is displayed at the top right of the icon bar.



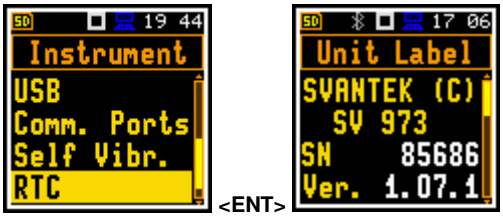
To edit the time or date, select the time or date field with the ◄ / ► or ▲ / ▼ key.

Use the ▲ / ▼ key pressed with **<Shift>** to change the value in the selected field.

Press **<Enter>** to confirm the selection. If you exit this screen with **<ESC>** will also save the new time.

7.3 CHECKING THE INSTRUMENT PROPERTIES – UNIT LABEL

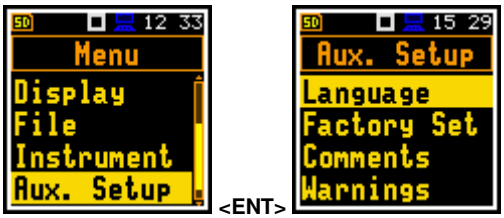
The **Unit Label** item allows you to check the instrument model, the instrument and microphone serial numbers, the current software version installed and the relevant standards that the instrument complies with.



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

8 AUXILIARY SETTINGS – Auxiliary Setup

The **Auxiliary Setup** section provides additional functions that, for example, allow the user interface to be customised to meet specific user requirements and are not directly related to the hardware components of the instrument.



The **Auxiliary Setup** section contains the following items that allow you to:

Language select the language of the interface,

Factory Set restore the factory default settings,

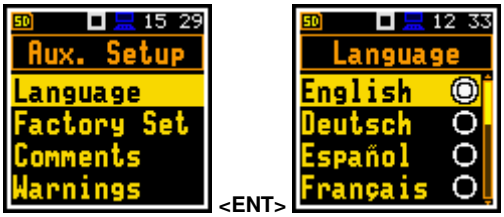
Comments define the file name for recording voice comments; this item is only available in the **Advanced** interface,

Leq & Lav select the option to display the **Leq** and **Lav** results; this item is only available in the **Dosimeter** function and in the **Advanced** interface,

Warnings enable/disable the warnings displayed during normal operation of the instrument.

8.1 SELECTING THE INTERFACE LANGUAGE – LANGUAGE

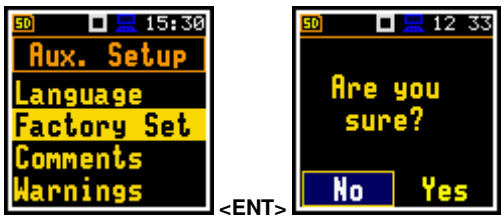
The **Language** item allows you to select the language of the interface. The default language is **English**.



If the display shows an interface in an unknown language when the unit is switched on, the user can reset the unit by pressing three **<Shift/Enter/Start>** keys together while switching on the instrument. This will return the instrument to the default setup with the English interface.

8.2 RESTORING FACTORY SETTINGS – FACTORY SETTINGS

The **Factory Set.** Item allows you to restore the default settings of the instrument.



Factory settings can be also restored by pressing three **<Shift/Enter/Start>** keys together while switching on the instrument.

After restoring the factory settings, the instrument asks if you want to keep the last calibration. If you select **No**, the factory calibration is restored and the new calibration record with the *Factory calibration* of the instrument is created in the **Calibration History** list (see Chapter 3.2.3).

8.3 VOICE COMMENTS – COMMENTS

The **Comments** item allows you to specify the file name for the voice comments recording. This item is only available in the **Advanced** interface mode. You can record voice comments in all interface options.

To record a comment, press the ◄, ► keys simultaneously when a measurement is stopped. This will bring up a screen asking which logger file is to be linked to the comment file - the previous one (**Prev.**) or the next one (**Next**). Pressing **<Enter>** will display the screen with the record command.

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After starting the recording (**Start rec.**) with the **<Enter>** key, a red circle will start to flashing on the top line of the screen to indicate that the recording is in progress. This allows you to comment on the measurement. Press **<Enter>** to end the recording. The end of the recording is confirmed with the message "**Saved O.K.**".

<ENT>

The voice comment file is saved in the same working directory as a connected logger file with a name starting with @ and the icon .

8.4 DISPLAYING LEQ & LAV RESULTS – LEQ & LAV

The **Leq & Lav** item allows you to select the option to display the **Leq** and **Lav** results.

This item is only available in the **Dosimeter** function and in the **Advanced** interface. See the description of this function in Chapter 11.7.1.

8.5 ACTIVATING WARNINGS – WARNINGS

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

<ENT>

If **Logging** is enabled, the instrument will generate a warning if you start a measurement without logging the results to a file (i.e., if the **Logger** is disabled).

If **Power Off** is enabled, any attempt to switch off the instrument during a measurement will result in a "Measurement in progress" warning. You should stop the measurement to be able to switch off the instrument. When the measurement is complete, the "Power Off" warning will become active. You should then confirm that you wish to switch off the instrument.

If **Microph.** is enabled, a warning is displayed if the instrument detects that there is no microphone connected to the input of the instrument.

If **Changes** is active, the instrument displays the warning message in the case when some parameters were changed, but the list of parameters was exit with the **<ESC>** key.

9 PRINTING REPORTS – Report

The **Report** section allows you to configure and print measurement reports in a predefined format.

<ENT>

The **Report** section contains the following items that allow you to:

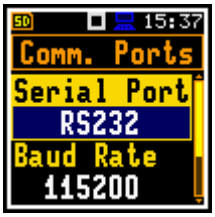
Print	print measurement results to the default printer,
Options	set report options,
Results	select the measurement results to be included in the report,
Statistics	select statistics to be included in the report,
Spectrum	select 1/3 octave bands to be included in the report,
Printer	select the number of characters in the report line.

To obtain a report, connect the instrument to the RS 232 port of the printer using the **SV 76** interface. This hardware interface is hidden inside the Cannon type 9-pin RS 232 connector. At the other end of the **SV 76** interface, which itself looks like a cable, is the USB-C connector which should be plugged into the USB-C socket on the instrument.

Make sure that the RS232 port is correctly configured.

To do this, in the **Communication Ports** screen (*path: <Menu> / Instrument*), select **RS232** in the **Serial Port** item and set the transmission speed (**Baud Rate**) and the time limit for data transmission (**Time Out**).

<ENT>



Printers with a USB interface only are not currently controlled by the instrument.

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

Note: *All reports are printed in the character format using the ASCII set on either A4 or A5 size paper.*

9.1 PRINTING MEASUREMENT RESULTS – PRINT

The **Print** item starts a report print on the connected printer or PC.

After pressing **<Enter>** the instrument checks its status. If the measurement is in progress, printing is not possible and a message to this effect is displayed.

If the measurement has already been performed and results are available, the data will be transferred from the instrument to the connected printer. The instrument returns to the **Report** list when all the data has been transferred.

If no measurements have been taken, the next message is displayed.

The timeout message is displayed if the printer (or PC) is not connected or there is some other reason for not receiving data. The instrument waits for a reaction from the user (any key should be pressed except **<Shift>**) and when a key is pressed it returns to the **Report** list.

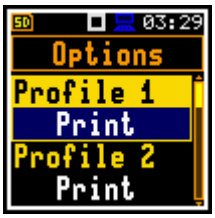
Below is an example of a report printout.

```
SVANTEK (C)   SV 973A   S/N:39039

2017-05-22 13:59:24    T:00:00:05

Profile 1          Slow          A

LCpeak:   82.9      Ld     :  55.9
LASmax:   77.0      LEPd   :  55.9
LASmin:   58.8      Ltm3   :  74.2
LAS    :  58.8      Ltm5   :  77.0
LAeq   :  55.9      OVL    :   0.0
LAE    :  62.9

Profile 2          Slow          C

LCpeak:   82.9      Ld     :  60.8
LCFmax:   80.0      LEPd   :  60.8
LCFmin:   53.3      Ltm3   :  77.2
LCF    :  60.3      Ltm5   :  80.0
LCeq   :  60.8      OVL    :   0.0
LCE    :  67.8

Profile 3          Slow          Z

LZpeak:   83.3      Ld     :  68.7
LZFmax:   81.4      LEPd   :  68.7
LZFmin:   60.1      Ltm3   :  78.8
LZF    :  65.6      Ltm5   :  81.4
LZeq   :  68.7      OVL    :   0.0
LZE    :  75.7
```

9.2 SELECTING PRINT OPTIONS – OPTIONS

The **Options** item allows you to specify the report content, select profiles, results for those profiles, statistics and spectra to be included in the report.

<ENT>



You can include (**Print**) or exclude (**Off**) results for each profile (**Profile x**) from the report.

You can exclude all the main results (**Results**) from the report (**Off**), include them all (**Print All**) or select results for the report (**Pr.Selected**). In the latter case the **Results** item appears in the **Report** menu.

You can exclude all statistics (**Statistics**) from the report (**Off**), include them all (**Print All**) or select essential statistics for the report (**Pr.Selected**). In the latter case, the **Statistics** item appears in the **Report** menu.

In case of 1/1 octave or 1/3 octave analysis functions, it is also possible to exclude all Leq, Lmax, Lmin and Lpeak spectra (items: **Leq Spect.**, **Lmax Spect.**, **Lmin Spect.**, **Lpeak Spect.**) from the report (**Off**), to include all bands of 1/1 or 1/3 spectra in the report (**Print All**) or selected bands (**Pr.Selected**). In the latter case the **Specrtum** item appears in the **Report** menu.

You can include (**Print**) or exclude (**Off**) units of the results from the report.

9.3 SELECTING RESULTS FOR THE REPORT – RESULTS

The **Results** item allows you to select the results to be included in the report for the selected profiles: **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **Lden**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **PTC**, **PTP**, **ULT**, **TWA**, **PrTWA**, **Lc-a**, **LR1**, **LR2** and **OVL**.

9.4 SELECTING STATISTICS FOR THE REPORT – STATISTICS

The **Statistics** item allows you to select the statistic levels from **N1** to **N10** to be included in the report.

9.5 SELECTING SPECTRA FOR THE REPORT – SPECTRUM

The **Spectrum** item allows you to select the 1/1 or 1/3 octave bands to be included in the report for the **Leq**, **Lmax**, **Lmin** and **Lpeak** spectra, based on their centre frequencies.

9.6 PRINTER SETTINGS – PRINTER

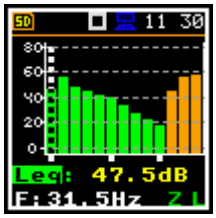
The **Printer** item allows you to set the number of characters in the report lines – from 20 to 500. The default value is 32.

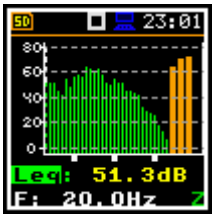
10 1/1 AND 1/3 OCTAVE ANALYSER

Real-time 1/1 octave or 1/3 octave analysis is performed in parallel with the SLM or SEM measurements. All digital bandpass filters (ten 1/1 octave filters with centre frequencies from 16 kHz down to 16.0 Hz and thirty-one 1/3 octave filters with centre frequencies from 20 kHz down to 8 Hz; in “base 10” system) work in real time with the weighting filters (**Z**, **A**, **B** or **C**) and the LEQ detector (**Linear**, **Fast** or **Slow**). This allows pre-weighting of the spectrum with one of the selected broadband filters if required by the application, e.g., to provide hearing protection when controlling high noise levels in the workplace.

For each 1/1 octave or 1/3 octave band, the Leq, Peak, Min or Max result is calculated and displayed as a bar on the spectrum plot. The results of 1/1 and 1/3 octave analysis (spectra) can be examined on a display in the **Spectrum** view.

A vertical cursor can be used to read the spectrum value.

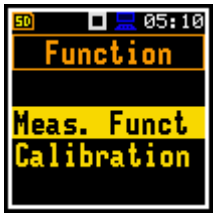




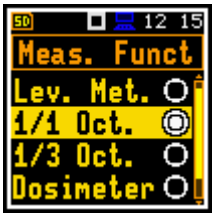
In addition to the band results, three totals are measured and displayed as three additional bars on the spectrum plot. Parameters for Total values (e.g., filters) are set by default and cannot be changed: Total 1 – A filter, Total 2 – C filter, Total 3 – Z filter.

10.1 SELECTING 1/1 OCTAVE OR 1/3 OCTAVE FUNCTION

To select the 1/1 octave or 1/3 octave analysis function, open the **Meas. Funct** item, select the **1/1 Octave** (**1/1.&Dose**) or **1/3 Octave** (**1/3.&Dose**) option and press **<Enter>**.



<ENT>



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

10.2 CONFIGURING 1/1 AND 1/3 OCTAVE ANALYSER

10.2.1 General measurement settings for the 1/1 and 1/3 octave analysis – General Settings

The execution of 1/1 or 1/3 octave analysis depends on a set of parameters configured in the **Measurement** section.

The averaging of the results for each band is performed during the **Integration Period** and is repeated the number of times set in **Repetition Cycles**.

Both parameters are defined in the **General Settings** list.

Note: *The measurement range for the **1/1 Octave** or **1/3 Octave** functions is the same as for the **Level Meter** function (see Chapter 4.6).*

*The measurement range for the **1/1.&Dose** or **1/3.&Dose** functions is the same as for the **Dosimeter** function (see Chapter 11.4).*

10.2.2 Logging of the 1/1 and 1/3 octave spectra

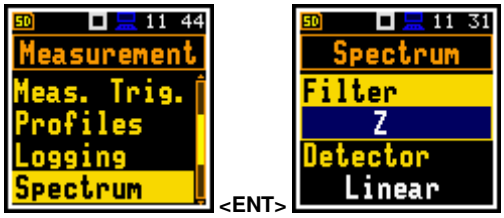
Spectra are always logged together with Summary results in a logger file with **Integration Period** step. The first requirement is that the **Logger** is switched on (*path: <Menu> / Measurement / Logging / Logger Setup / Logger: On).*

The **Leq** and **Lpeak** results of the 1/1 or 1/3 octave analysis can also be stored in the logger file with the step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). Activation of spectrum storage in the logger file with the **Logger step** is done by checking the **Peak Spectrum** or **Leq Spectrum** item.

10.2.3 Setting parameters of the 1/1 and 1/3 octave analysis – Spectrum

If the **1/1 Octave** or **1/3 Octave** functions are active, the additional item (**Spectrum**) appears in the **Measurement** list.

The **Spectrum** item allows you to select the pre-weighting broadband frequency filter and LEQ detector for the 1/1 or 1/3 octave analysis.

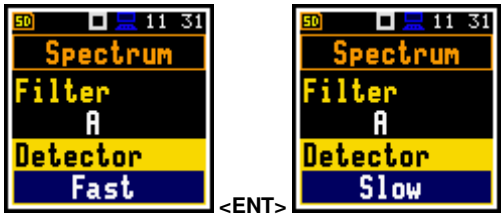


The following weighting filters are available for the 1/1 and 1/3 octave analysis in the **Filter** item:

- **A** class 1 according to IEC 651 and IEC 61672-1:2013,
- **C** class 1 according to IEC 651 and IEC 61672-1:2013,
- **Z** class 1 according to IEC 61672-1:2013,
- **B** class 1 according to IEC 651.

Filter characteristics are given in Appendix C.

The **Detector** item defines the RMS detector for the 1/1 octave or 1/3 octave bands and Total values: **Linear**, **Fast** or **Slow**.



Note: *Total values for 1/1 octave or 1/3 octave analysis may differ from the results for a level meter if the RMS detector settings are different.*

10.3 CONFIGURING THE 1/1 AND 1/3 OCTAVE SPECTRA VIEWS

The **Display** section is used to set various parameters, mainly to control of the spectrum view. The following items are used to set the presentation of 1/1 or 1/3 octave results that allows you to:

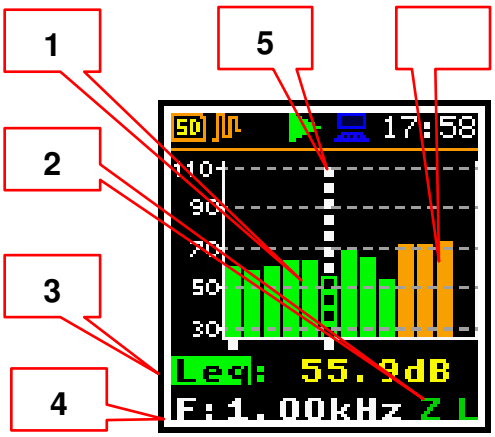
Display Modes	switch on the **Spectrum** view,
Display Scale	adjust the scale of the spectrum plot and switch the grid on/off,
Spectrum View	select the spectra to be viewed: instantaneous, averaged, maximum or minimum.

10.3.1 Presentation of the 1/1 and 1/3 octave spectra

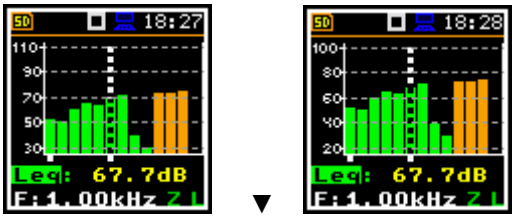
The **Spectrum** item in the **Display Modes** list becomes available for the **1/1 Octave** and **1/3 Octave** functions and allows you to enable the spectrum view (**Spectrum**).

Spectrum view fields

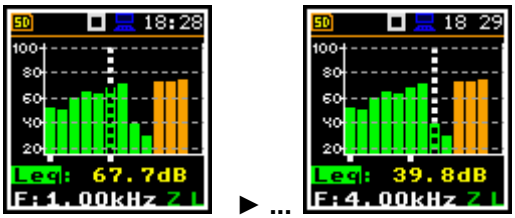
1. Spectrum plot
2. Type of filter and RMS detector
3. Type of result and its value for the cursor position
4. Central frequency for the cursor position
5. Cursor position
6. Total values



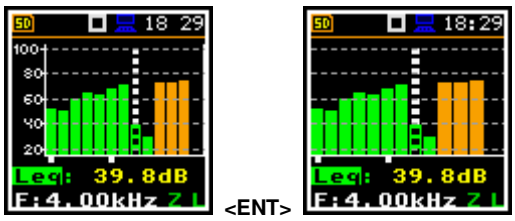
Use the ▲ / ▼ keys to move the Y-axis up or down.



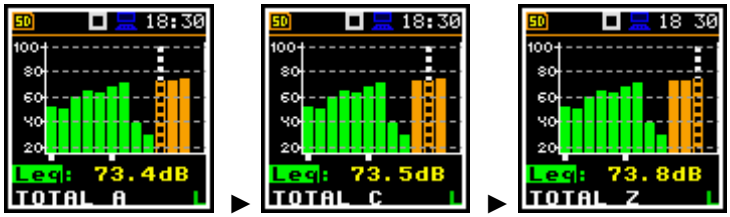
Use the ◄ / ► key to change the cursor position. The frequency and corresponding dB value are displayed in the line below the graph.



Spectrum view can be changed with the **<Enter>** key. The second spectrum view doesn't have the Y scale and therefore has wider bars.

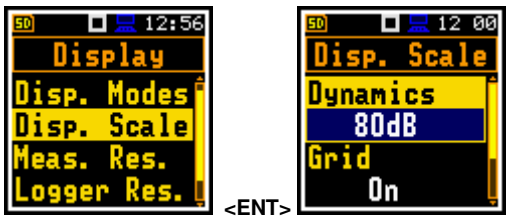


The **Total** values are calculated using the **A**, **C** and **Z** filters and their values are displayed at the bottom line of the screen when the cursor is placed on the corresponding orange bar.



10.3.2 Adjusting the spectrum plot scale – Display Scale

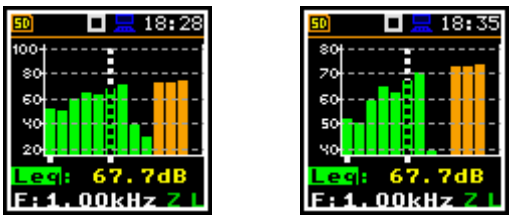
The **Display Scale** item allows you to change the scale of the spectrum plot and toggle the grid and automatic scale on/off.



Scaling vertical axis

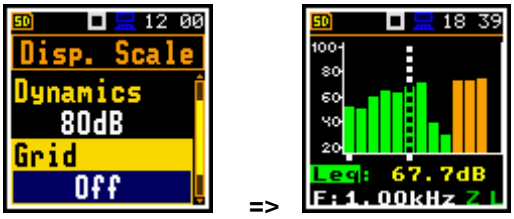
The **Dynamics** item allows you to select the desired dynamic range of the spectrum plot: **10dB**, **20dB**, **40dB**, **80dB** and **120dB**.

The attached example shows a spectrum view with 80 dB and 40 dB ranges.



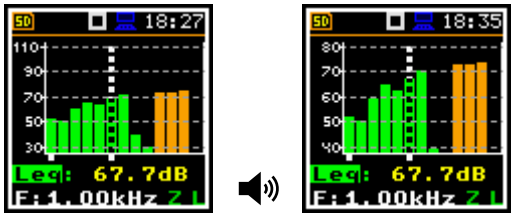
Switching the grid on/off

The **Grid** item switches the grid on/off in the spectrum view.



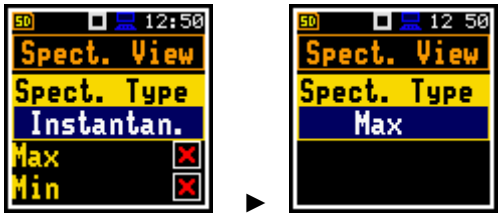
Automatic Y-scale adjustment

The **Autoscale** item switches on or off the automatic adjustment of the dynamic range of the Y-axis scale to the actual difference between the lowest and highest measured octave or third octave results. The example shows the changes in the scale after a sudden increase in sound pressure level.



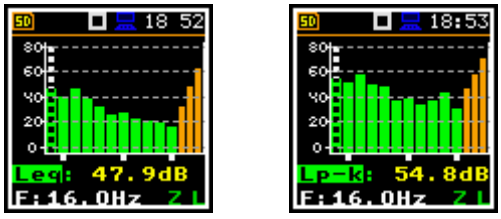
10.3.3 Selecting spectra to view – Spectrum View

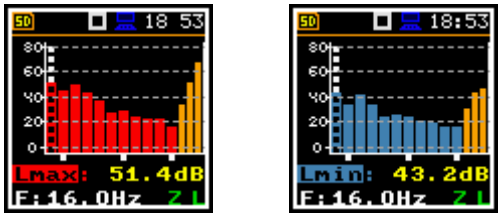
The **Spectrum View** item, which appears in the **1/1 Octave** or **1/3 Octave** functions, allows you to select different spectra to be displayed in the **Spectrum** view.



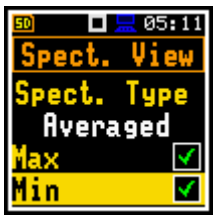
In the **Spectrum Type** item, you can select the type of spectrum to be displayed as a bar plot:

- **Instantaneous**, obtained for the Leq results integrated over 100 ms,
- **Averaged**, obtained by averaging the instantaneous spectra for the elapsed time [0, Integration Period],
- **Lp-k**, obtained for the Lpeak results for the elapsed time [0, Integration Period],
- **Max**, obtained as the maximum instantaneous spectrum for the elapsed time [0, Integration Period] or
- **Min**, obtained as the minimum instantaneous spectrum for the elapsed time [0, Integration Period].

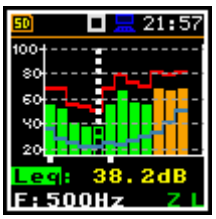




Minimum and maximum spectra can be displayed in the same plot as the main spectrum if the **Max** and/or **Min** parameter are enabled.



=>



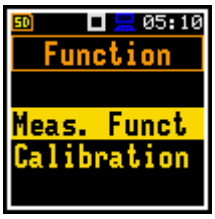
11 SOUND EXPOSURE METER – DOSIMETER

The instrument operates as a Sound Exposure Meter (SEM) / Dosimeter in much the same way as a Sound Level Meter (SLM) measuring basic dose parameters in addition to SLM results. This chapter describes settings specific to the SEM.

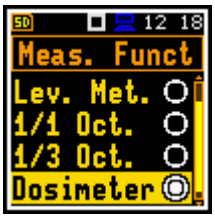
Note: *One important difference is that in the SEM mode, the instrument works in the different dynamic range than in the SLM mode (see Appendix C).*

11.1 SELECTING THE DOSIMETER FUNCTION

To select the **Dosimeter** function, enter the **Function** section, select the **Meas. Funct** item and press **<Enter>**. From the **Meas. Funct** list, select the **Dosimeter** function and press **<Enter>**.

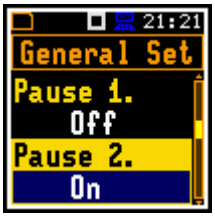


<ENT>



11.2 SETTING GENERAL PARAMETERS – GENERAL SETTINGS

Most of the general settings of the **Dosimeter** function are similar to those of the **Level Meter** function (see Chapter 4.1). In addition, the dosimeter has five programmable automatic pauses.



Programmable automatic pauses

The automatic pauses can be switched off (**Off**) or can be programmed based on the RTC time (**On**).

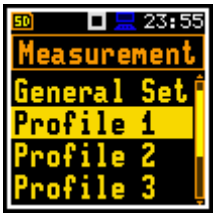
If **Pause** is **On**, two additional items appear allowing you to set the **Pause Begin** and **Pause End** times.

▼

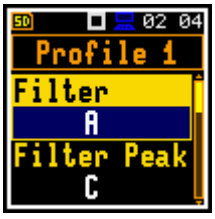
Note: *In the **Simple** interface, the **Pause** parameters are hidden, but the instrument uses settings previously defined in the **Advanced** interface or default settings (**Off**).*

11.3 SETTING PROFILE PARAMETERS – PROFILE X

The parameters of the three profiles can be set in the **Profile x** lists of parameters.



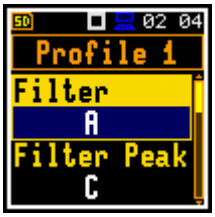
<ENT>



The following parameters can be programmed independently for each profile: weighting filter (**Filter**), peak filter (**Filter Peak**) and LEQ detector type (**Detector**), criterion level (**Crit. Level**), threshold level **(Thr. Level**), exchange rate (**Exch. Rate)**, thresholds - **ULT Thresh.** and **PTC Thresh.**.

Weighting filter selection

- **Z** according to IEC 61672-1:2013 for Class 2,
- **A** according to IEC 651 and IEC 61672-1:2013 for Class 2,
- **C** according to IEC 651 and IEC 61672-1:2013 for Class 2,
- **B** according to IEC 651 for Class 2.



LEQ detector

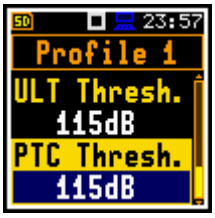
The following LEQ detectors are available in the instrument: **Imp.**, **Fast** and **Slow**.

Dosimeter specific parameters can be set in accordance with the OSHA HC (Occupational Safety and Health Administration - Hearing Conversation), OSHA PEL (Occupational Safety and Health Administration – Permissible Exposure Level) and ACGIH standards.

Criterion Level is a steady noise level permitted for a full eight-hour work shift: **60dB**, **65dB**, **70dB**, **75dB**, **80dB**, **84dB**, **85dB**, **87dB**, **90dB**.

Threshold Level is a noise level limit below which the dosimeter does not accumulate noise dose data: **None**, **60dB**, **65dB**, **70dB**, **75dB**, **80dB**, **85dB**, **90dB**.

Exchange Rate is an amount by which the permissible sound level may increase if the exposure time is halved: **2**, **3**, **4**, **5**, **6**.



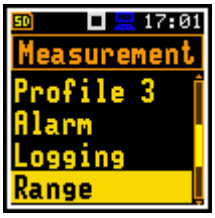
ULT Threshold Level (Upper Level Time) is a threshold level for calculating of the ULT results: **70dB** ÷ **140dB**.

PTC Threshold Level (Peak Threshold Counter) is a threshold level for calculating of the PTC results: **70dB** ÷ **140dB**.

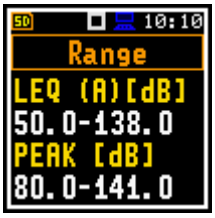
11.4 Checking the measurement range – Range

The measurement range for the **Dosimeter** function is 50.0 LEQ(A) – 141.0 PEAK. The detailed description of the measurement range is given in Appendix C.

The calibration factor is always added to the lower and upper range values.

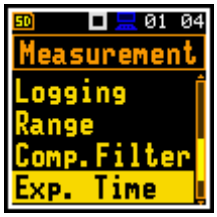


<ENT>



11.5 Setting the exposure time – Exposure Time

The **Exp. Time** item allows you to set the workday exposure time used to calculate the **LEPd** results (see Appendix D).



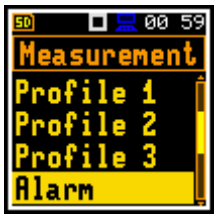
<ENT>

11.6 Setting alarm thresholds for dosimeter results – Alarm

The **Alarm** item is active only in the **Dosimeter** function and allows you to program the alarm thresholds for three profiles (**Thresh. P1 (2,3)**).

The thresholds can be set for the following measurement results in ranges:

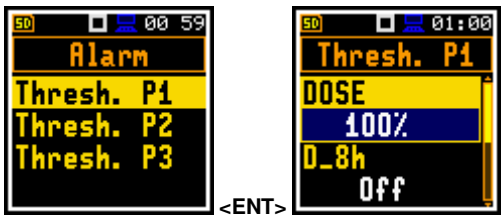
DOSE: 1÷200%;



<ENT>

D_8h: 1÷200%;
PTC: 1÷1000;
ULT: 1÷60s.

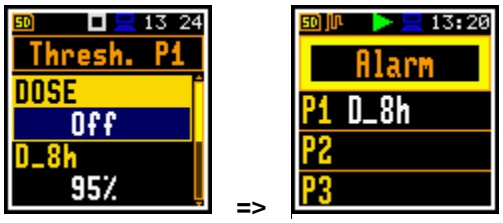
If **Off** is selected, the alarm is disabled.



The alarm is signalled on a special screen with the **Alarm** text in a flashing frame and exceeded the profile thresholds.

For example, with these settings, the alarm screen will look like this.

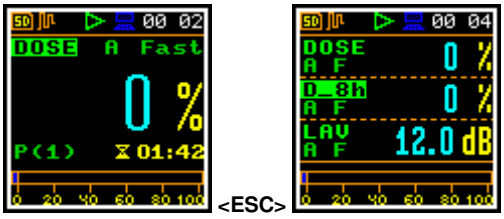
To exit the alarm screen, press any key.



11.7 Displaying Dosimeter results

The **Dose Meter** function measures and displays the following results: **TIME**, **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **Ln**, **PTC**, **PTP**, **ULT**, **TWA**, **PrTWA**, **Lc-a**, **EX**, **SD** and **OVL**.

Results can be enabled or disabled in the **Dosimeter results** screen (*path: <Menu> / Display / Meas. Res. / Dosim. Res.*).



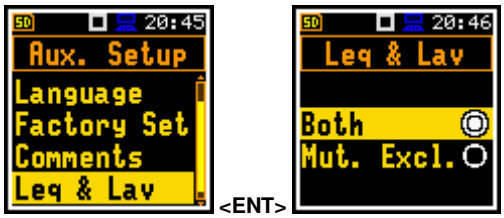
11.7.1 Displaying Leq & Lav results – Leq & Lav

The **Leq & Lav** item allows you to select the way the **Leq** and **Lav** results are to be displayed.

If **Both** is selected, **Leq** and **Lav** will always be displayed together.

If **Mutual Exclusive** is selected, the rule is:

- for an **Exchange Rate** equal to 3, **Leq** is displayed and **Lav** is not,
- for an **Exchange Rate** other than 3, **Lav** is displayed and **Leq** is not.



12 REVERBERATION TIME MEASUREMENTS – RT60

The **RT60** analysis is an optional function of the SV 973A that provides reverberation time calculation for 1/1 octave bands (from 63 Hz to 8 kHz) or 1/3 octave bands (from 50 Hz to 10 kHz) and three total RMS levels (**A**, **C** and **Z** weighted). The entire measurement process and calculations implemented in the SV 973A comply with the ISO 3382 standard.

The reverberation time of a room can be measured with the SV 973A using two measurement methods: Impulse Response Method (**Impulse**) and Interrupted Noise Method (**Decay**). The choice of method depends on the type of sound source used. The **Impulse** method is intended for measurements with an impulsive sound source (e.g., gunshot, petard explosion), whereas the **Decay** method is intended for measurements when the room is excited by a broadband or narrowband sound noise source (usually pink noise). For more details on the measurement and calculation process, see Appendix E.

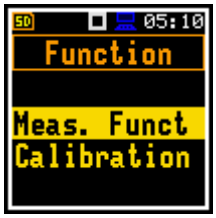
The reverberation time analysis used in the instrument consists of two parts:

1. The measurement part in which the acoustic response of the room is registered.
2. The calculation part in which the reverberation time (**EDT**, **RT20** and **RT30**) is calculated for the measured room response.

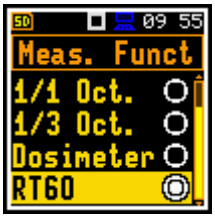
Note: *It is recommended that you familiarise yourself with Appendix E before proceeding. This chapter only describes how to navigate the instrument, while Appendix E provides definitions and describes reverberation time measurements.*

12.1 SELECTING THE RT60 FUNCTION

To activate the **RT60** function, enter the **Function** section, select the **Meas. Funct** item and press **<Enter>**. In the **Meas. Funct** screen, select the **RT60** function and press **<Enter>**.

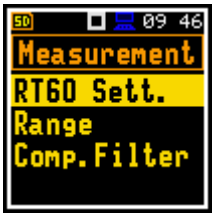


<ENT>



Note: *The **RT60** function is optional and should be unlocked by entering the activation code in the text editor screen that opens after the first attempt to select this function. Once unlocked, this option is permanently available.*

12.2 SETTING THE RT60 PARAMETERS – RT60 SETTINGS



The execution of the **RT60** analysis depends on certain parameters that can be set in the **Measurement** section screens: **RT60 Settings**, **Compensation Filter** and **Range**.

The **Range** screen only displays the **Low** measurement range, which cannot be changed (see Chapter 4.6).

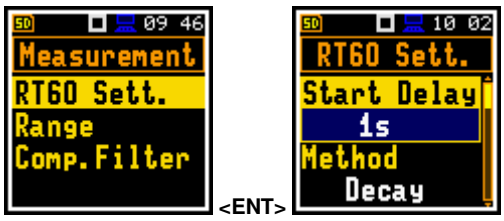
The **Compensation Filter** item, which only appears in the **Advanced** interface, allows you to switch on the required compensation filter (see Chapter 4.7). When the RT60 function is enabled, the **Field Compensation** is always set to **Free Field**.

Other measurement parameters are set by default:

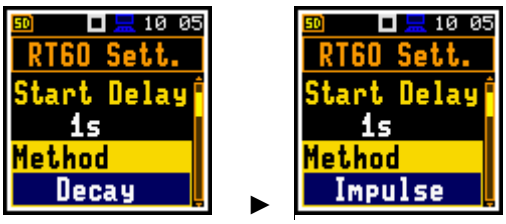
- **LEQ Integration**: **Linear**
- **Profiles** / **Detector**: **Slow**
- **Spectrum** / **Filter**: **Z**
- **Spectrum** / **Detector**: **Linear**

The **RT60 Settings** list allows you to select the method for **RT60** calculations, define the name of the file where the registered data will be collected, and other parameters for **RT60** calculations.

The **Start Delay** item defines the delay between the moment the **<Start>** key is pressed and the start of the actual measurement.



The **Method** item allows you to select the method for **RT60** calculations: **Decay** or **Impulse**. Both methods are described in Appendix E.



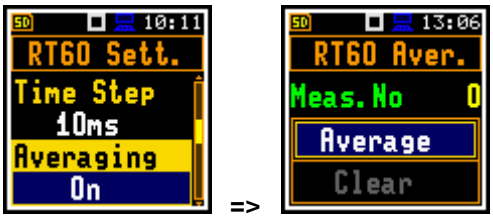
The **Recording Time** item allows you to define the recording time of the measurement data (sound pressure level decay curve). Data recording starts when the trigger condition occurs. The recording time can be set in the range **1s ÷ 30s** or **Auto**.

If **Auto** is selected, the instrument decides when to stop recording. The default time step is 2ms.

The **Time Step** item allows you to define the time step of the data recording (sound pressure level) in the file: **2**, **5**, **10**, **20**, **50 ms**.

The **Averaging** item allows you to enable averaging of the reverberation time results from several measurements.

When this item is **On,** the new **RT60 Aver.** screen is available in the measurement mode.



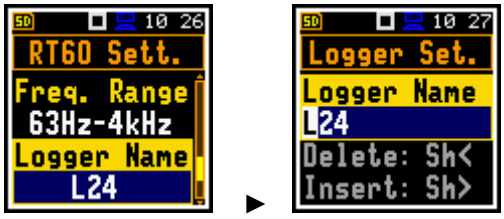
The **Noise Mar.** item allows you to define the margin value for the calculated noise level (for more detail see Appendix E). This parameter can be set in the range **0.0 dB ÷ 20.0 dB** with 0.1 dB step (default value is **10.0 dB**).

The **Octave** item allows you to define the bands (**1/1** or **1/3**) the **RT60** analysis is performed.

The **Freq. Range** item allows you to define the frequency range for 1/1 or 1/3 octave calculations:

- for 1/1 octave**: 63Hz-4kHz** (7 bands) or **63Hz-8kHz** (8 bands).
- for 1/3 octave: **50Hz-5kHz** (21 bands) or **50Hz-10kHz** (24 bands).

The **Logger Name** item allows you to specify the name of the logger file in which the **RT60** analysis data will be recorded. The name can be up to eight characters long. Press the ◄ / ► key to open the screen with the text editor.



The **Level** item allows you to define the threshold level of the sound source for triggering the RT60 measurement. If the measured sound is below the **Level** value, the RT60 measurement will not start. The parameter can be set in the range 24 ÷ 136 dB with 1 dB step (default value is **100dB**).

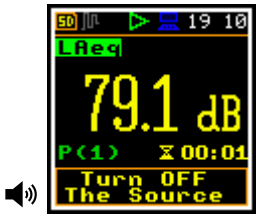
12.1 STARTING RT60 MEASUREMENTS

Measurements using the Decay method

1. Set parameters for **Decay** RT60 measurements. The most commonly used setup is as follows.
   - **Method:** **Decay**
   - **Recording Time:** **Auto**
   - **Time Step:** **2ms**
   - **Averaging:** **On**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100dB**.

2. Place the sound source in the room to be measured (for the location of the sound source, see the ISO standard for measuring reverberation time).
3. Place the microphone at one of the selected measurement points (for the location of the measurement points, see the ISO standard for measuring reverberation time).
4. Switch on the sound source.
5. Start the measurement by pressing the **<Start>** key. While the instrument is waiting for the trigger condition to be met, the **LAeq** result will be displayed and when the signal has stabilised, the instrument will prompt you to turn off the sound source.

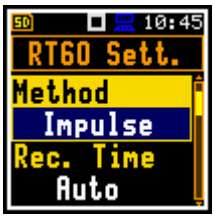
6. Switch off the sound source (the source should be left on long enough for the acoustic field to stabilise). Once the trigger condition has been met, the instrument collects data and returns the RT60 table for 1/1 octave or 1/3 octave bands.



***Note**: It is necessary to switch on the sound source before starting the measurement due to the trigger requirements (see Appendix E for details). If it is necessary to start the instrument before switching on the sound source, it is recommended to use the higher **Start Delay** value.*

Measurements using the Impulse method

1. Set parameters for **Impulse** RT60 measurements. The most commonly used setup is as follows.
   - **Method:** **Impulse**
   - **Recording Time:** **Auto**
   - **Time Step:** **10ms**
   - **Averaging:** **On**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100dB**



2. Place the microphone at one of the selected measurement points (for the location of the measurement points, see the ISO standard for measuring reverberation time).

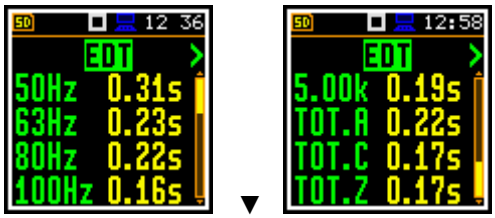
***Note**: The correct value of the sound level trigger threshold should be set well above the background noise and well below the maximum sound level emitted by the impulse source.*

3. Start the measurement by pressing the **<Start>** key. While the instrument is waiting for the trigger condition to be met, the **LAeq** result will be displayed.
4. Release the impulse sound source. When the trigger condition is met, the instrument collects data and returns the RT60 table for 1/1 octave or 1/3 octave bands.

***Note**: During data collection, all other sound sources in the tested room should be suppressed to avoid affecting the measurement results.*

12.2 VIEWING RT60 RESULTS

The **RT60** measurement results for all 1/1 or 1/3 octave bands and three Total values are presented in a table.



The table shows the next results of the reverberation time for:

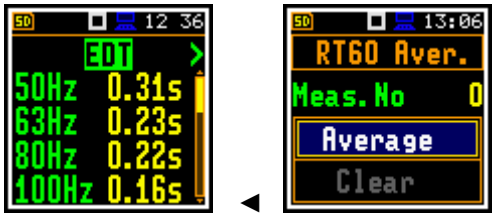
- **EDT** - early decay time,
- **RT20** - reverberation time calculated at 20 dB dynamics,
- **RT30** - reverberation time calculated at 30 dB dynamics.

***Note:** If "- - -" text appears in the RT indicator field, it means that for this band with the selected parameters (**Noise Mar.**) the required measurement conditions were not fulfilled to obtain the results (for more details see Appendix E).*

12.3 AVERAGING RT60 RESULTS

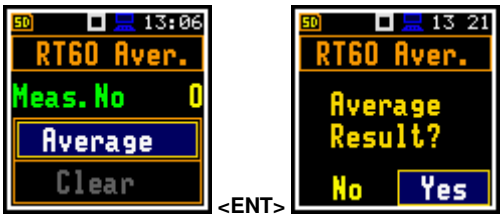
If **Averaging** is On, you can average the results of successive measurements by following the steps below:

1. While in the RT60 view, press the ◄ key from the **EDT** column or the ► key from the **RT30** column to access the **RT60 Aver.** screen.

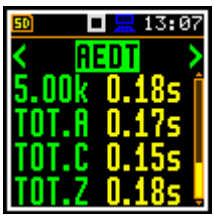


The **Meas.No** item displays the number of the measurement that has been averaged so far.

2. From the **RT60 Aver.** screen, press the **<Enter>** key to confirm averaging.



As a result, three additional columns appear in the RT60 table: **AEDT**, **A20** and **A30**.



When you start a new measurement and obtain results, you can perform averaging with previously averaged results as per steps 1 and 2 above. The **Meas.No** will be increased by one and columns **AEDT**, **A20** and **A30** will show new results averaged with previous results.

To clear averaging, select **Clear** from the **RT60 Aver.** screen, press **<Enter>** and confirm to clear.

<ENT>

13 STI CALCULATIONS – STIPA

The Speech Transmission Index (STI) is used to measure the deterioration of speech intelligibility caused by the transmission channel. The STI method uses a test signal applied to the transmission channel and an analysis of the received test signal. The speech transmission quality of the channel is determined and expressed as an STI value between 0 and 1.

Applications of STI include evaluation of sound reinforcement and emergency systems, communication channels, speech intelligibility, communication in rooms and auditoriums, etc.

STIPA (speech transmission index for public address systems) is an STI derived approach developed for fast measurement of electro-acoustic and acoustic environmental effects that affect speech intelligibility in room acoustics and/or public address systems.

STIPA calculations are performed in SV 973A according to IEC 60268-16:2011.

Note: *Svantek also provides applications (BA Assistant or Building Acoustics Pro) for mobile devices that perform STIPA measurements using Svantek's measuring instruments (including SV 973A) with a more convenient user interface (see user manuals for these applications).*

13.1 STI METHOD BACKGROUND

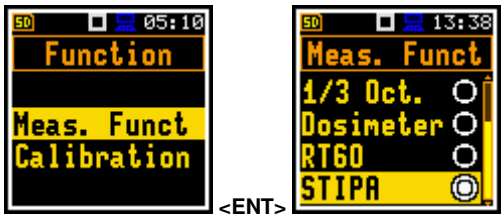
The STI method is based on measurements of the STI test signal comprising seven octave band noise signals corresponding with the octave bands from 125 Hz up to 8 kHz. Each noise carrier is modulated with one or more modulation frequencies at one-third octave intervals ranging from 0,63 Hz up to and including 12,5 Hz. Such a test signal which simulates speech fluctuations is reproduced in a room or through a communication channel and received at a listener position (superimposed by distortions presented in the room like echoes or noise) by means of omnidirectional microphone.

The STI method determines the modulation transfer function m(F) – the reduction in modulation depth per modulation frequency - of the transmission channel for the seven octave bands. The RMS level of each octave band carrier matches the relative level of the average, long-term spectrum of the speech material. Each octave band has a contribution to speech intelligibility which is weighted according to that band. The weighted sum of these transmission index values is used to determine the overall STI value for the transmission channel.

The STIPA method uses two modulation frequencies per octave band, generated simultaneously, giving a total of 14 modulation indices.

13.2 SELECTING THE STIPA FUNCTION

To activate the **STIPA** function, enter the **Function** section, select the **Meas. Funct** item and press **<Enter>**. In the **Meas. Funct** screen, select the **STIPA** function and press **<Enter>**.



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

13.3 STIPA MEASUREMENT AND CALCULATION PROCESS

STI measurements usually refer to objects (buildings), which may consist of several areas (rooms), in which measurements are made at a certain number of points (in practice, from 1 up to several dozen). In addition, especially when assessing speech intelligibility in a room directly, i.e. without an amplification system, tests are performed for a given number of source positions (in practice from one to several). A given area may be tested in several configurations, for example, a theatre auditorium with the curtain raised and lowered, or a railway vehicle at rest and in motion. The result for a given point is obtained from several measurements (in practice from 1 to 6) - most often as an average. Analyses are performed independently for areas in a given configuration.

13.3.1 Measured results

The **STIPA** function allows measurement and calculation of the following results:

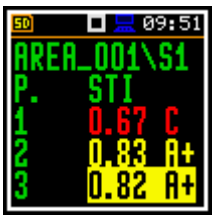
- **STI** - Speech Transmission Index representing the speech transmission quality in terms of intelligibility over a speech transmission channel, ranging from 0 to 1. STI is calculated for individual measurements and averaged for the measurement point and for the area.
- **Avg.** – averaged STI or CIS result for the measurement point.
- **Δ** – difference between maximum and minimum values of the STI index obtained for the measurement point of the tested area.
- **LAeq** – A-weighed time-averaged sound level over a 15-seconds integration period, in dB.
- **LCeq** – C-weighed time-averaged sound level over a 15-seconds integration period, in dB.
- **LZeq** – Z-weighed time-averaged sound level over a 15-seconds integration period, in dB.
- **LAS** – time-weighted sound level expressed at observation time (15 second integration period), in dB.
- **m(f1), m(f2)** - modulation transfer ratios as a function of two modulation frequencies for each of the 7 octave bands, between 0 and 1.
- **CIS** - Common Intelligibility Scale $CIS = 1 + log(STI)$.
- **σ** - standard deviation of the measured STI indices for the tested area.
- **Min** – minimum STI value obtained with the measurements.

There are some additional indications:

- The STI qualification band: **A+** to **U** (see Annex G of IEC 60268-16:2011).

These results are displayed in different views:

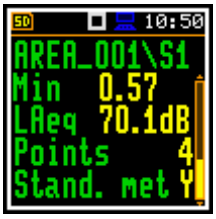
- *Area* view is a main STIPA view that allows you to create new measurement points, delete measurement points or exclude them from the calculation of averaged indices for the Area, as well as to switch to the *Point* view for the selected point. This view shows a list of measurement points and the next results:



  - Averaged **STI** or **CIS** indices taking into account the Ambient noise distortion for the measurement points.
  - The STI qualification band (**A+** to **U**) is displayed for each measurement point.

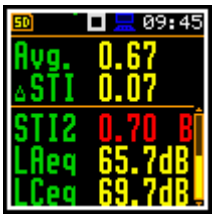
  The red colour of the STI/CIS result indicates errors or distortions detected during measurements in that point.

- *Area summary* view is a main STIPA view that shows summary results for the current area:



  - Averaged **STI** or **CIS** index considering Ambient noise distortions.
  - **σ** - standard deviation of the measured STI indices for the area.
  - **Min** – minimum STI value.
  - **LAeq** – averaged LAeq for the area.
  - Number of measurement points (**Points**) considered for the summary results calculations.
  - Conformity of the measurements with the selected standard (**Stand. met**): Yes (**Y**) or No (**N**).

- *Point* view is a main STIPA view that allows you to see the modulation function, to delete measurements (only for the last measurement point) and to exclude measurement results from the calculation of the averaged STI index. This view corresponds to the measurement point selected in the *Area* view. This view shows a list of measurements for the measurement point with the following results:



  - Averaged STI or CIS index considering Ambient noise distortions (**Avg.**) and the index spread (**ΔSTI**/**ΔCIS**) for the measurement point.
  - **STIx** results with considered ambient noise, STI qualification band, **LAeq** and **LCeq** results for the measurement (**x**: **1**, **2**, ..). The red colour of the STIx result indicates errors or distorbances detected during the measurement.

