SVANTEK

USER MANUAL

SV 973

CLASS 2

SOUND LEVEL METER

& SOUND EXPOSURE METER

Warsaw, 2022-10-22

Rev. 1.02

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 1.04.x (see the ***Unit Label*** *review to check version details).*

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

WEEE 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.*

Technical Support Contact Information:

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1 INTRODUCTION

SV 973 is an extremely small Class 2 IEC 61672-1:2013 Sound Level Meter (**SLM**) with the real time 1/1 & 1/3 octave analyser option and Sound Exposure Meter (**SEM**) conforming to international standards ISO 9612 and OSHA (IEC 61252; ANSI S1.25).

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

The user interface of this instrument makes measurement configuration as easy as possible. This all makes SV 973 an ideal choice for industrial hygiene noise measurements, audiometric tests, short period environmental noise measurements, acoustics consultancy surveys, technical engineers dealing with noise issues and general acoustics noise measurements.

SV 973 provides broad band results with all required frequency weighting filters plus real time 1/1 octave & 1/3 octave spectra in the audio range.

The instrument enables huge time history logging capability providing broad band results and spectra with adjustable double (long and short) logging steps. Audio recording on user selectable trigger conditions complete the logging functionality. Data are stored on 8GB built-in micro SD chip and can be easily downloaded to a PC (with the provided SvanPC++ software) over the USB-C or optional RS 232 interfaces.

Direct printing feature enables quick on-site printing with the use of optional portable printer.

The instrument can be easily calibrated in the field using an acoustic calibrator.

Thanks to a robust pocket size housing and Low Energy **Long Range Bluetooth®**[1] **Smart** wireless interface, this instrument is an excellent tool for anyone who deals with acoustic measurements.

The instrument works with Svantek's dedicated health and safety software packages – **Supervisor** for data downloading, visualization, basic post-processing and exporting to commonly used office software applications and also with the full analysis package **SvanPC++**.

1.1 SV 973 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 running Leq (**LR15** and **LR60**) 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**
- **SEM** mode: **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **LEPd**, **Ltm3**, **Ltm5**, Leq statistics (**Ln**), **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**, expected Leq value (**EX**), standard Leq deviation (**SD**), measurement time, overload time % (**OVL**) and no-motion time 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

[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.

- 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 center 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), time history logging and audio recording
- **1/3 Octave** real-time analysis (option). Twenty eight 1/3-octave filters with center 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), time history logging and audio recording
- **Audio events** recording (option), trigger and continuous mode, 12 kHz and 24 kHz sampling rate, WAV format
- Optional reverberation time **RT60** analysis function for 1/1 octave bands or 1/3 octave bands and three total RMS levels (**A**, **C** and **Z** weighted) in accordance with the ISO 3382 standard.

Note: *SV 973 has two different dynamic ranges - one dedicated for the SLM functions (**Level Meter**, **1/1 Octave**, **1/3 Octave** and **RT60**) and another one dedicated for the **Dosimeter** function. Due to this the instrument uses two different calibration factors, and you must perform separate calibrations while using SV973 as SLM and as Dosimeter!*

1.2 GENERAL FEATURES OF SV 973

- 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 event recording (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
- 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 973** MEMS microphone with **LIFETIME WARRANTY!**
- **SC 158** micro USB-C cable
- **SA 22** foam windscreen
- **SA 80** pocket soft bag for SV 973
- **batteries** four AAA type
- **USB disk** with manual and links to the Supervisor and SvanPC++ installation files

1.4 ACCESSORIES AVAILABLE

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

Note: *The software options listed above can be purchased at any time, as only the entry of a special unlocks code is required for their activation.*

2 GENERAL INFORMATION

2.1 INSTRUMENT CONFIGURATIONS

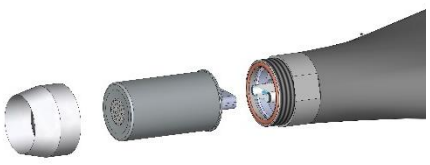
The instrument's normal operating mode as SLM assumes operating with the microphone attached to the instrument and without a windscreen. Optionally the instrument can be operated with the windscreen attached to the microphone (see Appendix C for specification).

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

2.1 INPUT AND OUTPUT SOCKETS OF THE INSTRUMENT

Top cover of the instrument

The measurement **Input** is placed in the centre of the instrument's top cover. The microphone capsule with the USB-C connector has a special locking ring with the screw. The ring should be tightened to light resistance only. The full description of the microphone connector is given in Appendix C.



Bottom cover of the instrument

In the bottom cover, there is only one socket - **USB**. This socket has a special protection cover held in place by a small captive screw.

The **USB-C Device** 2.0 interface is the serial interface working with 12 MHz clock in the full speed mode and with 480 MHz in the high-speed mode, which is a default mode of the instrument. Thanks to its speed, it is widely used in all PCs. The standard 4-pin socket is described in detail in Appendix C.

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

2.2 INSTRUMENT POWER

SV 973 can be powered by one of the following sources:

- Four AAA standard size batteries fitted internally. In the case of alkaline type, a new fully charged set can operate more than 20 h (6.0 V / 0.8 Ah). Measurements with the display off extend the working time to more than 30 h.
- **USB-C** interface – 100 mA HUB.

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

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

When voltage of the batteries is too low for reliable measurements, the icon is red and during attempt to switch the instrument on, the **Low Battery!** message occurs on the display for 2 seconds and the instrument switches off by itself.

Powering the instrument from the USB-C interface is performed by connecting its **USB** socket to the PC or other USB power source via the SC 158 cable.

When the USB is connected, the instrument automatically switches powering from the internal batteries to the USB powering. After disconnection the USB, the instrument will automatically switch powering to the internal batteries.

Note: *When the instrument is powering via USB, the internal batteries are slightly discharging. You should remember about this effect and remove the battery if discharging is undesirable.*

Note**:** *Use only high-quality USB-C cables, such as SC 158. Many poor-quality cables do not ensure low resistance of the cable, thus disabling proper operating of the instrument.*

When there is a connection to the USB-C interface (**USB Device** socket is connected by the SC 158 cable to a PC), the **"USB"** icon is presented on the top of the display and the **Battery** screen displays the source voltage.

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

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

2.3 CONTROL KEYS ON THE FRONT PANEL

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

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

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

The action given in (...) brackets denotes the second key function which is available after pressing 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 arrow keys. This key can be used in two different modes, which can be configured in the **Keyboard** screen (*path: <Menu> / Instrument / Keyboard*):

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

Note: *Simultaneous pressing of the* ***<Shift>*** *and* ***<Start/Stop>*** *keys turning the instrument on or off.*

<Start/Stop> This key allows you to start and stop a measurement process.

<Enter> This key allows you to open the selected position on the Menu list, to confirm selected settings or to switch the sub-views in the measurement mode. Some additional functions of this key will be described in the following chapters of this manual.

<ESC> This key closes lists of parameters or other screens and return to the upper list of the menu. It acts in an opposite way to the **<Enter>** key. When a screen is closed after pressing the **<ESC>** key, any changes just made are ignored.

In the Measurement mode, this key switches results presentation views.

<Shift>+<ESC> This combination of keys allows you to pause or break the measurement process temporarily. If there is no current running measurement in progress this key opens the Setup Manager menu.

◄ / ► These keys allow you, in particular, to:

- change viewed result in the measurement mode,
- select column in a multi-column parameter list,
- select parameter value in an active position (e.g. filter **Z**, **A**, **C**; integration period: **1s**, **2s**, **3s**, … etc.),
- control cursor in the **Logger**, **Statistics** and **Spectrum** views,
- select position of a character in the text editor screen,
- speed up changing of numerical values of the parameters when pressed and held.

(◄ / ►) These ◄ / ► keys pressed in together with **<Shift>** allow you, in particular, to:

- select parameter value in an active position (e.g. filter **Z**, **A**, **C**; integration period: **1s**, **2s**, **3s**, … etc.),
- shift cursor from the first to the last position and back on the plot.

▲ / ▼ These keys allow you, in particular, to:

- select position on the list,
- select correct character in the text editor screen.

(▲ / ▼) These ▲ / ▼ keys pressed with **<Shift>** allows you, in particular, to:

- change view in the measurement mode,

- change relationship between Y-axis and X-axis of plots,
- program the Real Time Clock (**RTC**) and delayed run **Timer**.

<Menu> The simultaneous pressing of the **<ESC>** and **<Enter>** keys opens the main **Menu** containing seven sections: **Function**, **Measurement**, **Display**, **File**, **Instrument**, **Aux. Setup** and **Report**. Each section contains positions, that open screens with submenu or lists of configuration parameters. These sections will be described in detail in the following chapters of the manual.

<REC> The simultaneous pressing of the ◄ and ► keys initiates recording of a voice signal as a comment (see Chapter 8.3).

2.4 WORKING WITH INSTRUMENT

To start using the instrument the user should turn it on with the **<Shift>** and **<Start/Stop>** keys at the same time. Hold both keys down for 1 or 2 seconds and release to switch on.

The instrument is controlled by means of eight keys on the keypad. Using these keys, one can access all available functions and change the value of all available parameters.

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

The instrument has two general modes of operation: measurement performance / results preview mode and configuration mode with the use of menu functionality.

2.4.1 Measurement mode

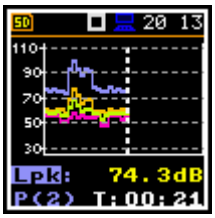
The measurement results can be viewed in different views, depending on the selected **Measurement Function**.

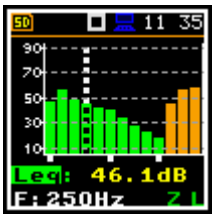
Measurement views

Views present measurement results as well as additional information by means of icons regarding:

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

Measurement results can be presented in different views, so called display modes, some of which are always available, and some can be activated or deactivated.





Some views present numerical and some graphical results, like on the right-hand example: time-history plot and spectrum.

In some display modes you can toggle sub-views by pressing the **<Enter>** key.

<ENT>

You can switch between views using the ▲ / ▼ keys pressed with **<Shift>**, or with the **<Esc>** key.

All icons are described in Chapter 2.6, other fields and view control functions - in Chapter 5.

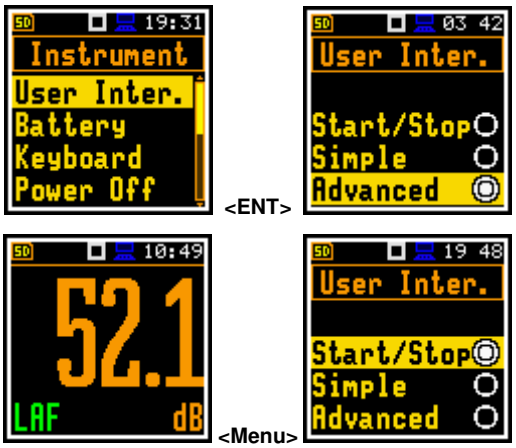
2.4.2 Configuration mode

To configure a measurement or the instrument, use the menu, which is switched with the **<Menu>** key. The menu consists of different type of screens, which include main menu, sections, lists of options, lists of parameters, text editor screens, information screens etc.

User interface mode

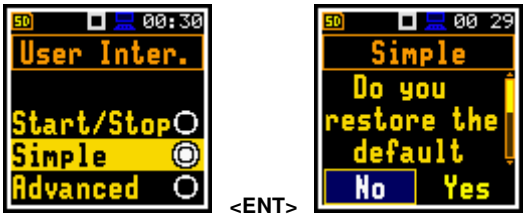
The user interface may be presented in three modes: **Start/Stop**, **Simple** or **Advanced**. These modes can be selected in the **User Inter.** screen of the **Instrument** section. The **Simple** mode enables basic instrument settings, while the **Advanced** mode enables full scope of available settings. Many screens can therefore have different view depending on the selected operational mode.

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



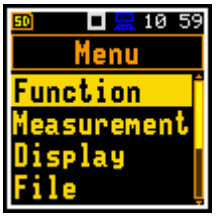
Note: *For parameters hidden in the* ***Simple*** *interface mode the instrument will use settings previously defined in the* ***Advanced*** *mode or default settings.*

When the **Simple** interface mode is being selected after the **Advanced** mode the instrument proposes to restore the default settings by asking the question: **Do you restore the default value of the advanced settings?** In case of **No**, all hidden in the **Simple** mode parameters will have settings defined in the **Advanced** mode. In case of **Yes**, the instrument will set all hidden parameters to default values.



Main menu

The main menu (**Menu**) contains headers of seven sections, which contain another sub-menu. The main menu is opened after pressing the **<Menu>** (**<Shift>** and **<Enter>**) key.

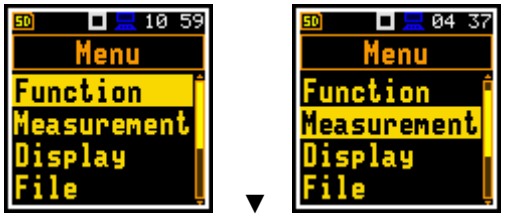


Recent Items list

Double-pressing of the **<Menu>** key opens the list of recently used menu items. This enables accessing most frequently used lists of parameters and lists of options quickly, without the necessity of passing through the whole menu.

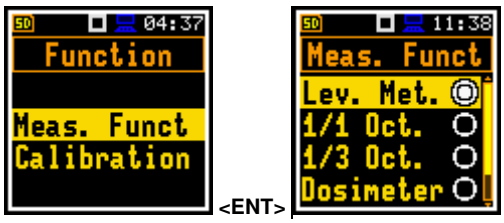
Selecting position

The desired position in the list is selected with the ▲ / ▼ key.



Opening position

After selecting a desired position in the menu list, press the **<Enter>** key to open it. After this operation, a new sub-menu, list of option, list of parameter or information screen appears on the display.



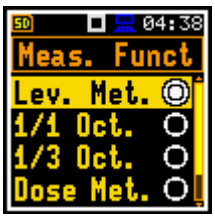
List of parameters

A list of parameters contains parameters for which you may select the value from the available set.

- Use the ▲ / ▼ key to select a parameter in the list.
- Use the ◄ / ► key to change a value of the selected parameter.
- Press **<Enter>** to saves all performed changes in the list of parameters.

List of options

In the list of options, you can select only one option. The selection of an option is performed in the following way. Select the desired option with the ▲ / ▼ key and press **<Enter>**. This option becomes active and the list is closed. After re-entering this list again, the last selected option will be marked.



If the parameter has a numerical value, you can speed up a selection by pressing the ◄ / ► key and keeping it pressed by more than 2 seconds. In this case, the parameter value starts to change automatically until you release the pressed button.

You may change the numerical parameter value with a larger step (usually 10) with the ◄ / ► key pressed with **<Shift>**.

Matrix of parameters

When the 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>**.

Complex parameters

For complex parameters, consisted of more than one value field like **RTC** or result screen, you should select the field with the ◄ / ► / ▲ / ▼ key and then select the value with the ◄ / ► key pressed with **<Shift>**. The selection should be confirmed by **<Enter>**.

In all cases the **<Enter>** key is used for confirmation of changes and for closing the opened list. The list is closed, ignoring any made changes by pressing the **<ESC>** key.

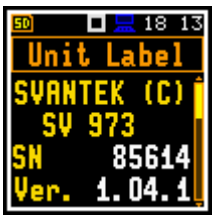
Text editor screen

There are screens used for text edition (i.e. the name of the file). Such screens contain help information to guide on how to edit the text. The character which is displayed inversely may be edited.

- Use the ◄ / ► key to select a position of the character in the edited text.
- Use the ▲ / ▼ key to change the existing character with another ASCII character. The subsequent digits, underline, upper case letters and space appear in the inversely displayed position after each press of said key.
- Use the ◄ / ► key pressed with **<Shift>** to insert or delete a position in the edited text.

Information screen

Some screens inform about the state of the instrument, available memory, standards fulfilled by the instrument, etc. To scroll through the screen, use the ▲ / ▼ keys. To close such screen, press **<ESC>**.



Help information

In most screens, the last line or two lines contain help information: how to select or modify the parameter's value, change the character in the text line etc. For example, **Delete: Shift <** means that you can delete the selected position with the ◄ key pressed with **<Shift>**.

Inactive parameters

If some functions or parameters are not available, the positions in the menu or parameter lists linked with this function or parameter become inactive (the selected line field will be in the frame with black background, not yellow). For example, if **Logger** (*path: <Menu> / Measurement / Logging / Logger Set.)* is switched off, some other **Logging** positions become not active!

2.5 GETTING STARTED

Turning instrument on

To switch the power on, press the **<Shift>** and **<Start/Stop>** keys simultaneously. The instrument goes through the self-test routine (during this time the manufacturer's logo and the name of the instrument is displayed) and then it enters Running SPL view mode, if it was enabled, or One profile view.

Starting measurements

To start a measurement, press the **<Start/Stop>** key. After start delay count down the results of the measurement will be displayed in the one profile view.

After turning on, the instrument requires 30 seconds to warm up. If you press the **<Start>** key earlier, the instrument will delay a measurement for longer time.

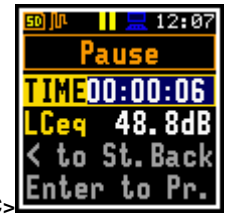
<Start>

One profile view is always available for most Functions of the instrument. The measurement results can also be presented in other views, which you may enable or disable.

Pausing measurement

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

<Sh+ESC>



The Pause mode allows you to erase up to 30 last seconds of the measurement which may be useful if, for example, the measurement is temporarily disturbed by some sound that should not normally occur.

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

◄ ..◄

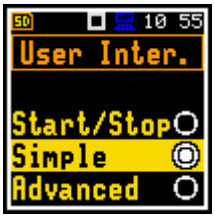
Setting default parameters

The instrument as sold has default settings which you may change, but always return to them with the use of the **Factory Settings** function of the **Auxiliary Setup** section.

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

Main default settings

With default settings, the instrument has the **Simple** user interface and is configured as the Sound Level Meter (**Measurement Function: Level Meter**) to measure sound pressure level by three virtual meters, so called profiles, with 1 second delay from the **<Start>** key pressure, infinite integration time (**Integration Period: Inf**), linear Leq integration (**LEQ Integration: Linear**), compensation of microphone internal noise and case effect in the free field (**Microphone: On**, **Field Comp.: Free Field**), active logging of the selected results (**Lpeak**, **Lmax**, **Lmin** and **Leq**) with 1 second step for all profiles and summary results saving. Other functions are switched off, like measurement trigger, logger trigger, event recording and timer.



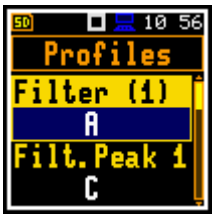
The logger and summary results will be automatically saved in the file with the name presented in the **Logger Setup** list (**Logger Name: Lxxxx**).

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**);



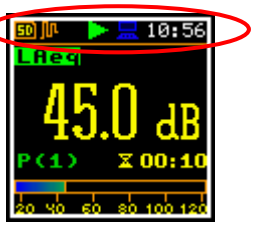
You can change all above-mentioned settings using the **Profiles** position of the **Measurement** section. The instrument remembers all changes by the next time it is used. You can return to default settings (set up by the manufacturer) with the use of the **Factory Set.** position in the **Aux. Setup**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

2.6 DESCRIPTION OF ICONS

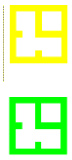
Indicators of the instrument state

Additional information about the instrument's state gives the row of icons visible in the top line of the display.

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



Meanings of icons are as follows:

 "**run**" icon is displayed when the measurement is running, and the icon shape is changing from self to contoured.	 "**SD card**" icon is displayed when the SD-card memory is in operation and has free space. Grey colour of the icon means that the card memory is full.
 "**wait**" icon is displayed when the instrument waits for the measurement start after pressing **<Start>** key due to a start delay or a delay caused by a trigger.	 "**no card**" icon is displayed when the SD memory card has malfunction.
 **"stop"** icon is displayed when the measurement is stopped.	**"pause"** icon is displayed when the measurement is paused.
 "**overload**" icon is displayed when during the measurement the overload was registered.	 "**underrange**" icon is displayed when during the measurement the underrange was registered.
 "**logger**" icon is displayed when the current measurement results are logged into the instrument's logger file. Grey colour of the icon means that the instrument waits for the logging start after pressing **<Start>** key due to a start delay or a delay caused by a trigger.	 "**signal**" icon is displayed during wave recording. Grey colour of the icon means that the instrument waits for the wave recording start after pressing **<Start>** key due to a start delay or a delay caused by a trigger.
 **"battery"** icon is displayed when the instrument is powered from the internal batteries. Icon colour corresponds to the charging status of the batteries (green - 30÷100%, yellow – 10÷30%, red – less than 10%).	 **"clock"** icon is displayed when the timer is **On**. It is active when the instrument is waiting for the measurement start to occur. When the measurement start is close, the icon changes its colour to green and start blinking.
 **"level +"** icon is displayed when the trigger condition is set to „**Level +**". The icon appears alternately with the „wait", "logger" or "wave" icons.	 **"level -"** icon is displayed when the trigger condition is set to „**Level -**". The icon appears alternately with the „play", "logger" or "wave" icons.
 **"slope –"** icon is displayed when the trigger condition is set to „**Slope-**". The icon appears alternately with the "wave" icons.	 **"slope +"** icon is displayed when the trigger condition is set to „**Slope+**". The icon appears alternately with the "wave" icons.
 **"trigger"** icon is displayed when other than Level or Slope trigger is waiting for condition fulfilment. The icon appears alternately with the "play", "logger" or "wave" icons.	 **"Bluetooth"** icon is displayed when the *Bluetooth®* is switched on. Color of the icon defines state of the connection: green – connected, grey – disconnected.
 "**USB**" icon is displayed when there is USB connection with the PC.	 **"Shift"** icon is displayed when the **<Shift>** key is pressed.
 **"RS232"** icon is displayed when the RS232 port is activated.	 "**plug**" icon is displayed when the instrument is powered through the USB-C socket without using USB interface.

2.7 OVERLOAD AND UNDERRANGE DETECTION

Overload detector

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

An overload is indicating by the flashing icon which is displayed during the period from the overload detection till the end of the Integration Period. If the overload disappears to the Integration Period end, the overload icon will not be displayed from the start of the next measurement cycle.

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

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

Underrange detector

The instrument has the 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 indicating by the flashing icon which is displayed during the period of the underrange detection. When an underrange is detected till the Integration Period, the special marker will be recorded to the logger file with the Integration Period step. If during the Integration Period the signal level increases and the total RMS is greater than the minimum, the icon stops displaying and the underrange marker is not recording.

2.8 SAVING DATA

The instrument creates files of the next types:

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

Detailed description of structures of all file types is given in Appendix B.

Memory type

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

File manager

The **File Manager** is used for checking content of the memory and operations on files and directories such as: renaming, deleting, displaying information and creating new directories.

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

The content of the memory can be checked with the help of the **File Manager** position in the **File** section.

Automatic saving logger and wave files

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

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 defined 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, which was set as a working directory. The default working directory (after using **Factory Settings** function) is called **SVANTEK**.

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

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

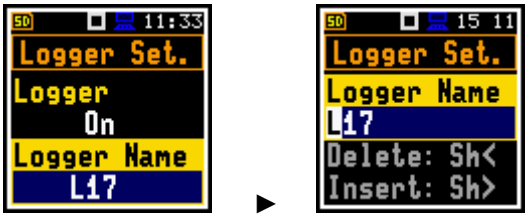
The default prefix for the logger files is **L** and for the wave files - **R**.

The instrument assigns an individual counter to each prefix of files the user has created 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 with names: **L0**, **L15** and **L16**, the counter value is 16.

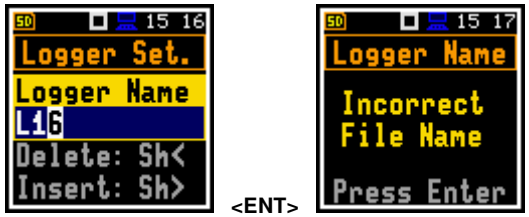
The number of the new automatically created file will have the value of the counter increased by one. So, for the above example, new file name will be **L17**.

You can change the automatically generated file name in the special screen, which is opened after pressing the ◄ / ► key.

After changing the number in file name without changing the prefix and pressing **<Enter>**, the counter will be automatically adjusted.



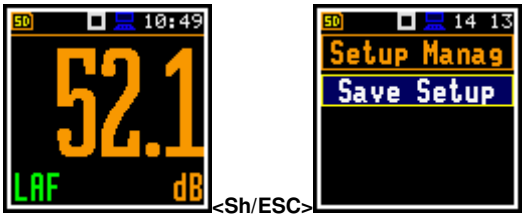
The instrument accepts only that name which number is higher than the counter of the prefix.



Saving setup files

Setup files can be created by means of the **Setup Manager** or from the measurement screen with the **<ESC>** key pressed with **<Shift>**, when a measurement is not running.

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



2.9 DOWNLOADING AND UPLOADING FILES

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

SvanPC++ and Supervisor enable also uploading functions (usually for setup files).

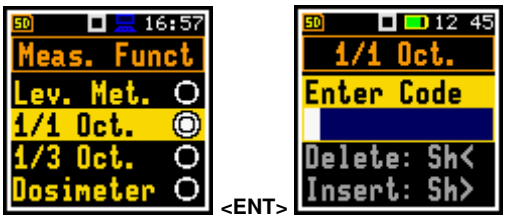
***Note**: Working with SvanPC++ and Supervisor software is fully described in the documents: "SvanPC++ User Manual" and "Supervisor User Manual".*

2.10 ACTIVATING OPTIONAL FUNCTIONS

Standard instrument firmware contains all basic functions to perform measurements in accordance with most international standards and methods. For more complex tasks you may expand the instrument with additional functions. These features include 1/1 and 1/3 octave analyser, wave recording and reverberation time measurement.

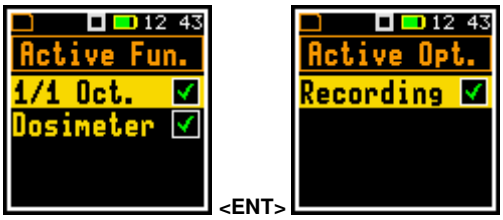
If additional functions were not included in the instrument kit and were not unlocked by the supplier, such a task is in responsibility of the user who decides to buy additional functions later.

The optional function is activated when you try to use it for the first time. For example, if **1/1 Octave** was locked, but is purchased later, then during the first attempt to switch it on, the instrument requires entering the special code that will unlock this option. Once unlocked the option is available permanently.



Pressing the **<Shift>** and ◄ keys right after turning on the instrument enables checking and locking early unlocked options.

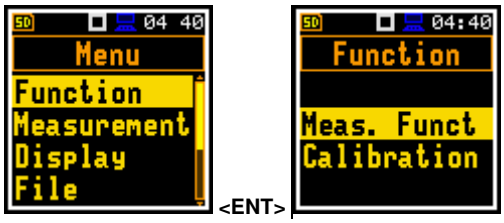
To select other options, press the **<Enter>** key, which opens another page of the **Active Functions/Options** list.



3 MEASUREMENT FUNCTIONS AND CALIBRATION – Function

In the **Function** section, you can select the measurement function (**Meas. Funct**) and perform the instrument calibration (**Calibration**).

To open the **Function** section, press the **<Menu>** key, select the **Function** position and press **<Enter>**.

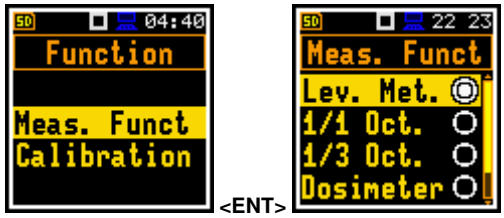


3.1 ACTIVATING MEASUREMENT FUNCTIONS – MEASUREMENT FUNCTION

The main function of the instrument is measurements of the broadband sound pressure level (**Lev. Met.**). The Sound Level Meter (SLM) function meets the standard IEC 61672-1:2013 for Class 2 accuracy.

You may also use 1/1 and 1/3-octave band real time analysis, dose meter (dosimeter) and reverberation time options. These options broaden the main Level Meter functionality of the instrument, because 1/1 and 1/3-octave analysis as well as dose meter measurements are performed along with all calculations of the broadband Level Meter results.

To activate a measurement function, open the **Meas. Funct** list and select with the ▲ / ▼ keys the required function: **Level Meter**, **1/1 Octave**, **1/3 Octave**, **Dosimeter** or **RT60**.



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

Note: *The **1/3 Octave** and **RT60** functions are optional and should be unlocked by entering an activation code in the text editor screen, which is opened after first attempt to select it. Once unlocked, this function will be available permanently.*

Optional functions that broaden the applications of the instrument can be easily installed. These optional functions can be provided initially by the manufacturer or can be purchased later when required.

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

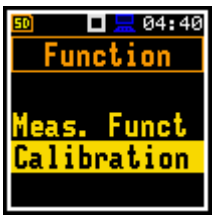
3.2 INSTRUMENT'S CALIBRATION – CALIBRATION

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

Due to automatic calibration option the instrument can perform the sound calibration automatically, when the calibrator is placed over the microphone (switched on or with the auto run function). The calibrator signal is automatically detected, and the calibration measurement is started automatically. Just press **<Enter>** to confirm the calibration results. A sound measurement cannot be in progress while the automatic calibration is being performed.

Note: *SV 973 has two different dynamic ranges - one dedicated for the SLM functions (**Level Meter**, **1/1 Octave**, **1/3 Octave** and **RT60**) and another one dedicated for the **Dosimeter** function. Due to this the instrument uses two different calibration factors, which are both calculated during the calibration.*

In the **Simple** user interface, the **Calibration** list comprises positions enabling calibration with the use of the sound calibrator (**By Measure.**), checking and erasing previous calibration records (**Last Calibration**, **Calibration History**, **Clear History**), adding current calibration results to the logger file (**Post Cal.**).



<ENT>


In the **Advanced** user interface, there is additional position in the **Calibration** list - **Auto Calibration**, which allows you to switch on/off the auto calibration function.

Note: *It is advised to perform calibration of the instrument each time before the measurements begin. A single calibration at the start of each day is usually sufficient for most regulations.*

Note: *The calibration factor is always added to measurement results and measurement range limits of the* ***Lev. Met.****,* ***1/1 Oct.****,* ***1/3 Oct.****,* ***RT60*** *and* ***Dosimeter*** *functions.*

Note: *The recommended factory calibration interval is 12 months for instruments to be confident in their continuing accuracy and compliance with the international codes. Please contact your local Svantek distributor for further details.*

Note: *It is possible to perform so called "By Sensitivity" calibration by setting the calibration factor with the use of 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 attach the sound calibrator (SV 34B or equivalent 114 dB / 1000 Hz) to the instrument's microphone.

Note: *It is also possible to use an electro-mechanical pistonphone, which generates the signal (ca 124 dB) or different type of sound calibrator dedicated for ½" microphones.*

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

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

The calibration process is divided into calibration of the Level meter and calibration of the Dosimeter. The progress bar displays the entire progress of the calibration.

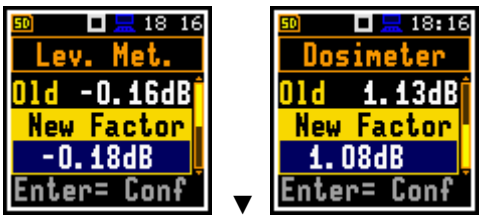
During the first calibration, the level of the calibration signal measured by the Level Meter is displayed until the measured result stabilizes (the maximum difference between three consecutive 1-second LCeq results should be within 0.05 dB). The result of the calibration will then be displayed and the next measurement for the Dosimeter will be waiting for the start.

...


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 within 0.05 dB).

After second calibration stop the screen with both calibration factors will be displayed.

The screen with the calibration factors is divided into two parts. First part displays the calibration factor for the Level Meter. You can scroll to the Dosimeter part with the ▼ key.



It is recommended to repeat calibration measurements few times. Obtained results should be almost the same (with ±0.1 dB difference). Reasons for unstable results are as follows:

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

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

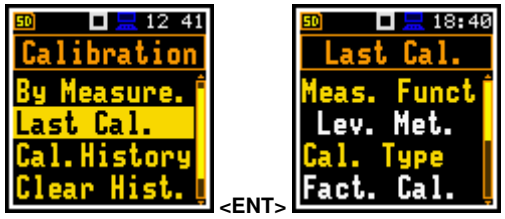
5. Press **<Enter>** to accept and save the new calibration factors.
6. Detach the calibrator from the microphone.

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

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

3.2.1 Last calibration record – Last Calibration

The **Last Cal.** screen displays the information regarding recent calibration record for the current measurement function: 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.



3.2.2 History of calibrations – Calibration History

The **Cal. History** screen displays list of calibration records which you can view by pressing the **<Enter>** key.

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

The calibration record includes information about the 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.

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

3.2.3 Erasing calibration records – Clear History

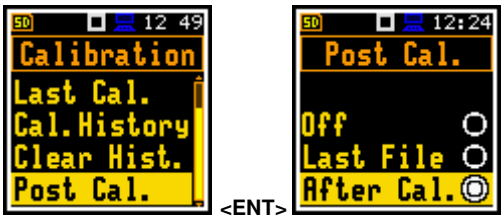
To erase all calibration records in the history, choose the position **Clear Hist.** and press **<Enter>**.

The instrument requests confirmation of the selected operation.

3.2.4 Post measurement calibration – Post Calibration

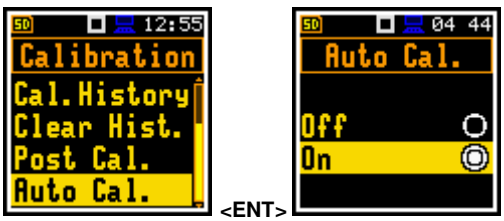
Some regulations require to add information about calibration performed after measurements to the files with measurement results created before such calibration. The latest calibration factor is for information purpose only since it was not considered during the measurement.

The **Post Cal.** screen allows three options: not to save (**Off**), save in the last created file (**Last File**) or save in the files which were created after the previous calibration (**After Cal.**).



3.2.5 Automatic calibration – Auto Calibration

The **Auto Cal.** position enables the user 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 switched off, the user should enter this screen through the **Menu**.



Automatic calibration feature was implemented to make calibration as easy as possible and allow the user to perform calibration of SV 973 with minimum steps.

If the automatic calibration is switched on, the instrument, when it doesn't perform the measurement, periodically compares the measured signal level (Running SPL for 1 second) with the reference calibration level and starts the calibration measurement if the stable SPL result is within ±5dB of the calibration level.

To perform the automatic microphone calibration, follow next steps:

1. Switch on the instrument.
2. Attach the SV 34B (or equivalent 114 dB/1000 Hz) calibrator to the microphone and switch it on (if the used calibrator doesn't have automatic switch-on feature).

The calibration starts automatically, and the calibration process is similar as in case of calibration By Measurement.

Note: *The automatic calibration will be performed regarding the calibration level set in the* ***By Measurement*** *screen.*

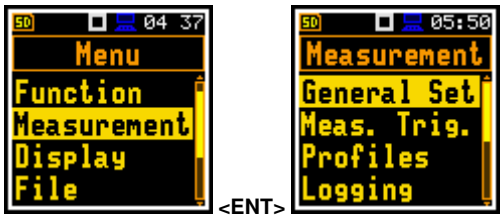
3. Press **<Enter>** to accept and save the new calibration factors.
4. Detach the calibrator from the microphone.

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

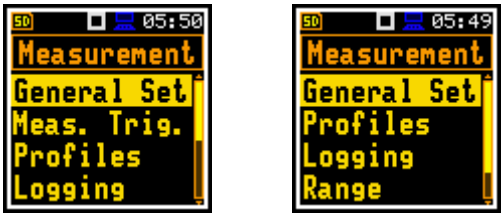
4 CONFIGURING MEASUREMENT PARAMETERS – Measurement

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

To open the **Measurement** section, press the **<Menu>** key, select the **Measurement** position and press **<Enter>**.



The content of the **Measurement** list depends on the **Interface** mode **(Simple** and **Advanced)** and **Measurement Function**. Some example screens for **Advanced** and **Simple** modes are presented.



The **Measurement** section contains following positions:

General Set allowing you to set general measurement parameters;

Meas. Trig. allowing you to configure the measurement trigger. This position appears only in the **Advanced** interface mode;

Profiles allowing you to set parameters specific for the profile. This position disappears in the **Dosimeter** function;

Profile 1 (2,3) allowing you to set parameters specific for profiles in the **Dosimeter** function. These positions appear only in the **Dosimeter** function instead of **Profiles**;

Alarm allowing you to programme the alarm function. This position appears only in the **Dosimeter** function and **Advanced** interface mode;

Logging allowing you to configure the logging function;

Spectrum allowing you to set spectrum parameters. This position becomes available only in **1/1 Oct.** and **1/3 Oct.** functions;

Range allowing you to check the available measurement range;

Comp. Filter allowing you to switch on the required compensation filter. This position appears only in the **Advanced** interface mode;

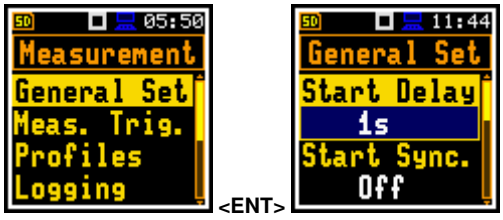
Stat. Lev. allowing you to define 10 statistical levels;

Exp. Time allowing you to set the exposure time for dose measurements. This position appears only in the **Dosimeter** function and **Advanced** interface mode;

Timer allowing you to programme the internal timer. This position appears only in the **Advanced** interface mode.

4.1 SETTING GENERAL MEASUREMENT PARAMETERS – GENERAL SETTINGS

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



Delay of measurement start

The **Start Delay** parameter defines the delay period from the **<Start/Stop>** keystroke to the real start of the measurement (digital filters of the instrument constantly analyse the input signal even when the measurement is stopped). This delay period can be set from **0 second** to **60 minutes**. Its value by default is set to **1s**.

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

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

Note: *After turning on, the instrument requires 30 seconds to warm up. If you press the **<Start/Stop>** key earlier, the instrument will start a measurement not earlier than after 30 seconds.*

Synchronisation of measurement starts

The **Start Sync.** parameter defines synchronisation points with the instrument's RTC. The **Start Sync.** parameter can be set as: **Off**, **1m**, **15m**, **30m** and **1h**. For example, if **1h** is selected, the measurement will start from the beginning of the first second of next hour after the **<Start/Stop>** keystroke, and then will be repeated also from the first second of the following hour after elapsing the integration period if the number of cycles is greater than one. The default value is set to **Off**.

Integration period

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

During the Integration Period, the instrument performs series of 1-second measurements/integrations, and every second averages 1-second results with the results averaged for the n-1 seconds. These averaged results are displayed and renewed every second for the elapsed measurement time (n seconds). In the end of the Integration Period the averaged measurement results are saved in the logger file providing that such saving is switched on.

The measurement will stop automatically after this period and start again if the number of measurement repetitions (**Rep. Cycles**) is greater than one.

The definitions of the measurement results in which the integration period is used are given in Appendix D.

Number of measurement repetitions

The **Rep. Cycles** parameter defines the number of measurements (with the measurement period defined by the **Integr. Per** parameter) to be performed by the instrument after the **<Start/Stop>** keystroke. The **Rep. Cycles** number values are within the limits [Inf, 1÷1000]. Its value by default is set to **1**.

For example, if **Integr. Period** is equal to 8 hours and **Rep. Cycles** is equal to 2, the instrument performs first integration for the 8-hour period from the measurement start and second integration for the 8-hour period from the end of the first integration. At the end of each cycle the 8 hours LEQ will be saved in the logger file.

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

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

Day time limits

The **Day Time Limits** parameter defines the day and night time limits required by the local standards. These limits are used for the calculation of the **Lden** function (see Appendix D for definition). Two options are available: **6H-18H** and **7H-19H**. By default, it is set to **6H-18H**.

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

Detector type

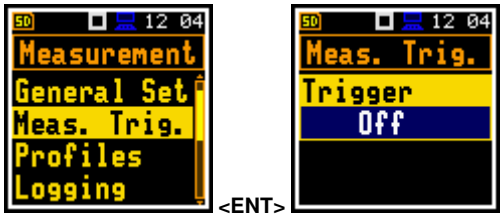
The **LEQ Integration** parameter defines the detector type for calculation of the **Leq**, **Lden**, **LEPd**, **Ln** and **Sel** results. Two options are available: **Exponential** and **Linear**. The formulae used for the **Leq** calculation are given in Appendix D. Its value by default is set to **Linear**.

Linear is required for obtaining the true RMS value of the measured signal. When this option is selected values of the **Leq**, **Lden**, **LEPd**, **Ln** and **Sel** results do not depend on the detector time constant: **Fast**, **Slow** or **Impulse** (results are displayed without indication of detectors selected in profiles). In this case, the indicator **Lin.** (or **L**) is displayed in different views.

Exponential enables fulfilling the requirements of another standard for time averaged **Leq** measurements. When this option is selected values of the **Leq, Lden, LEPd, Ln** and **Sel** results depend on the detector time constant. Results are displayed with the indicator of the detector type selected in the profiles (*path: <Menu> / Measurement / Profiles*).

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

4.2 SETTING MEASUREMENT TRIGGER – MEASUREMENT TRIGGER

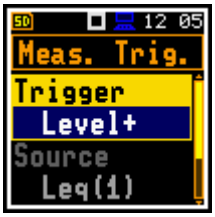


The **Meas. Trig.** position appears only in the **Advanced** interface mode and enables setting parameters of the measurement trigger. The **Meas. Trig.** is a contexts list of parameters in which the trigger (**Trigger**) can be switched **Off** or On by selecting the trigger type (**Level +**, **Level –** or **Gradient +**). In case the trigger is on, additional parameters can be defined: the measurement result that is checked for a trigger condition (**Source**), its threshold level (**Level**) and the speed of the Source value changing (**Gradient**).

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

The trigger condition is checked every 0,5 milliseconds.

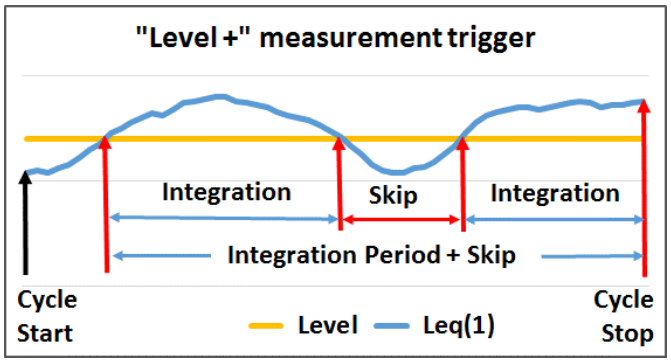
Level trigger



The **Level +** trigger starts the 1-second measurement/integration under the condition: value of the RMS result (**Source**) integrated by 0,5 ms is greater than the threshold value (**Level**). In other cases, the instrument continues checking the trigger condition every 0,5 mc.

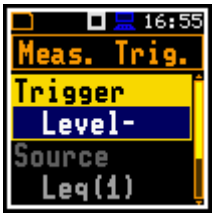
When a new measurement cycle begins (after pressing the **<Start/Stop>** key or automatically after previous measurement cycle stop) the instrument checks a trigger condition every 0.5 ms and starts 1-second integration if condition is met.

After 1-second integration, the instrument repeats trigger condition checking every 0.5 ms and starts next 1-second integration if condition is met. The instrument does it as many times as many seconds are within 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 moment with the **<Start/Stop>** key. Summary Results are calculated on the base of series of 1-second results measured during each measurement cycle and saved in a logger file.

The **Level -** trigger 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 mc.

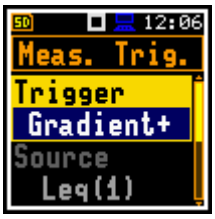


This is a mirrored trigger to the **Level +** trigger.

Note: *When a measurement is waiting for the level trigger, the flashing "level" icon superimposes on the „wait" icon.*

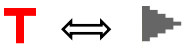
Gradient trigger

The **Gradient +** trigger 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**) and the gradient of the Source value is greater than the gradient threshold value (**Gradient**). In other cases, the instrument continues checking the trigger condition every 0.5 mc.



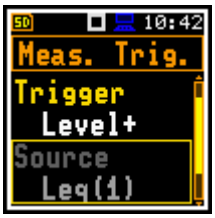
This trigger has the same logic as the **Level +** trigger, but the trigger condition requires also the gradient threshold level to be exceeded.

Note: *When a measurement is waiting for the gradient trigger, the flashing "trigger" icon superimposes on the „wait" icon.*



Source result

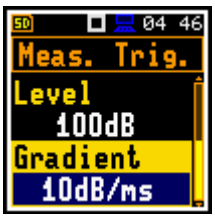
Only one measured result (**Source**) can be used for checking trigger condition in the **Level Meter** mode, namely the instantaneous LEQ from the first profile (with appropriate filter and detector), which is denoted here as **Leq(1)**. This position cannot be changed.



Threshold level

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

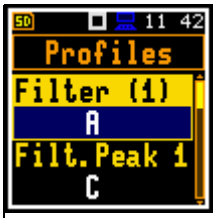
Speed of Source value changing



This position appears when the **Gradient+** trigger is chosen. The speed of the **Source** value changing (**Gradient**) can be set in the range from **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 (in case of **Lev. Met.** function) or in the **Profile x** screens (in case of **Dosimeter** function).

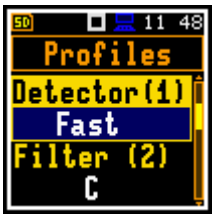
Following parameters can be programmed independently for each profile: weighting filters for other than peak results calculations (**Filter**), weighting filters for peak results calculations (**Filter Peak**) and LEQ detectors type (**Detector**).

Weighting filter

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

- **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,
- **LF** low frequency filter according to China requirements.

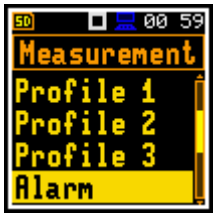
LEQ detector selection



Available LEQ detectors (time constants): **Impulse**, **Fast** and **Slow**.

Time constants are applied always to the **Lmax**, **Lmin**, **L**(SPL), **Ltm3** and **Ltm5** results and to the **Leq**, **LE**(SEL), **LEPd** and **Lden** results in case the **Exponential** LEQ detector is selected in the **General Settings** screen (see Appendix D).

4.4 SETTING ALARM THRESHOLDS FOR DOSE METER – ALARM



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The **Alarm** position is active only in the **Dosimeter** function and is described in detail in the **DOSIMETER** section of this manual.

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 saved in the file with the step defined by the **Integration Period** parameter as many times as defined by the **Repetition Cycles** parameter (*path: <Menu> / Measurement / General Settings*).

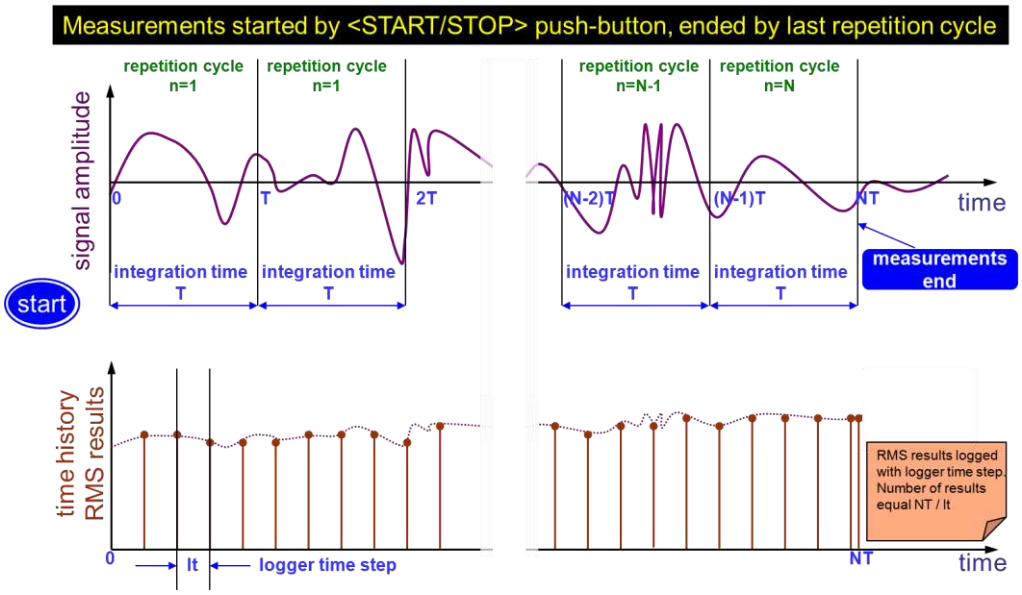
The instrument enables also additional registration of some results with different step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). Therefore, it is possible to save in parallel two sequences of measured results – one for Summary Results (SR) and another for so called Logger Results or Time History results (TH).