Note: *Averaged **CIS** is displayed instead of STI in the Area summary view and in the Point view when this parameter is selected as **Index** in the **STIPA Settings** screen.*

- *Measurement* view appears when a new measurement is started (manually or automatically). This view shows the results, which are updated every second and a 15-second progress bar:

  - **STI** index with or without considered Ambient noise (**Meas.**) and STI qualification band.
  - **LAeq** and **LAS** for the current measurement time.

At the end of the measurement, the instrument automatically switches to the *Point* view and the measurement results are placed in the measurement list. If you stop the measurement manually, the instrument switches to the *Point* view, but the measurement result is not included in the measurement list (see Chapter 13.3.6).

- *Modulation function* view corresponds to the measurement selected in the *Point* view and displays LZeq and modulation transfer ratios (*m(f1), m(f2)*) for seven octave bands with a centre frequency from 125 Hz up to 8 kHz:

Use the ◄ / ► key to change columns.

If the modulation ratios are greater than 1 due to errors or disturbances detected during the measurement, they are given a value of 1 and the results for this band are highlighted in red.

You can return to the *Point* view by pressing **<Enter>** or **<ESC>**.

Note: *You can switch between views by the pressing the ▼/▲ key together with* ***<Shift>****.*

13.3.2 Project structure

Speech intelligibility measurements are organised in a project structure. The project name is the name of the directory in the instrument's memory. Test areas are the names of its subdirectories. The test signal positions (called sources) are named in the next lower-level directories. The source position directory contains measurement point directories with predefined names (**P1**, **P2** etc.) where the measurement files are saved. The measurement file contains the measurement results for the single measurement. Projects are saved in the pre-defined STIPA catalogue in the instrument memory. Projects can be accessed from the **File Manager**.

For example, in the screenshots below, the project directory (**PROJ_001**) contains an area directory (**AREA_001**), which contains a source position directory (**S1**) which contains two point directories (**P1** and **P2**) and an Ambient noise file (**NOISE.SVL**). The **P1** directory contains files with measurement results (**M1.SVL**, **M2.SVL …**).

The first three directories are created by the user when configuring the **STIPA Settings** in the **Project**, **Area** and **Source** items.

Note: *Project, Area and Source directories can be created, renamed or deleted using the* ***File Manager*** *(see Chapter 6.1).*

Point directories are created automatically after the **Next** measurement point for the Area has been created during the measurement process. Measurement files are automatically at the start of each measurement (see Chapter 13.3.6).

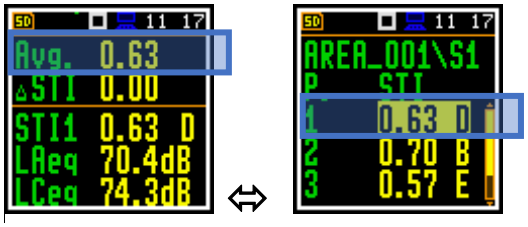
Note: *You cannot delete or rename point directories and measurement files using the* ***File Manager****. You can delete a point directory and a measurement file using the mechanism described in Chapter 13.3.6.*

13.3.3 Averaging results

STIPA measurements require an averaging of the STI/CIS indices. This averaging concerns two aspects:

1) Averaging of results for a measurement point.

The averaged **STI**/**CIS** for the measurement point is displayed in the first row of the *Point* view and in the measurement point list of the *Area* view.



2) Averaging the results for a tested area.

The averaged **STI**/**CIS** for the tested area is displayed in the second row of the *Area summary* view.

According to most standards, it is good practice to average the results for measurement points for two or three measurements. In the case of noise fluctuations during measurements, it is recommended to take at least three measurements and check that the spread of the STI index does not exceed 0.03.

13.3.4 STIPA settings

The performance of **STIPA** measurements depends on certain parameters that can be set in the **Measurement** section: **STIPA Settings**, **Ambient noise**, **Range** and **Compensation Filter**.

The **Range** screen presents only the **Low** measurement range, which cannot be changed (see Chapter 4.6).

The **Compensation Filter** item, which appears only in the **Advanced** interface, allows the required compensation filter to be switched on (see Chapter 4.7).

The other measurement parameters are set by default:

- **Start Synchronization**: **Off**
- **LEQ Integration**: **Linear**
- **Profiles** / **Detector**: **Slow**
- **Spectrum** / **Filter**: **Z**
- **Spectrum** / **Detector**: **Linear**

The STIPA Settings and Ambient Noise items are used to configure STIPA measurements. Follow the next steps to configure a STIPA project:

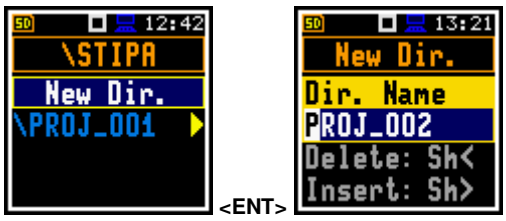
1. In the **Measurement** section, select the **STIPA Sett.** item and press **<Enter>**.

2. Select the **Project** item, press the ► key and in the **File Manager** screen select:
   - **New Dir.** to create a new project directory or
   - the directory of the previously created project

   and press **<Enter>**.

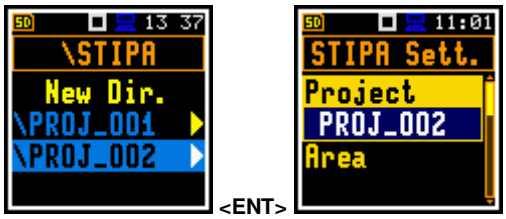
In the case of **New Dir.**, the instrument will suggest a default name for the new Project directory, which can be modified in the editor screen that opens after pressing **<Enter>**.

Once the directory name has been edited it should be confirmed with **<Enter>**.



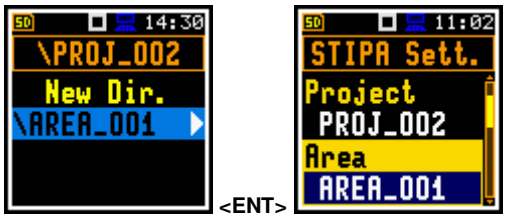
At the newly created directory line in the **File Manger**, press **<Enter>** to return to the **STIPA Sett.** screen.

The selected project name will be displayed in the **Project** item of the **STIPA Sett.** screen.



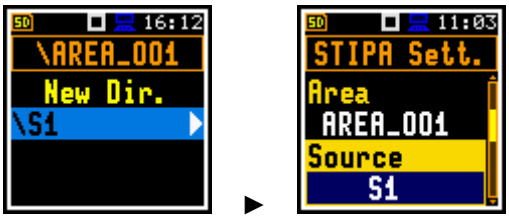
3. Go to the **Area** item and press the ► key. In the **File Manager** screen, create a new area directory (**New Dir.**) or select the directory of the previously created Area in the selected Project.

After creating a new area directory or selecting the existing one, press **<Enter>** and the selected area name will be displayed in the **Area** item of the **STIPA Sett.** screen.



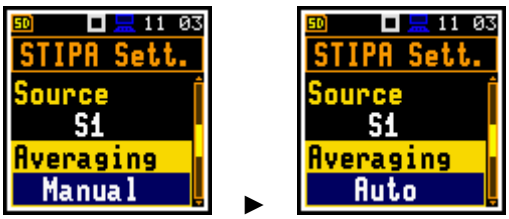
4. Go to the **Source** item and press the ► key. In the **File Manager** screen, create a new source directory (**New Dir.**) or select the directory of the previously created Source in the selected Area.

After creating a new source directory or selecting the existing one, press **<Enter>** and the selected source name will be displayed in the **Source** item of the **STIPA Sett.** screen.



5. Select the **Averaging** type: **Manual** or **Auto**.

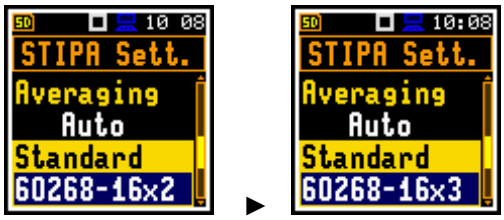
Manual averaging means that you can carry out as many measurements in the measurement point as necessary and you decide when to stop the series of measurements by using the **Complete** command (see Chapter 13.3.6).



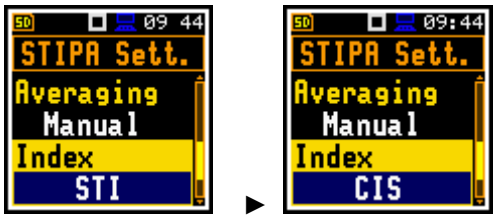
Automatic averaging assumes that the measurements are averaged according to IEC 60268-16:2011, which assumes two averaging procedures – for standard measurements (**60268-16x2**) and for measurements with fluctuating noise (**60268-16x3**). In the name of the standard, the abbreviation **x2** means that at least two measurements should be made, and **x3** means that at least three measurements should be made. When automatic averaging is selected, an additional item **Standard** appears in the **STIPA Settings** screen.

6. In the case of automatic averaging, select the **Standard** that defines the type of averaging: **60268-16x2** or **60268-16x3**.

   In automatic averaging mode, you perform measurements in the same way as in manual mode. The difference is that in automatic mode the instrument decides when to stop the series of measurements and stops it automatically when a certain condition is met.



7. In the **Index** item, select the **STI** or **CIS** result to be displayed in the main STIPA views.



8. In the **Source Calibration** item, adjust the level of the STIPA reference signal to the level of a real speech signal in the tested area.

   The LAeq of both signals must be measured, and if the difference between the real signal and the STIPA signal is different from -3 dB, enter it as the Source calibration.

13.3.5 Considering ambient noise distortion

During the measurement, the effect of ambient noise distortion can be considered in combination with the STIPA signal in the 1/1 octave bands with centre frequencies from 125 to 8000 Hz. These sound pressure levels should not necessarily be the result of some measurements. They can be defined based on the user's knowledge, design assumptions, literature, etc.

The **Ambient noise** item allows you to set the noise levels for the octave bands to be included in the STIPA calculations.

To set the ambient noise, select the 1/1 octave band and use the ◄/► key to set the desired value in dB.

The **Enable** item allows you to include/exclude the ambient noise in subsequent measurements.

13.3.6 STIPA measurements

When the STIPA settings are complete, you can start measuring.

1. To take measurements, enter the measurement mode (exit the configuration menu).

   When you start measurements, the *Area* view will show the first measurement point with a zero STI value.

   If you have already taken the measurements for some of the measurement points, you should create a new measurement point – see step 5.

2. Press the **<Start>** key to start the measurement. The *Measurement* view will appear showing the progress bar of the measurement and the STI index calculated with the ambient noise taken into account (**STI**), the measured STI index (**Meas.**), the STI qualification band next to the index, the **LAeq** and **LAS** results.

   The measurement lasts 15 seconds, with results updated every 1 second.

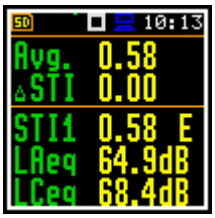
<Start>

Note: *Ambient noise distortion is considered according to the values set in the* ***Ambient noise*** *table (see Chapter 13.3.5).*

Note: *Pressing the* ***<Stop>*** *key during the measurement will abort the masurement without recording the results.*

When the measurement is complete, the instrument displays the *Point* view with the current measurement results. Use the ▲ / ▼ key to scroll through the results.

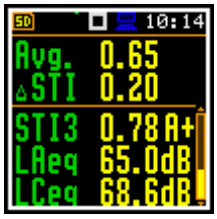
3. Press the **<Start>** key if you want to take another measurement.



or

4. To end the series of measurements for the measurement point, you should end them.

   To end the measurement series at the measurement point, press the **<Enter>** key, select **Complete** and in the command list and press **<Enter>**.



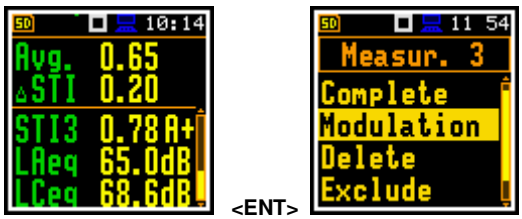
<ENT>

The instrument switches automatically to the *Area* view.

<ENT>

Note: *In the case of automatic averaging, the series of measurements is automatically completed after when the conditions specified in the selected standard are met.*

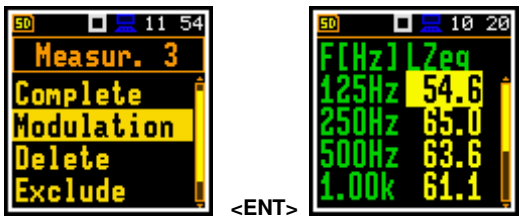
If you select a measurement in the *Point* view and open the command list, you can view the modulation function coefficients (**Modulation**) for the selected measurement and delete (**Delete**) or exclude the selected measurement from the averaging (**Exclude**).



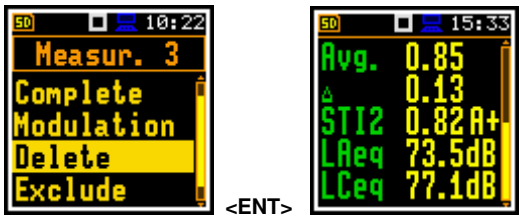
If you select **Modulation** and press **<Enter>**, the instrument will switch to the *Modulation function* view.

Use the ◄ / ► key to change columns in this view.

Press **<Enter>** or **<ESC>** to return to the *Point* view

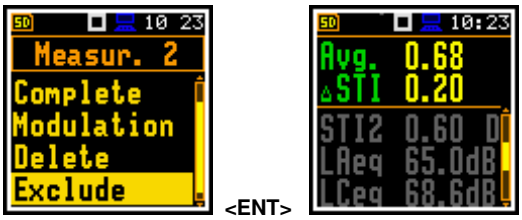


If you select **Delete** and press **<Enter>**, the instrument will delete the selected measurement from the measurement list and change the numbering in the *Point* view. At the same time, the file containing the measurement results is deleted from the Points directory.



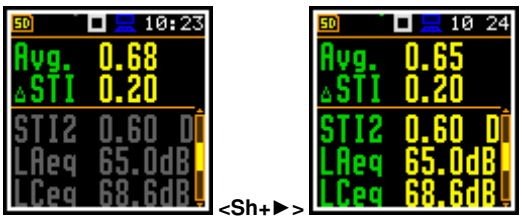
If you select **Exclude** and press **<Enter>**, the instrument will exclude the selected measurement from averaging and the excluded measurement results will be grey in the *Point* view.

When you select the excluded measurement and open the command list, the last command is named **Include**.



You can also exclude/include the selected measurement from averaging directly in the *Point* view by pressing the ◄ / ► key together with **<Shift>**.

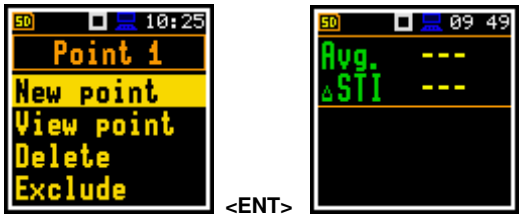
The file with the excluded measurement results will have the character "_" instead of "M".



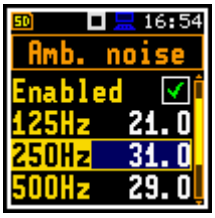
5. Once you have completed the series of measurements for the measurement point, you can create a new point.

   To do this, press **<Enter>** in the *Area* view and select **New point** from the command list and press **<Enter>**. The instrument will create a new point directory and switch to the *Point* view.

   To start measurements at the new measurement point, press the **<Start>** key and follow steps 2 – 4.

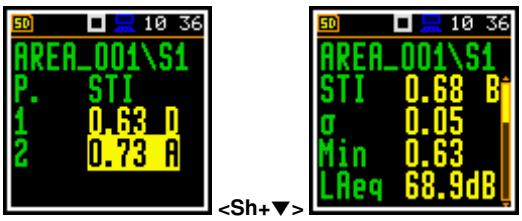


In some cases, it may be necessary to change the ambient noise levels for a new measurement point. In this case, open the **Ambient noise** item and make the necessary adjustments to the octave noise levels for. After confirming the changes with **<Enter>**, you can return to the measurement mode with the new ambient noise distortion parameters.

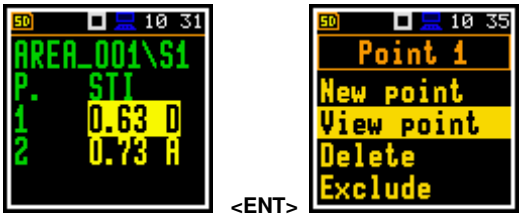


Note: *Any confirmed changes to the* ***Ambient noise*** *table will replace the previous ones and new ambient noise distortions will be considered in the next measurements!*

The summary results for the Area are presented in the *Area summary* view, which can be accessed from the *Area* view by pressing the ▼/▲ key together with **<Shift>**.

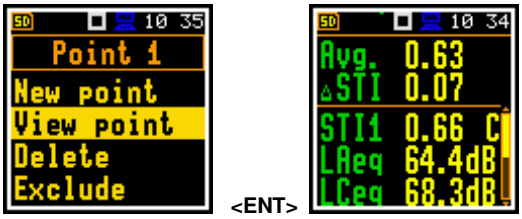


If you select the measurement point in the *Area* view and open the command list, you can also switch to the *Point* view (**View point**) and delete (**Delete**) or exclude (**Exclude**) the selected measurement point from the averaging.



If you select **View point** and press **<Enter>**, the instrument will open the *Point* view for the selected measurement point.

If the selected point is not the last measurement point, in the *Point* view, you can only view the measurement results together with the modulation function and exclude/include the selected measurements from the averaging. The **Delete** command is disabled.



If you select **Delete** and press **<Enter>**, the instrument will delete the selected measurement point and return to the *Area* view with a new point numbering. The point directory will be deleted from the Source directory along with any data files it contains.

If you select **Exclude** and press **<Enter>**, the instrument will exclude the selected measurement point from averaging and excluded measurement point will be grey in the *Area* view.

If you select the excluded measurement point and open the command list, the last command is named **Include**.

You can also exclude/include the selected measurement point from the averaging directly in the *Area* view by pressing the ◄ / ► key together with **<Shift>**.

The directory of the excluded point will have the character "_" instead of "P".

You can stop the measurements for the selected **Project**/**Area**/**Source** at any time and, if necessary, create the next **Project**/**Area**/**Source** combination in the **STIPA Settings** screen.

13.4 DOWNLOADING FILES AND PROCESSING DATA

The measurement files created by the instrument during STIPA measurements can be downloaded and analysed using the SvanPC++ software.

The SvanPC++ software allows you to download and analyse measurement files created directly by the instrument, as well as projects created by the Building Acoustics applications.

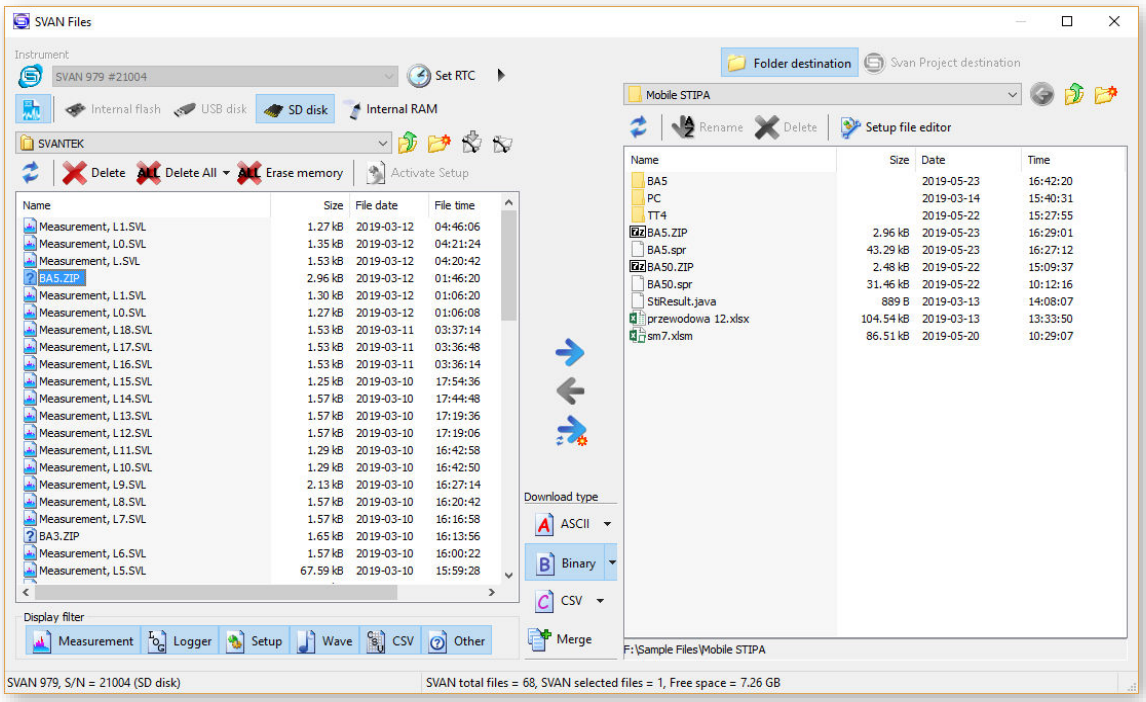
13.4.1 Measurement with Building Acoustics application

Building Acoustics is an application for mobile devices (smartphones, tablets) that uses Svantek instruments to measure building acoustics, including STIPA speech intelligibility.

After performing measurements with *Building Acoustics* application, a project (zip file containing files with results obtained during the measurement) is automatically copied to the instrument. The project zip file is called BAxxx.ZIP and you can download it to a PC and open it with the program SvanPC++ using the option "SVAN Files" (available in the menu "SVAN -> SVAN Files" or using the meter icon in the toolbar). Once the SvanPC++ software is installed on your PC, you can open the project directly by double clicking on it.

To open the project:

- Connect your Svantek instrument to the PC,
- Start SvanPC++,
- Select the project file from the list on the left side of the window and use the right arrow button to download the file to the PC.
- Double click on the downloaded file and it will automatically open in SvanPC++. The STIPA results window will appear.

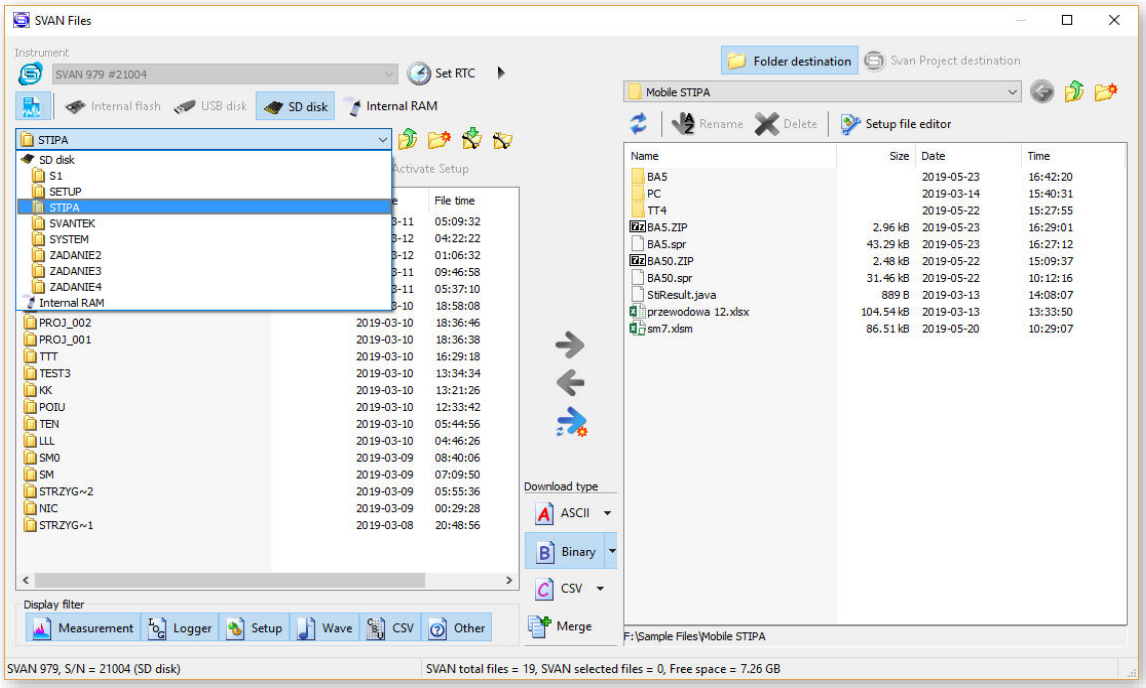


You can click on the file in the list on the left. The file will be downloaded to the temporary folder and opened.

13.4.2 Direct measurement with the instrument (without Building Acoustics application)

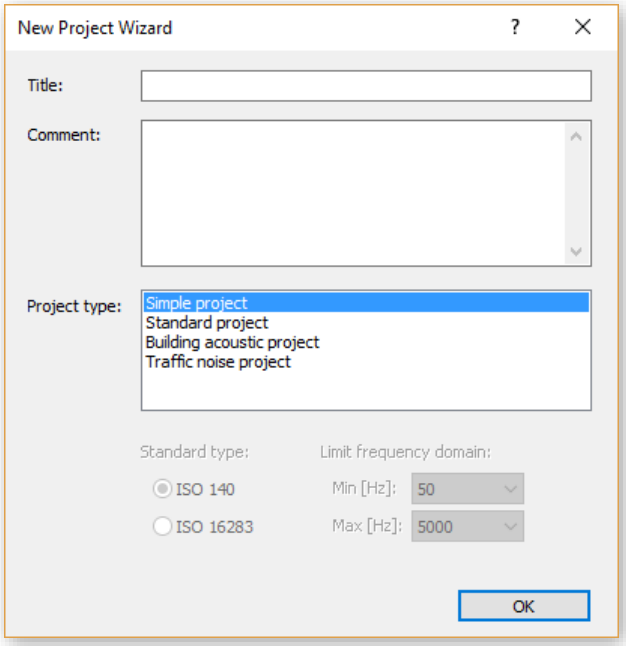
When the instrument is used directly for STIPA measurements, the measurement files are grouped into point catalogues. Point catalogues are grouped into source catalogues. These in turn are grouped into the area catalogues and the area catalogues are grouped into the project catalogue.

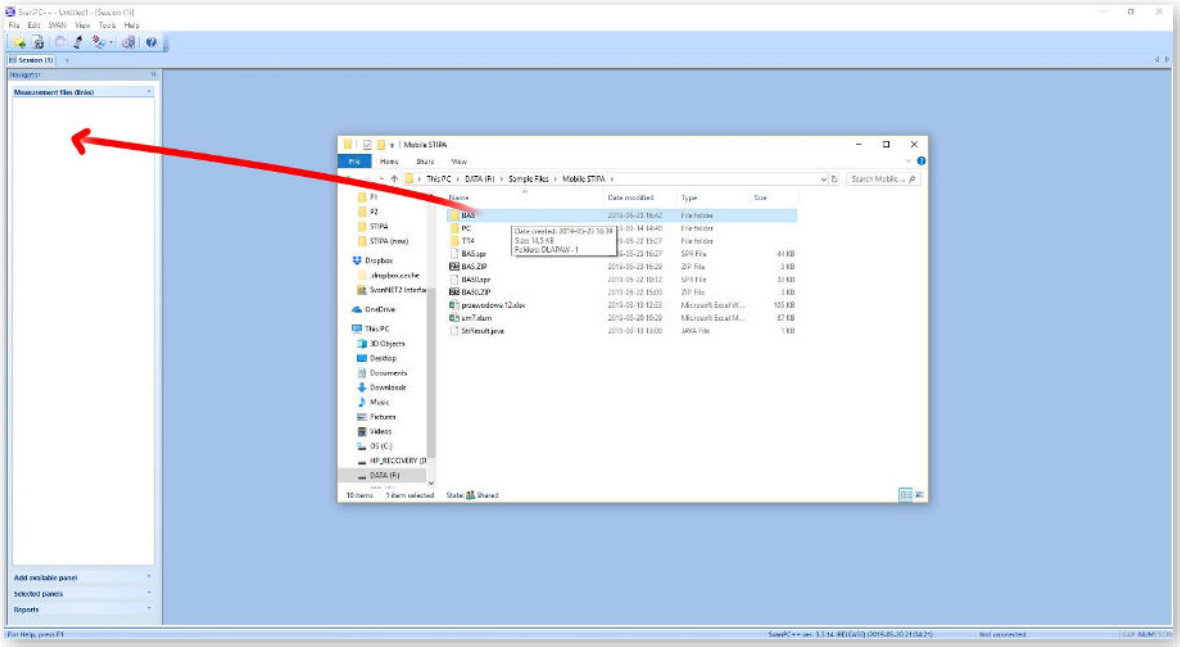
To download files with SvanPC++, use the "SVAN Files" window. Select the appropriate catalogue with the required data in the instrument left panel and then click on the right arrow to download it. You can select the whole project catalogue or only a catalogue for the area or point (or even a single SVL file).



If you have downloaded the file, you can open it with a double click. If you have downloaded the whole folder, you have to link the downloaded dataset. The easiest way to do this is to use the SvanPC++ project functionality. Close the "SVAN Files" window and create a new project ("File -> New Project" and select "Simple project" as the project type).

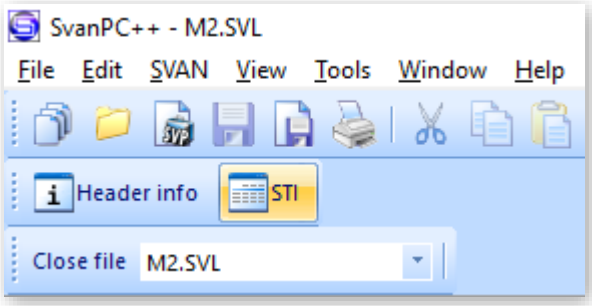
A window will appear on the left panel with a list of project files (empty for now). Add the folders/files you want to combine to the project. The easiest way to do this is by drag & drop from the file explorer, by selecting the folder/files and dragging them into the SvanPC++ window. The program will automatically link all files from the folder, whereby the program may ask you how to link files - in the case of STIPA, the option you choose is irrelevant, as STIPA measurements are linked by grouping on matching projects/areas/sources/points. After this operation the STIPA results window will automatically appear.



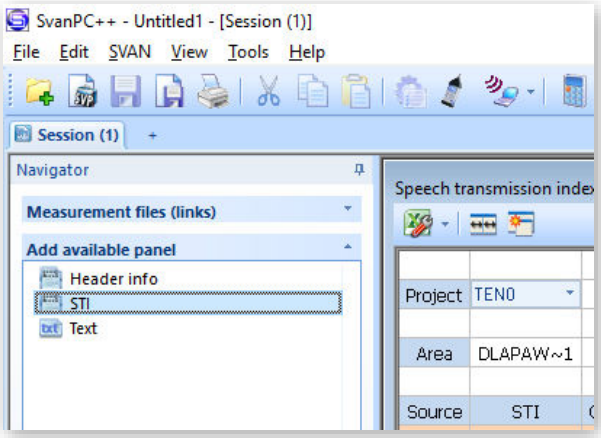


13.4.3 Presentation of STIPA results

The STIPA results are grouped in a window with the appropriate division into areas, sources and points for the selected project. When opening a project from the Building Acoustics application or creating a "Simple project" in SvanPC++, the STIPA window is be opened automatically. When opening individual SVL files, the results pane is accessed via the "STI" button on the toolbar.



In the case of Simple projects, this window can also be accessed from the "Add available panel" tab and selecting "STI".



By default, STIPA results are displayed for areas, sources and points. Each point in the view is a button which, when pressed, displays the measurement results for a given point.

Each measurement also has a 'checkbox' type which can be used to enable / disable a particular measurement - in this situation the STIPA results for the point and higher groups are automatically recalculated after the measurement is enabled / disabled.

Each point after the extension has background noise results at the end of the measurement list.

Speech transmission index

Project	TEN0										
Area	DLAPAW~1										
Source	STI	Category	σ	Δ	CIS	STI (Measure)	Category (Measure)	CIS (Measure)	LAeq [dB]	LCeq [dB]	Status
S1	0,59	E	0,10	0,20	0,77	0,62	D	0,79	112,85	113,49	E
[-]P1	0,69	B	0,05	0,11	0,84	0,71	B	0,85	71,15	80,97	✓
☑ 1	0,63	D	-	-	0,80	0,65	C	0,81	71,14	81,07	✓
☑ 2	0,74	A	-	-	0,87	0,77	A+	0,89	70,77	80,68	✓
☑ 3	0,70	B	-	-	0,85	0,72	A	0,86	71,50	81,14	✓
Background noise	-	-	-	-	-	-	-	-	-	-	-
[+]P2	0,49	G	0,13	0,34	0,69	0,53	F	0,72	115,86	116,50	E

13.4.4 Changing background noise values

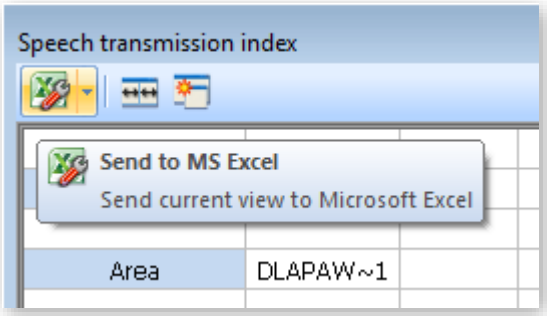
The cells containing the background noise results are editable, i.e., you can manually enter values for individual octaves (simply double click on the selected background noise value). Such a change will automatically convert the results for all points above.

You can also import background values using the paste option (CTRL+V or menu "Edit -> Paste"), after selecting the value from which you want to paste the results. Data that are in the clipboard will be pasted for the next octaves starting from the selected cell. You can copy data to the clipboard from Excel, from another program as well as you can copy values from another view of *SvanPC++* (thanks to which you can import results from another SVL file). If the clipboard contains numerical values separated by a white space (space, tab, enter), the program will accept them correctly.

13.4.5 Generating reports

There are two ways to create a report:

1. Using the Excel icon in the top left corner of the view, this will automatically open an Excel spreadsheet with all the data visible in the view.
2. By selecting cells in the table and using the copy-paste option (CTRL+C or menu "Edit -> Copy" or from the right-click context menu), you can transfer a fragment or the whole view to, for example, Word.



14 SVANTEK MOBILE APPLICATIONS

Svantek offers applications for mobile devices (smartphones and tablets) that extend the functionality of the SV 973A: ***Assistant Pro***, ***Assistant HS*** and ***Building Acoustics Pro***. These applications use the Bluetooth® interface to view current results and control the measurement from a mobile device.

Assistant Pro is dedicated for general SLM measurements and allows management of instrument settings, download of data files, and connection to the *SvanNET* web service.

Assistant HS is mainly dedicated to Health and Safety measurements when SV 973A is working as a dosimeter and displays dose measurement results in three profiles.

Building Acoustics Pro is dedicated to building acoustics and speech intelligibility measurements (STIPA).

This manual describes how to use ***Assistant Pro*** and ***Assistant HS*** with SV973A, as the interface of these applications depends on the type of instrument. ***Building Acoustics Pro*** is described in the respective manuals.

14.1 INSTALLING THE SVANTEK APPLICATION ON A MOBILE DEVICE

You can download the Svantek application from *Play Store*.

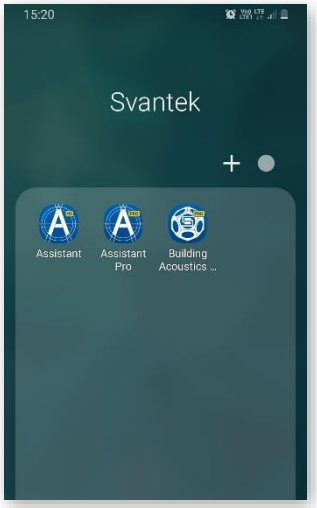
To start working with the Svantek application, tap the application icon on your mobile device.

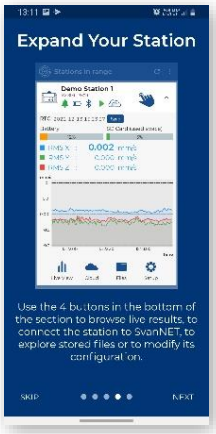
The application may ask you to enable Bluetooth®, location services, and access files, photos, and media on your mobile device.

The instruments with Bluetooth® enabled will broadcast their basic status and some basic data will be visible on a mobile device running the application.

The application will detect visible instruments and, if the automatic connection feature is enabled, will attempt to connect to them.

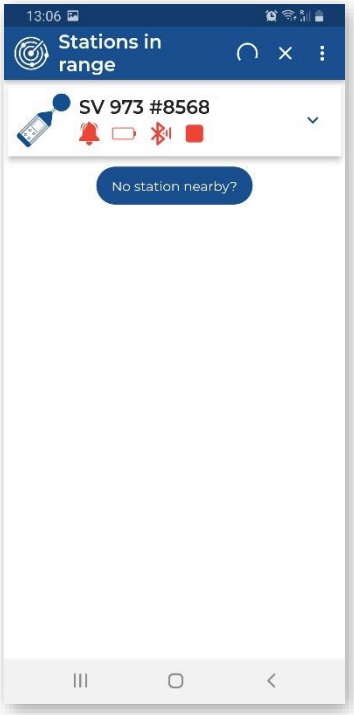
The first time you use the application after installation, the Welcome screen will appear, providing quick tips on how to start using the application.





14.2 ASSISTANT PRO

Assistant Pro compatible instruments with Bluetooth® enabled will broadcast their basic status and some basic data will be visible on a mobile device running the application.



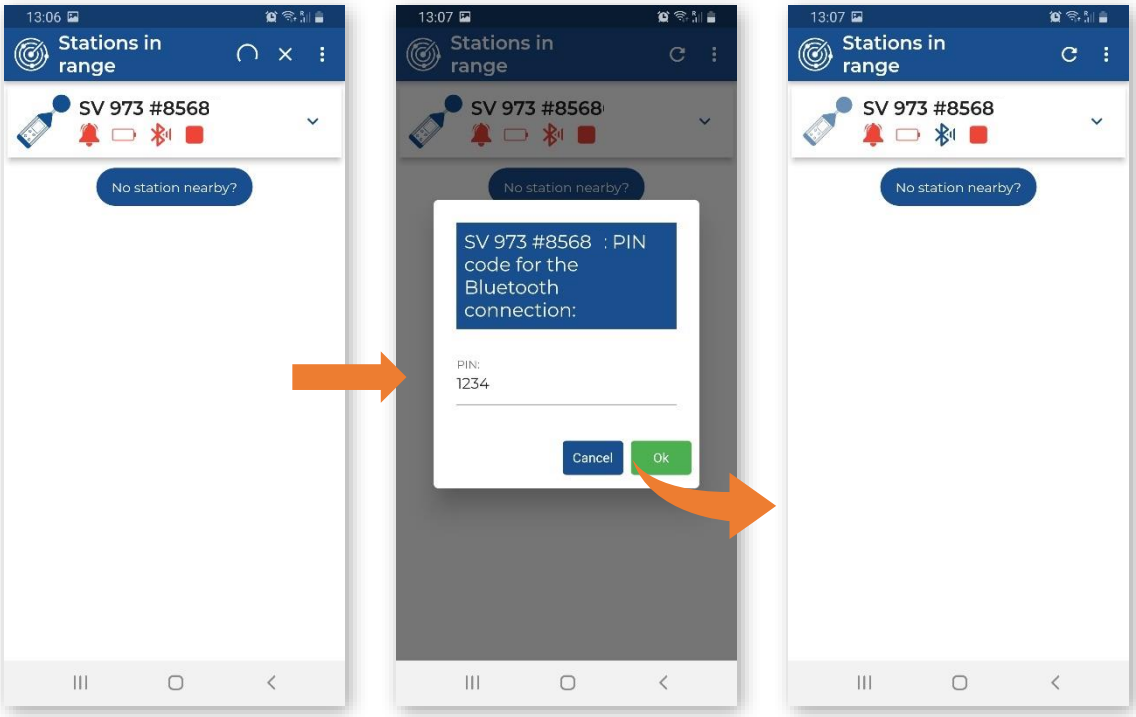
While scanning the instruments, the “scanning” icon is displayed in the upper right corner. You can stop scanning by tapping . When scanning is complete, the “scanning” icon changes to . To start scanning, tap .

If there is no connection to the instrument, the Bluetooth icon on the instrument bar will be red. During the connection, it “emits waves”. If the connection is successful, the Bluetooth icon changes to blue.

The “No stations nearby?” button opens a quick guide on how to prepare an instrument for use with the *Assistant* mobile application.

Note: *You cannot have access to the instruments controlled by other users who are simultaneously running Assistant Pro applications on other mobile devices.*

The first time you pair the instrument, the application will try to use the default PIN code (1234). If it does not match, you will be prompted to enter the PIN code. The same effect occurs if you have changed the PIN code on another mobile device and then try to connect to the previous mobile device.



When the connection is established, you can control this instrument and view measurement results.

14.2.1 Description of the status icons

The instrument status icons have the following meanings:

	Event alarms. If the icon is green there is no current event alarm; if it is red, there is a current event alarm.
	Battery status. When the battery is low, the icon changes colour to red.
	Bluetooth – connection being used by another mobile device.
	Bluetooth – not connected.
	Bluetooth – when connecting.
	Bluetooth – connected.
	The instrument is measuring.
	The instrument is not measuring.

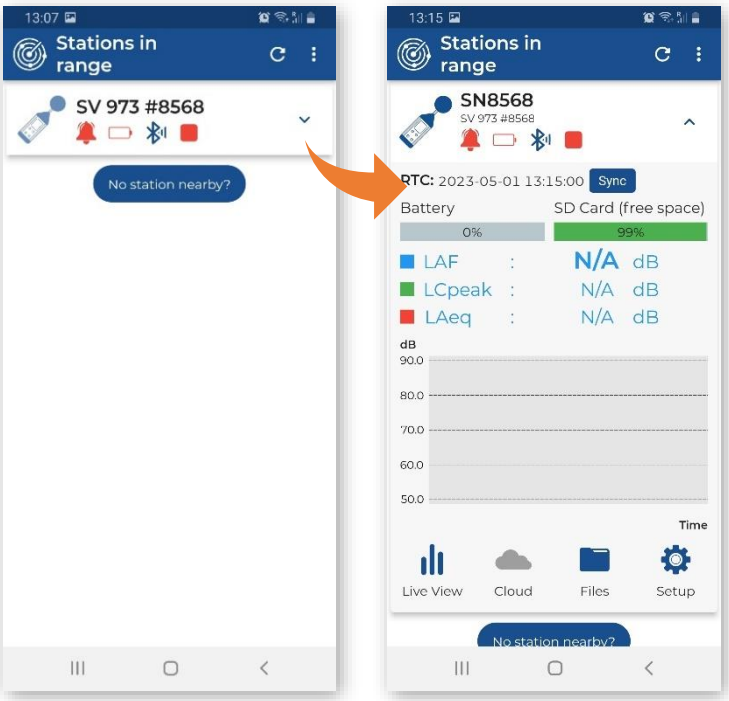
14.2.2 Controlling the instrument

The visible instruments appear on the **Stations in range** screen as a bar that can be expanded by tapping it. Once expanded, the instrument panel displays the real-time clock (**RTC**), the status of the instrument's battery (**Battery**) and memory (**SD Card (free space)**) status as well as the values of some predefined readings.

To synchronise the real-time clock with the clock on the mobile device, tap the **Sync** button.

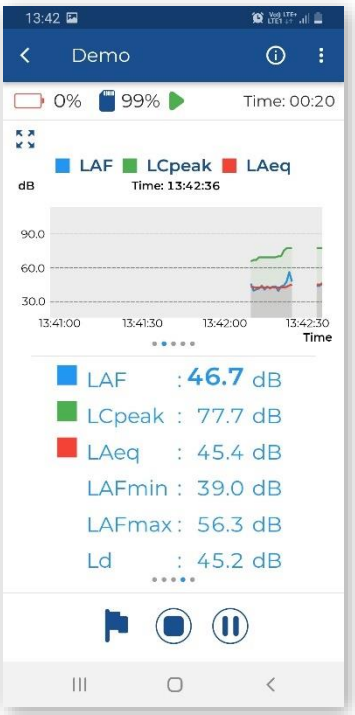
Four icons at the bottom of the panel give you quick access to some functions:

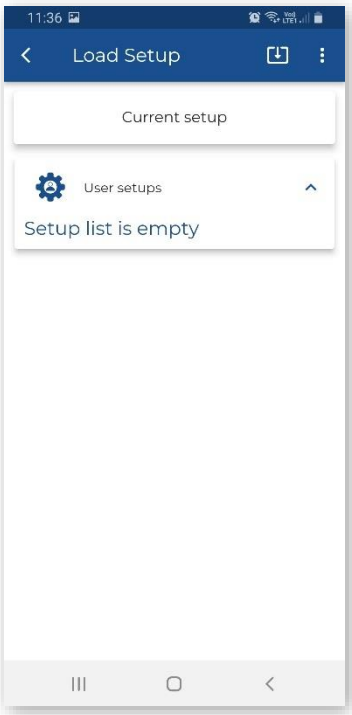
- **Live View** – viewing live results with the possibility to start/stop the measurement,
- **Cloud** – connecting to the *SvanNET* web service (this icon is inactive for SV 973A),
- **Files** – downloading instrument files (the icon is hidden by default),
- **Setup** – configuring instrument settings.



Note: *The **Files** icon is hidden by default. To make it visible and to be able to manage instrument files, you should activate it, see Chapter* 14.2.8.

Below are screens after tapping function icons: **Live View**, **Files** and **Setup**.

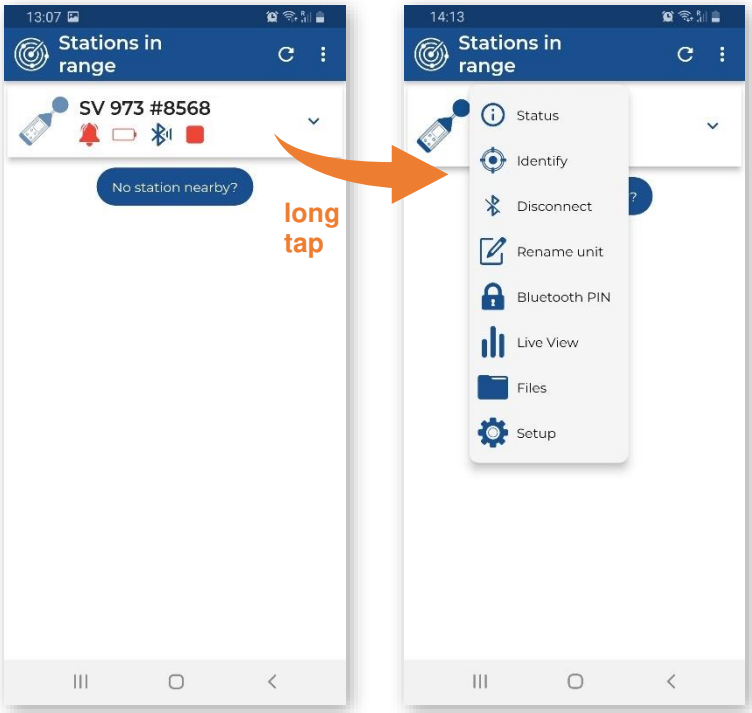




You can access these and other functions by long tapping on the instrument bar.

The pop-up menu that appears after a long tap on the instrument bar allows you to:

- check the **Status** of the instrument,
- **Identify** the instrument connected,
- **Connect** or **Disconnect** the instrument,
- **Rename unit** for personalisation,
- enter the **Bluetooth PIN** during connection or change the PIN in the instrument after successful connection,
- view current measurement results - **Live View**,
- open the file list - **Files**; this icon can be hidden, see Chapter 14.2.8,
- configure instrument settings - **Setup**.



14.2.3 Auxiliary commands

When you tap **Status**, the **Status** dialogue box will tell you if the measurement and communication configurations are correct. If not, the anomalies are listed.

When you tap **Identify**, the instrument name will flash on the instrument's display to indicate which device you are currently working with.

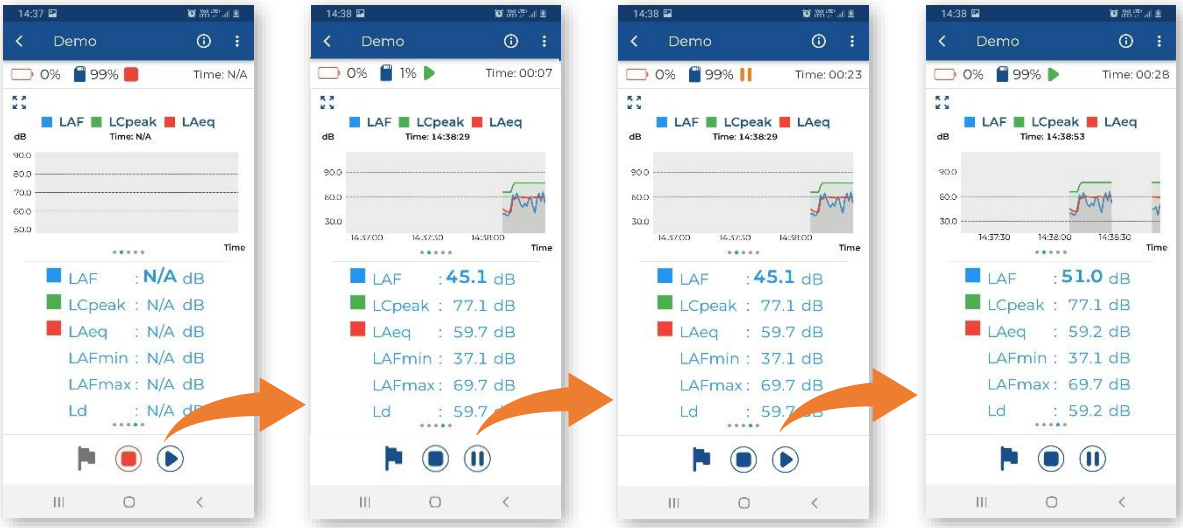
When you tap **Connect**, your mobile device begins to connect to this instrument via Bluetooth. When the connection is successful, this command changes to **Disconnect**. And vice versa.

When you tap **Rename Unit**, the **Device Name** dialogue box appears with the current instrument name, which you can edit.

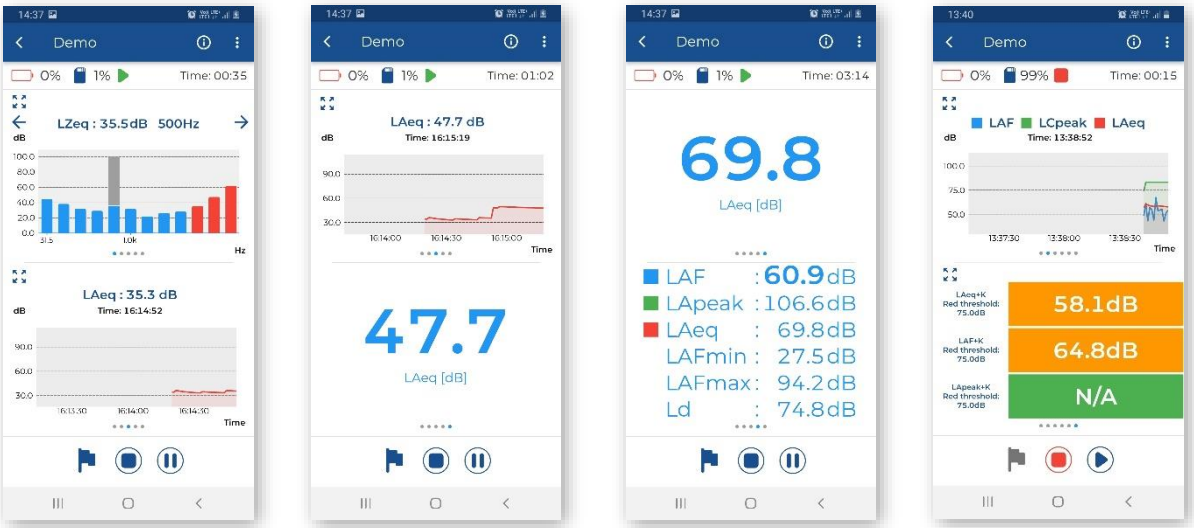
When you tap **Bluetooth PIN**, the dialog appears where you can change the Bluetooth PIN code.

14.2.4 Live View

From the **Live View** screen, you can start or stop the measurement and set a marker - a note during the measurement. The measurement results are displayed in two sections which you can adjust by scrolling through the presentation views. The top line shows the battery, memory and measurement status, as well as the integration time.

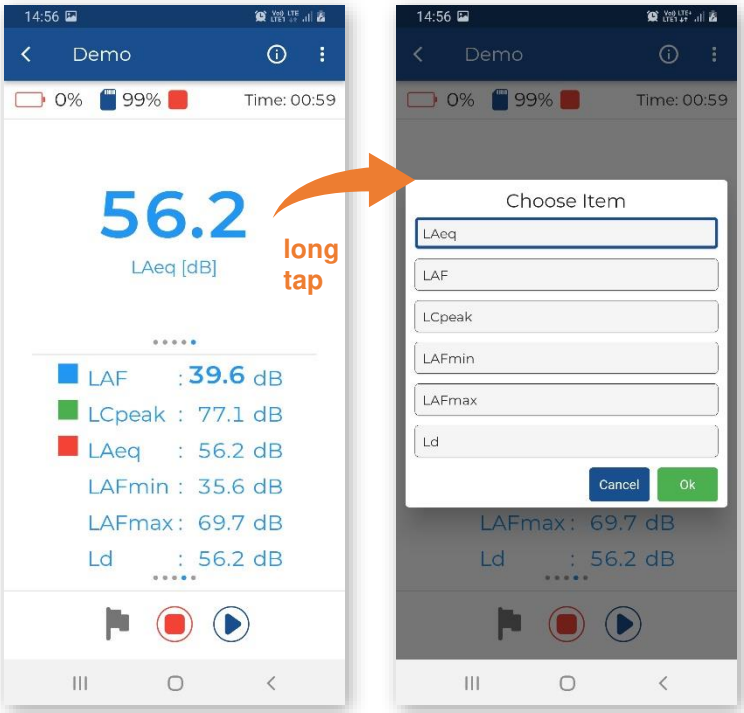


Below are some combinations of view, including spectra, time-histories of some results, current results values and alarm values.



Note: Live view *shows the limited set of measurement results. The full set of measured results is stored in the instrument files and can be viewed using of SvanNET or SvanPC++.*

You can long tap on the section to change the measurement results to be displayed.



During the measurement, you can tap the marker icon to open the **Create Marker** dialogue box, where you can activate the marker and assign to this marker the photo, video, or audio recording.

Tap **Title** to enter the marker name.

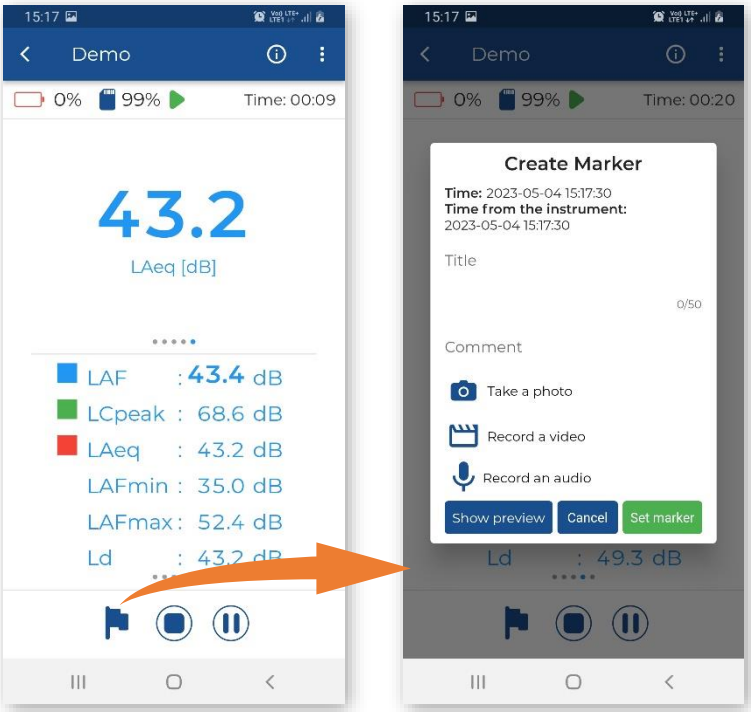
Tap **Comment** to enter the comment text.

Tap **Take a picture** to add a picture to this marker.

Tap **Record a video** to add a video to this marker.

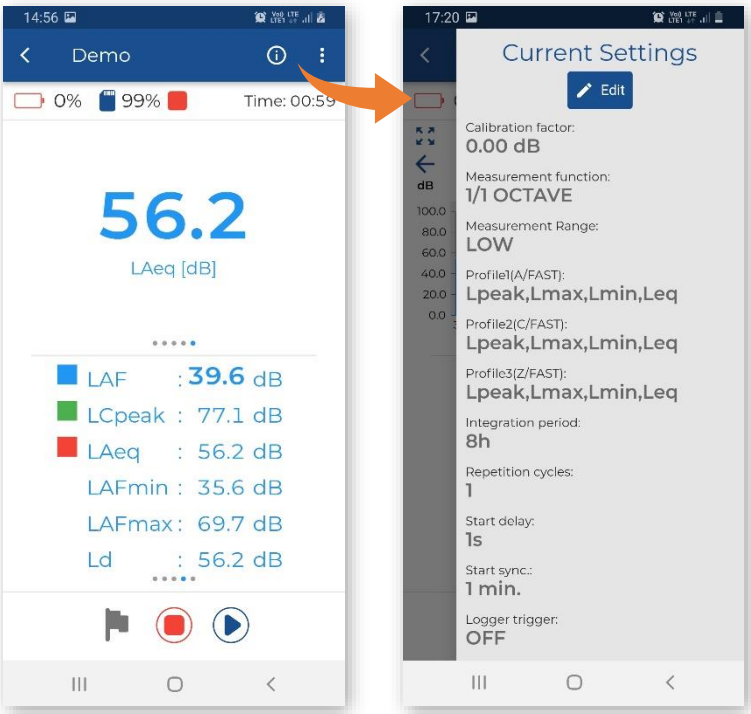
Tap **Record an audio** to add an audio to this marker.

Tap **Set marker** to set a marker.

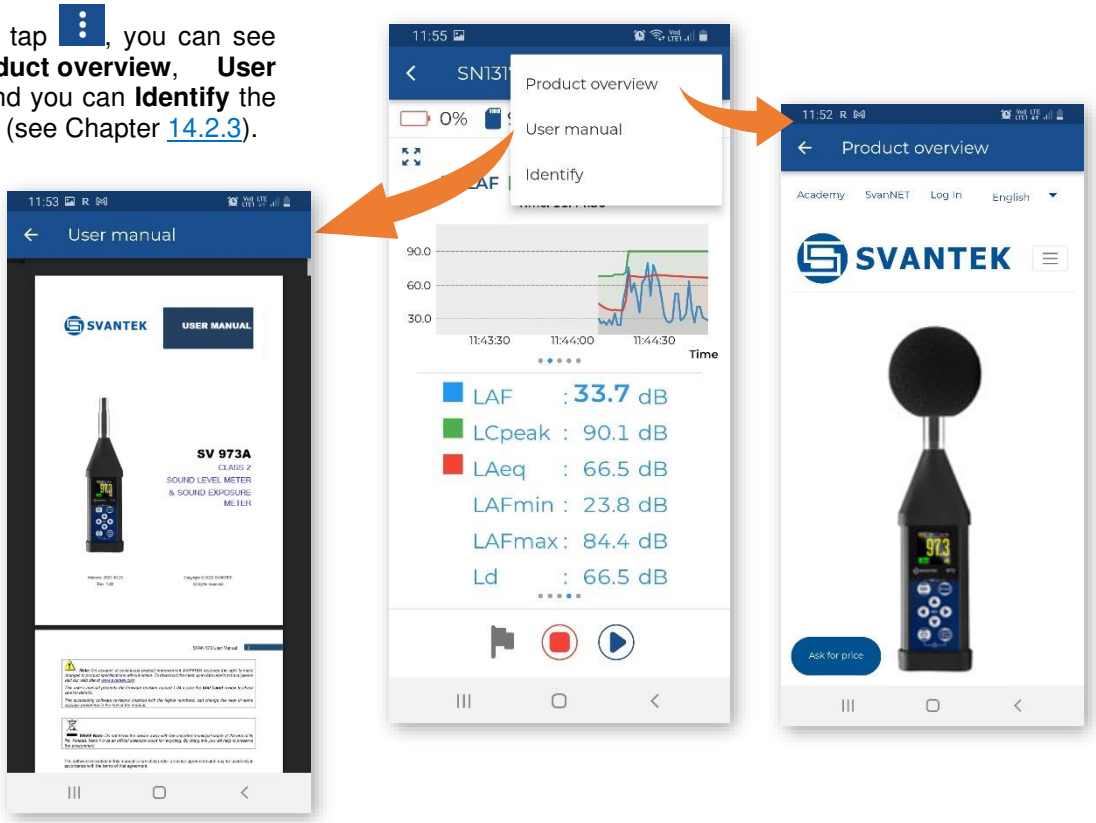


Tap the ⓘ icon to display the current settings for the device.

Tap **Edit** to edit them.



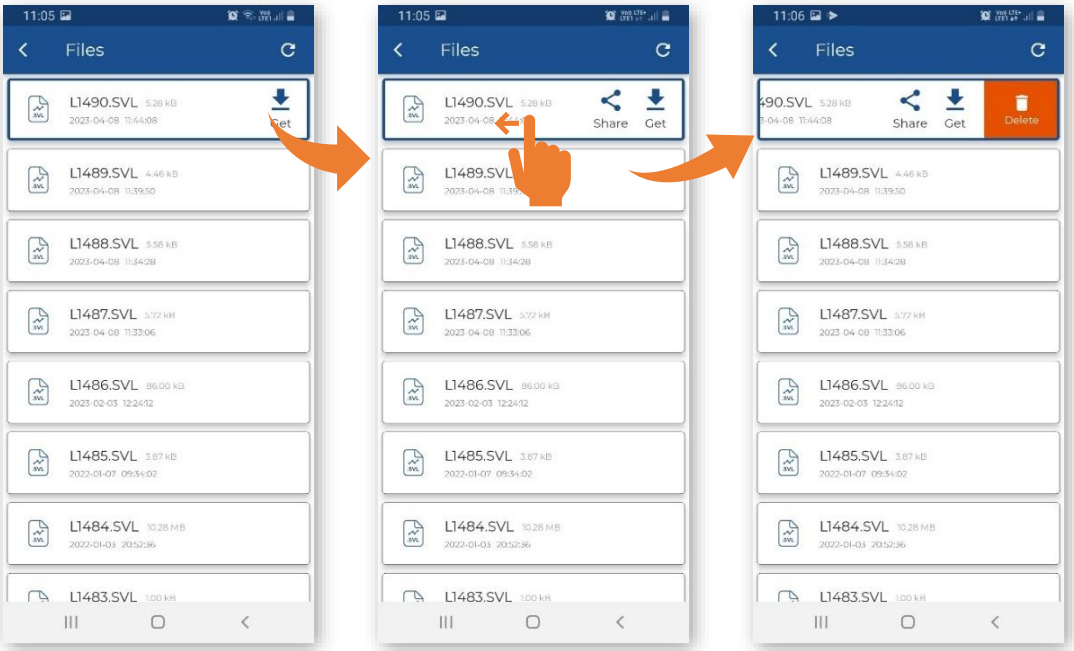
When you tap ⋮, you can see the **Product overview**, **User manual** and you can **Identify** the instrument (see Chapter 14.2.3).



To return to the “Stations in range” screen, tap the icon.

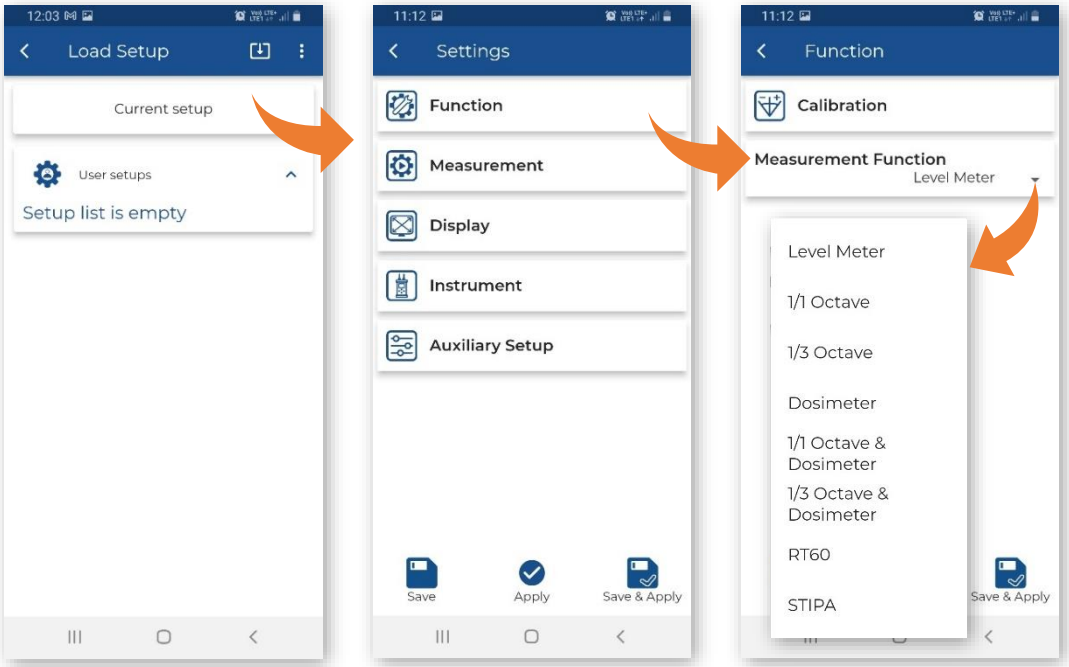
14.2.5 Files

The **Files** section displays the list of files created by the instrument on the instrument’s memory card. You can tap on each file to download it to your mobile device (**Get**). Once the file has been downloaded, you can share it. To delete the file, swipe left on the file ribbon and tap the icon.



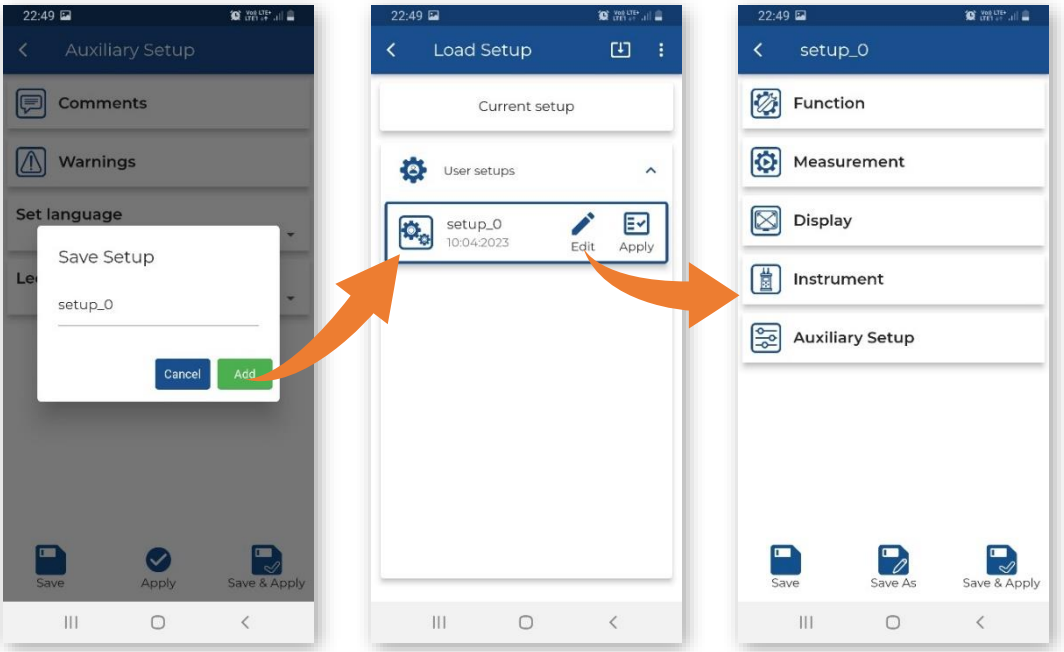
14.2.6 Instrument settings

The **Settings** section allows you to configure the measurement and specific instrument settings. The settings are grouped in sections such as **Function**, **Measurement** etc., which contain sub-sections etc. The last item in such a hierarchy consists of parameters that you can set, e.g., **Measurement Function**: *Level Meter*, *1/1 Octave* etc.



After configuring the settings, you can save them to the mobile device catalogue (**Save**), load them to the instrument as the current settings (**Apply**), or save and load them simultaneously (**Save & Apply**).

When you save settings, a new setup file is created in the dedicated application's directory on your mobile device, but the current instrument settings are not changed. You can load the settings saved in the file to the instrument. To do this, open the **User Setups** section, select the file with the desired settings, tap it, and select **Apply**. You can **Edit** these settings if necessary.



The instrument settings generally have a similar structure, and most items and parameters have similar names to those in the instrument menu. There are a few exceptions:

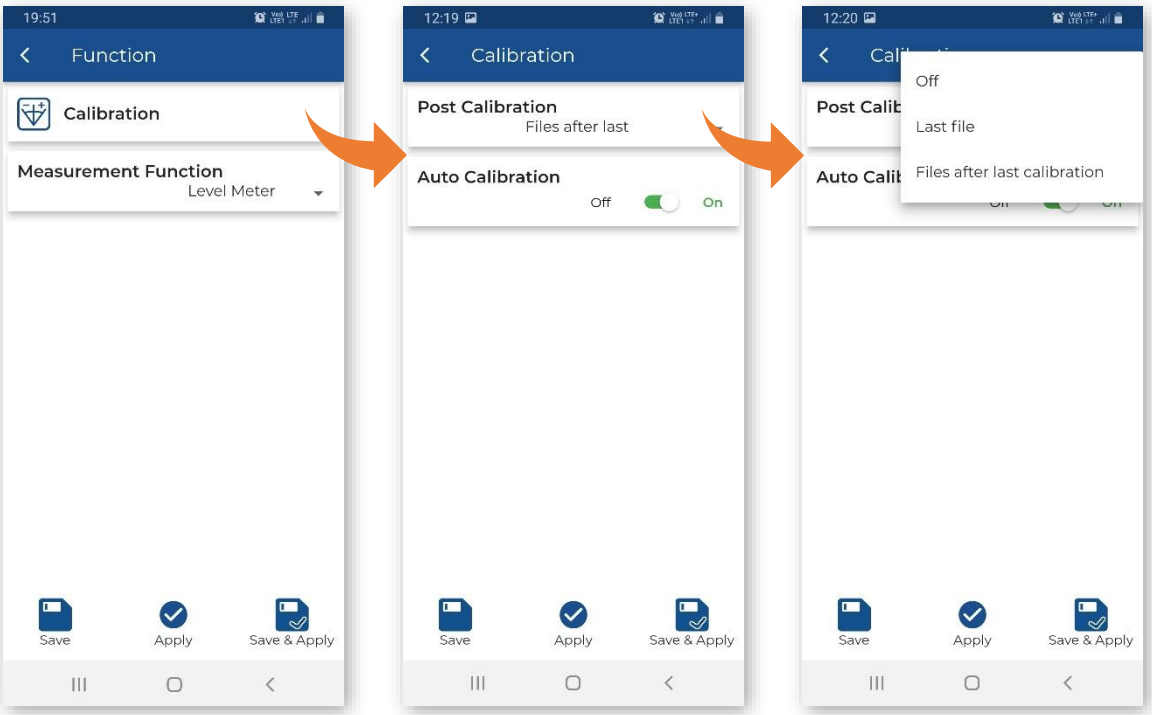
1. The **Files** section of the instrument menu does not appear in the application setup tree. The application has a special mechanism for managing instrument files, see Chapter 14.2.5.
2. The **Calibration** section does not allow you to calibrate the instrument. Its functionality is limited to displaying information about the last calibration for the Level Meter and Dosimeter functions (**SLM**, **Dosimeter**), storing information about the last calibration in the measurement files (**Post Calibration**) and activating the automatic calibration mechanism (**Auto Calibration**).
3. The **RTC** is set using RTC synchronisation, see Chapter 14.2.2.
4. It is not possible to the set communication ports, as this may cause a communication conflict between the instrument and a mobile device.
5. The factory settings can be restored in the **Load Setup** view, see Chapter 14.2.7.

Note: *For a detailed description of the parameters, see Chapters 3 ÷ 13.*

Note: *The following settings apply to the Level Meter function and Advanced User Interface.*

The **Function** section allows you to:

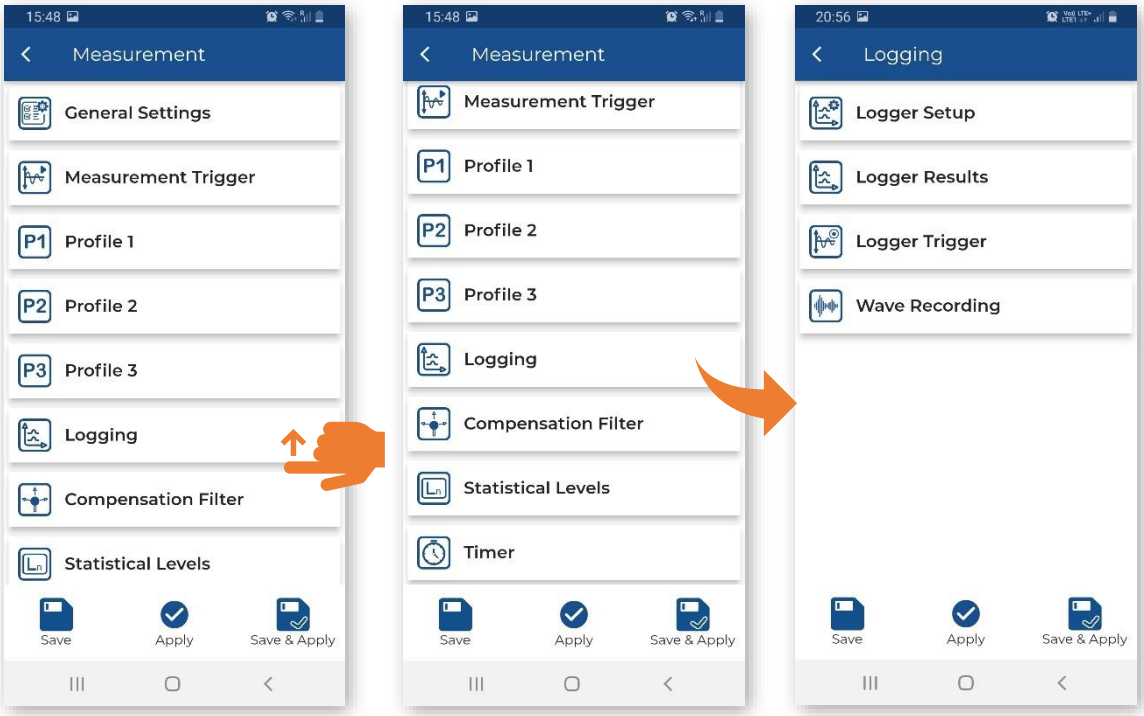
- select the **Measurement Function**: *Level Meter*, *1/1 Octave*, *1/3 Octave*, *Dosimeter*, *1/1Octave & Dosimeter*, *1/3 Octave & Dosimeter*,
- make some settings related to the **Calibration** of the instrument:
  - set the way in which the post-measurement calibration information is added to the measurement files created before this calibration (**Post Calibration**): not to be saved (*Off*), to be saved in the last file created (*Last File*) or to be saved in the files created after the last calibration (*Files after last calibration*),
  - enable the **Auto Calibration** function.



The **Measurement** section allows you to set the measurement parameters (the following settings apply to the *Level Meter* function):

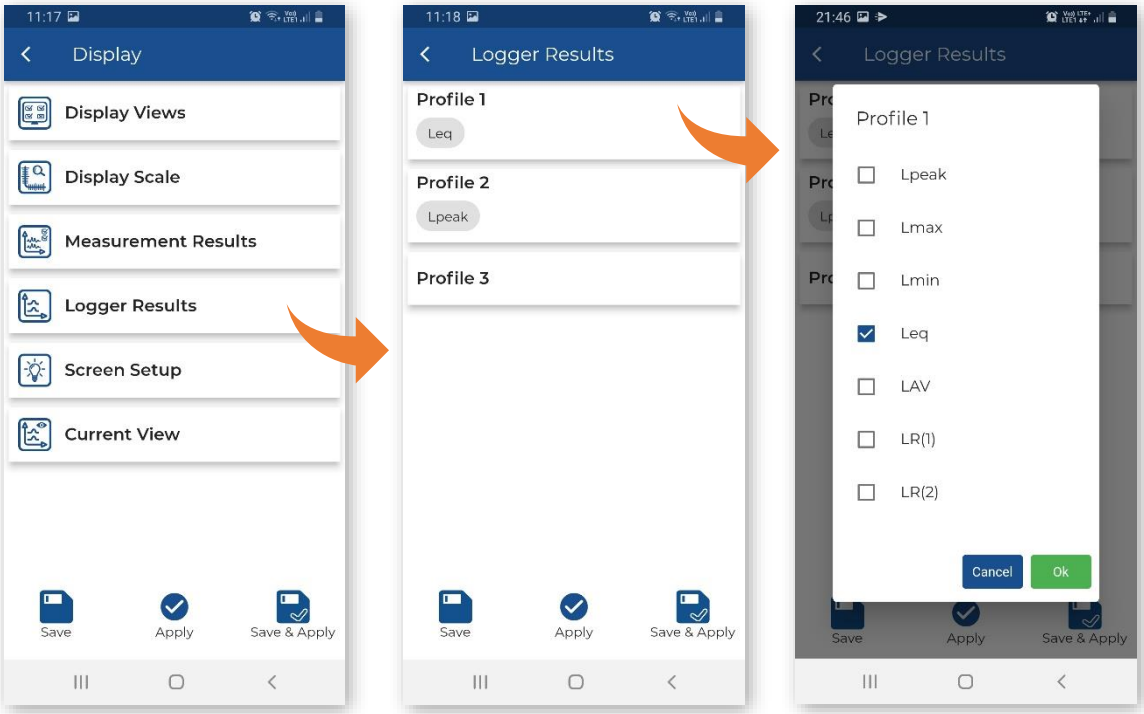
- **General Settings**:
  - **Start Delay**: *0s ÷ 1h*
  - **Start Synchronization**: *Off, 1s, 1m, 15m, 30m, 1h*
  - **Integration Period**: *infinity, 24h, 8h, 1h, 15m, 5m, 1m, 1s, ÷ 24h*
  - **Repetition Cycles**: *1 ÷ 1000, infinite*
  - **Day Time Limits**: *6H - 18H, 7H - 19H*
  - **Leq Integration**: *Linear, Exponential*
  - **Rolling Time(1)** and **Rolling Time(2)**: *1s ÷ 1h*
- **Measurement Trigger**:
  - **Mode**: *Off*, *Slope+*, *Slope-*, *Level+*, *Level-*, *Gradient+*
  - **Source**: *Leq (Prof.1)*
  - **Level**: *24 dB ÷ 136dB*
- **Profile 1/2/3**:
  - **Filter**: *Z, A, C, B, LF*
  - **Peak Filter**: *Z, A, C, B, LF*
  - **Detector**: *Impulse, Fast, Slow*
- **Logging**:
  - **Logger Setup**:
    - **Logger**: *On, Off*
    - **Logger Step**: *100ms, 200ms, 500ms, 1.0s ÷ 1.0h*
    - **Logger Name**
    - **Summary Results:** *On, Off*
    - **File Splitting:** *Off, Integration Period, Sync. to full 15m, Sync. to full 30m, Sync. to full hour, Specified Time*
  - **Logger Results**: *Lpeak, Lmax, Lmin, Leq, LAV, LR(1), LR(2)*
  - **Logger Trigger**: Off, Level+, Level-
    - **Source**: *Leq (Prof.1)*
    - **Level**: *24 dB ÷ 136dB*
    - **Pre**: *0 ÷ 10*
    - **Post**: *0 ÷ 200*
  - **Wave Recording:**
    - **Recording Mode**: *Off, Continuous, Trigger Slope+, Trigger Slope-, Trigger Level+, Trigger Level-, Trigger Gradient+, Trigger Manual, Integration Period*
- **Compensation Filter**:
  - **Windscreen Compensation**: *On, Off*
  - **Field Compensation**: *Off*, *Free Field*, *Diffuse Field*
- **Statistical Levels**:
  - **N1**: *1 ÷ 99*

  - **…**
  - **N10:** *1 ÷ 99*
- **Timer**:
  - **Timer**: *On, Off*
  - **Start** / **Stop** time
  - **Day of week**
  - **Max. no. of measurement days:** *Infinity, 0 ÷ 99*



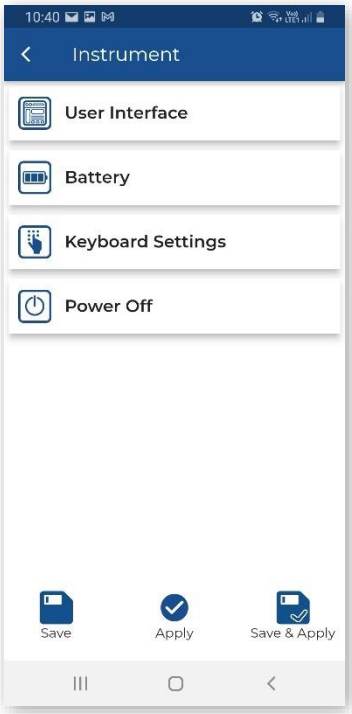
The **Display** section allows you to programme the display of the measurement results (the following settings apply to the *Level Meter* function):

- activate the **Display Views**: **Spectrum**, **3 Profiles**, **Statistics**, **Logger**, **Running SPL**, **File Info**, **View**
- set the **Display Scale**: **Dynamic**, **Grid**, **Auto Scale**
- enable the **Measurement Results** to be displayed: *TIME, Lpeak, Lmax, Lmin, L, Leq, LE, Lden, LEPd, Ltm3, Ltm5, Ln, LR(1), LR(2), Ex, SD, OVL*
- select the results for profiles to be displayed as time history (**Logger Results**): *Lpeak, Lmax, Lmin, Leq, LAV, LR(1), LR(2)*
- set **Screen Setup**: **Dim Mode** (*Off*, *Level 1*, *Level 2*, *Level 3*, *Screen Off*), **Dim Delay**, **Auto Rotate**, **Colour Scheme** (*Colorful*, *Black on white*),
- select the measurement result for each profile to be displayed at the start of the measurement (**Current View**): *TIME, Lpeak, Lmax, Lmin, L, Leq, LE, Lden, LEPd, Ltm3, Ltm5, Ln, LR(1), LR(2), Ex, SD or OVL.*



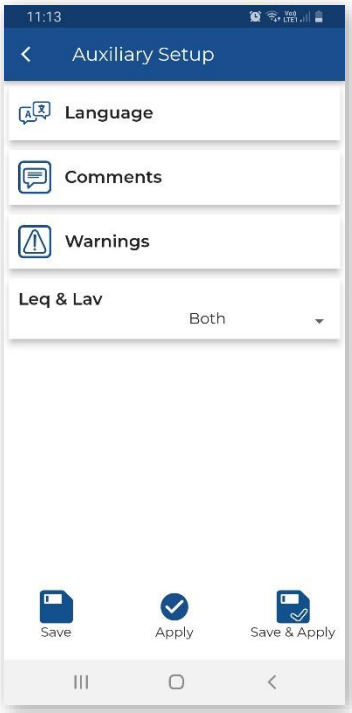
The **Instrument** section allows you to:

- select the **User Interface**
- check the **Battery** status
- configure the **Keyboard Settings**
- **Power Off** the instrument in the case of inactivity



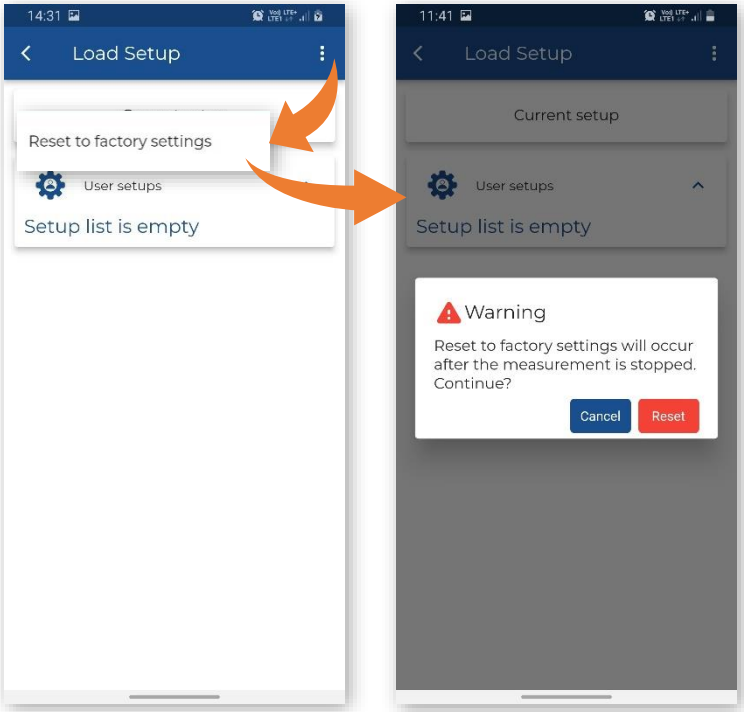
The **Auxiliary Setup** section allows you to:

- set **Language** of the user interface,
- define the file name for recording voice **Comments** and edit the comment text,
- enable/disable **Warnings** to be displayed during the normal operation of the instrument,
- set the mode of displaying the **Leq & Lav** results.



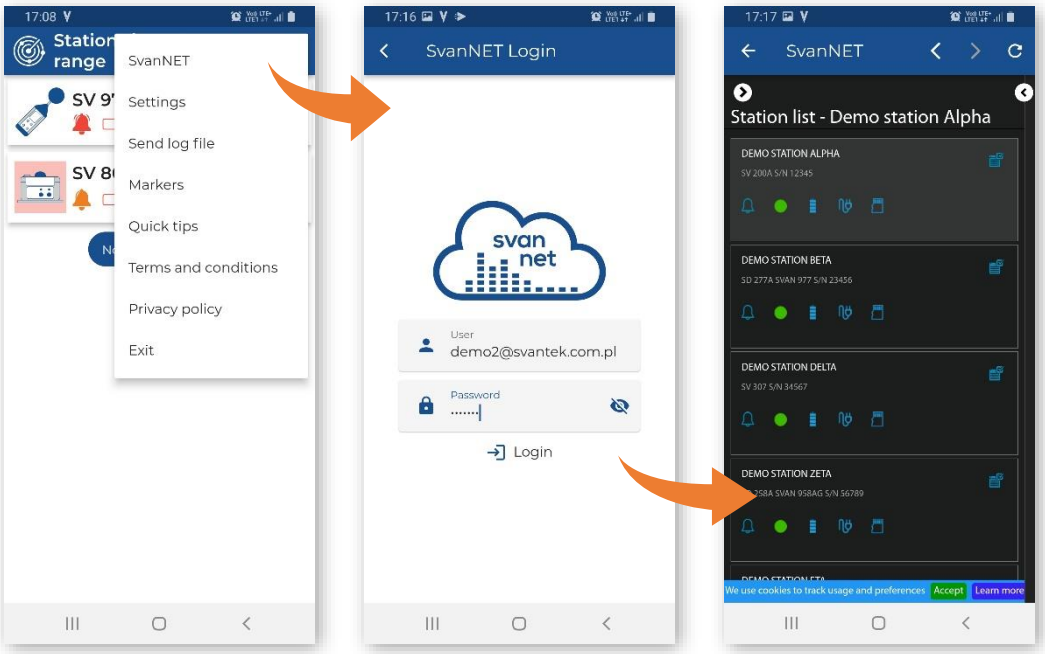
14.2.7 Restoring factory settings

Factory settings can be restored by tapping ⋮, then tapping **Reset to factory settings** and the *Reset* button in the Warning dialogue box.

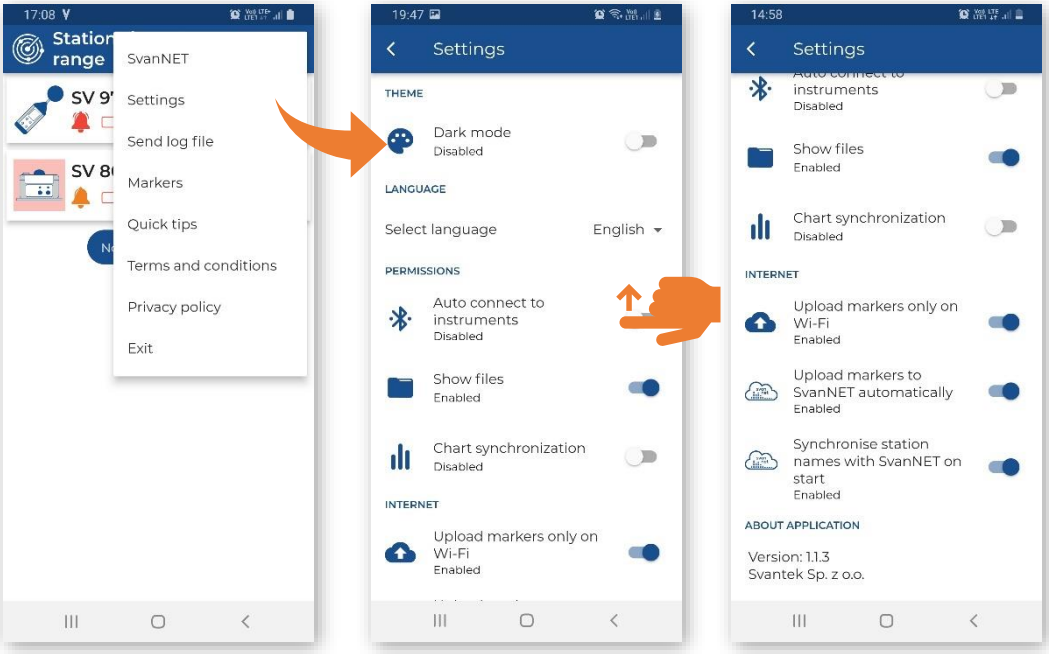


14.2.8 Assistant Pro auxiliary functions and settings

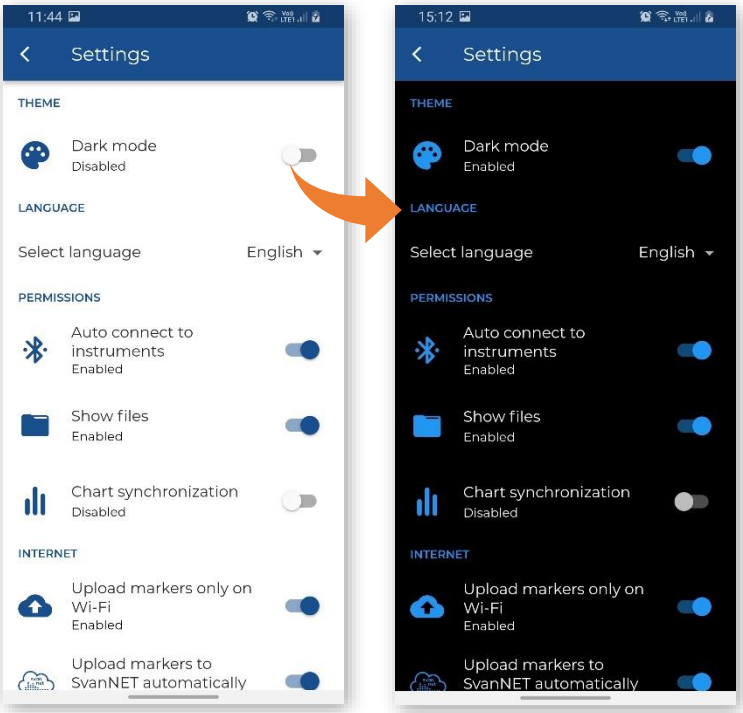
Tapping , you can open *SvanNET* in your mobile device, configure *Assistant Pro* settings, share the log file using Android applications and view, edit and share earlier created Markers, get quick tips, get acquainted with terms and conditions and privacy policy and exit the application.



In the *Settings* screen, you can choose the application THEME (enable or disable the **Dark Mode**), choose the application *LANGUAGE*, enable or disable some *PERMISSIONS*: automatic connection with the visible instruments (**Auto connect to instruments**), add/delete the Files item in the pop-up menu (**Show files**), switch on/off synchronization of cursors on different charts (**Chart synchronization**), enable uploading markers (**Upload markers only on Wi-Fi**, **Upload markers to SvanNET automatically**), enable synchronization of the station name (**Synchronization station name with SvanNET on start**) and get information about the application version (***ABOUT APPLICATION***).



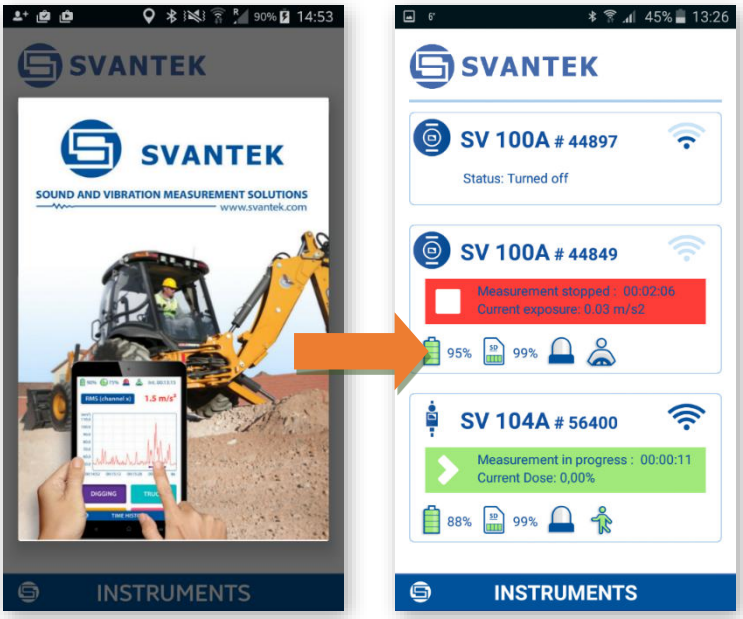
You can enable **Dark mode** to save your device power.



14.3 Assistant HS

When you run *Assistant HS*, the application starts screening the instruments. Instruments compatible with *Assistant HS* with enabled Bluetooth® broadcast their basic status and some basic data which are visible on a mobile device running the application.

If some of instruments (e.g., SV 104) are switched off, they appear on the instrument list with the comment “Turned off”. You may switch them on by clicking on the instrument’s bar.



Note: *You will not get access to the instruments that are under control of other simultaneously running Assistant applications on another mobile devices.*

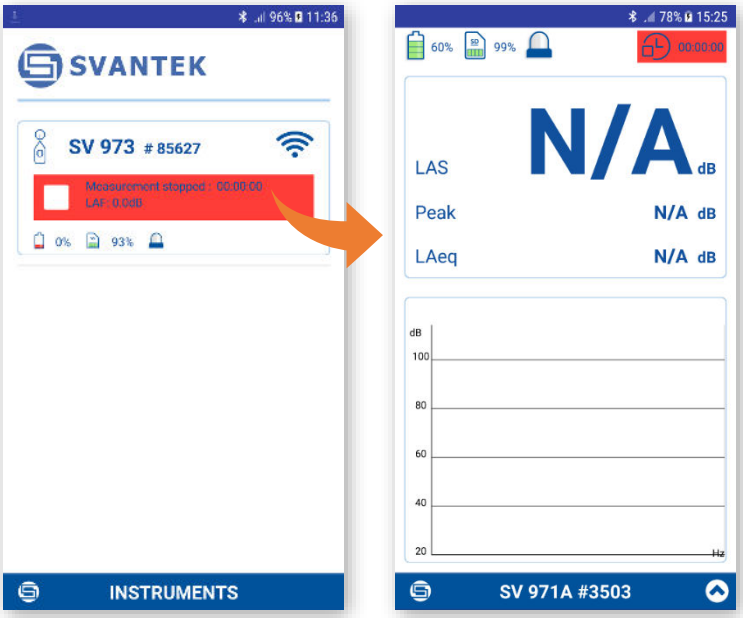
The *Assistant HS* application has two main views: status view and control view.

The status view displays the Svantek instruments which were found in the Bluetooth range.

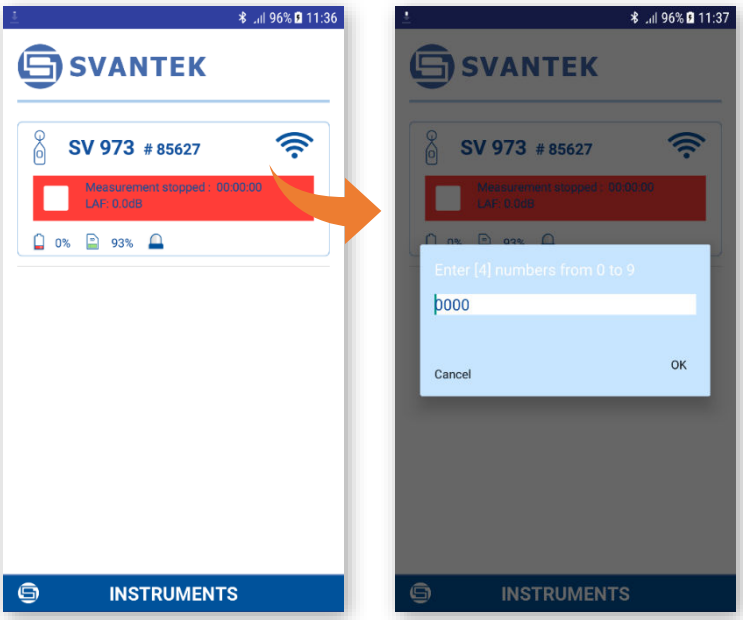
The control view displays current results and spectrum.

To switch from the status view to the control view, tap the instrument you would like to control.

If you wish to come back to the status view, just press the BACK button on your mobile device.



If the instrument was not paired before, you will be asked to enter the PIN code in a special box.



14.3.1 Instrument status view

Each instrument status is displayed in the frame that contain the instrument name and its serial number. Below the instrument status is displayed. If the status is not **Turned off**, the measurement and instrument status is shown. The measurement status is shown by the colour of the measurement status bar, if the measurement is stopped the bar is red, if in progress, the colour is green, if in pause – yellow.