When logging is enabled, selected logger results taken from three independent profiles will be saved simultaneously with time step down to **100ms**. Recording of logger results to a file is stopped after the

period, which is equal to **Integration Period** multiplied by **Repetition Cycles** or after stopping a measurement manually.

Summary Results are saved in the same file with Logger Results. Blocks of summary results are recorded to the file in the end of every measurement cycle.

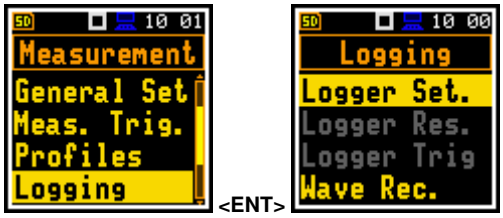
The figure below illustrates principles of logging measurement results.



Summary Results and Logger Results logging

The **Logging** list enables programming of the logging functions: recording of summary and logger results (measurement history) in a logger file and recording of audio signal in a wave file.

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



4.5.1 Setting general logging parameters – Logger Setup

The **Logger Set.** list enables activating the logging function (**Logger**) and programming logger general parameters.

The **Logger** position switches **On** or **Off** the logging functionality.

Switching on the **Logger** (**On**) activates two positions in the **Logging** list, which enable the user to save selected results from the three profiles and spectra with the step defined by the **Logger Step** parameter (**Logger Results**) and program the **Logger Trigger**.

***Note:** If **Logger** is **Off**, result files are not created, and measurement results (both summary and logger) are not saved!*

Splitting logger file

The **Log. Split** position enables splitting the data logging 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** position.

In other cases, registration will be carried out in separate files and the registration in the new file will start after expiration of 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 specified by the user times (**Spec. Time**). Whenever the split time is achieved the logger file is closed and the new file with the increased by one number is opened for subsequent measurement data.

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

If **Spec. Time** is selected in the **Log. Split** position, 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** defines a step for logger results measuring and logging in a file. It can be set from **100ms** to **1h**. Its value by default is set to **1s**.

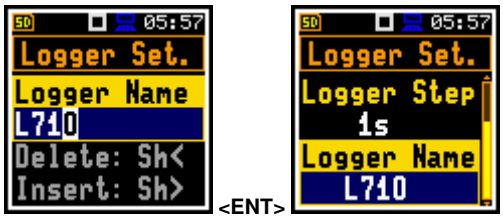
Note: *In the **Simple** interface mode, the **Logger Step** parameter is hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (**1s**).*

Logger file name

The **Logger Name** position enables defining the logger file name, which consists of a prefix and a number. The default logger file prefix is **L**. The name can be of up to eight characters long. After pressing the ◄ / ► key, the text editor screen is opened.

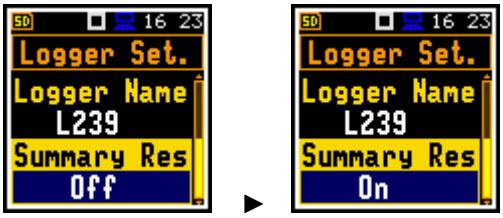
The edited name is accepted and saved after pressing the **<Enter>** key. The special warning is displayed in case the file with the same name already exists in the memory. The instrument informs with the message “Incorrect File Name” and waits for the **<Enter>** key to be pressed.

If the name is new the instrument changes the **Logger Name** in the **Logger Setup** list.



Summary Results saving

The **Summary Results** parameter switches on or off saving the full set of Summary results that the instrument measures with the **Integration Period** step: **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **OVL**, **Lpeak**, **Lmax**, **Lmin**, **EX**, **SD**.



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

4.5.2 Selecting results for logging – Logger Results

In the **Logger Results** list, you can select results for three independent profiles, which will be logged in a logger file with the **Logger Step**.

The list of logger results depends on the measurement function. For the **Level Meter** function, it is possible to log next results: Lpeak (**Lpk**), **Lmax**, **Lmin** and **Leq**.

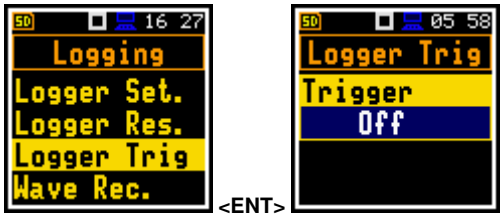
Activation / deactivation can be done with the ◄ / ► key pressed with **<Shift>**. The position is changed with the ◄ / ► and ▲ / ▼ keys.

Note: *When **Logger** is switched **Off** or no results for logging were selected, the logger plot cannot be activated in **Disp. Modes** and therefore doesn't appear on the display.*

Note: *In the **Simple** interface mode, the **Logger Results** position is hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (all results).*

4.5.3 Configuring Logger trigger – Logger Trigger

In the **Logger Trigger** screen, you can configure the way the logger results are to be registered in the logger file. It is a context list of parameters in which the trigger can be disabled (**Off**) or enabled by selecting its type (**Level+** or **Level-**) in the **Trigger** position.



When the trigger is enabled, other parameters appear in the list: a measured result that is checked for a trigger condition (**Source**), a threshold level (**Level**) as well as a number of results saved in the logger before the trigger condition is met (**Pre**) and the number of the results saved in the logger after the last trigger condition is met during logging (**Post**).

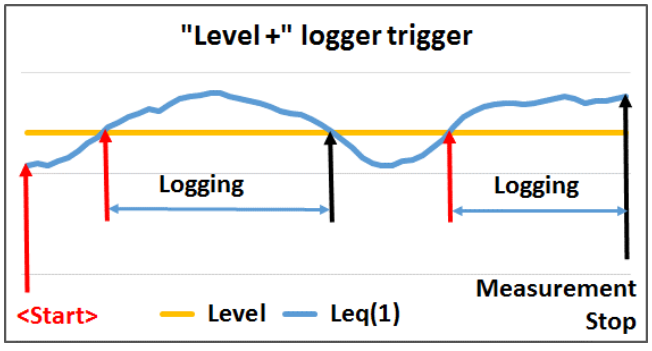
Note: *In the **Simple** interface mode, the **Logger Trigger** position is hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (**Trigger: Off**).*

Level trigger

The **Level +**/**Level -** trigger enables logging of the time-history results (**Logger Results**) with the **Logger Step** under the condition: value of the LEQ result (**Source**) averaged by the **Logger Step** period is greater/lower than the threshold value (**Level**). In other cases, the logging is skipped. Due to this type of trigger it is possible to separate results related to the low/high noise level.

The logging is active only when the summary results are measured, i.e. from the measurement start till the measurement stop.

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



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

Source result

Only one measured result (**Source**) can be used for checking 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 position cannot be changed.

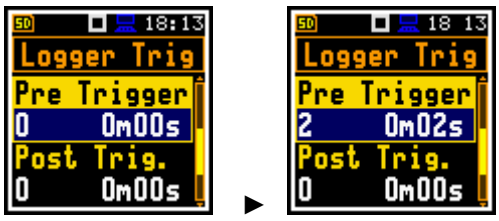
Threshold level

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

Pre and post trigger logging

In the **Pre Trigger** position, you can define the number of results which will be registered in the logger file before the fulfilment of the triggering condition. This number can be set in the range 0..10.

In the **Post Trigger** position, you can define the number of results which will be registered in the logger file after the fulfilment of the triggering condition. This number can be set in the range 0..200.

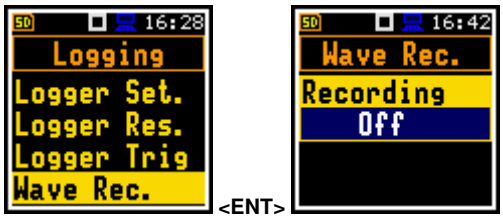


These parameters can perform double role. Firstly, when you wish to collect data right after or before the event that caused logger trigger. Secondly, when it is necessary to have continuous logging, but the source is oscillating near the threshold level. The extension of the registration window allows to avoid the effect of pulsation.

Periods of logging before or after fulfilment of the trigger condition are shown to the right of the number in minutes and seconds (in the format **0m00s**) as a result of multiplication of number of results by the **Logger Step**.

4.5.4 Configuring signal recording – Wave Recording

The **Wave Recording** position enables activating and configuring a waveform signal recording in the WAV type file.

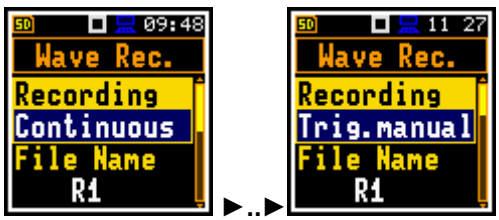


Note: *In the **Simple** interface mode, the **Wave Recording** position is hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (**Recording: Off**).*

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

The **Recording** position, if it is not **Off**, defines the way a signal recording should be done, continuously during measurement (**Continuous**) or on trigger: **Slope +**, **Slope -**, **Level +**, **Level -**, **Gradient +**, **Trig.manual** or **Integr. Per**. Default mode: **Off**.

The **File Name** position enables editing the name of the WAV file.



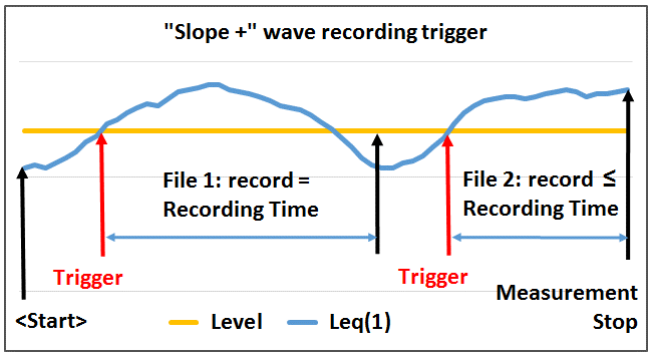
Note: *The* ***Wave Recording*** *function is optional and should be unlocked by entering the activation code in the text editor screen, opened by the ► key. Once unlocked this option will be available permanently.*

Slope trigger

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

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

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



The **Slope -** trigger starts a signal recording under the condition: falling value of the Leq result (**Source**) integrated by 0.5 ms passes below the threshold level (**Level**).

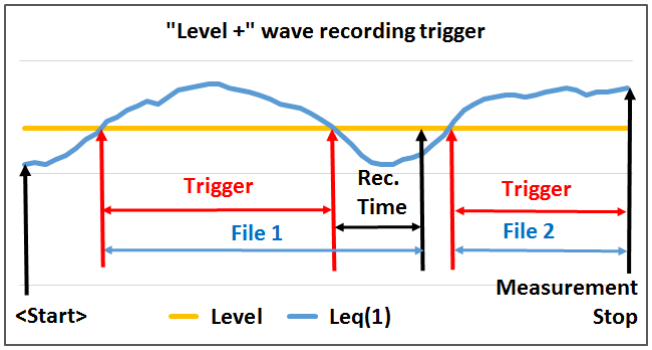
This is a mirrored trigger to the **Slope +** trigger.

Note: *When a signal recording is waiting for the slope trigger the "slope" icon superimposes on the grey „signal" icon.*

Level trigger

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

If during **Rec. Time** a trigger condition appears, recording will be prolonged for another **Rec. Time** from the moment of that trigger condition and so on.



Note: *When a signal recording is waiting for the level trigger the "level" icon appears alternatively with the grey „signal" icon.*

Gradient trigger

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

Integration period trigger

When the **Integr. Per** trigger is selected, a signal recording is triggered every time the measurement starts, and recording will last minimum **Rec. Time**. If the trigger condition appears during recording (when **Integration Period** is shorter than **Rec. Time**), from this moment, the recording will continue for the next **Rec. Time** and so on.

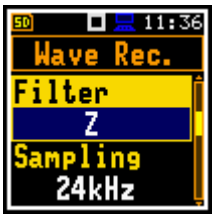
Manual trigger

When the **Trig.manual** trigger is selected, the signal recording starts and ends after pressing simultaneously the ◄ and ► keys during the measurement. After pressing these keys, the screen with the corresponding message appears. The registration always stops after period defined by the **Rec. Time** parameter.

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

The **Filter** position enables the user to choose the broadband frequency filter during a wave recording: **Z**, **A**, **C**, **B** or **LF**.

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



The **Signal Gain** position enables the user to choose the gain of the recorded signal: **0 dB** … **40 dB**.

.

The **Source** position indicates the trigger source. Only one measured result can be used as a triggering source in all modes, namely the instantaneous LEQ from the first profile (with appropriate filter and detector), which is denoted here as **Leq(1)**.

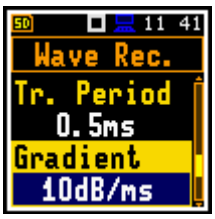
The threshold (**Level**) can be set in the range from 24 dB to 136 dB. The **Source** value compares with the **Level** value every 0.5 milliseconds.

Checking triggering condition

The **Tr. Period** parameter defines the time interval for checking the triggering condition as: **Logger Step**, **0.5ms**, **100ms** and **1s**.

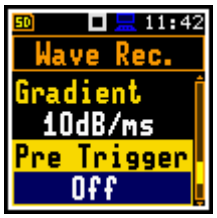
Speed of source value changing

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

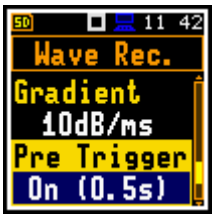


Recording before trigger

When the **Pre Trigger** parameter is switched on, the signal will be recorded before the first trigger. The interval of such recording is equal to the **Trigger period** (in the attached example, 0.5 s).



▶



Time of signal recording

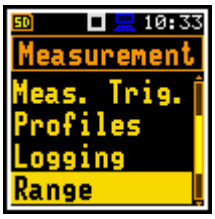
The **Rec. Time** parameter defines the time of signal recording after triggering. If next trigger condition appears during the Recording Time, the signal will be recorded for additional **Rec. Time**. The available values are from **1s** to **8h**, or infinitive (**Inf**).

4.6 MEASUREMENT RANGE – RANGE

The **Range** position is used for checking the available measurement range.

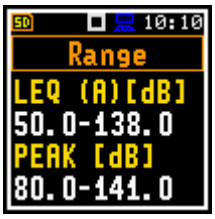
The absolute range values depend on the calibration factor and are shown in the **Range** screen.

The attached screens assume the calibration factor equal to zero.



<ENT>

The instrument uses two ranges – one for the **Level Meter**, **1/1 Octave**, **1/3 Octave** and **RT60** functions (32.0 LEQ(A) – 128.0 PEAK) and another for the **Dosimeter** function (50.0 LEQ(A) – 141.0 PEAK). The detailed description of the measurement ranges parameters is given in Appendix C.

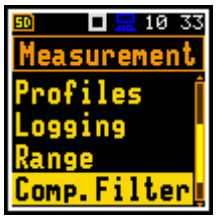


Note: *The calibration factor is always added to the lower and upper range level.*

4.7 SWITCHING ON COMPENSATION FILTERS – COMPENSATION FILTER

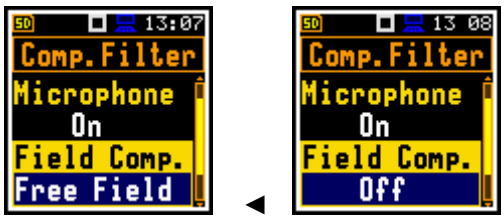
The **Comp. Filter** position is available only in the **Advanced** interface mode and enables to switch on or off compensation filters applied in the instrument.

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



<ENT>

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



The **Windscreen** position is active when the field compensation is on and switches on the compensation when the windscreen is applied. By default, it is **On**

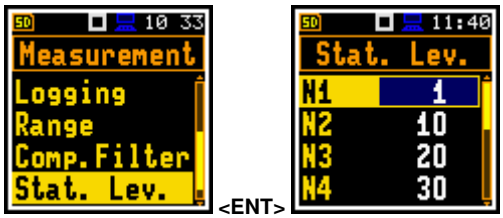
Note: *In the **Simple** interface mode, the **Comp. Filter** position is hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (**Microphone: On**; **Field Comp.: Free Field**; **Windscreen: On**).*

Note: *For laboratory instrument's tests, the compensation filters should be set in accordance with the Appendix C.*

4.8 SETTING STATISTICAL LEVELS – STATISTICAL LEVELS

In the **Stat. Lev.** screen, you can define ten statistical levels, named from **N1** to **N10**, to be calculated, displayed and saved in a file as Summary results (see Appendix D).

Default statistical levels have 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.

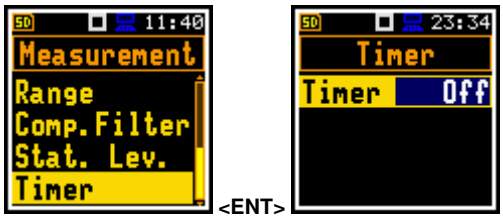


4.9 PROGRAMMING INSTRUMENT'S INTERNAL TIMER – TIMER

The **Timer** function is used for programming the automatic measurement start (and turning the instrument on if it was turned off) at a given time and day of a week.

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

The **Timer** position allows you to programme the internal real-time clock to act as a delayed start timer. The instrument will be switched on automatically at the programmed time and will perform the measurement with the same settings used before the instrument was turned off with one exception (see below Note).

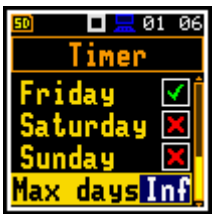


Note: *When **Timer** is **On**, measurements will be performed from defined **Start** to **Stop** times because the **Repetition Cycles** parameter will be changed to **Inf** (path: <Menu> / Measurement / General Set.). The last integration may be cut.*

Measurement start and stop

The **Start (hh:mm)** and **Stop (hh:mm)** positions determines times of measurement's `start and stop. `

In the positions: **Monday**, **Tuesday**, …, **Sunday**; you can select days in a week when measurements should start.



The timer can be programmed for **Max days** ahead (up to 100) or without limitation (**Inf**) and during these days, the instrument refers to the time of the **R**eal **T**ime **C**lock (**RTC**).

Note: *Make sure to check that the real-time clock settings are correct before using the timer.*

Note: *Make sure that there is sufficient internal batteries power available for the instrument to carry out the required measurements when it wakes up.*

4.9.1 Example of timer execution

Let us assume that you wish to switch on the measurement on Monday at 22:00, to measure noise level for 10 minutes and save results in the files with names R1, R2, R3 etc.

To do this configure the **Timer** function as on the attached screen and to set the measurement parameters (*path: <Menu> / Measurement / General Settings*) and the file name (*path: <Menu> / Measurement / Logging / Logger Setup*).

The instrument will start to warm up during 30 seconds before the measurement start time 22:00 on the nearest Monday.

The measurement will be performed by a period of ten minutes. Then, the results will be saved in the file with the name R1 automatically and the instrument will be waiting for the next Monday to start measurement at 22.00. Next file will be automatically named R2 and so on.

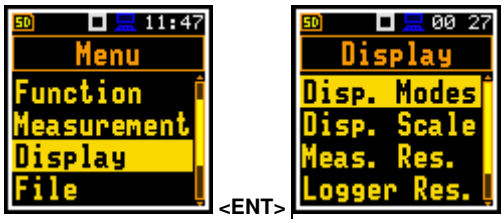
Such cycle will be repeated so many times as was defined by the **Max days** parameter. If more than one day in a week is selected, every performed measurement will increase the day-counter. The measurement cycle stops when the day-counter number is equal to **Max days**. If **Inf** value is selected the measurement cycles can be stopped only by the user (of course, if the power is assured).

5 CONFIGURING DATA VIEWING – Display

The **Display** section contains elements for programming measurement result views and display parameters.

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

To open the **Display** section, press the **<Menu>** key, select the **Display** position and press **<Enter>**.



The **Display** section contains following items:

Disp. Modes allowing you to enable modes of the measurement results presentation (views);

Disp. Scale allowing you to adjust the scale in the graphical views;

Spect. View allowing you to select spectra to be viewed. This position becomes available in the **1/1 Oct.** and **1/3 Oct.** modes only;

Meas. Res. allowing you to select measurement results to be displayed;

Logger Res. allowing you to select time history results to be viewed as a plot;

Screen Set. allowing you to switch rotation of the screen on/off and set the energy saver function.

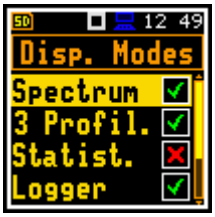
5.1 ENABLING VIEWS – DISPLAY MODES

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

You may switch in the measurement mode between those views, that were enabled in the **Disp. Modes** screen.

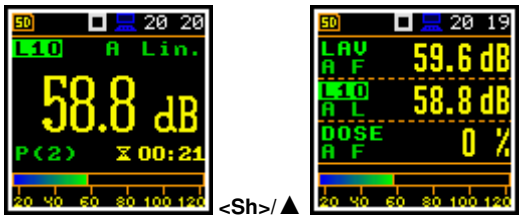
In the **Level Meter** function, following views are available: **3 Profiles**, **Statistics**, **Logger**, **Running SPL** and **File Info**.

In the **1/1 Octave** and **1/3 Octave** functions, additional view (**Spectrum**) becomes available.



Changing views

The view can be changed with the ▲ / ▼ key pressed with **<Shift>**.



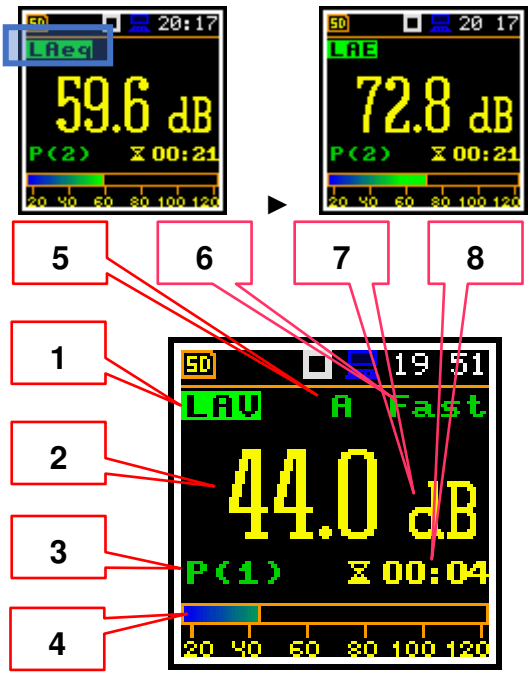
5.1.1 One Result view

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

The One Result view may have different sub-views. The user may change the sub-view of the One Result view by pressing the **<Enter>** key.

Changing measurement results

The measurement result displayed in this view can be changed with the ◄ / ► key.



One Result view fields

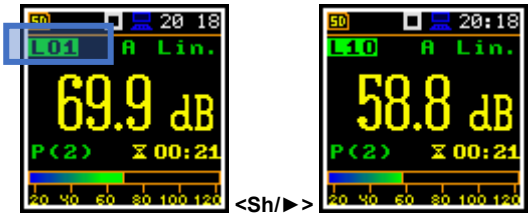
1. Result name for:
   - **SLM**, **1/1 Oct.** and **1/3 Oct.** functions: **OVL**, **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **EX**, **SD**
   - **Dosimeter** function: **OVL**, **Lpeak**, **Lmax**, **Lmin**, **L**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **Leq**, **LE**, **SEL8**, **E**, **E_8h**, **LEPd**, **PSEL**, **Ltm3**, **Ltm5**, **Ln**, **PTC**, **PTP**, **ULT**, **TWA**, **PrTWA**, **Lc-a**, **EX**, **SD**
2. Value of the measured result
3. 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

Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**0**, **Integration Period**]

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

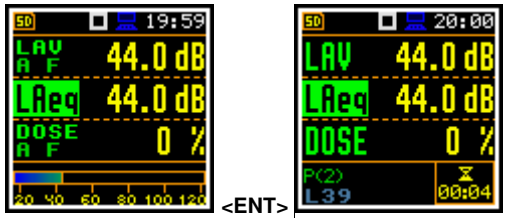
Changing statistical levels (Ln)

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



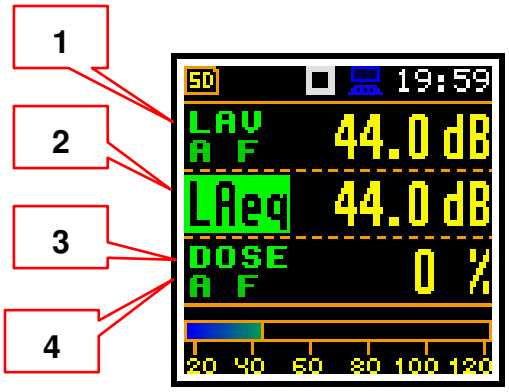
5.1.2 Three profiles view

In the **3 Profil.** view any three measurement results, selected in the **Disp. Res** list, may be presented for three profiles. You may change the **3 Profil.** sub-view by pressing the **<Enter>** key.



Field description of the 3 Profiles mode

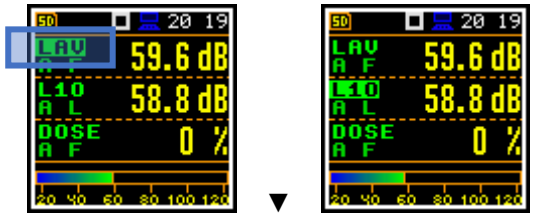
1. Result for the first profile
2. Result for the second profile
3. Result for the third profile
4. Implemented weighting filter: **A**, **C**, **Z** or **B** and detector time constant: **I** (Impulse), **F** (Fast), **S** (Slow) when the detector is exponential or **L** when the detector is linear



Changing measurement results

To change the result of the profile, you should select the profile with the ▲ / ▼ key and then change the result with the ◄ / ► key.

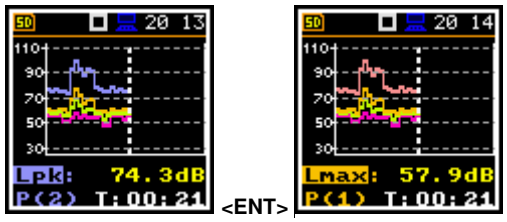
The statistical levels can be changed with the ◄ / ► key pressed with **<Shift>**.



5.1.3 Logger view

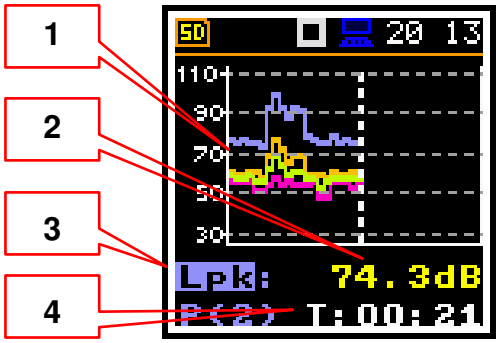
In the **Logger** view, the time history results, selected in the **Logger View** list, are displayed as a plot. You may change viewed results by pressing the **<Enter>** key.

The cursor position can be changed with the ◄ / ► key.



Logger view fields

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



***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!*

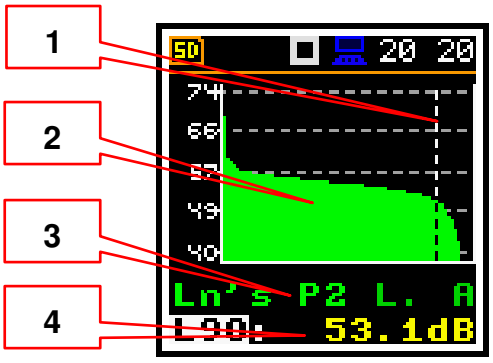
***Note:** When **Logger** is switched on, but results were not selected for logging the **Logger** presentation mode is disabled!*

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

Statistics view fields

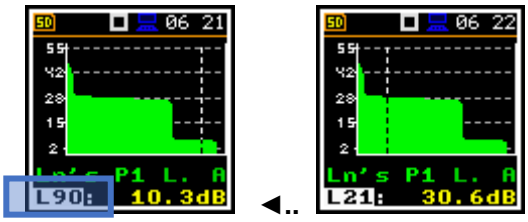
1. Cursor position
2. Statistics plot
3. Result name, active profile, LEQ detector (**L**inear, Fast, **S**low or **I**mpulse), used weighting filter name (**A**, **C**, **Z** or **B**)
4. Value of the selected statistical level **Ln** and units (dB)



The cursor position can be changed with the ◄ / ► key.

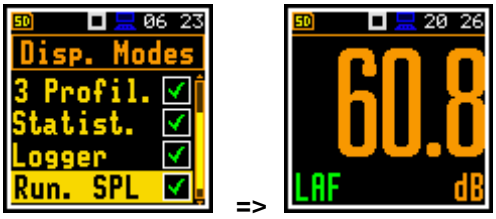
The profile can be changed with the ▲ / ▼ key pressed with **<Shift>**.

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



5.1.5 Running SPL view

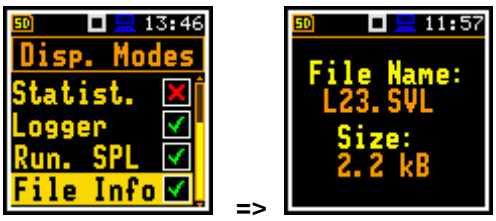
The **Run. SPL** view shows the **SPL** result when measurement is not currently running. In this mode, SPL result is calculated and displayed, but not stored in the instrument's memory. The purpose of this view is to give the user a first indication about the signal to be measured.



5.1.6 File information view

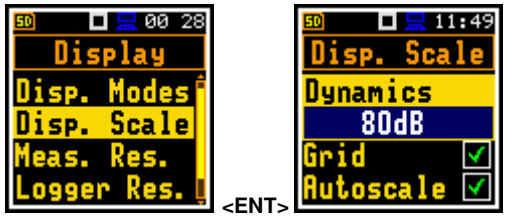
The **File Info** position enables additional view with information about the last saved logger file.

The **File Info** view indicates the file name and its size. When **Logger** is **Off** (*path: <Menu> / Measurement /Logging / Logger Set*) the **File Info** position is disabled.



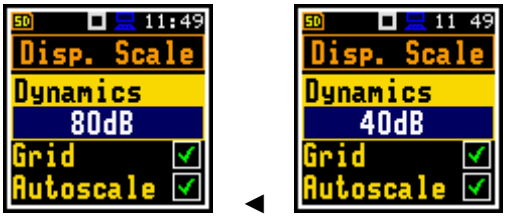
5.2 ADJUSTING PLOT SCALE – DISPLAY SCALE

The **Disp. Scale** list of parameters enables adjusting the scale of the plot and switching a grid on/off in the **Logger**, **Statistics** or **Spectrum** display modes.



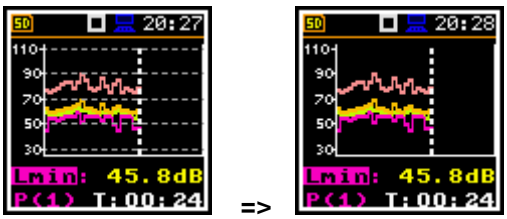
Scaling vertical axis

The **Dynamics** position enables selecting the required dynamic range of the plot (Y-axis). It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB** and **120dB**.



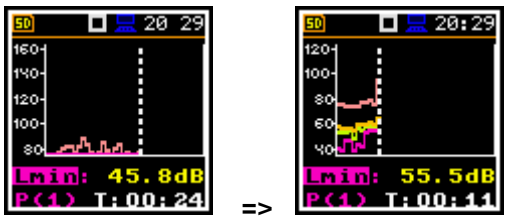
Switching grid on/off

The **Grid** position enables switching on or off the horizontal grid lines of the plot.



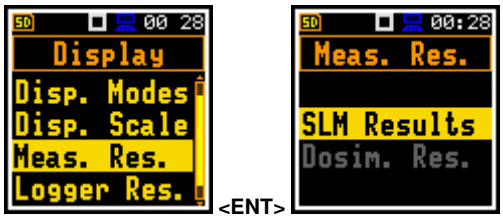
Switching automatic Y-scale adjustment on/off

The **Autoscale** position switches on the automatic scale adjustment of the Y-axis. The adjustment is performed automatically right after the start of the measurement to suit the initial level of the input signal from the microphone.



5.3 SELECTING MEASUREMENT RESULTS FOR PRESENTATION – MEASUREMENT RESULTS

The **Meas. Res.** position enables choosing the Sound Level Meter (**SLM Results**) or Dose Meter (**Dosim. Res**) measurement results, which will be presented in the different views.



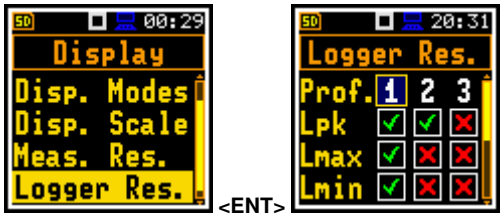
The result can be selected from:

- **SLM Results** list: **TIME**, **Lpeak**, **Lmax**, **Lmin**, **L**, **Leq**, **LE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln**, **EX**, **SD** and **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** and **OVL**.

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

5.4 CHOOSING LOGGER RESULTS FOR PRESENTATION – LOGGER RESULTS

The **Logger Res.** position enables choosing Logger Results (time-history results), saved in the logger file, which will be displayed in the Logger view.

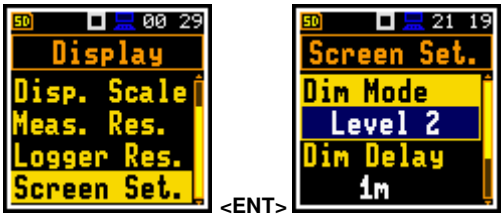


5.5 CONFIGURING POWER SAVER – SCREEN SETUP

The **Screen Set.** position enables configuring the power saver function (**Dim Mode**) and selecting the screen colour scheme.

Power saver function

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



There are two options of power saver function (**Dim Mode**). The screen may be switch off (**Screen Off**) or dimmed with different levels (**Level 1**, **2** or **3**). In the case when any of these options is set, after a delay, set by parameters **Dim Delay**, from pressing any key the screen is dimmed or switched off. After it has happened, pressing any key will cause the display to switch on again.

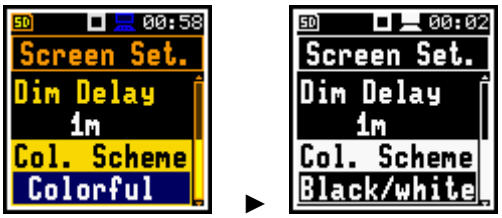
If **Dim Mode** is **Off** the screen will stay bright all the time.

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

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

Changing colour scheme

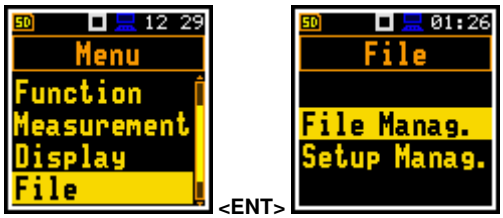
The **Col. Scheme** position enables changing of the colour scheme of the screen from **Colorful** to **Black/white**.



6 MANAGING FILES – File

The **File** section contains elements that enable managing measurement and setup files saved in the instrument's memory. The memory structure and files saving methods are described in Chapter 2.8.

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



The **File** section contains following positions:

File Manag. allowing you to manage measurement results files;

Setup Manag. allowing you to manage only setup files located in the predefined SETUP directory.

The instrument creates files of the next types:

- Logger files with measurement results (extension **.SVL**)
- Wave files with signal recording (extension **.WAV**)
- Setup files with measurement and instrument configurations (extension **.SVT**)

Logger and Wave files are created and saved automatically with default names, but you can define a specific logger file name in the **Logger Name** position of the **Logger Setup** screen (*path: <Menu> / Measurement / Logging / Logger Set.*) and a specific wave file name in the **File Name** position of the **Wave Recording** screen (*path: <Menu> / Measurement / Logging / Wave Rec.*).

Elements of the file structure depend on the selected function (**Lev. Met.**, **1/1 Oct.**, **1/3 Oct.**, **RT60**, **Dosimeter**) and may include:

- main results, including results of statistical analysis,
- time histories of logger results,
- marker recordings,
- results of the **1/1 Oct.** analysis,
- results of the **1/3 Oct.** analysis,
- results of the **RT60** analysis,
- **Dosimeter** results.

Detailed description of structures of all file types is given in Appendix B.

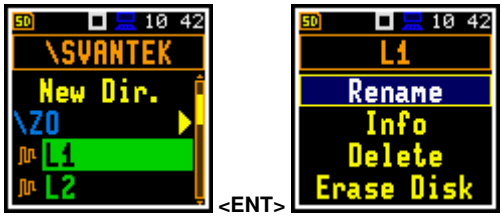
6.1 MANAGING INSTRUMENT'S FILES – FILE MANAGER

Files are stored in directories, which are organised hierarchically. The **File Manager** enables access to all files and directories.

In the **File Manager** all file and directory names are of upper-case letters and have no extensions. Directory names are of blue colour and file names are of green colour with additional icon.

In the **File Manager**, you can check the memory content and perform operations on files and directories, such as: renaming, deleting, displaying information, creating new directory and erasing memory.

All these operations can be done on the selected file or directory by means of the command list which is opened with the **<ENTER>** key.



Changing directories

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

To return to the upper directory press the ◄ key.

Creating new directory

First position of the **File Manag.** list is **New Dir.**, which enables creating the new directory.

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

Memory properties

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

6.1.1 Assigning directory for data files saving – Working Directory

You can assign a directory for automatic saving of logger and wave files. To do this, choose the required directory and press the **<Enter>** key. Select the **Work. Dir.** position in the command list and press **<Enter>**.

Starting from this moment all logger and wave files will be saved in this directory.

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

6.1.2 Renaming file/directory – Rename

To rename a file or a directory, select the file/directory you wish to rename and press **<Enter>**. Select the **Rename** position in the command list and press **<Enter>**. The screen with the text editor function in which you may enter the new file/directory name will appear.

6.1.3 Information about file/directory – Info

To get information about a file/directory, select the file/directory and press the **<Enter>** key. Select the **Info** position in the command list and press **<Enter>**. The instrument will display the information about the selected file/directory.

6.1.4 Deleting file/directory – Delete

To delete a file/directory from the file/directory list, select the file/directory to be deleted and press the **<Enter>** key. Select the **Delete** position in the command list and press **<Enter>**. You should confirm this action since it cannot be undone.

6.1.5 Erasing memory – Erase Disk

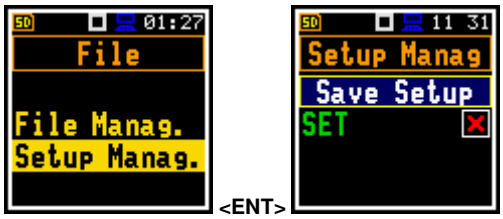
To delete all files and directories from the memory card, select any file in the directory and press **<Enter>**. Select the **Erase Disk** position in the command list and press **<Enter>**. The instrument will ask for confirmation of this action since it cannot be undone.

After disk erasing the default directories will be recreated.

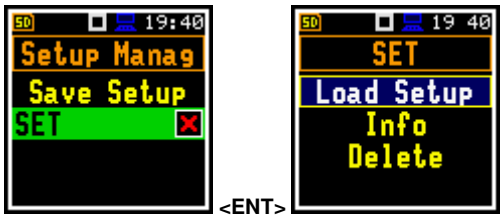
6.2 MANAGING SETUP FILES – SETUP MANAGER

The **Setup Manag.** enables saving new setup files, deleting, loading them as current instrument settings and displaying file information, as well as selecting those setup files that will appear in the setup screen during start-up of the instrument.

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



The screen with the list of available commands on setup files is opened after pressing the **<Enter>** key on the marked (highlighted) setup file.

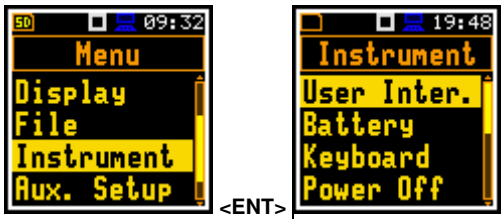


If the right-hand box of the setup file is marked, this setup will be in the list of setups during start-up of the instrument, so you can choose pre-defined setup in the beginning of the measurement session.

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** position and press **<Enter>**.

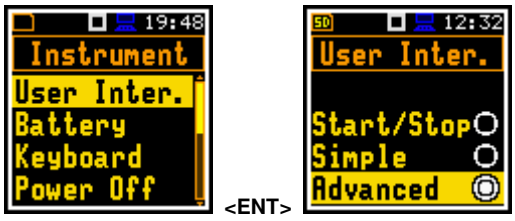


The **Instrument** section contains following items:

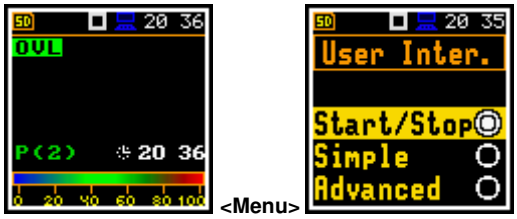
User Interface	allowing you to choose the user interface option;
Battery	allowing you to display information about current power source;
Keyboard	allowing you to program some keyboard functions;
Power Off	allowing you to switch off the instrument power in case of inactivity;
USB	allowing you to configure the USB interface. This position is available only in the **Advanced** user interface mode;
Bluetooth	allowing you to switch on/off Bluetooth;
RS232	allowing you to configure the RS232 interface;
RTC	allowing you to set the Real Time Clock;
Unit Label	allowing you to display instrument properties.

7.1 CHOOSING USER INTERFACE MODE – USER INTERFACE

There are three modes of the user interface: **Start/Stop**, **Simple** or **Advanced**. These modes can be selected in the **User Inter.** screen. The **Simple** mode enables basic instrument settings, while the **Advanced** mode - full scope of settings. Many screens thus have different views in different interface modes.



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

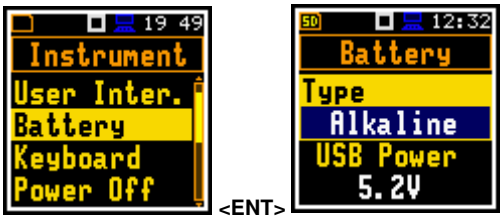


Note: *When you switch the interface mode from* ***Advanced*** *to the other there always appear the request "Do you restore the default value of the advanced settings?" If the answer is "No", then all settings that were made in positions not active in the* ***Simple*** *mode will stay unchanged. If answer is "Yes", then these positions will be changed to default settings.*

7.2 CHECKING POWER – BATTERY

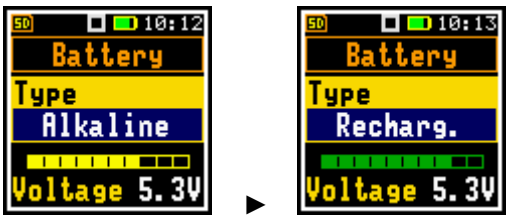
The **Battery** position enables checking the power source condition. The instrument can be powered from four AAA rechargeable or standard alkaline batteries or from the USB-C interface.

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



When the instrument is powered from internal batteries the current battery voltage is displayed together with its approximate charging state in the graphical format.

Select the correct type of batteries for the right detection of the charging state of the battery pack: **Alkaline** or **Rechargeable**.



Note: *Rechargeable batteries must be extracted and charged with the use of an external charger. They cannot be charged inside the instrument.*

7.3 PROGRAMMING KEYBOARD FUNCTIONS – KEYBOARD

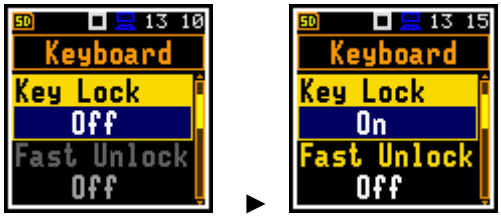
The **Keyboard** position enables programming the operation mode of the **<Shift>** key, to switch on the key lock and the fast unlock of the keyboard with four keys.

<Shift> key mode

In the **Shift** position you can choose between **2nd Funct.** and **Direct**. When the **Direct** option is selected, the **<Shift>** key operates as in the keyboard of a computer – to achieve the desired result, the second key must be pressed at the same time with **<Shift>**. When the **2nd Fun.** option is selected the **<Shift>** key operates as in the smartphone virtual keyboard – the **<Shift>** key should be pressed first, and the second key should be pressed after. Due to this you can operate the instrument with one hand.

Key locking

In the **Key Lock** position, you can enable the keyboard locking. When **On** option is selected, the **Fast Unlock** function becomes available. This function enables programming the keyboard unlocking code.



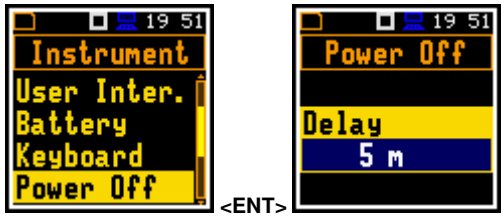
Key unlocking

The unlocking code can be programmed with next four positions: **First Key**, **Second Key**, **Third Key** and **Fourth Key**. In every position, the user may choose one of four arrow keys: **Left Key**, **Right Key**, **Up Key** or **Down Key**, the sequence of which creates unlocking code.

7.4 AUTOMATIC POWER OFF SETTING – POWER OFF

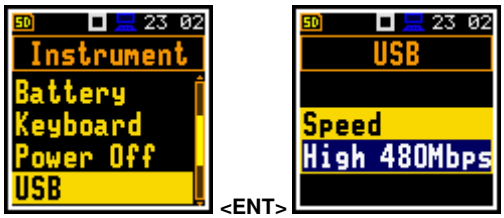
The **Power Off** position enables setting the period after which the instrument will automatically turn itself off in the case no key was pressed during this period.

If the **Inf** (infinitive) value is selected the instrument cannot be turned off automatically, only manually.



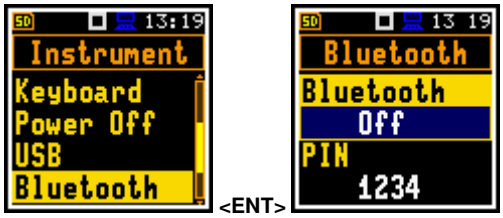
7.5 CONFIGURING USB INTERFACE – USB

The **USB** position enables selecting transmission speed of the USB interface. There are two options: **Full 12Mbps** or **High 480Mbps**.



7.6 SWITCHING BLUETOOTH – BLUETOOTH

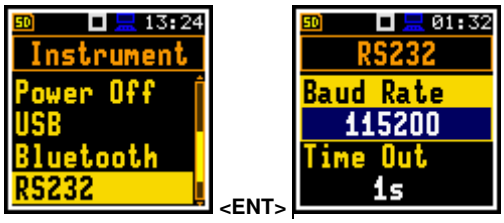
The **Bluetooth** position enables switching on/off Bluetooth and setting its PIN.



You can change the PIN with the ►/◄ keys. Default value is **1234**.

7.7 CONFIGURING SERIAL INTERFACE – RS232

The **RS232** position enables selecting the RS 232 interface transmission speed (**Baud Rate**) and setting the time limit during which the data transfer should be performed (**Time Out**).