The instrument status is displayed by means of icons that inform you about:

Internal **battery** status of the selected instrument. Battery capacity is displayed as a percentage. When the battery is low, the icon turns red.

Internal **memory** status of the selected instrument. The green area and the percentage display the empty memory capacity.

Dose **alarm**. If the dose exceeds the threshold level, the icon is red, and the mobile device vibrates.

Movement of a controlled person. If the controlled person is moving, the icon is green, otherwise the icon is red (not used in SV973 instruments).

Someone is using the instrument's **keyboard** (not used in SV973 instruments).

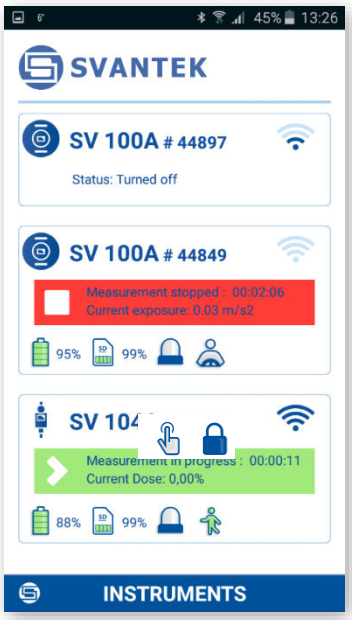
Lockout status due to different current device control over this instrument.

As an example:

- The instrument SV 100A #44897 is switched off.

- The instrument SV 100A #44897 is switched on and measurement is stopped. Battery charging is 95%, free memory is 99%, no alarm, the controlled person in not driving a vehicle.

- The instrument SV 104A #56400 is switched on and measurement is running. Current Dose value is displayed. The controlled person presses the instrument's button and this instrument is already controlled by another mobile device. Note, that since scanning there may be a few seconds' delay.

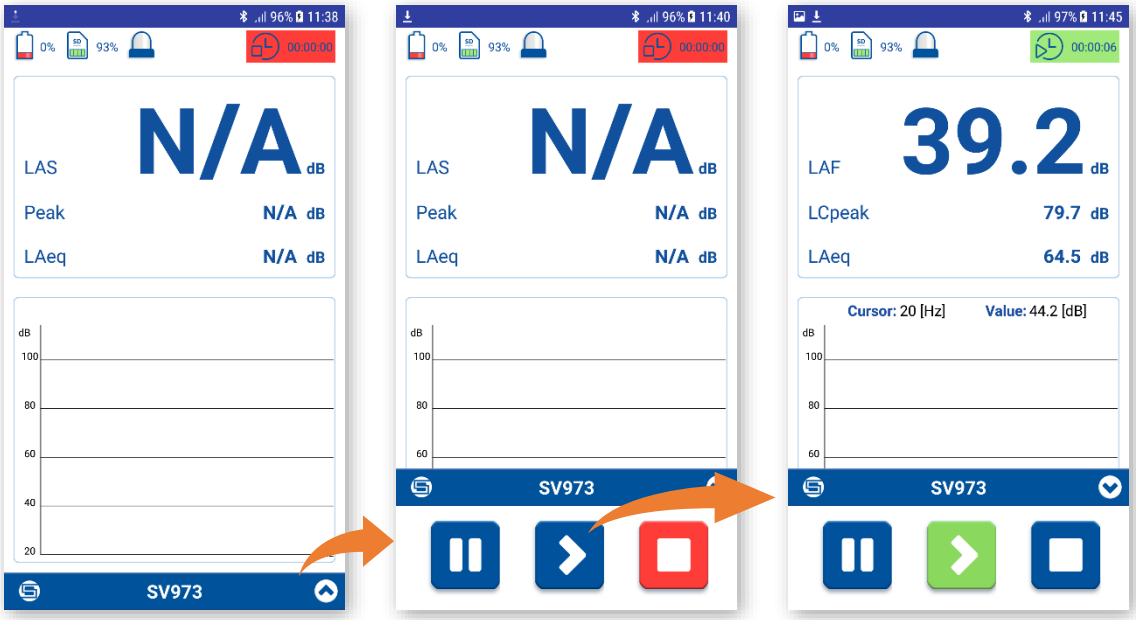


14.3.2 Instrument control view

The control view enables you viewing of measured results and controlling the measurement.

As in the status view, the same icons in the upper line describe the instrument status. In addition to them, the integration time is displayed.

In this view, you can Pause, Start, or Stop a measurement run tapping the appropriate icon on the measurement control bar. Stopping the measurement run requires confirmation.

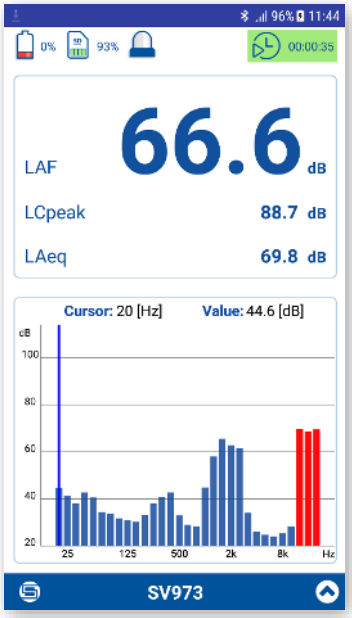


Integration time. If the measurement is in progress, the field turns green, and it shows the elapsed measurement time. If the measurement is stopped or paused, the field turns red or yellow, and the time is frozen.

The control view depends on the measurement function.

For the **Level Meter** function, the control view presents three results: L, Lpeak and Leq measured by the elapsed time with the chosen weighting filters (Z, A, B, C) and integration detector constant (I, F, S).

For the **1/1 Octave** or **1/3 Octave** function, also 1/1 or 1/3 octave spectrum with three TOTAL results is displayed.

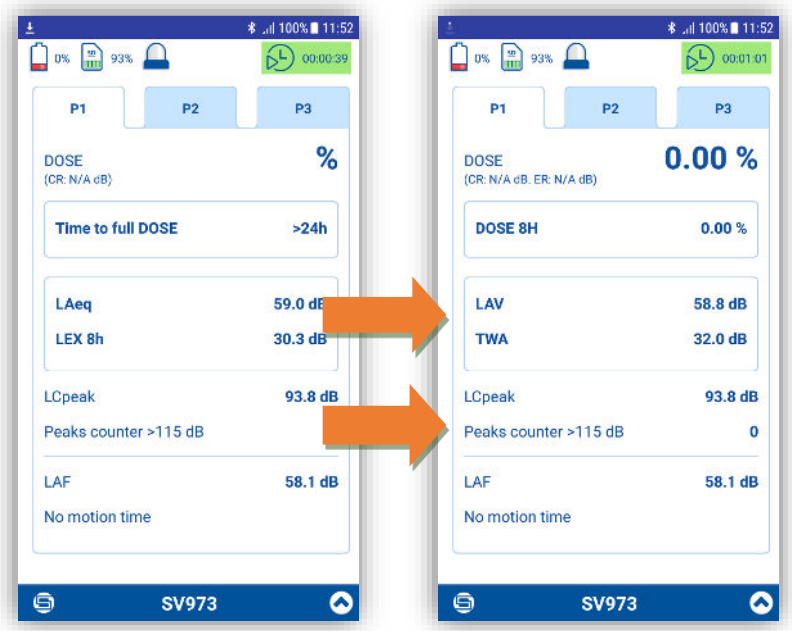


Note: *In the **Sound Level** and **1/1 Octave** or **1/3 Octave** functions, the application adds GPS point markers to the data file. This function can be switched off by pressing the button and selecting the **Disable GPS marker** command.*

For the **Dosimeter** function, the control view presents measurement results for three profiles.

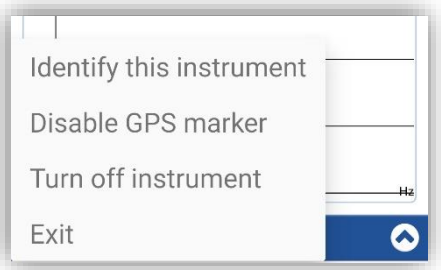
You can switch between profiles tapping the profile tab.

You can change the results in the frames to be viewed by tapping on them.



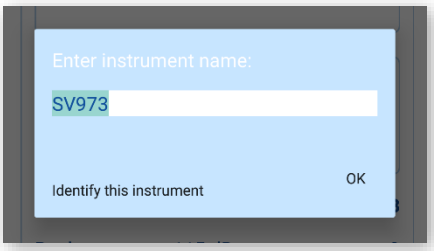
When you press the button, the pop-up menu appears in which you can:

- Identify corresponded instrument.
- Disable the GPS marker (only for the **Sound Level** and **1/1 Octave** / **1/3 Octave** functions).
- Turn the instrument off.
- Exit the application.



If you tap the **Identity this instrument** item, the pop-up box with the current name of the corresponded instrument will appear. If you tap “Identify this instrument”, the instrument shows its name which will blink for 5 seconds then the instrument returns to the previous screen.

At the same time, you can change the name of this instrument.

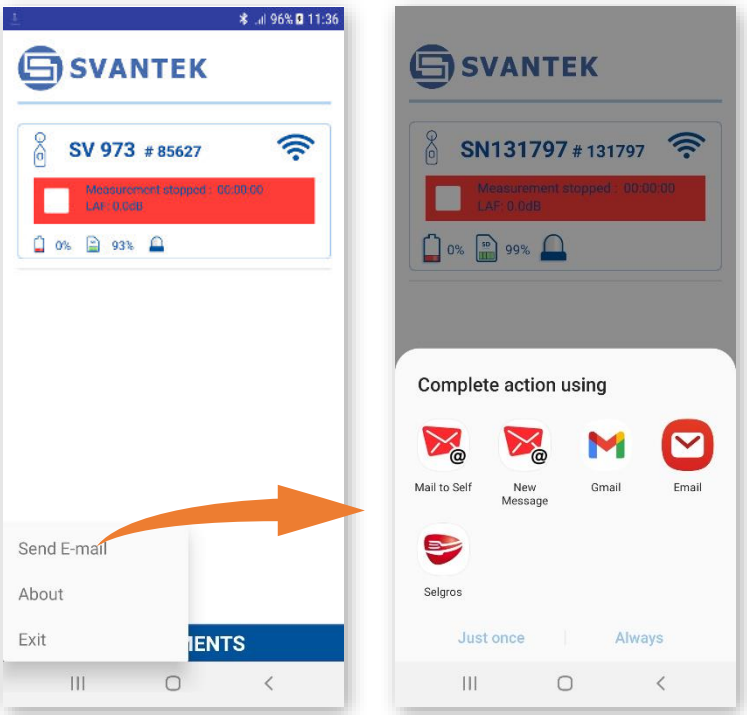


14.3.3 E-mail notifications, software version, exiting the application

If you tap the icon in the lower left corner of the status view, the menu with three items appear to enable you to:

- exit the application (Exit),
- check the software version (About),
- send e-mails directly from the application based on pre-programmed alarm conditions. Notifications are sent when the certain thresholds are exceeded – see Chapter 11.6.

The recipient and contents of the E-mail is defined after selecting the appropriate e-mail application.



14.4 BUILDING ACOUSTICS PRO APPLICATION

The ***Building Acoustics Pro*** application is dedicated to the assessment of airborne or impact sound insulation in buildings and of building elements in accordance with the following standards:

- ISO 16283-1:2014 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 1: Airborne sound insulation,
- ISO 16283-2:2018 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 2: Impact sound insulation,
- ISO 16283-3:2016 Acoustics -- Field measurement of sound insulation in buildings and of building elements -- Part 3: Façade sound insulation,
- ISO 140-4:1998 Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 4: Field measurements of airborne sound insulation between rooms,
- ISO 140-5:1998 Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 5: Field measurements of airborne sound insulation of façade elements and façades,
- ISO 140-7:1998 Acoustics -- Measurement of sound insulation in buildings and of building elements -- Part 7: Field measurements of impact sound insulation of floors.

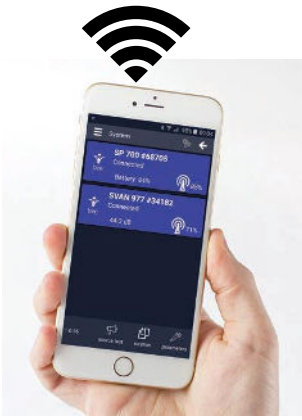
The application is also dedicated to the assessment of speech intelligibility induced by the transmission channel (STIPA) according to IEC 60268-16:2011.

Note: *To have connection with the application, it is necessary to switch on Bluetooth in your instrument (see Chapter 7.1).*

14.4.1 Building Acoustics

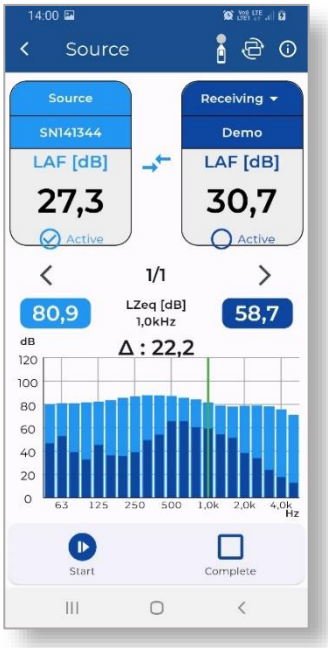
The *Building Acoustics Pro* application allows you to start simultaneous measurements from two instruments connected to your smartphone via Bluetooth®, one located in the source room, and the other in the receiving room.

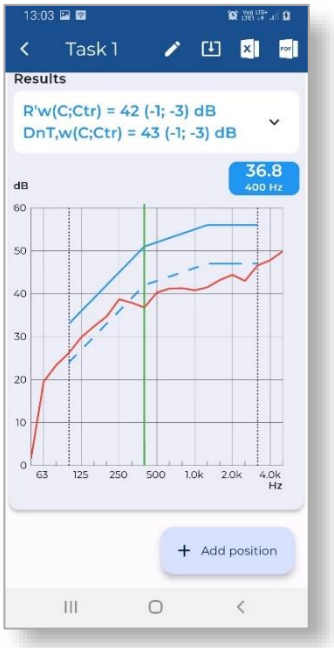
Source room	Receiving room
 	



Note: *For building acoustics, the measuring instrument should have the* ***1/3 Octave*** *and* ***RT60*** *options enabled.*

The *Building Acoustics Pro* application allows you to create a measurement project according to the required standard, configure building characteristics, perform measurements remotely and send the report to any address from your smartphone.



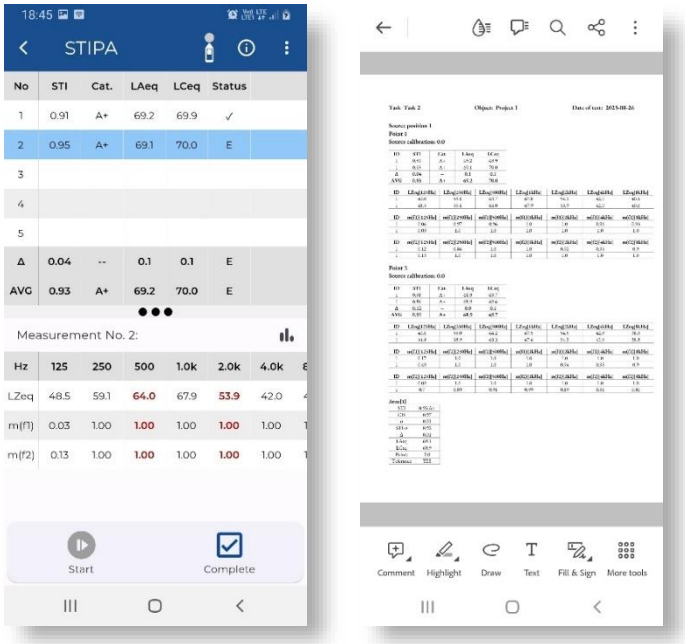


14.4.2 STIPA measurements

The STIPA project allows you to perform assessment of speech transmission index (STI) to evaluate speech intelligibility in room acoustics and/or public address systems. The *Building Acoustics Pro* application makes these measurements easy and fast. To perform such measurements, the user should have a Svantek sound meter (e.g., SV 973A), a test signal source (e.g., Audio TalkBox) and a smartphone with the *Building Acoustics Pro* application installed.

Note: *For STIPA measurements, the measuring instrument should have the* ***1/1 Octave****,* ***1/3 Octave*** *and* ***STIPA*** *options enabled.*

Building Acoustics Pro allows you to install the connection to the measuring instruments, create the measurement project according to the required standard, configure measurement points in the assessed area, perform measurements remotely and send the report to any address from your smartphone.



15 GENERAL PURPOSE SOFTWARE

SVANTEK offers PC software for data download and processing as well as remote control and communication with SV 973A, depending on the user's needs:

- *SvanPC++* - data download and upload, data post-processing, reporting and remote control via the USB or RS232 connection with a PC,
- *Supervisor* - data download and upload via the USB or RS232 connection with a PC, reporting,

The *SvanPC++* and *Supervisor* installation packages can be downloaded from the Svantek official website.

All software functionalities are described in the user manuals that can be downloaded from Svantek's official website:

1. SvanPC++ User Manual
2. Supervisor User Manual.

15.1 SVANPC++

SvanPC++ is an advanced PC software supporting Svantek instruments. The basic software version offers functions for editing instrument settings, downloading data files from the instrument as well as data preview and basic recalculation of Leq and RMS.

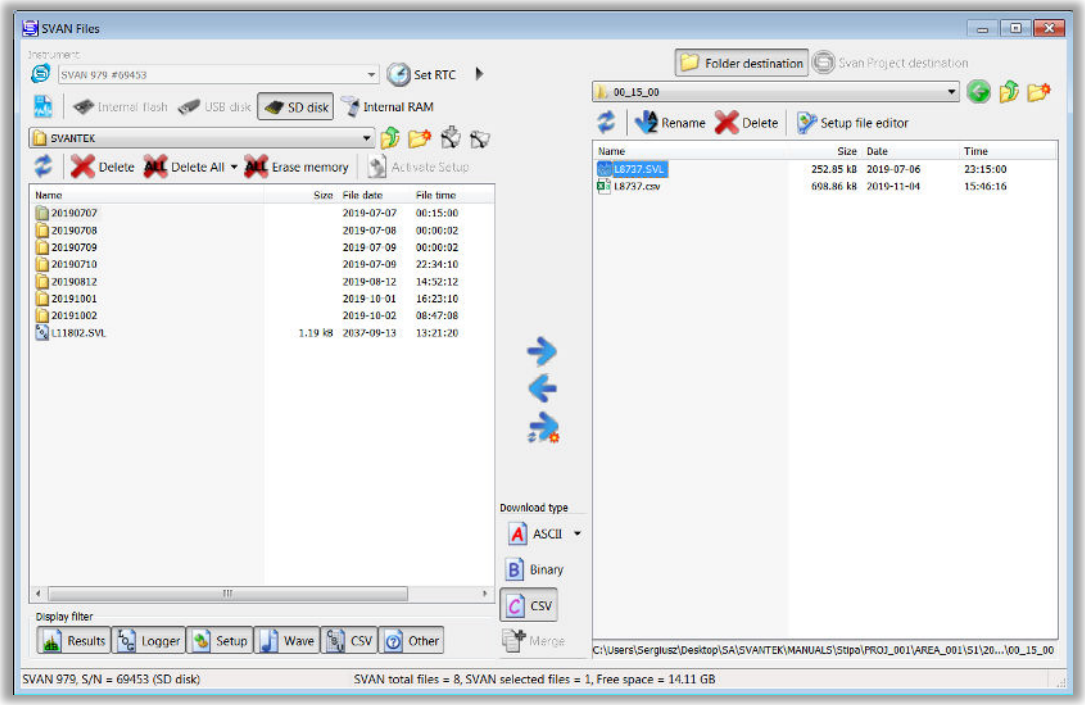
SvanPC++ is enriched with the Projects functionality that allows to combine numerous data files into Sessions. The main advantage of using Projects is the ability to compare data from different measurements and easy report management. Reports are prepared in the form of panels (text, photos, tables, graphs, plots) and can be exported to the Excel spreadsheet or Word text editor.

Main features of *SvanPC++:*

- Support for all Svantek instruments
- USB interfaces compatible
- Download measurement results from instruments to PC
- Storage and management data files in project documents
- Configuration of instrument settings
- Easy direct data export to popular applications
- Report generations
- Data post-processing (e.g., spectrum comparison, time-history and waveform recalculation)
- Wave files playback
- Remote communication with instruments equipped with 3G/4G/LAN modems (optional)

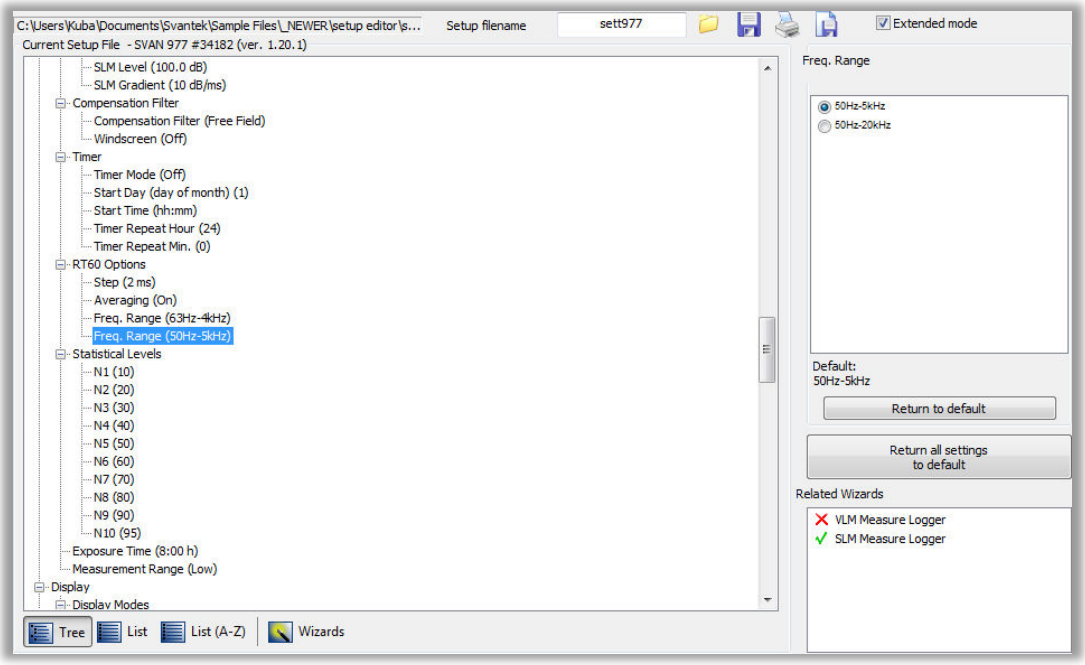
15.1.1 Downloading measurement results

If your Svantek instrument is connected to a PC (via USB, RS232 interface or wireless connection), *SvanPC++* offers a simple tool for downloading files, uploading files and configuring instrument settings – *SVAN Files*.



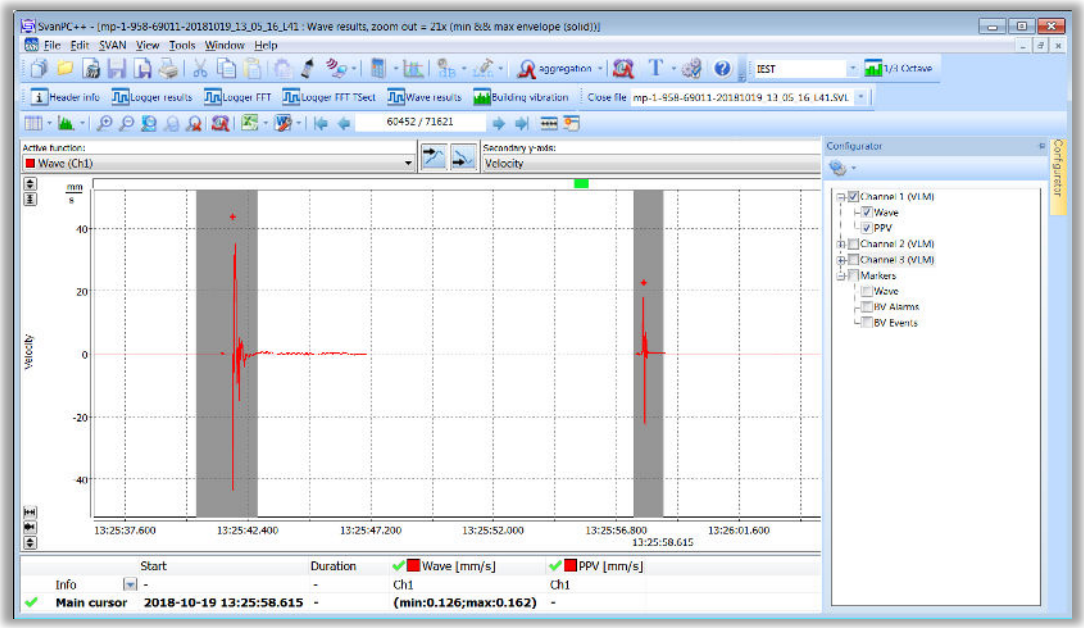
15.1.2 Configuring instrument settings

The *Setup file editor* is a feature that gives you an easy access to the current settings of Svantek instruments, allowing you to configure instrument settings and upload them to the instrument.



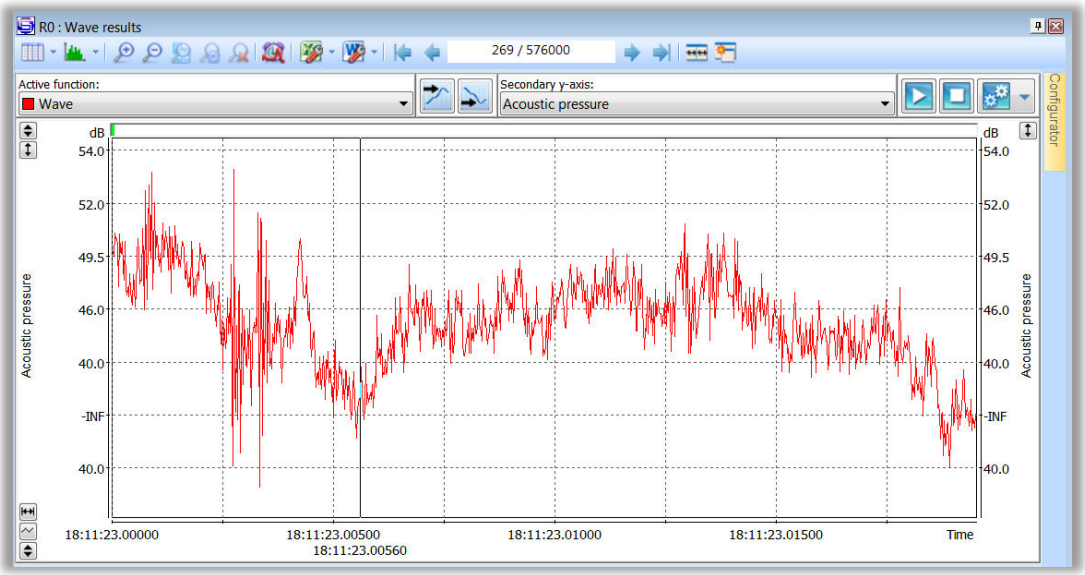
15.1.3 Markers & Block Generator

The Marker Block Generator searches through the long logger files for user defined events. It can find data in the specified time range and check it against thresholds. Search results can also be filtered by event duration, time of the day, etc.



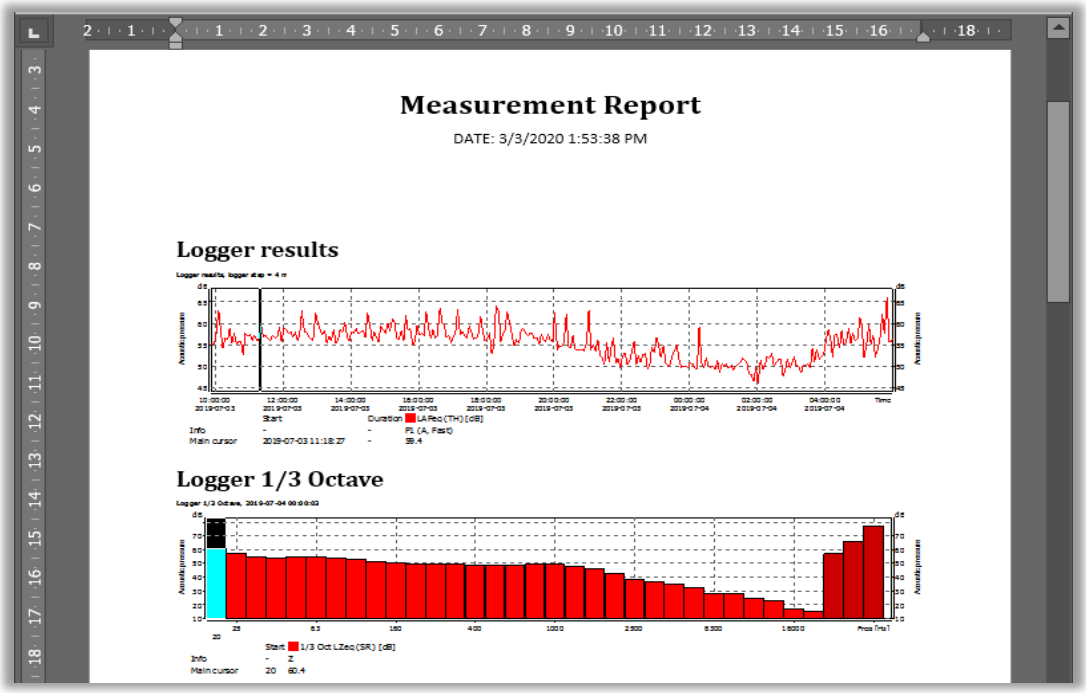
15.1.4 Waveform Analyser

The waveform analyser is used to analyse wave files. This module can calculate overall results such as Leq, Lmax, Lmin, Lpeak, noise statistics as well as 1/1, 1/3, 1/6 and 1/12 octave and FFT spectra or perform tonality analysis on 24 wave files in a single operation.



15.1.5 Reporting

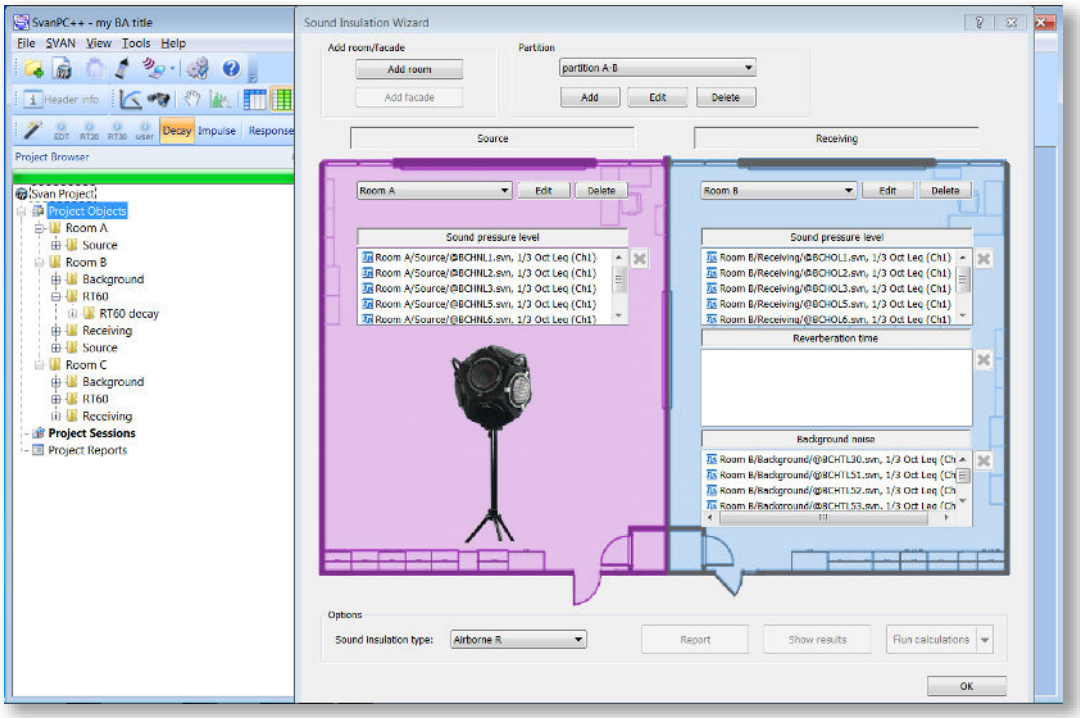
Reporting is based on MS Word™ and allows tables or graphs to be exported to a printable text document. Any report created can be saved as a template and used with other data files. Reports and templates are stored together with the Project so they can be recalled at any time.



15.1.6 Projects

The *Projects* feature is a useful tool that allows you to manage multiple files of different contents and group them into a project file, modify and save data views, and create reports using the measurement data contained in a project.

The project functionality uses the Building Acoustic module (BA), which extends the basic functionality of *SvanPC++* by providing an easy-to-use environment and tools for reverberation time and insulation calculation and reporting. It also provides tools for implementing calculations made with the *Building Acoustins Pro* application for mobile devices, including STIPA calculations.



15.2 SUPERVISOR

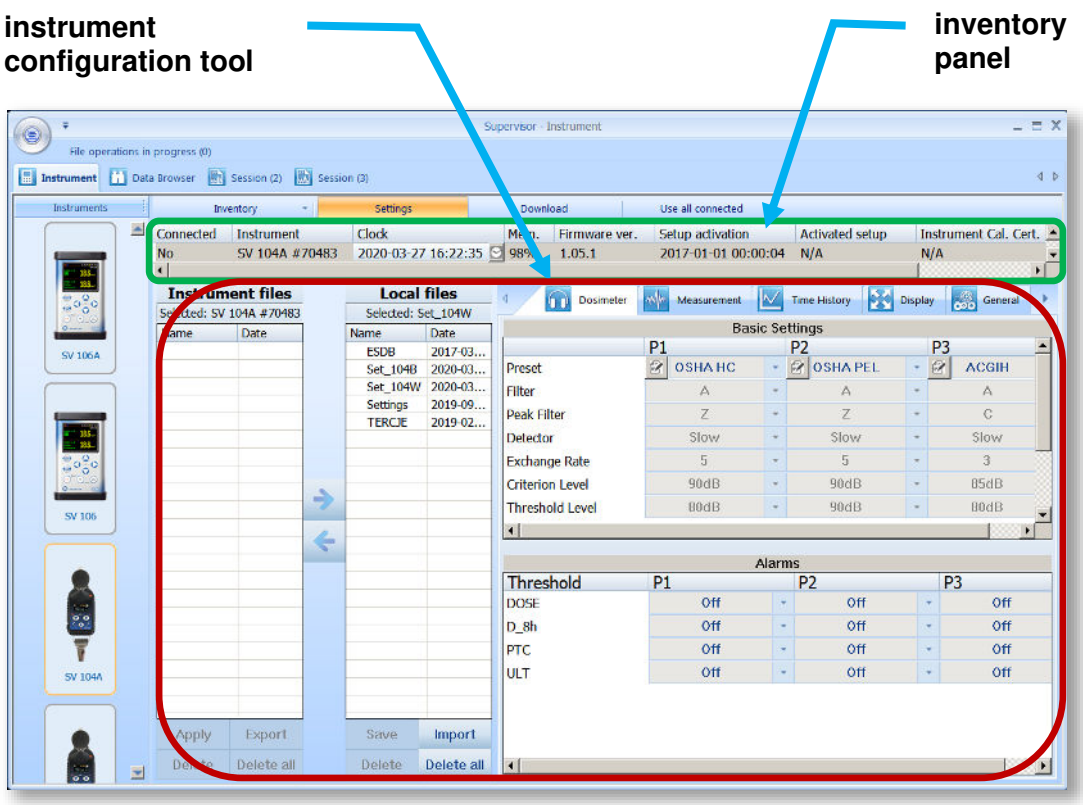
The *Supervisor* software has been developed to extend the functionality of some of Svantek's instruments dedicated for Health and Safety professionals.

Main features of *Supervisor*:

- Easy to use, intuitive interface
- Manage multiple instruments via the inventory panel tool
- Download measurement results from instruments connected to a PC
- Sessions tool for viewing the measurement results, analysing data and performing calculations, generating reports
- Clear setup editor with presets for health & safety compliance
- Easy data export to popular applications
- Quick and easy way to create reports using templates
- Powerful data analysis tools
- Support for audio events, voice comments and wave files
- Noise exposure recalculation according to ISO 9612
- Hearing protection fitting according to ISO 4869-2
- Hand-Arm dose recalculation according to ISO 5349-2
- Whole-Body dose recalculation according to ISO 2631-1

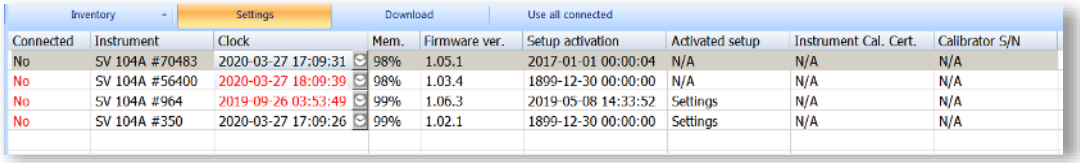
15.2.1 Easy to use, intuitive interface

The main *Supervisor* screen is divided into panels. Panels represent the areas of interest of the professional user and are used to find, configure, download, review and evaluate stored data in a very simple yet professional manner.



15.2.2 Instrument inventory

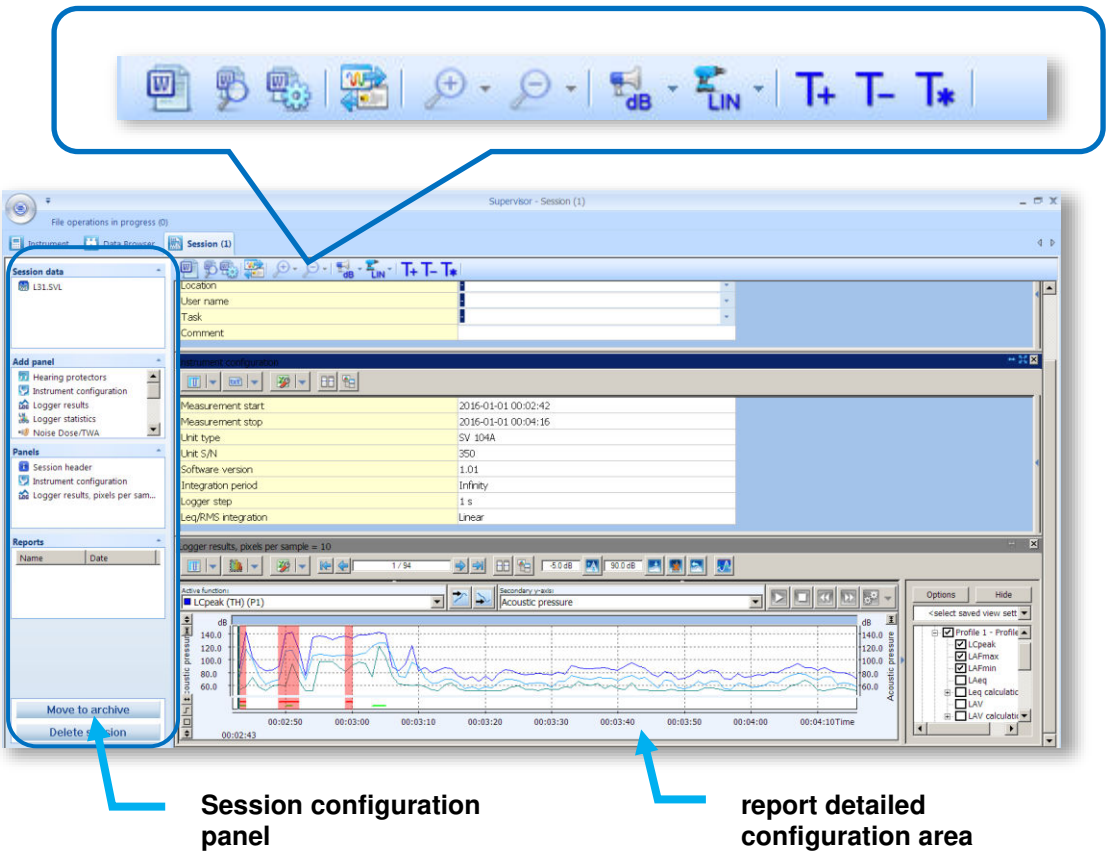
When a connected Svantek instrument is detected by *Supervisor*, it is added to the *Inventory* - a database of all Svantek instruments you have used with Supervisor. This tool allows you to view a group of selected instrument types. The columns of the Inventory table contain information about the multiple instruments: name, internal clock, free memory, firmware version, calibration details, etc. The Inventory panel provides you with more functions to manage the selected instrument, such as: Refresh Catalogue, Set Clock, Edit Name, etc. by right-clicking on the selected instrumen row.



Connected	Instrument	Clock	Mem.	Firmware ver.	Setup activation	Activated setup	Instrument Cal. Cert.	Calibrator S/N
No	SV 104A #70483	2020-03-27 17:09:31	98%	1.05.1	2017-01-01 00:00:04	N/A	N/A	N/A
No	SV 104A #56400	2020-03-27 18:09:39	98%	1.03.4	1899-12-30 00:00:00	N/A	N/A	N/A
No	SV 104A #964	2019-09-26 03:53:49	99%	1.06.3	2019-05-08 14:33:52	Settings	N/A	N/A
No	SV 104A #350	2020-03-27 17:09:26	99%	1.02.1	1899-12-30 00:00:00	Settings	N/A	N/A

15.2.3 Sessions and reporting

Sessions is the most advanced charting, tables, and reporting capability in its class. Each Session is highly configurable, and the *template* of a document once created can be saved for future use with other measurement data. This gives the user quick solution. Information is divided into panels and displayed in customisable graphs and/or with selected measurement data/parameters.



16 MAINTENANCE

16.1 REPLACING THE BATTERIES

SV 973A is supplied with four AAA alkaline batteries, but you can also use AAA rechargeable batteries.

The "**battery**" icon indicates the status of the internal batteries.

SV 973A does not have an internal charger, so the batteries can only be recharged after they have been removed from the instrument.

To change or charge the batteries, switch off the instrument, unscrew the coin slot screw, remove the black bottom cover of the instrument and slide out the battery tubes.

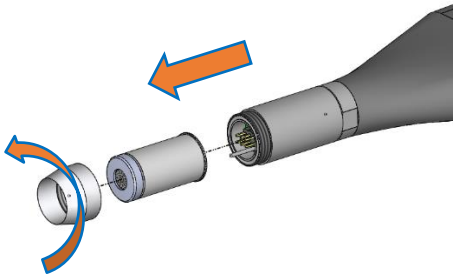
***Note**: When replacing the batteries, ensure that the polarity is correct.*

16.2 DISCONNECTING THE MICROPHONE

If the microphone requires service or you want to store it separately from the instrument, you can disconnect the microphone yourself.

To disconnect the microphone, switch off the instrument, unscrew the microphone protection ring, and pull the microphone to remove it from the connector.

To reattach the microphone, insert it into the connector and screw on the microphone protection ring.



***Note:** The instrument kit includes a microphone cap which should be kept on the microphone at all times when the instrument is not being used for measurements!*

16.3 RESETTING THE INSTRUMENT

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

- **HARDWARE RESET:** internal hardware reset doesn't change any settings. Make sure that the battery is not exhausted and that the instrument is switched off. Press and hold the **<Shift>** and **<Start/Stop>** keys for 20 seconds, then release. Switch the instrument on.

***Note:** The hardware reset should only be used in extreme situations, such as when an instrument has hung up.*

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

16.4 UPGRADING THE FIRMWARE

Svantek is committed to continuous innovation and therefore reserves the right to provide firmware enhancements based on user feedback.

To update the instrument firmware:

- Unpack the supplied firmware package (provided as a suitable compressed file).
- Make sure that the instrument is switched off.
- Connect the SC 158 cable to the instrument and then to the PC.
- Press and hold the **<Enter>** and **<ESC>** keys while switching on the instrument with **<Shift>** and **<Start/Stop>** keys. The following message should appear on the instrument's screen: Bootstrap ver: x.xx.
- Wait for the "<USB>" message to appear on the instrument's screen and run the *go-usb.bat* file on the PC.
- The changing number and final message "..... o.k." should appear on the PC screen.
- A successful firmware update is indicated by the message "Program loaded!"
- Switch off the instrument.

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

16.5 PRESERVATION OF INTERNAL BATTERIES

- To prolong the life of the internal batteries, it is recommended to switch off the instrument when storing it. In the case of alkaline batteries, it is recommended to remove them from the instrument.
- When the instrument is switched off, it still uses a small amount of battery power. It is therefore recommended that rechargeable batteries are recharged every few months if they are not used regularly.

16.6 TRANSPORTATION AND STORAGE

For transport or storage, we recommend using 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 waterproof case (SA 72) or the pocket soft bag (SA 80), which offer excellent mechanical and environmental protection and long-term storage conditions.

16.7 CLEANING

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

The instrument sockets should be cleaned with compressed air.

Note: *In cases of larger dirt, such as oil or grease, contact your Local Authorized Distributor or Svantek Service Office.*

16.8 TROUBLESHOOTING

- If the instrument does not switch on, connect the USB power supply. Then perform a hardware reset.
- If the instrument is switched on but does not respond to any key, perform a hardware reset.
- If 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 website.