Transmission speed

RS 232 interface transmission (**Baud Rate**) speed can be selected from the following available values: **1200**, **2400**, **4800**, **9600**, **19200**, **38400**, **57600** or **115200** bits/s. Other RS 232 transmission parameters are fixed to **8 bits for data**, **No parity** & **1 Stop bit**.

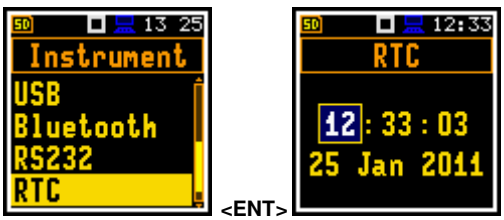
Transmission time limit

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

7.8 PROGRAMMING INTERNAL REAL TIME CLOCK – RTC

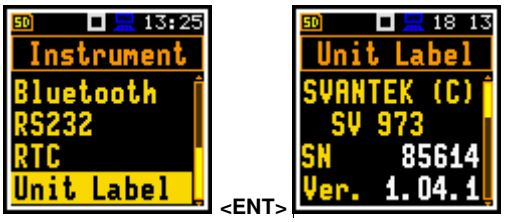
The **RTC** position enables programming the internal Real Time Clock of the instrument. This clock is displayed in the top right corner of the display.

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



7.9 CHECKING INSTRUMENT PROPERTIES – UNIT LABEL

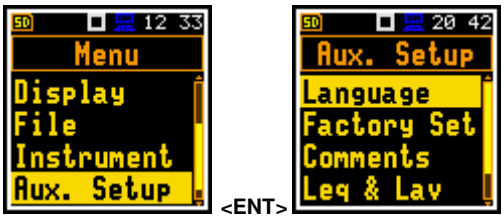
The **Unit Label** position enables checking the model of the instrument, it's serial number, the current software version installed and the appropriate standards, which the instrument fulfils.



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

8 AUXILIARY SETTINGS – Auxiliary Setup

The **Auxiliary Setup** section provides additional functions that allow, for instance, customization of the device interface to a specific user requirement and are not directly related to the hardware components of the instrument.



To open the **Auxiliary Setup** section, press the **<Menu>** key, select the **Auxiliary Setup** position and press **<Enter>**.

The **Auxiliary Setup** section contains following positions:

Language allowing you to select the language of the user interface;

Factory Set allowing you to restore default, factory settings;

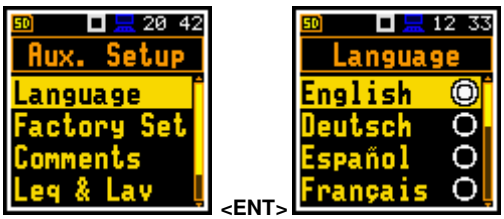
Comments allowing you to define the file name for recording voice comments. This position is available only in the case of the **Advanced** interface mode;

Leq & Lav allowing you to set the mode of displaying the **Leq** and **Lav** results. This position is available only in the **Dosimeter** function and in the case of the **Advanced** interface mode;

Warnings allowing you to enable/disable warnings to be displayed during the normal operation of the instrument.

8.1 SELECTING USER INTERFACE LANGUAGE – LANGUAGE

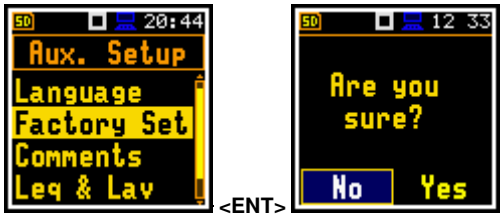
The **Language** position enables selecting the language of the user interface.



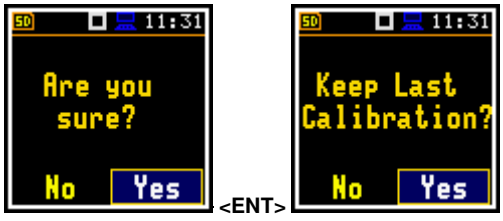
If after turning the instrument on, an unknown language interface appears on the display, the user can reset the instrument with three **<Shift/Enter/Start>** keys pressed together during the switching on of the device. After this, the instrument will go back to the default setup with the English interface.

8.2 RESTORING FACTORY SETTINGS – FACTORY SETTINGS

The **Factory Set.** position enables restoring default settings of the instrument.



Factory settings can be restored also with three **<Shift/Enter/Start>** keys pressed together.

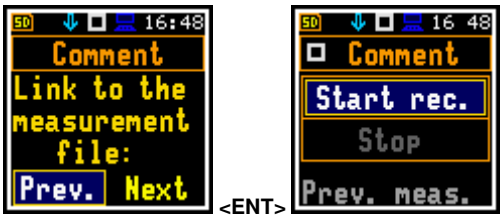


After restoring the factory settings, the instrument will ask you whether to keep the last calibration. If you select **No** the factory calibration will be restored and the new calibration record stating the *Factory calibration* of the instrument will be created in the **Calibration History** list (see Chapter 3.2.2).

8.3 VOICE COMMENTS – COMMENTS

The **Comments** position enables defining the file name for the voice comments recording. This position is available only in the **Advanced** interface mode. You can record voice comments in all interface modes.

To record a comment, press simultaneously the ◄ / ► key when a measurement is stopped. This will bring up a screen with a question to which logger file to link the file containing a comment - to the previous (**Prev.**) or the next one (**Next**). After selecting an answer and pressing the **<Enter>** key, the record command screen will open.



After starting the recording (**Start rec.**) with the **<Enter>** key, red circle that indicates “recording in progress” will start to flash at the top line of the screen. In this case, you can comment the measurement. Press **<Enter>** to finish recording. The recording end will be confirmed with the message "**Saved O.K.**".

The file with voice comment will be saved in the same working directory as a logger connected file. It has a special icon “♪”.

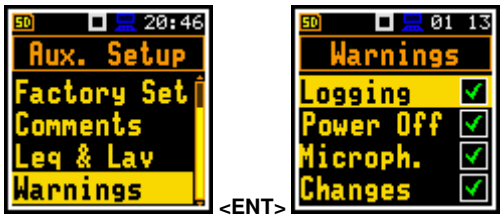
8.4 DISPLAYING LEQ & LAV RESULTS – LEQ & LAV

The **Leq & Lav** position enables setting the mode of displaying the **Leq** and **Lav** results.

This position is available only in the **Dosimeter** function and in the case of the **Advanced** interface mode. See the description of this function in the **DOSIMETER** section of this manual.

8.5 ACTIVATING WARNINGS – WARNINGS

The **Warnings** position allows to activate messages, which will be displayed during the normal operation of the instrument.



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

If **Power Off** is active, then in the case the measurement is in progress, any attempt to switch off the instrument will be warned "Measurement in progress". You should stop the measurement to be able to turn off the unit. When the measurement is completed the warning "Power Off" becomes active. Then, if you would like to turn off the instrument, you should confirm this.

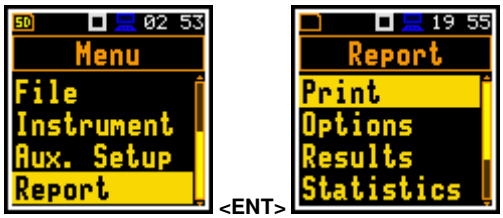
If **Microph.** is active, there will be warning if the instrument detects that there is no microphone attached to the instrument's input.

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 enables configuring printed reports of the sound measurement results in the predefined format.

To open the **Report** section, press the **<Menu>** key, select the **Report** position and press **<Enter>**.

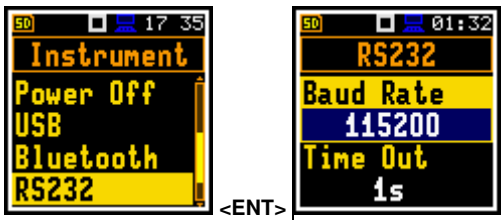


The **Report** section contains following positions:

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

To obtain the report, connect the instrument to the printer's RS 232 port using the **SV 75** RS 232 interface. This hardware interface is hidden in the Cannon type, 9-pin RS 232 plug-in. On the other end of the SV 75 interface, which itself looks like a cable, there is the USB-C plug-in. This plug-in should be placed in the USB-C socket of the instrument.

Be sure that the **RS232** port is properly configured (*path: <Menu> / Instrument / RS232*). Select in the **RS232** list the transmission speed (**Baud Rate**) and set the time limit during which the data transmission should be performed (**Time Out**).



The RS 232 interface transmission speed (**Baud Rate**) can be selected from the following available values: **1200**, **2400**, **4800**, **9600**, **19200**, **38000**, **57600** or **115200** bits/s. The transmission speed should correspond to the same one selected in the printer. The other RS 232 transmission parameters are fixed to **8 bits for data**, **No parity** & **1 Stop bit**. The default value of the **Time Out** period is equal to one second, but it can be too short for printers, which are not fast enough. In such cases this parameter should be increased.

Printers, which have only the USB interface, are currently not driven by the instrument.

Note: *Switch the power off before connecting the instrument to any external device (e.g. a printer or a 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** position enables printing a report on the attached printer or PC.

After pressing **<Enter>**, the instrument checks its current state. If the measurement is running, printing is not possible, and the appropriate message is displayed.

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

If no measurements were performed the next message is displayed.

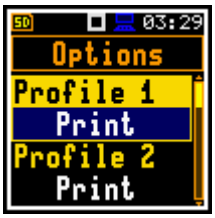
The message about the time limit is displayed if the printer (or a PC) is not connected or there is any other reason that it does not receive data. The instrument waits for the reaction of the user (any key should be pressed except **<Shift>**) and after pressing a key it returns to the **Report** list.