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

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

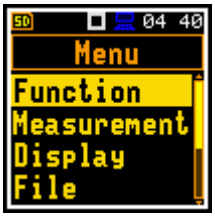
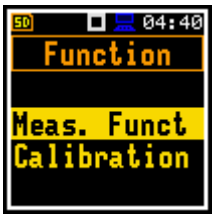
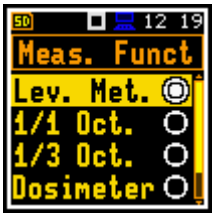
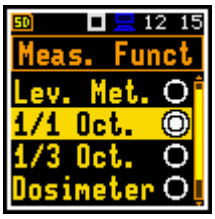
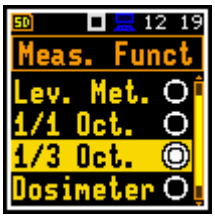
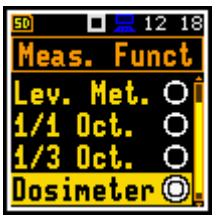
E-mail: support@svantek.com.pl
office@svantek.com.pl

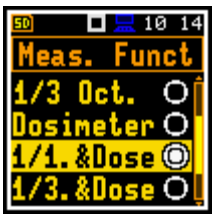
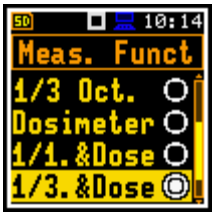
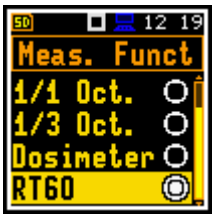
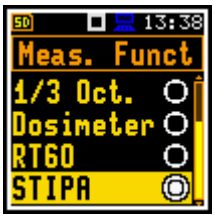
Internet: www.svantek.com

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

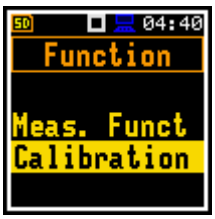
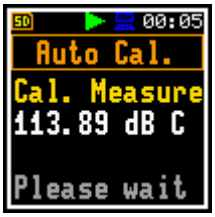
17 GLOSSARY

17.1 Modes and Measurement Functions

Name	Description	Screen	Reference
Function	The menu section that enables selecting the *Measurement Function* and performing *Calibration* of the instrument.		Chapter 3
Measurement Function	Type of calculations the instrument currently performs: - *Level Meter*, - *1/1 Octave*, - *1/3 Octave*, - *Dosimeter,* - *RT60,* - *STIPA*.		Chapter 3.1
Level Meter	*Measurement Function* enabling calculation of broad band results (*Summary Results*) and time-history for sound measurements in accordance with Class 2 IEC 61672-1:2013 accuracy. All results can be calculated in parallel by three virtual meters (so called profiles) using different weighting filters and LEQ detectors.		Chapter 3.1
1/1 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/1 octave sound results in accordance with Class 2 IEC 61260-1:2014. 1/1 octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/1 octave results can be saved as a time-history.		Chapter 3.1, 10
1/3 Octave	*Measurement Function* enabling calculation of *Level Meter* results and 1/3 octave sound results in accordance with Class 2 IEC 61260-1:2014. 1/3 octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/3 octave results can be saved as a time-history.		Chapter 3.1, 10
Dosimeter	*Measurement Function* enabling calculation of broad band (*Level Meter*) and sound exposure results in accordance with Class 2 IEC 61672-1:2013 accuracy.		Chapter 3.1, 11

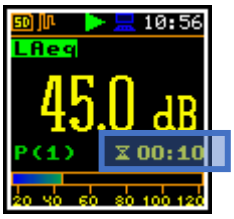
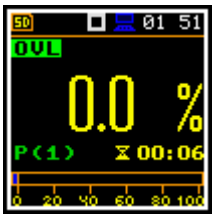
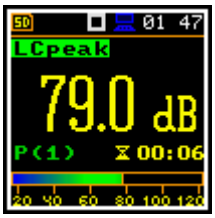
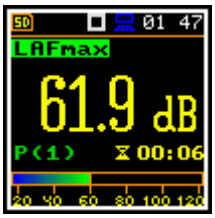
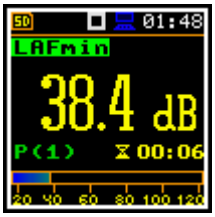
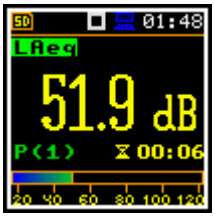
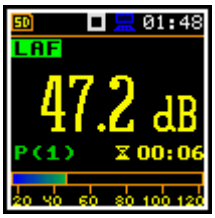
1/1.&Dose	*Measurement Function* enabling calculation of *Dose Meter* results and 1/1 octave sound results in accordance with Class 2 IEC 61260-1:2014. 1/1 octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/1 octave results can be saved as a time-history.		Chapter 3.1, 10
1/3.&Dose	*Measurement Function* enabling calculation of *Dose Meter* results and 1/3 octave sound results in accordance with Class 2 IEC 61260-1:2014. 1/3 octave results are presented as a spectrum graph - a function of result value vs central band frequency. 1/3 octave results can be saved as a time-history.		Chapter 3.1, 10
RT60	*Measurement Function* enabling calculation of reverberation time in 1/1 octave bands or 1/3 octave bands including three total RMS levels (A, C and Z weighted). Two methods can be applied: Impulse Response Method and Interrupted Noise Method. Results are presented for 1/1 or 1/3 octave bands.		Chapter 3.1, 12
STIPA	*Measurement Function* enabling analysis of the speech intelligibility with the STIPA method.		Chapter 3.1, 13

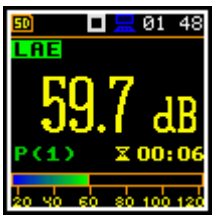
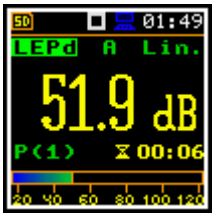
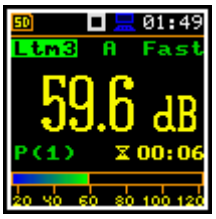
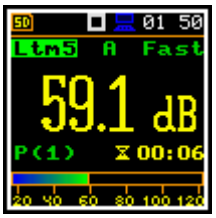
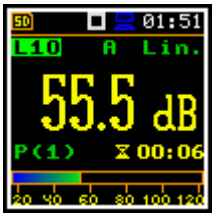
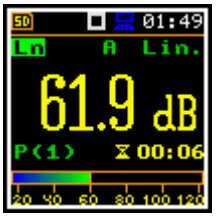
17.2 CALIBRATION

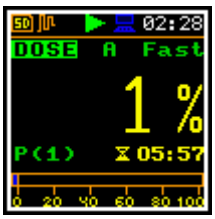
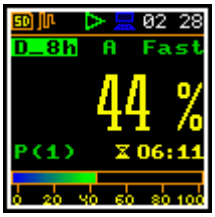
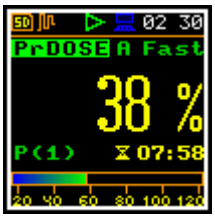
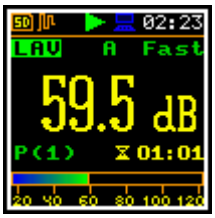
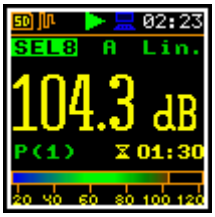
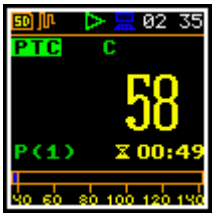
Name	Description	Screen	Reference
Calibration	Item on the *Function* screen that opens a screen with items that allow you to perform calibration of the instrument: *By Measurement, Last Calibration, Calibration History, Clear History, Post Calibration* and *Auto Calibration*.		Chapter 3.2
By Measurement	Type of calibration based on the reference signal measurement with the use of a sound calibrator.		Chapter 3.2.1
Calibration Measure	Measured by the instrument reference signal level without calibration factor correction.		Chapter 3.2.1, 3.2.6

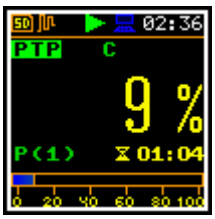
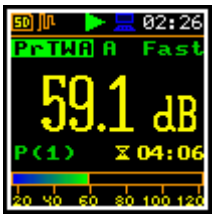
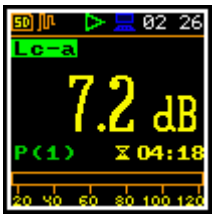
Calibration Level	Level of the reference signal generated by used calibrator.		Chapter 3.2.1, 3.2.6
Calibration Factor	Difference between the reference signal level and the measured level. The calibration factor is always added to the results and measurement range limits.		
New Calibration Factor	Difference between the *Calibration Level* and the *Calibration Result* (calculated in dB).		Chapter 3.2.1, 3.2.6
Last Calibration	Recent calibration record: measurement function for which calibration was performed (*Level Meter* or *Dosimeter*), type of calibration (*Factory Calibration*, *By Sensitivity* or *By Measurement*), date of calibration and calibration factor.		Chapter 3.2.2
Calibration History	List of calibration records which you can view by pressing the **<Enter>** key.		Chapter 3.2.3
Clear History	Operation that clears all calibration records.		Chapter 3.2.4
Post Calibration	Feature that enables adding the new calibration factor to some files already saved in the instrument's memory or to the files that will be created in the future.		Chapter 3.2.5
Auto Calibration	Feature that enables automatic calibration when the reference sound signal is detected by the instrument.		Chapter 3.2.6

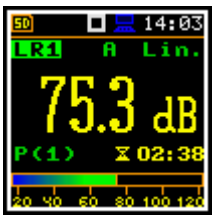
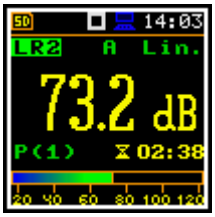
17.3 MEASURED RESULTS

Name	Description	Screen	Reference
Elapsed time	Time from the measurement start, that is displayed under the result in the format ⌛ mm:ss in the range from 00:00 to 59:59, or in the format ⌛ hh:mm:ss in the range from 01:00:00 to 99:59:59, or in format ⌛ xxxh from 100h to 999h, and ⌛ >999h if the elapsed time exceeds 999 hours. Its maximum value is equal to the *Integration Period* and the elapsed time is zeroed when new measurement cycle starts.		Chapter 5.1.1
OVL	Percentage of the overloaded input signal, which occurred within the elapsed measurement time.		Appendix D
Lpeak	Peak Sound Level, the greatest instantaneous value of a standard frequency weighted sound pressure level within the elapsed measurement time. It is measured with frequency weighting A, C or Z and accordingly displayed as LApeak, LCpeak or LZpeak.		Appendix D
Lmax	Maximal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time. The *Max* result for the 1 second period is equal to the Spl result. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAFmax, LASmax, LCFmax, LCSmax etc.		Appendix D
Lmin	Minimal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAFmax, LASmax, LCFmax, LCSmax etc.		Appendix D
Leq	Equivalent continuous sound level, time-averaged sound level for the elapsed measurement time (equivalent sound level). It is measured with frequency weighting A, C or Z and accordingly displayed as LAeq, LCeq or LZeq.		Appendix D
L	Time weighted sound level expressed at observation time, expressed in dB. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAF, LAS, LCF, LCS etc.		Appendix D

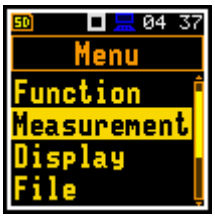
LE	Sound Exposure Level (SEL), the constant sound level that has the same amount of energy in one second as the original noise event and is the subset of the *Leq* result so, for the integration time equal to 1 s, *SEL* is always equal to *Leq*. It is measured with frequency weighting A, C or Z and accordingly displayed as LAE, LCE or LZE.		Appendix D
LEPd	Daily Personal Noise Exposure, the noise exposure level for a nominal 8-hour working day, used for assessing the noise exposure of a worker during a working day. The *LEPd* result is calculated on the base of the *Leq*.		Appendix D
Ltm3	Takt-Maximal Level calculated according to the German standard TA Lärm.		Appendix D
Ltm5	Takt-Maximal Level calculated according to the German standard TA Lärm.		Appendix D
Ln	Statistical Noise Levels, the certain boundary level surpassed by the temporary noise level values in not more than nn% of the observation period. *Ln* are calculated on the base of 100ms Leq results and renewed every second on the display as cumulated statistics over the current measurement time.		Appendix D
L(den)	Day-evening-night equivalent level, *Leq*. Sound Level, measured over the 24 hour period, with a 10 dB penalty added to the levels between 23.00 and 07.00 hours and a 5 dB penalty added to the levels between 19.00 and 23.00 hours to reflect people's extra sensitivity to noise during the night and the evening. The instrument displays: Ld, Le, Ln, Lde, Len, Lnd, or Lden depending on the day and night time which the measurement covers. Due to different country requirements, it is possible to shift day time from 7h-19h to 6h-18h.		Appendix D
PSEL	Individual Sound Exposure Level to the noise is equal to the standing sound level in a measurement period. The *PSEL* result is calculated on the base of the *LEQ*.		Appendix D

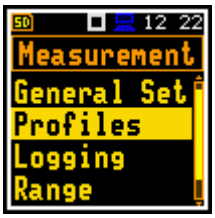
DOSE	Quantity of noise received by the worker, expressed as the percentage of the whole day acceptable value.		Appendix D
D_8h	Quantity of noise received by the worker for 8 hours.		Appendix D
PrDOSE	Quantity of noise received by the worker during exposure time.		Appendix D
LAV	Average level of the acoustic pressure for the given time period of the measurement.		Appendix D
SEL8	*SEL* result corresponding to the integration time equal to 8 hours. The *SEL8* result is calculated on the base of the LEQ.		Appendix D
E	Exposition represents the amount of the acoustical energy received by the worker.		Appendix D
E_8h	Exposition in 8 hours represents the amount of the acoustical energy received by the worker for 8 hours. The *E_8h* result is expressed in the linear units [Pa²h].		Appendix D
PTC	Peak Threshold Counter – the number of the overpasses of the Threshold Level by *Lpeak* result. This result is incremented in 100 ms intervals.		Appendix D

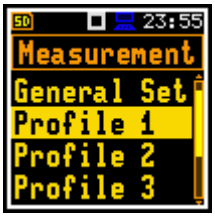
PTP	PTC result expressed in percent.		Appendix D
ULT	Upper Limit Time - time that SPL exceeded the “ULT Threshold Level” set during configuration.		Appendix D
TWA	Time Weighted Average - average A-weighted sound level for a nominal 8-hour workday with Time Weighting S and Exchange Rate 5. TWA is usually measured with A-weighting and Slow response detector type. TWA is calculated from the measured LAV (taking Threshold Level into account) and a Reference time of 8 h. Mainly used in the USA for assessing the noise exposure for a worker during a workday.		Appendix D
PrTWA	Projected Time Weighted Average is calculated from the measured LAV (taking THRESHOLD LEVEL into account) and the exposure time.		Appendix D
Lc-a	*Leq* that enhances the low-frequency components of the sound signal. It is the result of subtracting an A-weighted LAeq from a simultaneously collected C-weighted Leq.		Appendix D
EX	Expected value. Calculated on the basis of 100ms Leq results.		Appendix D
SD	Standard deviation. Calculated on the basis of 100ms Leq results.		Appendix D

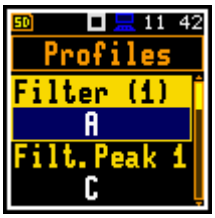
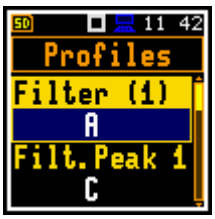
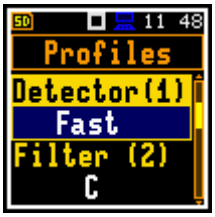
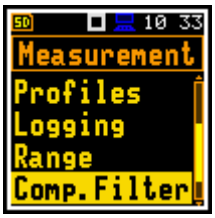
LR1	First rolling *Leq* - Leq for the window of the last xx seconds/minutes of the measurement moving with 1 second step.		Appendix D
LR2	Second rolling *Leq* - Leq for the window of the last yy seconds/minutes of the measurement moving with 1 second step.		Appendix D

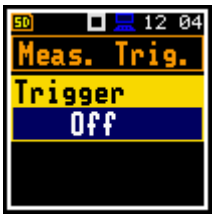
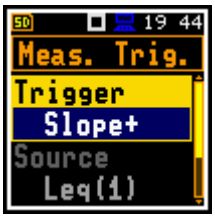
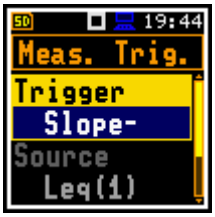
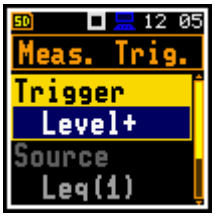
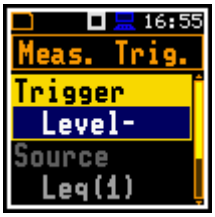
17.4 MEASUREMENT PARAMETERS

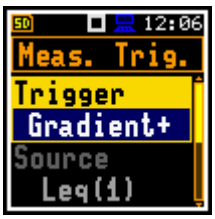
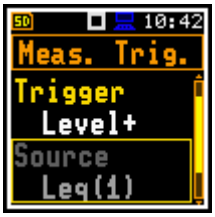
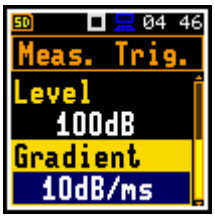
Name	Description	Screen	Reference
Measurement	Section of the Main Menu that enables selecting the measurement parameters in the screens: *General Settings, Measurement Trigger, Profiles, Logging, Spectrum, Range, Compensation Filter, Statistical Levels, Exposure Time, Timer* and *Alarm*.		Chapter 4
General Settings	General measurement settings: *Start Delay*, *Start Sync.*, *Integration Period*, *Repetition Cycles*, *RMS Integration* and *Day Time Limits*.		Chapter 4.1
Start Delay	Delay between pressing the <Start> key and the start of measurement integration.		Chapter 4.1
Start Synch.	Synchronization of the measurement/integration start to the nearest full minute or hour of the instrument real-time clock. It helps to measure in full cycles.		Chapter 4.1
Integration Period	Time of averaging of *Summary Results*: from 1 second to Infinitive. For example, with 8 hours integration period the LEQ result will be averaged for 8 hours. In case of Infinitive, the measurement will last until the user presses the <Stop> key.		Chapter 4.1

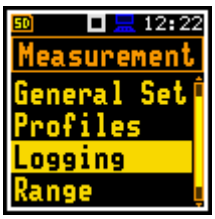
Repetition Cycles	Number of measurement/integration repetitions after the <Start> key pressure. This enables to make a series of measurements without pressing the <Start> key and save this series in the results file.		Chapter 4.1
LEQ Integration	Type of integration of RMS based results (RMS detector): *Linear* or *Exponential*. The IEC 61672-1:2013 standard requires Linear integration, without time weighting, however in some countries old regulation refers to the Exponential RMS integration with standard time weighting: Fast or Slow.		Chapter 4.1
Linear	Linear type of integration of RMS based results (RMS detector), without time weighting according to the IEC 61672-1:2013 standard.		Chapter 4.1
Exponential	Exponential type of integration of RMS based results (RMS detector), where averaging is a continuous averaging process that weighs current and past data differently. The amount of weight given to past data as compared to current data depends on the exponential time constant. In exponential averaging, the averaging process continues indefinitely.		Chapter 4.1
Day Time Limits	Definition of the day and night periods required by local standards: 6–18h and 7–19h. These limits are used for the calculation of the L(den) function.		Chapter 4.1
LRx Time	Definition of the integration periods for calculating the LR1 and LR2 results.		Chapter 4.1
Profiles	Virtual broadband level meters, which calculate the set of results with own weighting filter (*Filter*) and exponential detector time constant (*Detector*). Profiles can be programmed together in the *Profile* screen if the instrument works in the *Level Meter*, *1/1 Octave* or *1/3 Octave* modes, or individually if the instrument works in the *Dosimeter* mode.		Chapter 4.3, 11.3

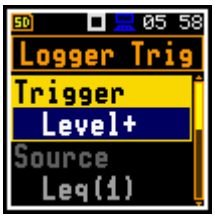
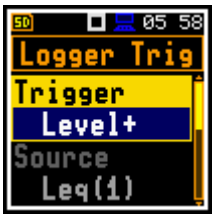


Filter	Weighting filter applied in the profile for all results except *Lpeak* in accordance with most applicable world standards: Z, A, C, B, LF.		Chapter 4.3 Appendix C Appendix D
Filter Peak	Weighting filter applied in the profile for *Lpeak* results calculation in accordance with most applicable world standards: Z, A, C, B, LF.		Chapter 4.3 Appendix C Appendix D
Detector	Exponential RMS detector time constant applied in the profile: *Impulse*, *Fast* or *Slow* for such results like *Leq, Lmax, Lmin, LE, LEPd, Lden, L, Ltm3 and Ltm5*.		Chapter 4.3 Appendix D
Compensation Filter	Digital filter that compensates some effect: *Microphone*, *Diffuse Field and Windscreen*.		Chapter 4.7
Microphone	Digital filter that compensates the microphone inner noise. It is switched On by default, however it should be switched Off for electrical measurements (e.g. for laboratory calibration measurements).		Chapter 4.7
Field Compensation	Digital filter that compensates the free-field (**Free Field**) or diffuse field (**Dif. Field**) effects. The user may switch off (**Off**) all compensations for laboratory purposes.		Chapter 4.7
Windscreen	Digital filter that compensates the effect of the SA 22 windscreen.		Chapter 4.7

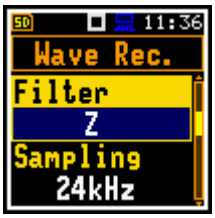
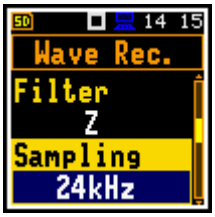
Range	Item that enables checking the linear operating range for the sinusoidal signal. The instrument uses two ranges – one for the *SLM functions* (32.0 LEQ(A) – 128.0 PEAK) and another for the *SEM* function (50.0 LEQ(A) – 141.0 PEAK). The range limits depend on the calibration factor.		Chapter 4.6
Measurement Trigger	Screen that enables configuring triggering of the measurement/integration process with parameters: *Trigger, Source, Level* and *Gradient*.		Chapter 4.2
Trigger	Item that switches *Off* or on the measurement trigger by selecting its type: *Level+, Level–* or *Gradient+*. If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „play" icon.		Chapter 4.2
Slope +	Type of trigger that starts the measurement/ integration by the duration of the *Integration Period* on condition: rising value of the RMS result (*Source*) integrated during 0,5 ms passes above the threshold value (Level).		Chapter 4.2
Slope–	Type of trigger that starts the measurement/ integration by the duration of the *Integration Period* on condition: falling value of the RMS result (*Source*) integrated during 0,5 ms passes below the threshold value (Level).		Chapter 4.2
Level+	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0.5 ms. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.		Chapter 4.2
Level–	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0.5 ms is lower than the threshold value (*Level*). In other cases, the instrument continues checking the trigger condition every 0.5 ms. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle.		Chapter 4.2

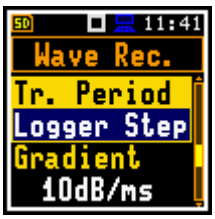
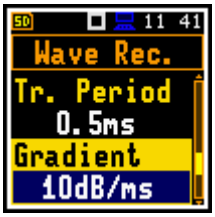
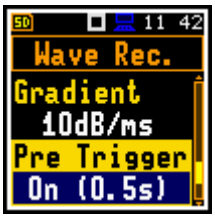
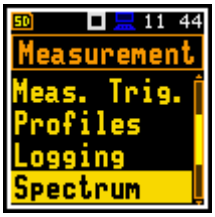
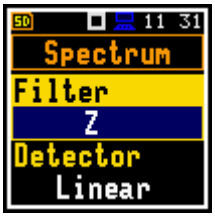
Gradient+	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold level (*Level*) and the gradient of this Source is greater than the threshold level (*Gradient*). In other cases, the instrument continues checking the trigger condition every 0.5 ms. During one measurement cycle the instrument performs as many 1-second integrations as many seconds the *Integration Period* consists and stops the measurement cycle. This type of trigger has the same logic as *Level+* trigger, but the trigger condition requires also gradient level to be exceeded.		Chapter 4.2
Source	Measured result that is compared with the threshold level (*Level*) for triggering – RMS measured in the first profile: Leq(1).		Chapter 4.2
Level	Threshold level of the *Source* for trigger condition fulfilment.		Chapter 4.2
Gradient	Threshold level of the source signal value speed of changing (Gradient) for trigger condition fulfilment.		Chapter 4.2
Statistical Levels	Screen that enables setting a boundary level (*Ln*) surpassed by the temporary noise level values in not more than nn% of the observation period. The user can define ten statistical levels, named from N1 to N10, to be calculated, displayed and saved in the files together with the main results.		Chapter 4.8 Appendix D
Timer	Screen that enables configuring automatic switching *On* the instrument and performing the measurement on the programmed time with defined setup. Timer can be *Single* or repeatable (*Multiple*). After every timer cycle, the instrument automatically switches itself off.		Chapter 4.9

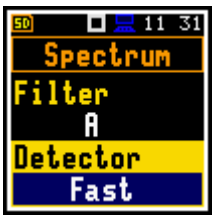
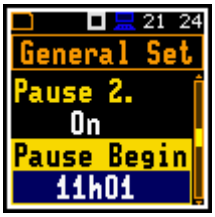
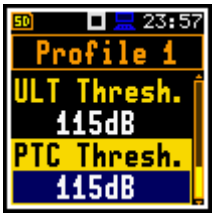
Logging	Screen that enables configuring saving of the *Summary Results*, *Logger Results* and a waveform signal in files with the use of the next screens: *Logger Setup, Logger Results, Logger Trigger* and *Event Recording.*		Chapter 4.5
Logger Setup	Screen that enables switching the logger function on and setting the main logging parameters: *Logger*, *Split*, *Logger Step* and *Logger Name*.		Chapter 4.5.1
Logger	Item in the *Logger Setup* list that switches On or Off the *Logging* functionality. If *Logger* is Off no data recording is available.		Chapter 4.5.1
Logger Split	Item in the *Logger Setup* screen that enables saving of the logger records in separate files according to different rules: after the integration period, or every quarter/half an hour/hour, or on specific times of a day.		Chapter 4.5.1
Logger Step	Time of measuring/integrating *Logger Results* and recording them to the logger file (same meaning as *Integration Period* for *Summary Results*). *Logger Step* can be selected from the set: 100 ms, 200 ms, 500 ms or from 1 second to 59 seconds with 1-second step or from 1 minute to 59 minutes with 1-minute step and up to 1 hour.		Chapter 4.5.1
Logger Name	Item in the *Logger Setup* screen that enables defining the name of file in which *Logger Results*, *Summary Results*, *Markers* and *Event Recordings* will be saved.		Chapter 4.5.1
Summary Results	Main measurement results: *Leq*, *Lpeak*, *Lmax*, *Lmin*, *L*, *LE*, *Lden*, *LEPd*, *Ltm3*, *Ltm5, LR1*, *LR2* statistics *Ln, EX, SD* and *OVL*; that are measured, displayed and saved in the file with the *Integration Period* step as many times as defined by the *Repetition Cycles* parameter. They are renewed and displayed every second when the measurement is running. The saving of the *Summary Results* can be switched on or off in the *Logger Setup* screen.		Chapter 4.5.1

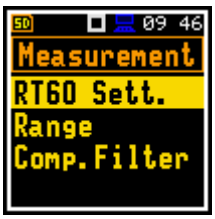
Logger Results	Screen in the *Logging* list enabling selecting results that will be logged to the logger file as a time-history with the *Logger Step*: *Lpeak, Lmax, Lmin, Leq, LR1*, *LR2*. For the 1*/1 Octave* and *1/3 Octave* functions also spectra can be saved.		Chapter 4.5.2
Logger Trigger	Screen that enables configuring parameters for triggering of *Logger Results* recording to the logger file: *Trigger, Source, Level, Pre Trigger* and *Post Trigger*.		Chapter 4.5.3
Trigger	Item that switches Off or On the logger trigger by selecting its type: *Level+* or *Level–*. If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „logger" icon.		Chapter 4.5.3
Level+	Type of trigger, that starts logging of *Logger Results* under the condition: value of the Leq result (*Source*) integrated by the *Logger Step* period is greater than the threshold level (*Level*). In other cases, the logging is skipped.		Chapter 4.5.3
Level–	Type of trigger, that starts logging of *Logger Results* under the condition: value of the Leq result (*Source*) integrated by the *Logger Step* period is lower than the threshold level (*Level*). In other cases, the logging is skipped.		Chapter 4.5.3
Source	Measured result that is compared with the threshold level (*Level*) for triggering – LEQ measured in the first profile (Leq(1)).		Chapter 4.5.3
Level	Threshold level of *Source* for triggering condition fulfilment.		Chapter 4.5.3
Pre Trigger	Period of additional logging before triggering condition fulfilment.		Chapter 4.5.3

Post Trigger	Period of additional logging after triggering condition fulfilment.		Chapter 4.5.3
Wave Recording	Recording of the waveform signal in the wave file.		Chapter 4.5.4
Recording	Switching on the signal recording: *Continuous* or on trigger: *Slope +, Slope–, Level+, Level–, Gradient+, Trigger manual* or *Integr. Period*. Continuous means that the waveform signal will be recorded continuously from the start of the measurement till its end. On trigger recording put additional conditions for triggering and ending of the recording. If the instrument is waiting for the trigger condition, the appropriate trigger icon is flashing on the display alternatively with the „signal" icon.		Chapter 4.5.4
Slope +	Type of trigger that starts the signal recording for *Recording Time* under the condition: rising value of the LEQ result (*Source*) integrated during 0,5 ms passes above the threshold level (*Level*).		Chapter 4.5.4
Slope–	Type of trigger that starts the signal recording for *Recording Time* under the condition: falling value of the LEQ result (*Source*) integrated during 0,5 ms passes below the threshold level (*Level*).		Chapter 4.5.4
Level+	Type of trigger that starts the signal recording for *Recording Time* under the condition: value of the LEQ result (*Source*) integrated by the 0,5 ms period is greater than the threshold level (*Level*).		Chapter 4.5.4
Level–	Type of trigger that starts the signal recording to start for *Recording Time* under the condition: value of the LEQ result (*Source*) integrated by the 0,5 ms period is lower than the threshold level (*Level*).		Chapter 4.5.4

Gradient+	Type of trigger that starts the signal recording for *Recording Time* under the condition: value of the LEQ result (*Source*) integrated by the 0,5 ms period is greater than the threshold level (*Level*) and the gradient of this Source is greater than the threshold level (*Gradient*).		Chapter 4.5.4
Trigger manual	Type of trigger that starts manual triggering of the signal recording start after pressing simultaneously ◄ and ► keys during the measurement.		Chapter 4.5.4
Integr. Period	Type of trigger that starts the signal recording for *Recording Time* every time the measurement starts. If *Integration Period* is shorter than *Recording Time,* the event recording will be continued for additional *Recording Time*.		Chapter 4.5.4
Filter	Weighting filter used during signal recording: Z, A, C, B or LF.		Chapter 4.5.4
Sampling	Sampling frequency of the event recording: 24 kHz or 12 kHz.		Chapter 4.5.4
Signal Gain	Gain of the recorded signal: *0 dB … 40 dB*.		Chapter 4.5.4
Source	Measured result that is compared with the threshold level for triggering (*Level*) – LEQ measured in the first profile: Leq(1).		Chapter 4.5.4
Level	Threshold level of the *Source* for the trigger condition fulfilment.		Chapter 4.5.4

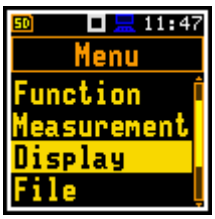
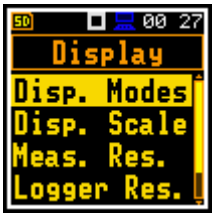
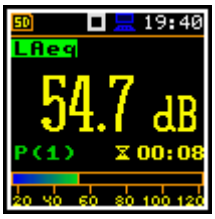
Trigger Period	Time interval of checking the triggering conditions. This parameter can be set as: Logger Step, 0.5 ms, 100.0 ms and 1 s.		Chapter 4.5.4
Gradient	Threshold level of the source signal value speed of changing (Gradient) for trigger condition fulfilment.		Chapter 4.5.4
Pre Trigger	Period of signal recording before the first trigger condition moment: Off or 1 s.		Chapter 4.5.4
Recording Time	Time of the signal recording after meeting every trigger condition. The available values can be selected from 1 s to 8 h. Recording stops after *Recording Time* or earlier if the measurement is stopped manually.		Chapter 4.5.4
Spectrum	Screen that enables setting the *1/1 Octave* or *1/3 Octave* spectrum parameters setup: *Filter* and *Detector*.		Chapter 10.2.3
Peak Sp.	Item in the *Logger Results* screen that switches on/off the Lpeak spectra saving as a time-history in a logger file.		Chapter 10.2.2
Leq Sp.	Item in the *Logger Results* screen that switches on/off the Leq spectra saving as a time-history in a logger file.		Chapter 10.2.2
Filter	Weighting filters for the *1/1 Octave* and *1/3 Octave* analysis: A, B, C, Z.		Chapter 10.2.3

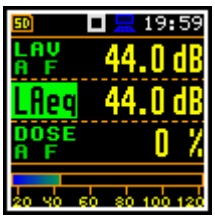
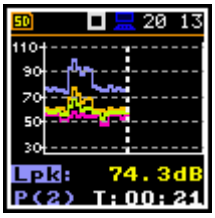
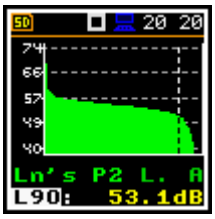
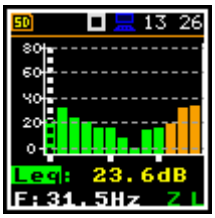
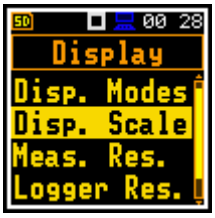
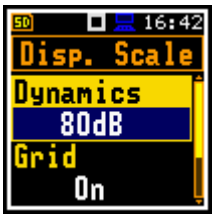
Detector	Type of integration of RMS based results for *1/1 Octave* and *1/3 Octave* analysis: Linear, Fast or Slow.		Chapter 10.2.3
Pause	Automatic pause(s) in the *Dosimeter* mode, that can be programmed based on absolute time.		Chapter 11.2
Exposure Time	Total time during working day in which the worker is exposed to the noise. This time is considered for the LEPd result calculation.		Chapter 11.5 Appendix D
Criterion Level	Steady noise level permitted for a full eight-hour work shift.		Chapter 11.3
Threshold Level	Noise level limit below which the dosimeter does not accumulate noise dose data.		Chapter 11.3
Exchange Rate	Amount by which the permitted sound level may increase if the exposure time is halved.		Chapter 11.3
ULT Threshold Level	Threshold level for calculation of ULT results.		Chapter 11.3
PTC Threshold Level	Threshold level for calculation of PTC results.		Chapter 11.3

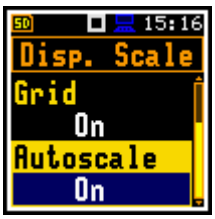
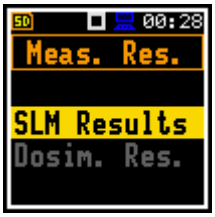
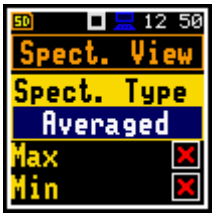
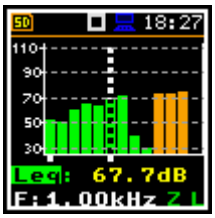
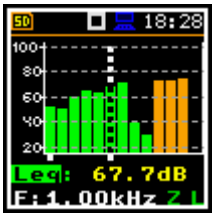
RT60 Settings	Screen that enables setting the reverberation time measurement parameters: *Start Delay, Method, Recording Time, Time Step, Averaging, Noise Mar., Octave, Freq. Range, Logger Name* and *Level*.		Chapter 12.2
Start Delay	Delay between pressing the <Start> key and the start of the RT60 measurement.		Chapter 12.2
Method	Method of the RT60 calculation: *Decay* (Interrupted Noise Method) or *Impulse* (Impulse Response Method). The selection of the method depends on the used type of the sound source.		Chapter 12.2
Recording Time	Time of measurement data (sound pressure level decay curve) registration during RT60 calculations: *1s .. 30 s* or *Auto*.		Chapter 12.2
Time Step	Time-step of data registration (sound pressure level) in the file during RT60 calculations: *2, 5, 10, 20, 50 ms*.		Chapter 12.2
Averaging	Averaging of the reverberation time results from several measurements during RT60 calculations.		Chapter 12.2
Noise Mar.	Margin value to the calculated noise level for RT60 calculations: *0 ÷ 20 dB*.		Chapter 12.2
Octave	Type of spectrum (1/1 octave or 1/3 octave) based on which the RT60 analysis is performed.		Chapter 12.2

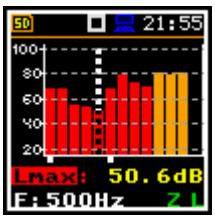
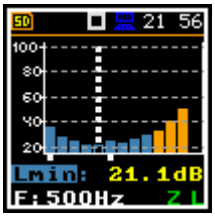
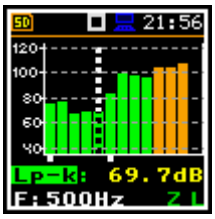
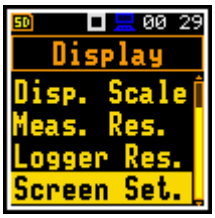
Freq. Range	Frequency range for RT60 calculations: *63Hz-4kHz* (7 bands) and *63Hz-8kHz* (8 bands) for 1/1 octave; *50Hz-5kHz* (21 bands) and *50Hz-10kHz* (24 bands) for 1/3 octave.		Chapter 12.2
Logger Name	Name of the Logger file in which data of the RT60 analysis will be recorded.		Chapter 12.2
Level	Threshold level of the sound source for triggering the RT60 measurement. If the measured sound is below the *Level* value, the RT60 measurement will not start.		Chapter 12.2

17.5 DISPLAY PARAMETERS

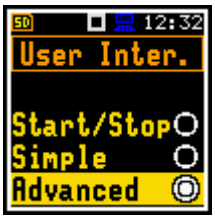
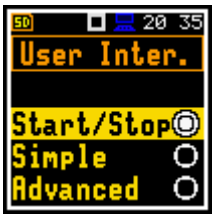
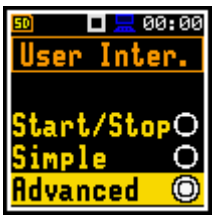
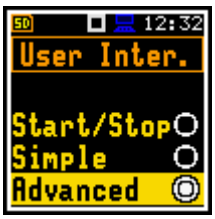
Name	Description	Screen	Reference
Display	Section of the Main Menu that enables setting of the measurement views.		Chapter 5
Display Mode	Mode of measurement results presentation - view. Views can be activated in the *Display Modes* screen.		Chapter 5.1
One Result view	View of the one result. This view is always available and cannot be disabled.		Chapter 5.1
Running SPL view	View of the running SLP result. This view is used before the measurement start for the noise level estimation.		Chapter 2.5, 5.1.5

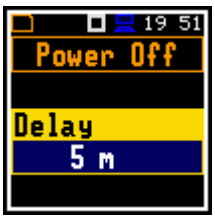
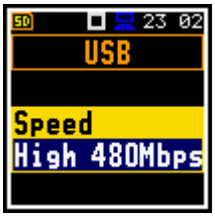
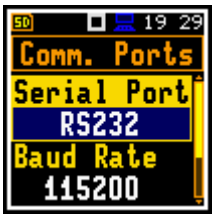
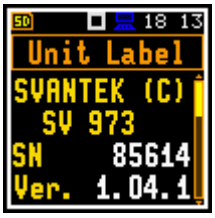
3 Profiles view	View of three results on the display at the same time.		Chapter 5.1.2
Logger view	View of time-history (logger) results.		Chapter 5.1.3
Statistics view	View of statistics of sound results.		Chapter 5.1.4
Spectrum view	View spectra: *1/1 Octave* and *1/3 Octave*.		Chapter 5.1, 10.3
RT60 results view	View of RT60 results calculated for octave or third-octave bands: EDT, RT20, RT30; and averaged results: AEDT, ART20, ART30.		Chapter 12.2
Display Scale	Screen that enables setting parameters of the results presentation: *Dynamics*, *Grid* and *Autoscale*.		Chapter 5.2
Dynamics	Range of the plot scale: 10 dB, 20 dB, 40 dB, 80 dB, 100 dB and 120 dB.		Chapter 5.2
Grid	Toggle of the grid on the graph views.		Chapter 5.2

Autoscale	Switching automatic scale adjustment of the Y axis.		Chapter 5.2
Measurement Results	Screen that enables selecting the Sound Level Meter and/or Dose Meter results, which will be presented on the display.		Chapter 5.3
SLM Results	Screen that enables selecting the Sound Level Meter results, which will be presented on the display.		Chapter 5.3
Dosimeter Results	Screen that enables selecting the Dose Meter results, which will be presented on the display.		Chapter 5.3
Logger Results	Screen that enables selecting time-history results, which will be presented on the display.		Chapter 5.4
Spectrum View	Screen that enables selecting types of spectra for displaying: *Averaged*, *Instantaneous*, *Max*, *Min* and *Peak*.		Chapter 10.3.3
Instantaneous	Spectrum of instantaneous *Leq* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Averaged	Spectrum of averaged *Leq* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3

Max	Spectrum of *Lmax* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Min	Spectrum of *Lmin* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Peak	Spectrum of *Lpeak* results for the *1/1 Octave* or *1/3 Octave* bands.		Chapter 10.3.3
Screen Setup	Screen that enables setting the screen brightness and power saving.		Chapter 5.5
Dim Mode	Screen dimming in no activity after delay. The screen may be switch off (*Screen Off*) or dimmed with different levels (*Level 1, 2* or *3*).		Chapter 5.5
Dim Delay	Screen dimming time delay in no activity after last key pressing.		Chapter 5.5
Col. Scheme	Colour scheme of the screen.		Chapter 5.5

17.6 INSTRUMENT PARAMETERS

Name	Description	Screen	Reference
Instrument	Section in the Main Menu that enables setting the hardware components of the instrument in the screens: *User Interface, Battery, Keyboard, Power Off, USB, Communication Ports, RTC* and *Unit Label.*		Chapter 7
User Interface	Screen that allows to select the user interface - a set of functions that are available for the user. Instrument offers three types of user interface: limited to start and stop of the measurement (*Start/Stop*), narrow set of functions for novice users (*Simple*) and full set of functions (*Advanced*).		Chapter 7.1
Start/Stop	User interface mode that limits the menu to only one *User Interface* item in the main *Menu* and measurement screens		Chapter 7.1
Simple	User interface that limits instrument's settings to the most frequent used items, hiding other items. Before activation of the *Simple* mode the user may decide whether to leave settings of hiding items as they were set before the activation of the *Simple* mode or to reset them to the factory default settings.		Chapter 7.1
Advanced	User interface that enables full scope of instrument settings.		Chapter 7.1
Battery	Item in the *Instrument* list that enables checking of the instrument power source status.		Chapter 7.2
Keyboard	Item in the *Instrument* list that enables setting of the Shift, Alt, Start/Stop keys functionality and programming of locking/unlocking the keyboard.		Chapter 7.3

Power Off	Item in the *Instrument* list that enables selecting of the period after which the instrument will automatically switches off in case there was no any key pressed during this period.		Chapter 7.4
USB	Item in the *Instrument* list that enables selecting the transmission speed of the USB interface. There are two options: *Full 12Mbps* and *High 480Mbps*.		Chapter 7.5
Communication Ports	Item in the *Instrument* list that enables selecting and programming the serial port of the instrument (*Serial Port*).		Chapter Error! Reference source not found.
Serial Port	Item in the *Communication Ports* list which enables selecting the serial port of the instrument – *RS232* or *Bluetooth*. In case of the *RS232* serial port, you can set the transmission speed (*Baud Rate*) and the time limit during for the data transfer (*Time Out*). In case of *Bluetooth*, you can set the PIN.		Chapter Error! Reference source not found.
RTC	Instrument's Real Time Clock. This clock is displayed in the upper right corner places of the display.		Chapter 7.2
Unit Label	Information about the instrument type, its serial number, the current software version installed and the relevant standards, which the instrument fulfils.		Chapter 7.3

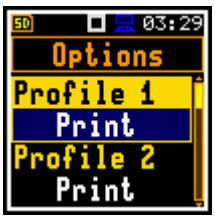
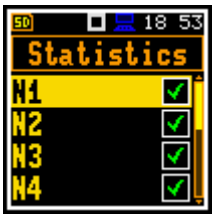
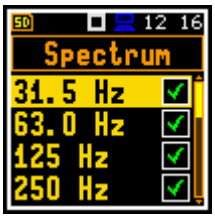
17.7 AUXILIARY PARAMETERS

Name	Description	Screen	Reference
Auxiliary Setup	Section in the Main Menu that enables customizing the instrument interface to specific user requirements in the screens: *Language, Factory Settings, Comments, Leq & Lav* and *Warnings*.		Chapter 8

Language	Screen that enables selecting the user interface language.		Chapter 8.1
Factory Settings	Restoration of the default settings of the instrument.		Chapter 8.2
Comments	Definition of the file name for recording of voice comments.		Chapter 8.3
Leq & Lav	Item in the *Auxiliary Setup* screen that enables to control displaying of Leq and Lav results: *Both* or *Mutually Exclusive*.		Chapter 8.4
Warnings	Activation of the warning messages, which are to be displayed during the normal operation of the instrument.		Chapter 8.5

17.8 Report

Name	Description	Screen	Reference
Report	Section in the Main Menu that enables configuring and printing measurement reports in the predefined format and includes items: *Print, Options, Results, Statistics*, *Spectrum* and *Printer*.		Chapter 9
Print	Item in the *Report* screen that enables printing of the report.		Chapter 9.1

Options	Item in the *Report* screen that enables specifying the report content, selecting profiles, results for these profiles, statistics and spectra which will be included in the report.		Chapter 9.2
Results	Item in the *Report* screen that allows you to select results to be included in the report for the selected profiles.		Chapter 9.3
Statistics	Item in the *Report* screen that allows you to select statistic levels from *N1* to *N10* to be included in the report.		Chapter 9.4
Spectrum	Item in the *Report* screen that allows you to select based on their central frequencies the 1/1 or 1/3 octave bands which will be included in the report for the *Leq*, *Lmax*, *Lmin* and *Lpeak* spectra.		Chapter 9.5
Printer	Item in the *Report* screen that enables setting the number of characters in the report lines – from 20 to 500.		Chapter 9.6

APPENDIX A. REMOTE CONTROL

The **USB 2.0 interface** is the Type C serial interface working with 480 MHz clock which enables one to control remotely the unit. Its speed is relatively high, and it ensures the common usage of USB-C in most produced nowadays Personal Computers.

Alternatively, all commands described in this appendix are valid for any other kinds of interfaces (if present) like **Bluetooth** communication **or RS232**.

Functions, which are developed in order to control data flow in the serial interfaces, ensure:
- Bi-directional data transmission,
- Remote control of the instrument.

In order to program the serial interface, the user has to:
1. send a "function code",
2. get a response to the “function code”
3. send/receive a data file (optionally)

A.1 INPUT/OUTPUT TRANSMISSION TYPES

Following basic input/output transmission types (called functions) are available:
#1 – general control functions,
#2 – read out of the measurement results in the **SLM** mode,
#3 – read out of the measurement results in the **1/1** or **1/3 Octave** analysis mode,
#4 – read out data from the setup file,
#5 – read out of the statistical analysis results,
#7 – special control functions,
#9 – writing data to the setup file,
#D – data files access,
#S – direct setup access.

A.2 FUNCTION #1 – GENERAL CONTROL FUNCTIONS

#1 function enables the user to send the control setting codes to the instrument and read out a file containing the current control state. A list of the control setting codes is given in A.3 ***Control setting codes***. The format of #1 function is defined as follows:

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

or

#1,Xccc,X?,Xccc,(...),X?,Xccc; **(2)**

or

#1,X?,X?,(...),X?; **(3)**

where:

X - group code, **ccc** – new code value,

X? - request to send the current X code setting.

In the first case (1) the instrument does not respond to a command, even if an error occurs.

In the second and third cases (2), (3) the instrument outputs control settings for all requests X? in the following format:

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

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

Note: *Changing settings using #1 functions during measurements running state (#1,S1;) is blocked. Stop the measurements (#1,S0;) before changing the settings.*

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

#1;

In this case the instrument outputs all control settings given in A.3 ***Control setting codes*** in the format:

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

Example: The instrument sends the following sequence of characters as an answer for the mentioned above request:

#1,U973,N1234,W1.06.1,Q0.01,M1,R1,F2:1,F3:2,F1:3,F2:4,F3:5,F1:6,J2:1,J3:2,J1:3,J3:4,J3:5,J1:6,f1,C1:1,C0:2,C2:3,C1:4,C0:5,C2:6,B0:1,B3:2,B15:3,b0,d1s,D10s,K5,L0,Y3,y0,XT0,XL100,XQ0,Xq0,XC115:1,XC115:2,XC115:3,XI115:1,XI115:2,XI115:3,XA0,XD-1:1,XD-1:2,XD-1:3,XD-1:4,XD-1:5,XD-1:6,S0,T1,e480,c1:1,c1:2,c1:3,h0:1,h0:2,h0:3,x3:1,x3:2,x5:3,m0,s0,l100,O10,o0,t0;

means that:

- SV 973A is investigated (**U973**); see #7,US; command for unit subtype information;
- its number is 1234 (N1234);
- software version number is 1.06.1 (W1.06.1);
- calibration factor is equal to 0.01 dB (Q0.01);
- **Level Meter** is selected as the measurement function (M1);
- range is **Low** (R1);
- **A** filter is selected in profile 1, SLM function (F2:1);
- **C** filter is selected in profile 2, SLM function (F3:2);
- **Z** filter is chosen in profile 3, SLM function (F1:3);
- **A** filter is selected in profile 1, SEM function (F2:4);
- **C** filter is selected in profile 2, SEM function (F3:5);
- **Z** filter is chosen in profile 3, SEM function (F1:6);
- **A** Peak filter is selected in profile 1, left channel, SLM function (J2:1);
- **C** Peak filter is selected in profile 2, left channel, SLM function (J3:2);
- **Z** Peak filter is selected in profile 3, left channel, SLM function (J1:3);
- **C** Peak filter is selected in profile 1, both channels, SEM function (J3:4);
- **C** Peak filter is selected in profile 2, both channels, SEM function (J3:5);
- **Z** Peak filter is selected in profile 3, both channels, SEM function (J1:6);
- **Z** filter is selected for **1/1 Octave** or **1/3 Octave** analysis (f1)
- **Fast** detector is selected in profile 1, SLM function (C1:1);
- **Impulse** detector is chosen in profile 2, SLM function (C0:2);
- **Slow** detector is selected in profile 3, SLM function (C2:3);
- **Fast** detector is selected in profile 1, SEM function (C1:4);
- **Impulse** detector is chosen in profile 2, SEM function (C0:5);
- **Slow** detector is selected in profile 3, SEM function (C2:6);
- logger's buffer is not filled by the results from profile 1 (B0:1);
- **Lpeak** and **Lmax** values are stored in the files of the logger from profile 2 (B3:2);
- **Lpeak**, **Lmax**, **Lmin** and **Leq** values are stored in the files of the logger from profile 3 (B15:3);
- results of **1/1 Octave** or **1/3 Octave** analysis are not stored in the files of the logger (b0);

- results are stored in a logger's file every 1 second (d1s);
- integration period is equal to 10 seconds (D10s);
- the measurement has to be repeated 5 times (K5);
- linear detector is selected to the **Leq** calculations (L0);
- .. and so on.

See A.3 ***Control setting codes*** for more details.

Note: *Control settings presented in the instrument's response and not described in* A.3 ***Control setting codes*** *considered as reserved. Do not change these settings!*

A.3. FUNCTION #2 – MEASUREMENT RESULTS READ-OUT IN THE SLM MODE

#2 function enables one to read out the current measurement results from the selected profile.

#2 function has the format defined as follows:

#2 [,<aver>] [,<profile>] [[[,X?] ,X?] ,(...)];

where:

<aver> – type of results:

i – instantaneous results, i.e. results from the current cycle (default),

a – averaged results, i.e. results from the previous cycle,

<profile>– profile number:

1, 2 or 3 – one of the profile, i.e. only results from the given profile will be sent;

X – code of the specified result (see below); if no codes are specified all results will be sent;

In the case of **<profile> = 1, 2 or 3** the instrument sends results in the format defined as follows:

#2 [,<aver>],<profile>,Xccc,(...);

where **ccc** is the value of the result **X** or question mark (**?**) if result **X** is not available;

If no results are available, the instrument returns:

#2,?;

The **X** codes of the results from the **SLM** mode are defined as follows:

v under-range flag (ccc equals to 0 when the overload did not occur, 2 when the under-range took place during the last measurement period but did not occur in the last second of the measurement and 3 when the under-range took place during the last measurement period and it lasted in the last second of the measurement);

V overload flag (ccc equals to 0 or 1);

T time of the measurement (ccc – value in seconds);

x start date of the measurement in format ***dd/mm/yyyy*** (***dd*** – day, ***mm*** – month, ***yyyy*** - year)

t start time of the measurement in format ***hh/mm/ss*** (***hh*** – hour, ***mm*** – minute, ***ss*** - second)

P **Lpeak** value (ccc – the value in dB);

M **Lmax** value (ccc – the value in dB);

N **Lmin** value (ccc – the value in dB);

S **L** result (ccc – the value in dB);

R **Leq** result (ccc – the value in dB).