Below is an example printout of the report.

```
SVANTEK (C)  SV 973  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 PRINTING OPTIONS – OPTIONS

The **Options** position enables selecting profiles, results, statistics and spectra for the report.

<ENT>


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

You may exclude all main results (**Results**) from the report (**Off**), include them all (**Print All**) or select results for the report (**Pr.Selected**) from the **Results** list of the **Report** menu.

You may exclude all statistics (**Statistics**) from the report (**Off**), include them all (**Print All**) or select essential statistics for the report (**Pr.Selected**) from the **Statistics** list of the **Report** menu.

You may exclude all Leq, Lmax, Lmin and Lpeak spectra (positions: **Leq Spect.**, **Lmax Spect.**, **Lmin Spect.**, **Lpeak Spect.**) from the report (**Off**), include all bands of 1/1 or 1/3 spectra (**Print All**) or select essential bands for the report (**Pr.Selected**) from the **Spectrum** list of the **Report** menu.

You may include (**Print**) units of the results or excluded them (**Off**) from the report.

9.3 SELECTING RESULTS FOR THE REPORT – RESULTS

The **Results** position allows you to select results for the report from the list: **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**, **LR15**, **LR60** and **OVL**.

<ENT>

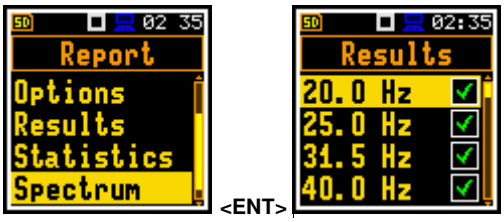

9.4 SELECTING STATISTICS FOR THE REPORT – STATISTICS

The **Statistics** position allows you to select statistic calculations from **N1** to **N10** for the report.

<ENT>


9.5 SELECTING SPECTRA FOR THE REPORT – SPECTRUM

The **Spectrum** position allows you to select essential bands of the **Leq**, **Lmax**, **Lmin** and **Lpeak** spectra for the report.



9.6 PRINTER SETTINGS – PRINTER

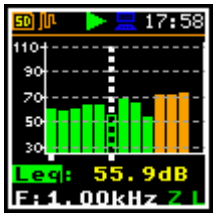
The **Printer** position enables setting the number of characters in the report lines.

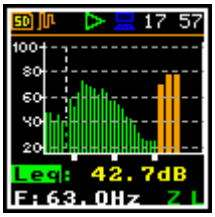
10 1/1-OCTAVE AND 1/3-OCTAVE ANALYSER

The instrument operates as a real time 1/1-octave or 1/3-octave analyser in a very similar way to the **Level Meter**. Moreover, 1/1-octave or 1/3-octave analysis is performed in parallel with the Level Meter measurements. All 1/1-octave (with 9 center frequencies from 8 kHz down to 31.5 Hz; in base ten system) and 1/3-octave (with 28 center frequencies from 10 kHz down to 20 Hz; in base ten system) digital pass-band filters are working in real-time with weighting filters (**Z**, **A**, **B** or **C**) selected in the **Spectrum** screen (*path: Menu / Measurement / Spectrum / Filter*) and the linear LEQ detector. This enables a spectrum pre-weighting with one of the selected broadband frequency curves if required for the application such as the provision of hearing protectors during the control of high workplace noise levels.

Note: *TOTAL LEQ results are measured with their own weighting filters (**A**, **C**, **Z**) regardless of settings made in profiles for Level Meter calculations. Spectra are always linearly averaged. Thus, **TOTAL** values from 1/1-octave or 1/3-octave analysis can be different from those obtained for profiles (if the **LEQ Integration** was set as **Exponential**).*

For each octave or one-third octave band, the RMS, Min or Max result is calculated and presented as a bar on the spectrum plot. Results of 1/1-octave and 1/3-octave analysis (spectra) can be examined by the user on a display in the **Spectrum** presentation mode.



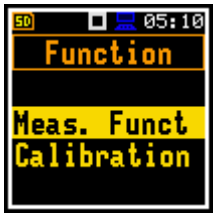


The read-out of the spectrum value can be done using a vertical cursor.

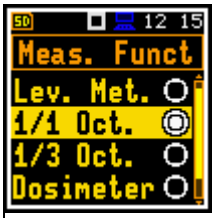
Besides results for bands three **Total** values are measured and displayed as an additional three bars on the spectrum plot. Parameters for Total values (e.g. filters) are set by default and cannot be changed.

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** screen, select the **1/1 Octave** or **1/3 Octave** position and press **<Enter>**.



<ENT>



Note: *The **1/3 Octave** function is optional and should be unlocked by entering the activation code in the text editor screen, which is opened after first attempt to select them. Once unlocked this option will be available permanently.*

10.2 CONFIGURING 1/1- OR 1/3-OCTAVE ANALYSER

10.2.1 General measurement settings for 1/1- or 1/3-octave analysis – General Settings

Execution of the 1/1-octave or 1/3-octave analysis depends on certain set of parameters, configured in the **Measurement** section.

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

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

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

10.2.2 Logging 1/1- or 1/3-octave spectra – Logging

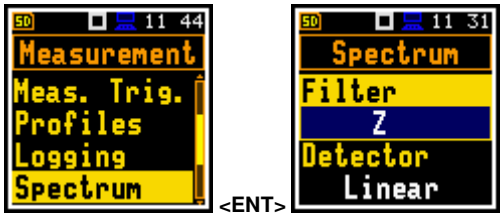
Spectra are always logged together with the Summary results in a logger file with **Integration Period** step. The first condition should be fulfilled, namely the **Logger** must be switched on (*path: <Menu> / Measurement / Logging / Logger Setup / Logger: On).*

The **Leq** and **Lpeak** results from the 1/1-octave or 1/1-octave analysis can also be saved in the logger file with the step defined by the **Logger Step** parameter (*path: <Menu> / Measurement / Logging / Logger Setup*). The enabling of spectrum saving in the logger file is made by checking the **Peak Spectrum** or **Leq Spectrum** position with the ◄ / ► key.

10.2.3 Setting parameters of 1/1- or 1/3-octave analysis – Spectrum

For active **1/1 Octave** or **1/3 Octave** functions, the additional position (**Spectrum**) appears on the **Measurement** list.

The **Spectrum** position enables selecting the pre-weighting broadband frequency filter and the LEQ detector for the octave or third octave analysis.

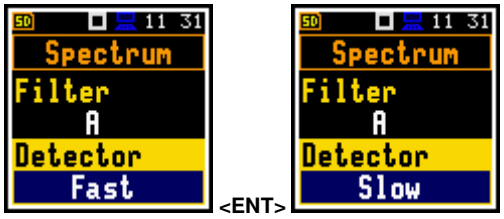


Following weighting filters are available for the 1/1 and 1/3-octave analysis:

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

Filter characteristics are given in Appendix C.

The **Detector** parameter can be set to **Linear**, **Fast** or **Slow**.



10.3 CONFIGURING 1/1- OR 1/3-OCTAVE SPECTRA VIEWS

The **Display** section is used for setting various parameters, which are mainly dedicated for control of the spectrum view. Following positions are used for setting up presentation of 1/1 and 1/3-octave results:

Disp. Modes allowing you to enable the **Spectrum** view;

Disp. Scale allowing you to adjust scales of the spectrum plot and switch on/off the grid;

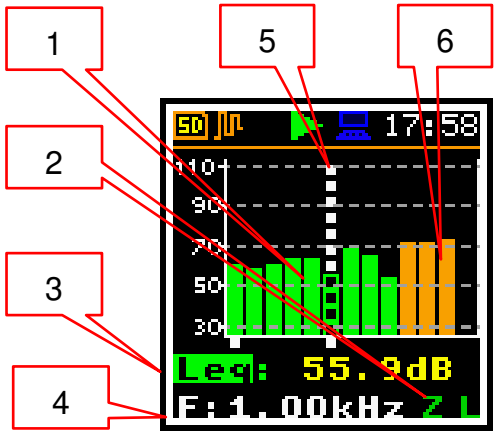
Spect. View allowing you to select spectra to be viewed: instantaneous, averaged, maximum or minimum.

10.3.1 Presentation of 1/1- or 1/3-octave spectra

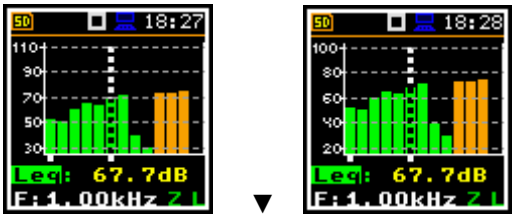
The **Spectrum** position in the **Display Modes** list becomes available for the **1/1 Octave** and **1/3 Octave** functions and enables/disables the spectrum view (**Spectrum**).

Spectrum view fields

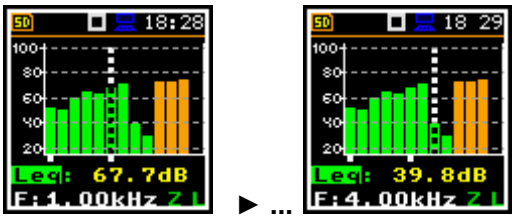
1. Spectrum plot
2. Type of filter and RMS detector
3. Type of result and its value for the cursor position
4. Central frequency for the cursor position
5. Cursor position
6. Total values



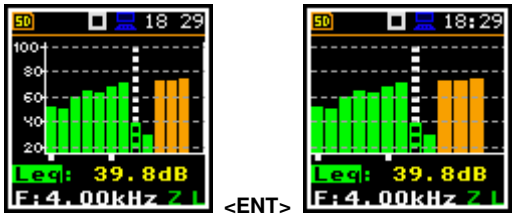
You can shift the Y-axis up or down during the spectrum presentation by with the ▲ / ▼ key.



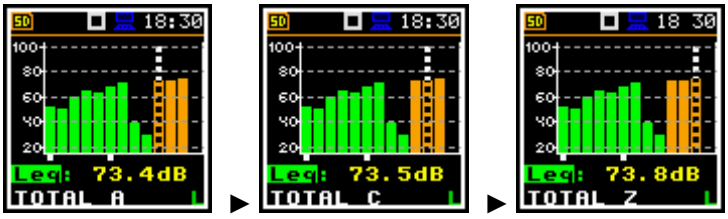
You can change the cursor position with the ◄ / ► key. The frequency and appropriate dB value are presented in the line below the plot.



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

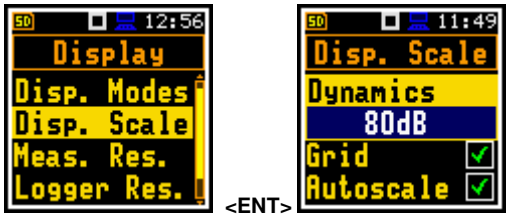


Total values are calculated with the filters **A**, **C** and **Z**, and are displayed at the bottom line of the screen when the cursor has been placed on the appropriate orange bar.



10.3.2 Adjusting spectrum plot scale – Display Scale

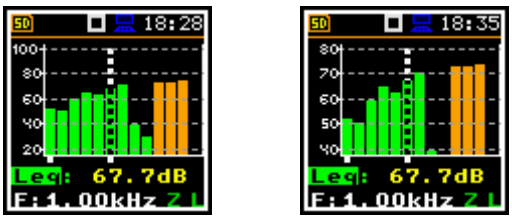
The **Disp. Scale** position allows you to change the scale of the spectrum plot and switch the grid and automatic scale adjustment on/off.



Scaling vertical axis

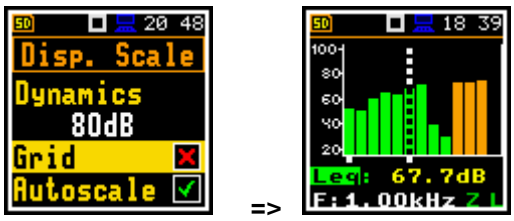
The **Dynamics** position enables selecting the required scale dynamic range of the spectrum plot. It is possible to select the range from the set: **10dB**, **20dB**, **40dB**, **80dB** and **120dB**.

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



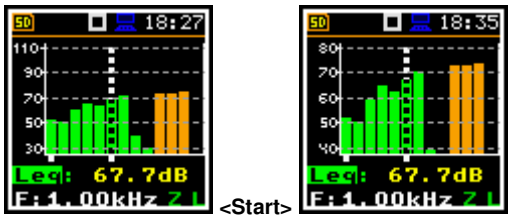
Switching grid on/off

The **Grid** position switches on or off the grid in the spectrum view.



Automatic Y-scale adjustment

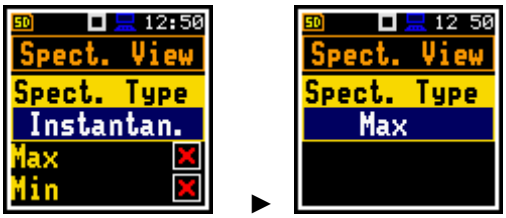
The **Autoscale** position switches on or off the automatic adjustment of the Y-axis scale dynamic range to the current spread between lowest and highest measured octave or third octave results.

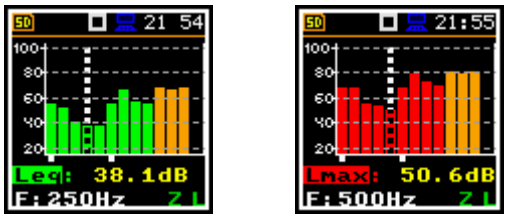


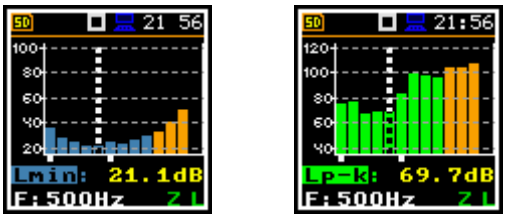
10.3.3 Selection of spectra to be viewed – Spectrum View

In the **Spectrum View** screen, which appears in the **1/1 Octave** or **1/3 Octave** functions, you can select different spectra to be visible on the display (**Spect. Type**): **Averaged**, **Instantaneous**, **Max**, **Min** and **Peak**.

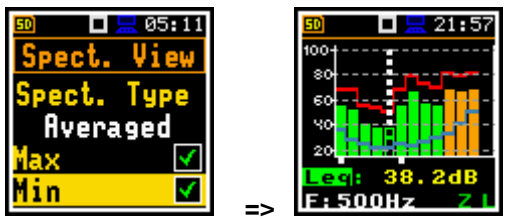
Below are views of different spectra.







Minimum and maximum spectra can be presented at the same plot with the **Averaged** and **Instantaneous** spectrum when the **Max** or/and **Min** parameter is switched on.



11 DOSIMETER

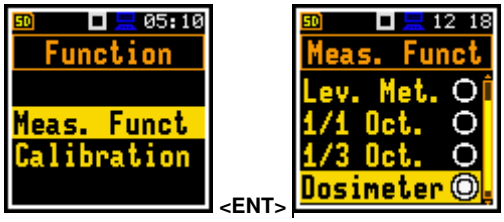
The instrument operates as a **Dosimeter** in a very similar way to the **Level Meter** and, in addition to SLM results, measures also basic dose parameters. This chapter describes Dosimeter specific settings.

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 DOSIMETER FUNCTION

To change the SLM mode to the SEM mode you should activate the **Dosimeter** function.

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



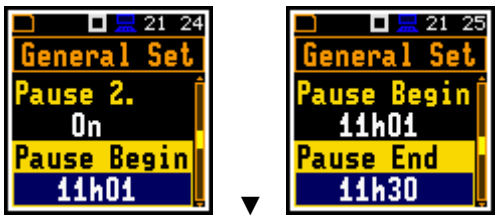
11.2 SETTING GENERAL PARAMETERS – GENERAL SETTINGS

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

Programable automatic pauses

Automatic pause(s) can be switched off (**Off**) or can be programmed based on the RTC time (**On**).

If **Pause** is **On**, two additional positions appear which enable setting time for pause begin (**Pause Begin**) and time for pause end (**Pause End**).

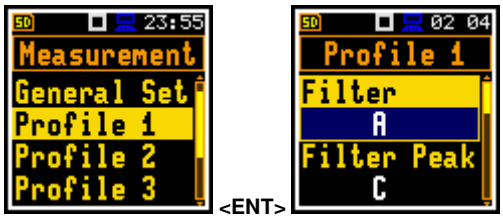


Note: *In the **Simple** interface mode, the **Pause** parameters are hidden, but the instrument will use settings previously defined in the **Advanced** mode or default settings (**Off**).*

11.3 SETTING PROFILE PARAMETERS – PROFILE X

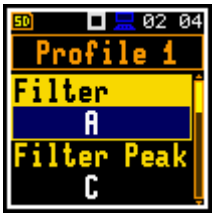
Parameters of three profiles can be set in the **Profile x** lists of parameters.

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

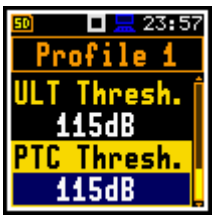
Following LEQ detectors are available in the instrument: **Imp.**, **Fast** and **Slow**.

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 permitted sound level may increase if the exposure time is halved: **2**, **3**, **4**, **5**, **6**;



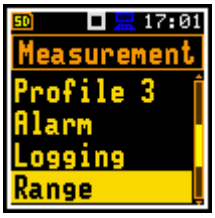
ULT Threshold Level (Upper Level Time) is a threshold level for calculation of the ULT results: **70dB** ÷ **140dB**;

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

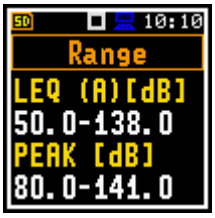
11.4 CHECKING MEASUREMENT RANGE – RANGE

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

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

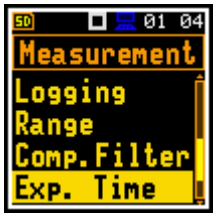


<ENT>



11.5 SETTING EXPOSURE TIME – EXPOSURE TIME

The **Exp. Time** enables setting the desired value of the workday exposure time which is used for calculation of the **LEPd** results (see Appendix D).



<ENT>

11.6 SETTING ALARM THRESHOLDS FOR DOSE METER RESULTS – ALARM

The **Alarm** position is active only in the **Dosimeter** function and enables programming the alarm thresholds for three profiles (**Thresh. P1 (2,3)**).

Thresholds can be set for next measurement results of the **Dosimeter** in ranges:

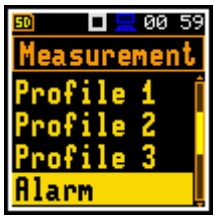
DOSE: 1÷200%;

D_8h: 1÷200%;

PTC: 1÷1000;

ULT: 1÷60s.

If **Off** is selected, the alarm for the measurement result is switched off.



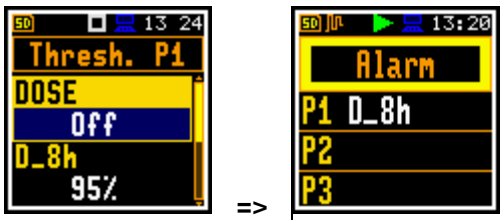
<ENT>

<ENT>

Alarm is signalled on a special screen with flashing frame and **Alarm** text inside and exceeded profiles threshold.

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

To exit the alarm screen, press any key.



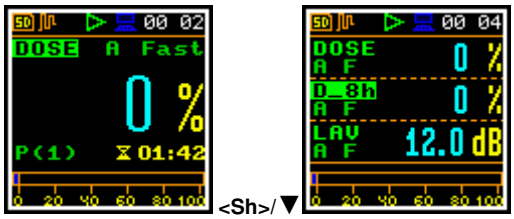
11.7 LOGGING TIME-HISTORY RESULTS – LOGGER RESULTS

The **Logger Res.** list enables activating results for three independent profiles, which will be recorded to the logger file during the measurement: **Lpk**, **Lmax**, **Lmin**, **Leq** and **LAV**.

11.8 DISPLAYING DOSIMETER RESULTS

In the **Dose Meter** function, next results are measured and displayed: **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**.

You can enable or disable results in the **Dosimeter results** screen (*path: <Menu> / Display / Meas. Res. / Dosim. Res.*).



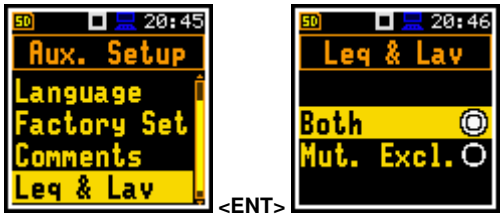
11.8.1 Displaying of Leq & Lav results – Leq & Lav

The **Leq & Lav** position enables selecting the mode of displaying the **Leq** and **Lav** results.

If **Both** is selected **Leq** and **Lav** are always displayed together.

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

- for **Exchange Rate** equal to 3, **Leq** is displayed and **Lav** is not;
- for **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 SV 973, which 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). Whole measurement process and calculations implemented in SV 973 fulfil the ISO 3382 standard.

The reverberation time of the room can be obtained with the use of SV 973 by two measurement methods: Impulse Response Method (**Impulse**) and Interrupted Noise Method (**Decay**). The selection of the method depends on the type of the used sound source. The **Impulse** method is designed for measurements using the impulse sound source (like pistol shot, petard explosion), whereas the **Decay** method is intended for measurements when room is excited by broad or narrow band sound noise source (usually pink noise). For more details about the measurement and calculation process see Appendix E.

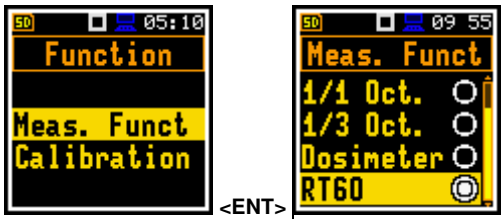
The reverberation time analysis applied in the instrument consists of two parts:

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

Note: *It is recommended to familiarize with Appendix E before proceeding. This chapter describes only the navigation of the instruments, whereas Appendix E depicts the definitions and describes reverberation time measurements.*

12.1 SELECTING RT60 FUNCTION

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

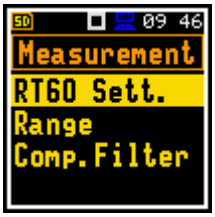


Note: *The **RT60** function is optional and should be unlocked by entering the activation code in the text editor screen, which is opened after first attempt to select this function. Once unlocked this option will be available permanently.*

12.2 SETTING RT60 PARAMETERS – RT60 SETTINGS

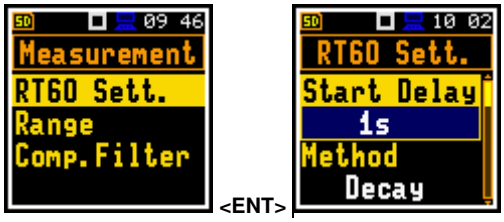
Execution of the **RT60** analysis depends on a certain number of the parameters, which can be set in the different screens of the **Measurement** section: **RT60 Settings**, **Compensation Filter** and **Range**.

Positions **Range** and **Compensation Filter** are the same as for the SLM functions (see Chapters 4.6 and 4.7).



The **RT60 Settings** list allows 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** parameter defines the delay period from the moment the **<Start/Stop>** keystroke to the start of the actual measurement.



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

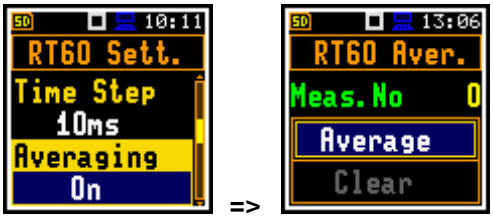
The **Recording Time** parameter defines the recording time of the measurement data (sound pressure level decay curve). Data registration starts in the moment of the trigger condition appearance. Recording time can be set in the range **1s** ÷ **30s** or **Auto**.

When **Auto** is selected the instrument decides itself when to stop recording.

The **Time Step** parameter defines the time-step of data registration (sound pressure level) in the file. The parameter value can be selected from the set: **2**, **5**, **10**, **20**, **50 ms**.

The **Averaging** position enables averaging of the reverberation time results from several measurements.

When this position is **On** the new **RT60 Aver.** screen becomes available in the measuring mode.



The **Noise Mar.** parameter defines the margin value to 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** parameter defines for which bands (**1/1** or **1/3**) the **RT60** analysis will be performed.

The **Freq. Range** parameter defines 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** position allows to define the name of the logger file in which data of the **RT60** analysis will be recorded. The name can be up to eight characters long. After pressing the ◄ / ► key, the special screen with text editor is opened.

The **Level** position defines 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**).

12.3 STARTING RT60 MEASUREMENTS

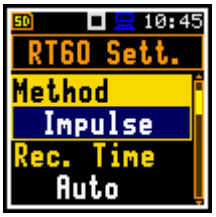
Measurements using Decay method

1. Set parameters for **Decay** RT60 measurements. Most used setup is as presented below.
   - **Method:** **Decay**
   - **Recording Time:** **Auto**
   - **Time Step:** **10ms**
   - **Averaging:** **On**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100dB**.

2. Place the sound power source in the measured room (for the sound power source location - see the reverberation time measurement ISO standard).
3. Place the microphone in one of the selected measurement points (for the measurement points location see the reverberation time ISO standard).
4. Switch on the sound power source.
5. Start the measurement process by pressing the **<Start/Stop>** key. While the instrument is waiting for the trigger condition fulfilment the **LCpeak** result is displayed.
6. Switch off the sound power source (the source should work enough long to obtain the acoustic field stabilisation). After the trigger condition fulfilment, the instrument collects data and gives the RT60 table for octave or third octave bands.

***Note**: It is necessary to switch on the sound source before starting the measurement because of the trigger requirements (for more details see Appendix E). 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 Impulse method



1. Set parameters for **Impulse** RT60 measurements. Most used setup is presented below.
   - **Method:** **Impulse**
   - **Recording Time:** **Auto**
   - **Time Step:** **10ms**
   - **Averaging:** **On**
   - **Noise Mar.:** **10.0dB**
   - **Level:** **100dB**

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

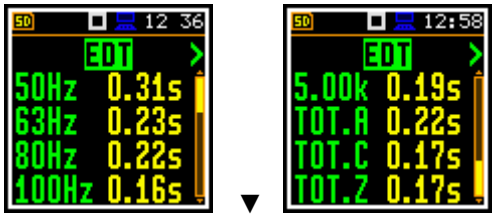
***Note**: The proper value of the sound level trigger threshold should be set well above the background noise and significantly below the maximum sound level emitted by the impulse source.*

3. Start the measurement process with the **<Start/Stop>** key. While the instrument is waiting for the trigger condition fulfilment the **LCpeak** result is displayed.
4. Release the impulse sound power source. If the trigger condition is fulfilled the instrument collects data and gives the RT60 table for octave or third octave bands.

***Note**: During collecting data all other sources of sound should be suppressed in the tested room to not affect the measurement results.*

12.1 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 form.



The table presents next results of reverberation time for:

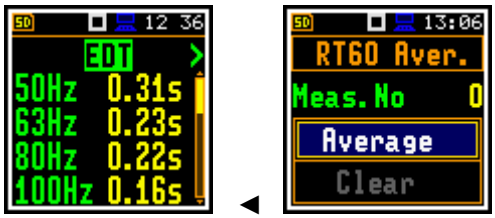
- **EDT** - early decay time;
- **RT20** - reverberation time calculated with 20 dB dynamics;
- **RT30** - reverberation time calculated with 30 dB dynamics.

***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).*

12.1 AVERAGING RT60 RESULTS

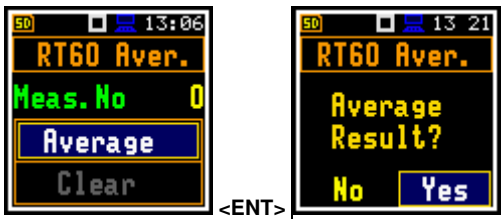
If **Averaging** is On, you can average results for consecutive measurements following next steps:

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

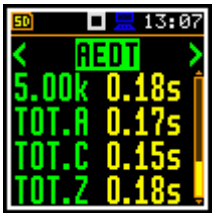


The **Meas.No** position displays the number of the measurement which is being averaged so far.

2. In the **RT60 Aver.** screen, press the **<Enter>** key and confirm averaging.

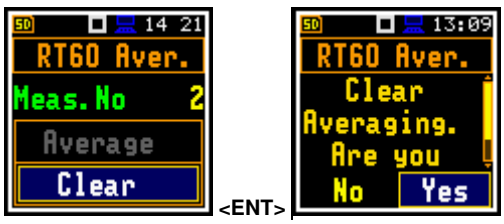


As a result, additional three columns appear in the RT60 table: **AEDT**, **A20** and **A30**.



If you start new measurement and get results you can perform averaging with previous averaged results as per steps 1 and 2 above. The **Meas.No** will increase by one and the **AEDT**, **A20** and **A30** columns will present new results averaged with previous ones.

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



13 MAINTENANCE

13.1 BATTERIES REPLACEMENT

SV 973 is delivered with four AAA alkaline batteries, but the you may also use AAA rechargeable batteries.

The "**battery**" icon shows the condition of the internal batteries.

The instrument is not equipped with an internal charger; therefore, the rechargeable batteries can be charged only after removal them out of the instrument.

To change or charge the batteries, switch off the instrument, unscrew the coin slot screw, take off the black bottom cover of the instrument and slide the battery tubes out.

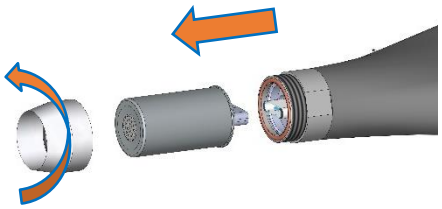
***Note*:** *While changing the batteries, observe the correct polarity.*

13.2 DISCONNECTING MICROPHONE

When 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 protective ring and pull the microphone to extract it from the USB-C type connector.

To reinstall the microphone, insert it into the USB-C type connector and screw on the microphone protective ring.



Note: *The instrument set includes a protective microphone cap, which is recommended to have always on the microphone, when the instrument is not used for measurements!*

13.3 RESETTING THE INSTRUMENT

- **SYSTEM RESET:** internal software reset clears any setup configuration and brings back the default factory settings. See **Factory Settings** (*path: <Menu> / Auxiliary Setup*).
- **HARDWARE RESET:** internal hardware reset doesn't change any settings. Make sure the battery is not exhausted, and the unit is turned off. Hold down the **<Shift>** and **<Start/Stop>** keys for 20 seconds, and then release them. Turn on the instrument as usually.

Note: *Hardware reset should only to be used in extreme situations such as an instrument hang-up.*

Be aware, that a hardware reset:

- will stop any pre-programmed auto-run modes,

- will stop measurement run!

13.4 FIRMWARE UPGRADE

SVANTEK is committed to continuous innovation path of development, and as such reserves the right to provide firmware enhancements based on user's feedback.

To update the instrument firmware:

- Unpack the provided firmware package (provided as a suitable compressed file).
- Make sure the unit is turned off.
- Connect SC 158 cable to the computer and SV 973 instrument (USB-C interface).
- Keeping pressed the **<Enter>** and **<ESC>** keys switch on the instrument - the following message should appear on the unit's screen: BOOTSTRAP v2.01 (or higher).
- Wait for the message **<USB>** on the unit's screen and start from the PC: **go-usb.bat**.
- The changing number and final message: "..... o.k." should appear on the computer screen.
- Successful firmware update will be indicated by the message: *Program loaded!*
- Switch off the instrument.

Note: *With the use of* ***SvanPC++*** *software it is very easy to check if there are any new firmware releases available for download.*

13.5 PRESERVATION OF INTERNAL BATTERIES

- To preserve the life of the internal batteries, it is recommended that the instrument is turned off when it is stored. In case of alkaline batteries, it is recommended to extract them out of the instrument.
- When the instrument is turned off, it still draws a small amount of battery power. Therefore, it is recommended to charge cells every few months if it is not going to be used regularly.

13.6 TRANSPORTATION AND STORAGE

For transportation or storage purpose, we recommend using the packaging provided by the manufacturer. In a potentially dirty industrial environment, it is advised to use the carrying case provided by the manufacturer such as waterproof case (SA 72) or pocket soft bag (SA 80), which ensures excellent mechanical and environmental protection and long-term storage conditions.

13.7 CLEANING

Clean the surface of the instrument with damp soft cloth.

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

Note: *In cases of larger dirt, such as oil or grease, contact your Local Authorized Distributor or Svantek Service Office.*

13.8 TROUBLESHOOTING

- In case your instrument does not respond proceed with hardware reset of the instrument (see Chapter 13.3).
- In case the reset does not help call your Local Authorized Distributor or Svantek Service Office.

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

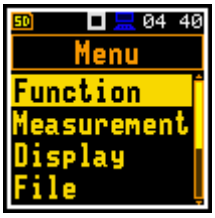
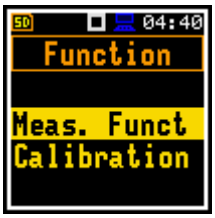
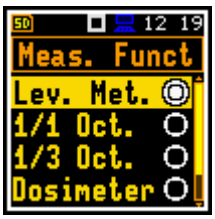
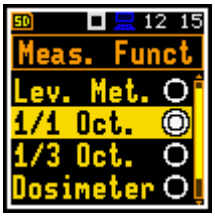
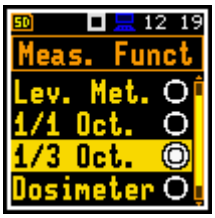
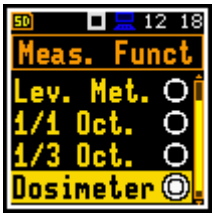
E-mail: support@svantek.com.pl
office@svantek.com.pl

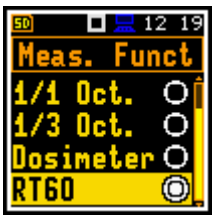
Internet: www.svantek.com

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

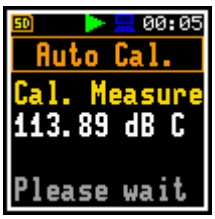
14 GLOSSARY

14.1 MODES AND MEASUREMENT FUNCTIONS

Name	Description	Screen	Reference
Function	The menu section that enables selecting the *Measurement Function* and performing *Calibration* of the instrument.		Manual 3
Measurement Function	Type of calculations the instrument currently performs: - *Level Meter*, - *1/1 Octave*, - *1/3 Octave*, - *Dosimeter,* - *RT60*.		Manual 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.		Manual 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 plot - a function of result value vs central band frequency. 1/1-octave results can be saved as a time-history.		Manual 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 plot - a function of result value vs central band frequency. 1/3-octave results can be saved as a time-history.		Manual 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.		Manual 3.1, 11

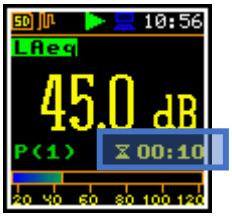
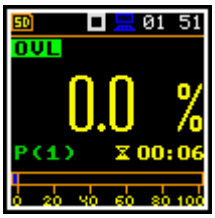
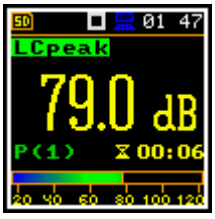
RT60	*Measurement Function* enabling calculation of reverberation time in 1/1-octave bands or 1/3-octave bands including three total RMS levels (A, C and Z weighted). Two methods can be applied: Impulse Response Method and Interrupted Noise Method. Results are presented for 1/1 or 1/3 octave bands.		Manual 3.1, 12

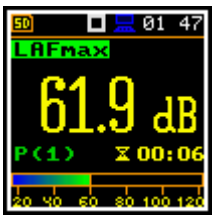
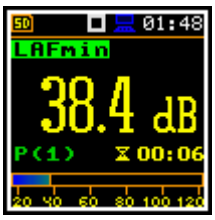
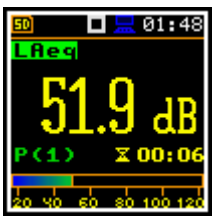
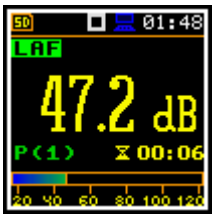
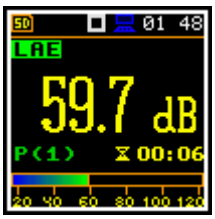
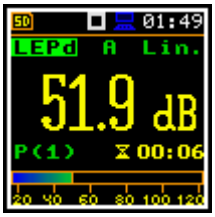
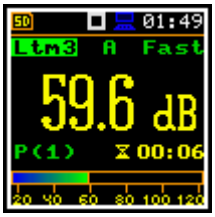
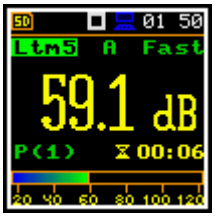
14.2 CALIBRATION

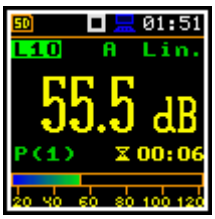
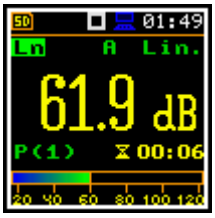
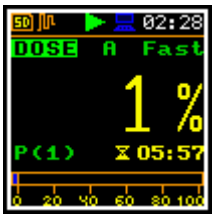
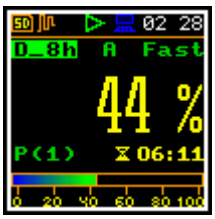
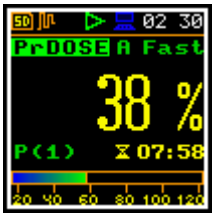
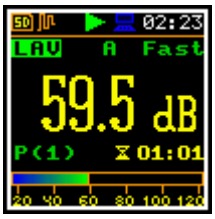
Name	Description	Screen	Reference
Calibration	Position on the *Function* screen that opens a screen with positions allowing you to perform calibration of the instrument: *By Measurement, Last Calibration, Calibration History, Clear History, Post Calibration* and *Auto Calibration*.		Manual 3.2
By Measurement	Type of calibration based on the reference signal measurement with the use of a sound calibrator.		Manual 3.2.1
Calibration Measure	Measured by the instrument reference signal level without calibration factor correction.		Manual 3.2.1, 3.2.5
Calibration Level	Level of the reference signal generated by used calibrator.		Manual 3.2.1, 3.2.5
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).		Manual 3.2.1, 3.2.5
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.		Manual 3.2.1

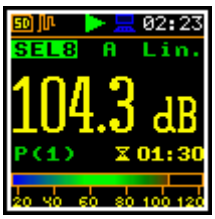
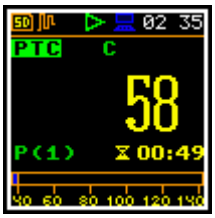
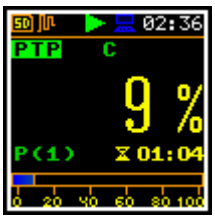
Calibration History	List of calibration records which you can view by pressing the **<Enter>** key.		Manual 3.2.2
Clear History	Operation that clears all calibration records.		Manual 3.2.3
Post Calibration	Feature that enables adding the new calibration factor to some files already saved in the instrument's memory or to the files that will be created in the future.		Manual 3.2.4
Auto Calibration	Feature that enables automatic calibration when the reference sound signal is detected by the instrument.		Manual 3.2.5

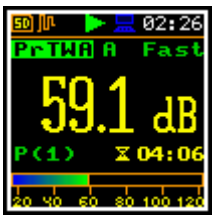
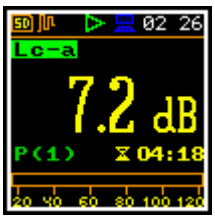
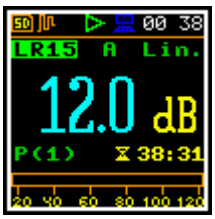
14.3 DEFINITIONS OF MEASURED RESULTS

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.		Manual 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

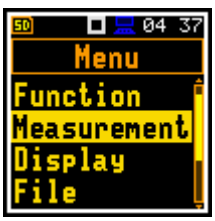
Lmax	Maximal value of the time-weighted sound pressure level at the exponential RMS detector output within the elapsed measurement time. The *Max* result for the 1 second period is equal to the Spl result. It is measured with frequency weighting A, C or Z and time weighting F, S, I and displayed as LAFmax, 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

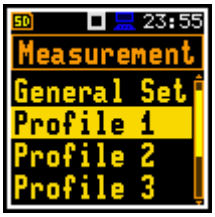
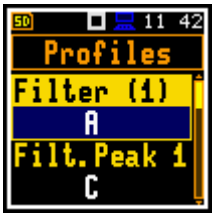
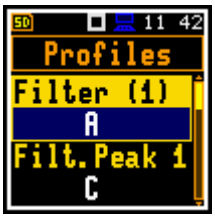
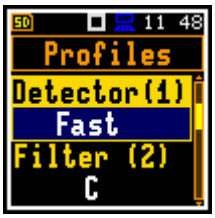
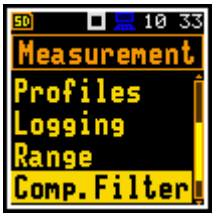
SEL8	*SEL* result corresponding to the integration time equal to 8 hours. The *SEL8* result is calculated on the base of the LEQ.		Appendix D
E	Exposition represents the amount of the acoustical energy received by the worker.		Appendix D
E_8h	Exposition in 8 hours represents the amount of the acoustical energy received by the worker for 8 hours. The *E_8h* result is expressed in the linear units [Pa^2h].		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

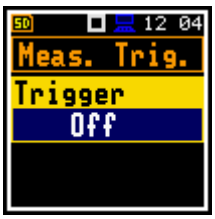