U **LE** result (ccc – the value in dB);

B(k) **Lden** result (ccc – the value in dB; k – flag determining the kind of the result);

I(nn) **LEPd** result (ccc – the value in dB, nn – the value of Exposure Time in minutes);
Y **Ltm3** result (ccc – the value in dB);
Z **Ltm5** result (ccc – the value in dB);
L(nn) **L** result of the nn statistics (ccc – the value in dB).
g **LR1** result (ccc – the value in dB);
G **LR2** result (ccc – the value in dB);
s **SD** result (ccc – the value in dB);
k **EX** result (ccc – the value in dB);

Note: *In the case of **Lden**, the value k placed in the parenthesis after the code **B**, denotes the kind of the currently measured result. The kind of the **Lden** result depends on the time during which the measurements were performed (**d** denotes day, **e** denotes evening and **n** denotes night). The corresponding values of k parameter and the kind of the measured **Lden** result are presented below:*

k = 1 ***Ld*** *result,*

k = 2 ***Le*** *result,*

k = 3 ***Lde*** *result,*

k = 4 ***Ln*** *result,*

k = 5 ***Lnd*** *result,*

k = 6 ***Len*** *result,*

k = 7 ***Lden*** *result.*

The codes of the results from the **DOSE METER** mode are defined as follows:

v under-range flag (ccc equals to 0 when the overload did not occur, 2 when the under-range took place during the last measurement period but did not occur in the last second of the measurement and 3 when the under-range took place during the last measurement period and it lasted in the last second of the measurement);
V overload flag (ccc equals to 0 or 1);
T time of the measurement (ccc – value in seconds);
x start date of the measurement in format ***dd/mm/yyyy*** (***dd*** – day, ***mm*** – month, ***yyyy*** - year)
t start time of the measurement in format ***hh/mm/ss*** (***hh*** – hour, ***mm*** – minute, ***ss*** - second)
P **Lpeak** value (ccc – the value in dB);
M **Lmax** value (ccc – the value in dB);
N **Lmin** value (ccc – the value in dB);
S **L** result (ccc – the value in dB);
D **DOSE** result (ccc – the value in %);
d **D_8h** result (ccc – the value in %);
p **PrDOSE** result (ccc – the value in %);
A **LAV** result (ccc – the value in dB);
R **Leq** result (ccc – the value in dB);
U **LE** result (ccc – the value in dB);
u **SEL8** result (ccc – the value in dB);
E **E** result (ccc – the value in Pa^2h);
e **E_8h** result (ccc – the value in Pa^2h);
I(nn) **LEPd** result (ccc – the value in dB, nn – the value of Exposure Time in minutes);
J **PSEL** result (ccc – the value in dB);
Y **Ltm3** result (ccc – the value in dB);
Z **Ltm5** result (ccc – the value in dB);

L(nn) value L of the nn statistics (ccc – the value in dB);
C **PTC** result (ccc – the counter value);
c **PTP** result (ccc – the value in %);
l **ULT** result (ccc – value in seconds);
W **TWA** result (ccc – the value in dB);
w **PrTWA** result (ccc – the value in dB);
a **Lc-a** result (ccc – the value in dB);

The exemplary results of the instrument's response after sending to it the following sequence of characters: **#2,1;** coming from the first profile are given below:

a) for the case of the **SLM** mode:

#2,1,x17/03/2014,t13:44:28,v0,V0,T10,P79.97,M52.92,N38.50,S46.35,R43.91,U53.91,B(1)43.91,l(480)43.92,Y50.67,Z51.15,L(01)55.00,L(10)45.60,L(20)44.30,L(30)42.80,L(40)41.50,L(50)40.80,L(60)40.40,L(70)40.00,L(80)39.50,L(90)39.00,g?,G?,k?,s?;

b) and for the case of the **SEM** mode:

#2,1,x17/03/2014,t13:48:36,v0,V0,T7,P124.39,M99.26,N41.54,S42.05,D0,d389,p389,A85.86,R85.86,U94.31,u130.45,E0.00,e1.23,l(480)85.87,J49.72,Y95.62,Z99.22,L(01)100.30,L(10)89.50,L(20)78.60,L(30)68.50,L(40)60.30,L(50)54.00,L(60)51.00,L(70)46.50,L(80)44.00,L(90)42.40,C4,c6,l0,W49.72,w85.87,a-0.55;

Note: *The presented above order of the measurement results sent out by the instrument does not depend about the characters sent to the unit.*

Example: After sending to the instrument the string:

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

the unit sends out the results of measurement coming from the first profile in predefined, described above, order:

#2,1,V0,T1,P65.80,R43.99,L(01)52.00,L(10)51.10,L(20)46.10,L(30)44.10,L(40)38.60,L(50)38.10,L(60)37.60,L(70)37.10,L(80)36.60,L(90)36.10;

Read-out the RT60 results

In the case of RT60 function there are additional codes:
#2,EDT; this function allows you to read the current EDT results.
#2,T20; this function allows you to read the current RT20 results.
#2,T30; this function allows you to read the current RT30 results.

The function's answer is in the one of the following format:
#2,<type>,0,<status>; when results are not available
#2,<type>,1,<results>; when results are available.
<type> accepts the following values: EDT/T20/T30
<status> is the status of device
0 – no results,
1 – waiting for trigger,
2 – measurement in progress,
3 – calculations
<results> is the full list of frequencies with corresponding results in the format:
freq1:value1,freq2:value2,…,freqN:valueN

The exemplary answer:

#2,T30,1,50.0Hz:0.36s,63.0Hz:0.41s,80.0Hz:0.20s,100Hz:---,125Hz:0.07s,160Hz:0.09s,200Hz:0.32s,250Hz:0.33s,315Hz:0.44s,400Hz:0.29s,500Hz:0.39s,630Hz:0.49s,800Hz:0.44s,1.00k:0.47s,1.25k:0.46s,1.60k:0.34s,2.00k:0.42s,2.50k:0.40s,3.15k:0.42s,4.00k:0.42s,5.00k:0.41s,TOT.A:0.42s,TOT.C:0.42s,TOT.Z:0.42s;

A.2.3. Read-out the STIPA results

#2,STI,CP; this command creates new project and returns new project name.
#2,STI,CA; this command creates new area and returns new area name.
#2,STI,CS; this command creates new source and returns new source name. e.g. **#2,STI,CS,"S2"**;

#2,STI,PL; this command returns the project list. e.g. **#2,STI,PL,2,"PROJ0001","PROJ0002"**;
#2,STI,AL; this command returns the area list. e.g. **#2,STI,AL,2,"AREA1","AREA2"**;
#2,STI,SL; this command returns the source list. e.g. **#2,STI,SL,2,"S1","S2"**;

The following list of commands require prior setting of the project, area and source.
#2,STI,NP; this command adds the new point and returns the new point ID.
#2,STI,PC; this command returns the count of the measurement points and list of point IDs. e.g.
#2,STI,PC,n,1,2,3;
#2,STI,MC,p; this command returns the count of the measurements at the point **p**.
#2,STI,AP,p; this command allows you to read and set average flag at the point **p**.
#2,STI,AM,p,m; this command allows you to read and set average flag for the m measurement at the point **p**.
#2,STI,DP,p; this command deletes the point **p**.
#2,STI,DM,p,m; this command deleted the measurement m at the point **p**.
#2,STI,MR,p,m,mrn; this command allows you to read the results of the m measurement at the point **p**.
#2,STI,FR,p,m,frn; this command allows you to read the modulation results of the m measurement at the point **p**.
#2,STI,SN; this command allows you to read and write Ambient Noise parameters. e.g.
#2,STI,SN,enabled,90.0,91.0,...,95.0;

p: 0..PointCount-1
m: 0..MeasurementCount-1
mrn: STI,LAQ,LCQ,LAS,STM,FLG
frn: LZQ,MF1,MF2,ERR
enabled: 0/1
flags: UNDERRANGE = 1, OVERLOAD = 2

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

A.4. FUNCTION #3 – MEASUREMENT RESULTS READ-OUT IN 1/1 AND 1/3 OCTAVE MODES

#3 function enables one to read out the current measurement results in **1/1 Octave** or **1/3 Octave** modes, depends on device function selected.

#3 function format is defined as follows:

#3;	- displayed spectrum
#3,A;	- averaged spectrum
#3,I;	- instantaneous spectrum
#3,M;	- max spectrum
#3,N;	- min spectrum

#3,P; - peak spectrum

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

#3[,T<time>];<Status Byte> <LSB of the transmission counter> <MSB of the transmission counter> <data byte> (...) <data byte>

<time> is the measurement time given in seconds

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

D7	D6	D5	D4	D3	D2	D1	D0

where:

D7 = 0 means that "overload does not happen",
= 1 means that “overload appeared”,
D6 = 0 means that "spectrum is not averaged ",
= 1 means that "spectrum is averaged ",
D4 = 0 the instantaneous current result (RUN State),
= 1 the final result (STOP State),
D3 = 1 results in **1/3 Octave** mode,
D2 = 1 results in **1/1 Octave** mode,
D5, D1, D0 reserved bits.

Note: *ASCII part of the response ends with semicolon “;”. Status byte, transmission counter and data bytes are coded in binary form.*

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

A.5. FUNCTION #4 – SETUP FILE READ-OUT

#4 function enables the user to read-out a file from the internal Flash-disk or RAM memory. The data file formats are given in Appendix B.

#4 function formats are defined as follows:

#4,0,\; file containing the catalogue,
#4,0,?; count of the files,
#4,0,index,count; part of the file containing the catalogue,
where:
index - first record,
count - number of records in the catalogue.

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

words 0 - 3 8 characters of the file name,
word 4 type (binary number),
word 5 reserved,
word 6 least significant word of the file size,
word 7 most significant word of the file size,
words 8 - 15 reserved.

#4,4; current setup file,
#4,4,?; size of the current setup file,

#4,4,offset,length; part of current setup file,

where:

offset - offset from the beginning of the current setup file,

length - number of bytes to read,

Note: *The "\" character is treated as the file name of the catalogue and must be sent to the instrument.*

All data words are sent **<LSB>** (least significant byte) first.

When an error is detected in the file specification or data, the instrument responds with:

#4,?;

Note: *Current setup file placed in RAM is serviced by this command in SV 973A only. For data files access see* A.1 **Function #D – data files access**.

A.6. FUNCTION #5 – STATISTICAL ANALYSIS RESULTS READ-OUT

#5 function enables one to read out the statistical analysis results.

#5 function format is defined as follows:

#5,p;

where:

p - the number of the profile (1, 2 or 3)

The device responds, sending the current classes of the statistics in the following format:

#5,p;<Status Byte> <LSB of the transmission counter> <MSB of the transmission counter> <NofClasses><BottomClass><ClassWidth><Counter of the class> (...) <Counter of the class>

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

D7	D6	D5	D4	D3	D2	D1	D0

where:

D7 = 0 means "overload does not happen",
= 1 means "overload appeared",
D5 = 0 instantaneous current result (RUN State),
= 1 final result (STOP State),
D6, D0 to D4 reserved bits.

Note: *There is no any succeeding transmission in the case when the* ***Status Byte*** *is equal to zero.*

The **transmission counter** is a two-byte word denoting the number of the remaining bytes to be transmitted. Its value is calculated from the formulae:

Transmission counter = 6+n * (4 * the number of the classes in the statistics)

where:

n is a number of the transmitted statistics. For p = 1, 2 or 3 only one statistic is transmitted (n = 1).

NofClasses is a two-byte word denoting the number of classes in the statistic.

BottomClass is a two-byte word denoting the lower limit of the first class (*10 dB).

ClassWidth is a two-byte word denoting the width of the class (*10 dB).

Counter of the class is a four-byte word containing the number of the measurements belonging to the current class.

Note: *The bytes in the words are sent* ***<LSB>*** *(least significant byte) first.*

Note: *ASCII part of the response ends with semicolon ";". Status byte, transmission counter and data bytes are coded in binary form.*

A.7. FUNCTION #7 – SPECIAL CONTROL FUNCTIONS

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

#7 function format is defined as follows.

To read settings a query should be send to the device:

#7,<code>;

where **<code>** is a two ASCII letter code.

The device responds with a control settings:

#7,<code>,set1[,set2[,set3[,...[,setN]]]];

where **<code>** is the same code sent in the query and **set1, set2,... setN** are settings.

To write settings to the device follow the opposite procedure. Send to the device:

#7,<code>,set1[,set2[,set3[,...[,setN]]]];

In case of success the device responds with:

#7,<code>;

In case of an unknown function or error the device returns:

#7,?;

Codes and settings for #7 function are described in the A.3 ***Control setting codes***.

Note: *#7 function protocol consist of ASCII characters only.*

Note: *Some of the #7 functions are blocked during measurements running state (#1,S1;). Stop the measurements (#1,S0;) before changing these settings.*

A.8. FUNCTION #9 – SETUP FILE WRITE-IN

#9 function enables the user to write a configuration file into the instrument's storage or non-volatile memory. The data file formats are given in Appendix B.

#9 function formats are defined as follows:

#9,<FILE_TYPE>,<FILE_LENGTH>,<DATA>

where:

<FILE_TYPE>	type of the file
	2 - setup file (file is saved on SD card; does not change current setup),
	4 - current setup file,
<FILE_LENGTH>	length of the file in bytes,
<DATA>	binary content of the file.

Note: *#9 function is blocked during measurements running state (#1,S1;). Stop the measurements (#1,S0;) before using the function.*

A.1 FUNCTION #D – DATA FILES ACCESS

#D functions are used to access data files in the instrument's storage like microSD card or USB Flash Disc with FAT file system. A basic knowledge of FAT file system is necessary to use these functions.

#D functions take the following parameters:

<disk>	logical disk number: 0 – SD-card, 1 – USB Disk (not implemented), 2 – Internal Memory (not implemented)
<address>	directory address (cluster number),
<offsetB>	offset of the first byte to read (an even number),
<nB>	number of bytes to read (an even number),
<data>	binary data,
<count>	directory size in bytes,
<name>	filename in the format XXXXXXXX.YYY (XXXXXXXX – filename, YYY- filename extension),
<dirName>	directory name,
<nBwr>	number of bytes to write.

1) **#D,c,?;** this function returns a list of available disks in format:

#D,c,<disk1>[,<disk2>[,<disk3>]];

2) **#D,d,?;** this function returns parameters of the working directory in format:

#D,d,<disk>,<address>,<count>;

3) **#D,d,<disk>,<address>;** this function enables to change the working directory.

Response:

#D,d; - command was executed

#D,d,?; - command cannot be executed

4) **#D,r,<disk>,<address>,<offsetB>,<nB>;** the function enables to read a file from the working directory.

Response:

#D,r,<disk>,<address>,<offsetB>,<nB>;[<data>]

5) **#D,w,<name>,<nBwr>;<data>** the function enables to write a file to the working directory.

Response:

#D,w; - command was executed

#D,w,?; - command cannot be executed

6) **#D,e,<name>;** function enables to delete a file in working directory.

Response:

#D,e; - command was executed

#D,e,?; - command cannot be executed

7) **#D,e;** function enables to delete all files in the working directory.

Response:

#D,e; - command was executed

#D,e,?; - command cannot be executed

8) **#D,m,<address>,<dirName>;** function enables to create a subdirectory in the directory defined by <address>.

Response:

#D,m; - command was executed

#D,m,?; - command cannot be executed

9) **#D,f,<address>;** function enables to delete directory and its contents (files and subdirectories).

Response:

#D,f; - command was executed

#D,f,?; - command cannot be executed

10) **#D,s,?;** this function returns parameters of the setup directory in format:

#D,s,<disk>,<address>;

11) **#D,i,?;** this function returns parameters of the STIPA function directory in format:

#D,i,<disk>,<address>;

Note: *Only read functions are available during measurements running state (#1,S1;). Stop the measurements (#1,S0;) to unlock all the functions.*

A.2 FUNCTION #S – DIRECT SETUP ACCESS

#S function enables to read/write instrument's settings in a direct manner. Any settings changed by this command affect current setup, are written into non-volatile memory and are available on the next power up.

#S function format is defined as follows.

To read settings a query should be send to the device:

#S[,<code1>[,<code2>[,code3[,...]]]];

where **<codeN>** is a two to four ASCII letter setting code.

The device responds with the control settings:

#S[,<code1>:<set1>[,<code2>:<set2>[,<code3>:<set3>[,...]]]];

where **<codeN>** is the same settings code sent in the query and <**setN>** is a settings value.

To return all settings available send:

#S;

To write settings to the device follow the opposite procedure. Send to the device:

#S,<code1>:<set1>[,<code2>:<set2>[,<code3>:<set3>[,...]]];

In case of success the device responds with the same ASCII string:

#S,<code1>:<set1>[,<code2>:<set2>[,<code3>:<set3>[,...]]];

In case of an error (e.g. settings code does not exist or parameter value is out of range) the device respond with "?" instead of **<setN>** value:

#S,<codeN>:?;

For example if three parameters are set and <set2> is out of range the device response is:

#S,<code1>:<set1>,<code2>:?,<code3>:<set3>;

Codes and settings for #S function are described in the A.3 ***Control setting codes***.

Note: *#S function protocol consist of ASCII characters only.*

Note: *Some of the #S functions are blocked during measurements running state (#1,S1;). Stop the measurements (#1,S0;) before changing these settings.*

A.3 CONTROL SETTING CODES

The control setting codes used in the SV 973A instrument are given in the below tables:

Table A.1 Unit information
Table A.2 Measurements settings and control
Table A.3 Calibration and microphone settings
Table A.4 Profile settings
Table A.5 Spectrum settings
Table A.6 Dosimeter settings
Table A.7 RT60 settings
Table A.8 STIPA settings
Table A.9 Statistical settings
Table A.7 Audio settings
Table A.8 Logger settings
Table A.9 CSV export settings
Table A.10 Programmable pauses (valid only in Dosimeter function)
Table A.11 Audio settings
Table A.12 Logger settings
Table A.13 Display and keyboard settings
Table A.14 Setup settings
Table A.15 Alarms settings (valid only in the Dosimeter function)
Table A.16 General settings
Table A.17 Power settings
Table A.18 Position and time settings
Table A.19 Report printing settings

Notes:

*- function codes marked in green are **read only**!*

*- function codes marked in red are **locked during measurements run state**! Stop measurements before changing these settings.*

*- values in square brackets are **[optional]**!*

- values are written in the form of numbers or in the form of a bit number (prefix 'b') or hexadecimal (prefix '0x') e.g. the b5 is equal to the number 32 = 2^5 or hexadecimal 0x20.

Table A.1 Unit information

Group name	#1 code	#7 code	#S code	Code description
Unit type	U			973
Unit subtype		US		Returns unit subtype. 1 – SV 973A
Serial number	N			xxxxxx
Software version	W			a.bb.c – firmware version a.bb.**0**c – beta firmware version
			AA	abbc - firmware version in hex format
Files system version		FS		a.bb - file system version
PIC version		PI		x.xx - version of auxiliary microcontroller
Hardboot version		VH		x.xx - version of hardboot program
Bootstrap version		VB		x.xx - version of bootstrap program

Table A.2 Measurements settings and control

Group name	#1 code	#7 code	#S code	Code description
Measurement function	M		BB	1 - **Level Meter** 2 - **1/1 Octave** 3 - **1/3 Octave** 4 - **Dosimeter** 102 - **1/1 Octave** & **Dosimeter** 103 - **1/3 Octave** & **Dosimeter** 8 - **RT60** 19 - **STIPA**
Measurement Range	R		BC	1 - **Low** (function other than Dosimeter) 2 - **High** (Dosimeter function)
Measurement state	S			0 - **Stop** 1 - **Start** 2 - **Pause** 4 - **Delay before START** (read only)
Start delay	Y		BD	nn - nn delay given in seconds ∈ (0 ÷ 59) and (60 ÷ 3600) with step 60s
Start synchronization	y		BN	0 - switched off (**OFF**) -1 - synchronization to full second 1 - synchronization to 1 min. 15 - synchronization to 15 min. 30 - synchronization to 30 min. 60 - synchronization to 1 hour.

Group name	#1 code	#7 code	#S code	Code description
Integration period	D			0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) nns - nn number in seconds nnm - nn number in minutes nnh - nn number in hours
			BE	0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) 1 - 24 hours 2 - 8 hours 3 - 1 hour 4 - 15 minutes 5 - 5 minutes 6 - 1 minute x ∈ (7 ÷ 65) - (x-6) seconds x ∈ (66 ÷ 124)- (x-65) minutes x ∈ (125÷148)- (x-124) hours 149 - infinity
Repetition number	K		BF	Repetition number of the measurement cycles. 0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) nnnn - nnnn number of repetitions ∈ (1 ÷ 1000)
Detector type in the **LEQ** function	L		BG	0 - **Linear** 1 - **Exponential**
Day time limits		DL	BH	0 - 6h-18h 1 - 7h-19h
Rolling time (1)			BU	nn- nn time in seconds ∈(1 ÷60) nn- nn time in minutes multiplied by 60 ∈(60 ÷3600)
Rolling time (2)			BW	nn- nn time in seconds ∈(1 ÷60) nn- nn time in minutes multiplied by 60 ∈(60 ÷3600)
Exposure Time	e		EA	x - time in minutes ∈ (1 ÷ 720)
Microphone compensation		MC	JD	0 - Off 1 - On
Free field compensation		FF		Free Field compensation. 0 - **Off** 1 - **Free Field** 2 - **Diffuse Field**
			BT0	Free Field compensation for function other than Dosimeter
			BT1	Free Field compensation for Dosimeter function
Windscreen compensation		WD	BP	0 - Off 1 - On

Group name	#1 code	#7 code	#S code	Code description
Measure trigger mode	m		FA	0 - **Off** 2 - **Slope+** 3 - **Slope–** 4 - **Level+** 5 - **Level–** 6 - **Gradient+**
Measure trigger level	I		FI	x - level [dB] ∈(24 ÷ 136); default 100dB
Measure trigger gradient	O		FK	x - gradient [dB] ∈(1 ÷ 100); default 10dB/(trigger period)
Auto-Run		AS		#7,AS,<e>,<HH>,<MM>,<hh>,<mm>,<dW>,<mR>; where: <e> - On (e=1), Off (e=0), <HH> - hour of the measurement start, <MM> - minutes of the measurement start, <hh> - hour of the measurement stop, <mm> - minutes of the measurement stop, <dW> - day of week in which the measurement will be done defined as a sum of flags: b0 - Monday b1 - Tuesday b2 - Wednesday b3 - Thursday b4 - Friday b5 - Saturday b6 - Sunday <mR> - maximum number of the measurement days,
			MR	<e> - On (e=1), Off (e=0)
			MJ	<HH> - hour of the measurement start
			MK	<MM> - minutes of the measurement start
			ML	<hh> - hour of the measurement stop
			MM	<mm> - minutes of the measurement stop
			MN	<dW> - day of week
			MO	<mR> - maximum number of the measurement days

Table A.3 Calibration and microphone settings

Group name	#1 code	#7 code	#S code	Code description
Calibration factor	Q			nn.nn - calibration factor [dB] represented as real number ∈(-10.00 ÷ 10.00) Valid for current selected function.
			AJ	nnnn - calibration factor [dB] multiplied by 100 ∈ (-1000 ÷ 1000). Valid for function other than Dosimeter.

Group name	#1 code	#7 code	#S code	Code description
			AP	nnnn - calibration factor [dB] multiplied by 100 ∈ (-1000 ÷ 1000). Valid for Dosimeter function.
Calibration history		CH		#7,CH; Get number of records calibration history. Response format: #7,CH,n; n – number of records calibration history, #7,CH,n; Get n record from calibration history. Response format: #7,CH,n,R,cT,hh,mm,ss,DD,MM,YYYY,cF ,cL; n – record number in the history of calibration, R - Instrument range, 0 – Low (function other than Dosimeter) 1 – High (Dosimeter function, cT – type of calibration: 0 - none, 1 - by measurement, 2 - by sensitivity, 3 - factory calibration, hh:mm:ss – time of calibration, DD/MM/YYYY – date of calibration, cF – calibration factor in dB. cL – calibration level in dB. Response #7,CH,-1; denotes incorrect data in the selected record
Last calibration type			AF	Previously performed calibration type 0 - none 1 - By Measurement (manual) 2 - Remote 3 - Factory Calibration 4 - Auto Calibration Valid for function other than Dosimeter.
			AL	Previously performed calibration type 0 - none 1 - By Measurement (manual) 2 - Remote 3 - Factory Calibration 4 - Auto Calibration Valid for Dosimeter function.
Last calibration date and time		CT		Function returns calibration date and time in the format: **#7,CT,DD-MM-YYYY,hh:mm:ss;** where

Group name	#1 code	#7 code	#S code	Code description
				hh:mm:ss denotes the time and **DD/MM/YYYY** gives the date Valid for current selected function.

			AG	Last calibration date
				d - coded data ∈(0 ÷ 65535)
				Date decoding in C language:
				day = (d & 0x1F);
				month = ((d>>5) & 0x0F);
				year = ((d>>9) & 0x7F) + 2000;
				Valid for function other than Dosimeter.

			AM	Last calibration date
				d - coded data ∈(0 ÷ 65535)
				Date decoding in C language:
				day = (d & 0x1F);
				month = ((d>>5) & 0x0F);
				year = ((d>>9) & 0x7F) + 2000;
				Valid for Dosimeter function.

			AH	Last calibration time
				t - t coded time ∈(0 ÷ 65535)
				Time decoding in C language:
				sec = (t%30);
				min = ((t/30)%60);
				hour = (t/1800);
				Note: time resolution is 2 seconds!
				Valid for function other than Dosimeter.

			AN	Last calibration time
				t - t coded time ∈(0 ÷ 65535)
				Time decoding in C language:
				sec = (t%30);
				min = ((t/30)%60);
				hour = (t/1800);
				Note: time resolution is 2 seconds!
				Valid for Dosimeter function.

Calibration level			AI	nnnn - calibration reference level [dB] multiplied by 100 Valid for function other than Dosimeter.
			AO	nnnn - calibration reference level [dB] multiplied by 100 Valid for Dosimeter function.
Auto calibration settings		AC	JF	0 - **Off** 1 - **On**
Post calibration settings			JA	0 - **Off** 1 - **Last file** 2 - **Files after last calibration**
Microphone TEDs type		TT		Returns type of the microphone saved in TEDS memory. Where

Group name	#1 code	#7 code	#S code	Code description
				-1 - unknown, 73 - ST73 173 - SL973
Microphone TEDs serial number		TS		Returns serial number of the microphone saved in TEDS memory in format. #7,TS,<sn>[,<ver>]; Where <sn> - microphone serial number, <ver> - version of ST73
Microphone TEDs calibration		TC		Returns calibration factor of the microphone saved in TEDS memory.
Microphone TEDs factory calibration		TF		Returns factory calibration factor of the microphone saved in TEDS memory.
Load TEDs		LF		Load TEDS memory.

Table A.4 Profile settings

Group name	#1 code	#7 code	#S code	Code description
Filter type in profile n	F			Fk:n - k filter in profile n k: 1 - **Z** filter, 2 – **A** filter, 3 – **C** filter, 5 – **B**, 6 – **LF** filter n: 1, 2, 3 – profile number: 1, 2 or 3 for function other than Dosimeter n: 4, 5, 6 – profile number: 1, 2 or 3 for Dosimeter function.
			BIn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for function other than Dosimeter.
			EGn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for Dosimeter function.
Peak Filter type in profile n	J			Fk:n - k filter in profile n k: 1 - **Z** filter, 2 – **A** filter, 3 – **C** filter, 5 – **B**, 6 – **LF** filter n: 1, 2, 3 – profile number: 1, 2 or 3 for function other than Dosimeter n: 4, 5, 6 – profile number: 1, 2 or 3 for Dosimeter function.
			BJn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for function other than Dosimeter.
			EHn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for Dosimeter function.
Detector type in profile n	C			Ck:n - k detector in profile n k: 0 - **Impulse**, 1 – **Fast**, 2 – **Slow**

Group name	#1 code	#7 code	#S code	Code description
				n: 1, 2, 3 – profile number: 1, 2 or 3 for function other than Dosimeter n: 4, 5, 6 – profile number: 1, 2 or 3 for Dosimeter function.
			BKn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for function other than Dosimeter.
			EIn	k - k filter in profile n+1, n ∈(0 ÷ 2) Valid for Dosimeter function.

Table A.5 Spectrum settings

Group name	#1 code	#7 code	#S code	Code description
Filter type in **1/x OCTAVE** analysis	**f**		**BL**	1 - **Z** filter 2 - **A** filter 3 - **C** filter 5 - **B** filter
Detector type in **1/x OCTAVE** analysis	**XB**		**BS**	0 - **Linear** 1 - **Fast** 2 - **Slow**

Table A.6 Dosimeter settings

Group name	#1 code	#7 code	#S code	Code description
Criterion Level	**c**			c1:p - 80 dB c2:p - 84 dB c3:p - 85 dB c4:p - 90 dB c5:p - 60 dB c6:p - 65 dB c7:p - 70 dB c8:p - 75 dB c9:p - 87 dB p: 1, 2, 3 - profile number
			EBn	criterion level in profile n+1, n ∈(0 ÷ 2) 0 - 80 dB 1 - 84 dB 2 - 85 dB 3 - 90 dB 4 - 60 dB 5 - 65 dB 6 - 70 dB 7 - 75 dB 8 - 87 dB
Threshold Level	**h**			h0:p - None h1:p - 70 dB h2:p - 75 dB h3:p - 80 dB h4:p - 85 dB h5:p - 90 dB

Group name	#1 code	#7 code	#S code	Code description
				h6:p - 60 dB h7:p - 65 dB p: 1, 2, 3 - profile number
			ECn	threshold level in profile n+1, n ∈(0 ÷ 2) 0 - None 1 - 70 dB 2 - 75 dB 3 - 80 dB 4 - 85 dB 5 - 90 dB 6 - 60 dB 7 - 65 dB
Exchange Rate	**x**			xk:n - k exchange rate in profile n, k ∈(2 ÷ 6) n: 1, 2, 3 – profile number
			EDn	k - k exchange rate in profile n+1, n ∈(0 ÷ 2), k ∈(2 ÷ 6)
Threshold level for ULT calculation	**XI**			xk:n - k threshold level in profile n, k ∈(70 ÷ 140) dB n: 1, 2, 3 – profile number
			EEn	k - k threshold level in profile n+1, n ∈(0 ÷ 2), k ∈(70 ÷ 140) dB
Threshold level for PCT calculation	**XC**			xk:n - k threshold level in profile n, k ∈(70 ÷ 140) dB n: 1, 2, 3 – profile number
			EFn	k - k threshold level in profile n+1, n ∈(0 ÷ 2), k ∈(70 ÷ 140) dB

Table A.7 RT60 settings

Group name	#1 code	#7 code	#S code	Code description
RT60 Method			**VA**	1 - **Decay** 2 - **Impulse**
Octave			**VG**	1 - **1/1 octave** 2 - **1/3 octave**
Frequency Range in 1/1 mode			**VH**	1 - 63Hz÷4kHz 2 - 63Hz÷8kHz
Frequency Range in 1/3 mode			**VI**	1 - 50Hz÷5kHz 2 - 50Hz÷10kHz
Recording Time			**VB**	0 - Auto n - n = time in seconds ∈(1 ÷ 30)
Time Step			**VC**	0 - **2ms** 1 - **5ms** 2 - **10ms** 3 - **20ms** 4 - **25ms** 5 - **50ms**

Group name	#1 code	#7 code	#S code	Code description
Averaging			VD	0 - **Off** 1 - **On**
Smoothing			VE	n - n = graph smoothing factor ∈(1 ÷ 15)
Noise Margin			VF	n - n = Value in dB multiplied by 10 ∈ (0 ÷ 200)

Table A.8 STIPA settings

Group name	#1 code	#7 code	#S code	Code description
Project Name			QR	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Area Name			QS	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Source Name			QX	xxxxx - xxxxx up to 8 characters (permitted characters: 0-9, A-Z and '_')
Source Level			QZ	x - source calibration level in dB multiple by 10 ∈ (-300 ÷ 300)
Averaging			QT	0 - Manual 1 - Auto
Standard			QU	0 - **60268x2** 1 - **60268x3**
Index			QV	0 - **STI** 1 - **CIS**
Ambient noise			QY	0 - **Off** 1 - **On**

Table A.9 Statistical settings

Group name	#1 code	#7 code	#S code	Code description
Statistical levels		SL		Reading (response from the instrument): #7,SL,<sl1>,<sl2>,<sl3>,<sl4>,<sl5>,<sl6>,<sl7>,<sl8>,<sl9>,<sl10>; Writing: #7,SL,<sl_index>,<sl_level>; This function sets statistical levels where <sl_index> is the statistical index ∈(1 ÷ 10), <sl_level> is the statistical level [%] ∈(1 ÷ 99)
			RA	<sl1> - statistical level 1
			RB	<sl2> - statistical level 2
			RC	<sl3> - statistical level 3
			RD	<sl4> - statistical level 4
			RE	<sl5> - statistical level 5
			RF	<sl6> - statistical level 6

Group name	#1 code	#7 code	#S code	Code description
			RG	<sl7> - statistical level 7
			RH	<sl8> - statistical level 8
			RI	<sl9> - statistical level 9
			RJ	<sl10> - statistical level 10

Table A.10 Programmable pauses (valid only in Dosimeter function)

Group name	#1 code	#7 code	#S code	Code description
Pause 1			CA	0 - **Off** 1 - **On**
Pause 1 - start hour			CB	hour ∈(0 ÷ 23)
Pause 1 - start minute			CC	minute ∈(0 ÷ 59)
Pause 1 - stop hour			CD	hour ∈(0 ÷ 23)
Pause 1 - stop minute			CE	minute ∈(0 ÷ 59)
Pause 2			CF	0 - **Off** 1 - **On**
Pause 2 - start hour			CG	hour ∈(0 ÷ 23)
Pause 2 - start minute			CH	minute ∈(0 ÷ 59)
Pause 2 - stop hour			CI	hour ∈(0 ÷ 23)
Pause 2 - stop minute			CJ	minute ∈(0 ÷ 59)
Pause 3			CK	0 - **Off** 1 - **On**
Pause 3 - start hour			CL	hour ∈(0 ÷ 23)
Pause 3 - start minute			CM	minute ∈(0 ÷ 59)
Pause 3 - stop hour			CN	hour ∈(0 ÷ 23)
Pause 3 - stop minute			CO	minute ∈(0 ÷ 59)
Pause 4			CP	0 - **Off** 1 - **On**
Pause 4 - start hour			CR	hour ∈(0 ÷ 23)
Pause 4 - start minute			CS	minute ∈(0 ÷ 59)
Pause 4 - stop hour			CT	hour ∈(0 ÷ 23)
Pause 4 - stop minute			CU	minute ∈(0 ÷ 59)
Pause 5			CW	0 - **Off** 1 - **On**
Pause 5 - start hour			CV	hour ∈(0 ÷ 23)
Pause 5 - start minute			CX	minute ∈(0 ÷ 59)
Pause 5 - stop hour			CY	hour ∈(0 ÷ 23)
Pause 5 - stop minute			CZ	minute ∈(0 ÷ 59)

Table A.11 Audio settings

Group name	#1 code	#7 code	#S code	Code description
Wave file name			IB	xxxxxxxx – up to 8 characters (permitted characters: 0:9, A:Z, and '_'). Default name "R1"
Last wave file name		LW		a name of a previous wave file
Wave recording mode			IA	0 - Off 1 - continuous 2 - slope+ 3 - Slope– 4 - level+ 5 - Level– 6 - gradient+ 7 - manual 8 - integration period
Format			IC	0 - PCM 1 - Extensible
Sampling			IE	1 - 24 kHz 2 - 12 kHz
Filter			ID	1 - **Z** filter 2 - **A** filter 3 - **C** filter 5 - **B** filter
Gain			IO	x - x gain [dB] used in 16 bit mode ∈(0 ÷ 40)
Trigger level			II	x - x level [dB] ∈(24 ÷ 136); default 100dB
Trigger period			IJ	0 - logger step 5 - 0.5 ms 1000 - 100 ms 10000 - 1 s
Trigger gradient			IK	x - x gradient [dB] ∈(1 ÷ 100); default 10dB/(trigger period)
Pre trigger			IL	x - x pre trigger time [s] (default 1s) ∈ (0 ÷ 30) - for 12 kHz sampling (0 ÷ 15) - for 24 kHz sampling
Recording time			IN	x - x recording time [s]; ∈ (1 ÷ 59), (60 ÷ 3600) with 60s steps and (3600 ÷ 28800) with 3600s steps
Length Limit			IP	0 - file size limit 4GB x - file size limit in minutes; ┐(1 ┐480)

Table A.12 Logger settings

Group name	#1 code	#7 code	#S code	Code description
Logger file name			DC	xxxxxxxx – up to 8 characters (permitted characters: 0:9, A:Z, and '_'). Default name "L1"
Last logger file name		LB		a name of a previous logger file
Next logger file name		NB		a name of a next logger file

Group name	#1 code	#7 code	#S code	Code description
Logger step	**d**			nn - nn number of milliseconds ∈ (100,200,500) nns - nn number of seconds ∈ (1 ÷ 60) nnm - nn number of minutes ∈ (1 ÷ 60)
			DB	nn - nn number of milliseconds ∈ (100,200,500), (1000 ÷ 60000) with 1000ms steps and (60000 ÷ 3600000) with 60000ms steps
Logger	**T**		**DA**	0 - Off 1 - On *Note: this setting must be on in order to create a logger data file!*
Logger results in profile n	**B**			Bx:n - x – sum of the following flags: b0 - logger with **Lpeak** values in profile n b1 - logger with **Lmax** values in profile n b2 - logger with **Lmin** values in profile n b3 - logger with **Leq** values in profile n b4 - logger with **Lav** values in profile n b5 - logger with **LR1** values in profile n b6 - logger with **LR2** values in profile n n – profile ∈ (1 ÷ 3)
			DDn	x - x logger results in profile n+1, n ∈(0 ÷ 2)
Summary results	**XXE**		**DG**	0 - Off 1 - On *Note: this is a main switch for all summary results.*
1/x Octave analysis results	**b**		**DE**	x - x – sum of the following flags: b0 - logger with **Lpeak** spectrum b3 - logger with **Leq** spectrum
Logger File Splitting Mode	**XA**		**DH**	0 switched off (**OFF**) -1 - file is created for each measurement cycle. 15 - file is created every 15 min, synchronized to RTC. 30 - file is created every 30 min, synchronized to RTC. 60 - file is created every 1 hour, synchronized to RTC. 1440 - file is created on the specified times, see next parameter *Note: for "-1" – integration period must be at least 60s*
Specified Time for Logger File Splitting	**XD**			XDx:n – x = -1 (switched off) x = 0 ÷ 1439 (time in minutes) n = 1 ÷ 6 (specified time number)

Group name	#1 code	#7 code	#S code	Code description
				Note: valid only if Split Mode is equal to 1440
			DI	Active split time number x - x – sum of the following flags b0 - split on time number 1 b1 - split on time number 2 b2 - split on time number 3 b3 - split on time number 4 b4 - split on time number 5 b5 - split on time number 6
			DJn	Split hour (0 ÷ 23) for time number n-1, n ∈(0 ÷ 5)
			DKn	Split minute (0 ÷ 59) for time number n-1, n ∈(0 ÷ 5)
User text			**UB**	text – to up to 128 characters of user text added each data file. Default text " ". Permitted characters: 0-9, a-z, A-Z, space and the following characters !"#$%&')(*+-./:<=>?@[\]^}_{`|~
Logger trigger mode	**XT**		**GA**	0 - Off 4 - level+ 5 - Level–
Logger trigger level	**XL**		**GI**	x - level [dB] ∈(24 ÷ 136); default 100dB
Logger pre-trigger	**XQ**		**GL**	x - number of the records taken into account before the fulfilment of the triggering condition ∈(0 ÷ 10); default 0
Logger post-trigger	**Xq**		**GM**	x - number of the records taken into account after the fulfilment of the triggering condition ∈(0 ÷ 200); default 0

Table A.13 Display and keyboard settings

Group name	#1 code	#7 code	#S code	Code description
Key shift mode			**NA**	0 - **2nd function** 1 - **Direct**
Make Key Lock			**NB**	0 - **Off** 1 - **On**
Fast Unlock			**NC**	0 - **Off** 1 - **On**
Unlock 1st key			**ND**	1 - **Left** 2 - **Up** 4 - **Esc** 8 - **Enter** 16 - **Right** 32 - **Down**
Unlock 2nd key			**NE**	1 - **Left** 2 - **Up** 4 - **Esc** 8 - **Enter**

Group name	#1 code	#7 code	#S code	Code description
				16 - **Right** 32 - **Down**
Unlock 3rd key			**NF**	1 - **Left** 2 - **Up** 4 - **Esc** 8 - **Enter** 16 - **Right** 32 - **Down**
Unlock 4th key			**NG**	1 - **Left** 2 - **Up** 4 - **Esc** 8 - **Enter** 16 - **Right** 32 - **Down**
Keyboard lock		**KL**		0 - **Unlock** 1 - **Lock**
Files lock		**FL**	**XE**	0 - **Unlock** 1 - **Lock**
Main View Mode			**SG**	0 - **Normal** 1 - **Full** 2 - **Large**
Spectrum View			**SA**	0 - **Off** 1 - **On**
Spectrum View Mode			**SI**	0 - **Normal** 1 - **Full**
3-profiles View			**SB**	0 - **Off** 1 - **On**
3-profiles View Mode			**SH**	0 - **Normal** 1 - **Full**
Statistics View			**SC**	0 - **Off** 1 - **On**
Statistics View Mode			**SJ**	0 - **Normal** 1 - **Full**
Time History View			**SD**	0 - **Off** 1 - **On**
Time History View Mode			**SK**	0 - **Normal** 1 - **Full**
Running SPL View			**SE**	0 - **Off** 1 - **On**
File Info View			**SF**	0 - **Off** 1 - **On**
Display **Time** result in the main and 3-profile views			**OA**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Lpeak** result in the main and 3-profile views			**OB**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Lmax** result in the main and 3-profile views			**OC**	0 - Off 1 - On Valid for function other than Dosimeter.

Group name	#1 code	#7 code	#S code	Code description
Display **Lmin** result in the main and 3-profile views			**OD**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **L** result in the main and 3-profile views			**OE**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Leq** result in the main and 3-profile views			**OF**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LE** result in the main and 3-profile views			**OG**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Lden** result in the main and 3-profile views			**OH**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LEPd** result in the main and 3-profile views			**OI**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Ltm3** result in the main and 3-profile views			**OJ**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Ltm5** result in the main and 3-profile views			**OK**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Ln** result in the main and 3-profile views			**OL**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LR1** result in the main and 3-profile views			**OM**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **LR2** result in the main and 3-profile views			**ON**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **EX** result in the main and 3-profile views			**OR**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **SD** result in the main and 3-profile views			**OS**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **OVL** result in the main and 3-profile views			**OO**	0 - Off 1 - On Valid for function other than Dosimeter.
Display **Time** result in the main and 3-profile views			**PA**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lpeak** result in the main and 3-profile views			**PB**	0 - Off 1 - On Valid for Dosimeter function.

Group name	#1 code	#7 code	#S code	Code description
Display **Lmax** result in the main and 3-profile views			**PC**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lmin** result in the main and 3-profile views			**PD**	0 - Off 1 - On Valid for Dosimeter function.
Display **L** result in the main and 3-profile views			**PE**	0 - Off 1 - On Valid for Dosimeter function.
Display **Dose** result in the main and 3-profile views			**PF**	0 - Off 1 - On Valid for Dosimeter function.
Display **D_8h** result in the main and 3-profile views			**PG**	0 - Off 1 - On Valid for Dosimeter function.
Display **PrDose** result in the main and 3-profile views			**PQ**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lav** result in the main and 3-profile views			**PH**	0 - Off 1 - On Valid for Dosimeter function.
Display **Leq** result in the main and 3-profile views			**PI**	0 - Off 1 - On Valid for Dosimeter function.
Display **LE** result in the main and 3-profile views			**PJ**	0 - Off 1 - On Valid for Dosimeter function.
Display **SEL8** result in the main and 3-profile views			**PK**	0 - Off 1 - On Valid for Dosimeter function.
Display **E** result in the main and 3-profile views			**PL**	0 - Off 1 - On Valid for Dosimeter function.
Display **E_8h** result in the main and 3-profile views			**PM**	0 - Off 1 - On Valid for Dosimeter function.
Display **LEPd** result in the main and 3-profile views			**PN**	0 - Off 1 - On Valid for Dosimeter function.
Display **PSEL** result in the main and 3-profile views			**PO**	0 - Off 1 - On Valid for Dosimeter function.
Display **Ltm3** result in the main and 3-profile views			**PP**	0 - Off 1 - On Valid for Dosimeter function.
Display **Ltm5** result in the main and 3-profile views			**PR**	0 - Off 1 - On Valid for Dosimeter function.

Group name	#1 code	#7 code	#S code	Code description
Display **Ln** result in the main and 3-profile views			**PS**	0 - Off 1 - On Valid for Dosimeter function.
Display **PTC** result in the main and 3-profile views			**PT**	0 - Off 1 - On Valid for Dosimeter function.
Display **PTP** result in the main and 3-profile views			**PU**	0 - Off 1 - On Valid for Dosimeter function.
Display **ULT** result in the main and 3-profile views			**PW**	0 - Off 1 - On Valid for Dosimeter function.
Display **TWA** result in the main and 3-profile views			**PV**	0 - Off 1 - On Valid for Dosimeter function.
Display **PrTWA** result in the main and 3-profile views			**PY**	0 - Off 1 - On Valid for Dosimeter function.
Display **Lc-a** result in the main and 3-profile views			**PZ**	0 - Off 1 - On Valid for Dosimeter function.
Display **EX** result in the main and 3-profile views			**OT**	0 - Off 1 - On Valid for Dosimeter function.
Display **SD** result in the main and 3-profile views			**OW**	0 - Off 1 - On Valid for Dosimeter function.
Display **OVL** result in the main and 3-profile views			**PX**	0 - Off 1 - On Valid for Dosimeter function.
Graph Y axis for 1/x OCTAVE			**SM**	0 - **10dB** 1 - **20dB** 2 - **40dB** **3 - 80dB** (default) 4 - **120dB**
Graph grid for 1/x OCTAVE			**SN**	0 - **Off** **1 - On** (default)
Spectrum type for 1/x OCTAVE			**SP**	0 - **Averaged** 1 - **Instantaneous** 2 - **Max** **3 - Min** 4 - **Peak**
Spectrum view Min. for 1/x OCTAVE			**SR**	0 - Off 1 - On
Spectrum view Max. for 1/x OCTAVE			**SS**	0 - Off 1 - On
Chart auto-scale			**SO**	0 - Off **1 - On (default)**

Group name	#1 code	#7 code	#S code	Code description
Displayed result in the main and 3-profile views (function other then Dosimeter)			**LDn**	x - x result in profile n+1, n ∈(0 ÷ 2) 1 - Time 2 - Lpeak 3 - Lmax 4 - Lmin 5 - LF 6 - Leq 7 - LAE 8 - Lden 9 - LEPd 10 - Ltm3 11 - Ltm5 12 - Ln 13 - LR1 14 - LR2 15 - EX 16 - SD 17 - OVL
Displayed result in the main and 3-profile views (Dosimeter function)			**LEn**	x - x result in profile n+1, n ∈(0 ÷ 2) 1 - Time 2 - Lpeak 3 - Lmax 4 - Lmin 5 - LF 6 - Dose 7 - D_8h 8 - PrDOSE 9 - Lav 10 - Leq 11 - LE 12 - SEL8 13 - E 14 - E_8h 15 - LEPd 16 - PSEL 17 - Ltm3 18 - Ltm5 19 - Ln 20 - PTC 21 - PTP 22 - ULT 23 - TWA 24 - PrTWA 25 - Lc-a 26 - EX 27 - SD 28 - SD

Group name	#1 code	#7 code	#S code	Code description
Results displayed on the Time history view			**STn**	x - x logger results in profile n+1, n ∈(0 ÷ 2) x – sum of the following flags: b0 - logger with Lpeak values in profile n b1 - logger with Lmax values in profile n b2 - logger with Lmin values in profile n b3 - logger with Leq values in profile n b4 - logger with L values in profile n b5 - logger with LR1 values in profile n b6 - logger with LR2 values in profile n
Display dim mode			**SU**	0 - Off 1 - Level 1 2 - Level 2 (default) **3** - Level 3 4 - Screen Off
Display dim timeout			**SW**	0 - disabled, display stays on all the time nn - timeout [s] for display dim; nn delay given in seconds ∈ (5 ÷ 59) with 1s step and ∈ (60 ÷ 3600) with 60s step; default is 60s *Note: it is not recommended to disable this feature!*
Colour Scheme			**SX**	0 - Colorful 1 - Black/White
Warning: Logger Off			**TA**	0 - Off 1 - On (default)
Warning: Power Off			**TB**	0 - Off 1 - On (default)
Warning: Microphone disconnected			**TE**	0 - Off 1 - On (default)
Warning: Save changes			**TD**	0 - Off 1 - On (default)

Table A.14 Setup settings

Group name	#1 code	#7 code	#S code	Code description
Load setup		**LS**		name - a name of a setup file to be loaded (activated) *Notes:* *- name is given without "svt" extension* *- a setup file must be placed into the SETUP directory of the instrument's SD card prior using this command; see* 0 *or* A.1 *on file upload*
Save setup		**SS**		name - a current instrument setup will be saved as a "name.svt" file in the SETUP directory of the instrument's SD card; 8 characters is a maximum name length *Notes:* *- name is given without "svt" extension*

Group name	#1 code	#7 code	#S code	Code description
Clear setup		CS		This command restores factory defaults of the instrument. To execute command send #7,CS[,<sel>]; where <sel> is settings selector: 0 - inquiry, clear and ask to save the calibration 1 - TEDS, clear and read TEDs 2 - Memory, 3 - Factory (set factory calibration)
Delete setup		DS		name - a name of a setup file to be deleted from the SETUP directory of the instrument's SD card *Notes:* *- name is given without "svt" extension*

Table A.15 Alarms settings (valid only in the Dosimeter function)

Group name	#1 code	#7 code	#S code	Code description
Alarm Dose threshold			WAn	threshold in dB for profile n+1, n ∈(0 ÷ 2)
Alarm D_8h threshold			WDn	threshold in dB for profile n+1, n ∈(0 ÷ 2)
Alarm PTC threshold			WBn	threshold for profile n+1, n ∈(0 ÷ 2)
Alarm ULT threshold			WCn	threshold in seconds for profile n+1, n ∈(0 ÷ 2)

Table A.16 General settings

Group name	#1 code	#7 code	#S code	Code description
Interface mode		IM	AE	0 - **Start/Stop** 1 - **Simple** (default) 2 - **Advanced**
Language		LA	JC	0 - **English** (default) 1 - **German** 2 - **Spanish** 3 - **French** 4 - **Hungarian** 5 - **Italian** 6 - **Dutch** 7 - **Polish** 8 - **Portuguese** 9 - **Russian** 10 - **Turkish**
Leq & Lav			JE	0 - **Both** 1 - **Mutual exclusive**
USB		UF	JG	0 - USB High Speed (480 MHz) 1 - USB Full Speed (12 MHz) (default)
Serial interface mode		BT	JN	0 - **RS232** 1 - **Bluetooth**
Bluetooth PIN		BP	JL	0 - PIN off PIN ∈(1 ÷ 9999)

Group name	#1 code	#7 code	#S code	Code description
RS232 Baud Rate			JH	7 - 115200 6 - 57600 5 - 38400 4 - 19200 3 - 9600 2 - 4800 1 - 2400 0 - 1200
RS232 Time Out			JI	n - n = time in seconds ∈(1 ÷ 60)
Unit Name		UN		Up to 12 characters (permitted characters: 0:9, a:z, A:Z, space, and '_').
Display Unit Name		DN		k - display unit name on the instruments screen for k seconds
Comment file name			UA	Qxxxxxxx – up to 7 characters (permitted characters: 0:9, A:Z, and '_'). Default name "@C1"
SD card: erase disk		ED		Erase all files from SD card.
SD card: version of Fat file system		FT		-1 - SD disk not ready 1 - FAT16 2 – FAT32
SD card: number of sectors		NS		n - number of sectors. *Sector is 512 bytes in size*
SD card: number of free sectors		NF		n - number of free sectors. *Sector is 512 bytes in size*
Measurement files number		BN		n - number of "*.svl" files in the instrument's working directory
Instrument temperature		TP		xx.x - temperature of the instrument [°C]
Microphone temperature		TM		xx.x - temperature of the microphone [°C]
SPL on stop		LL		Reading (response from the instrument): #7,LL,<L1>; where <L1> - L value from profile 1 in [dB] *Notes: function is not available during measurements.*
Station status		II		This function provides cumulative station status. Reading (response from the instrument): #7,II,[L1],Fx<flags>,B<bat>,D<disk>; where <L1> - L value from profile 1 in [dB] (on STOP only) <flags> - station status flags defined in hexadecimal format as a sum of the following flags: b0 - measurements are running, b1 - pause is active, b2 - programed pause id active, b5 - USB power supply is present, <bat> - battery relative state of charge [%] <disk> - SD card occupation [%]

Table A.17 Power settings

Group name	#1 code	#7 code	#S code	Code description
Battery type			**JB**	0 - **Alkaline** 1 - **Rechargeable**
Power status		**BS**		To read settings send #7,BS;. Response: #7,BS,<bat>; where <bat>: 1 ÷ 100 – battery state in [%] -1 - external USB power supply
Battery voltage		**BV**		volt - battery voltage [mV] multiplied by 10;
USB voltage		**UV**		volt - USB voltage [mV] multiplied by 10;
Power off		**PO**		Power off the instrument.
Reset		**XR**		Hardware reset of the instrument (power off and on).
Automatic power off			**JK**	0 - disabled, display stays on all the time nn - timeout [s] for instrument power off; nn delay given in seconds ∈ (300 ÷ 3600) with 60s step and ∈ (3600 ÷ 14400) with 3600s step; **default is 14400s** *Note: instrument automatically power off only if doesn't measurement!* *Automatic power off is blocked when instrument is powered from USB supply*

Table A.18 Position and time settings

Group name	#1 code	#7 code	#S code	Code description
Set GPS marker		**MG**		#7,MG,p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12,p13,p14,p15,p16,p17,p18,p19,p20; All parameters are optional. where: p1 – signal quality, p1 = 0 - no signal, p1 = 1 - GPS fix, p2 – Seconds part of time, p3 – Minutes part of time, p4 – Hours part of time, p5 – Day, p6 – Month, p7 – Year, p8 – Degree part of latitude, p9 – Minutes part of latitude, p10 – Seconds part of latitude, p11 – Milliseconds part of latitude, p12 – Latitude direction: N, S, p13 – Degree part of longitude, p14 – Minutes part of longitude,

Group name	#1 code	#7 code	#S code	Code description
				p15 – Seconds part of longitude, p16 – Milliseconds part of longitude, p17 – Longitude direction: E, W, p18 – Altitude in meters, p19 – Decimal part of altitude, p20 – Speed * 100 (km/h),
Real Time Clock (RTC)		**RT**		Current instrument's date/time settings. Reading (response from the instrument): #7,RT,<hour>,<min>,<sec>,<day>,<month>,<year>; Writing: #7,RT,<hour>,<min>,<sec>,<day>,<month>,<year>; where <hour> - hour ∈ (0 ÷ 23) <min> - min ∈ (0 ÷ 59) <sec> - sec ∈ (0 ÷ 59) <day> - day ∈ (1 ÷ 31) <month> - hour ∈ (1 ÷ 12) <year> - hour ∈ (2000 ÷ 2099)

Table A.19 Report printing settings

Group name	#1 code	#7 code	#S code	Code description
Print data from profiles			**QAn**	k - k print in profile n+1, n ∈(0 ÷ 2), 0 - Off 1 - On
Print profile results			**QB**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print statistics			**QC**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Aver spectrum			**DD**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Max spectrum			**QE**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Min spectrum			**QF**	0 - **Off** 1 - **All results** 2 - **Selected results**
Print Peak spectrum			**QG**	0 - **Off** 1 - **All results** 2 - **Selected results**
Printer chars per line			**QH**	n ∈(20 ÷ 500)
Units			**QJ**	0 - **Off** 1 - **Print**
Print **Lpeak** profiles result			**QK1**	0 - Off 1 - On

Group name	#1 code	#7 code	#S code	Code description
Print **Lmax** profiles result			**QK2**	0 - Off 1 - On
Print **Lmin** profiles result			**QK3**	0 - Off 1 - On
Print **L** profiles result			**QK4**	0 - Off 1 - On
Print **Dose** profiles result			**QK5**	0 - Off 1 - On
Print **D_h8** profiles result			**QK6**	0 - Off 1 - On
Print **PrDose** profiles result			**QK7**	0 - Off 1 - On
Print **Lav** profiles result			**QK8**	0 - Off 1 - On
Print **Leq** profiles result			**QK9**	0 - Off 1 - On
Print **LE** profiles result			**QL1**	0 - Off 1 - On
Print **SEL8** profiles result			**QL2**	0 - Off 1 - On
Print **E** profiles result			**QL3**	0 - Off 1 - On
Print **E_8h** profiles result			**QL4**	0 - Off 1 - On
Print **Lden** profiles result			**QL5**	0 - Off 1 - On
Print **LEPd** profiles result			**QL6**	0 - Off 1 - On
Print **PSEL** profiles result			**QL7**	0 - Off 1 - On
Print **Ltm3** profiles result			**QL8**	0 - Off 1 - On
Print **Ltm5** profiles result			**QL9**	0 - Off 1 - On
Print **PTC** profiles result			**QM1**	0 - Off 1 - On
Print **PTP** profiles result			**QM2**	0 - Off 1 - On
Print **ULT** profiles result			**QM3**	0 - Off 1 - On
Print **TWA** profiles result			**QM4**	0 - Off 1 - On
Print **PrTWA** profiles result			**QM5**	0 - Off 1 - On
Print **Lc-a**profiles result			**QM6**	0 - Off 1 - On
Print **LR1** profiles result			**QM7**	0 - Off 1 - On
Print **LR2** profiles result			**QM8**	0 - Off 1 - On

Group name	#1 code	#7 code	#S code	Code description
Print **OVL** profiles result			**QN1**	0 - Off 1 - On
Print **EX** profiles result			**QN2**	0 - Off 1 - On
Print **SD** profiles result			**QN3**	0 - Off 1 - On
Print statistics			**QOn**	k - print statistic for statistical level n, 0 - Off 1 - On n ∈(0 ÷ 9),
Print **20Hz** octave result			**QP1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **25Hz** octave result			**QP2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **31.5Hz** octave result			**QP3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **40Hz** octave result			**QP4**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **50Hz** octave result			**QP5**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **63Hz** octave result			**QP6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **80Hz** octave result			**QP7**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **100Hz** octave result			**QP8**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **125Hz** octave result			**QP9**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **160Hz** octave result			**QR1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **200Hz** octave result			**QR2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **250Hz** octave result			**QR3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **315Hz** octave result			**QR4**	0 - Off 1 - On Valid for or 1/3 Octave function.

Group name	#1 code	#7 code	#S code	Code description
Print **400Hz** octave result			**QR5**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **500Hz** octave result			**QR6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **630Hz** octave result			**QR7**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **800Hz** octave result			**QR8**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **1kHz** octave result			**QR9**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **1.25kHz** octave result			**QS1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **1.6kHz** octave result			**QS2**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **2kHz** octave result			**QS3**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **2.5kHz** octave result			**QS4**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **3.15kHz** octave result			**QS5**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **4kHz** octave result			**QS6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **5kHz** octave result			**QS7**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **6.3kHz** octave result			**QS8**	0 - Off 1 - On Valid for 1/3 Octave function.
Print **8kHz** octave result			**QS9**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **10kHz** octave result			**QT1**	0 - Off 1 - On Valid for or 1/3 Octave function.
Print **total A** result			**QT5**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.
Print **total C** result			**QT6**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.

Group name	#1 code	#7 code	#S code	Code description
Print **total Z** result			**QT7**	0 - Off 1 - On Valid for 1/1 Octave or 1/3 Octave function.

APPENDIX B. DATA FILE STRUCTURES

B.1 GENERAL STRUCTURE OF THE SV 973A FILES

Each file containing data from the SV 973A instrument consists of several groups of words. In the case of SV 973A (the internal file system rev. **1.06**), there are two different types of files containing:

- the results stored in the file in the instrument's logger (cf. App. B.2);
- setup data (cf. App. B.3).

Each file has the following elements:

- SvanPC file header (cf. Tab. B.1.1);
- file header (cf. Tab. B.1.2);
- unit and internal software specification (cf. Tab. B.1.3);
- calibration settings (cf. Tab. B.1.4);
- user's text (a header) stored together with the measurement data (cf. Tab. B.1.5);
- parameters and global settings, common for all profiles (cf. Tab. B.1.6);
- parameters for measurement trigger (cf. Tab. B.1.7);
- parameters for logger trigger (cf. Tab. B.1.8);
- parameters for Wave-file recording (cf. Tab. B.1.9);
- special settings for profiles (cf. Tab. B.1.10);
- display settings of the main results (cf. Tab. B.1.11);
- header of the statistical analysis (cf. Tab. B.1.12);
- header of the file from the logger (cf. Tab. B.1.13);
- contents of the file from the logger (cf. Tab. B.1.14);
- parameters for RT60 analysis (cf. Tab. B.1.22);
- parameters for STIPA analysis (cf. Tab. B.1.25).

Other elements of the file structure are not obligatory for each file type stated above. They depend on the file type (**SLM**, **Dosimeter**, file from the logger) and on the setting of the **FULL STAT.** These elements are as follows:

- Header of the Summary Results Record (saved in Summary Results Record) (cf. Table B.1.15);
- main results (saved in Summary Results Record) (cf. Tab. B.1.16_SLM, B.1.16_DM);
- statistical levels (saved in Summary Results Record) (cf. Tab. B.1.17);
- 1/1 Octave analysis results (saved in Summary Results Record) (cf. Tab. B.1.18);
- 1/3 Octave analysis results (saved in Summary Results Record) (cf. Tab. B.1.19);
- results of the statistical analysis (saved in Summary Results Record) (cf. Tab. B.1.20);
- settings of the instrument saved in the setup file (cf. Tab. B.1.21);
- results of the RT60 analysis (cf. Tab. B.1.23, B.1.24);
- results of the STIPA analysis (cf. Tab. B.1.26, B.1.27);
- file-end-marker (cf. Tab. B.1.30).

Below, all file structure groups are described separately in Tab. B.1.1 – Tab. B.1.23. The format used in the columns, named **Comment** with the square parenthesis ([xx, yy]), means the contents of the word with; **xx** is the most significant byte (MSB) and **yy** the lowest significant byte (LSB) of the word. The format 0xnnnn means that the nnnn is four-digit number in hexadecimal form.

Table B.1.1. SvanPC file header

Word number	Name	Comment
0..2	“SvanPC”	reserved
3	26	reserved
4	32	reserved
5	73	reserved
6..15	reserved	reserved
…	…	…

Table B.1.2. File header

Word number	Name	Comment
0	0xnn01	[01, nn=header’s length]
1..4	FileName	name of the file (8 characters)
5	reserved	reserved
6	CurrentDate	file creation date (cf. App. B.4)
7	CurrentTime	file creation time (cf. App. B.4)
8..13	reserved	reserved
…		…

Table B.1.3. Unit and software specification

Word number	Name	Comment
0	0xnn02	[02, nn=specification’s length]
1	UnitNumberL	unit number (LSB word)
2	UnitType	type of the unit: 973
3	SoftwareVersion	software version: 109
4	SoftwareIssueDate	software issue date
5	DeviceMode	mode of the instrument
6	UnitSubtype	subtype of the unit: 1 – **SV 973** 2 – **SV 973A**
7	FileSysVersion	file system version: 106
8	reserved	reserved
9	SoftwareSubversion	software subversion: 01
10	UnitNumberH	unit number (MSB word)
11	MicNumberL	microphone number (LSB word)
12	MicNumberH	microphone number (MSB word)
…		…

Table B.1.4. Calibration settings

Word number	Name	Comment
0	0xnn47	[47, nn=header's length]
1	PreCalibrType	type of calibration performed prior to measurement: 0 - none 1 - **By Measurement** (manual) 2 - **Remote** 3 - **Factory Calibration** 4 - **Auto Calibration**
2	PreCalibrDate	date of calibration performed prior to measurement (cf. App. B.4)
3	PreCalibrTime	time of calibration performed prior to measurement (cf. App. B.4)
4	PreCalibrFactor	factor (*100 dB) of calibration performed prior to measurement
5	PreCalibrLevel	level (*100 dB) of calibration performed prior to measurement
6	PostCalibrType	type of calibration performed prior to measurement: 0 - none 1 - **By Measurement** (manual) 2 - **Remote** 3 - **Factory Calibration** 4 - **Auto Calibration** 0xFFFF - **Calibration not performed**
7	PostCalibrDate	date of calibration performed after the measurement (cf. App. B.4)
8	PostCalibrTime	time of calibration performed after the measurement (cf. App. B.4)
9	PostCalibrFactor	factor (*100 dB) of calibration performed after the measurement
10	PostCalibrLevel	level (*100 dB) of calibration performed after the measurement
…	…	…

Table B.1.5. USER's text

Word number	Name	Comment
0	0xnn03	[03, nn=specification's length]
1…	title text	user's text (two characters in a word) finished with one or two null bytes

Table B.1.6. Parameters and global settings

Word number	Name	Comment
0	0xnn04	[04, nn=block's length]
1	MeasureStartDate	measure start date (cf. App. B.4)
2	MeasureStartTime	measure start time (cf. App. B.4)
3	DeviceFunction	device function: 1 - **Sound Level Meter**, 2 - **1/1 Octave**, 3 - **1/3 Octave**,

		4 - **Dosimeter,** 102 - **1/1 Octave & Dosimeter**, 103 - **1/3 Octave & Dosimeter**, 8 - **RT60** 19 - **STIPA**
	MeasureInput	measurement input type: 2 - **Microphone**
5	Range	measurement range: 1 - **Low** 2 - **High**
6	UnitFlags	calibration flags: b0 - if set to 1: calibration coefficient is used b3 - if set to 1: overload occurred b7,b6,b5: type of the result **Lden** 000 – **Lden** result is not available 001 – **Ld** result 010 – **Le** result 011 – **Lde** result 100 – **Ln** result 101 – **Lnd** result 110 – **Len** result 111 – **Lden** result
7	RepCycle	repetition cycle: 0 - infinity nnnn - number of repetitions $\in(1 \div 1000)$
8	NofChannel	number of channels (1)
8	NofProf	number of profiles (3)
10	StartDelay	start delay time
11..12	IntTimeSec	integration time specified in seconds
13	InterfaceMode	user interface mode: 0 - **Start/Stop**, 1 - **Simple**, 2 - **Advanced**
14	LeqInt	detector's type in the **Leq** function: **0 - Linear,** 1 - **Exponential**
15	SpectrumFilter	1/1 or 1/3 Octave analysis filter: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** in other cases: Reserved
16	SpectrumBuff	1/1 or 1/3 Octave logger: sum of the following flags: 1 - logger with **Lpeak** values 8 - logger with **Leq** values in other cases: reserved
17	ExposureTime	exposure time: 1..720 (min)

18	Leq & Lav	method of viewing results Leq and Lav 0 - **Both** 1 - **Mutually exclusive (**visibility depends of the EXCHANGE RATE parameter**)**
19	MicComp	compensating filter for microphones: 0 - switched off, 1 - switched on
20	SpectrumRMSDetector	spectrum RMS detector type: 0 - **Linear**, 1 - **Fast**, 2 - **Slow**
21	Reserved	reserved
22	CriterionLevel[0]	1st profile criterion level (only **Dosimeter**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
23	ThresholdLevel[0]	1st profile threshold level (only **Dosimeter**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
24	ExchangeRate[0]	1st profile exchange rate (only **Dosimeter**): 2, 3, 4, 5, 6
25	CriterionLevel[1]	2nd profile criterion level (only **Dosimeter**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
26	ThresholdLevel[1]	2nd profile threshold level (only **Dosimeter)**: 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
27	ExchangeRate[1]	2nd profile exchange rate (only **Dosimeter**): 2, 3, 4, 5, 6
23	CriterionLevel[2]	3rd profile criterion level (only **Dosimeter**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
29	ThresholdLevel[2]	3rd profile threshold level (only **Dosimeter**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
30	ExchangeRate[2]	3rd profile exchange rate (only **Dosimeter**): 2, 3, 4, 5, 6
31	MainResBuff	Summary results. Contents defined as a sum of: 0 - none 1 - **Main Results** 2 - **Spectrum** 4 - **Spectrum MAX** 8 - **Spectrum MIN** 16 - **Spectrum PEAK** 32 - **Statistical levels** 64 - **Statistical analysis in profiles** 128 - **Statistical analysis in 1/1 or 1/3 Octave mode**
32	StartSync	synchronization the start of measurement with RTC 0 - switched off -1 - synchronization to **1 sec** 1 - synchronization to **1 min** 15 - synchronization to **15 min** 30 - synchronization to **30 min** 60 - synchronization to **1 hour**.
33	reserved	reserved

34	Windscreen	Windscreen compensation: 0 - off. 1 - on.
35	FieldCompensation	Field Compensation: 0 – Off 1 – Free Field 2 – Diffuse Field
36	UL Th. Level[0]	1st profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
37	UL Th. Level[1]	2nd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
38	UL Th. Level[2]	3rd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
39	PEAK Th. Level[0]	1st profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
40	PEAK Th. Level[1]	2nd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
41	PEAK Th. Level[2]	3rd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
42	SplitMode	logger files splitting mode: 0 - off. -1 - The file is created for each measurement cycle. 15 - The file is created every 15 min synchronized to RTC. 30 - The file is created every 30 min synchronized to RTC. 60 - The file is created every 1 hour synchronized to RTC. 1440 - The file is created on the specified times.
43	SplitTime[1]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
44	SplitTime[2]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
45	SplitTime[3]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
46	SplitTime[4]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
47	SplitTime[5]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
48	SplitTime[6]	logger files splitting time: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440.
49	Pause[1]	programmable pause no. 1.
50	PauseBegin[1]	start time of the pause no. 1 in format 0xhhmm hh – hour mm – minute
51	PauseEnd[1]	end time of the pause no. 1 in format 0xhhmm: hh – hour mm – minute

52	Pause[2]	programmable pause no. 2.
53	PauseBegin[2]	start time of the pause no. 2 in format 0xhhmm hh – hour mm – minute
54	PauseEnd[2]	end time of the pause no. 2 in format 0xhhmm: hh – hour mm – minute
55	Pause[3]	programmable pause no. 3.
56	PauseBegin[3]	start time of the pause no. 3 in format 0xhhmm hh – hour mm – minute
57	PauseEnd[3]	end time of the pause no. 3 in format 0xhhmm: hh – hour mm – minute
58	Pause[4]	programmable pause no. 4.
59	PauseBegin[4]	start time of the pause no. 4 in format 0xhhmm hh – hour mm – minute
60	PauseEnd[4]	end time of the pause no. 4 in format 0xhhmm: hh – hour mm – minute
61	Pause[5]	programmable pause no. 5.
62	PauseBegin[5]	start time of the pause no. 5 in format 0xhhmm hh – hour mm – minute
63	PauseEnd[5]	end time of the pause no. 5 in format 0xhhmm: hh – hour mm – minute
64..65	MeasureStartTimeMS	measure start time in ms (cf. App. B.4)
66	RollLeq1	Rolling time (1) in seconds
67	RollLeq2	Rolling time (2) in seconds
…		

Table B.1.7. Measurement trigger parameters

Word number	Name	Comment
0	0xnn2B	[2B, nn=block's length]
1	TriggerMode	trigger mode: 0 - **Off**, 2 - measurement on trigger **Slope+** 3 - measurement on trigger **Slope–** 4 - measurement on trigger **Level+** 5 - measurement on trigger **Level–** 6 - measurement on trigger **Gradient+**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLevel	level of triggering: 24 ÷ 136 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)

5	TriggerPre	reserved
6	TriggerPost	reserved
7	TriggerSampling	reserved
8	TriggerRecTime	reserved
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	reserved
11	BitsPerSample	reserved
12	Range	reserved
13	Gain	reserved
14	LengthLimit	reserved
…		

Table B.1.8. Logger trigger parameters

Word number	Name	Comment
0	0xnn2C	[2C, nn=block's length]
1	TriggerMode	trigger mode: 0 - **Off**, 4 - measurement on trigger **Level+**, 5 - measurement on trigger **Level–**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLev	level of triggering: 24 ÷ 136 dB (*10)
4	TriggerGrad	reserved
5	TriggerPre	number of the records taken into account before the fulfilment of the triggering condition ∈(1 ÷ 10)
6	TriggerPost	number of the records taken into account after the fulfilment of the triggering condition ∈(1 ÷ 200)
7	TriggerSampling	reserved
8	TriggerRecTime	reserved
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	reserved
11	BitsPerSample	reserved
12	Range	reserved
13	Gain	reserved
14	LengthLimit	reserved
…		

Table B.1.9. Wave-file recording parameters

Word number	Name	Comment
0	0xnn2D	[2D, nn=block's length]
1	TriggerMode	trigger mode: 0 - **Off**, 1 - recording whole measurement 2 - recording on trigger **Slope+** 3 - recording on trigger **Slope–** 4 - recording on trigger **Level+** 5 - recording on trigger **Level–** 6 - recording on trigger **Gradient+** 7 - recording on trigger **Manual**
2	TriggerSource	source of the triggering signal: 0 - **Leq(1)** the **Leq** result from the first profile
3	TriggerLevel	level of triggering: 24 ÷ 136 dB (*10)
4	TriggerGrad	gradient of triggering: 1 dB/ms ÷ 100 dB/ms (*10)
5	TriggerPre	pretrigger time given in 10ms
6	TriggerPost	reserved
7	TriggerSampling	sampling frequency given in 10Hz
8	TriggerRecTime	recording time of single data block: 0 - recording to the end of measurement 1..28800 (sec)
9	TriggerStep	trigger period given in 0.1 ms. If zero Step is equal to logger time-step (cf. Tab. B.1.15)
10	TriggerFilter	filter type: 1 - **Z**, 2 - **A**, 3 - **C** 5 - **B**
11	BitsPerSample	bits/sample: 16
12	Range	full scale signal range in 0.01dB
13	Gain	signal gain in dB
14	LengthLimit	wave file length limit in minutes
…		

Table B.1.10. Special settings for profiles

Word number	Name	Comment
0	0xnn05	[05, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm06	[06, mm=sub-block's length]

3	DetectorP[1]	detector type in the 1st profile: 0 - **Imp.**, 1 - **Fast**, 2 - **Slow**
4	FilterP[1]	filter type in the 1st profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
5	BufferP[1]	logger contents in the 1st profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV** 32 - **LR1** 64 – **LR2**
6	FilterPeakP[1]	filter type for Peak result calculation in the 1st profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
7	reserved	reserved
8	0xmm06	[06, mm=sub-block's length]
9	DetectorP[2]	detector type in the 2nd profile: 0 - **Imp.**, 1 - **Fast**, 2 - **Slow**
10	FilterP[2]	filter type in the 2nd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
11	BufferP[2]	logger contents in the 2nd profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV** 32 – **LR1** 64 – **LR2**

12	FilterPeakP[2]	filter type for Peak result calculation in the 2nd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
13	reserved	reserved
14	0xmm06	[06, mm=sub-block's length]
15	DetectorP[3]	detector type in the 3rd profile: 0 - **Imp.**, 1 - **Fast**, 2 - **Slow**
16	FilterP[3]	filter type in the 3rd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
17	BufferP[3]	logger contents in the 3rd profile defined as a sum of: 0 - none, 1 - Lxpeak[1] 2 - Lxymax[2] 4 - Lxymin[2] 8 - Lxyeq[23] 16 - **LAV** 32 – **LR1** 64 – **LR2**
18	FilterPeakP[3]	filter type for Peak result calculation in the 3rd profile: 1 - **Z**, 2 - **A**, 3 - **C** 5 – **B** 6 – **LF**
19	reserved	reserved
…		

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.11. Display settings of the main results

Word number	Name	Comment
0	0xnn48	[48, nn=header's length]
1	TIME	0 – TIME result not displayed, 1 - TIME result displayed
2	Lpeak	0 – Lxpeak[1] result not displayed, 1 – Lxpeak[1] result displayed
3	Lmax	0 – Lxymax[2] result not displayed, 1 – Lxymax[2] result displayed
4	Lmin	0 – Lxymin[2] result not displayed, 1 – Lxymin[2] result displayed
5	L	0 – Lxy[2] result not displayed, 1 – Lxy[2] result displayed
6	DOSE	0 – DOSE result not displayed, 1 - DOSE result displayed
7	D_8h	0 – D_8h result not displayed, 1 - D_8h result displayed
8	LAV	0 – LAV result not displayed, 1 - LAV result displayed
9	Leq	0 – Lxyeq[23] result not displayed, 1 – Lxyeq[23] result displayed
10	LE	0 – LxyE[23] result not displayed, 1 - LxyE[23] result displayed
11	SEL8	0 – SEL8 result not displayed, 1 - SEL8 result displayed
12	E	0 – E result not displayed, 1 – E result displayed
13	E_8h	0 – E_8h result not displayed, E_8h 1 - result displayed
14	Lden	0 – Lden result not displayed, 1 - Lden result displayed
15	LEPd	0 – LEPd result not displayed, 1 - LEPd result displayed
16	PSEL	0 – PSEL result not displayed, 1 - PSEL result displayed
17	Ltm3	0 – Ltm3 result not displayed, 1 - Ltm3 result displayed
18	Ltm5	0 – Ltm5 result not displayed, 1 - Ltm5 result displayed
19	Ln	0 – Ln result not displayed, 1 - Ln result displayed
20	PTC	0 – PTC result not displayed, 1 - PTC result displayed
21	PTP	0 – PTP result not displayed, 1 - PTP result displayed
22	ULT	0 – ULT result not displayed, 1 - ULT result displayed
23	TWA	0 – TWA result not displayed, 1 - TWA result displayed
24	PrDOSE	0 – PrDOSE result not displayed, 1 - PrDOSE result displayed
25	PrTWA	0 – PrTWA result not displayed, 1 - PrTWA result displayed
26	LR1	0 – LR1 result not displayed, 1 - LR1 result displayed
27	LR2	0 – LR2 result not displayed, 1 – LR2 result displayed
28	LCA	0 – Lc-a result not displayed, 1 – Lc-a result displayed
29	OVL	0 – OVL result not displayed, 1 - OVL result displayed
30	LeqLF	0 – LeqLF result not displayed, 1 - LeqLF result displayed
…	…	…

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.12. Header of the statistical analysis

Word number	Name	Comment
0	0xnn09	[09, nn=block's length]
1	0x0307	[03=number of profiles, 07=active profiles mask]
2	0xmm0A	[0A, mm=sub-block's length]

3	NofClasses[1]	number of classes in the first profile (120)
4	BottomClass[1]	bottom class boundary (*10 dB) in the first profile
5	ClassWidth[1]	class width (*10 dB) in the first profile
6	0xmm0A	[0A, mm=sub-block's length]
7	NofClasses[2]	number of classes in the second profile (120)
8	BottomClass[2]	bottom class boundary (*10 dB) in the second profile
9	ClassWidth[2]	class width (*10 dB) in the second profile
10	0xmm0A	[0A, mm=sub-block's length]
11	NofClasses[3]	number of classes in the third profile (120)
12	BottomClass[3]	bottom class boundary (*10 dB) in the third profile
13	ClassWidth[3]	class width (*10 dB) in the third profile
…	…	…

Table B.1.13. Header of the file from the logger

Word number	Name	Comment
0	0xnn0F	[0F, nn=header's length]
1	BuffTSec	logger time step - full seconds part
2	BuffTMilisec	logger time step - milliseconds part
3	LowestFreq	lowest 1/1 Octave or 1/3 Octave frequency (*100 Hz)
4	NOctTer	number of 1/1 Octave or 1/3 Octave results
5	NOctTerTot	number of TOTAL values
6..7	BuffLength	logger length (bytes)
8..9	RecsInBuff	number of records in the logger
10..11	RecsInObserv	number of records in the observation period equal to: number of records in the logger + number of records not saved
12..13	AudioRecords	number of audio records in the logger
…	…	…

Note: *The current logger time step in seconds can be obtained from the formulae:*

T = BuffTSec + BuffTMillisec / 1000

Table B.1.14. Contents of the file from the logger

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

Table B.1.15. Header of the Summary Results Record (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn59	[59, nn=header's length]
1..2	RecNumber	Summary Results Record number: 1..
…	…	…

Table B.1.16_SLM. Main results in the SLM mode (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	Lxpeak[1] value in the 1st profile (*100 dB)
6	Result[1][2]	LxyE[23] value in the 1st profile (*100 dB)
7	Result[1][3]	maximal value (Lxymax[2]) in the 1st profile (*100 dB)
8	Result[1][4]	minimal value (Lxymin[2]) in the 1st profile (*100 dB)
9	Result[1][5]	Lxy[2] value in the 1st profile (*100 dB)
10	Result[1][6]	Lxyeq[23] value in the 1st profile (*100 dB)
11	Result[1][7]	**Lden** value in the 1st profile (*100 dB)
12	Result[1][8]	**Ltm3** value in the 1st profile (*100 dB)
13	Result[1][9]	**Ltm5** value in the 1st profile (*100 dB)
14	Result[1][10]	**LR1** value in the 1st profile (*100 dB)
15	Result[1][11]	**LR2** value in the 1st profile (*100 dB)
16	UnderRes[1]	under-range value in the 1st profile
17..18	ULTime[1]	reserved
19..20	PTC[1]	reserved
21	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
22	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
23	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
24	0xmm08	[08, mm=sub-block's length]
25..26	OVL	overload time
27	Result[2][1]	Lxpeak[1] value in the 2nd profile (*100 dB)
28	Result[2][2]	LxyE[23] value in the 2nd profile (*100 dB)
29	Result[2][3]	maximal value (Lxymax[2]) in the 2nd profile (*100 dB)
30	Result[2][4]	minimal value (Lxymin[2]) in the 2nd profile (*100 dB)

31	Result[2][5]	Lxy[2] value in the 2nd profile (*100 dB)
32	Result[2][6]	Lxyeq[23] value in the 2nd profile (*100 dB)
33	Result[2][7]	**Lden** value in the 2nd profile (*100 dB)
34	Result[2][8]	**Ltm3** value in the 2nd profile (*100 dB)
35	Result[2][9]	**Ltm5** value in the 2nd profile (*100 dB)
36	Result[2][10]	**LR1** value in the 2nd profile (*100 dB)
37	Result[2][11]	**LR2** value in the 2nd profile (*100 dB)
38	UnderRes[2]	under-range value in the 2nd profile
39..40	ULTime[2]	reserved
41..42	PTC[2]	reserved
43	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
44	EX[2]	**EX** (Expected Value) in the 2nd profile (*100 dB)
45	SD[2]	**SD** (Standard Deviation) in the 2nd profile (*100 dB)
46	0xmm08	[08, mm=sub-block's length]
47..48	Reserved	reserved
49	Result[3][1]	Lxpeak[1] value in the 3rd profile (*100 dB)
50	Result[3][2]	LxyE[23] value in the 3rd profile (*100 dB)
51	Result[3][3]	maximal value (Lxymax[2]) in the 3rd profile (*100 dB)
52	Result[3][4]	minimal value (Lxymin[2]) in the 3rd profile (*100 dB)
53	Result[3][5]	Lxy[2] value in the 3rd profile (*100 dB)
54	Result[3][6]	Lxyeq[23] value in the 3rd profile (*100 dB)
55	Result[3][7]	**Lden** value in the 3rd profile (*100 dB)
56	Result[3][8]	**Ltm3** value in the 3rd profile (*100 dB)
57	Result[3][9]	**Ltm5** value in the 3rd profile (*100 dB)
58	Result[3][10]	**LR1** value in the 2nd profile (*100 dB)
59	Result[3][11]	**LR2** value in the 2nd profile (*100 dB)
60	UnderRes[3]	under-range value in the 3rd profile
61..62	ULTime[3]	reserved
63..64	PTC[3]	reserved
65	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
66	EX[3]	**EX** (Expected Value) in the 3rd profile (*100 dB)
67	SD[3]	**SD** (Standard Deviation) in the 3rd profile (*100 dB)
…	…	…

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)

[2] x - depends of the filter type in selected profile: A, C, Z, B (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)

[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.16_DM. Main results in Dosimeter mode (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn07	[07, nn=block's length]
1	0x0307	[used_profile, profile's mask]
2	0xmm08	[08, mm=sub-block's length]
3..4	MeasureTime	time of the measurement
5	Result[1][1]	Lxpeak[1] value in the 1st profile (*100 dB)
6	Result[1][2]	LxyE[23] value in the 1st profile (*100 dB)
7	Result[1][3]	maximal value (Lxymax[2]) in the 1st profile (*100 dB)
8	Result[1][4]	minimal value (Lxymin[2]) in the 1st profile (*100 dB)
9	Result[1][5]	Lxy[2] value in the 1st profile (*100 dB)
10	Result[1][6]	Lxyeq[23] value in the 1st profile (*100 dB)
11	Result[1][7]	Lc-a (LCeq-LAeq) value (*100 dB)
12	Result[1][8]	**Ltm3** value in the 1st profile (*100 dB)
13	Result[1][9]	**Ltm5** value in the 1st profile (*100 dB)
14	Result[1][10]	**LAV** value in the 1st profile (*100 dB)
15	Result[1][11]	**TLAV** value in the 1st profile (*100 dB)
16	UnderRes[1]	under-range value in the 1st profile
17..18	ULTime[1]	**ULT** value in the 1st profile (sec.)
19..20	PTC[1]	**PTC** value in the 1st profile
21	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
22	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
23	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
24	0xmm08	[08, mm=sub-block's length]
25..26	OVL	overload time
27	Result[2][1]	Lxpeak[1] value in the 2nd profile (*100 dB)
28	Result[2][2]	LxyE[23] value in the 2nd profile (*100 dB)
29	Result[2][3]	maximal value (Lxymax[2]) in the 2nd profile (*100 dB)
30	Result[2][4]	minimal value (Lxymin[2]) in the 2nd profile (*100 dB)
31	Result[2][5]	Lxy[2] value in the 2nd profile (*100 dB)
32	Result[2][6]	Lxyeq[23] value in the 2nd profile (*100 dB)
33	Result[2][7]	reserved
34	Result[2][8]	**Ltm3** value in the 2nd profile (*100 dB)
35	Result[2][9]	**Ltm5** value in the 2nd profile (*100 dB)
36	Result[2][10]	**LAV** value in the 2nd profile (*100 dB)
37	Result[2][11]	**TLAV** value in the 2nd profile (*100 dB)

38	UnderRes[2]	under-range value in the 2nd profile
39..40	ULTime[2]	**ULT** value in the 2nd profile (sec.)
41..42	PTC[2]	**PTC** value in the 2nd profile
43	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
44	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
45	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
46	0xmm08	[08, mm=sub-block's length]
47..48	Reserved	reserved
49	Result[3][1]	Lxpeak[1] value in the 3rd profile (*100 dB)
50	Result[3][2]	LxyE[23] value in the 3rd profile (*100 dB)
51	Result[3][3]	maximal value (Lxymax[2]) in the 3rd profile (*100 dB)
52	Result[3][4]	minimal value (Lxymin[2]) in the 3rd profile (*100 dB)
53	Result[3][5]	Lxy[2] value in the 3rd profile (*100 dB)
54	Result[3][6]	Lxyeq[23] value in the 3rd profile (*100 dB)
55	Result[3][7]	reserved
56	Result[3][8]	**Ltm3** value in the 3rd profile (*100 dB)
57	Result[3][9]	**Ltm5** value in the 3rd profile (*100 dB)
58	Result[3][10]	**LAV** value in the 3rd profile (*100 dB)
59	Result[3][11]	**TLAV** value in the 3rd profile (*100 dB)
60	UnderRes[3]	under-range value in the 3rd profile
61..62	ULTime[3]	**ULT** value in the 3rd profile (sec.)
63..64	PTC[3]	**PTC** value in the 3rd profile
65	UnitFlags	flags word for measurement cycle (definition in table B.1.6)
66	EX[1]	**EX** (Expected Value) in the 1st profile (*100 dB)
67	SD[1]	**SD** (Standard Deviation) in the 1st profile (*100 dB)
…	…	…

[1] x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.10)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.17. Statistical levels (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn17	[17, nn=block's length]
1	0xpprr	[pp=used_profile, rr=profile's mask]
2	N_stat_level	number of statistical levels = N

3+i*(pp+1)	nn[i]	number of the **Ln** statistics; i=0..N-1
3+i*(pp+1)+p	**Lnn**[i,p]	value of the **Ln** statistics for profile p (p=1..pp) (*100 dB)
…	…	…

Table B.1.18. 1/1 Octave analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn0E, 0xnn26, 0xnn27, 0xnn30	[block_id, nn=block_length] 0xnn0E - averaged spectrum results, 0xnn26 - min. spectrum results, 0xnn27 - max. spectrum results 0xnn30 - peak spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	lowest 1/1 Octave frequency (*100 Hz): 3150
3	NOct	number of 1/1 Octave values: 10
4	NOctTot	number of **TOTAL** values: 3
5÷20	Octave[i]	1/1 Octave[i] value (*100 dB); i=1÷NOct+NoctTot (1÷13)
…	…	…

Table B.1.19. 1/3 Octave analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn10, 0xnn28, 0xnn29, 0xnn32	[block_id, nn=block_length] 0xnn10 - averaged spectrum results, 0xnn28 - min. spectrum results, 0xnn29 - max. spectrum results 0xnn32 - peak spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	lowest 1/3 Octave frequency (*100 Hz): 2000
3	NTer	number of 1/3 Octave values: 31
4	NTerTot	number of TOTAL values: 3
5÷50	Tercje[i]	1/3 octave[i] value (*100 dB); i=1÷NTer+NTerTot (1÷34)
…	…	…

Table B.1.20. Results of the statistical analysis in profiles (saved in Summary Results Record)

Word number	Name	Comment
0	0x010B	[0B, prof_mask#1]
1	SubblockLength	2 * number of classes in the first profile + 2
2..3	Histogram[1][1]	first counter in the first profile
4..5	Histogram[1][2]	second counter in the first profile
.....	.....	.....
0	0x020B	[0B, prof_mask#2]
1	SubblockLength	2 * number of classes in the second profile + 2
2..3	Histogram[2][1]	first counter in the second profile
4..5	Histogram[2][2]	second counter in the second profile
.....	.....	.....
0	0x040B	[0B, prof_mask#3]
1	SubblockLength	2 * number of classes in the third profile + 2
2..3	Histogram[3][1]	first counter in the third profile
4..5	Histogram[3][2]	second counter in the third profile
.....	.....	.....

Table B.1.21. Setup file

Word number	Name	Comment
0	0x0020	[20, 00=block's length in the second word]
1	BlockLength	length of the block
2..BlockLength-1	SetupTextData	saved setup values

Table B.1.22. RT60 parameters

Word number	Name	Comment
0	0xnn1A	[1A, nn=block's length]
1	ResultsType	type of results in block 1B: 1 - results, 2 - averaged results
2	Method	calculation method: 1 - **Decay**, 2 - **Impulse**
3	Spectrum	type of spectrum: 1 - **1/1 Octave**, 2 - **1/3 Octave**
4	TimeStep	logger time step in milliseconds

5	MeasureTime	measure time in seconds
6		reserved
7	DispSmooth	smoothing parameter (0 means no smoothing)
8	NoiseMargin	noise margin level (*10 dB)
9	Reserved	reserved
10	AverNo	number of averaged results
...		

Table B.1.23. RT60 results

Word number	Name	Comment
0	0x001B	[1B, 00= block's length in the second word]
1	BlockLength	length of the block
2	LowestFreq	lowest **1/3 Octave** frequency (*100 Hz)
3	NTer	Number of **1/3 Octave** values
4	NTotal	Number of **TOTAL** values
5	N1_rt60_freq	first frequency
6	N2_rt60_freq	last frequency
7+i	calculated[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
8+i	EDT[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
9+i	RT20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
10+i	RT30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
11+i	RT_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
12+i	Cor_EDT[i]	reserved
13+i	Cor_RT20[i]	reserved
14+i	Cor_RT30[i]	reserved
15+i	Cor_RT_user[i]	reserved
...		reserved

Table B.1.24. RT60 averaged results

Word number	Name	Comment
0	0x001C	[1C, 00= block's length in the second word]
1	BlockLength	length of the block
2	LowestFreq	lowest 1/3 Octave frequency (*100 Hz)
3	NTer	number of 1/3 Octave values
4	NTotal	number of TOTAL values
5	N1_rt60_freq	first frequency
6	N2_rt60_freq	last frequency
7+i	calculated[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
8+i	EDT[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
9+i	RT20[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
10+i	RT30[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
11+i	RT_user[i]	i=N1_rt60_freq÷N2_rt60_freq; i=N_tercje÷N_tercje+N_max_total-1
12+i	N_EDT[i]	number of averaging for the EDT[i]
13+i	N_RT20[i]	number of averaging for the RT20[i]
14+i	N_RT30[i]	number of averaging for the RT30[i]
15+i	N_RT_user[i]	number of averaging for the RT_user[i]
...		reserved

Table B.1.25. STIPA parameters

Word number	Name	Comment
0	0x0063	[63, 00= block's length in the second word]
1	BlockLength	length of the block
2	Standard	standard: 0 – IEC 60268-16x2, 1 – IEC 60268-16x3
3	Averaging	averaging type: 0 – Manual, 1 – Auto
4	N	project name length
5..	ProjectName[N]	project name

5+N	M	area name length
6+N..	AreaName[M]	area name
6+N+M	PointId	point Id
7+N+M	K	source name length
8+N+M..	SourceName[K]	source name
8+N+M+K	CalibrLevel	Calibration factor level (*10 dB)
…		reserved

Table B.1.26. STIPA results

Word number	Name	Comment
0	0x0061	[61, 00= block's length in the second word]
1	BlockLength	length of the block
2	STI	STI result (*100)
3	LAeq	LAeq result (*100 dB)
4	LCeq	LCeq result (*100 dB)
5	N	STIPA analysis frequency count
6	LZeq[1]	LZeq result for the first frequency (*100 dB)
7	Err1[1]	error flag of m(f1) for the first frequency (0,1)
8	Mf1[1]	result of m(f1) for the first frequency (*100 dB)
9	Err2[1]	error flag of m(f2) for the first frequency (0,1)
10	Mf2[1]	result of m(f2) for the first frequency (*100 dB)
i*5+1	LZeq[i]	LZeq result for the next frequency (*100 dB)
i*5+2	Err1[i]	error flag of m(f1) for the next frequency (0,1)
i*5+3	Mf1[i]	result of m(f1) for the next frequency (*100 dB)
i*5+4	Err2[i]	error flag of m(f2) for the next frequency (0,1)
i*5+5	Mf2[i]	result of m(f2) for the next frequency (*100 dB)
N*5+6	Flags	bit 0 – underrange flag bit 1 – overload flag
N*5+7	STI-Measured	STI result not including Ambient Noise
…		reserved

Table B.1.27. STIPA noise results

Word number	Name	Comment
0	0x0062	[62, 00= block's length in the second word]
1	BlockLength	length of the block
2	N	STIPA analysis frequency count
3..	Distortion[N]	STIPA distortion table (*100 dB)
…		reserved

Table B.1.24. File-end-marker

Word number	Name	Comment
0	0xFFFF	file end marker

B.2 STRUCTURE OF THE FILE CONTAINING RESULTS FROM LOGGER'S FILE

SvanPC file header - cf. Tab. B.1.1.
File header - cf. Tab. B.1.2.
Unit and software specification - cf. Tab. B.1.3.
Calibration settings - cf. Tab. B.1.4.
User's text - cf. Tab. B.1.5.
Parameters and global settings - cf. Tab. B.1.6.
Measurement trigger settings - cf. Tab. B.1.7.
Logger trigger settings - cf. Tab. B.1.8.
Wave-file recording parameters - cf. Tab. B.1.9.
Special settings for profiles - cf. Tab. B.1.10.
Display settings of the main results - cf. Tab. B.1.11.
Header of the statistical analysis - cf. Tab. B.1.12.
Header of the file from the logger - cf. Tab. B.1.13.
Contents of the file from the logger - cf. Tab. B.1.14. and the description in B.2.1.
RT60 parameters – cf. Tab. B.1.22
STIPA parameters – cf. Tab. B.1.25

B.2.1. The contents of the files in the logger

The records with the results and the records with the state of the markers as well as the records with the breaks in the results registration are saved in the files in the logger. All results are written in dB*100.