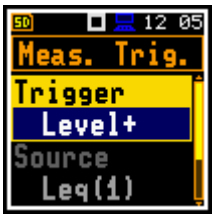
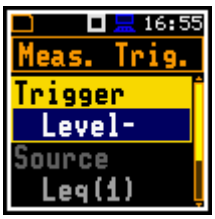
PrTWA	Projected Time Weighted Average is calculated from the measured LAV (taking THRESHOLD LEVEL into account) and the exposure time.		Appendix D
Lc-a	*Leq* that enhances the low-frequency components of the sound signal. It is the result of subtracting an A-weighted LAeq from a simultaneously collected 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
LR15	15-minutes running *Leq* - the rolling (sliding) Leq window for the last 15 minutes of measurement (900 seconds) moving with 1 second step.		Appendix D
LR60	60-minutes running *Leq* - the rolling (sliding) Leq window for the last 60 minutes of measurement (3600 seconds) moving with 1 second step.		Appendix D

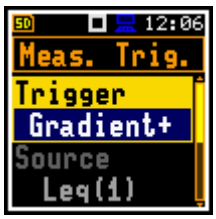
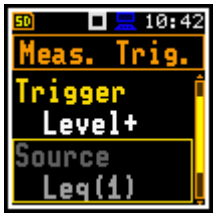
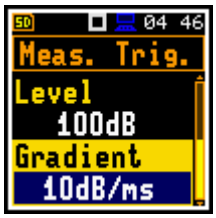
14.4 MEASUREMENT PARAMETERS

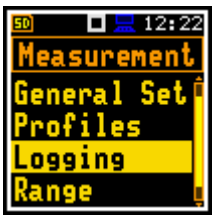
Name	*Description*	*Screen*	*Reference*
Measurement	Section of the Main Menu that enables selecting the measurement parameters in the screens: *General Settings, Measurement Trigger, Profiles, Logging, Spectrum, Range, Compensation Filter, Statistical Levels, Exposure Time, Timer* and *Alarm*.		Manual 4

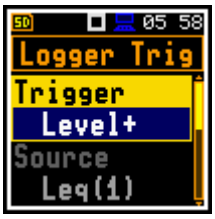
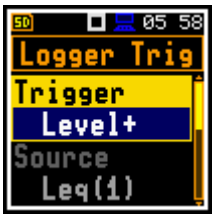
General Settings	General measurement settings: *Start Delay*, *Start Sync.*, *Integration Period*, *Repetition Cycles*, *RMS Integration* and *Day Time Limits*.		Manual 4.1
Start Delay	Delay between pressing the <Start> key and the start of measurement integration.		Manual 4.1
Start Synch.	Synchronization 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.		Manual 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.		Manual 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.		Manual 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.		Manual 4.1
Linear	Linear type of integration of RMS based results (RMS detector), without time weighting according to the IEC 61672-1:2013 standard.		Manual 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.		Manual 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.		Manual 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.	 	Manual 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.		Manual 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.		Manual 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*.		Manual 4.3 Appendix D
Compensation Filter	Digital filter that compensates some effect: *Microphone*, *Diffuse Field and Windscreen*.		Manual 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).		Manual 4.7

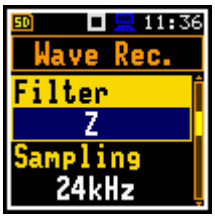
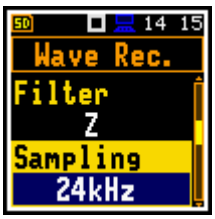
Field Compensation	Digital filter that compensates the free-field (**Free Field**) or diffuse field (**Dif. Field**) effects.		Manual 4.7
Windscreen	Digital filter that compensates the effect of the SA 22 windscreen.		Manual 4.7
Range	Position that enables checking the linear operating range for the sinusoidal signal. The instrument uses two ranges – one for the *Level Meter*, *1/1 Octave, 1/3 Octave* and *RT60* functions (32.0 LEQ(A) – 128.0 PEAK) and another for the **Dosimeter** function (50.0 LEQ(A) – 141.0 PEAK). The calibration factor is always added to the range limits.		Manual 4.6
Measurement Trigger	Screen that enables configuring triggering of the measurement/integration process with parameters: *Trigger, Source, Level* and *Gradient*.		Manual 4.2
Trigger	Position 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.		Manual 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.		Manual 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.		Manual 4.2

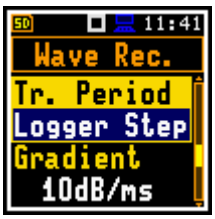
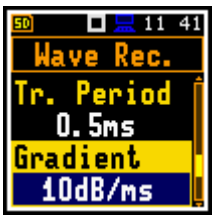
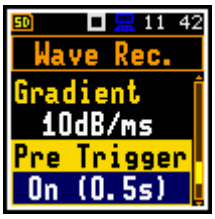
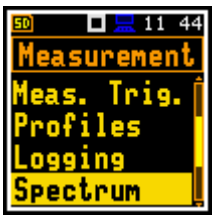
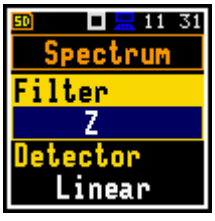
Gradient +	Type of trigger that starts the 1-second measurement/ integration under the condition: value of the RMS result (*Source*) integrated during 0,5 ms is greater than the threshold level (*Level*) and the gradient of this Source is greater than the threshold level (*Gradient*). In other cases, 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.		Manual 4.2
Source	Measured result that is compared with the threshold level (*Level*) for triggering – RMS measured in the first profile: Leq(1).		Manual 4.2
Level	Threshold level of the *Source* for trigger condition fulfilment.		Manual 4.2
Gradient	Threshold level of the source signal value speed of changing (Gradient) for trigger condition fulfilment.		Manual 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.		Manual 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.		Manual 4.9

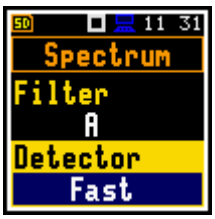
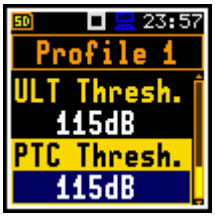
Logging	Screen that enables configuring saving of the *Summary Results*, *Logger Results* and a waveform signal in files with the use of the next screens: *Logger Setup, Logger Results, Logger Trigger* and *Event Recording.*		Manual 4.5
Logger Setup	Screen that enables switching the logger function on and setting the main logging parameters: *Logger*, *Split*, *Logger Step* and *Logger Name*.		Manual 4.5.1
Logger	Position in the *Logger Setup* list that switches On or Off the *Logging* functionality. If *Logger* is Off no data recording is available.		Manual 4.5.1
Logger Split	Position 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.		Manual 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.		Manual 4.5.1
Logger Name	Position 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.		Manual 4.5.1
Summary Results	Main measurement results: *Leq*, *Lpeak*, *Lmax*, *Lmin*, *L*, *LE*, *Lden*, *LEPd*, *Ltm3*, *Ltm5,* statistics *Ln*; 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.		Manual 4.5.1

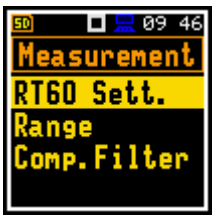
Logger Results	Screen in the *Logging* list enabling selecting results that will be logged to the logger file as a time-history with the *Logger Step*: *Lpeak, Lmax, Lmin, Leq*. For the 1*/1 Octave* and *1/3 Octave* functions also spectra can be saved.		Manual 4.5.2
Logger Trigger	Screen that enables configuring parameters for triggering of *Logger Results* recording to the logger file: *Trigger, Source, Level, Pre Trigger* and *Post Trigger*.		Manual 4.5.3
Trigger	Position 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.		Manual 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.		Manual 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.		Manual 4.5.3
Source	Measured result that is compared with the threshold level (*Level*) for triggering – LEQ measured in the first profile (Leq(1)).		Manual 4.5.3
Level	Threshold level of *Source* for triggering condition fulfilment.		Manual 4.5.3
Pre Trigger	Period of additional logging before triggering condition fulfilment.		Manual 4.5.3

Post Trigger	Period of additional logging after triggering condition fulfilment.		Manual 4.5.3
Wave Recording	Recording of the waveform signal in the wave file.		Manual 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.		Manual 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*).		Manual 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*).		Manual 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*).		Manual 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*).		Manual 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*).		Manual 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.		Manual 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*.		Manual 4.5.4
Filter	Weighting filter used during signal recording: Z, A, C, B or LF.		Manual 4.5.4
Sampling	Sampling frequency of the event recording: 24 kHz or 12 kHz.		Manual 4.5.4
Signal Gain	Gain of the recorded signal: **0 dB** … **40 dB**.		Manual 4.5.4
Source	Measured result that is compared with the threshold level for triggering (*Level*) – LEQ measured in the first profile: Leq(1).		Manual 4.5.4
Level	Threshold level of the *Source* for the trigger condition fulfilment.		Manual 4.5.4

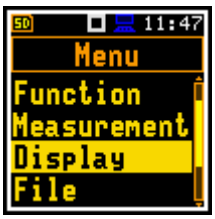
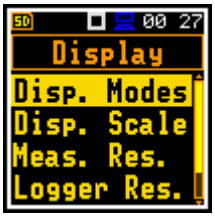
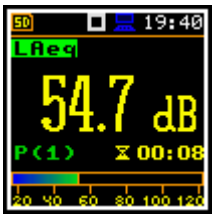
Trigger Period	Time interval of checking the triggering conditions. This parameter can be set as: Logger Step, 0.5 ms, 100.0 ms and 1 s.		Manual 4.5.4
Gradient	Threshold level of the source signal value speed of changing (Gradient) for trigger condition fulfilment.		Manual 4.5.4
Pre Trigger	Period of signal recording before the first trigger condition moment: Off or 1 s.		Manual 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.		Manual 4.5.4
Spectrum	Screen that enables setting the *1/1 Octave* or *1/3 Octave* spectrum parameters setup: *Filter* and *Detector*.		Manual 10.2.3
Peak Sp.	Position in the *Logger Results* screen that switches on/off the Lpeak spectra saving as a time-history in a logger file.		Manual 10.2.2
Leq Sp.	Position in the *Logger Results* screen that switches on/off the Leq spectra saving as a time-history in a logger file.		Manual 10.2.2
Filter	Weighting filters for the *1/1 Octave* and *1/3 Octave* analysis: A, B, C, Z.		Manual 10.2.3

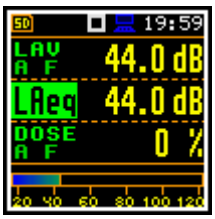
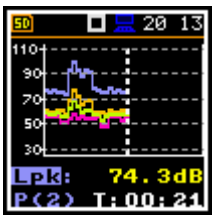
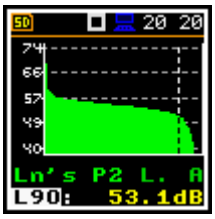
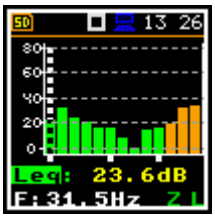
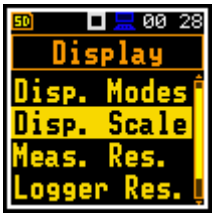
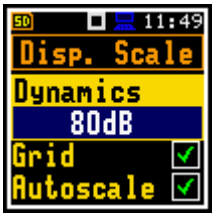
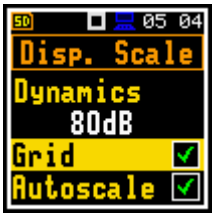
Detector	Type of integration of RMS based results for *1/1 Octave* and *1/3 Octave* analysis: Linear, Fast or Slow.		Manual 10.2.3
Pause	Automatic pause(s) in the *Dosimeter* mode, that can be programmed based on absolute time.		Manual 11.2
Exposure Time	Total time during working day in which the worker is exposed to the noise. This time is considered for the LEPd result calculation.		Manual 11.5 Appendix D
Criterion Level	Steady noise level permitted for a full eight-hour work shift.		Manual 11.3
Threshold Level	Noise level limit below which the dosimeter does not accumulate noise dose data.		Manual 11.3
Exchange Rate	Amount by which the permitted sound level may increase if the exposure time is halved.		Manual 11.3
ULT Threshold Level	Threshold level for calculation of ULT results.		Manual 11.3
PTC Threshold Level	Threshold level for calculation of PTC results.		Manual 11.3

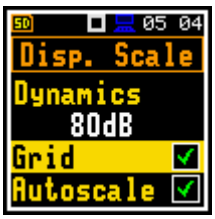
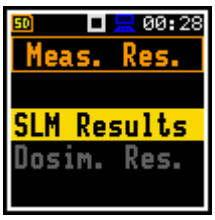
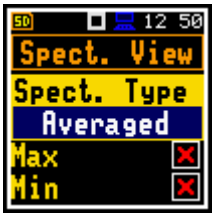
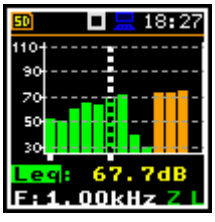
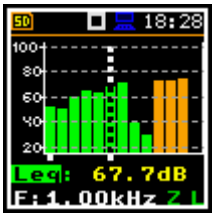
RT60 Settings	Screen that enables setting the reverberation time measurement parameters: *Start Delay, Method, Recording Time, Time Step, Averaging, Noise Mar., Octave, Freq. Range, Logger Name* and *Level*.		Manual 12.2
Start Delay	Delay between pressing the <Start> key and the start of the RT60 measurement.		Manual 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.		Manual 12.2
Recording Time	Time of measurement data (sound pressure level decay curve) registration during RT60 calculations: *1s .. 30 s* or *Auto*.		Manual 12.2
Time Step	Time-step of data registration (sound pressure level) in the file during RT60 calculations: *2, 5, 10, 20, 50 ms*.		Manual 12.2
Averaging	Averaging of the reverberation time results from several measurements during RT60 calculations.		Manual 12.2
Noise Mar.	Margin value to the calculated noise level for RT60 calculations: *0 ÷ 20 dB*.		Manual 12.2
Octave	Type of spectrum (1/1-octave or 1/3-octave) based on which the RT60 analysis is performed.		Manual 12.2

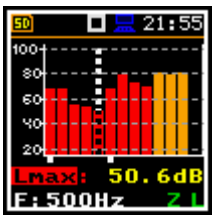
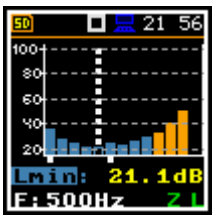
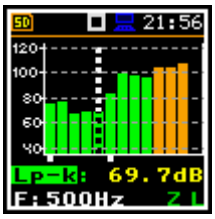
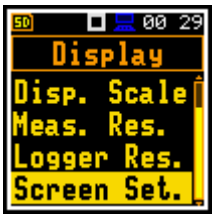
Freq. Range	Frequency range for RT60 calculations: *63Hz-4kHz* (7 bands) and *63Hz-8kHz* (8 bands) for 1/1-octave; *50Hz-5kHz* (21 bands) and *50Hz-10kHz* (24 bands) for 1/3 octave.		Manual 12.2
Logger Name	Name of the Logger file in which data of the RT60 analysis will be recorded.		Manual 12.2
Level	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.		Manual 12.2

14.5 DISPLAY PARAMETERS

Name	Description	Screen	Reference
Display	Section of the Main Menu that enables setting of the measurement views.		Manual 5
Display Mode	Mode of measurement results presentation - view. Views can be activated in the *Display Modes* screen.		Manual 5.1
One Result view	View of the one result. This view is always available and cannot be disabled.		Manual 5.1
Running SPL view	View of the running SLP result. This view is used before the measurement start for the noise level estimation.		Manual 2.5

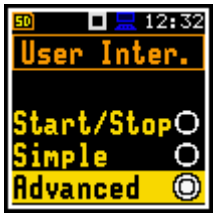
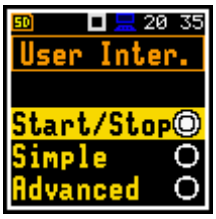
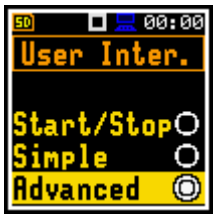
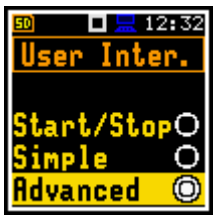
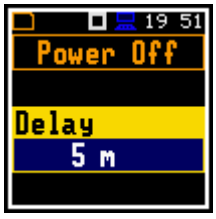
3 Profiles view	View of three results on the display at the same time.		Manual 5.1.2
Logger view	View of time-history (logger) results.		Manual 5.1.3
Statistics view	View of statistics of sound results.		Manual 5.1.4
Spectrum view	View spectra: *1/1 Octave* and *1/3 Octave*.		Manual 5.1, 10.3
RT60 results view	View of RT60 results calculated for octave or third-octave bands: EDT, RT20, RT30; and averaged results: AEDT, ART20, ART30.		Manual 12.3
Display Scale	Screen that enables setting parameters of the results presentation: *Dynamics*, *Grid* and *Autoscale*.		Manual 5.2
Dynamics	Range of the plot scale: 10 dB, 20 dB, 40 dB, 80 dB, 100 dB and 120 dB.		Manual 5.2
Grid	Toggle of the grid on the plot views.		Manual 5.2

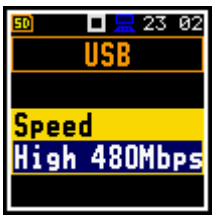
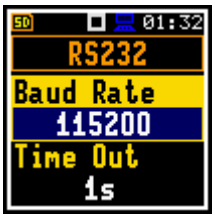
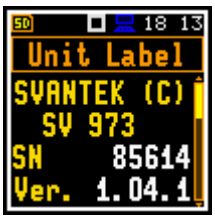
Autoscale	Toggle the automatic scale adjustment of the Y axis.		Manual 5.2
Measurement Results	Screen that enables selecting the Sound Level Meter and/or Dose Meter results, which will be presented on the display.		Manual 5.3
SLM Results	Screen that enables selecting the Sound Level Meter results, which will be presented on the display.		Manual 5.3
Dosimeter Results	Screen that enables selecting the Dose Meter results, which will be presented on the display.		Manual 5.3
Logger Results	Screen that enables selecting time-history results, which will be presented on the display.		Manual 5.4
Spectrum View	Screen that enables selecting types of spectra for displaying: *Averaged*, *Instantaneous*, *Max*, *Min* and *Peak*.		Manual 10.3.3
Instantaneous	Spectrum of instantaneous *Leq* results for the *1/1 Octave* or *1/3 Octave* bands.		Manual 10.3.3
Averaged	Spectrum of averaged *Leq* results for the *1/1 Octave* or *1/3 Octave* bands.		Manual 10.3.3

Max	Spectrum of *Lmax* results for the *1/1 Octave* or *1/3 Octave* bands.		Manual 10.3.3
Min	Spectrum of *Lmin* results for the *1/1 Octave* or *1/3 Octave* bands.		Manual 10.3.3
Peak	Spectrum of *Lpeak* results for the *1/1 Octave* or *1/3 Octave* bands.		Manual 10.3.3
Screen Setup	Screen that enables setting the screen brightness and power saving.		Manual 5.5
Dim Mode	Screen dimming in no activity after delay.		Manual 5.5
Dim Delay	Screen dimming time delay in no activity after last key pressing.		Manual 5.5
Col. Scheme	Colour scheme of the screen.		Manual 5.5

14.6 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, Bluetooth, RS232, RTC* and *Unit Label.*		Manual 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*).		Manual 7.1
Start/Stop	User interface mode that limits the menu to only one *User Interface* position in the main *Menu* and measurement screens		Manual 7.1
Simple	User interface that limits instrument's settings to the most frequent used positions, hiding other positions. Before activation of the *Simple* mode the user may decide whether to leave settings of hiding positions as they were set before the activation of the *Simple* mode or to reset them to the factory default settings.		Manual 7.1
Advanced	User interface that enables full scope of instrument settings.		Manual 7.1
Battery	Position in the *Instrument* list that enables checking of the instrument power source status.		Manual 7.2
Keyboard	Position in the *Instrument* list that enables setting of the Shift, Alt, Start, Stop keys functionality and programming of locking/unlocking the keyboard.		Manual 7.3
Power Off	Position 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.		Manual 7.4

USB	Position in the *Instrument* list that enables selecting the transmission speed of the USB interface. There are two options: *Full 12Mbps* and *High 480Mbps*.		Manual 7.5
Bluetooth	Position in the *Instrument* list that enables switching on/off Bluetooth and setting its PIN.		Manual 7.6
RS232	Position in the *Instrument* list that enables selecting of the RS 232 interface transmission speed (*Baud Rate*) and to set the time limit during which the communication operation should be performed (*Time Out*).		Manual 7.7
RTC	Instrument's Real Time Clock. This clock is displayed in the upper right corner places of the display.		Manual 7.8
Unit Label	Information about the instrument type, its serial number, the current software version installed and the relevant standards, which the instrument fulfils.		Manual 7.9

14.7 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*.		Manual 8
Language	Screen that enables selecting the user interface language.		Manual 8.1

Factory Settings	Restoration of the default settings of the instrument.		Manual 8.2
Comments	Definition of the file name for recording of voice comments.		Manual 8.3
Leq & Lav	Position in the *Auxiliary Setup* screen that enables to control displaying of Leq and Lav results: *Both* or *Mutually Exclusive*.		Manual 8.4
Warnings	Activation of the warning messages, which are to be displayed during the normal operation of the instrument.		Manual 8.5

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.

The functions, which are developed in order to control data flow in the serial interfaces, ensure:
- Bi-directional data transmission,
- Remote control of the instrument.

The user, in order to programme the serial interface, has to:
1. send "the function code",
2. send an appropriate data file

or
3. receive a data file.

A.1 INPUT/OUTPUT TRANSMISSION TYPES

Following basic input/output transmission types (called functions) are available:
#1 input/output of the control setting codes,
#2 read out of the measurement results in the **SLM** mode,
#3 read out of the measurement results in the **1/1 OCTAVE** analysis or **1/3 OCTAVE** analysis mode,
#4 read out of the data file from the internal Flash-disc or RAM memory,
#5 read out of the statistical analysis results,
#7 special control functions,
#9 writing the data file into the internal flash-disk.
#D read/write the data file from the external memory (SD-card),

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

#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 Tab. A.1. The format of #1 function is defined as follows:

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

or

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

where:

X - the group code, **ccc** - the code value,

X? - the request to send the current X code setting.

The instrument outputs in this case a control settings file for all requests X? in the following format:

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

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

#1;

The instrument outputs in this case a file containing all control settings given in Tab. A1 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,W1.01.1,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,Xl115:1,Xl115:2,Xl115:3,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 973 is investigated (U973);
- its number is 1234 (N1234);
- software version number is 1.01.1 (W1.01.1);
- 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, DOSE function (F2:4);
- **C** filter is selected in profile 2, DOSE function (F3:5);
- **Z** filter is chosen in profile 3, DOSE 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, DOSE function (J3:4);
- **C** Peak filter is selected in profile 2, both channels, DOSE function (J3:5);
- **Z** Peak filter is selected in profile 3, both channels, DOSE 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, DOSE function (C1:4);
- **IMPULSE** detector is chosen in profile 2, DOSE function (C0:5);
- **SLOW** detector is selected in profile 3, DOSE 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);
- delay of the start of the measurements is equal to 3 seconds (Y3);
- synchronization the start of measurement with RTC is switched off (y0);
- logger triggering mode is switched off (XT0);
- logger triggering level is set to 100 dB (XL100);
- number of the records before the triggering saved in a file of the logger is equal to 0 (XQ0);
- number of records registered, after the moment in which the measured signal does not fulfil any longer the condition of the triggering, is equal to 0 (Xq0);
- threshold level for PTC calculation in profile 1, is set to 115 dB (XC115:1);
- threshold level for PTC calculation in profile 2, is set to 115 dB (XC115:2);

- threshold level for PTC calculation in profile 3, is set to 115 dB (XC115:3);
- threshold level for ULT calculation in profile 1, is set to 115 dB (Xl115:1);
- threshold level for ULT calculation in profile 2, is set to 115 dB (Xl115:2);
- threshold level for ULT calculation in profile 3, is set to 115 dB (Xl115:3);
- logger splitting is disabled (XA0);
- logger splitting time 1 is disabled (XD-1:1);
- logger splitting time 2 is disabled (XD-1:2);
- logger splitting time 3 is disabled (XD-1:3);
- logger splitting time 4 is disabled (XD-1:4);
- logger splitting time 5 is disabled (XD-1:5);
- logger splitting time 6 is disabled (XD-1:6);
- instrument is in the Stop state (S0);
- logger is active (T1);
- exposition time is set to 8 hours (e480);
- criterion level in profile 1 is chosen as 80 dB (c1:1);
- criterion level in profile 2 is chosen as 80 dB (c1:2);
- criterion level in profile 3 is chosen as 80 dB (c1:3);
- threshold level in profile 1 is None (h0:1);
- threshold level in profile 2 is None (h0:2);
- threshold level in profile 3 is None (h0:3);
- exchange rate in profile 1 is set to 3 (x3:1).
- exchange rate in profile 2 is set to 3 (x3:2).
- exchange rate in profile 3 is set to 5 (x5:3).
- measurement trigger mode is switched off (m0);
- **LEQ** result from the first profile is used as the measure triggering signal (s0);
- measurement trigger level is set to 100 dB (l100);
- gradient in measurement trigger is equal to 10 dB/ms (O10)
- **LEQ** result from the first profile for **1/1 Octave** is used as the measurement trigger signal (o0);
- **LEQ** result from the first profile for **1/3 Octave** is used as the measurement trigger signal (t0);

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

A.3 FUNCTION #2 – MEASUREMENT RESULTS READ-OUT IN THE SLM MODE

#2 function enables one to read out the current measurement result 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 code are specified all results will be sent;

In case of <profile> = 1, 2 or 3 the instrument sends results in the format defined as follows:

#2 [,<aver>],<profile>,Xc,(...);

where **c** is the value of the result **X** or question mark (**?**) if result **X** is not available;

If no results are available the instrument will send:

#2,?;

The 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) value L of the nn statistics (ccc – the value in dB).

g **LR15** result (ccc – the value in dB;);

G **LR60** 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,I(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;

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,I(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,T7,P124.39,R85.86,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;

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

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A.4 FUNCTION #3 – READ-OUT OF MEASUREMENT RESULTS IN 1/1 OCTAVE AND 1/3 OCTAVE MODE

#3 function enables one to read out the current measurement results in **1/1 OCTAVE** or **1/3 OCTAVE** modes.

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

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

D7	D6	D5	D4	D3	D2	D1	D0

where:

D7 = 0 means that "overload does not happen",
= 1 means that “overload appeared”,
D5 = 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,
D6, D1, D0 reserved bits.

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

A.5 FUNCTION #4 – READ-OUT OF THE DATA FILE FROM THE INTERNAL FLASH-DISK OR RAM MEMORY

#4 function enables the user to read-out the data 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.

#4,1,fname; file containing the measurement results,

#4,1,fname,?; size,

#4,1,fname,offset,length; part of the file containing the measurement results,
where:
fname - name containing not more than eight characters,
offset - offset from the beginning of the file,
length - number of bytes to read,

#4,4; current settings file,

#4,4,?; size of the current settings file,

#4,4,offset,length; part of current settings file,
where:
offset - offset from the beginning of the current settings 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 as **<LSB>**,**<MSB>**.

When an error is detected in the file specification or data, the instrument will send:

#4,?;

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

Note: *#4 commands unlocks access to files and results.*

A.6 FUNCTION #D – READ / WRITE THE DATA FILES FROM THE EXTERNAL MEMORY (SD-CARD)

<disk> logical disk number:
0 – SD-card,
1 – USB Disk (not implemented),
2 – Internal Memory (not implemented)

<address> directory address (cluster numer) – for internal memory 0

<offsetB> offset 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>	file name in format XXXXXXXX.YYY (XXXXXXXX – file name, YYY- file name extension)
<dirName>	directory name
<nBwr>	number of bytes to write

1) #D,c,?; this function returns the list of available disks in format:

   #D,c,<disk1>[,<disk2>[,<disk3>]];

2) #D,d,?; this function returns the 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>; function enables the user to read the file (except of internal memory):

   Response:

   #D,r,<disk>,<address>,<offsetB>,<nB>; [<data>]

5) #D,w,<name>,<nBwr>;<data> function enables the user to write the file to working directory:

   Response:

   #D,w; - command was executed

   #D,w,?; - command cannot be executed

6) #D,e,<name>; function enables the user to delete the file in working directory:

   Response:

   #D,e; - command was executed

   #D,e,?; - command cannot be executed

7) #D,e; function enables the user to delete all files in in working directory:

   Response:

   #D,e; - command was executed

   #D,e,?; - command cannot be executed

8) #D,m,<address>,<dirName>; function enables the user 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 the user to delete directory and its contents (files and subdirectories):

Response:

#D,f; - command was executed
#D,f,?; - command cannot be executed

A.7 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",
D6 = 1 reserved,
D5 = 0 instantaneous current result (RUN State),
= 1 final result (STOP State),
D0 to D4 reserved bits.

Note: *There is not 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 the 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 according to the scheme* ***<LSByte>..<MSByte>****.*

A.8 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 formats are defined as follows:

#7,AC;

This function returns auto calibration in the format **#7,AC,x;**

#7,AC,x;

This function enables (x = 1) or disables (x = 0) the auto calibration and returns the following sequence of characters: **#7,AC;**

#7,AS;

Get settings for the Auto-Run function.

Response format:

#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:
  - bit:0 – Monday,
  - ...
  - bit:6 – Sunday
- mR – maximum number of the measurement days,

#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:
  - bit:0 – Monday,
  - ...
  - bit:6 – Sunday
- mR – maximum number of the measurement days,

Response format:

#7,AS;

#7,BN;

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

#7,BS;

This function returns battery state in %. If the instrument is powered from the USB interface – the function returns (-1).

#7,BV;

This function returns battery voltage in 10 mV.

#7,CD;

This function returns diffuse field correction setting in the format **#7,CD,x;**

#7,CD,x;

This function enables (x = 1) or disables (x = 0) the diffuse field correction setting and returns the following sequence of characters: **#7,CD;**

#7,CS;

This function restores the factory settings.

#7,DL;

This function returns day time limits in format **#7,DL,x;**

#7,DL,x;

This function enables (x = 1) or disables (x = 0) day time limits and returns the following sequence of characters: **#7,DL;**

#7,DS,file_name;

This function deletes setup file in SETUP directory specified by **file_name**.

#7,ED;

This function deletes all files on SD-card. The function returns **#7,ED;**

This function is not accepted while the instrument is in the RUN state.

#7,FL,x;

This function locks (x = 1) or unlocks (x = 0) access to files and results and returns the following sequence of characters: **#7,KL;**

#7,FL;

This function returns the states of access to files and results lock in the format **#7,FL,x;**

#7,FT;

This function returns file system on SD-card in the format **#7,FT,x;**.where **x** denotes -1: no SD-card, 1: FAT16, 2: FAT32, 3: FAT12.

#7,IM,x;

This function sets mode of the interface in the format **#7,IM,x;** where x denotes 0: START_STOP, 1: SIMPLE, 2 ADVANCED. Function returns the following sequence of characters: **#7,IM;**

#7,IM;

This function returns mode of the interface in the format **#7,IM,x;**

#7,KL,x;

This function locks (x = 1) or unlocks (x = 0) keyboard and returns the following sequence of characters: **#7,KL;**

#7,KL;

This function returns the states of keyboard lock in the format **#7,KL,x;**

#7,LA;

This function returns current language in the format: **#7,LA,xx;** where **xx** is language codes: **GE** (German), **EN** (English), **IT** (Italian), **PL** (Polish), **RU** (Russian), **HU** (Hungarian), **TU** (Turkish), **NL** (Flemish), **FR** (French), **SP** (Spanish).