B.2.1.1. Record with the results

The contents of the record with the results depends on the selected measurement function and the value set in the **Logger** position of the **Profile x** and **Spectrum** sub-lists. The following elements can be present (in the given sequence):

(1) flag record

< flags > :

b0: 1- the overload detected, 0 - the overload not detected

(2) results of the measurement from the first profile if the corresponding **LOGGER** position was active *(paths: Measurement / Logging / Logger Res. / Prof. 1*); up to seven words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result2> - Lxymax[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result3> - Lxymin[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result4> - Lxyeq[23] result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result5> - **LAV** result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result6> - **LR1** result, depending on the value of BufferP[1] (cf. Tab. B.1.10)
<result7> - **LR2** result, depending on the value of BufferP[1] (cf. Tab. B.1.10)

(3) results of the measurement from the second profile if the corresponding **LOGGER** position was active *(paths: Measurement / Logging / Logger Res. / Prof. 2*); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result2> - Lxymax[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result3> - Lxymin[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result4> - Lxyeq[23] result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result5> - **LAV** result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result6> - **LR1** result, depending on the value of BufferP[2] (cf. Tab. B.1.10)
<result7> - **LR2** result, depending on the value of BufferP[2] (cf. Tab. B.1.10)

(4) results of the measurement from the third profile if the corresponding **LOGGER** position was active *(paths: Measurement / Logging / Logger Res. / Prof. 3*); up to five words are written:

<result1> - Lxpeak[1] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result2> - Lxymax[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result3> - Lxymin[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result4> - Lxyeq[23] result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result5> - **LAV** result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result6> - **LR1** result, depending on the value of BufferP[3] (cf. Tab. B.1.10)
<result7> - **LR2** result, depending on the value of BufferP[3] (cf. Tab. B.1.10)

1	x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.10)
2	x - depends of the filter type in selected profile: A, C, Z, B (cf. Tab. B.1.10) y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.10)
3	y - only for exponential detector's type (cf. Tab. B.1.6)

(5) results of **1/1 Octave** analysis or **1/3 Octave** analysis if **1/1 Octave** analysis or **1/3 Octave** analysis was selected as the measurement function and the **Logger** was active *(paths: Measurement / Logging / Logger Res. / Peak Sp. [√] and Leq Sp. [√]*); the sequence of words is written:

<Octave Peak[1]> <Octave Peak [2]> ... <Octave Peak [Noct+NOctTot]> <Octave Leq[1]> <Octave Leq[2]> ... <Octave Leq[NOct+NOctTot]>

where:

Octave Peak[i] - the result of **1/1 Octave** or **1/3 Octave** Peak analysis (*100 dB); i = 1..NOct+NOctTot

Octave Leq[i] - the result of **1/1 Octave** or **1/3 Octave** Leq analysis (*100 dB); i = 1..NOct+NOctTot

B.2.1.2. Record with the state of the markers

The record with the state of the markers consists of one word:

<0x8nnn>

in which 12 bits nnn denote the state of the markers:

b11 = state of #12 marker

b10 = state of #11 marker

...

b1 = state of #2 marker

b0 = state of #1 marker

B.2.1.3. Record with the breaks in the results registration

The record with the breaks in the results registration consists of four words:

<0xB0ii> <0xB1jj> <0xB2kk> <0xB3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter of left or skipped records: nnkkjjii (ii is the least significant byte, nn – the most significant byte).

B.2.1.4. Record with the breaks account PAUSE in the results registration

The record with the breaks in the results registration consists of four words:

<0xA0ii> <0xA1jj> <0xA2kk> <0xA3nn>

in which ii, jj, kk, nn bytes denote 4-bytes counter duration of PAUSE in milliseconds:

nnkkjjii (ii is the least significant byte, nn - the most significant byte).

B.2.1.5. Record with the wave file name

The record with the wave file name consists of six words:

<0xC2aa>

<0xccbb>

<0xeedd>

<0xggff>

<0xiihh>

<0xCAaa>

in which:

aa - size of records,

bb cc dd ee ff gg hh ii - 8-bytes name of wave file name

B.2.1.6. Record with Summary Results

The format of the data frame is as follows:

HS	L (optional)	D	L (optional)	HE

where:

HS starting header (1 word)
L length of the block (field is optional and occurs only when b7..b0 in header are set to zero)
D Summary Data:
- Main results (cf. Tab. B.1.17_SLM, B.1.17_DM)
- Statistical levels (optional, cf. Tab. B.1.18)
- 1/1 Octave analysis results (optional, cf. Tab. B.1.19)
- 1/3 Octave analysis results (optional, cf. Tab. B.1.20)
- The results of the statistical analysis in profiles (optional, cf. Tab. B.1.21)

HE ending header (1 word), which differs from the HS only on b11 bit (thanks to it, it is possible to analyse the recorded file starting from its end)

The HEADER format is as follows:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:

0 - HS

1 - HE

b10 - 0

b9 - 1

b8 - 1

b15÷b8 – HS (0xC3), HE (0xCB)
b7÷b0 – length of the block (if zero length of the block is saved in additional word L)

B.2.1.8. Record with name of the comment file

The format of the data frame is as follows:

HS	D	HE

where:

HS starting header (1 word)
D The full name of the comment file (e.g. “REC62.WAV”).
HE ending header (1 word), which differs from the HS only on b11 bit (thanks to it, it is possible to analyse the recorded file starting from its end)

The HEADER format is as follows:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

where:

b15 - 1
b14 - 1
b13 - 0
b12 - 0,
b11 - header type:
0 - HS
1 - HE
b10 - 1
b9 - 0
b8 - 0
b15÷b8 – HS (0xC4), HE (0xCC)
b7÷b0 – length of the block

B.2.1.9. Record with GPS data

The value equal to -12288 (0xd000) denotes the undefined value.

Word number	Name
0	0xC703
1	Length
2	Quality
3	Time.Sec
4	Time.Min
5	Time.Hour
6	Date.Day
7	Date.Month
8	Date.Year
9	Latitude.Deg
10	Latitude.Min
11	Latitude.Sec
12	Latitude.MiliSec
13	Latitude.Dir
14	Longitude.Deg
15	Longitude.Min
16	Longitude.Sec
17	Longitude.MiliSec
18	Longitude.Dir
19	Altitude
20	Altitude.10
21	Speed
22	Length
23	0xCF03
…	…

B.3 STRUCTURE OF THE SETUP FILE

SvanPC file header - cf. Tab. B.1.1.
File header - cf. Tab. B.1.2.
Unit and software specification - cf. Tab. B.1.3.
Setup data - cf. Tab. B.1.23.
File-end-marker - cf. Tab. B.1.24.

B.4 DATE AND TIME

Following function written in C explain how the date and time are coded:

```
void ExtractDateTime(int date, unsigned int time, int dt[])
{
      dt[0] = time % 30;                  /* sec */
      dt[1] = (time/30) % 60;             /* min */
      dt[2] = time/1800;                  /* hour */

      dt[3] = date & 0x001F;              /* day */
      dt[4] = (date>>5) & 0x000F;         /* month */
      dt[5] = ((date>>9) & 0x007F) + 2000;      /* year */
}
```

APPENDIX C. TECHNICAL SPECIFICATIONS

under development

APPENDIX D. DEFINITIONS AND FORMULAE OF MEASURED VALUES

D.1 BASIC TERMS AND DEFINITIONS

T Current time period of the measurement in seconds.

T_1 Last second of the measurement.

T_e Exposure time in seconds (time period during which a person is exposed to the action of noise). This parameter can be set in the **Exposure Time** setup (**Measurement** menu). The available values are from 1 minute to 12 hours with 1-minute step.

T_{8h} Time period equal to 8 hours (28 800 seconds).

τ Exponential time constant in seconds for the giving time-weighting. Three time constants are available: **Slow** (1000 ms), **Fast** (125 ms), **Impulse** (35 ms, but on falling values a longer time constant of 1500 ms is applied).

W Frequency-weighting filter: **A**, **C, B** or **Z**.

$p_W(t)$ Instantaneous frequency-weighted sound pressure with the weighting filter **W**. Sound pressure is expressed in pascals (Pa).

$p_{W\tau}(t)$ Instantaneous frequency and time-weighted sound pressure with the weighting filter **W** and time constant τ calculated from the equation:

$$p_{W\tau}(t) = \sqrt{\frac{1}{\tau}\int_{-\infty}^{t} p_W^2(\xi)\, e^{-(t-\xi)/\tau}\, d\xi}$$

where: ξ – variable of integration.

$r(t)$ Instantaneous sound pressure depends on the <**RMS Integration**> parameter:

$$r(t) = \begin{cases} p_W(t) & \text{RMS Integration} = \text{Lin} \\ p_{W\tau}(t) & \text{RMS Integration} = \text{Exp} \end{cases}$$

p_0 Reference value (20 μPa).

$\log(x)$ Logarithm of x to the base 10.

Q Exchange rate in decibels is equal to 2, 3, 4, 5 or 6. The value of Q influences the calculations of dose meter results, namely **DOSE**, **D_8h** and **LAV**. The exposure rate equal to 3 complies with ISO R 1999 “Assessment of Occupational Noise Exposure for Hearing Conservation Purposes”, while Q equal to 5 complies with the American “Occupational Safety and Health Act” – OSHA.

q Value of q is used in the calculations of **DOSE**, **D_8h** and **LAV** is taken from the formula

$$q = \begin{cases} \dfrac{Q}{\log 2} & \text{for } Q \neq 3 \\ 10 & \text{for } Q = 3 \end{cases}$$

L_T Threshold sound level set in the **Threshold Level** parameter. The available values are as follows: **None**, **60dB** up to **90dB** in 5 dB steps.

L_C Criterion sound level set in the **Criterion Level** parameter. The available values are form **60dB**, up to **90dB** in 5 dB steps.

L(t) Sound level (a function of time) measured with the selected time constant (**Impulse**, **Fast** or **Slow**) and the weighting filter (equal to **A**, **C** or **Z**)

$$L(t) = 20 \log \frac{p_W(t)}{p_0}$$

$L_d(t)$ Sound level (a function of time) depends on the selected threshold level.

In case **None** option is selected

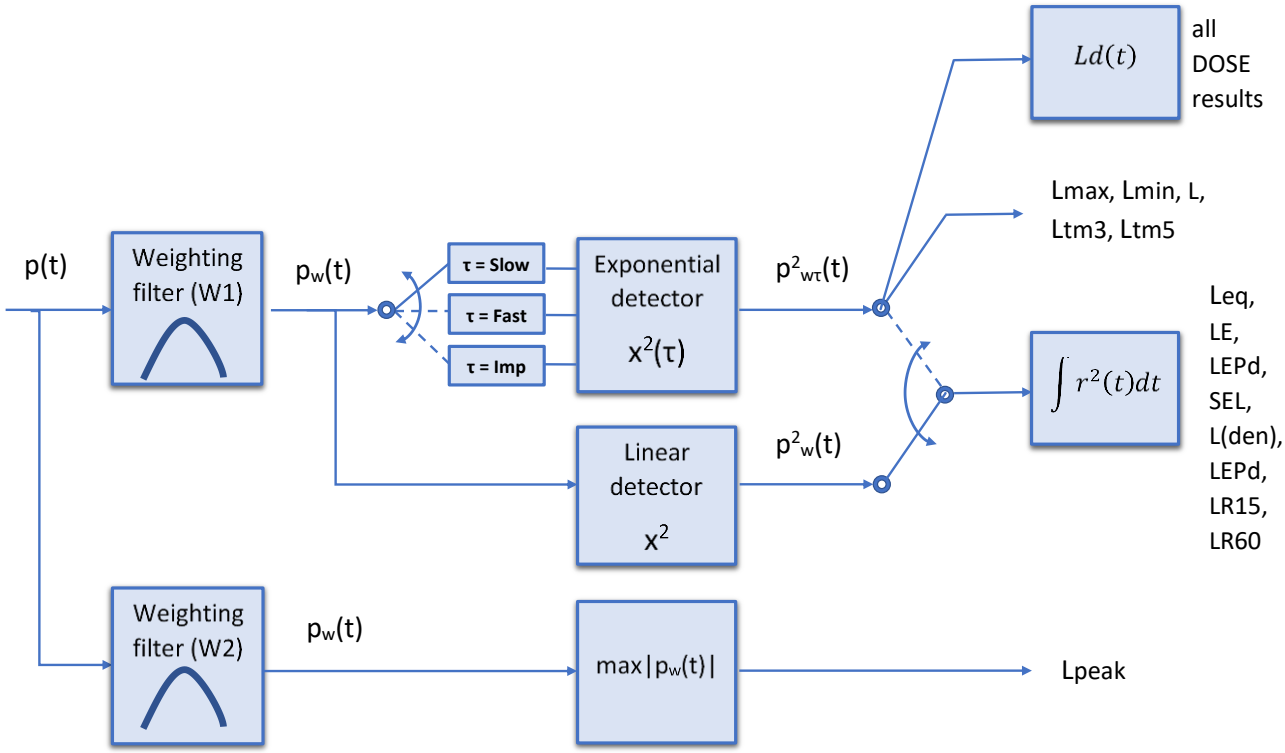
$$L_d(t) = L(t)$$

In other cases (when **Threshold Level** is not set to none and equal to **60 dB** … or up to **90 dB**)

$$L_d(t) = \begin{cases} L(t) & \text{for } L(t) \geq L_T \\ -\infty & \text{for } L(t) < L_T \end{cases}$$

D.2 DEFINITIONS AND FORMULAS OF THE SLM RESULTS

The instrument calculates the sound measurement results for three profiles. The calculation flow diagram for one profile is presented below:



OVL Percentage of the overloaded input signal, which occurred during the current time period of the measurement (**T**)

L(A/C/Z)peak

Peak sound level expressed in dB, for frequency weightings A, C, Z, symbols are **LApeak**, **LCpeak** and **LZpeak**. Peak sound level is calculated for the given **T**.

$$\mathbf{Peak} = 10\log\left(\max_T \frac{p_W^2(t)}{p_0^2}\right)$$

L(A/C/Z)(S/F/I) max

The highest time weighted sound level (**Max**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are LAFmax, LASmax, LCFmax, LCSmax etc.

$$\mathbf{Max} = 10\log\left(\max_T \frac{p_{W\tau}^2(t)}{p_0^2}\right)$$

L(A/C/Z)(S/F/I) min

The lowest time weighted sound level (**Min**) expressed in dB, within a stated time interval, for frequency weightings A, C, Z and time weightings F, S, I symbols are LAFmin, LASmin, LCFmin, LCSmin etc.

$$\mathbf{Min} = 10\log\left(\min_T \frac{p_{W\tau}^2(t)}{p_0^2}\right)$$

L(A/C/Z)(S/F/I)

Time weighted sound level expressed at observation time, expressed in dB, for frequency weightings A, C, Z and time weightings F, S, I symbols are LAF, LAS, LCF, LCS etc.

$$\mathbf{L} = 10\log\left(\frac{p_{W\tau}^2(t)}{p_0^2}\right)$$

L(A/C/Z)eq

Time averaged equivalent continuous sound level (**Leq**) expressed in dB, for frequency weightings A, C, Z symbols are LAeq, LCeq and LZeq. In principle time weighting is not involved in a determination of time averaged sound level. Time-averaged sound level is calculated for current time period of the measurement (**T**).

$$\mathbf{Leq} = 10\log\left(\frac{1}{T}\int_0^T \left(r(t)/p_0\right)^2 dt\right)$$

L(A/C/Z)E

Sound Exposure Level (**SEL**) expressed in dB, for frequency weightings A, C, Z, symbols are LAE, LCE and LZE. **SEL** is essentially the subset of the **Leq** result. Its value is equal to the **Leq** result referred to the integration time equal to one second (so, for the Integration time equal to 1 s, **SEL** is always equal to **Leq**).

$$\mathbf{SEL} = 10\log\left(\int_0^T \left(r(t)/p_0\right)^2 dt\right) = \mathbf{Leq} + 10\log\frac{T}{1s}$$

L(den)

Only one result from: **Lday**, **Leve**, **Lnight**, **Lde**, **Len**, **Lnd**, and **Lden** is available in the instrument. It depends on the day and night time in which the measurement was performed. Day and night time depend on the **<Day Time Limits>** option (**6h-18h** or **7h-19h**).

If **<6h-18h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 6 am and ends at 6 pm,
T_e (evening-time) starts from 6 pm and ends at 10 pm,
T_n (night-time) starts at 10 pm and ends at 6 am.

If **<7h-19h>** option is selected for the <**Day Time Limits>** in the instrument then:

T_d (day-time) starts from 7 am and ends at 7 pm,
T_e (evening-time) starts from 7 pm and ends at 11 pm,
T_n (night-time) starts at 11 pm and ends at 7 am.

Lday

Lday is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n = 0$.

$$Ld = 10 \log \left(\frac{1}{T_d} \int_{T_d} (r_W(t)/p_0)^2 dt \right)$$

Leve

Leve is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n = 0$.

$$Le = 5\ dB + 10 \log \left(\frac{1}{T_e} \int_{T_e} (r_W(t)/p_0)^2 dt \right)$$

Lnight

Lnight is calculated for: $T_d = 0$, $T_e = 0$, $T_n \neq 0$.

$$Ln = 10\ dB + 10 \log \left(\frac{1}{T_n} \int_{T_n} (r_W(t)/p_0)^2 dt \right)$$

Lde

Lde is calculated for: $T_d \neq 0$, $T_e \neq 0$, $T_n = 0$.

$$Lde = 10 \log \left[\frac{1}{12+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} \right) \right]$$

Len

Len is calculated for: $T_d = 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Len = 10 \log \left[\frac{1}{4+8} \left(4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

Lnd

Lnd is calculated for: $T_d \neq 0$, $T_e = 0$, $T_n \neq 0$.

$$Lnd = 10 \log \left[\frac{1}{8+12} \left(8 \cdot 10^{Ln/10} + 12 \cdot 10^{Ld/10} \right) \right]$$

Lden

Lden is calculated for: $T_d \neq 0$, $T_e \neq 0$, $T_n \neq 0$.

$$Lden = 10 \log \left[\frac{1}{12+8+4} \left(12 \cdot 10^{Ld/10} + 4 \cdot 10^{Le/10} + 8 \cdot 10^{Ln/10} \right) \right]$$

LEPd

Daily Personal Noise Exposure is the noise exposure level for a nominal 8-hour working day. The **LEPd** result is calculated on the base of the **LEQ**

$$LEPd = Leq + 10 \log \frac{T_e}{T_{8h}}$$

Ltm3 and **Ltm5**

The **Ltm3** and **Ltm5** results (Takt-Maximal Levels) are calculated according to the German standard TA Lärm.

Ln Statistical level is the certain boundary level surpassed by the temporary noise level values in not more than **n%** of the observation period

see Chapter D.4

EX Expected value. Calculated on the basis of 100ms Leq results.

SD Standard deviation. Calculated on the basis of 100ms Leq results.

LR Rolling Leq measured in the time window for the last seconds of the measurement (**Tw**) moving with 1 second step.

$$LR(Tw) = 10\log\left(\frac{1}{Tw}\int_{T-Tw}^{T}(r(t)/p_0)^2 dt\right)$$

Note: *If the current measurement time **T** is less than the time window **Tw** the **LR** result is undefined.*

D.3 DEFINITIONS AND FORMULAS OF THE ADDITIONAL DOSIMETER FUNCTION RESULTS

DOSE The **DOSE** result is the quantity of noise received by the worker, expressed as the percentage of the whole day acceptable value.

$$DOSE = \frac{100\%}{T_{8h}}\int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt$$

D_8h The **D_8h** result is the quantity of noise received by the worker during 8 hours.

$$D\_8h = \frac{100\%}{T}\int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt = \frac{T_{8h}}{T}\cdot DOSE$$

PrDOSE The **PrDOSE** result is the quantity of noise received by the worker during exposure time.

$$Pr\,DOSE = \frac{100\%}{T}\int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt = \frac{T_e}{T}\cdot DOSE$$

LAV The **LAV** result is the average level of the acoustic pressure for the given time period of the measurement.

$$LAV = q\cdot\log\left(\frac{1}{T}\int_0^T 10^{\frac{L_d(t)}{q}} dt\right)$$

SEL8 The **SEL8** result is the **SEL** result corresponding to the integration time equal to 8 hours. The **SEL8** result is calculated on the base of the **LEQ**.

$$SEL8 = LEQ + 10\cdot\log\frac{T_{8h}[s]}{1[s]}$$

PSEL

Individual Sound Exposure Level to the noise is equal to the standing sound level in a measurement period. The **PSEL** result is calculated on the base of the **LEQ**.

$$\mathbf{PSEL} = \mathbf{LEQ} + 10 \cdot \log \frac{T}{T_{8h}}$$

E

The **E** result (Exposition) represents the amount of the acoustical energy received by the worker.

$$E = \frac{T[s]}{3600} p_o^2 \cdot 10^{\frac{LEQ}{10}}$$

E_8h

The **E_8h** result (Exposition in 8 hours) represents the amount of the acoustical energy received by the worker during 8 hours. The E_8h result is expressed in the linear units [Pa^2h].

$$E\_8h = 8[h] \cdot p_o^2 \cdot 10^{\frac{LEQ}{10}}$$

PTC

The PTC result (Peak Threshold Counter) – the number of the overpasses of the Threshold Level by Lpeak result. This result is incremented in 100 ms intervals.

PTP

The **PTP** result is the **PTC** result expressed in percent.

$$PTP = \frac{100 \cdot PTC}{10T_c}$$

ULT

Upper Limit Time - time that SPL exceeded the “ULT Threshold Level” set during configuration.

TWA

The Time Weighted Average is the average A-weighted sound level for a nominal 8-hour workday with Time Weighting S and Exchange Rate 5. **TWA** is usually measured with A-weighting and Slow response detector type. TWA is calculated from the measured LAV (taking Threshold Level into account) and a Reference time of 8 h. Mainly used in the USA for assessing the noise exposure for a worker during a workday.

- Sound levels at or above the **THRESHOLD LEVEL** are averaged into the calculations relating to noise exposure. **TWA** is calculated with no threshold level, or with threshold level (typically 80dB or 90dB)
- In case the time period is below 8 hours, the **TWA** is less than the **LAV** In case the time period is more than 8 hours, the **TWA** is greater than the **LAV**

PrTWA

The Projected Time Weighted Average is calculated from the measured **LAV** (taking **THRESHOLD LEVEL** into account) and the exposure time.

Lc-a

The C-A measurement is an Leq that enhances the low-frequency components of the sound signal. It is the result of subtracting an A-weighted LAeq from a simultaneously collected C-weighted Leq

Lc-a = LCeq - LAeq

D.4 STATISTICAL LEVELS – LN DEFINITION

The noise level **L(t)** is the continuous random variable. The probability that the temporary noise level **L(t)** belongs to the interval $\langle L_k, L_k + \Delta L \rangle$ is called the class density and it can be expressed by the equation:

$$P_k\left[L_k \le L(t) \le L_k + \Delta L\right] = \sum_{i=1}^{n} \Delta t_i \Big/ P$$

where: Δt_i - time intervals, in which the noise level $L(t) \in \langle L_k, L_k + \Delta L \rangle$ occurs,

ΔL - so-called class interval or distribution class of the series,

P - total observation period.

In case when the class interval approaches infinity, the probability of **L(t)** tends to the probability of L_k. In practice, ΔL value is strictly determined for the measuring instrument. For SV 973A, there are 120 classes and the width of each class is 1 dB. The histogram is the set of the class density values calculated for all classes.

The statistical distribution function, which determines the probability (expressed in %) of the noise occurrence on the level equal or less than $L_k + \Delta L$ is given by the formulae:

$$P\left[L(t) \le L_j\right] = \sum_{k=1}^{j} P_k(L)$$

The cumulative density function expressed by the equation:

$$P\left[L(t) > L_j\right] = 1 - P\left[L(t) \le L_j\right]$$

is directly used to determine so-called statistical levels **Ln** or position parameters of the distribution.

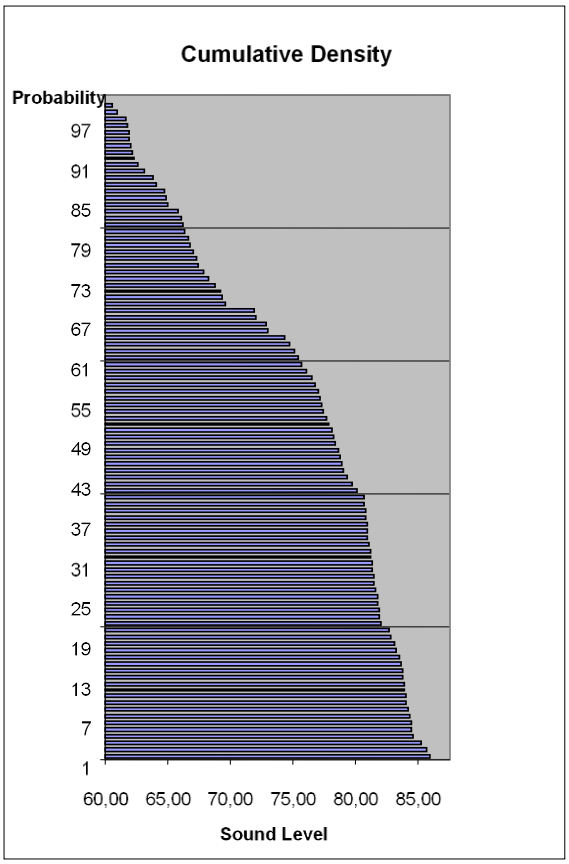
The **Ln** is the certain boundary level surpassed by the temporary noise level values in not more than **n%** of the observation period.

Example:

Let us assume that **L35** is equal to 76.8 dB. It means that during the measurements the noise level 76.8 dB was exceeded in not more than 35% of the observation period.

The cumulative density function for the exemplary data is presented in Figure on the right side. In order to determine the **Ln** level, one must draw the horizontal cursor and find out the crossing point between the cumulative density function and the cursor. In the instrument the user can determine 10 statistical levels - from **L01** to **L99** (1% step of observation period).

The statistical level **Ln** value, the profile's number the statistics are taken from, the RMS detector (**Lin.**, or **Exp.**: **Fast**, **Slow** or **Imp**.), the filter's name (**A**, **C** or **Z**) and real time are displayed in the top-right side of the display in one-result view mode.



Exemplary cumulative density

APPENDIX E. REVERBERATION TIME CALCULATIONS

E.1 INTRODUCTION

If an impulsive sound is generated in a room with reflecting boundaries, repeated reflections at the boundaries result in the rapid establishment of a more or less uniform sound field. This field then decays as the sound energy is absorbed by the bounding materials. The rate at which the sound energy decays is determined by the absorptive properties of the reflecting surfaces and the distances between them. The time taken for the sound intensity or the sound pressure level to decay by 60 dB is called the **reverberation time** (RT). RT values can range from fractions of a second to several seconds, depending on the size of the room and the type of materials used in its construction.

The graphs below show the nature of the reverberation time (when only one frequency is emitted):

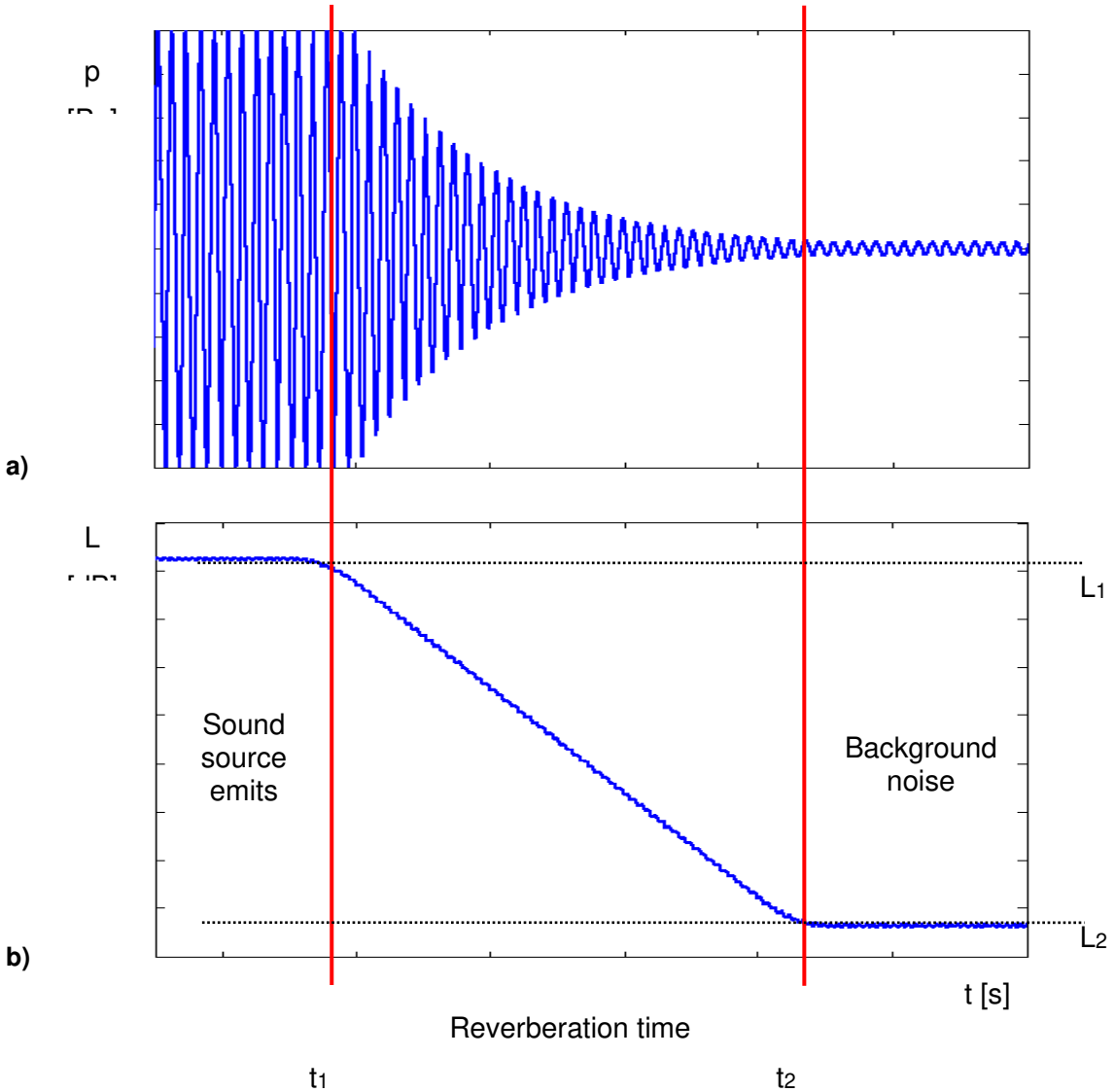


Fig 1. The acoustic pressure versus time (a) and the value of the sound pressure level versus time, so-called decay curve (b)

The marker t_1 indicates the moment when the sound source was switched off. From this moment on, the acoustic sound pressure / acoustic power (reflected waves propagating in the room) decreases tunil the moment indicated by the marker t_2. The lower graph shows the so-called **decay curve**. The reverberation time value is equal to $t_2 – t_1$ when the difference between the sound pressure levels L_1 and L_2 is 60 dB. The 60 dB dynamic condition is impractical in real measurements (very difficult to achieve), so the reverberation

time (RT 60) is obtained using the slope coefficient of the decay curve. The type of definition from which the slope coefficient is calculated (EDT, RT 20, RT 30 or user defined) depends on the difference between the levels L_1 and L_2 (the difference between the background noise level and the sound source level) of the decay curve and it depends significantly on the acoustic source capability. If the level difference is greater than 45 dB, the RT 60 parameter can be calculated using three definitions: EDT, RT 20 and RT 30.

The real measurement results are not as smooth as the curves shown on the graphs in Figure 1. In order to highlight the interesting region of the decay curve (the position of the markers t_1 and t_2), some measurement data processing (generally signal smoothing by averaging) must be applied.

E.2 DEFINITIONS AND CALCULATION OF THE RT 60 REVERBERATION TIME

➢ **EDT (early decay time):**

The EDT decay curve region is indicated by markers t_1 and t_3 (cf. Fig. 2). It is checked whether the selected decay curve region has the correct dynamics for the EDT calculation:

$$L_1 - L_2 >= 10 \text{ dB}$$

$$L_2 - L_3 >= \text{noise margin}$$

The ISO-3382 standard recommends a value of 10 dB for the noise margin.

In the case of the **impulse method**, the sound pressure level values between points t_1 (with L_1) and t_2 (with L_2) are approximated by the straight line ($y = a \cdot x + b$) by linear regression. Before the approximation, the EDT value is calculated using the slope coefficient 'a' according to the formula:

$$EDT = -60.0 / a$$

In the case of the **decay method**, the EDT value is calculated according to the formula:

$$EDT = 6 \cdot (t_2 - t_1)$$

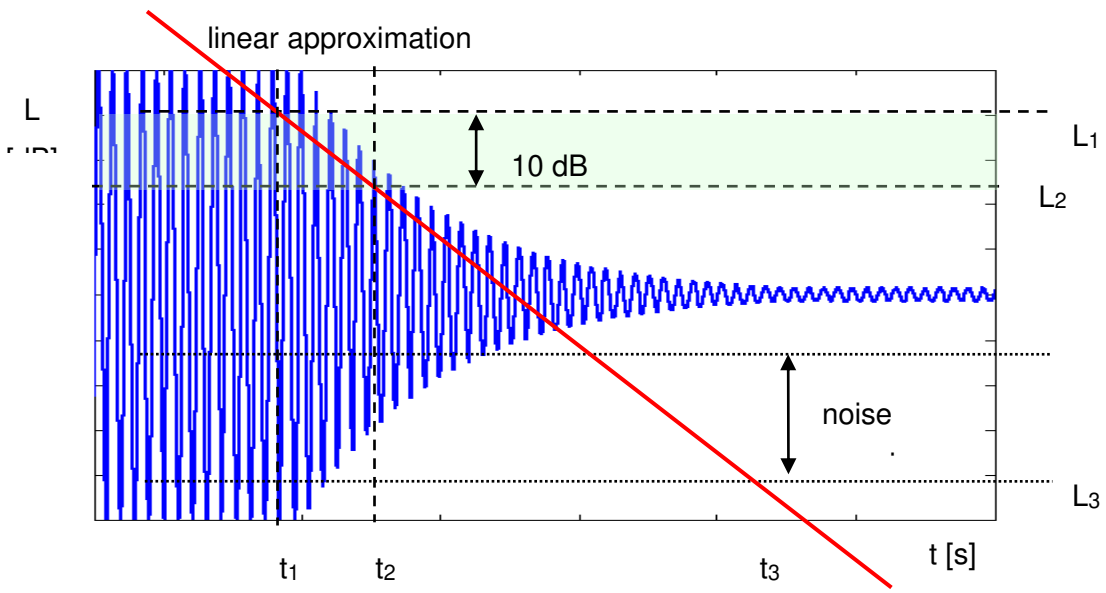


Fig 2. The EDT evaluation

➢ **RT 20 (reverberation time calculated with 20 dB dynamics):**

The RT 20 decay curve region is indicated by the t_1 and t_4 markers (cf. Fig. 3). It is checked whether the selected decay curve region has the correct dynamics for the RT 20 calculation:

$$L_1 - L_4 > 5 \text{ dB} + 20 \text{ dB} + \text{noise margin}$$

The ISO-3382 standard recommends a value of 10 dB for the noise margin.

In the case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated by the straight line (y = a · x + b) by linear regression. The RT 20 value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{RT\ 20 = -\ 60.0\ /\ a}$$

In the case of the **decay method**, the RT 20 value is calculated according to the formula:

$$\mathbf{RT\ 20 = 3 \cdot (t_3 - t_2)}$$

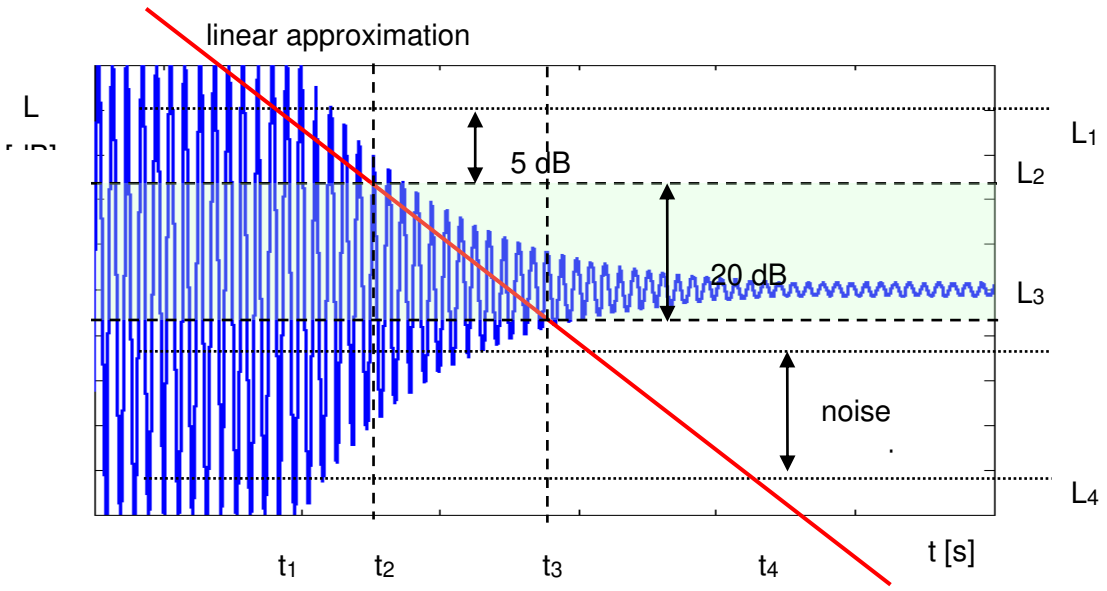


Fig 3. The RT 20 evaluation

- **RT 30 (reverberation time calculated with 30 dB dynamics):**

The RT 30 decay curve region is indicated by the t_1 and t_4 markers (cf. Fig. 4). It is checked whether the selected decay curve region has the correct dynamics for the RT 30 calculation:

$$\mathbf{L_1 - L_4 > 5 + 30\ dB + noise\ margin}$$

The ISO-3382 standard recommends a value of 10 dB for the noise margin.

In the case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated by the straight line (y = a · x + b) by linear regression. The RT 30 value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{RT\ 30 = -\ 60.0\ /\ a}$$

In the case of the **decay method**, the RT 30 value is calculated according to the formula

$$\mathbf{RT\ 30 = 2 \cdot (t_3 - t_2)}$$

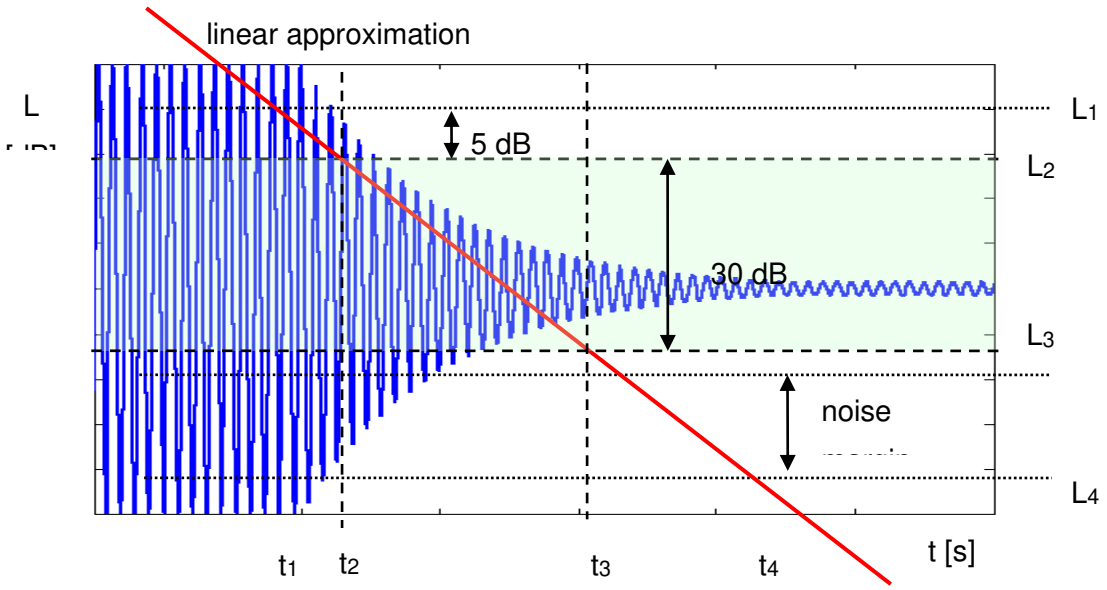


Fig 4. The RT 30 evaluation

E.3 DESCRIPTION OF THE DECAY CURVE RECORDING IN DIFFERENT MEASUREMENT METHODS

➢ **DECAY method**

This RT 60 measurement method requires an omnidirectional sound source emitting pink noise in the appropriate frequency band. The most critical parameter of the omnidirectional sound source is the emitted sound pressure level, as mentioned at the beginning of this appendix.

The graphical illustration of the data recording with this method is presented in Figure 5.

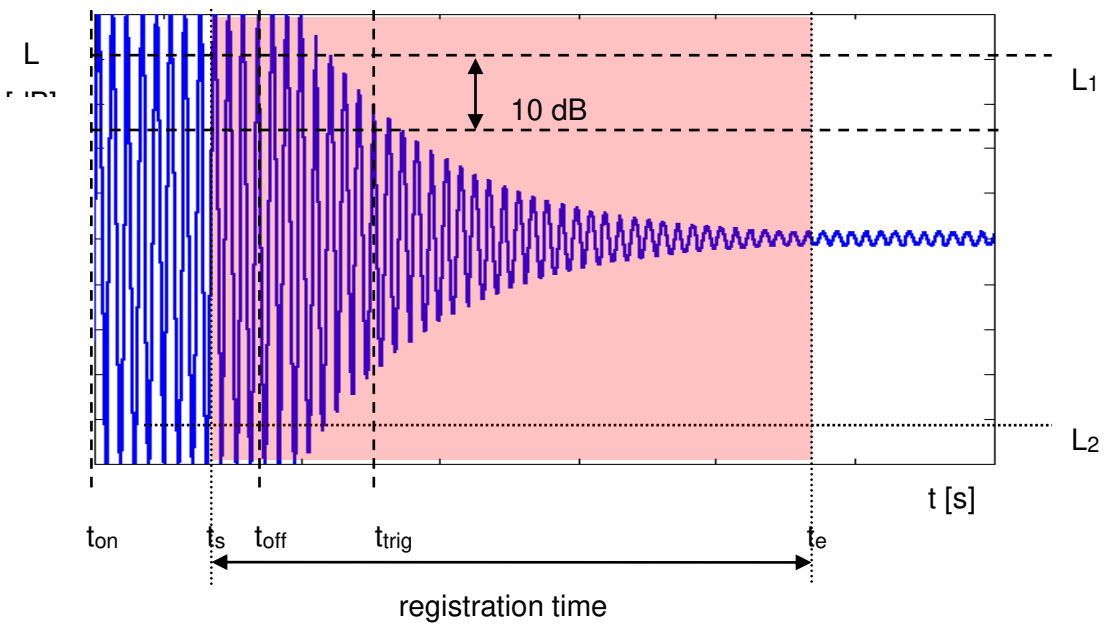


Fig 5. Data recording in the decay method of the reverberation time evaluation

The measurement time in this method consists of:

- The time between the t_{on} and t_{off} markers during which the omnidirectional sound source emits acoustic power and the Svantek instrument measures the actual sound pressure level.
- The time between t_{off} and t_{trig} markers during which the omnidirectional sound source is switched off and the Svantek instrument waits for the trigger condition to be met.
- The time between the t_s and t_{trig} markers from the time the trigger condition is met to the time t_s, in order to identify the beginning of the decay region. In the Svantek instruments, this time is equal to the **Time Step** item value (*path: <Menu> / Measurement / RT60 Settings*) multiplied by 50.
- The time between the t_{trig} and t_e markers registered since t_{trig} forward to record the whole decay curve together with a significantly long period of the noise level. In the Svantek instruments, this time is adjusted by the **Recording Time** item value (*path: <Menu> / Measurement / RT60 Settings*).

The above graph shows that the correct setting of the **Recording Time** value is very important. The recording time must be long enough to acquire a sufficient number of background noise level values. Otherwise, the decay curve region could not be properly analysed, or the decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than the expected reverberation time.

➢ Impulse method

In the Impulse method, the reverberation time is calculated by using the reverse time integrated impulse response. This method of measuring sound decay was first introduced by M. R. Schroeder in two historical articles:

- New Method of Measuring Reverberation Time, *Journal of Acoust. Soc. Am.1965*
- Integrated-Impulse Method Measuring Sound Decay without Using Impulses, *Journal of Acoust. Soc. Am. Vol. 66(2) 1979*

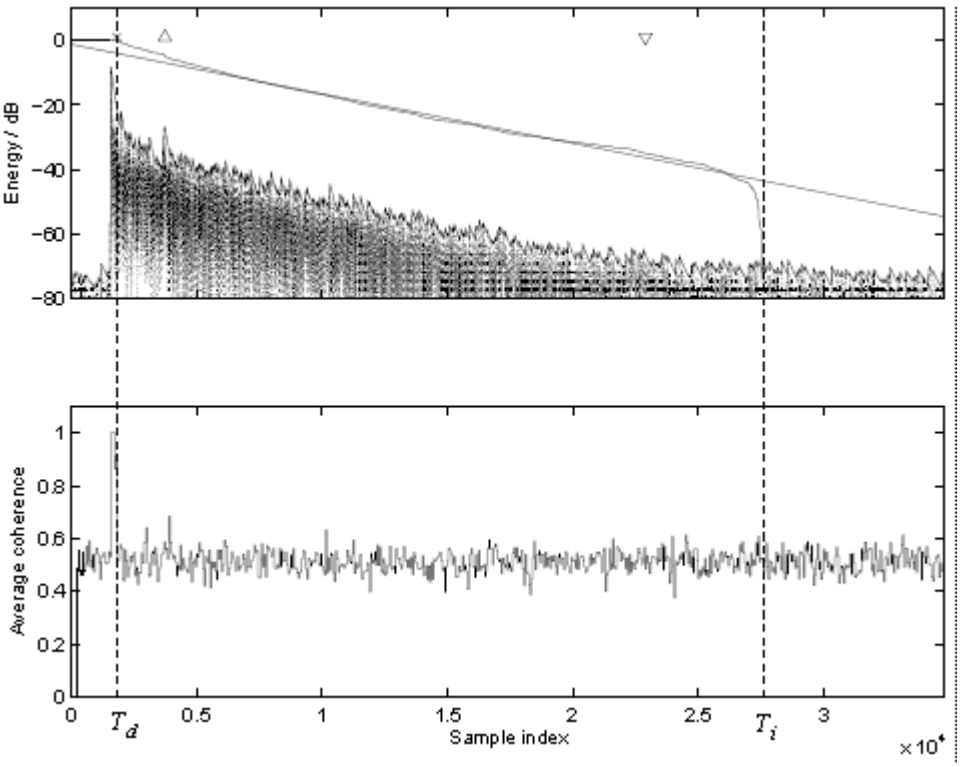


Fig. 6 An example of Schroeder integration with the limits Ti and Td

This RT 60 measurement method requires an impulse sound source such as a pistol, petard or other sound source that emits an impulse signal with a very high sound pressure level.

A graphical illustration of the data recorded using this method is shown in Figure 7.

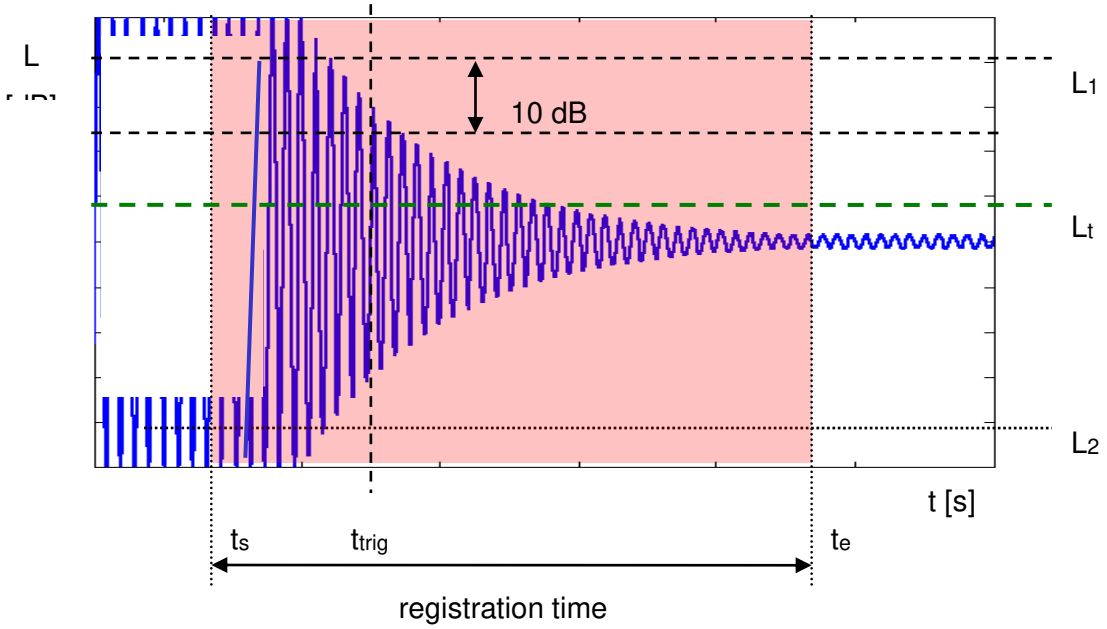


Fig 7. Data recording in the impulse method of the reverberation time evaluation

The measurement time in this method consists of:

- The time before the t_{trig} marker during which the Svantek instrument measures the actual sound pressure level and waits for the very high impulse sound pressure level that will meet the trigger condition. The trigger conditions are only met when the emitted pulse has a maximum sound pressure level higher than the L_t level (cf. Fig. 6). The L_t level in the Svantek instrument is adjusted by the **Level** item value (*path: <Menu> / Measurement / RT60 Settings*).
- The time between markers t_s and t_{trig} that is registered from the fulfilment of the trigger condition back to the point t_s to allow the beginning of the decay region to be recognised. In the Svantek instruments this time is equal to the **Time Step** item value (*path: <Menu> / Measurement / RT60 Settings*) multiplied by 50.
- The time between the t_{trig} and t_e markers registered since t_{trig} forward to record the whole decay curve together with a significantly long period of the noise level. This time in Svantek instruments is adjusted by the **Recording Time** item value (*path: <Menu> / Measurement / RT60 Settings*).

The above graph shows that the correct setting of the **Recording Time** value is very important. The recording time must be long enough to acquire a sufficient number of background noise level values. Otherwise, the decay curve region could not be properly analysed, or the decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than the expected reverberation time.