#7,LB;

This function returns the name of last logger in format **#7,LB,logger_name;**

#7,LS,setup_name;

This function loads setup and writes settings into EEPROM. The selected file must exist. The function returns **#7,LS;**

#7,LW;

This function returns the name of last wave file in format **#7,LW,wave_file_name;**

#7,MC;

This function returns microphone compensation in the format **#7,MC,x;**

#7,MC,x;

This function enables (x = 1) or disables (x = 0) the microphone compensation and returns the following sequence of characters: **#7,MC;**

#7,MG,p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12,p13,p14,p15,p16,p17,p18,p19,p20;

Set GPS marker. 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,

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),

Response format:

#7,MG;

#7,NS;

This function returns number of sectors on SD-card (-1 denotes no SD-card). Sector size is 512B.

#7,NF;

This function returns number of free sectors on SD-card (-1 denotes no SD-card). Sector size is 512B.

#7,PI;

This function returns PIC version.

#7,PO;

This function powers off the instrument.

#7,RT;

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

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

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

#7,SS;

This function creates setup file based on the current settings. The function returns **#7,SS;**

#7,SL;

This function returns all statistical levels in the format **#7,SL,sl1,sl2,sl3,sl4,sl5,sl6,sl7,sl8,sl9,sl10;**

#7,SL,sl_index,sl_level;

This function sets statistical levels where **sl_index** is the statistical index, **sl_level** is the statistical level and returns the following sequence of characters: **#7,SL;**

#7,TP;

This function returns the temperature in preamplifier.

#7,UF;

This function returns USB speed in the format **#7,UF,x;**

#7, UF,x;

This function sets USB full speed (12Mbps, x = 1) or sets USB high speed (480Mbps, x = 0) and returns the following sequence of characters: **#7,UF;**

#7,US;

This function returns unit subversion.

#7,UV;

This function returns USB voltage in 10 mV.

#7,WD;

This function returns windscreen compensation in the format **#7,WD,x;**

#7,WD,x;

This function enables (x = 1) or disables (x = 0) the windscreen compensation and returns the following sequence of characters: **#7,WD;**

#7,VB;

This function returns the Bootstrap software version.

#7,VH;

This function returns the Hardboot software version.

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

A.9 FUNCTION #9 – WRITE-IN THE DATA FILE INTO THE INTERNAL FLASH-DISC

#9 function enables the user to write-in the data file into the internal Flash-disc 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,
	4 - current settings file,
FILE_LENGTH	length of the file in bytes,
DATA	binary content of the file.

A.10 CONTROL SETTING CODES

The control setting codes used in the SV 973 instrument (the internal software revision 1.01.1) are given in the table below.

Table A.1. Control setting codes

Group name	Group code	Code description
Unit type	**U**	U973 (read only)
Serial number	**N**	Nxxxx (read only)
Software version	**W**	Wyyy yyy - revision number (read only)
Calibration factor	**Q**	Qnnnn:c nnnn - real number with the value of the calibration factor ∈(-99.9 ÷ 99.9) c: 0 - left channel, 1 - right channel
Measurement function	**M**	M1 - **LEVEL METER** M2 - **1/1 OCTAVE** analyser M3 - **1/3 OCTAVE** analyser M4 - **DOSE METER**
Range	**R**	R1 - **LOW (LEVEL METER, 1/x OCTAVE)** R2 - **HIGH (DOSE METER)** Read only
Filter type in profile n	**F**	F1:n - **Z** filter for profile n F2:n - **A** filter for profile n F3:n - **C** filter for profile n **SLM, 1/1OCTAVE, 1/3OCTAVE, functions:** n: 1, 2, 3 – Profile Number*:* 1, 2 or 3 **DOSE functions:** n: 4, 5, 6 – Profile Number*:* 1, 2 or 3
Peak Filter type in profile n	**J**	J1:n - **Z** filter for profile n J2:n - **A** filter for profile n J3:n - **C** filter for profile n **SLM, 1/1 OCTAVE, 1/3 OCTAVE RUNNING LEQ functions:** n: 1, 2, 3 – Profile Number*:* 1, 2 or 3 **DOSE function:** n: 4, 5, 6 – Profile Number*:* 1, 2 or 3
Detector type in profile n	**C**	C0:n - **IMPULSE** detector in profile n C1:n - **FAST** detector in profile n C2:n - **SLOW** detector in profile n **SLM, 1/1 OCTAVE, 1/3 OCTAVE functions:** n: 1, 2, 3 – Profile Number*:* 1, 2 or 3 **DOSE function:** n: 4, 5, 6 – Profile Number*:* 1, 2 or 3
Filter type in **1/1 OCTAVE** analysis and **1/3 OCTAVE** analysis	**f**	f1 - **Z** filter f2 - **A** filter f3 - **C** filter
Logger type in profile n	**B**	Bx:n - x - sum of the following flags flags:

		1:n - logger with **Lpeak** values in profile n 2:n - logger with **Lmax** values in profile n 4:n - logger with **Lmin** values in profile n 8:n - logger with **Leq** values in profile n 16:n - logger with **LAV** values in profile n 32:n - logger with **LR15** values in profile n 64:n - logger with **LR60** values in profile n
Storing the results of **1/1 OCTAVE** analysis and **1/3 OCTAVE** analysis in logger's file	**b**	bx - x - sum of the following flags flags: 1 - logger with **Lpeak** values 8 - logger with **Leq** values
Logger step	**d**	dnns - nn number in seconds ∈(1 ÷ 60) dnnm - nn number in minutes ∈(1 ÷ 60)
Integration period	**D**	D0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) Dnns - nn number in seconds Dnnm - nn number in minutes Dnnh - nn number in hours
Repetition of the measurement cycles (RepCycle)	**K**	K0 - infinity (measurement finished by pressing the **Stop** or remotely - by sending S0 control code) ..... Knnnn - nnnn number of repetitions ∈(1 ÷ 1000)
Detector type in the **LEQ** function	**L**	L0 - **LINEAR** L1 - **EXPONENTIAL**
Measure Triggering mode (TriggerMode)	**m**	m0 - switched off (**OFF**) m2 - **SLOPE +** m3 - **SLOPE –** m4 - **LEVEL +** m5 - **LEVEL –** m6 - **GRAD+**
Source of the measure triggering signal for measurement functions: M1, M4, M7 (TriggerSource)	**s**	s0 - **LEQ** result from the 1st profile
Source of the measure triggering signal for measurement function M2 (TriggerOctSource)	**o**	o0 - **LEQ** result from the 1st profile
Source of the measure triggering signal for measurement function M3 (TriggerTerSource)	**t**	t0 - **LEQ** result from the 1st profile
Measure Triggering level (TriggerLev)	**l**	lnnn - nnn level in dB ∈ (24 ÷ 136)

Measure Triggering gradient	**O**	Onnn - nnn gradient in dB/ms ∈ (1 ÷ 100)
Exposure Time	**e**	ennn - nnn time in minutes ∈ (1 ÷ 720)
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
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 h6:p - 60 dB h7:p - 65 dB p: 1, 2, 3 - profile number
Exchange Rate	**x**	x2:p - 2 x3:p - 3 x4:p - 4 x5:p - 5 x6:p - 6 p: 1, 2, 3 - profile number
Logger	**T**	T0 - switched off (**[ ]**) T1 - switched on (**[√]**)
Delay in the start of measurement	**Y**	Ynn - nn delay given in seconds ∈ (0 ÷ 59) and (60 ÷ 3600) with step 60s
Synchronization the start of measurement with RTC	**y**	y0 - switched off (**OFF**) y1 - synchronization to 1 min. y15 - synchronization to 15 min. y30 - synchronization to 30 min. y60 - synchronization to 1 hour.
State of the instrument (Stop, Start or Pause)	**S**	S0 - **STOP** S1 - **START** S2 - **PAUSE**
Threshold level for ULT calculation	**Xl**	Xlnnn:p - nnn level in dB ∈ (70 ÷ 140) p: 1, 2, 3 - profile number
Logger Triggering mode (TriggerMode)	**XT**	XT0 - switched off (OFF) XT4 - **LEVEL +**

		XT5 - **LEVEL –**
Logger Triggering level (TriggerLev)	**XL**	XLnnn -nnn level in dB ∈ (24 ÷ 136)
Logger Triggering - Number of records taken into account before the fulfilment of the triggering condition (TriggerPre)	**XQ**	XQnn - nn number of records saved in the logger before the triggering condition; nn ∈ (0 ÷ 10)
Logger Triggering - Number of records taken into account after the fulfilment of the triggering condition (TriggerPost)	**Xq**	Xqnnn - nnn number of records saved in the logger after the fulfilment of the triggering condition; nn ∈ (0 ÷ 200)
Threshold level for PTC calculation	**XC**	XCnnn:p - nnn level in dB ∈ (70 ÷ 140) p: 1, 2, 3 - profile number
Logger File Splitting Mode	**XA**	XA0 switched off (**OFF**) XA-1 - The file is created for each measurement cycle. XA15 - The file is created every 15 min. synchronized to RTC. XA30 - The file is created every 30 min synchronized to RTC. XA60 - The file is created every 1 hour synchronized to RTC. XA1440 - The file is created on the specified times.
Specified Time for Logger File Splitting	**XD**	XDnnn:p – nnn: -1 - off. 0:1439 - Time in minutes. Valid only if SplitMode is equal 1440. p: 1 … 6 – specified time number

APPENDIX B. DATA FILE STRUCTURES

B.1 GENERAL STRUCTURE OF THE SV 973 FILES

Each file containing data from the SV 973 instrument consists of several groups of words. In the case of SV 973 (the internal file system rev. **1.01**), 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 Time-domain signal recording (cf. Tab. B.1.9);
- parameters for Wave-file recording (cf. Tab. B.1.10);
- special settings for profiles (cf. Tab. B.1.12);
- display settings of the main results (cf. Tab. B.1.13);
- header of the statistical analysis (cf. Tab. B.1.14);
- header of the file from the logger (cf. Tab. B.1.15);
- contents of the file from the logger (cf. Tab. B.1.16).

Other elements of the file structure are not obligatory for each file type stated above. They depend on the file type (**SLM**, **DOSE METER**, 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.1.17);
- main results (saved in Summary Results Record) (cf. Tab. B.1.18_SLM, B.1.18_DM);
- statistical levels (saved in Summary Results Record) (cf. Tab. B.1.19);
- 1/1 OCTAVE analysis results (saved in Summary Results Record) (cf. Tab. B.1.20);
- 1/3 OCTAVE analysis results (saved in Summary Results Record) (cf. Tab. B.1.21);
- results of the statistical analysis (saved in Summary Results Record) (cf. Tab. B.1.22);
- settings of the instrument saved in the setup file (cf. Tab. B.1.23);
- file-end-marker (cf. Tab. B.1.24).

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 – **SV 973**
3	SoftwareVersion	software version: 101
4	SoftwareIssueDate	software issue date
5	DeviceMode	mode of the instrument
6	UnitSubtype	subtype of the unit: 1 – **SV 973**
7	FileSysVersion	file system version: 101
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 - **AUTOCALIBRATION**
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 after the measurement: 0 - none 1 - **BY MEASUREMENT** (manual) 2 - **REMOTE** 3 - **FACTORY CALIBRATION** 4 - **AUTOCALIBRATION** 0xFFFF - C**alibration 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	the 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** analyser, 3 - **1/3 OCTAVE** analyser, 4 - **DOSE METER**
4	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 b1 - 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 - **EXPONENT.**
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	the 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]	the 1st profile criterion level (only **DOSE METER**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
23	ThresholdLevel[0]	the 1st profile threshold level (only **DOSE METER**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
24	ExchangeRate[0]	the 1st profile exchange rate (only **DOSE METER**): 2, 3, 4, 5, 6
25	CriterionLevel[1]	the 2nd profile criterion level (only **DOSE METER**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
26	ThresholdLevel[1]	the 2nd profile threshold level (only **DOSE METER)**: 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
27	ExchangeRate[1]	the 2nd profile exchange rate (only **DOSE METER**): 2, 3, 4, 5, 6
23	CriterionLevel[2]	the 3rd profile criterion level (only **DOSE METER**): 60, 65, 70, 75, 80, 84, 85, 87, 90 (*10 dB)
29	ThresholdLevel[2]	the 3rd profile threshold level (only **DOSE METER**): 0, 60, 65, 70, 75, 80, 85, 90 (*10 dB)
30	ExchangeRate[2]	the 3rd profile exchange rate (only **DOSE METER**): 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 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]	the 1st profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
37	UL Th. Level[1]	the 2nd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
38	UL Th. Level[2]	the 3rd profile threshold level for ULT calculation 70 ÷ 140 dB (*10)
39	PEAK Th. Level[0]	the 1st profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
40	PEAK Th. Level[1]	the 2nd profile threshold level for PTC calculation 70 ÷ 140 dB (*10)
41	PEAK Th. Level[2]	the 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]	The start time of the pause no. 1 in format 0xhhmm hh – hour mm – minute
51	PauseEnd[1]	The end time of the pause no. 1 in format 0xhhmm: hh – hour mm – minute
52	Pause[2]	Programmable pause no. 2.
53	PauseBegin[2]	The start time of the pause no. 2 in format 0xhhmm

		hh – hour mm – minute
54	PauseEnd[2]	The end time of the pause no. 2 in format 0xhhmm: hh – hour mm – minute
55	Pause[3]	Programmable pause no. 3.
56	PauseBegin[3]	The start time of the pause no. 3 in format 0xhhmm hh – hour mm – minute
57	PauseEnd[3]	The end time of the pause no. 3 in format 0xhhmm: hh – hour mm – minute
58	Pause[4]	Programmable pause no. 4.
59	PauseBegin[4]	The start time of the pause no. 4 in format 0xhhmm hh – hour mm – minute
60	PauseEnd[4]	The end time of the pause no. 4 in format 0xhhmm: hh – hour mm – minute
61	Pause[5]	Programmable pause no. 5.
62	PauseBegin[5]	The start time of the pause no. 5 in format 0xhhmm hh – hour mm – minute
63	PauseEnd[5]	The end time of the pause no. 5 in format 0xhhmm: hh – hour mm – minute
…		

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 **GRAD+**
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
…		

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
…		

Table B.1.9. Time-domain signal recording parameters

Word number	Name	Comment
0	0xnn31	[31, 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 **GRAD+** 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
…		

Table B.1.10. 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 **GRAD+** 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
…		

Table B.1.12. 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 - **LR15** 64 - **LR60**
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**
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 - Lxvmax[2] 4 - Lxvmin[2] 8 - Lxveq[23] 16 - **LAV**
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.1.12)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.12)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.13. 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	LR15	0 – LR15 result not displayed, 1 - LR15 result displayed
27	LR60	0 – LR60 result not displayed, 1 - LR60 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.1.12)
[2] x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.12)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.14. 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.1.15. 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	the 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.1.16. 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.1.17. 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.1.18_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]	reserved

15	Result[1][11]	reserved
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]	reserved
37	Result[2][11]	reserved
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]	reserved
59	Result[3][11]	reserved
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.1.12)
[2] x - depends of the filter type in selected profile: A, C, Z, B (cf. Tab. B.1.12)
y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12)
[3] y - only for exponential detector's type (cf. Tab. B.1.6)

Table B.1.18_DM. Main results in the DOSE METER 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	overlad 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 2nd profile (*100 dB)
45	SD[1]	**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]	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[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.1.12)	
[2]	x - depends of the filter type in selected profile: A, C, Z, B, LF (cf. Tab. B.1.12) y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12)	
[3]	y - only for exponential detector's type (cf. Tab. B.1.6)	

Table B.1.19. 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.1.20. 1/1 OCTAVE analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn0E, 0xnn26, 0xnn27, 0xnn30	[block_id, nn=block_length] 0xnn**0E** - averaged spectrum results, 0xnn**26** - min. spectrum results, 0xnn**27** - max. spectrum results 0xnn**30** - peak spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	the lowest **1/1 OCTAVE** frequency (*100 Hz): 3150 (**AUDIO BAND**)

3	NOct	number of **1/1 OCTAVE** values: 10 (**AUDIO BAND**)
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.1.21. 1/3 OCTAVE analysis results (saved in Summary Results Record)

Word number	Name	Comment
0	0xnn10, 0xnn28, 0xnn29, 0xnn32	[block_id, nn=block_length] 0xnn1**0** - averaged spectrum results, 0xnn**28** - min. spectrum results, 0xnn**29** - max. spectrum results 0xnn**32** - peak spectrum results
1	0x0101	[used_profile, profile's mask]
2	LowestFreq	the lowest **1/3 OCTAVE** frequency (*100 Hz): 2000 (**AUDIO BAND**)
3	NTer	number of **1/3 OCTAVE** values: 31 (**AUDIO BAND**)
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.1.22. 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]	the first counter in the first profile
4..5	Histogram[1][2]	the 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]	the first counter in the second profile
4..5	Histogram[2][2]	the 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]	the first counter in the third profile
4..5	Histogram[3][2]	the second counter in the third profile
.....	.....	.....

Table B.1.23. 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.1.24. 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.
Time-domain signal recording parameters - cf. Tab. B.1.9.
Wave-file recording parameters - cf. Tab. B.1.10.
Special settings for profiles - cf. Tab. B.1.12.
Display settings of the main results - cf. Tab. B.1.13.

Header of the statistical analysis - cf. Tab. B.1.14.

Header of the file from the logger - cf. Tab. B.1.15.

Contents of the file from the logger - cf. Tab. B.1.16. and the description in B.2.1.

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):

15 flag record

< flags > :

- b0: 1- the overload detected, 0 - the overload not detected

16 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.1.12)
<result2> - Lxvmax[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result3> - Lxvmin[2] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result4> - Lxveq[23] result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result6> - **LR15** result, depending on the value of BufferP[1] (cf. Tab. B.1.12)
<result7> - **LR60** result, depending on the value of BufferP[1] (cf. Tab. B.1.12)

(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.1.12)
<result2> - Lxvmax[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result3> - Lxvmin[2] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result4> - Lxveq[23] result, depending on the value of BufferP[2] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[2] (cf. Tab. B.1.12)

(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.1.12)
<result2> - Lxvmax[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result3> - Lxvmin[2] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result4> - Lxveq[23] result, depending on the value of BufferP[3] (cf. Tab. B.1.12)
<result5> - **LAV** result, depending on the value of BufferP[3] (cf. Tab. B.1.12)

[1]	x - depends of the filter type for Peak result calculation in selected profile: A, C, Z, B (cf. Tab. B.1.12)
[2]	x - depends of the filter type in selected profile: A, C, Z, B (cf. Tab. B.1.12)

3	y - depends of the detector type in selected profile: I (imp.), F (fast), S (slow) (cf. Tab. B.1.12) 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.2.1.7 Record with audio data

This record exists only in the case when the **EVENT RECORDING** function is active (*path: Measurement / Logging / Event Rec.*). Samples of the signal, taken in the periods from 1 second to 8 hours, are saved in the blocks. Each block is divided into frames, which are stored in a file among the logger results. The frame starting block and the frame ending it are marked with the set b10 and b9 bits in the header of the frame, respectively. It happens in the case of stopping the recording that the ending frame does not exist.

The format of the data frame is as follows:

HS	L	S	L	HE

where:

HS starting header (1 word)

L block length (1 word), expressed in words (4 + (number of samples)*1.5)

S samples of the measured signal (in the case of SV 973 each sample is written in three bytes; the recording starts with the least significant byte)

HE ending header (1 word), which differs from the HS only on b11 bit (thanks to it, it is possible to analyse the recorded file starting from its end)

The HEADER format is as follows:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

where:

b15 - 1

b14 - 0

b13 - 0

b12 - 1, bits b15 ÷ b12 = 9 constitute the marker of the frame

b11 - header type:

0 - HS

1 - HE

b10 - 1 denotes the first frame in the block

b9 - 1 denotes the last frame in the block

b7 - 1 denotes an error (the samples were overwritten in the cycle buffer, which means that the recording in the analyzed block is not correct)

b8, b6÷b0 – reserved

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

Accessories included in the SV 973 instrument set

ST 973	MEMS microphone
SC 158	USB-C cable
SA 22	windscreen
SA 80	pocket soft bag

Accessories available

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

C.1 SPECIFICATION OF SV 973 AS SOUND LEVEL METER IN THE STANDARD CONFIGURATION

Statement of performance

SV 973 working as SLM with all accessories meets requirements of IEC 61672:2013 for Class 2 Group X instruments.

Configuration of the complete SLM in its normal mode of operation

SV 973 including the ST 973 microphone (1/2", nominal sensitivity 11 mV/Pa)

Recommended calibrator:
SV 34B Class 2 sound calibrator 114 dB@1000 Hz or equivalent (not included in the standard set)

Measured quantities

The measured quantities for SLM mode are: **LXpeak**, **LXYmax**, **LXYmin**, **LXY**, **LXeq**, **LXE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln** (Leq statistics), **EX** (expected Leq value), **SD** (standard Leq deviation), **OVL** (overload time %), **LR15** (running Leq for 15 minutes) and **LR60** (running Leq for 60 minutes). Definitions for above mentioned parameters are given in Appendix D.

Additional features

- Overload indication
- Under-range indication
- Battery state indication

Conformance testing

This chapter contains the information needed to conduct conformance testing according to the specified standards.

Mounting for acoustical tests	The microphone must be mounted on the instrument.
Electrical substitute for the microphone	To obtain a BNC Class electrical input, the microphone must be replaced by an electrical microphone impedance adapter SL 973.

Note: *For the conformance electrical tests, the microphone compensation must be switched off (**Microphone=Off**)!*

Note: *For the frequency response evaluation in the acoustic coupler the microphone compensation must be switched on (**Microphone=On**) and the Free-filed compensations must be switched off (**Field Comp=Off**).*

*The **Windscreen** compensation is switching off automatically.*

Periodical test upper frequency 8 kHz

Linear Operating Ranges

Table C.1. Linear operating ranges for the sinusoidal signal and microphone sensitivity 11 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31,5 Hz	32	85	40	108	40	122	55	125	32	85	40	108	40	122	35	88	65	125
500 Hz	32	121	40	124	40	125	55	125	32	121	40	124	40	125	35	124	65	128
1 kHz	32	125	40	125	40	125	55	125	32	125	40	125	40	125	35	128	65	128
4 kHz	32	126	40	124	40	124	55	125	32	126	40	124	40	124	35	129	65	127
8 kHz	32	124	40	122	40	122	55	125	32	124	40	122	40	122	35	127	65	125
12.5 kHz	32	120	40	119	40	119	55	125	32	120	40	119	40	119	35	123	65	122

Note: *For signals with the crest factor n > 1.41 upper measuring range of the RMS (LEQ and SPL) is reduced. The valid upper limit can be calculated according to the below given formula:*

$An = 125 - 20log(n/\sqrt{2})$*, where A is the upper limit for the sinusoidal signal*

Example: For the crest factor n = 10 the upper limit is A_{10} = 108 dB

The starting point at which tests of level linearity shall begin — 94.0 dB (74 dB for A filter @ 31.5 Hz).

Measuring frequency range of the acoustic pressure (-3 dB) — 20 Hz ÷ 10 000 Hz.

Basic measurement error of the acoustic pressure — < 0.7 dB (measured for the reference conditions, see below).

Weighting filters (see part C.3)

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

Table C.2. Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Weighting filter	**A**	**C**	**Z**	**A**	**C**	**Z**
Noise	< 20 dB	< 20 dB	< 30 dB	< 25 dB	< 33 dB	< 48 dB

*) measured with the **SL 973** microphone equivalent

Special filters

- **Windscreen** compensation filter improving the instrument frequency response in the free acoustic field when windscreen SA 22 is mounted on the microphone (see Chapter C.3)

RMS detector

- Digital "True RMS" with Peak detection,
- Resolution 0.1 dB
- Range 327.7 dB
- Crest Factor unlimited (for signals in 8 kHz band).

Overload detector

The instrument has the built-in overload detectors. Both A/D converter and input amplifier overload conditions are detected. The overload in the measurement channel (in its analogue part) and the overload of the analogue / digital converter are both detected. The "overload" indication appears when the input signal amplitude is 0.5 dB above the declared "Peak measurement range".

Underrange detector

The instrument has the built-in under-range detector. The "underrange" indication appears when the Leq value for the elapsed time or the last second L_{XY} value is below the lower linear operating range.

Time weighting characteristics (Exponential averaging)

Slow "**S**" according to IEC 61672-1:2013 for Class 2, Equivalent Time Constant 1000 ms
Fast "**F**" according to IEC 61672-1:2013 for Class 2, Equivalent Time Constant 125 ms
Impulse "**I**" according to IEC 61672-1:2013 for Class 2, Equivalent Time Constant 35 ms, Hold Time 1500 s

Reference conditions as per IEC 61672-1:2013

- Class of the acoustic field Free field
- Reference acoustic pressure 114.0 dB (related to 20 μPa)
- Reference frequency 1000 Hz
- Reference temperature +23°C
- Reference relative humidity 50 %
- Reference static pressure 1013.25 hPa
- Reference incidence direction perpendicular to the microphone diaphragm.

Calibration

Acoustical **-** with the SV 34B acoustic calibrator (or equivalent):

- Calibration level — 114.0 dB (equal to the calibrator pressure level - see calibration chart of the used calibrator)

Note: *The above levels correspond to 114 dB of calibrator's sound pressure. If the calibrator has a different sound pressure than 114 dB, the calibration levels must be accordingly adjusted.*

Maximum peak voltage	3 V Peak-Peak (Maximum peak voltage of input sinusoidal signal, which can be applied to the SLM without destruction the meter)
Warm-up time	1 min. (for 0.1 dB accuracy)
Typical stabilization time after change in environmental conditions by 20°C	1 hour
Time shift after completion of a measurement, before a measurement is shown	< 1 sec

Note: *When the instrument is moved from a warm environment with high humidity, to a colder environment, care should be taken not to produce condensation inside the instrument. In this case, much longer stabilization periods may be necessary.*

Environmental, electrostatic and radio frequency criteria

Effect of humidity	< 0.5 dB (for 30%<RH<90% at 40°C and 1000 Hz)
Effect of magnetic field	below electrical noise level (for 80 A/m and 50 Hz)
Effect of radio frequency fields	meets requirements of IEC 61672-1:2013

The greatest susceptibility (the least immunity) is achieved when the SLM is placed parallel to the radio frequency field and **Z** filter and time weighting **F** are selected and the SPL measurements are considered.

Effect of electrostatic discharge — meets requirements of IEC 61672-1:2013

During electrostatic discharge, the influence of the displayed results could be observed.
No changes in instrument operation state, configuration or stored data corruption were found out.

Effect of ambient pressure	< 0.01 dB/kPa
Effect of temperature	< 0.5 dB (from -10°C to + 50°C)
Operating temperature	from -10°C to + 50°C
Storage temperature	from -20°C to + 60°C

Microphone

ST 973	free-field condenser microphone MEMS **(**½" housing)
Nominal sensitivity	11 mV/Pa (corresponding to -39 dBV/Pa re 1 V/Pa)
Output impedance	2 x 177,5 Ohm / 30nF, differential

Note: *Maximum level of sound pressure level, which can be affect the microphone without destruction the microphone: 160 dB.*

ST 973 and SV 973 frequency characteristics

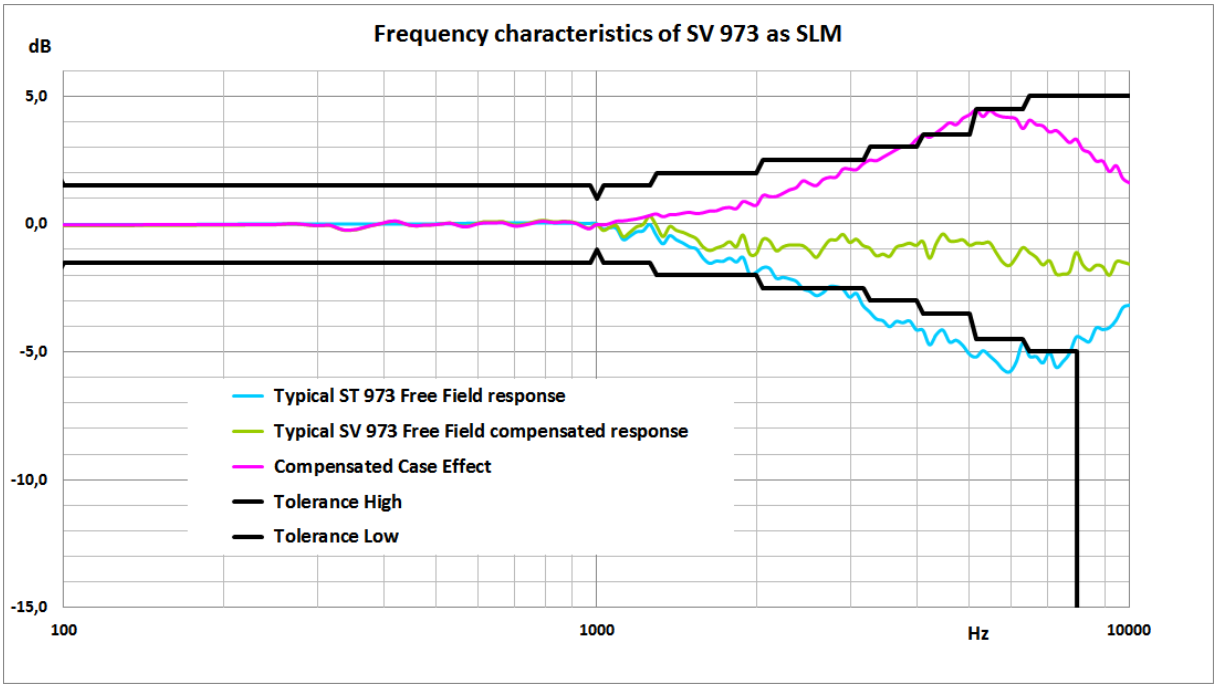


Table C.3. ST 973 free field corrections with the use of the Bruel & Kjaer 4226 sound calibrator

[dB]	Frequency [Hz]								
	31.5	63	125	250	500	1000	2000	4000	8000
Typical pressure response	0.00	0.00	0.00	0.00	0.00	0.00	-1.90	-5.30	-8.50
ST 973 Free Field corrections	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	4.05
Uncertainty (IEC 62585:2012)	0.25	0.25	0,25	0.25	0.25	0.25	0.25	0.25	0.35

Table C.4. Typical ST 973 and SV 973 frequency characteristics

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
20	-0.78	-0.80	-0.02	0.25
25	-0.20	-0.21	-0.01	0.25
32	-0.03	-0.04	-0.01	0.25
40	0.01	-0.01	-0.02	0.25
50	-0.01	-0.02	-0.01	0.25
63	-0.03	-0.05	-0.02	0.25
79	-0.06	-0.07	-0.01	0.25
100	-0.05	-0.06	-0.02	0.25
126	-0.04	-0.06	-0.01	0.25
158	-0.05	-0.05	0.00	0.25
200	-0.03	-0.04	-0.01	0.25
251	-0.03	-0.02	0.00	0.25

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
259	-0.03	-0.01	0.02	0.25
266	-0.03	0.01	0.03	0.25
274	-0.03	0.00	0.03	0.25
282	-0.03	-0.02	0.01	0.25
290	-0.03	-0.05	-0.02	0.25
299	-0.03	-0.07	-0.04	0.25
307	-0.03	-0.06	-0.03	0.25
316	-0.03	-0.05	-0.03	0.25
325	-0.03	-0.15	-0.12	0.25
335	-0.03	-0.24	-0.21	0.25
345	-0.03	-0.25	-0.22	0.25
355	-0.03	-0.22	-0.19	0.25
365	-0.03	-0.15	-0.12	0.25
376	-0.03	-0.07	-0.05	0.25
387	-0.02	-0.02	0.00	0.25
398	-0.02	0.04	0.06	0.25
410	-0.02	0.10	0.12	0.25
422	-0.02	0.11	0.13	0.25
434	-0.02	0.03	0.05	0.25
447	-0.02	-0.05	-0.03	0.25
460	-0.02	-0.08	-0.05	0.25
473	-0.02	-0.04	-0.02	0.25
487	-0.02	-0.04	-0.02	0.25
501	-0.02	-0.02	0.00	0.25
516	-0.01	0.01	0.03	0.25
531	-0.01	0.05	0.05	0.25
546	0.00	-0.02	-0.02	0.25
562	0.00	-0.09	-0.09	0.25
579	0.01	-0.06	-0.07	0.25
596	0.02	0.03	0.01	0.25
613	0.02	0.08	0.06	0.25
631	0.03	0.09	0.06	0.25
649	0.03	0.09	0.06	0.25
668	0.03	0.10	0.07	0.25
688	0.02	0.00	-0.02	0.25
708	0.02	-0.05	-0.07	0.25
729	0.02	-0.01	-0.03	0.25
750	0.02	0.04	0.02	0.25
772	0.02	0.11	0.09	0.25
794	0.02	0.15	0.13	0.25
818	0.02	0.11	0.09	0.25
841	0.02	0.09	0.07	0.25
866	0.01	0.12	0.10	0.25
891	0.01	0.10	0.09	0.25
917	0.01	0.04	0.04	0.25
944	0.00	-0.09	-0.09	0.25
972	0.00	-0.16	-0.16	0.25
1000	0.00	0.00	0.00	0.25
1029	-0.22	-0.24	-0.02	0.25

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
1059	-0.17	-0.13	0.04	0.25
1090	-0.20	-0.06	0.13	0.25
1122	-0.63	-0.49	0.14	0.25
1155	-0.50	-0.32	0.18	0.25
1189	-0.33	-0.11	0.22	0.25
1223	-0.29	-0.02	0.27	0.25
1259	-0.04	0.31	0.35	0.25
1296	-0.47	-0.06	0.41	0.25
1334	-0.79	-0.49	0.30	0.25
1372	-0.47	-0.09	0.38	0.25
1413	-0.64	-0.25	0.39	0.25
1454	-0.77	-0.32	0.44	0.25
1496	-0.92	-0.44	0.48	0.25
1540	-1.00	-0.57	0.43	0.25
1585	-1.35	-0.89	0.46	0.25
1631	-1.56	-1.03	0.53	0.25
1679	-1.47	-0.93	0.53	0.25
1728	-1.48	-0.84	0.63	0.25
1778	-1.36	-0.69	0.66	0.25
1830	-1.50	-0.88	0.62	0.25
1884	-1.32	-0.43	0.89	0.25
1939	-1.98	-1.17	0.82	0.25
1995	-1.90	-1.15	0.75	0.25
2054	-1.72	-0.59	1.13	0.25
2113	-1.75	-0.66	1.09	0.25
2175	-2.14	-1.04	1.10	0.25
2239	-2.10	-0.88	1.22	0.25
2304	-2.17	-0.81	1.35	0.25
2371	-2.26	-0.82	1.44	0.25
2441	-2.55	-0.84	1.70	0.25
2512	-2.64	-1.05	1.60	0.25
2585	-2.82	-1.30	1.52	0.25
2661	-2.70	-0.95	1.76	0.25
2738	-2.47	-0.63	1.84	0.25
2818	-2.46	-0.61	1.85	0.25
2901	-2.57	-0.40	2.16	0.25
2985	-2.88	-0.71	2.16	0.25
3073	-2.73	-0.59	2.14	0.25
3162	-3.20	-0.84	2.37	0.25
3255	-3.45	-0.94	2.51	0.25
3350	-3.73	-1.24	2.49	0.25
3447	-3.80	-1.17	2.63	0.25
3548	-4.03	-1.26	2.77	0.25
3652	-3.83	-0.90	2.92	0.25
3758	-3.87	-0.83	3.05	0.25
3868	-3.80	-0.74	3.06	0.25
3981	-4.15	-0.83	3.32	0.25
4097	-4.17	-0.68	3.49	0.35
4217	-4.74	-1.33	3.41	0.35

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
4340	-4.34	-0.76	3.58	0.35
4467	-4.16	-0.39	3.78	0.35
4597	-4.63	-0.65	3.98	0.35
4732	-4.56	-0.66	3.90	0.35
4870	-4.77	-0.61	4.15	0.35
5012	-5.11	-0.83	4.28	0.35
5158	-5.21	-0.74	4.47	0.35
5309	-4.97	-0.75	4.22	0.35
5464	-5.17	-0.72	4.45	0.35
5623	-5.40	-1.12	4.28	0.35
5788	-5.70	-1.49	4.20	0.35
5957	-5.80	-1.62	4.18	0.35
6131	-5.41	-1.29	4.12	0.35
6310	-4.66	-0.92	3.74	0.35
6494	-5.18	-1.11	4.07	0.35
6683	-5.20	-1.30	3.90	0.35
6879	-5.44	-1.59	3.85	0.35
7079	-5.04	-1.43	3.61	0.35
7286	-5.62	-1.95	3.67	0.35
7499	-5.40	-1.95	3.45	0.35
7718	-5.07	-1.87	3.20	0.35
7943	-4.44	-1.10	3.33	0.35
8175	-4.51	-1.59	2.92	0.35
8414	-4.61	-1.80	2.81	0.35
8660	-4.08	-1.60	2.48	0.35
8913	-4.14	-1.67	2.47	0.35
9173	-4.06	-2.00	2.07	0.35
9441	-3.77	-1.48	2.30	0.35
9716	-3.28	-1.49	1.80	0.35
10000	-3.19	-1.56	1.62	0.35

Table C.5. SV 973 combined free field corrections (ST 973 + Compensated Case Effect) with the use of the Bruel & Kjaer 4226 sound calibrator

[dB]	Frequency [Hz]								
	31.5	63	125	250	500	1000	2000	4000	8000
SV 973 Free Field corrections	0.00	0.00	0.00	0.00	0.00	0.00	0.75	4.45	7.40
Uncertainty (IEC 62585:2012)	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.49

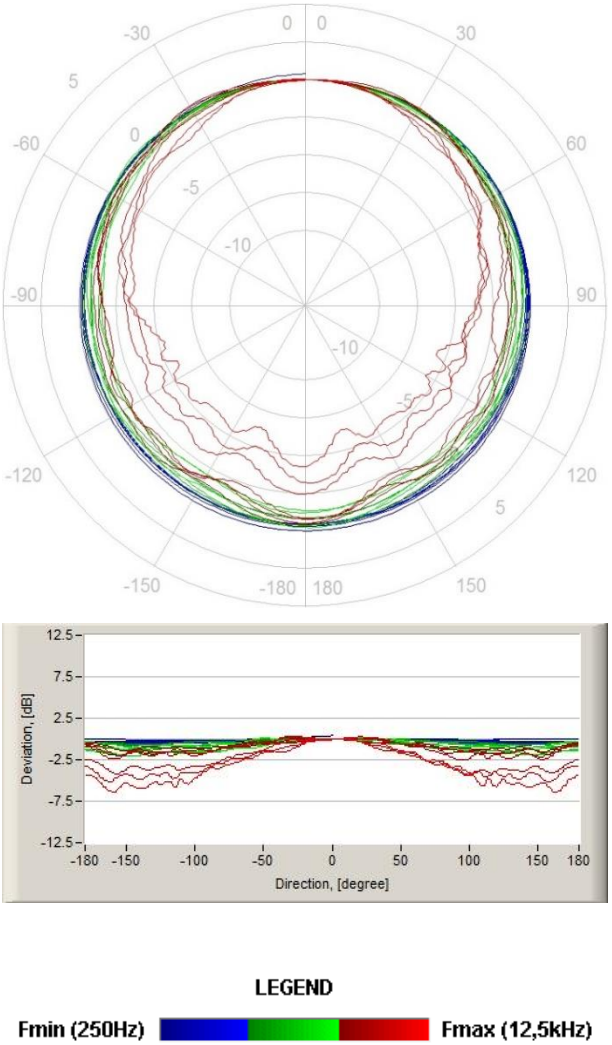
Table C.6. Sum of the Free Field corrections (ST 973 + Compensated Case Effect) with the use of the with the use of the G.R.A.S. 51AB comparison coupler and reference 1/2“ microphone B&K 4134

[dB]	Frequency [Hz]												
	31.5	63	125	250	500	1000	2000	3150	4000	5000	6300	8000	10000
SV 973 Free Field corrections	0.00	0.00	0.00	0.00	0.00	0.00	0.84	3.41	4.75	6.07	7.29	8.54	9.77
Uncertainty (IEC 62585)	--	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.49	0.49	0.49	0.61

Directional characteristics of SV 973 as SLM

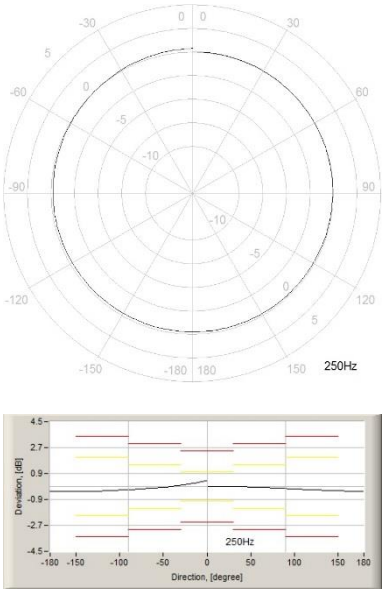
Directional characteristics show deviation of Leq measured at different incidence angle from the Leq measured at 0 deg incidence angle.

Combined directional characteristics

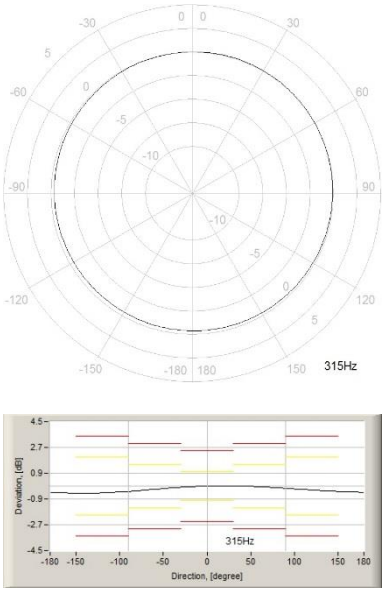


The round charts show the directional characteristic and the charts below shows errors for angles.

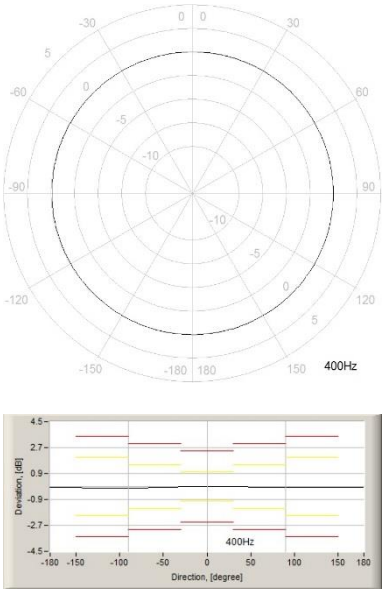
250 Hz



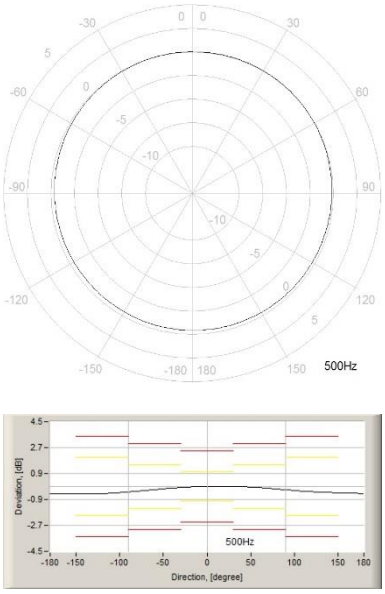
315 Hz



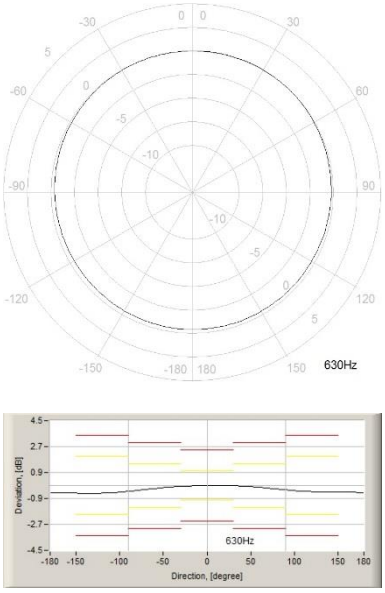
400 Hz



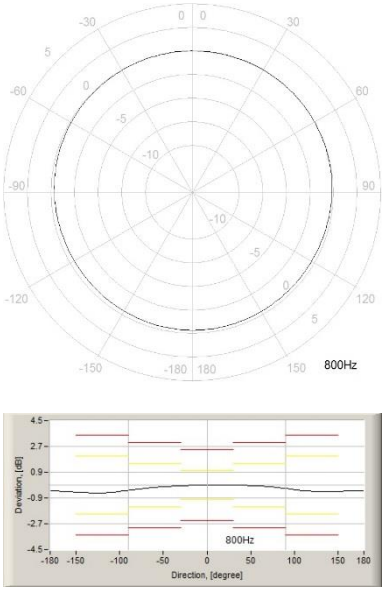
500 Hz

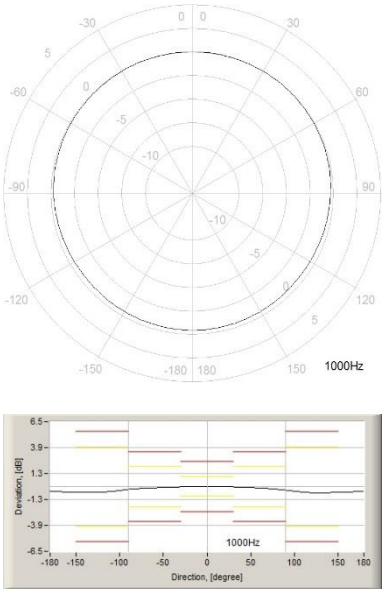
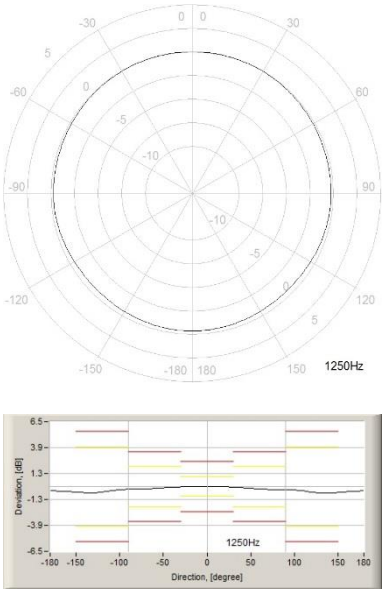
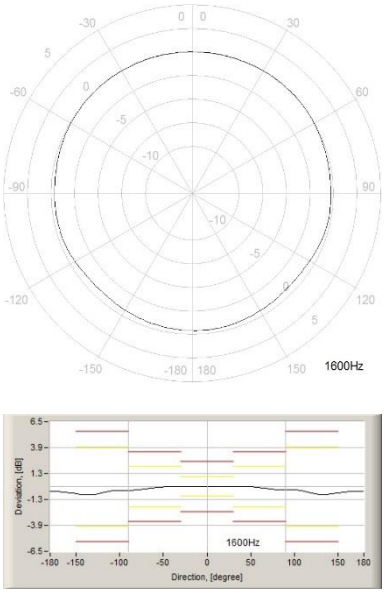
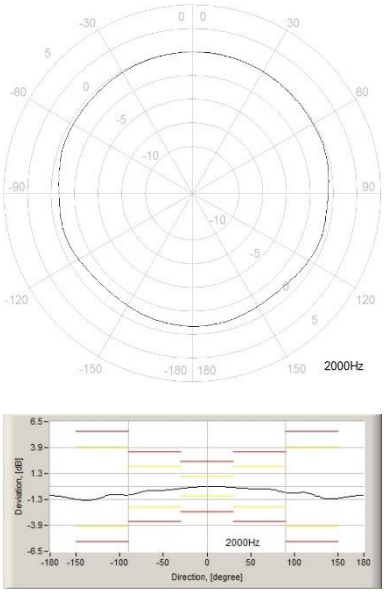
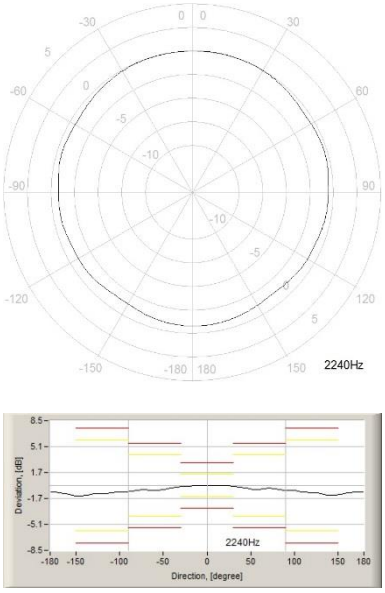
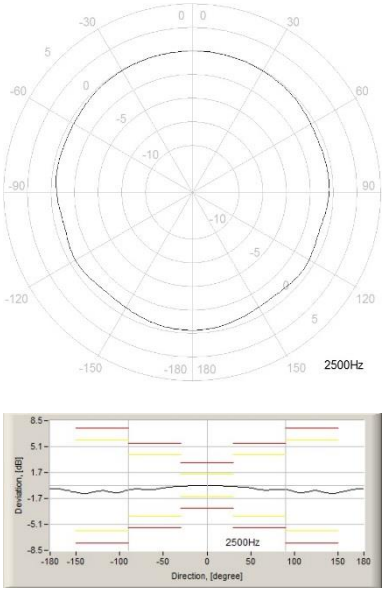


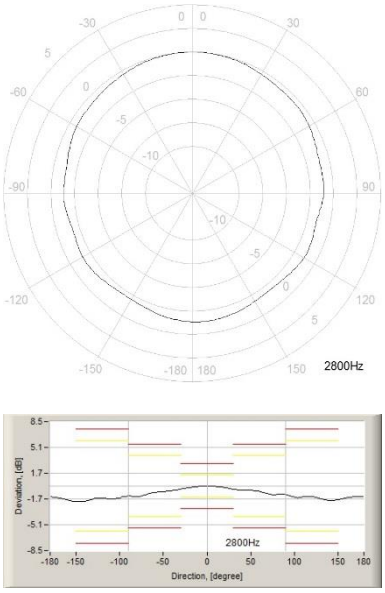
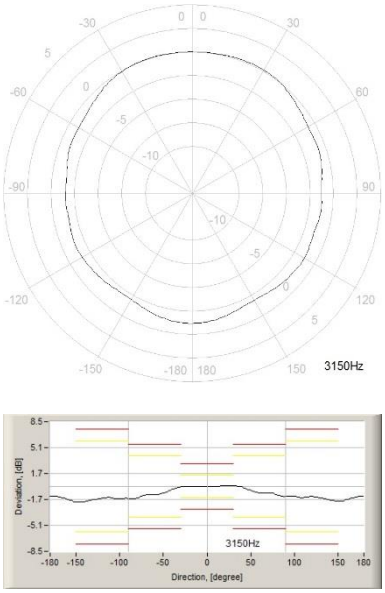
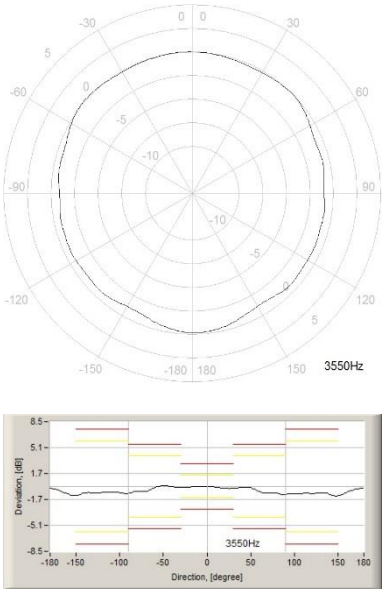
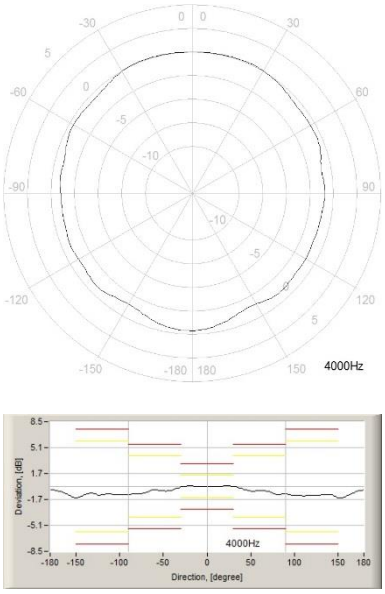
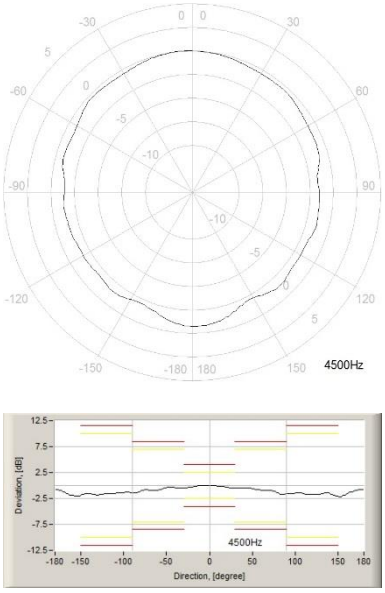
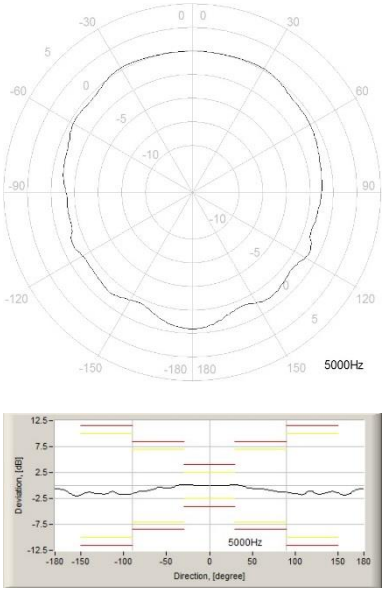
630 Hz



800 Hz



1000 Hz	
1250 Hz	
1600 Hz	
2000 Hz	
2240 Hz	
2500 Hz	

2800 Hz		**3150 Hz**	
3550 Hz		**4000 Hz**	
4500 Hz		**5000 Hz**	

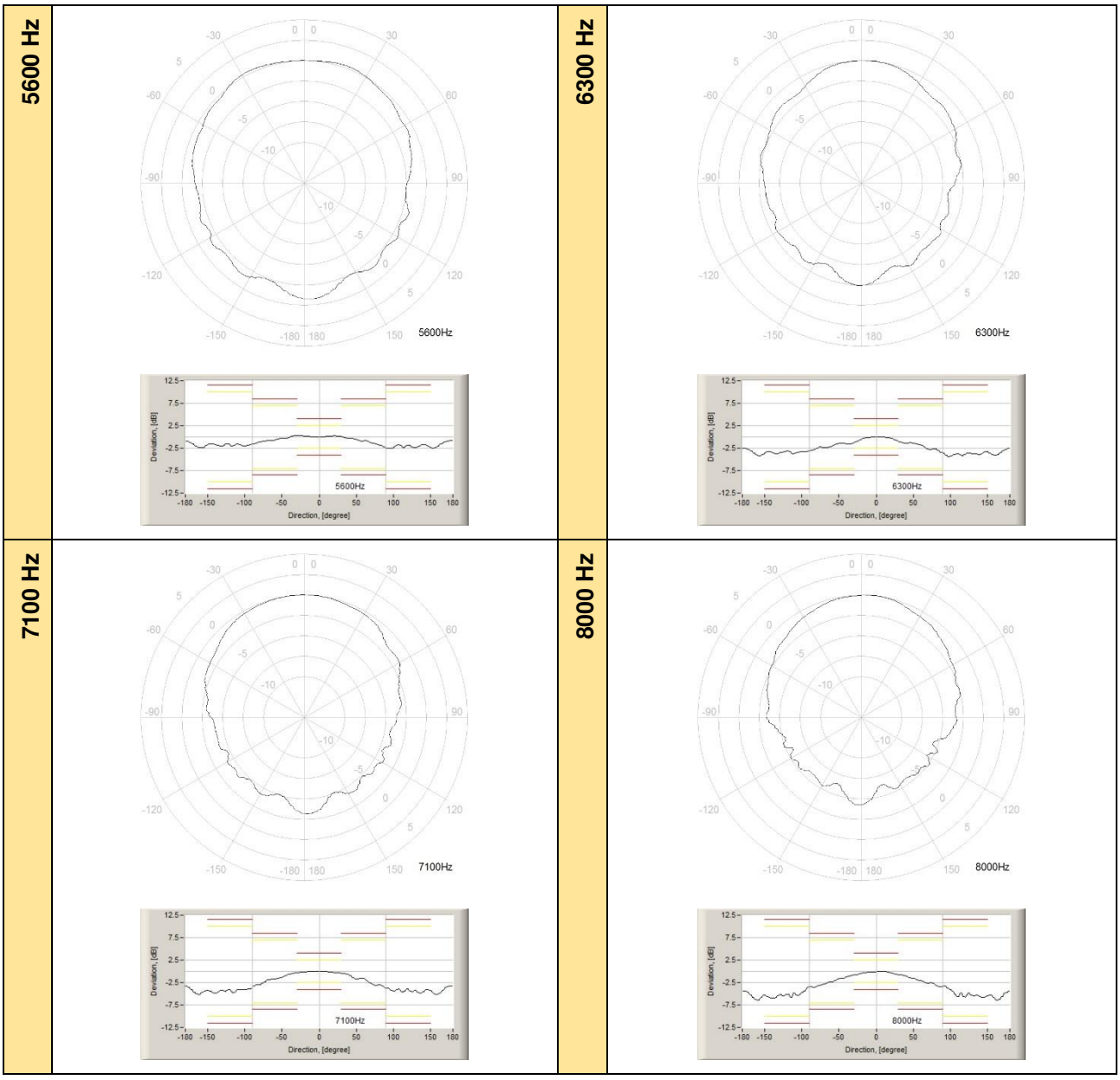


Table C.7. Directional response for SV 973 – Deviation from 0 deg in dB

f [Hz]	Angle [°]									
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
250	0.00	0.01	-0.01	-0.02	-0.03	-0.05	-0.08	-0.11	-0.14	-0.17
315	-0.01	0.02	0.02	0.02	-0.02	-0.05	-0.08	-0.12	-0.16	-0.20
400	0.01	0.01	0.00	-0.02	-0.03	-0.04	-0.06	-0.07	-0.07	-0.08
500	0.02	0.02	0.02	-0.01	-0.04	-0.08	-0.13	-0.18	-0.23	-0.28
630	0.01	0.01	-0.01	-0.04	-0.08	-0.13	-0.19	-0.25	-0.30	-0.36
800	0.01	0.01	0.01	-0.01	-0.04	-0.06	-0.11	-0.17	-0.23	-0.31
1000	0.00	-0.02	-0.05	-0.08	-0.10	-0.14	-0.21	-0.28	-0.36	-0.48
1250	0.00	-0.03	-0.06	-0.12	-0.18	-0.24	-0.29	-0.31	-0.32	-0.35
1600	0.00	0.01	0.02	0.02	-0.03	-0.11	-0.22	-0.32	-0.33	-0.32
2000	0.00	-0.04	-0.10	-0.17	-0.22	-0.23	-0.25	-0.40	-0.62	-0.67
2240	0.00	-0.02	-0.11	-0.28	-0.45	-0.52	-0.48	-0.50	-0.62	-0.67

2500	-0.02	-0.07	-0.12	-0.18	-0.33	-0.53	-0.60	-0.58	-0.54	-0.81
2800	-0.07	-0.22	-0.43	-0.55	-0.58	-0.73	-1.06	-1.14	-1.12	-1.50
3150	0.03	0.09	0.11	-0.12	-0.57	-0.87	-0.88	-1.12	-1.33	-1.32
3550	-0.08	-0.22	-0.27	-0.23	-0.12	-0.60	-0.88	-0.90	-1.07	-1.04
4000	0.02	0.07	0.07	-0.33	-0.60	-0.60	-0.68	-1.10	-1.08	-1.16
4500	-0.10	-0.32	-0.48	-0.48	-0.60	-0.90	-0.96	-1.58	-1.71	-1.51
5000	-0.02	0.04	0.12	-0.22	-0.55	-0.61	-0.91	-1.18	-1.31	-1.58
5600	0.08	0.25	0.25	-0.34	-0.63	-0.92	-1.34	-1.83	-2.50	-2.54
6300	-0.03	-0.38	-1.02	-1.38	-1.42	-1.85	-2.82	-2.83	-3.64	-4.32
7100	-0.04	-0.26	-0.41	-0.94	-1.65	-1.66	-2.79	-3.08	-3.73	-4.42
8000	-0.02	-0.35	-0.77	-1.08	-1.59	-2.10	-2.69	-3.13	-3.50	-4.03
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	-0.20	-0.23	-0.25	-0.27	-0.29	-0.31	-0.33	-0.34	-0.34	-0.35
315	-0.24	-0.28	-0.31	-0.34	-0.37	-0.40	-0.42	-0.44	-0.47	-0.48
400	-0.08	-0.08	-0.07	-0.06	-0.05	-0.05	-0.04	-0.04	-0.05	-0.06
500	-0.32	-0.36	-0.39	-0.42	-0.44	-0.45	-0.47	-0.49	-0.50	-0.51
630	-0.40	-0.43	-0.44	-0.45	-0.46	-0.47	-0.47	-0.49	-0.50	-0.52
800	-0.39	-0.44	-0.45	-0.46	-0.45	-0.43	-0.41	-0.41	-0.43	-0.46
1000	-0.56	-0.61	-0.63	-0.62	-0.61	-0.57	-0.54	-0.51	-0.52	-0.54
1250	-0.43	-0.57	-0.64	-0.65	-0.64	-0.58	-0.51	-0.46	-0.46	-0.50
1600	-0.47	-0.69	-0.81	-0.81	-0.76	-0.64	-0.51	-0.47	-0.52	-0.61
2000	-0.64	-0.81	-1.11	-1.23	-1.24	-1.17	-1.03	-0.93	-0.99	-1.13
2240	-0.87	-0.92	-1.10	-1.29	-1.30	-1.17	-0.97	-0.88	-0.94	-1.14
2500	-0.96	-0.91	-0.82	-1.01	-1.04	-0.94	-0.67	-0.46	-0.44	-0.69
2800	-1.55	-1.38	-1.68	-1.89	-1.89	-1.76	-1.53	-1.40	-1.56	-1.89
3150	-1.48	-1.43	-1.48	-1.73	-1.95	-1.94	-1.65	-1.34	-1.34	-1.68
3550	-0.95	-0.92	-0.92	-1.05	-1.23	-1.15	-0.66	-0.30	-0.51	-1.00
4000	-1.23	-1.23	-1.19	-1.10	-1.49	-1.54	-1.21	-0.66	-0.59	-1.18
4500	-1.66	-1.79	-1.78	-1.64	-2.14	-2.13	-1.47	-0.96	-1.21	-1.92
5000	-1.80	-1.49	-1.69	-1.59	-1.48	-1.86	-1.67	-0.84	-0.84	-1.86
5600	-2.10	-2.28	-2.36	-2.32	-2.38	-2.46	-1.76	-0.93	-1.60	-2.41
6300	-4.17	-4.17	-3.80	-3.93	-3.71	-4.10	-4.01	-2.92	-2.96	-4.10
7100	-4.59	-4.72	-4.48	-4.88	-4.46	-5.14	-4.80	-3.41	-4.43	-5.10
8000	-5.70	-5.77	-5.50	-5.65	-5.78	-6.34	-6.41	-5.23	-5.36	-6.43
f [Hz]	**200-210**	**210-220**	**220-230**	**230-240**	**240-250**	**250-260**	**260-270**	**270-280**	**280-290**	**290-300**
250	-0.34	-0.34	-0.33	-0.32	-0.29	-0.27	-0.25	-0.21	-0.17	-0.14
315	-0.49	-0.49	-0.49	-0.48	-0.46	-0.44	-0.41	-0.37	-0.31	-0.27
400	-0.08	-0.09	-0.10	-0.11	-0.12	-0.12	-0.12	-0.11	-0.10	-0.09
500	-0.52	-0.52	-0.52	-0.51	-0.49	-0.46	-0.41	-0.38	-0.32	-0.26
630	-0.53	-0.55	-0.55	-0.55	-0.53	-0.50	-0.45	-0.39	-0.33	-0.26
800	-0.49	-0.53	-0.55	-0.55	-0.54	-0.51	-0.42	-0.34	-0.27	-0.22
1000	-0.57	-0.60	-0.60	-0.59	-0.55	-0.47	-0.37	-0.28	-0.21	-0.16
1250	-0.56	-0.62	-0.63	-0.61	-0.52	-0.41	-0.31	-0.26	-0.25	-0.23
1600	-0.74	-0.84	-0.84	-0.78	-0.59	-0.43	-0.39	-0.39	-0.32	-0.21
2000	-1.29	-1.38	-1.38	-1.30	-1.04	-0.83	-0.87	-0.85	-0.65	-0.42
2240	-1.36	-1.39	-1.28	-1.06	-1.04	-0.91	-0.81	-0.78	-0.59	-0.67
2500	-0.95	-1.05	-1.02	-0.83	-0.90	-0.96	-0.81	-0.57	-0.51	-0.52
2800	-2.04	-2.05	-1.92	-1.64	-1.73	-1.75	-1.50	-1.38	-1.36	-1.07
3150	-2.06	-2.07	-1.93	-1.70	-1.50	-1.64	-1.58	-1.59	-1.45	-1.11
3550	-1.20	-1.12	-0.86	-0.87	-0.78	-0.83	-0.94	-0.88	-0.66	-0.60

4000	-1.46	-1.45	-1.00	-1.12	-1.04	-1.10	-1.10	-1.02	-0.97	-0.70
4500	-2.06	-1.78	-1.80	-1.76	-1.64	-1.45	-1.48	-1.48	-0.96	-0.96
5000	-2.03	-1.77	-1.59	-1.66	-1.51	-1.74	-1.72	-1.60	-1.10	-0.85
5600	-2.38	-1.70	-2.05	-1.99	-2.06	-1.99	-1.98	-1.56	-1.02	-0.81
6300	-4.22	-3.64	-3.80	-3.42	-3.74	-3.63	-3.23	-3.07	-2.49	-2.39
7100	-4.73	-4.89	-4.83	-4.46	-4.77	-4.13	-4.00	-3.28	-2.91	-1.94
8000	-6.33	-5.91	-5.90	-5.53	-5.78	-5.41	-4.65	-3.63	-3.19	-2.80
f [Hz]	**300-310**	**310-320**	**320-330**	**330-340**	**340-350**	**350-360**				
250	-0.09	-0.03	0.09	0.19	0.29	0.40				
315	-0.22	-0.16	-0.11	-0.08	-0.04	-0.01				
400	-0.06	-0.05	-0.03	-0.02	-0.01	0.00				
500	-0.20	-0.15	-0.10	-0.06	-0.02	0.01				
630	-0.20	-0.14	-0.08	-0.06	-0.03	-0.01				
800	-0.15	-0.11	-0.07	-0.04	-0.02	0.01				
1000	-0.13	-0.09	-0.07	-0.04	-0.01	0.00				
1250	-0.18	-0.12	-0.07	-0.04	-0.01	0.00				
1600	-0.11	-0.04	-0.01	0.01	0.02	0.03				
2000	-0.40	-0.36	-0.28	-0.17	-0.08	-0.03				
2240	-0.66	-0.49	-0.24	-0.13	-0.06	-0.02				
2500	-0.46	-0.28	-0.14	-0.08	-0.04	-0.02				
2800	-0.81	-0.71	-0.54	-0.37	-0.17	-0.05				
3150	-1.06	-0.73	-0.36	0.04	0.04	0.02				
3550	0.10	0.09	-0.13	-0.13	-0.05	0.02				
4000	-0.58	-0.59	-0.33	0.06	0.06	-0.03				
4500	-0.81	-0.45	-0.49	-0.44	-0.18	0.03				
5000	-0.51	-0.51	0.21	0.20	0.06	-0.02				
5600	-0.64	-0.39	0.28	0.31	0.19	0.04				
6300	-1.86	-1.57	-1.61	-1.08	-0.37	-0.09				
7100	-1.65	-1.03	-0.57	-0.30	-0.12	0.02				
8000	-2.32	-1.60	-1.16	-0.82	-0.38	-0.12				

C.2 SPECIFICATION OF SV 973 AS SOUND EXPOSURE METER (DOSIMETER) IN THE STANDARD CONFIGURATION

Statement of performance

SV 973 working as SEM with all accessories meets requirements of IEC 61252 and IEC 61672:2013 for Class 2 Group X instruments.

Configuration of the complete SEM in its normal mode of operation

SV 973 including, ST 973 microphone (1/2", nominal sensitivity 1.8 mV/Pa)

Recommended calibrator:
SV 34B Class 2 sound calibrator 114 dB@1000 Hz or equivalent (not included in the standard set)

Measured quantities

The measured quantities for SEM mode are: : **LXpeak**, **LXYmax**, **LXYmin**, **LXY**, **LXeq**, **LXE**, **Lden**, **LEPd**, **Ltm3**, **Ltm5**, **Ln** (Leq statistics), **Lc-a**, **DOSE**, **D_8h**, **PrDOSE**, **LAV**, **LAE8** (SEL8), **PLAE** (PSEL), **E**, **E_8h**, **PTC** (peak counter), **PTP** (peak threshold), **ULT** (upper limit time), **TWA**, **PrTWA**, **EX** (expected Leq value), **SD** (standard Leq deviation), **OVL** (overload time %). Definitions for above mentioned parameters are given in Appendix D.

Additional features

Overload indication

Under-range indication

Battery state indication

Conformance testing

This chapter contains the information needed to conduct conformance testing according to the specified standards.

Mounting for acoustical tests The microphone must be mounted on the instrument.

Electrical substitute for the microphone To obtain a BNC Class electrical input, the microphone must be replaced by an electrical microphone impedance adapter SL 973.

Note: *For the conformance of electrical tests, the microphone compensation must be switched off (**Microphone=Off**)!*

Note: *For the frequency response evaluation in the acoustic coupler the microphone compensation must be switched on (**Microphone=On**) and the Free-filed compensations must be switched off (**Field Comp=Off**).*

*The **Windscreen** compensation is switching off automatically.*

Periodical test upper frequency 8 kHz

Linear Operating Ranges

Table C.8. Linear operating ranges for the sinusoidal signal and microphone sensitivity 1.8 mV/Pa

[dB]	$L_{AS/F}$		$L_{BS/F}$		$L_{CS/F}$		$L_{ZS/F}$		L_{AeqT}		L_{BeqT}		L_{CeqT}		L_{AE} (t_{int} = 2 s)		L_{Cpeak}	
	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to	from	to
31.5 Hz	50	98	55	121	55	135	70	138	50	98	55	121	55	135	53	101	83	138
500 Hz	50	134	55	137	55	138	70	138	50	134	55	137	55	138	53	137	83	141
1 kHz	50	138	55	138	55	138	70	138	50	138	55	138	55	138	53	141	83	141
4 kHz	50	139	55	137	55	137	70	138	50	139	55	137	55	137	53	142	83	140
8 kHz	50	137	55	135	55	135	70	138	50	137	55	135	55	135	53	140	83	138
12.5 kHz	50	133	55	132	55	132	70	138	50	133	55	132	55	132	53	136	83	135

Note: *For signals with the crest factor n > 1.41 upper measuring range of the RMS (LEQ and SPL) is reduced. The valid upper limit can be calculated according to the below given formula:*

$An = 138 - 20log(n/\sqrt{2})$, *where A is the upper limit for the sinusoidal signal*

Example: For the crest factor n = 10 the upper limit is A_{10} *= 121 dB*

The starting point at which tests of level linearity shall begin 114.0 dB (94 dB for A filter @ 31.5 Hz).

Measuring frequency range of the acoustic pressure (-3 dB) 20 Hz ÷ 10 000 Hz.

Basic measurement error of the acoustic pressure < 0.7 dB (measured for the reference conditions, see below).

Weighting filters (see part C.3)

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

Table C.9. Self-generated noise for different weighting filters

	Electrical *)			Acoustical compensated		
Weighting filter	**A**	**C**	**Z**	**A**	**C**	**Z**
Noise	< 40 dB	< 40 dB	< 50 dB	< 43 dB	< 48 dB	< 63 dB

*) measured with the **SL 973** microphone equivalent

Special filters

- **Windscreen** — compensation filter improving the instrument frequency response in the free acoustic field when windscreen SA22 is mounted on the microphone (see C.3)

RMS detector

- Digital — "True RMS" with Peak detection,
- Resolution — 0.1 dB
- Range — 327.7 dB
- Crest Factor — unlimited (for signals in 8 kHz band).

Overload detector

The instrument has the built-in overload detectors. The overload in the measurement channel (in its analogue part) and the overload of the analogue / digital converter are both detected. The "overload" indication is when the input signal amplitude **is 0.5 dB above** the declared "Peak measurement range"

Underrange detector

The instrument has the built-in under-range detector. The "underrange" indication appears when the Leq value for the elapsed time or the last second L_{XY} value is below the lower linear operating range.

Time weighting characteristics (Exponential averaging)

Slow "**S**" according to IEC 61672-1:2013 for Class 2, Equivalent Time Constant 1000 ms
Fast "**F**" according to IEC 61672-1:2013 for Class 2, Equivalent Time Constant 125 ms
Impulse "**I**" according to IEC 61672-1:2013 for Class 2, Equivalent Time Constant 35 ms, Hold Time 1500 s

Reference conditions as per IEC 61252

- Class of the acoustic field — Free field
- Reference acoustic pressure — 114.0 dB (related to 20 μPa)
- Reference frequency — 1000 Hz
- Reference temperature — +20°C
- Reference relative humidity — 65 %
- Reference static pressure — 1013 hPa
- Reference incidence direction — perpendicular to the microphone diaphragm.

Calibration

Acoustical **-** with the SV 34B acoustic calibrator (or equivalent):

- Calibration level — 114.0 dB (equal to the calibrator pressure level - see calibration chart of the used calibrator)

Note: *The above levels correspond to 114 dB of calibrator's sound pressure. If the calibrator has a different sound pressure than 114 dB, the calibration levels must be accordingly adjusted.*

Maximum peak voltage — 3 V Peak-Peak (Maximum peak voltage of input sinusoidal signal, which can be applied to the SLM without destruction the meter)

Warm-up time	1 min. (for 0.1 dB accuracy)
Typical stabilization time after change in environmental conditions by 20°C	1 hour
Time shift after completion of a measurement, before a measurement is shown	< 1 sec

Note: *When the instrument is moved from a warm environment with high humidity, to a colder environment, care should be taken not to produce condensation inside the instrument. In this case, much longer stabilization periods may be necessary.*

Environmental, electrostatic and radio frequency criteria

Effect of humidity	< 0.5 dB (for 30%<RH<90% at 40°C and 1000 Hz)
Effect of magnetic field	below electrical noise level (for 80 A/m and 50 Hz)
Effect of radio frequency fields	meets requirements of IEC 61672-1:2013

The greatest susceptibility (the least immunity) is achieved when in the SLM the **Z** filter and time weighting **F** are selected, and the SPL measurements are considered.

The greatest susceptibility is achieved when the SLM is placed parallel to the radio frequency field. In addition, if there is an extension cable, the greatest susceptibility is achieved when the SLM and cable is placed along field and the cable is coil as solenoid.

Effect of electrostatic discharge	meets requirements of IEC 61672-1:2013

During electrostatic discharge, the influence of the displayed results could be observed.

No changes in instrument operation state, configuration or stored data corruption were found out.

Effect of ambient pressure	< 0.01 dB/kPa
Effect of temperature	< 0.5 dB (from -10°C to + 50°C)
Operating	from -10°C to + 50°C
Storage	from -20°C to + 60°C

Microphone

ST 973	free-field condenser microphone MEMS (½" housing)
Nominal sensitivity	1.8 mV/Pa (corresponding to -55 dBV/Pa re 1 V/Pa)
Output impedance	2 x 177.5 Ohm / 15nF, differential

Note: *Maximum level of sound pressure level, which can be affect the microphone without destruction the microphone: 160 dB.*

ST 973 and SV 973 frequency characteristics

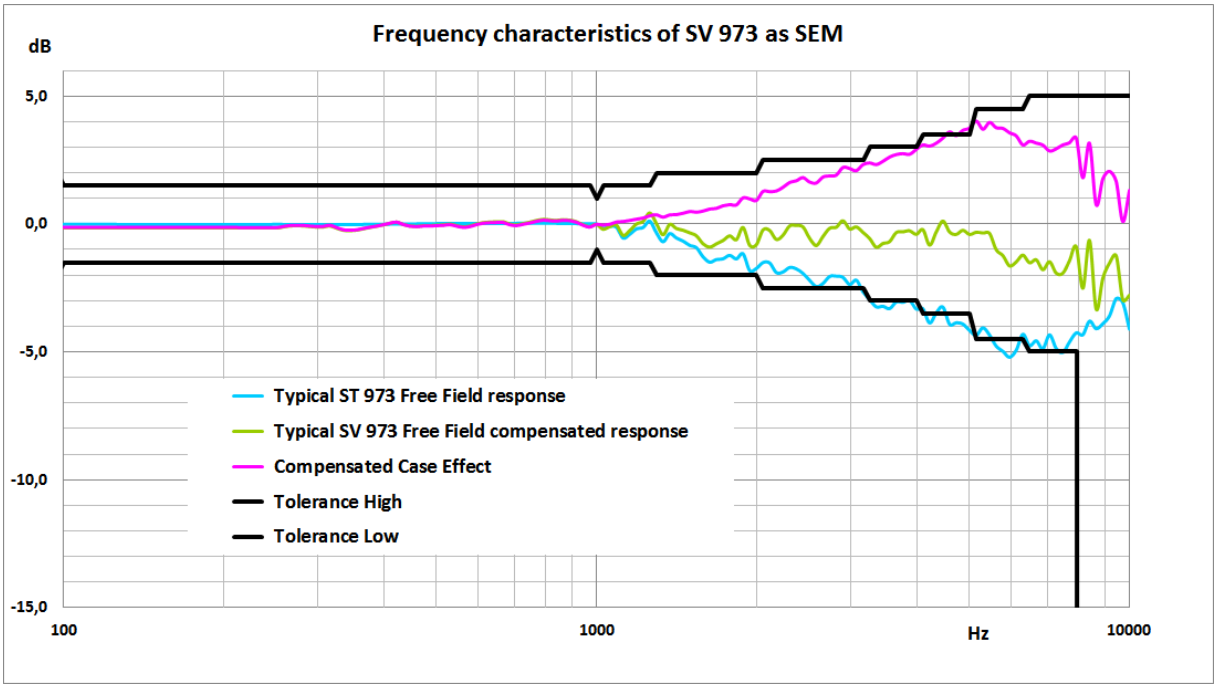


Table C.10. ST 973 free field corrections with the use of the Bruel & Kjaer 4226 sound calibrator

[dB]	Frequency [Hz]								
	31.5	63	125	250	500	1000	2000	4000	8000
Typical pressure response	0.00	0.00	0.00	0.00	0.00	0.00	-1.70	-4.60	-7.70
ST 973 Free Field corrections	-0.50	-0.10	0.00	0.00	0.00	0.00	0.00	1.30	3.45
Uncertainty (IEC 62585:2012)	0.25	0.25	0,25	0.25	0.25	0.25	0.25	0.25	0.35

Table C.11. Typical ST 973 and SV 973 frequency characteristics

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
20	-0.82	-0.93	-0.11	0.25
25	-0.67	-0.78	-0.11	0.25
32	-0.49	-0.60	-0.11	0.25
40	-0.31	-0.42	-0.12	0.25
50	-0.16	-0.28	-0.11	0.25
63	-0.09	-0.21	-0.12	0.25
79	-0.06	-0.17	-0.12	0.25
100	-0.02	-0.14	-0.12	0.25
126	-0.02	-0.14	-0.11	0.25
158	-0.03	-0.14	-0.11	0.25
200	-0.03	-0.14	-0.11	0.25
251	-0.02	-0.14	-0.12	0.25
259	-0.02	-0.10	-0.08	0.25

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
266	-0.03	-0.06	-0.04	0.25
274	-0.03	-0.06	-0.03	0.25
282	-0.03	-0.06	-0.04	0.25
290	-0.03	-0.09	-0.06	0.25
299	-0.03	-0.11	-0.08	0.25
307	-0.03	-0.11	-0.07	0.25
316	-0.04	-0.06	-0.03	0.25
325	-0.03	-0.15	-0.12	0.25
335	-0.03	-0.23	-0.20	0.25
345	-0.03	-0.25	-0.22	0.25
355	-0.03	-0.23	-0.21	0.25
365	-0.02	-0.18	-0.16	0.25
376	-0.02	-0.12	-0.10	0.25
387	-0.02	-0.08	-0.06	0.25
398	-0.01	-0.02	-0.01	0.25
410	-0.01	0.04	0.05	0.25
422	-0.01	0.08	0.09	0.25
434	-0.01	-0.01	0.00	0.25
447	0.00	-0.07	-0.06	0.25
460	0.00	-0.08	-0.08	0.25
473	0.00	-0.06	-0.06	0.25
487	0.01	-0.06	-0.06	0.25
501	0.01	-0.03	-0.04	0.25
516	0.01	-0.03	-0.04	0.25
531	0.01	0.01	-0.01	0.25
546	0.01	-0.05	-0.06	0.25
562	0.01	-0.10	-0.11	0.25
579	0.01	-0.07	-0.08	0.25
596	0.02	0.01	0.00	0.25
613	0.02	0.07	0.05	0.25
631	0.02	0.09	0.07	0.25
649	0.02	0.10	0.08	0.25
668	0.02	0.10	0.08	0.25
688	0.02	0.01	-0.01	0.25
708	0.02	-0.02	-0.04	0.25
729	0.02	0.03	0.01	0.25
750	0.02	0.08	0.06	0.25
772	0.02	0.15	0.12	0.25
794	0.03	0.19	0.17	0.25
818	0.02	0.17	0.15	0.25
841	0.02	0.15	0.13	0.25
866	0.02	0.18	0.16	0.25
891	0.01	0.16	0.15	0.25
917	0.01	0.10	0.09	0.25
944	0.01	-0.02	-0.03	0.25
972	0.00	-0.10	-0.10	0.25
1000	-0.01	0.00	0.00	0.25
1029	-0.17	-0.19	-0.02	0.25
1059	-0.10	-0.09	0.01	0.25

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
1090	-0.13	-0.03	0.10	0.25
1122	-0.55	-0.44	0.12	0.25
1155	-0.40	-0.24	0.16	0.25
1189	-0.20	0.01	0.21	0.25
1223	-0.14	0.11	0.25	0.25
1259	0.10	0.44	0.34	0.25
1296	-0.35	0.03	0.38	0.25
1334	-0.70	-0.41	0.29	0.25
1372	-0.38	0.00	0.37	0.25
1413	-0.55	-0.17	0.38	0.25
1454	-0.67	-0.23	0.44	0.25
1496	-0.84	-0.33	0.51	0.25
1540	-0.93	-0.45	0.48	0.25
1585	-1.28	-0.76	0.52	0.25
1631	-1.49	-0.89	0.60	0.25
1679	-1.39	-0.76	0.63	0.25
1728	-1.36	-0.63	0.73	0.25
1778	-1.23	-0.45	0.77	0.25
1830	-1.37	-0.60	0.76	0.25
1884	-1.16	-0.13	1.04	0.25
1939	-1.82	-0.83	1.00	0.25
1995	-1.74	-0.80	0.94	0.25
2054	-1.51	-0.22	1.29	0.25
2113	-1.52	-0.24	1.28	0.25
2175	-1.90	-0.59	1.30	0.25
2239	-1.87	-0.42	1.45	0.25
2304	-1.70	-0.06	1.64	0.25
2371	-1.75	-0.05	1.70	0.25
2441	-1.93	-0.10	1.83	0.25
2512	-2.20	-0.55	1.65	0.25
2585	-2.45	-0.83	1.62	0.25
2661	-2.33	-0.48	1.85	0.25
2738	-2.05	-0.16	1.89	0.25
2818	-2.04	-0.11	1.92	0.25
2901	-2.08	0.14	2.22	0.25
2985	-2.36	-0.18	2.18	0.25
3073	-2.20	-0.10	2.10	0.25
3162	-2.65	-0.32	2.33	0.25
3255	-2.96	-0.56	2.40	0.25
3350	-3.24	-0.90	2.34	0.25
3447	-3.21	-0.75	2.46	0.25
3548	-3.30	-0.68	2.63	0.25
3652	-3.05	-0.32	2.72	0.25
3758	-3.06	-0.30	2.76	0.25
3868	-2.99	-0.25	2.73	0.25
3981	-3.32	-0.39	2.93	0.25
4097	-3.31	-0.21	3.10	0.35
4217	-3.86	-0.81	3.05	0.35
4340	-3.47	-0.30	3.17	0.35

Frequency	ST 973 Free Field response	SV 973 Free Field compensated response	Compensated Case Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
4467	-3.24	0.12	3.37	0.35
4597	-3.91	-0.30	3.61	0.35
4732	-3.85	-0.39	3.46	0.35
4870	-3.91	-0.23	3.67	0.35
5012	-4.15	-0.40	3.76	0.35
5158	-4.34	-0.31	4.03	0.35
5309	-4.05	-0.34	3.71	0.35
5464	-4.34	-0.36	3.98	0.35
5623	-4.77	-1.00	3.77	0.35
5788	-4.97	-1.22	3.74	0.35
5957	-5.20	-1.63	3.57	0.35
6131	-4.92	-1.47	3.45	0.35
6310	-4.30	-1.21	3.10	0.35
6494	-4.75	-1.50	3.24	0.35
6683	-4.56	-1.39	3.17	0.35
6879	-4.87	-1.77	3.09	0.35
7079	-4.33	-1.46	2.86	0.35
7286	-4.86	-1.91	2.95	0.35
7499	-5.01	-1.91	3.10	0.35
7718	-4.60	-1.42	3.18	0.35
7943	-4.25	-0.87	3.38	0.35
8175	-4.32	-2.50	1.82	0.35
8414	-3.79	-0.63	3.16	0.35
8660	-4.09	-3.31	0.77	0.35
8913	-3.89	-2.11	1.78	0.35
9173	-3.59	-1.52	2.07	0.35
9441	-2.91	-1.24	1.68	0.35
9716	-3.07	-2.96	0.11	0.35
10000	-4.11	-2.77	1.33	0.35

Table C.12. SV 973 combined free field corrections (ST 973 + Compensated Case Effect) with the use of the Bruel & Kjaer 4226 sound calibrator

[dB]	Frequency [Hz]								
	31.5	63	125	250	500	1000	2000	4000	8000
SV 973 Free Field corrections	-0.04	-0.05	-0.06	-0.02	-0.02	0.00	0.90	4.20	6.85
Uncertainty (IEC 62585:2012)	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.49

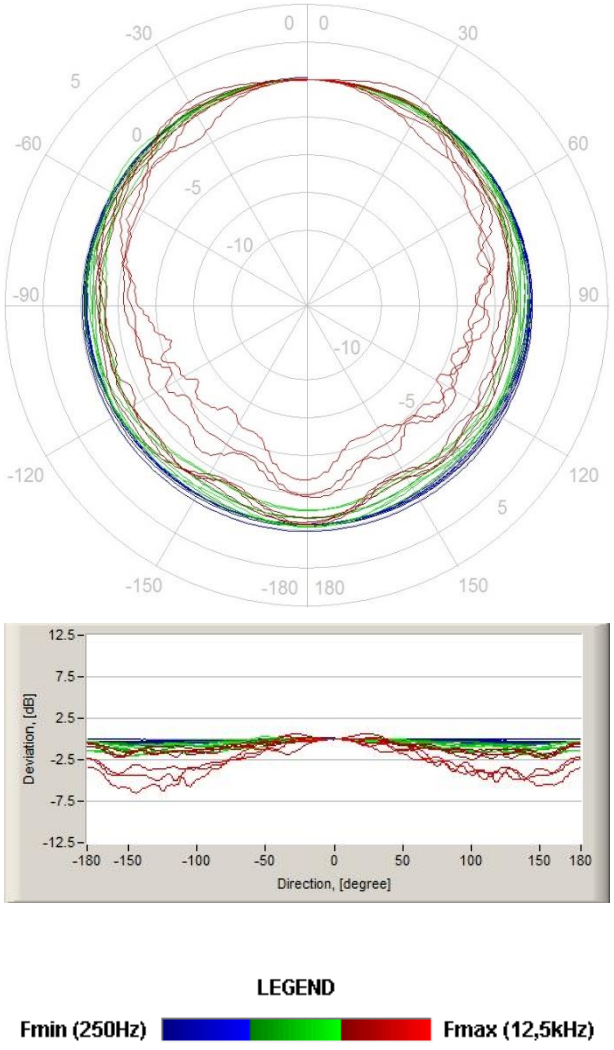
Table C.13. Sum of the Free Field corrections (ST 973 + Compensated Case Effect) with the use of the with the use of the G.R.A.S. 51AB comparison coupler and reference 1/2“ microphone B&K 4134

[dB]	Frequency [Hz]												
	31.5	63	125	250	500	1000	2000	3150	4000	5000	6300	8000	10000
SV 973 Free Field corrections	0.00	0.00	0.00	0.00	0.00	0.00	0.76	2.54	3.53	4.55	5.47	6.39	7.1
Uncertainty (IEC 62585)	--	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.49	0.49	0.49	0.61

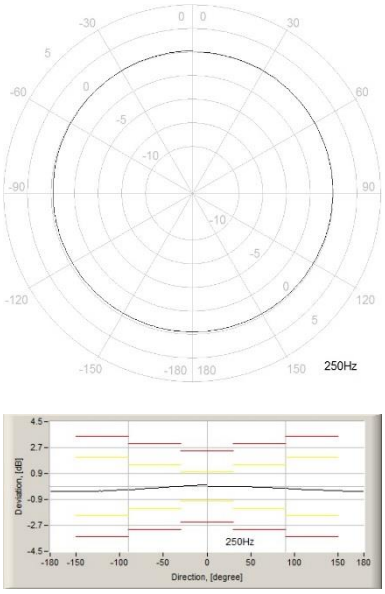
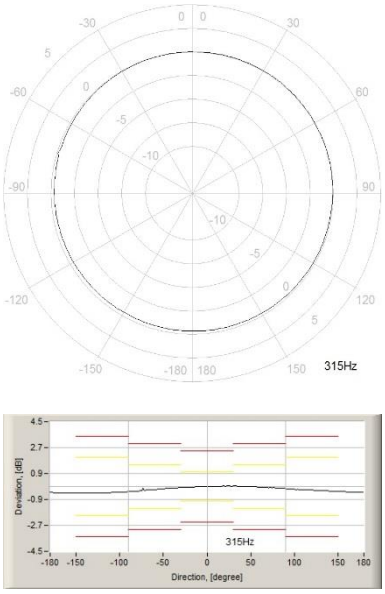
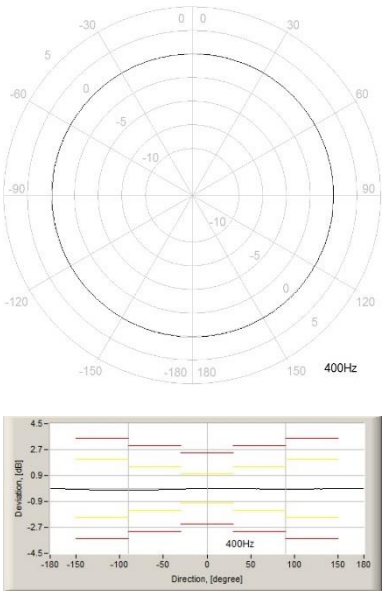
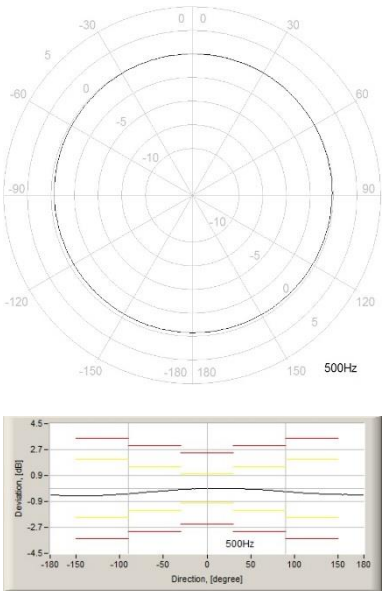
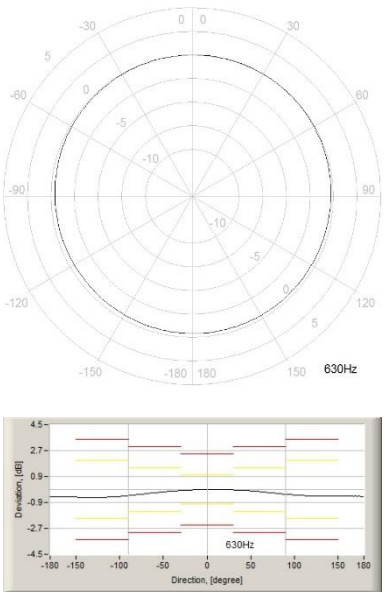
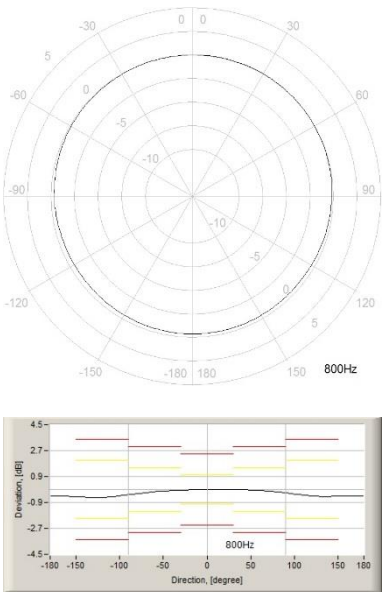
Directional characteristics of SV 973 as SEM

Directional characteristics show deviation of Leq measured at different incidence angle from the Leq measured at 0 deg incidence angle.

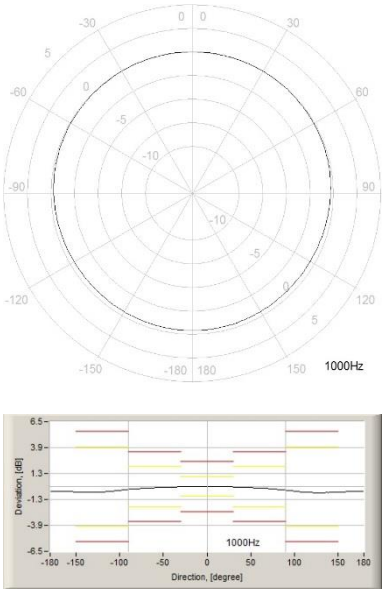
Combined directional characteristics



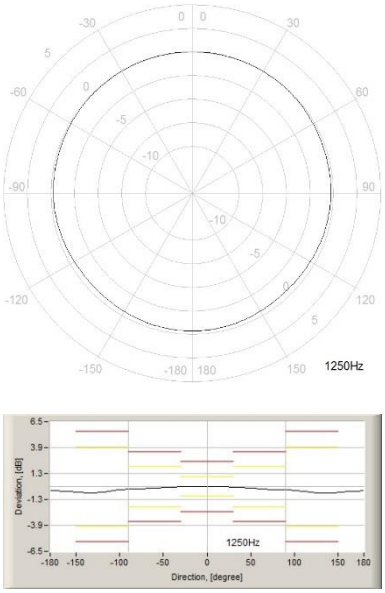
The round charts show the directional characteristic and the charts below shows errors for angles.

250 Hz		**315 Hz**	
400 Hz		**500 Hz**	
630 Hz		**800 Hz**	

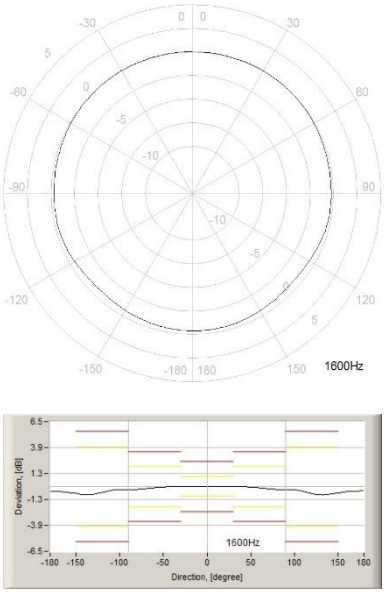
1000 Hz



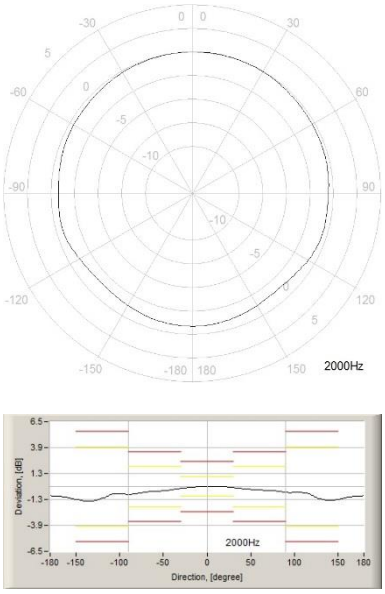
1250 Hz



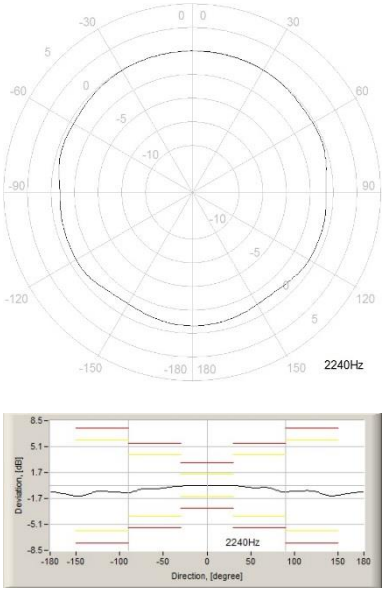
1600 Hz



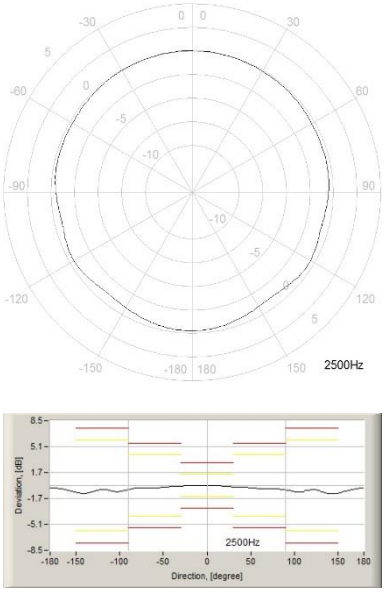
2000 Hz



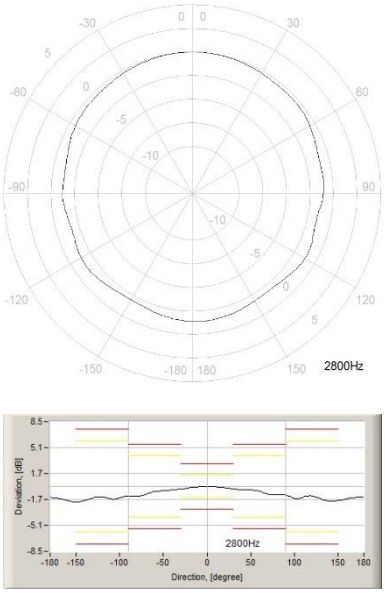
2240 Hz



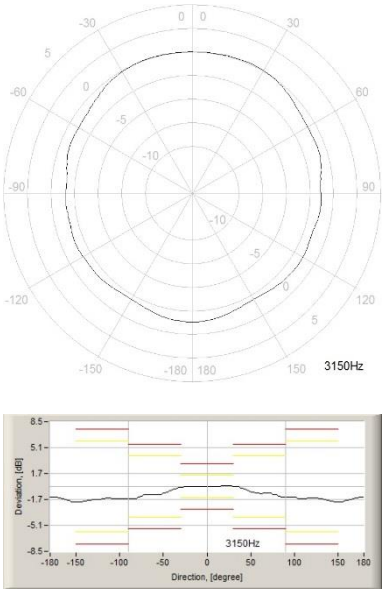
2500 Hz



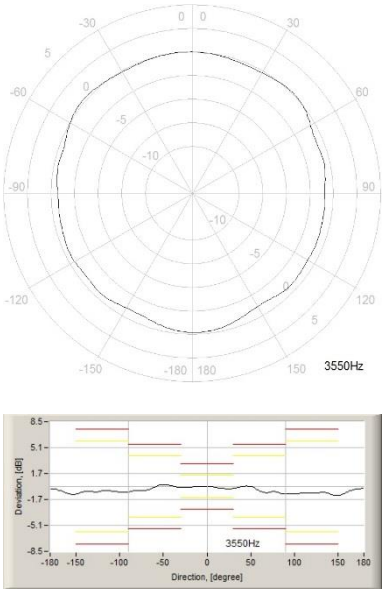
2800 Hz



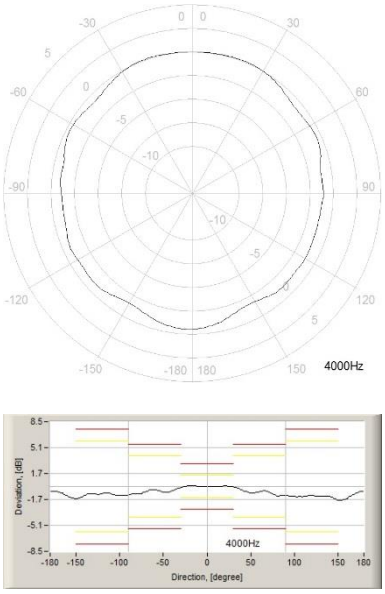
3150 Hz



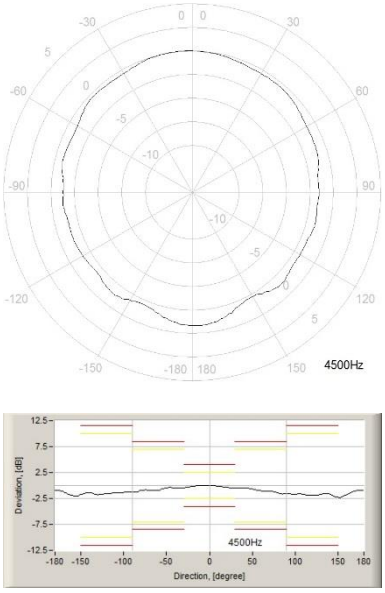
3550 Hz



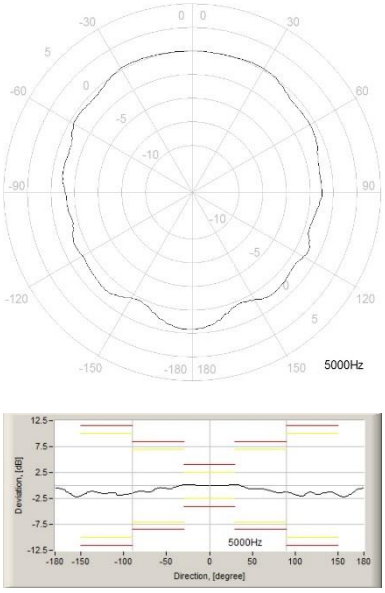
4000 Hz



4500 Hz



5000 Hz



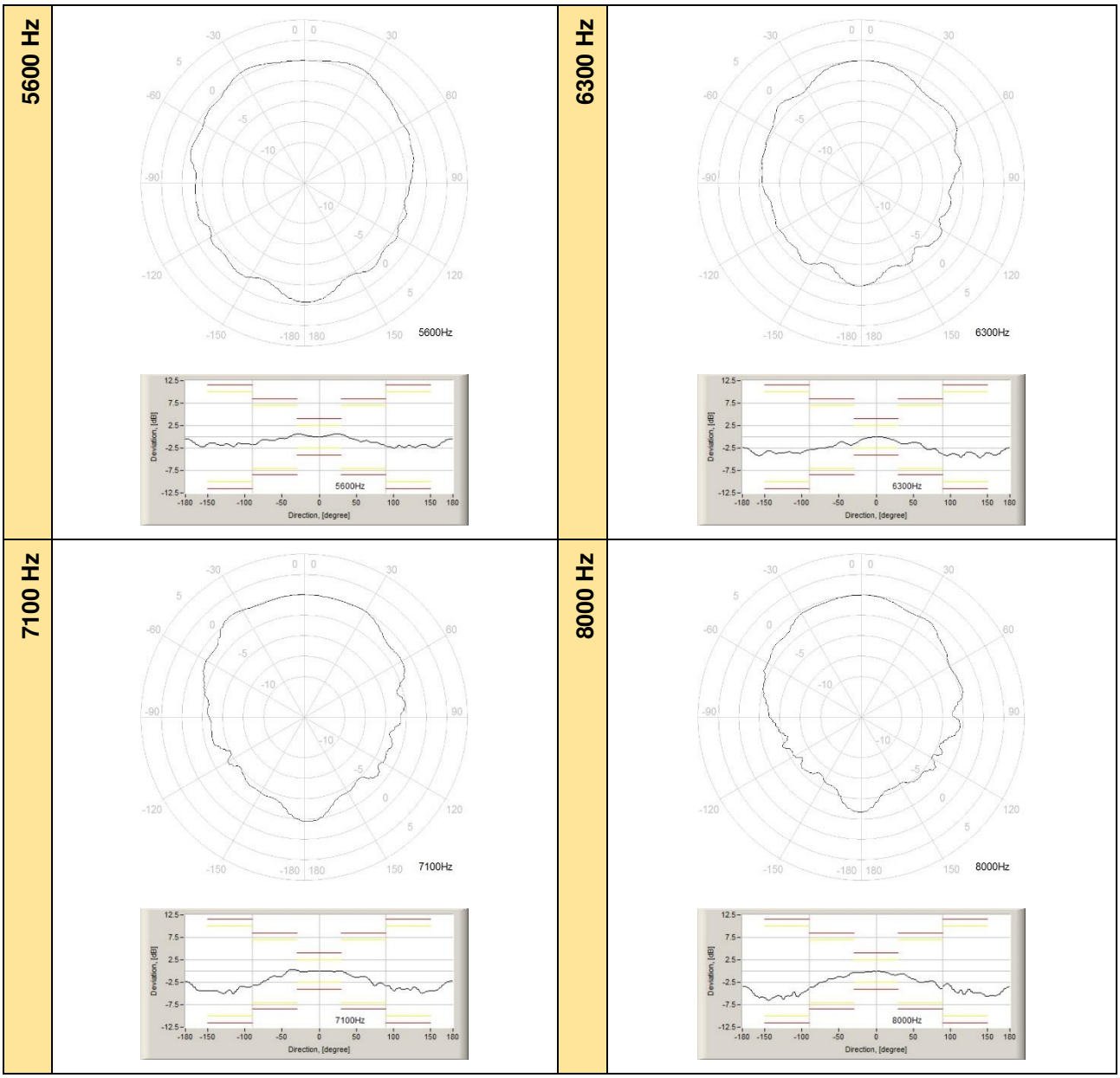


Table C.14. Directional response for SV 973 – Deviation from 0 deg in dB

f [Hz]	Angle [°]									
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
250	0.01	0.01	0.01	0.01	-0.02	-0.06	-0.08	-0.10	-0.14	-0.17
315	0.02	0.03	0.03	0.03	-0.02	-0.04	-0.09	-0.10	-0.15	-0.18
400	0.01	0.01	0.01	-0.01	-0.02	-0.03	-0.04	-0.05	-0.06	-0.06
500	0.02	0.01	0.01	-0.02	-0.04	-0.07	-0.13	-0.18	-0.21	-0.26
630	0.00	-0.01	-0.03	-0.06	-0.10	-0.15	-0.21	-0.27	-0.33	-0.38
800	0.01	0.01	0.01	-0.02	-0.03	-0.07	-0.11	-0.16	-0.23	-0.32
1000	0.01	-0.02	-0.05	-0.08	-0.12	-0.16	-0.22	-0.29	-0.38	-0.48
1250	0.01	-0.03	-0.06	-0.11	-0.17	-0.23	-0.29	-0.33	-0.34	-0.39
1600	-0.01	0.01	0.01	-0.02	-0.07	-0.14	-0.24	-0.29	-0.30	-0.33
2000	0.01	-0.04	-0.11	-0.21	-0.31	-0.36	-0.39	-0.47	-0.59	-0.61
2240	0.01	0.02	-0.02	-0.14	-0.25	-0.28	-0.30	-0.68	-0.86	-0.85

2500	-0.02	-0.10	-0.18	-0.22	-0.30	-0.41	-0.44	-0.45	-0.58	-0.81
2800	-0.04	-0.18	-0.32	-0.40	-0.45	-0.68	-1.05	-1.10	-1.15	-1.55
3150	0.03	0.07	0.07	-0.24	-0.70	-0.91	-0.92	-1.21	-1.42	-1.41
3550	-0.09	-0.27	-0.28	-0.21	0.07	-0.63	-0.80	-0.78	-1.00	-1.00
4000	0.03	0.06	0.06	-0.49	-0.83	-0.84	-0.70	-1.24	-1.23	-1.32
4500	-0.11	-0.36	-0.48	-0.48	-0.66	-1.04	-1.11	-1.55	-1.65	-1.71
5000	-0.03	0.06	0.14	-0.33	-0.70	-0.70	-0.98	-1.37	-1.35	-1.82
5600	0.19	0.58	0.63	0.40	-0.64	-1.04	-1.25	-1.58	-2.02	-2.54
6300	-0.10	-0.56	-1.29	-1.63	-1.52	-1.56	-2.89	-2.97	-3.85	-4.25
7100	-0.03	-0.09	-0.08	-0.93	-1.45	-1.45	-2.69	-3.29	-3.26	-4.40
8000	-0.20	-0.74	-0.88	-1.00	-1.76	-2.55	-2.51	-3.10	-3.84	-3.29
f [Hz]	**100-110**	**110-120**	**120-130**	**130-140**	**140-150**	**150-160**	**160-170**	**170-180**	**180-190**	**190-200**
250	-0.20	-0.22	-0.25	-0.27	-0.30	-0.31	-0.33	-0.34	-0.34	-0.35
315	-0.22	-0.25	-0.30	-0.31	-0.34	-0.38	-0.39	-0.42	-0.43	-0.45
400	-0.06	-0.05	-0.04	-0.03	-0.01	0.01	0.01	-0.01	-0.02	-0.03
500	-0.32	-0.34	-0.37	-0.39	-0.42	-0.43	-0.45	-0.46	-0.48	-0.49
630	-0.42	-0.45	-0.46	-0.47	-0.47	-0.47	-0.48	-0.48	-0.50	-0.51
800	-0.39	-0.45	-0.48	-0.48	-0.48	-0.46	-0.44	-0.43	-0.45	-0.47
1000	-0.56	-0.61	-0.62	-0.62	-0.59	-0.55	-0.51	-0.50	-0.49	-0.51
1250	-0.49	-0.60	-0.66	-0.67	-0.65	-0.59	-0.49	-0.45	-0.45	-0.50
1600	-0.50	-0.73	-0.84	-0.86	-0.76	-0.62	-0.50	-0.46	-0.50	-0.60
2000	-0.61	-0.87	-1.24	-1.40	-1.39	-1.27	-1.09	-0.96	-0.98	-1.14
2240	-0.72	-0.74	-1.05	-1.34	-1.35	-1.23	-1.02	-0.91	-0.97	-1.19
2500	-0.86	-0.74	-0.81	-1.07	-1.11	-0.98	-0.67	-0.42	-0.40	-0.67
2800	-1.57	-1.31	-1.60	-1.90	-1.91	-1.80	-1.58	-1.43	-1.64	-1.90
3150	-1.64	-1.59	-1.60	-1.83	-2.05	-2.03	-1.77	-1.48	-1.47	-1.84
3550	-0.92	-0.89	-0.89	-0.99	-1.19	-1.12	-0.66	-0.31	-0.50	-0.98
4000	-1.33	-1.31	-1.30	-1.32	-1.78	-1.82	-1.43	-0.83	-0.74	-1.35
4500	-1.76	-1.84	-1.86	-1.65	-2.29	-2.28	-1.58	-0.97	-1.28	-1.94
5000	-2.02	-1.57	-1.71	-1.57	-1.89	-2.24	-1.87	-0.82	-0.82	-2.04
5600	-2.56	-2.32	-2.30	-2.24	-2.30	-2.38	-1.80	-0.70	-1.22	-2.20
6300	-4.04	-4.46	-3.57	-4.71	-4.56	-4.14	-4.09	-2.94	-3.11	-4.22
7100	-4.40	-4.14	-4.22	-4.98	-4.89	-4.43	-3.68	-2.40	-3.33	-4.38
8000	-4.81	-5.11	-4.87	-4.90	-5.62	-5.58	-5.54	-4.17	-4.29	-5.84
f [Hz]	**200-210**	**210-220**	**220-230**	**230-240**	**240-250**	**250-260**	**260-270**	**270-280**	**280-290**	**290-300**
250	-0.35	-0.35	-0.33	-0.31	-0.30	-0.27	-0.23	-0.21	-0.18	-0.13
315	-0.47	-0.47	-0.47	-0.47	-0.45	-0.42	-0.39	-0.36	-0.31	-0.24
400	-0.05	-0.08	-0.09	-0.11	-0.12	-0.12	-0.13	-0.13	-0.12	-0.11
500	-0.49	-0.50	-0.50	-0.49	-0.47	-0.45	-0.40	-0.35	-0.30	-0.25
630	-0.54	-0.55	-0.56	-0.55	-0.54	-0.51	-0.47	-0.42	-0.34	-0.28
800	-0.50	-0.54	-0.56	-0.56	-0.54	-0.51	-0.42	-0.34	-0.27	-0.20
1000	-0.54	-0.56	-0.57	-0.57	-0.53	-0.45	-0.37	-0.27	-0.21	-0.16
1250	-0.56	-0.61	-0.63	-0.61	-0.53	-0.43	-0.30	-0.25	-0.23	-0.20
1600	-0.72	-0.83	-0.83	-0.76	-0.56	-0.38	-0.33	-0.32	-0.27	-0.20
2000	-1.30	-1.46	-1.50	-1.42	-1.10	-0.77	-0.80	-0.80	-0.65	-0.53
2240	-1.40	-1.40	-1.18	-0.82	-0.83	-0.89	-0.96	-0.91	-0.57	-0.44
2500	-0.95	-1.05	-1.00	-0.72	-0.70	-0.81	-0.74	-0.51	-0.33	-0.33
2800	-2.00	-1.99	-1.77	-1.43	-1.63	-1.66	-1.43	-1.30	-1.24	-0.95
3150	-2.07	-2.07	-1.84	-1.72	-1.59	-1.64	-1.61	-1.64	-1.38	-1.07
3550	-1.04	-0.93	-0.73	-0.72	-0.63	-0.71	-0.78	-0.67	-0.53	-0.47

4000	-1.61	-1.60	-1.08	-1.01	-0.93	-1.20	-1.20	-1.05	-0.98	-0.60
4500	-2.05	-1.65	-1.82	-1.79	-1.55	-1.48	-1.32	-1.31	-0.95	-1.01
5000	-2.25	-1.92	-1.39	-1.54	-1.46	-1.94	-1.74	-1.42	-1.25	-1.21
5600	-2.21	-1.53	-1.88	-1.88	-2.15	-1.58	-1.69	-1.73	-0.75	-0.82
6300	-4.23	-3.44	-3.74	-3.61	-3.67	-3.70	-3.45	-2.83	-2.56	-2.50
7100	-4.38	-4.44	-5.00	-5.06	-5.03	-3.67	-3.60	-3.19	-2.76	-1.80
8000	-5.92	-6.52	-5.90	-6.21	-5.57	-5.71	-4.77	-3.66	-2.73	-2.33
f [Hz]	**300-310**	**310-320**	**320-330**	**330-340**	**340-350**	**350-360**				
250	-0.09	-0.05	0.02	0.06	0.09	0.14				
315	-0.20	-0.14	-0.10	-0.06	-0.03	-0.02				
400	-0.09	-0.07	-0.05	-0.04	-0.02	-0.02				
500	-0.21	-0.16	-0.10	-0.06	-0.04	-0.02				
630	-0.21	-0.15	-0.10	-0.07	-0.04	-0.01				
800	-0.14	-0.10	-0.08	-0.05	-0.02	-0.01				
1000	-0.12	-0.09	-0.06	-0.03	-0.02	-0.01				
1250	-0.14	-0.10	-0.06	-0.02	-0.01	0.01				
1600	-0.12	-0.05	0.02	0.03	0.04	0.04				
2000	-0.47	-0.39	-0.28	-0.18	-0.07	-0.02				
2240	-0.44	-0.30	-0.15	-0.06	-0.03	-0.01				
2500	-0.31	-0.21	-0.11	-0.06	0.03	0.04				
2800	-0.65	-0.53	-0.42	-0.30	-0.15	-0.05				
3150	-1.05	-0.80	-0.34	-0.06	0.03	0.02				
3550	0.26	0.26	-0.12	-0.14	-0.08	0.02				
4000	-0.76	-0.79	-0.46	0.08	0.08	0.03				
4500	-0.87	-0.45	-0.47	-0.41	-0.10	0.03				
5000	-0.56	-0.57	0.18	0.19	0.13	-0.04				
5600	-0.59	-0.40	0.59	0.62	0.38	0.06				
6300	-2.18	-1.55	-1.87	-1.61	-0.47	-0.09				
7100	-1.26	-0.74	0.35	-0.17	-0.13	0.03				
8000	-1.75	-1.38	-0.88	-0.34	-0.26	-0.09				

C.3 EFFECT OF THE SA 22 WINDSCREEN

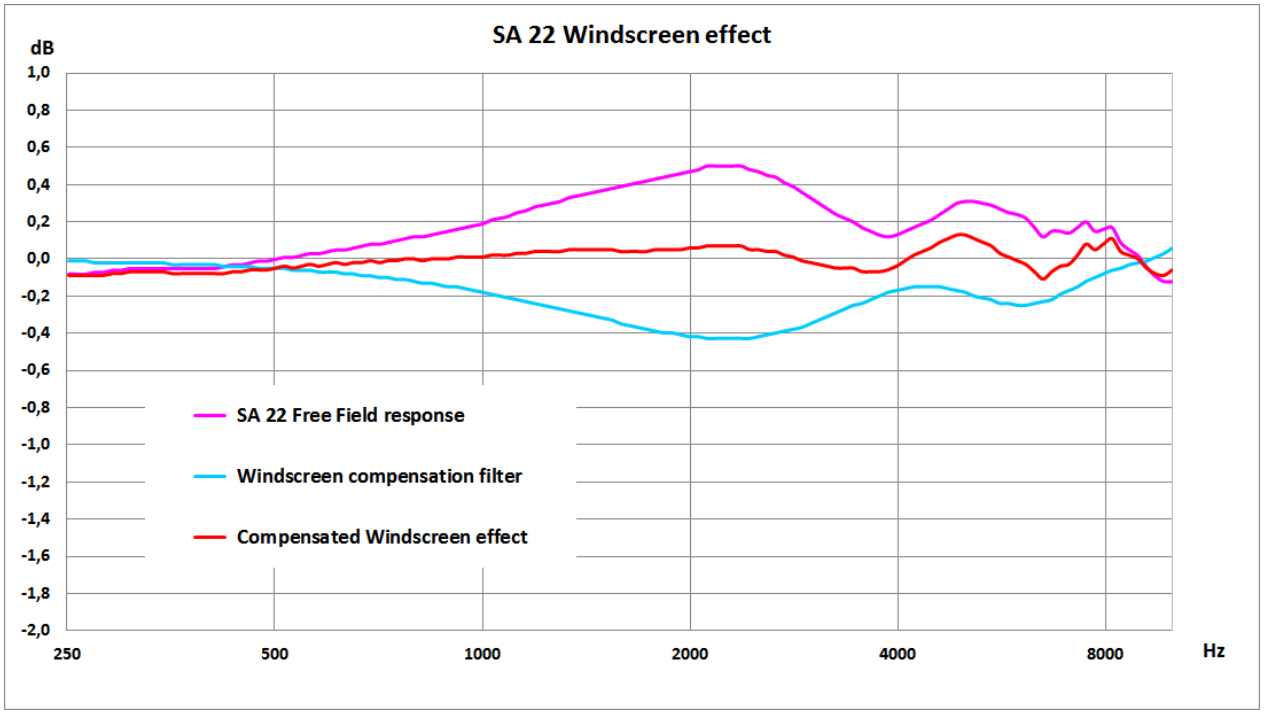


Table C.15. SA 22 windscreen effect

Frequency	SA 22 Free Field response	Compensation filter	SA 22 Compensated Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
251	-0.08	-0.01	-0.09	0.20
259	-0.08	-0.01	-0.09	0.20
266	-0.08	-0.01	-0.09	0.20
274	-0.07	-0.02	-0.09	0.20
282	-0.07	-0.02	-0.09	0.20
290	-0.06	-0.02	-0.08	0.20
299	-0.06	-0.02	-0.08	0.20
307	-0.05	-0.02	-0.07	0.20
316	-0.05	-0.02	-0.07	0.20
325	-0.05	-0.02	-0.07	0.20
335	-0.05	-0.02	-0.07	0.20
345	-0.05	-0.02	-0.07	0.20
355	-0.05	-0.03	-0.08	0.20
365	-0.05	-0.03	-0.08	0.20
376	-0.05	-0.03	-0.08	0.20
387	-0.05	-0.03	-0.08	0.20
398	-0.05	-0.03	-0.08	0.20
410	-0.05	-0.03	-0.08	0.20
422	-0.04	-0.04	-0.08	0.20
434	-0.03	-0.04	-0.07	0.20
447	-0.03	-0.04	-0.07	0.20
460	-0.02	-0.04	-0.06	0.20
473	-0.01	-0.05	-0.06	0.20
487	-0.01	-0.05	-0.06	0.20

Frequency	SA 22 Free Field response	Compensation filter	SA 22 Compensated Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
501	0.00	-0.05	-0.05	0.20
516	0.01	-0.05	-0.04	0.20
531	0.01	-0.06	-0.05	0.20
546	0.02	-0.06	-0.04	0.20
562	0.03	-0.06	-0.03	0.20
579	0.03	-0.07	-0.04	0.20
596	0.04	-0.07	-0.03	0.20
613	0.05	-0.07	-0.02	0.20
631	0.05	-0.08	-0.03	0.20
649	0.06	-0.08	-0.02	0.20
668	0.07	-0.09	-0.02	0.20
688	0.08	-0.09	-0.01	0.20
708	0.08	-0.10	-0.02	0.20
729	0.09	-0.10	-0.01	0.20
750	0.10	-0.11	-0.01	0.20
772	0.11	-0.11	0.00	0.20
794	0.12	-0.12	0.00	0.20
818	0.12	-0.13	-0.01	0.20
841	0.13	-0.13	0.00	0.20
866	0.14	-0.14	0.00	0.20
891	0.15	-0.15	0.00	0.20
917	0.16	-0.15	0.01	0.20
944	0.17	-0.16	0.01	0.20
972	0.18	-0.17	0.01	0.20
1000	0.19	-0.18	0.01	0.20
1029	0.21	-0.19	0.02	0.20
1059	0.22	-0.20	0.02	0.20
1090	0.23	-0.21	0.02	0.20
1122	0.25	-0.22	0.03	0.20
1155	0.26	-0.23	0.03	0.20
1189	0.28	-0.24	0.04	0.20
1223	0.29	-0.25	0.04	0.20
1259	0.30	-0.26	0.04	0.20
1296	0.31	-0.27	0.04	0.20
1334	0.33	-0.28	0.05	0.20
1372	0.34	-0.29	0.05	0.20
1413	0.35	-0.3	0.05	0.20
1454	0.36	-0.31	0.05	0.20
1496	0.37	-0.32	0.05	0.20
1540	0.38	-0.33	0.05	0.20
1585	0.39	-0.35	0.04	0.20
1631	0.40	-0.36	0.04	0.20
1679	0.41	-0.37	0.04	0.20
1728	0.42	-0.38	0.04	0.20
1778	0.43	-0.39	0.05	0.20
1830	0.44	-0.4	0.05	0.20
1884	0.45	-0.40	0.05	0.20
1939	0.46	-0.41	0.05	0.20
1995	0.47	-0.42	0.06	0.20
2054	0.48	-0.42	0.06	0.20
2113	0.50	-0.43	0.07	0.20
2175	0.50	-0.43	0.07	0.20
2239	0.50	-0.43	0.07	0.20

Frequency	SA 22 Free Field response	Compensation filter	SA 22 Compensated Effect	Uncertainty (IEC 62585:2012)
[Hz]	[dB]	[dB]	[dB]	[dB]
2304	0.50	-0.43	0.07	0.20
2371	0.50	-0.43	0.07	0.20
2441	0.48	-0.43	0.05	0.20
2512	0.47	-0.42	0.05	0.20
2585	0.45	-0.41	0.04	0.20
2661	0.44	-0.40	0.04	0.20
2738	0.41	-0.39	0.02	0.20
2818	0.39	-0.38	0.01	0.20
2901	0.36	-0.37	-0.01	0.20
2985	0.33	-0.35	-0.02	0.20
3073	0.30	-0.33	-0.03	0.20
3162	0.27	-0.31	-0.04	0.20
3255	0.24	-0.29	-0.05	0.20
3350	0.22	-0.27	-0.05	0.20
3447	0.20	-0.25	-0.05	0.20
3548	0.17	-0.24	-0.07	0.20
3652	0.15	-0.22	-0.07	0.20
3758	0.13	-0.20	-0.07	0.20
3868	0.12	-0.18	-0.06	0.20
3981	0.13	-0.17	-0.04	0.20
4097	0.15	-0.16	-0.01	0.30
4217	0.17	-0.15	0.02	0.30
4340	0.19	-0.15	0.04	0.30
4467	0.21	-0.15	0.06	0.30
4597	0.24	-0.15	0.09	0.30
4732	0.27	-0.16	0.11	0.30
4870	0.30	-0.17	0.13	0.30
5012	0.31	-0.18	0.13	0.30
5158	0.31	-0.20	0.11	0.30
5309	0.30	-0.21	0.09	0.30
5464	0.29	-0.22	0.07	0.30
5623	0.27	-0.24	0.03	0.30
5788	0.25	-0.24	0.01	0.30
5957	0.24	-0.25	-0.01	0.30
6131	0.22	-0.25	-0.03	0.30
6310	0.17	-0.24	-0.07	0.30
6494	0.12	-0.23	-0.11	0.30
6683	0.15	-0.22	-0.07	0.30
6879	0.15	-0.19	-0.04	0.30
7079	0.14	-0.17	-0.03	0.30
7286	0.17	-0.15	0.02	0.30
7499	0.20	-0.12	0.08	0.30
7718	0.15	-0.10	0.05	0.30
7943	0.16	-0.08	0.08	0.30
8175	0.17	-0.06	0.11	0.30
8414	0.09	-0.05	0.04	0.30
8660	0.05	-0.03	0.02	0.30
8913	0.02	-0.02	0.00	0.30
9173	-0.04	-0.01	-0.05	0.30
9441	-0.09	0.01	-0.08	0.30
9716	-0.12	0.03	-0.09	0.30
10000	-0.12	0.06	-0.06	0.30

C.4 SPECIFICATION OF SV 973 AS 1/1 OCTAVE AND 1/3 OCTAVE ANALYZER

Statement of performance

SV 973 can operate as 1/1-octave or 1/3-octave analyser which meets requirements of the international IEC 61260-1:2014 standard for the pass band filters for the Class 1 instruments. For sound analysis, its accuracy results from the accuracy of the Sound Level Meter - see Chapters C.1 for specification.

Note: *Simultaneously to the frequency analysis SV 973 operates as a Sound Level Meter - see Chapters C.1 for specification.*

Signal input

SV 973 microphone input throughout the SL 973 adapter

Maximum input voltage:

SV 973 meets the requirements of IEC 348 for the 2nd Class devices. The input voltage shall not exceed the limits between 0 V and +3 V.

SL 973 the input voltage shall not exceed the limits between -3 V and +3 V.

Impedance:

SV 973 differential input: ≤ 94 kΩ, ≤ 50 pF each.

SL 973 ≤ 10900 Ω, ≤ 30 pF, single ended input.

Linear Operating Range

Table C.16. Linear operating range with SL 973

Weighting	**Linear operating range** (with 10 dB margin from noise) (**RMS** for the sinusoidal signal at reference conditions @ 1 kHz, 0.0 dB calibration factor)	
A	from 20.2 μV_{RMS}	to 1135 mV_{RMS}
B	from 20.2 μV_{RMS}	to 1135 mV_{RMS}
C	from 20.2 μV_{RMS}	to 1135 mV_{RMS}
Z	from 63.8 μV_{RMS}	to 1135 mV_{RMS}

Table C.17. Peak for the sinusoidal signal 1 kHz, at reference conditions with SL 973 (@ 128 dB Peak indication)

Peak for the sinusoidal signal **1 kHz**, at reference conditions @ 1 kHz (0.0 dB calibration factor)	
Weighting	**Max Peak value**
A	1.605 V
B	1.605 V
C	1.605 V
Z	1.605 V

Measuring frequency range 5 Hz ÷ 11.2 kHz with the **Z** filter (-3 dB)

Centre Frequency Ranges for 1/1 Octave 31.5 Hz ÷ 8 kHz

Centre Frequency Ranges for 1/3 Octave 20 Hz ÷ 10 kHz

RMS detector

- Digital — "True RMS" with Peak detection
- Resolution — 0.1 dB
- Range — 327.7 dB
- Crest Factor — unlimited (for signals in 10 kHz band)

Reference conditions as per IEC 61260-1:2014

- Reference frequency — 1000 Hz
- Reference level — 114 dB
- Reference temperature — from +20°C to +26°C
- Reference relative humidity — from 35% to 65%

Calibration (electrical)

Calibration level 0.11 V_{RMS} (@ 114 dB indication)

Basic accuracy < ± 0.2 dB (for the temperature T=+23°C ± 5°C for sinusoidal signal 114 dB_{RMS} in the band 20 Hz ÷ 10 kHz with the **Z** input filter)

Measurement error in the full temperature range

< ± 0.1 dB when the temperature is from -10°C to +50°C for the sinusoidal signal 114 dB_{RMS} in the band 20 Hz ÷ 10 kHz with the **Z** input filter.

Overload detector

The instrument has the built-in overload detectors. Both A/D converter and input amplifier overload conditions are detected. The overload in the measurement channel (in its analogue part) and the overload of the analogue / digital converter are both detected. The "overload" indication appears when the input signal amplitude is 0.5 dB above the declared "Peak measurement range".

Warm-up time / Auto-start delay	1 min. (for 0.1 dB accuracy)
Effect of humidity	< 0.5 dB (for 30%<RH<90% at 40°C)
Effect of magnetic field	below electrical noise level (for 80 A/m and 50 Hz)

Antialiasing filter

Built-in electric anti-aliasing filter ensuring correct sampling of the measured signal.

Built-in antialiasing filter. On-chip digital filter of the analogue-to-digital converter, ensuring correct sampling of the measured signal.

Pass band (-3 dB)	11.3 kHz
Stop band	14.4 kHz
Attenuation in the stop band	> 50 dB
Sampling frequency	24 kHz
Analogue to digital converter	sigma-delta 24 bit
Input attenuator accuracy	± 0.1 dB (for f = 1 kHz and T = +23°C)
Internal oscillator accuracy	0.01 % (for f = 1 kHz and T = +23°C).

Digital Filters

Weighting filters

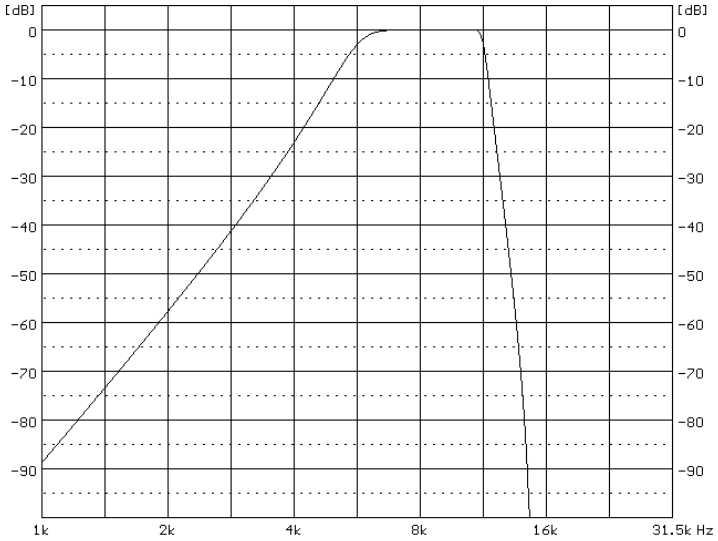
- A meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “A” filter,
- C meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “C” filter,
- Z meeting requirements of the IEC 61672-1:2013 standard for the Class 1 “Z“ filter,
- B meeting IEC651 for the Type 1 filter

See Chapter C.5 for the A, C, B and Z filter characteristics,

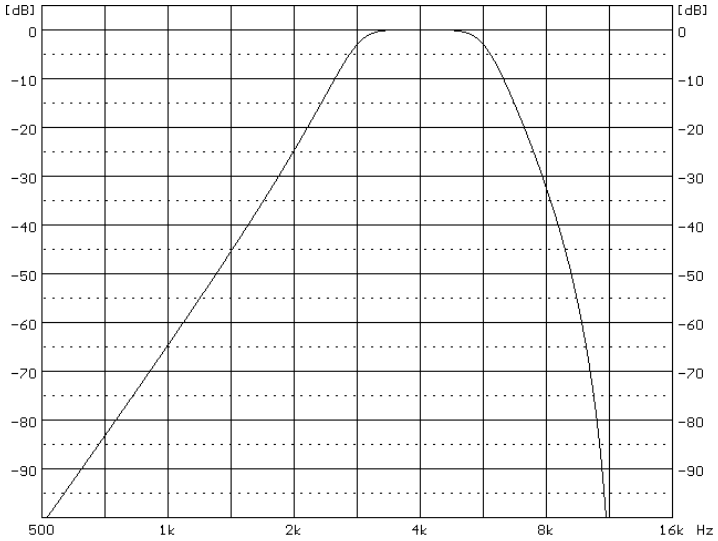
Noise levels (measured with the **SL 973** and source impedance **50 Ω**, **Microphone** compensation switched-off)

”**Z**” weighting	< 7.1 μV_{RMS} (30 dB)
”**A**” weighting	< 2.2 μV_{RMS} (20 dB)
”**C**” weighting	< 2.2 μV_{RMS} (20 dB)
”**B**” weighting	< 2.2 μV_{RMS} (20 dB)

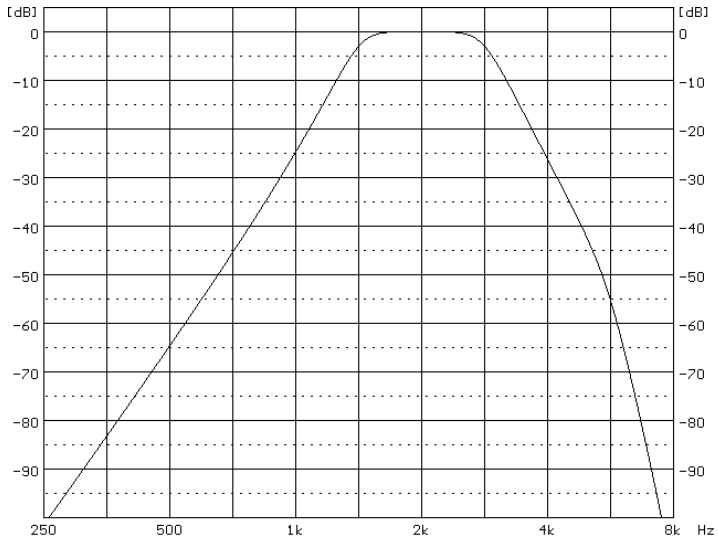
1/1 Octave filters 9 filters with centre frequencies from 31.5 Hz to 8 kHz (base 10), meeting IEC 61260-1:2014 standard for Class 1.



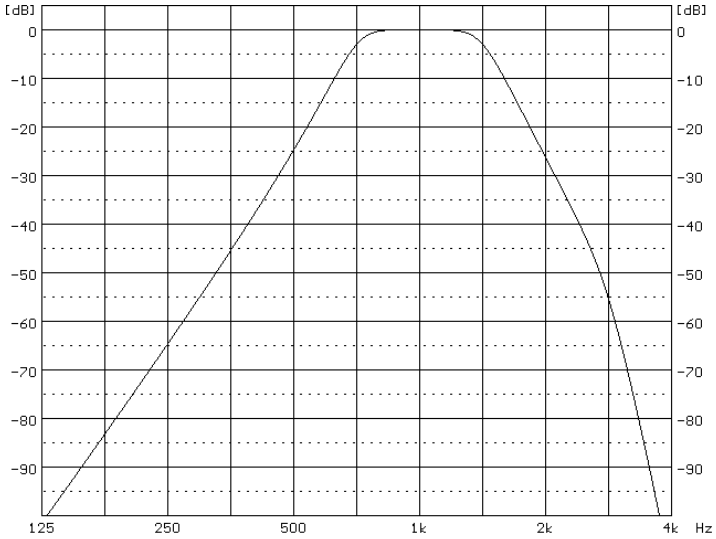
8.0 kHz 1/1 octave filter



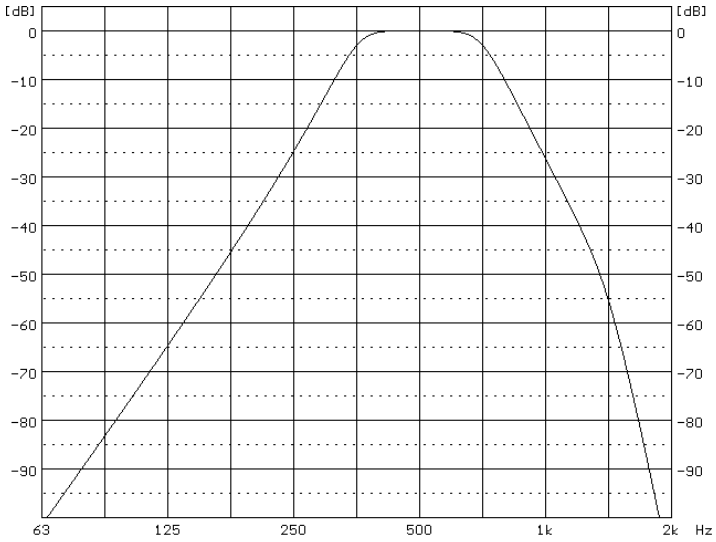
4.0 kHz 1/1 octave filter



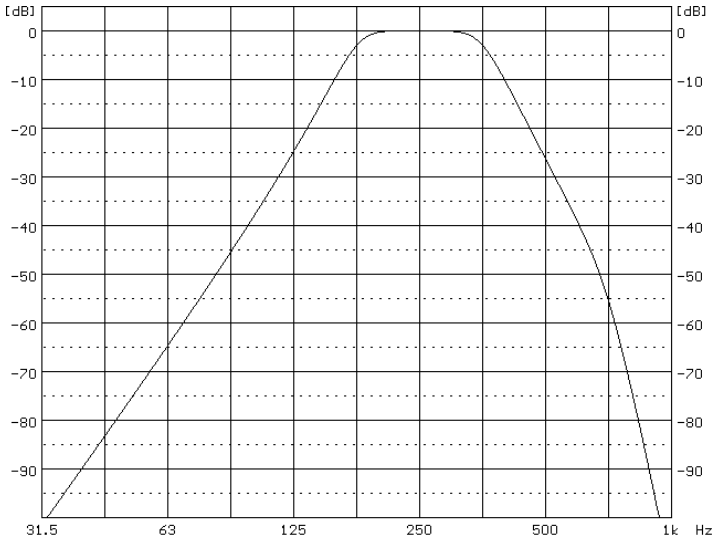
2.0 kHz 1/1 octave filter



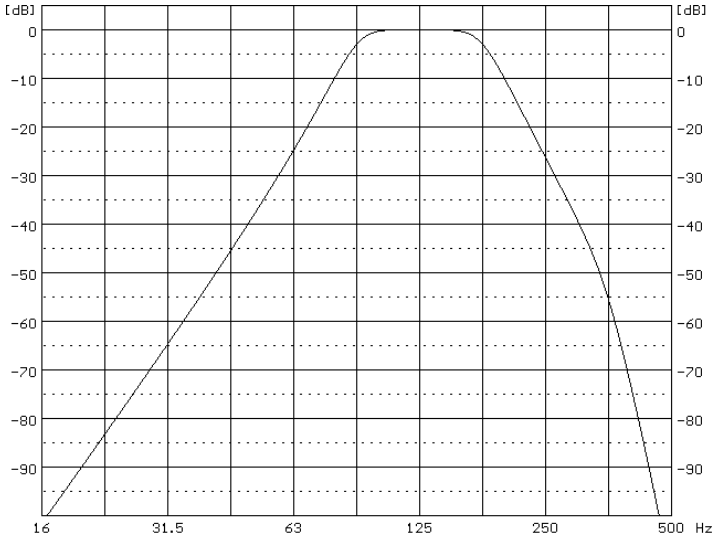
1.0 kHz 1/1 octave filter



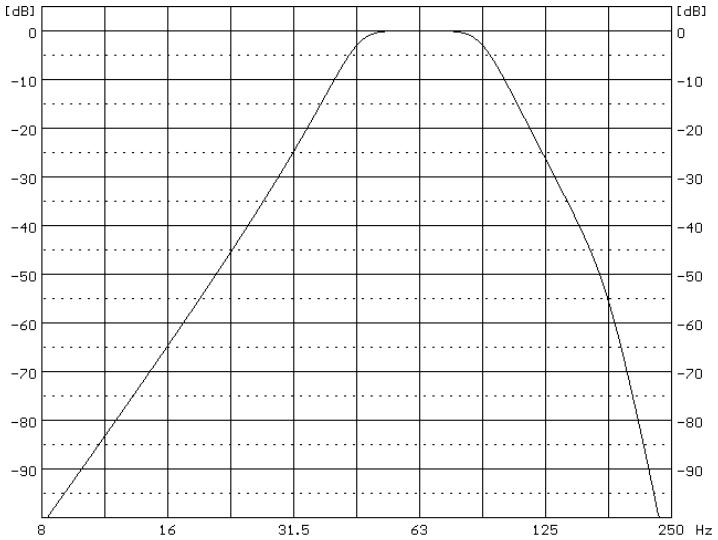
500 Hz 1/1 octave filter



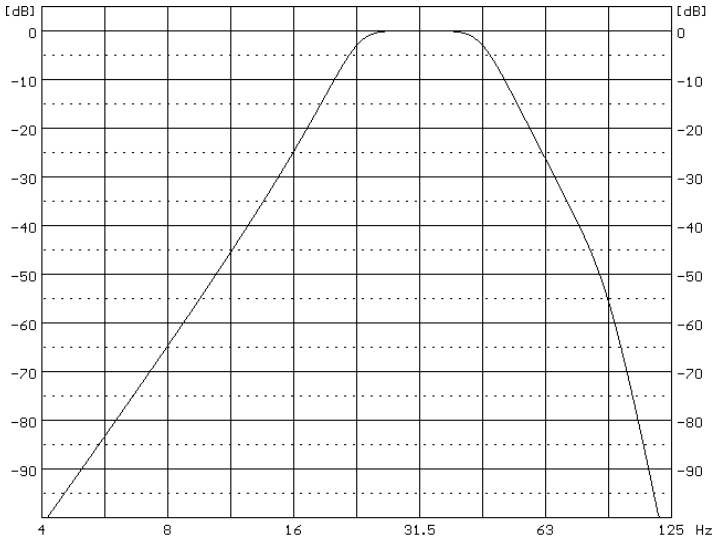
250 Hz 1/1 octave filter



125 Hz 1/1 octave filter

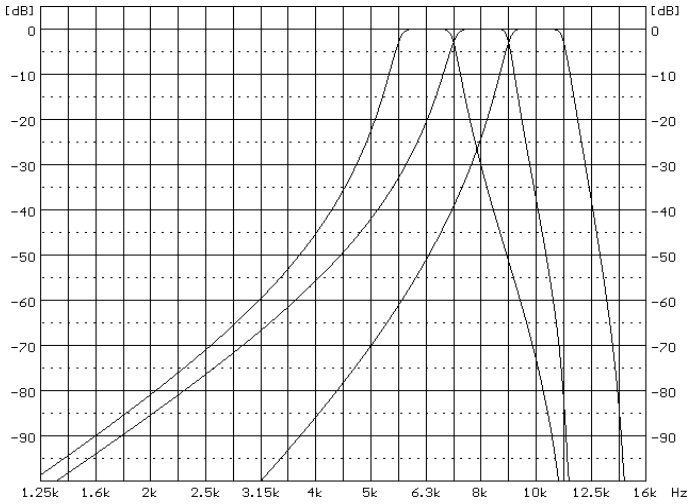


63.0 Hz 1/1 octave filter

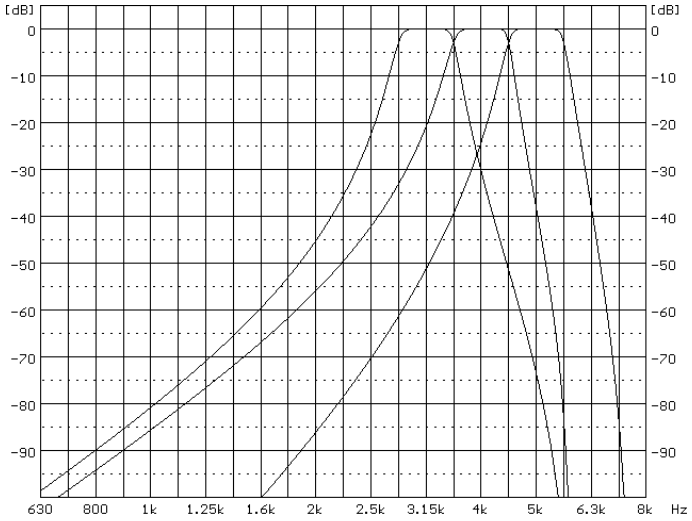


31.5 Hz 1/1 octave filter

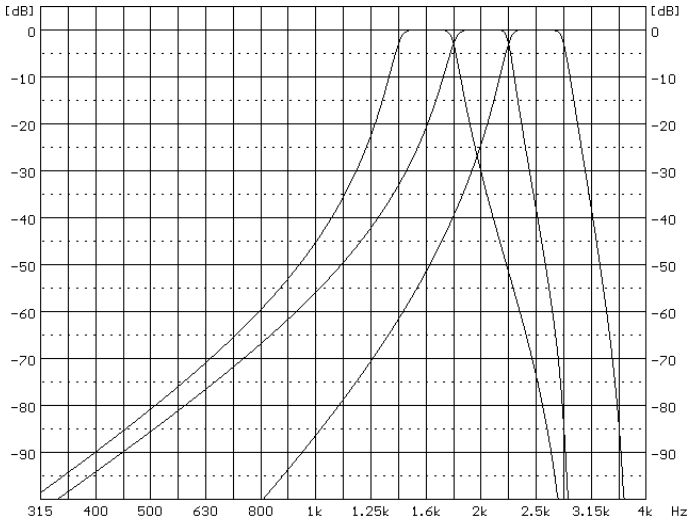
1/3 Octave filters 28 filters with centre frequencies from 20 Hz to 10 kHz (base 10), IEC 61260-1:2014 standard for Class 1.



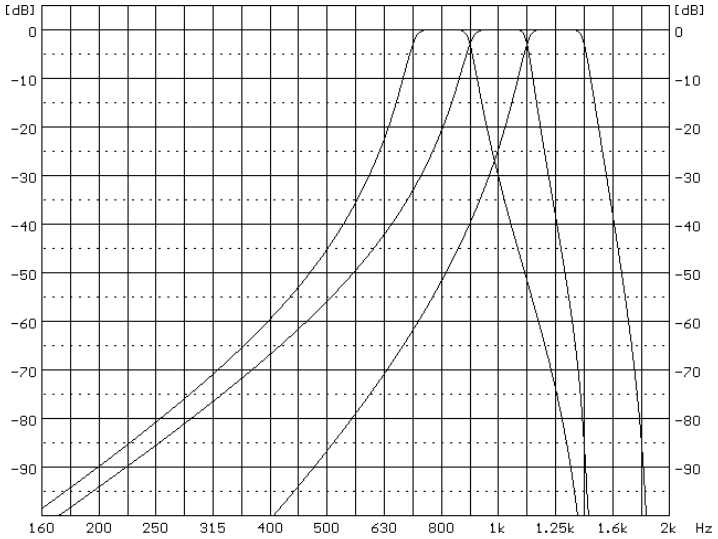
1/3 octave filters for 8.0 kHz 1/1 octave filter



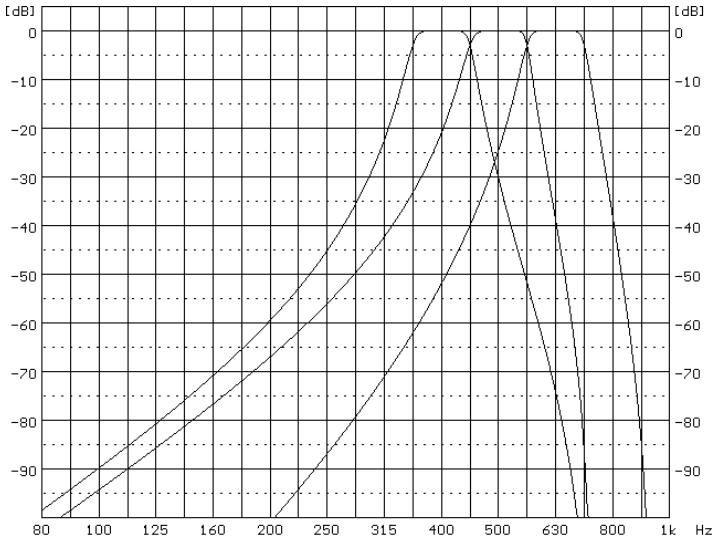
1/3 octave filters for 4.0 kHz 1/1 octave filter



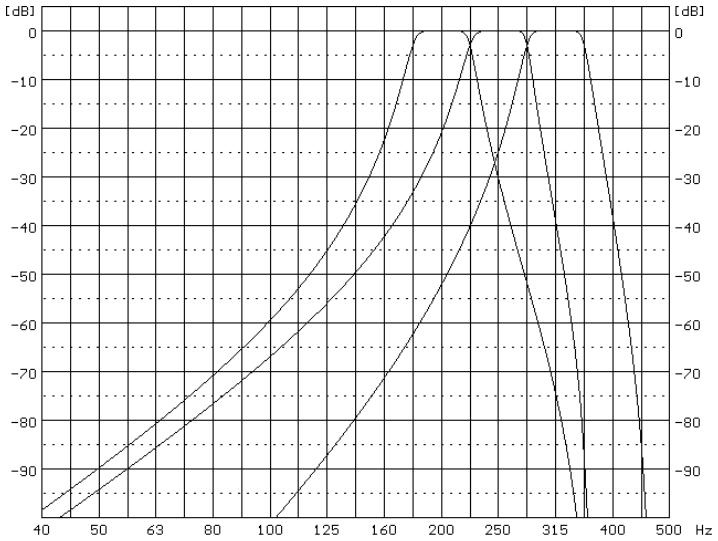
1/3 octave filters for 2.0 kHz 1/1 octave filter



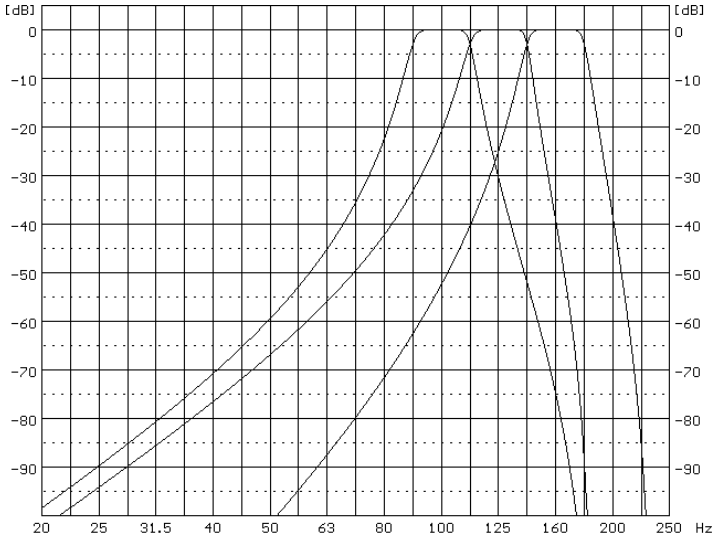
1/3 octave filters for 1.00 kHz 1/1 octave filter



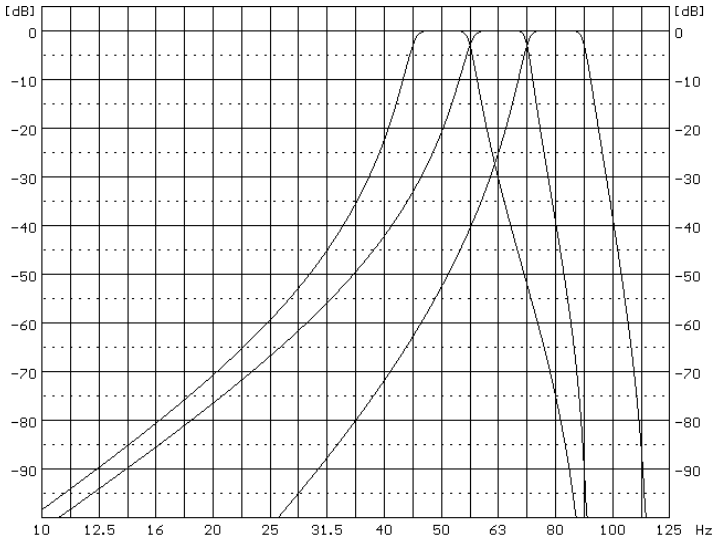
1/3 octave filters for 500 Hz 1/1 octave filter



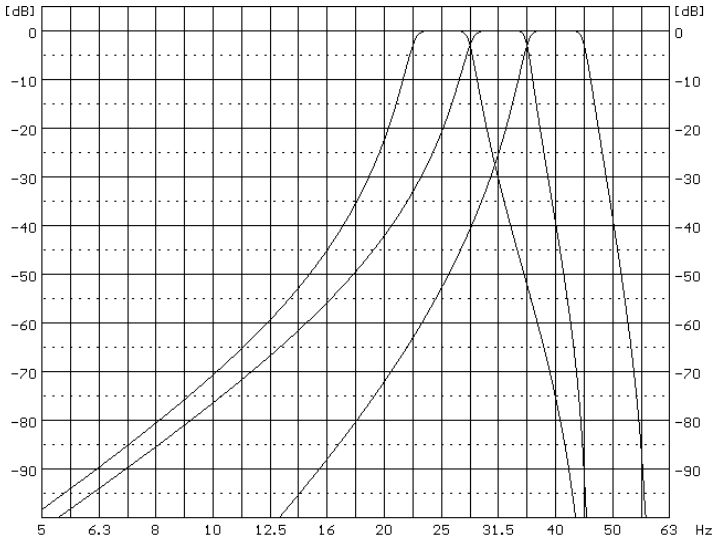
1/3 octave filters for 250 Hz 1/1 octave filter



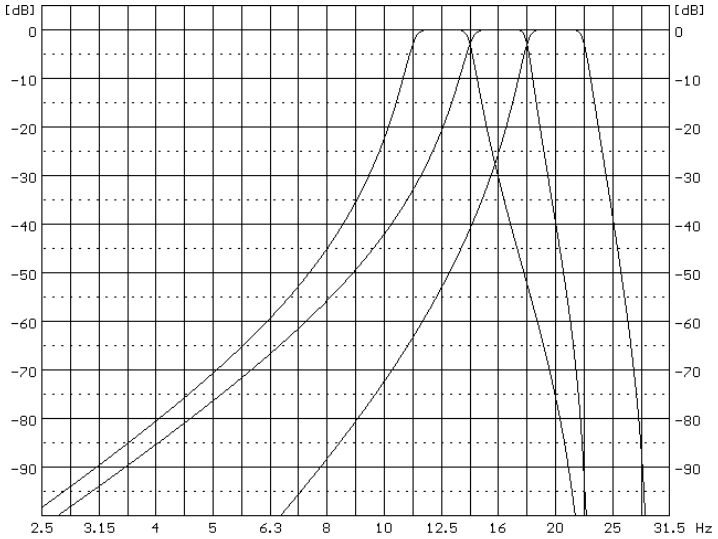
1/3 octave filters for 125 Hz 1/1 octave filter



1/3 octave filters for 63.0 Hz 1/1 octave filter



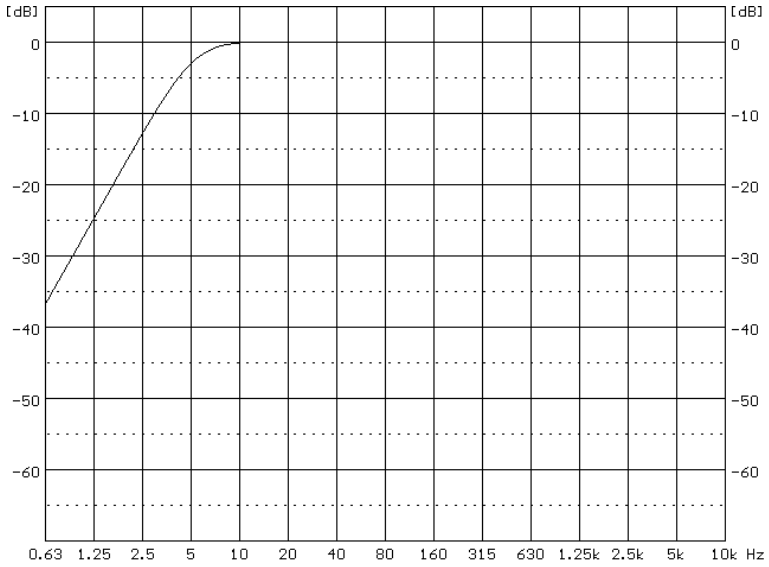
1/3 octave filters for 31.5 Hz 1/1 octave filter



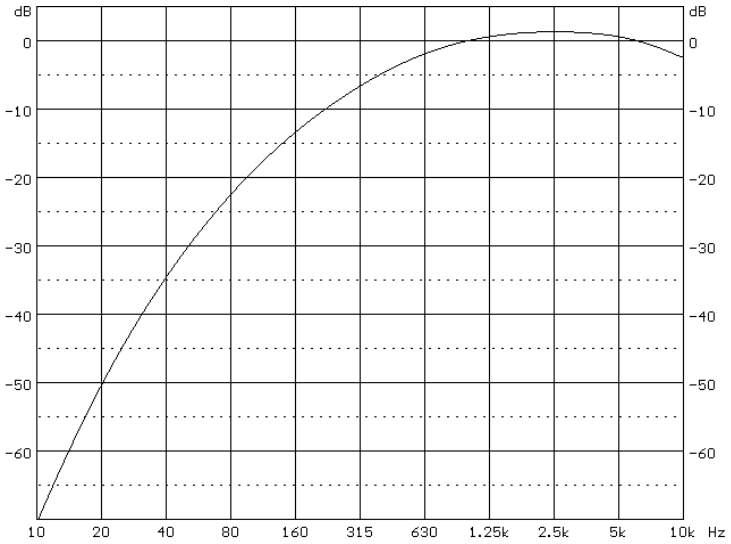
1/3 octave filters for 16.0 Hz 1/1 octave filter

C.5 FREQUENCY CHARACTERISTICS OF THE IMPLEMENTED DIGITAL FILTERS

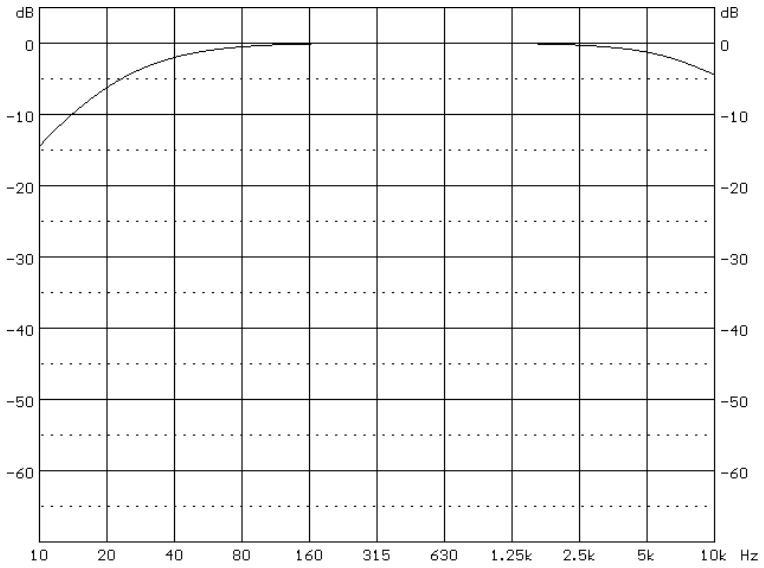
Z Filter: Class 2 according to the IEC 61672-1:2013 standard.



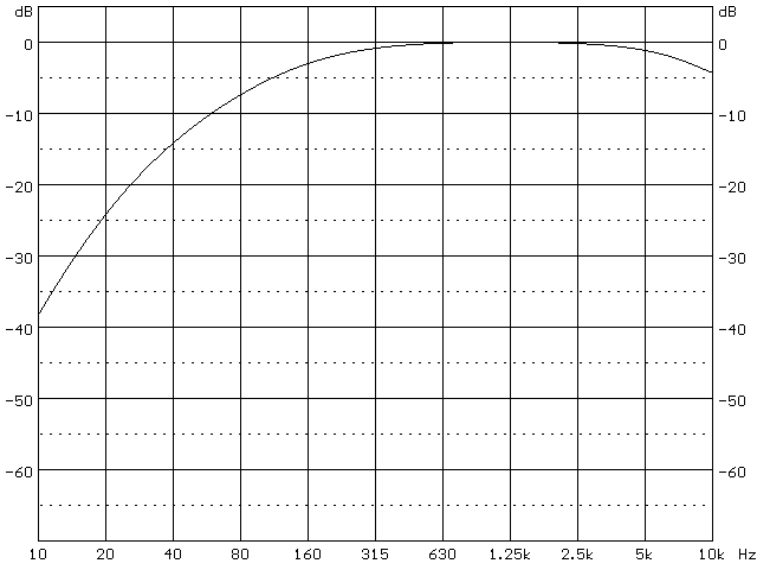
A Filter: Class 2 according to the IEC 61672-1:2013 standard.



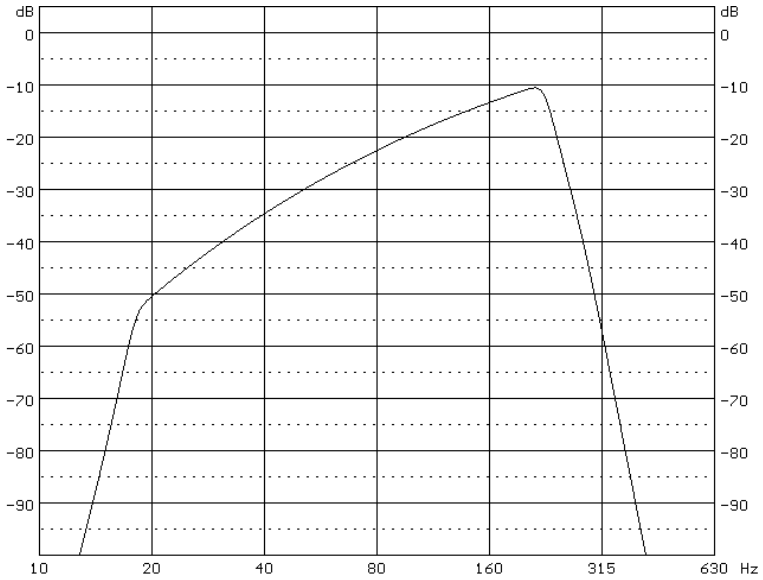
C Filter Class 2 according to the IEC 61672-1:2013 standard.



“B” filter Class 2 according to the IEC 651



“LF” filter according to EPA-93-F105-02-104 Low Frequency Noise Control Regulations

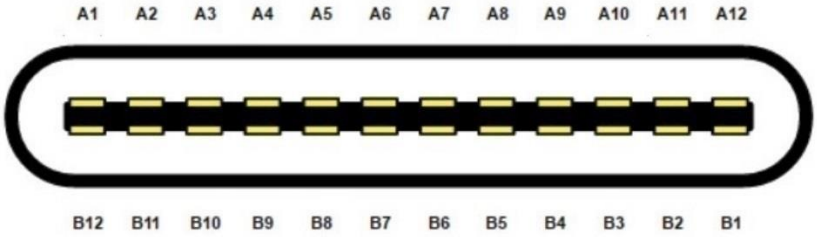


C.6 MISCELLANEOUS SPECIFICATION OF SV 973

Display	Super contrast OLED color display (96 x 96 pixels).
Memory	4 MB flash memory and 2MB + 320 kB RAM memory.
Memory card	Internal 8 GB micro SD card.

Microphone input

The SV 973 microphone input uses USB-C connector:



Microphone connector

Table C.18. Pin out of the microphone connector

ST 30 connector		SV 973 connector		Signal name	Description
Contact no.		Contact no.			
A1	B1	A1	B1	VA_TEDS	MEMS Microphones Supply Voltage / TEDS I/O
A2	B2	A2	B2	MIC_TMP	MEMS Microphones Temperature Measurement
A3	B3	A3	B3	S3_N	MEMS 3 Differential Signal Output, phase N
A4	B4	A4	B4	S3_P	MEMS 3 Differential Signal Output, phase P
A5	B5	A5	B5		
A6	B6	A6	-		
A7	B7	A7	-		
A8	B8	A8	B8	MIC_GND	Ground / Shell
A9	B9	A9	B9	S1_N	MEMS 1 Differential Signal Output, phase N
A10	B10	A10	B10	S1_P	MEMS 1 Differential Signal Output, phase P
A11	B11	A11	B11		
A12	B12	A12	B12		

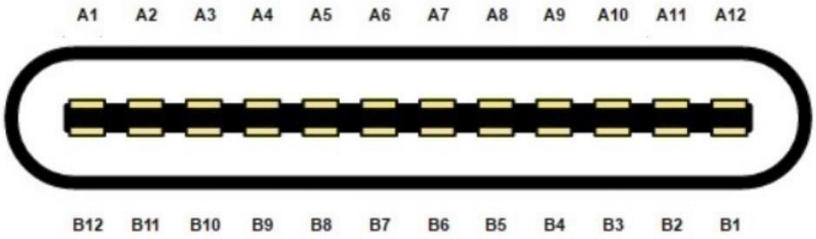
Note: *This connector is dedicated to the microphone. Do not connect standard USB-C cables!*

SV 973 back cover (external view) with mini USB-C socket and Battery screw

Interface USB Type C

The SV 973 USB-C 2.0 interface enables remote control of the instrument and data transfer with the speed up to that attainable with 480 MHz clock.

The USB-C interface can work as external power source for the meter.



USB-C socket (external view)

Table C.19. Pin-out of the USB-C device connector

Contact no.		Signal name	Description
A1	B1	GND	Ground return
A2	B2	SSTXp1	not used
A3	B3	SSTXn1	not used
A4	B4	V_{BUS}	Bus power (5VDC ±0.5V)
A5	B5	CC1	Configuration channel (5.1kΩ to ground as UFP receiver)
A6	B6	Dp1	USB 2.0 differential pair, position 1, positive
A7	B7	Dn1	USB 2.0 differential pair, position 1, negative
A8	B8	SBU1	not used
A9	B9	V_{BUS}	Bus power (5VDC ±0.5V)
A10	B10	SSRXn2	not used
A11	B11	SSRXp2	not used
A12	B12	GND	Ground return

RS 232 interface (optional)

The RS 232 interface option for SV 973 is provided by means of the **SP 75** interface. It conforms to the EIA Standard RS 232C. It enables the user to programme remotely all instrument functions and the transmissions to and from the meter with the speed from 1200 bit/s to 115200 bit/s.

Note: *The SP 75 must be connected to the SV 973 USB port and proper operation of this port has to be set-up in the instrument's SETUP Menu before!*

The SP 75 - DB 09 F - pin female connector pin-out is given below.

Table C.20. SP 75 interface description

PC RS 232, 9 - pin connector Signal name	SP 75 connector (DB 09 F) Pin number
1 – LSD	1 (not connected)
2 – RXD	3
3 – TXD	2
4 – DTR	6 connected to pin 4
5 – GND	5
6 – DSR	4 connected to pin 6
7 – RTS	8
8 – CTS	7
9 – GND	9 (not connected)

Power Supply

Instrument is dedicated for the operation from the internal four replaceable AAA batteries. Power consumption from the 6V source is approx. 40 mA (at + 20°C). So, typical operating time from 4 x AAA alkaline batteries will be about **20 hours**. Measurements with the display off extend the working time to more than 30 h.

SV 973 can be also powered from the AAA Class rechargeable batteries.

Note: *For the temperatures below 0°C operating time can decree (depending on the batteries)!*

Real Time Clock

Built-in real time. Accuracy better than 1 minute/month.

Wireless Bluetooth 4.2 Connectivity

This dosimeter supports wireless connection via Bluetooth® 4.2 (Low energy). This connectivity is compatible with mobile and PC devices that support Bluetooth® 4.2.

- TX power: up to 8 dBm
- Receiver sensitivity: -90 dBm
- Range: typically >50m line-of-sight and depending on local RF conditions.

The instrument contains a wireless transmission module, BGM121 from Silicon Laboratories technologies. Copies of the modules regional approvals certificates may be obtained from Svantek or Silicon Laboratories.

- Declaration ID: D033250, Controller Subsystem Qualified Design ID: 88831

FCC and ISEDC

This product contains an FCC and Industry Canada certified Bluetooth® Low energy wireless transmission module:

- **FCC IDENTIFIER:** QOQBGM12LMA
- **Industry Canada IC:** 5123A-BGM12LMA
- Producer: Silicon Laboratories Inc.
- Model: BGM121A Bluetooth smart module
- Modular Type: Single Modular

FCC Statements:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter meets both portable and mobile limits as demonstrated in the RF Exposure Analysis and SAR test report. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

ISEDC Statements:

This radio transmitter has been approved by Industry Canada to operate with its embedded antenna. Other antenna types are strictly prohibited for use with this device. This device complies with Industry Canada's license-exempt RSS standards. Operation is subject to the following two conditions:

(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Exception from routine SAR evaluation limits are given in RSS-102 Issue5. BGM121N meets the given requirements when the minimum separation distance to human body is less than equal to 15 mm. RF exposure or SAR evaluation is not required when the separation distance is 15 mm or more. BGM121A module has been tested for worst case RF exposure. As demonstrated in the SAR test report, BGM121A and BGM123A can be mounted in touch with human body without further SAR evaluation.

Weight with the battery	225 g (including microphone and preamplifier).
Dimensions	20x52x232 mm .

Environmental parameters

- Working temperature range -10°C ÷ +50°C
- Storing temperature range -20°C ÷ +50°C (-30°C ÷ +60°C without batteries)
- Humidity 90% RH in 40°C (uncondensed vapour)

Compliance with EU Directives (see Chapter C.7)

CE mark indicates compliance with RED Directive 2014/53/EU (see DECLARATION OF CONFORMITY):

- Art 3.1a: Safety
- Art 3.1b: Electromagnetic Compatibility
- Art 3.2: Radio.

Note: *Electromagnetic compatibility is guaranteed only with the original accessories supplied by SVANTEK!*

C.7 DECLARATION OF CONFORMITY

Manufacturer:	**SVANTEK Sp. z o. o**
Address:	Strzyglowska 81 04-872 Warszawa Poland
Kind of product:	SOUND LEVEL METER
Type:	SV 973
Directive:	**Directive 2014/53/EU** of The European Parliament and of The Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (OJ L 153/62 of 22.5.2014).
Standards:	
Art 3.1a: Safety	EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
Art 3.1b: EMC	ETSI EN 301 489-1 V2.1.1. Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU. ETSI EN 301 489-17 V3.1.1. Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU. EN 61000-4-2:2009. Electromagnetic compatibility (EMC). Testing and measurement techniques. Part 4-2; Electrostatic discharge immunity test. EN 61000-4-8:2010. Electromagnetic compatibility (EMC). Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test. EN 61000-4-20:2010. Electromagnetic compatibility (EMC). Testing and measurement techniques. Part 4-20: Emission and immunity testing in traverse electromagnetic (TEM) waveguides.
Art 3.2: Radio	ETSI EN 300 328 V2.1.1. Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU.
Directive:	**Restriction of Hazardous Substances** (ROHS II) 2011/65/EU
Standards:	EN 50581:2012 *Assessment of electronic products with respect to RoHS* **Auxiliary industry standards:** EN 61672-1:2013. Electroacoustics - Sound level meters – Part 1: Specifications. EN 61260-1:2014. Octave-band filters

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:

$$r(t) = \begin{cases} p_W(t) & \text{RMS Integration = Lin} \\ p_{W\tau}(t) & \text{RMS Integration = Exp} \end{cases}$$

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

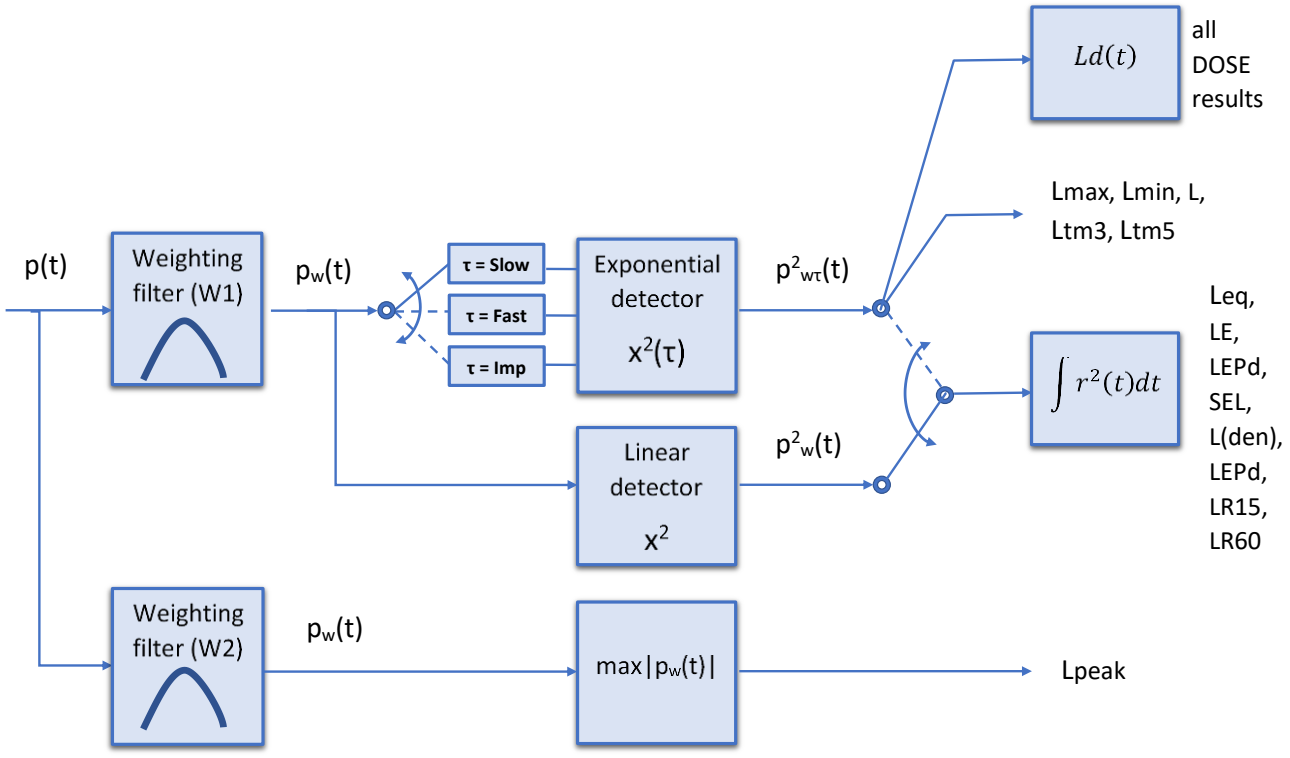
$$L_d(t) = L(t)$$

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**).

$$\mathbf{Leq = 10\log\left(\frac{1}{T}\int_0^T (r(t)/p_0)^2 dt\right)}$$

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**).

$$\mathbf{SEL = 10\log\left(\int_0^T (r(t)/p_0)^2 dt\right) = Leq + 10\log\frac{T}{1s}}$$

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:
$\mathbf{T_d}$ (day-time) starts from 6 am and ends at 6 pm,
$\mathbf{T_e}$ (evening-time) starts from 6 pm and ends at 10 pm,
$\mathbf{T_n}$ (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:
$\mathbf{T_d}$ (day-time) starts from 7 am and ends at 7 pm,
$\mathbf{T_e}$ (evening-time) starts from 7 pm and ends at 11 pm,
$\mathbf{T_n}$ (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

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.

EX

Expected value. Calculated on the basis of 100ms Leq results.

SD

Standard deviation. Calculated on the basis of 100ms Leq results.

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.

$$\mathbf{DOSE} = \frac{100\%}{T_{8h}} \int_0^T 10^{\frac{L_d(t)-L_c}{q}} dt$$

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**.

$$PSEL = LEQ + 10 \cdot \log \frac{T}{T_{8h}}$$

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 DEFINITIONS AND FORMULAS OF THE ADDITIONAL RUNNING LEQ FUNCTION RESULTS

LR15

15-minutes running Leq is the rolling (sliding) Leq window for the last 15 minutes of measurement (900 seconds) moving with 1 second step

$$LR15 = 10 \log \left(\frac{1}{900s} \int_{T-900}^{T} \left(r(t)/p_0 \right)^2 dt \right)$$

Note: *If the current time period of the measurement **T** is less then 15 minutes then **LR15** result is undefined.*

LR60 60-minutes running Leq is the rolling (sliding) Leq window for the last 60 minutes of measurement (3600 seconds) moving with 1 second step

$$LR60 = 10 \log \left(\frac{1}{3600s} \int_{T-3600}^{T} (r(t)/p_0)^2 dt \right)$$

Note: *If the current time period of the measurement **T** is less then 60 minutes then **LR60** result is undefined.*

D.5 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, and it depends mainly on the dynamics of the measurements performed in the instrument. There are 120 classes in the instrument and the width of each class is equal to 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 **nn** of the observation period.

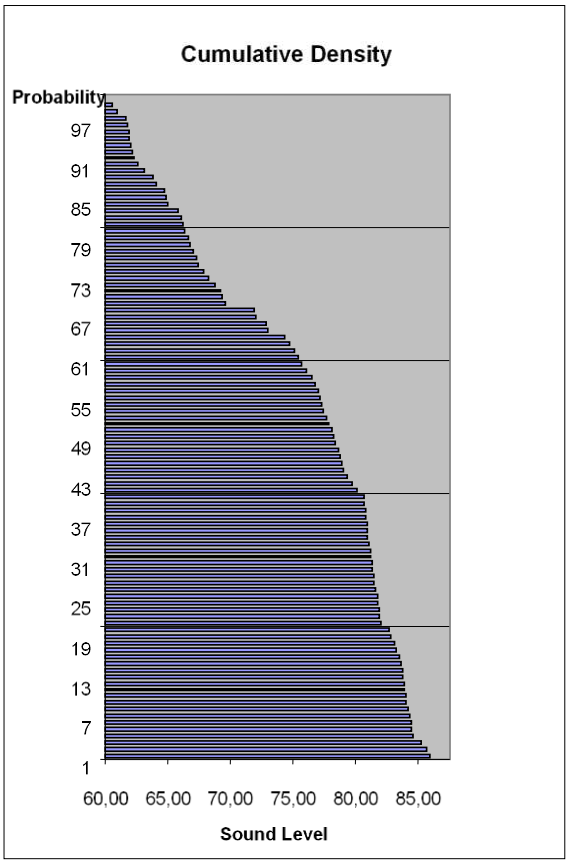
Example:

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 has to 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 display in the instrument presents only first statistical level N1 (set to: L01 up to L99).

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). The values of RT may range from fractions of a second to a few seconds and depend upon the size of the room and the nature of the materials used in its construction.

The graphs below present the reverberation time nature (in the case when only one frequency is emitted):

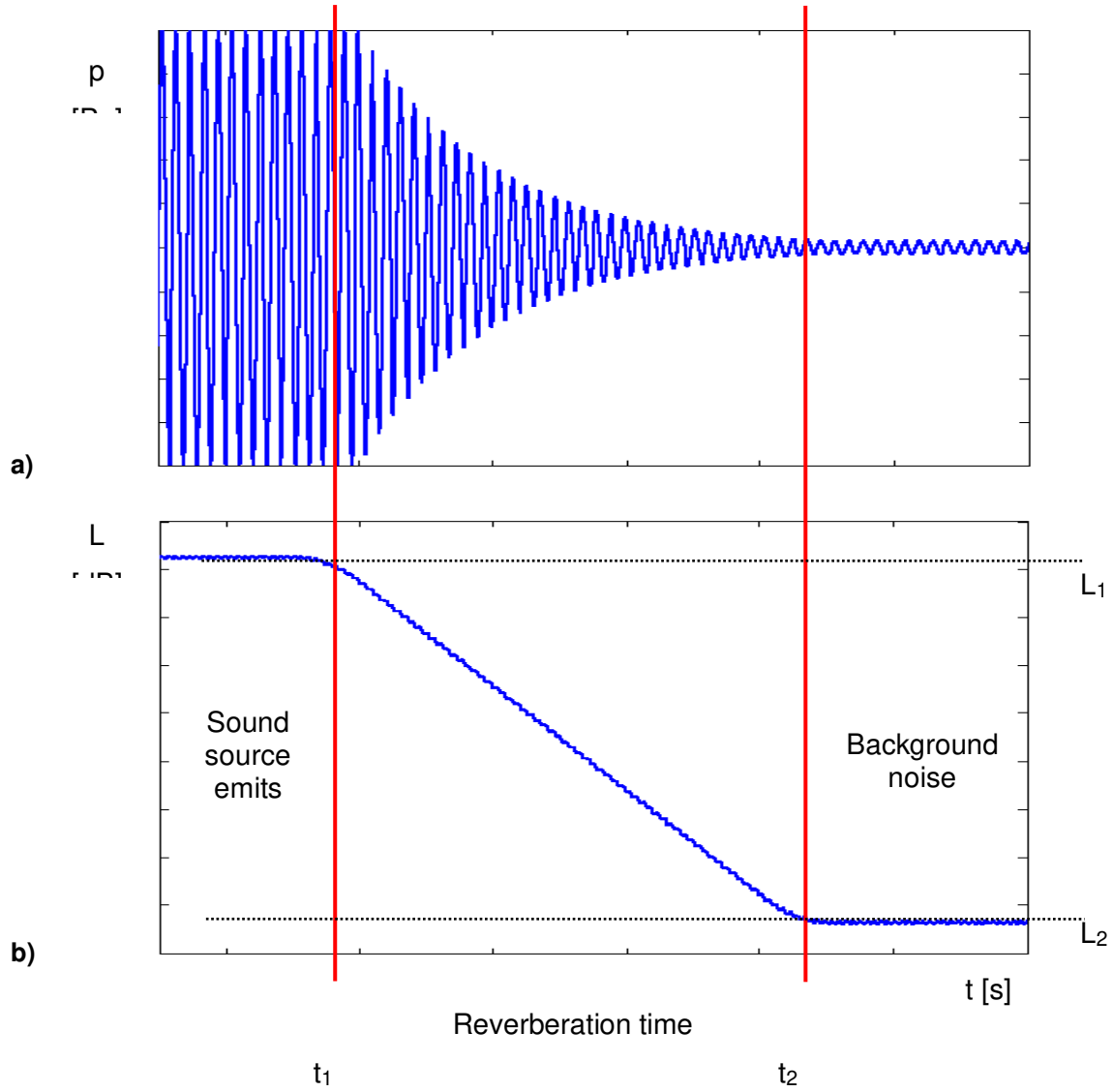


Fig 1. The acoustic pressure versus time (a) and the value of the sound pressure level versus time, so-called decay curve (b)

The marker t_1 indicates the moment when the sound source was switched off. From this moment the acoustic sound pressure / acoustic power (reflected waves propagate in the room) decreases till the moment indicated by the marker t_2. The lower graph presents so-called the **decay curve**. The reverberation time value is equal to $t_2 – t_1$ when the difference between sound pressure levels L_1 and L_2 is 60 dB. The 60 dB dynamic condition is impractical in real measurements (very difficult to fulfil) hence the reverberation time (RT 60) is obtained

using the slope coefficient of the decay curve. The type of the definition from which slope coefficient is calculated (EDT, RT 20, RT 30 or user defined) depends on the difference between levels L_1 and L_2 (the difference between background noise level and sound source level) of the decay curve and it depends on significantly from the acoustic source ability. If the level difference is larger 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 presented on graphs in Figure 1. In order to point out the interesting decay curve region (the position of the markers t_1 and t_2) some measurement data processing (in general signal smoothing by averaging) need to be applied.

E.2. DEFINITIONS AND CALCULATION OF THE RT 60 REVERBERATION TIME

- **EDT (early decay time):**

The EDT decay curve region is pointed out by markers t_1 and t_3 (cf. Fig. 2). It is checked whether the selected decay curve region has proper dynamics for the EDT calculation:

$$\mathbf{L_1 - L_2 >= 10\ dB}$$

$$\mathbf{L_2 - L_3 >= noise\ margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_1 (with L_1 level) and t_2 (with L_2) are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. Before approximation the EDT value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{EDT = -60.0 / a}$$

In case of the **decay method**, the EDT value is calculated according to the formula:

$$\mathbf{EDT = 6 \cdot (t_2 - t_1)}$$

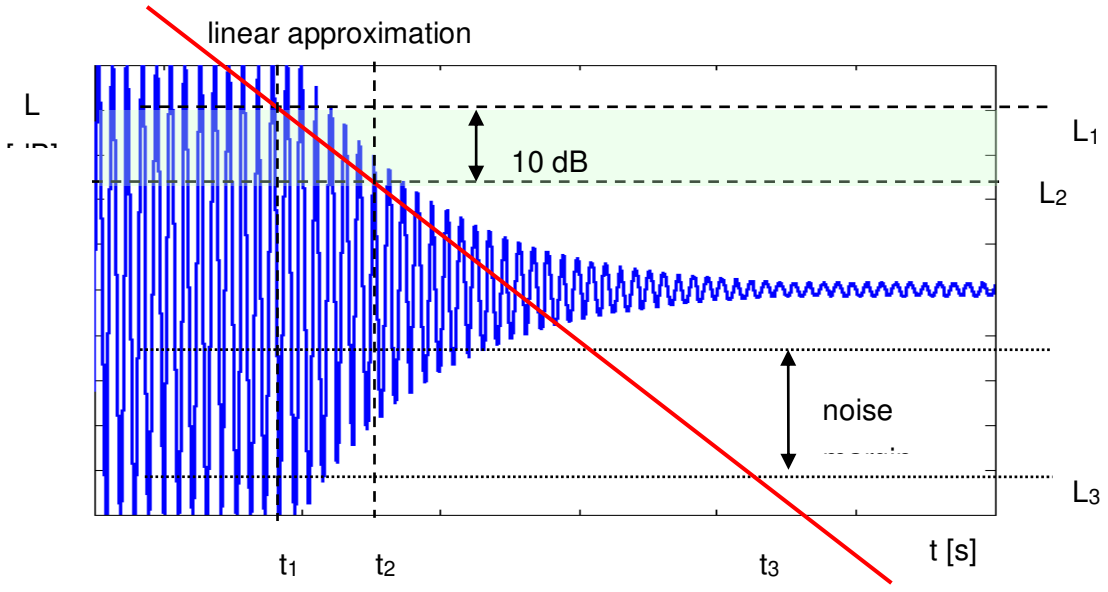


Fig 2. The EDT evaluation

- **RT 20 (reverberation time calculated with 20 dB dynamics):**

The RT 20 decay curve region is pointed out by markers t_1 and t_4 (cf. Fig. 3). It is checked whether the selected decay curve region has proper dynamics for the RT 20 calculation:

$$\mathbf{L_1 - L_4 > 5\ dB + 20\ dB + noise\ margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. The RT 20 value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{RT\ 20 = -\ 60.0\ /\ a}$$

In case of the **decay method**, the RT 20 value is calculated according to the formula:

$$\mathbf{RT\ 20 = 3 \cdot (t_3 - t_2)}$$

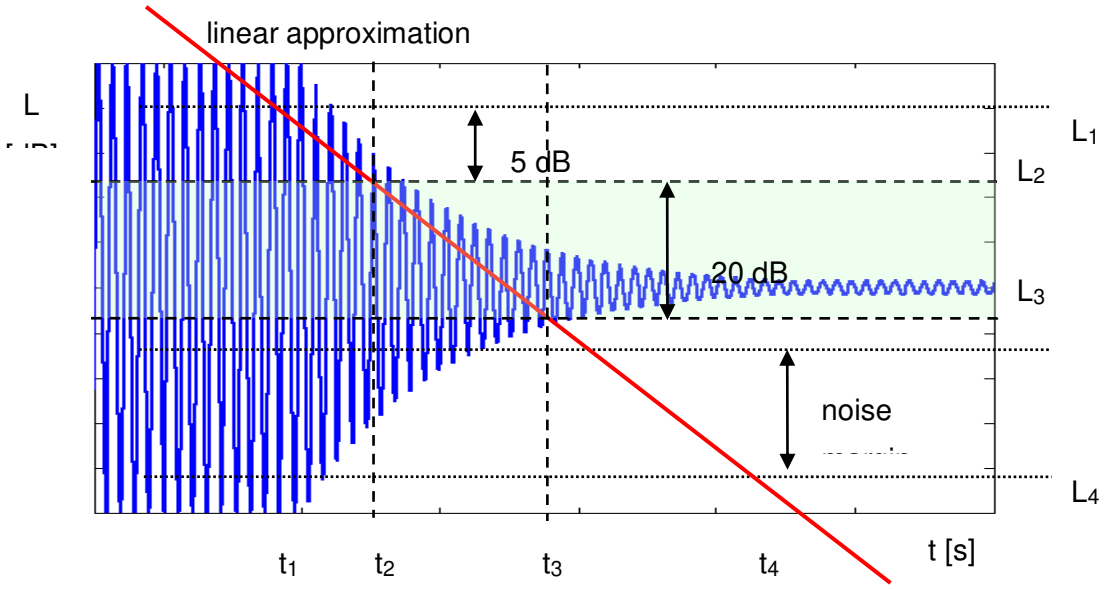


Fig 3. The RT 20 evaluation

- **RT 30 (reverberation time calculated with 30 dB dynamics):**

The RT 30 decay curve region is pointed out by markers t_1 and t_4 (cf. Fig. 4). It is checked whether the selected decay curve region has proper dynamics to the RT 30 calculation:

$$\mathbf{L_1 - L_4 > 5 + 30\ dB + noise\ margin}$$

It is recommended by the ISO-3382 standard to set 10 dB value for noise margin.

In case of the **impulse method**, the sound pressure level values between points t_2 and t_3 are approximated with the straight line ($y = a \cdot x + b$) by the linear regression. The RT 30 value is calculated using the slope coefficient 'a' according to the formula:

$$\mathbf{RT\ 30 = -\ 60.0\ /\ a}$$

In case of the **decay method**, the RT 30 value is calculated according the formula

$$\mathbf{RT\ 30 = 2 \cdot (t_3 - t_2)}$$

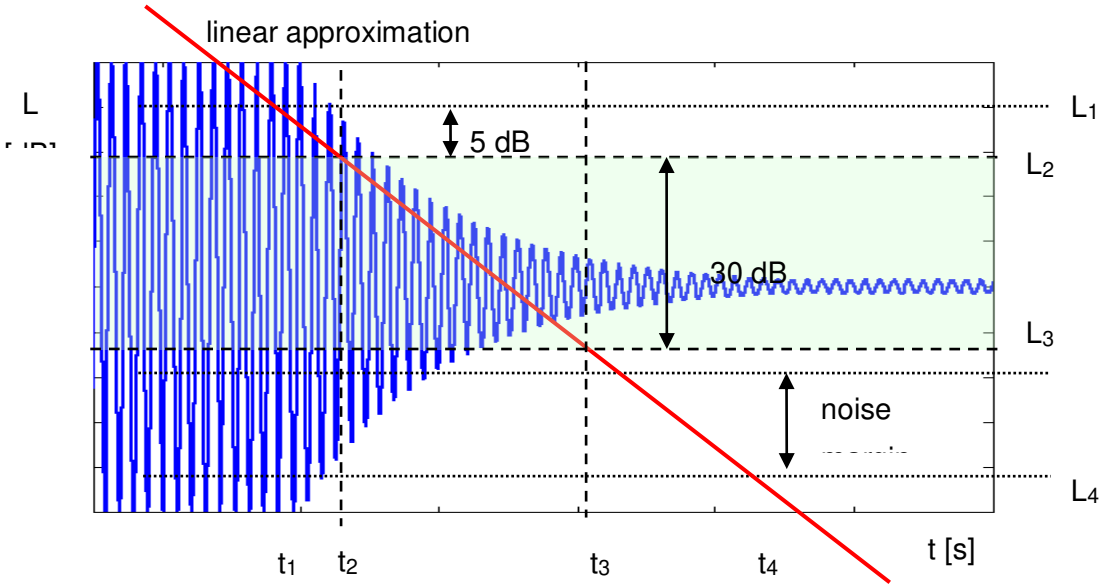


Fig 4. The RT 30 evaluation

E.3. DESCRIPTION OF THE DECAY CURVE RECORDING IN DIFFERENT MEASUREMENT METHODS

➢ **DECAY method**

This RT 60 measurement method requires omnidirectional sound source which emits pink noise in appropriate frequency band. The most critical parameter of the omnidirectional sound source is emitted sound pressure level as it was mentioned in the beginning of the appendix.

The graphical illustration of the data recording in this method is presented in Figure 5.

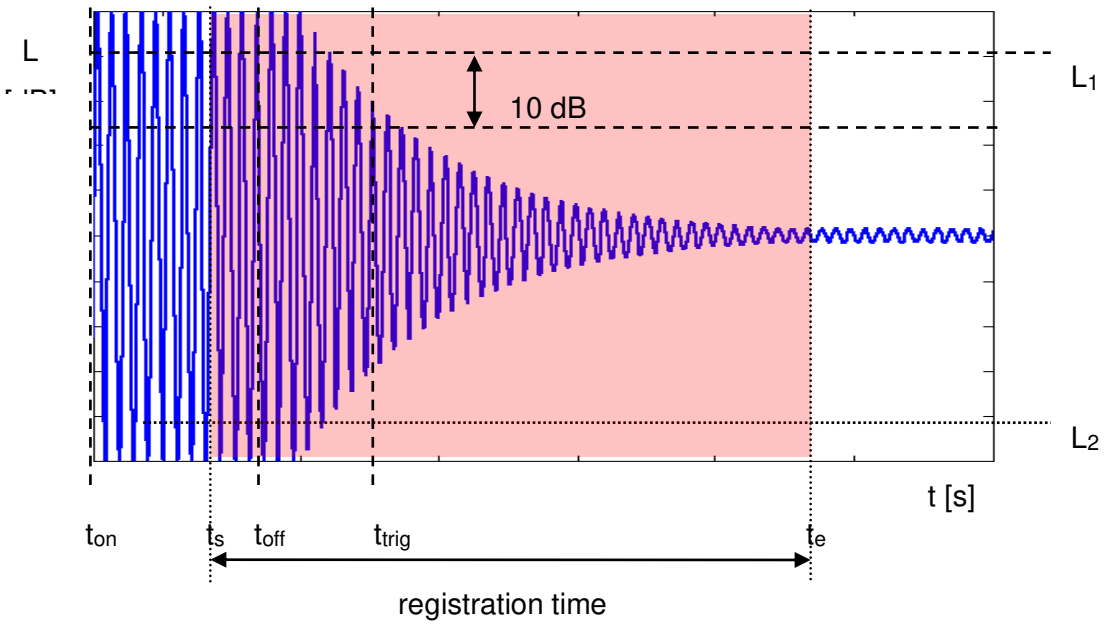


Fig 5. Data recording in the decay method of the reverberation time evaluation

The measurement time in this method consists of:

- The time between markers t_{on} and t_{off} in which the omnidirectional sound source emits acoustic power and the SVAN xxx analyser measures the actual sound pressure level.
- The time between markers t_{off} and t_{trig} in which the omnidirectional sound source is switched off and the SVAN xxx instrument waits for trigger condition fulfilment.
- The time between markers t_s and t_{trig} registered since the trigger condition fulfilment back till point t_s to allow recognising the beginning of the decay region. In the SVAN xxx instruments this time is equal to the **Time Step** (*path: <Menu> / Measurement / RT60 Settings*) parameter value multiplied by 50.
- The time between markers t_{trig} and t_e registered since t_{trig} forward to record whole decay curve together with significantly long period of the noise level. This time in SVAN xxx instruments is adjusted by **Recording Time** (*path: <Menu> / Measurement / RT60 Settings*) parameter.

The above graph shows that the proper setting of the **Recording Time** value is very important. The registration time has to be long enough to acquire sufficient number of background noise level values. In other case the decay curve region could not be properly analysed or decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than expected reverberation time.

➢ **IMPULSE method**

In the Impulse method, Reverberation Time is computed by using the reverse-time integrated impulse response. This way of measuring sound decay was introduced firstly 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*

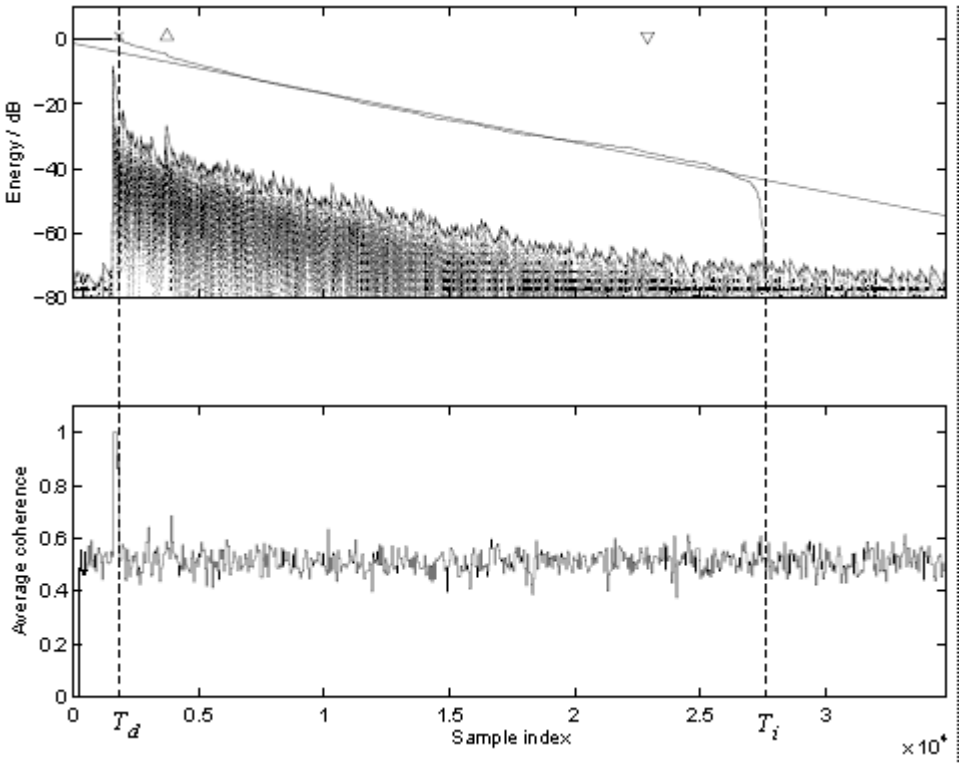


Fig. 6 An example of Schroeder integration with the limits Ti and Td

This RT 60 measurement method requires impulse sound source like pistol, petard or other sound source which emits impulse signal with very high sound pressure level.

The graphical illustration of data registering in this method is presented in Figure 7.

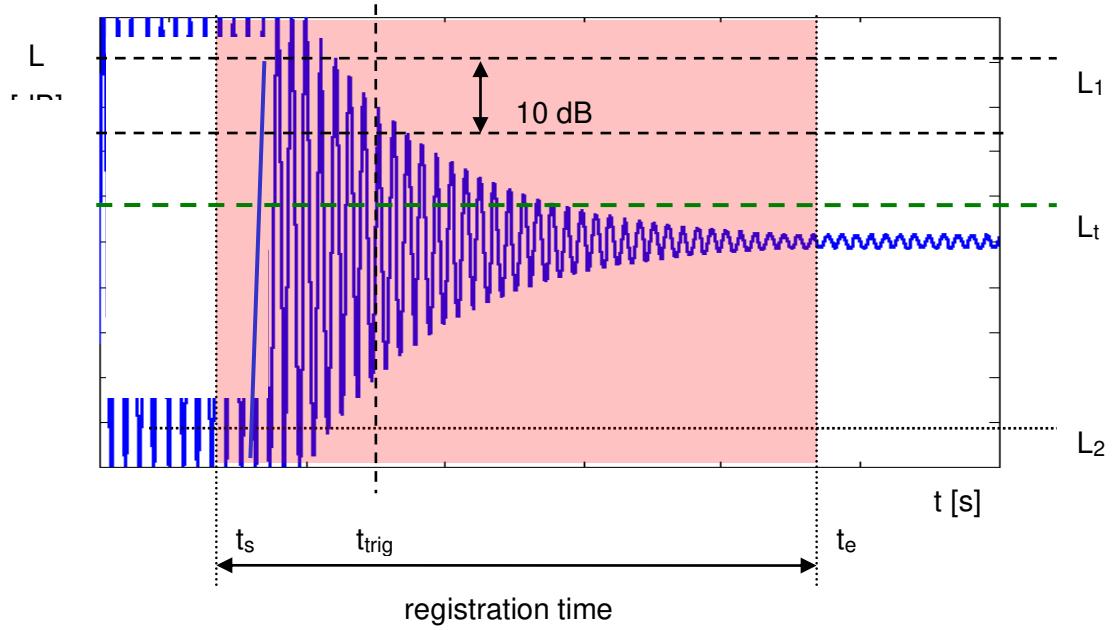


Fig 7. Data recording in the impulse method of the reverberation time evaluation

The measurement time in this method consists of:

- The time before marker t_{trig} in which the SVAN xxx analyser measures the actual sound pressure level and waits for the very high impulse sound pressure level which will fulfil the trigger condition. The trigger conditions will be fulfilled only when emitted impulse has maximal sound pressure level higher than L_t level (cf. Fig. 6). The L_t level in the SVAN xxx analyser is adjusted by parameter **Level** (*path: <Menu> / Measurement / RT60 Settings*).
- The time between markers t_s and t_{trig} registered since the trigger condition fulfilment back till point t_s to allow recognising the beginning of the decay region. In the SVAN xxx instruments this time is equal to the **Time Step** (*path: <Menu> / Measurement / RT60 Settings*) parameter value multiplied by 50.
- The time between markers t_{trig} and t_e registered since t_{trig} forward to record whole decay curve together with significantly long period of the noise level. This time in SVAN xxx instruments is adjusted by **Recording Time** (*path: <Menu> / Measurement / RT60 Settings*) parameter.

The above graph shows that the proper setting of the **Recording Time** value is very important. The registration time has to be long enough to acquire sufficient number of background noise level values. In other case the decay curve region could not be properly analysed or decay region could not fulfil the dynamic condition mentioned above. It is recommended to set the **Recording Time** parameter two times longer than expected reverberation time.